



# City of Stockbridge

## Minimum Development Standards

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Prepared By



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## ARTICLE I: DEFINITIONS

### Section 101: Interpretation of Certain Terms and Words

For the purposes of this document, certain words or terms used herein are interpreted as follows: Additional definitions may be found in individual Articles.

- A. The words "shall," "must," and "will," are mandatory in nature, implying an obligation or duty to comply with the particular provision.
- B. The word "may" is permissive in nature.
- C. Words used in the present tense include the future tense.
- D. Words used in the singular number include the plural number and the plural number includes the singular number, unless the context of the particular usage clearly indicates otherwise.
- E. Words used in the masculine gender include the feminine gender.
- F. The word "person" includes a firm, association, organization, partnership, trust, company or corporation, as well as an individual.
- G. The word "lot" includes the words "plot" or "parcel".
- H. The word "used" or "occupied" as applied to any land or building shall be construed to include the words "intended", "arranged", or "designed to be used or occupied".
- I. Any act authorized by this document to be carried out by a specific official or agency of the City is impliedly authorized to be carried out by a designee of such official or agency. Any transfer of duties to a different official impliedly transfers the authority to carry out acts under this ordinance.
- J. The time within which an act is to be done shall be computed by excluding the first and including the last day; if the last day is a Saturday, Sunday or a legal holiday, that day shall be excluded.
- K. Any words and terms not defined herein shall have the meaning indicated by common dictionary definition.
- L. Any reference to State of Georgia or Federal statutes shall be construed to be a reference to the most recent enactment of such statute and shall include any amendments as may from time to time be adopted.

**Section 102: Definitions**

Except as specifically defined herein, all words used in this ordinance have their customary dictionary definition. Additional definitions may be found in individual Articles.

**Access:** A way or means of approach or entrance by which pedestrians, vehicles, or both shall have safe, adequate, and usable ingress/egress to a property or use. A private access is an access not in public ownership and controlled by means of deed, dedication, or easement.

**Abutting:** Having property boundaries or lot lines in common with no separation by a street, alley or other right-of-way.

**Acre:** A measure of land equating to 43,560 square feet.

**Adequate channel:** A natural or man-made channel or pipe that is capable of conveying the runoff from the applicable storm design without overtopping its banks or eroding, after development of the site in question.

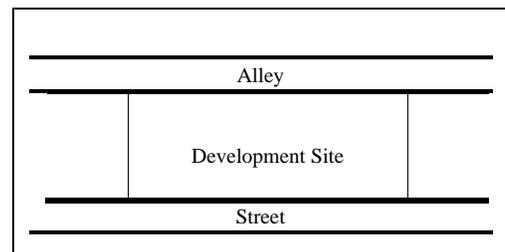
**Adjacent/adjoining:** Abutting or being directly across a street, alley, other rights-of-way or waterways.

**Administrative Officer:** The City Manager of the City of Stockbridge, or his or her duly authorized representative.

**Alley:** A public or private thoroughfare which affords only a secondary means of access to abutting property.

**ANSI:** The American National Standards Institute, Inc.

**Appeal:** A request for a review of an Administrative Officer's interpretation of any provision of this ordinance, or an action taken by an Administrative Officer in the application or enforcement of this ordinance.



**Applicant:** A person seeking any determination or approval under, or permits required by, this ordinance.

**Application:** An application for development approval that contains the supporting documentation required by this ordinance.

**Arborist:** A professional in the practice of arboriculture, which is the cultivation, management, and study of individual trees, shrubs, vines, and other perennial woody plants.

**Architect:** A person who, by reason of his knowledge of the mathematical and physical sciences and the principles of architecture and architectural design, acquired by professional

education, practical experience or both, is qualified to engage in the practice of architecture as attested by the issuance to said person of a license as an architect by the State of Georgia.

Area: The area of a property shown to the nearest whole square foot.

Area of Special Flood Hazard: The land in the flood plain within a community subject to a one (1) percent or greater chance of flooding in any given year.

Arterial Street: A major highway with full or partial control of access.

ASCE: The American Society of Civil Engineers.

ASSHTO: The American Association of State Highway and Transportation Officials.

ASTM: The American Society of Testing and Materials.

AWWA: The American Water Works Association.

Base Flood (100-year Flood): A flood having a one (1) percent chance of being equaled or exceeded in any given year.

Base Flow: The normal flow in a stream after the impact of any specific rainfall event has dissipated.

Basement: That portion of the building having its floor sub-grade (below ground level).

Bench: The space left between the upper edge of a cut and toe of an embankment to break the continuity of an otherwise long slope.

Berm: A mound of earth or embankment, linear in dimension, which intercepts or diverts the flow of water down a slope, or visually interrupts the line of sight to provide visual interest, screen views, reduce noise or fulfill other such purposes.

Bike Lane: Paved and marked lane on the side of a roadway or other path designed and marked specifically for bicycle traffic.

Block: A piece or parcel of land or multiple parcels, entirely surrounded by public highways or streets.

BMP or Best Management Practice: An effective practicable means of reducing the amount of pollution generated by nonpoint sources, which may be structural or nonstructural practices or a combination of practices.

Buffer: That portion of a lot or area set aside with adequate natural or planted vegetation to accomplish visual and sound screening to separate residential zoning districts from other zoning districts, or to protect and/or preserve environmentally sensitive areas and allow them to be maintained in an undisturbed and natural condition. In the event that insufficient existing vegetation or trees exist in the buffer zone, planting, fencing, or other supplemental screening shall be required, with a density or opacity to accomplish buffering as required by all approved ordinances. Roads, parking areas, above ground stormwater retention

facilities, recreational facilities, or other above ground construction shall not be permitted within the required buffer area. Public right-of-way and utility easements may be part of a buffer. Required buffer areas are in addition to required yard areas.

**Building:** Any structure, either temporary or permanent, above or below ground, having a roof or other covering, and designed, built, or used as a shelter or enclosure for persons, animals or property of any kind, including tents, awnings, or vehicles used for purposes of a building.

**Building Official:** The person or persons designated by the City of Stockbridge to be responsible for the administrative functions required in connection with the enforcement of the requirements in this document for the City of Stockbridge.

**Building Setback Line:** A line establishing the minimum allowable distance between the buildings, including any covered porches, and the street right-of-way or property line when measured perpendicularly thereto. In the case of corner lots or double frontage lots, front yard requirements shall be observed for those areas adjacent to street right-of-ways.

**Caliper:** A standard of measure of tree diameter of new or replacement plantings. It is defined by the American Association of Nurserymen. Caliper is the diameter of the trunk measured six (6) inches above the ground for up to and including four (4) inches in diameter and twelve (12) inches above the ground for larger sizes.

**Catchment area or basin:** Watershed; drainage basin; also, the area of such a basin.

**Cemetery:** A place used or to be used and dedicated or designated for earth interments of human remains.

**Centerline of Street:** That line surveyed and monumented by the Governing Body and designated as the center of a public street. If a centerline has not been surveyed, it shall be the line running midway between the outside curbs, ditches or pavement/improvement ends of such street, or such midway line extended.

**Channel:** Elongated open depressions in which water may, or does, flow. An elongated depression, either naturally or artificially created and of appreciable size, which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. It must have a definite bed and bank that serve to confine the water.

**Clearing:** The selective removal of vegetation from a property, whether by cutting or other means.

**Clear-Cutting:** The clearing or removal of all trees from a site larger than one (1) acres in a manner contrary to the Best Management Practices of the Georgia Forestry Council, except as authorized by a development permit or building permit. This definition does not include clear-cutting necessary to install required infrastructure such as roads and utilities.

**City:** The City of Stockbridge, Georgia.

**City Attorney:** The City Attorney of the City of Stockbridge.

City Council: The governing body of the City of Stockbridge, Georgia.

City Engineer: The Engineer of the City of Stockbridge, or his authorized representative.

Comprehensive Plan: Those coordinated plans or portions thereof which have been prepared by or for the Governing Body for the physical development of the jurisdiction; or any plans that designate plans or programs to encourage the most appropriate use of the land in the interest of public health, safety and welfare.

Concept Plan: A drawing which shows the overall concept (e.g., a concept plan) of a proposed development, and which may include lots and streets in a subdivision or the general location of buildings and improvements for a residential or non-residential project.

Conduit: A general term for any channel intended for the conveyance of water, whether open or closed; any container for flowing water.

Conservation: The management of natural resources to prevent waste, destruction, or degradation.

Conservation areas, primary: Any property qualifying as conservation use property under O.C.G.A. § 48-5-7.4; and any steep slopes, floodplains, wetlands, water bodies, upland buffers around wetlands and water bodies, critical wildlife habitat, and sites of historic, cultural, or archaeological significance, located outside of building envelopes and lots established for building purposes.

Conservation areas, secondary: Prime farmland, natural meadows, mature woodlands, farm fields, localized aquifer recharge areas, and lands containing scenic views and sites, located outside of building envelopes and lots established for building purposes.

Conservation easement: A legally enforceable agreement between a property owner and the holder of the easement, with content meeting requirements of Georgia law and in a form acceptable to the City Attorney and recorded in the office of the Clerk of Superior Court of Henry County. A conservation easement restricts the existing and future use of the defined tract or lot to conservation use, agriculture, passive recreation, or other use approved by the Governing Body and prohibits further subdivision or development. Such agreement also provides for the maintenance of open spaces and any improvements on the tract or lot. Such agreement cannot be altered except with the express written permission of the easement holder and any other co-signers. A conservation easement may also establish other provisions and contain standards that safeguard the tract or lot's special resources from negative changes.

Conservation subdivision: A subdivision where open space is the central organizing element of the subdivision design and that identifies and permanently protects all primary conservation areas and all or some of the secondary conservation areas within the boundaries of the subdivision.

Construction, continual: Construction performed by a full complement of workers and equipment mobilized at the project site, actively engaged in incorporating materials and equipment into the building or structure each normal working day.

Construction Costs: The total value of the construction of, or reconstruction work on structures, as determined by the Administrative Officer or their designee, in issuing a building, or other type, permit for construction or reconstruction.

Construction Entrance: A temporary access for the ingress and egress of construction vehicles.

Construction, Existing: Any structure for which the “start of construction” commenced before the effective date of the initial adoption of this document.

Construction, New: Structures for which the “start of construction” commenced on or after the effective date of this document.

Contractor: A person, firm or corporation who the owner of a property has employed, or contracted to perform, construction activity associated with a development. For purpose of this ordinance, the term contractor shall include all subcontractors who are under separate contract or agreement with the contractor for performance of a part of the work at the site.

Corridor Map: A map adopted by the City which designates land to be reserved for the construction of future or improvement of existing transportation facilities and future parks, open spaces, and green spaces.

County: Henry County, Georgia

Critical Root Zone: An area of root space that is within a circle circumscribed around the trunk of a healthy tree corresponding to the drip line.

Cross-section: A profile of the ground surface perpendicular to the center line of a road, stream, or other feature.

Cul-de-sac: A street having one end open to traffic and being permanently terminated at the other end by a vehicular turn-around.

Cul-de-sac, Temporary: A non-permanent vehicular turn-around located at the termination of a street.

Culvert: A closed conduit of waterway carrying water through or under a driveway, fill area, street, highway, or railroad. A culvert is distinguished from a bridge by certain characteristics: (a) a culvert is typically monolithic in cross-section, and has a regular, symmetrical shape; a bridge is typically constructed such that the span is separate from and supported by abutments and/or piers; (b) a culvert usually has a large ratio of length to width.

Curb: A boundary, usually constructed of concrete, usually marking the edge of a roadway or paved area, which is designed to channel stormwater to drainage inlets and/or prevent or deter access.

Curb Cut: A provision for vehicular ingress and/or egress between property and an abutting street.

Curb Radius: The curved edge of a street at street intersections.

Cut: A portion of land surface to which soil or other solid materials have been removed; the depth below the original grade.

Dead-End Street: A street, other than a cul-de-sac, with only one outlet. Dead-end streets are not allowed within the City.

Debris: Any material, including floating trash, suspended sediment or bed load moved by a flowing stream; detritus. This term also includes those materials that may be disposed of in a debris landfill. Also includes trash, garbage, junk, building material, or plant material left or deposited on a site or street, or disposed of improperly.

Deceleration Lane: An added roadway lane, of a specified distance and which may include a taper, as approved by the City Engineer, that permits vehicles to slow down and leave the main vehicle stream.

Deciduous: Any plant or tree which drops its leaves annually at the end of the growing season.

Dedication: The deliberate appropriation of land by an owner for any general and public use or purpose, reserving to himself no other rights than such as are compatible with the full exercise and enjoyment of the public uses to which the property has been devoted.

Dedication Plat: A plat that indicates property to be dedicated for public right-of-way or land for public use.

Demolition: The razing of any structure above or below the existing grade.

Design Professional: An individual who meets State licensure requirements applicable to the profession or practice in which he or she is engaged in.

Detention: The temporary retraining of stormwater on-site.

Detention Pond: A pond or pool used for the temporary storage of stormwater runoff and which provides for the controlled release of such stormwater.

Developer: Any person, individual, firm, partnership, association, corporation, estate, trust or any other group or combination acting as a unit who directs the undertaking or proposes to undertake development as herein defined, whether the development involves the subdivision of the land for sale, the construction of buildings or other improvements on a single land ownership, or both.

Development: Any man-made change of improved or unimproved real estate, including but not limited to, buildings, structures, mining, dredging, filling, grading, paving, excavation or drilling operations.

Development Department: Administrative Officer and staff responsible for the processing and review of all plans related to new construction and redevelopment.

Development Plan: Any plan containing substantial information required to be filed by this ordinance, which shows how the property to be affected by the development will be changed and improved in a specific manner, including the installation of roads and utilities and the erection of buildings and structures, among other specific requirements.

Dike: An embankment to confine or control water, especially one built along the banks of a river to prevent overflow of lowlands; a levee.

Discharge: The act involved in water or other liquid passing through an opening or along a conduit or channel; and/or the water or other liquid which emerges from an opening or passes along a conduit of channel.

Disturbed Area: Disturbed area is defined as the entire limits of the site project activity, outside of the buffer area.

Ditch: An artificial channel, usually distinguished from a canal by its smaller size.

Drainage Area: The contributory area of a stream at a specified location, measured in a horizontal plane, which is enclosed by a topographic divide such that direct surface runoff from precipitation normally would drain by gravity into the river basin above the specified point.

Drainage Structure: A device composed of a virtually non-erodible material such as concrete, steel, plastic or other such material that conveys water from one place to another by intercepting the flow and carrying it to a release point for storm-water management, drainage control, or flood control purposes.

Easement: A non-possessory interest in land; a grant by a property owner for the use by the public, a corporation or persons, of a portion of land for a specified purpose or purposes. Historically, easements may have been descriptive or prescriptive, may or may not be recorded in the public land record in the Henry County Courthouse. The lack of record or specificity in a historic easement does not reduce its validity. Any historic easement to the interest of the City shall be construed to the maximum benefit of the City. It is the intent of this ordinance that all easements (new or historic) shall be made a part of the public record and shall be recorded in the Henry County Courthouse.

EPD: The Environmental Protection Division (EPD) of the Georgia Department of Natural Resources is a state agency charged with protecting Georgia's air, land and water resources through the authority of state and federal statutes. EPD issues and enforces all state permits related to air, land and water pollution and control and has full delegation for Federal environmental permits except Section 404 (wetland) permits.

Escrow Account: A type of subdivision improvement guarantee where the subdivider deposits cash, a note, a bond, or some other instrument readily convertible to cash for specific face value specified by the Administrative Officer to cover the costs of required improvements.

Fill: A portion of land surface to which soil or other solid materials have been added; the depth above the original ground.

Final Plan: A detailed engineering drawing(s) showing the proposed improvements required in the development of a given parcel and demonstrating compliance with the requirements of this ordinance and other law, prepared by a qualified design professional (e.g., Professional Engineer) who is licensed to prepare such in accordance with State law.

Final Plat: A scale drawing showing the boundaries, dimensions, and features of real property. Plats submitted or recorded in compliance with this ordinance shall meet the requirements of the Georgia Plat Act.

Finished Grade: The final elevation and contour of the ground after cutting and filling and conforming to the proposed design.

Fire Flow: The flow of water required to extinguish the largest probable fire served by a water utility service or company.

Flood Hazard Area: Any normally dry area that is susceptible to being inundated by water. The flood hazard areas include, but are not limited to, land subject to the 100-year flood.

Flood Hazard Boundary Map (FHBM): An official map of a community issued by the Federal Emergency Management Agency, where the boundaries of the areas of special flood hazard have been defined as Zone A.

Flood Insurance Rate Map (FIRM): An official map of a community on which the Federal Emergency Management Agency has delineated both the areas of special flood hazard and the risk premium zones applicable to the community.

Flood Insurance Study: Official report provided by the Federal Emergency Management Agency containing flood profiles, as well as the Flood Boundary-Floodway Map and the water surface elevation of the base flood.

Flood Peak: The maximum water level at the time of maximum discharge of a particular flood at a given point along a stream.

Floodplain: Area which borders a stream channel and is covered by its water in time of flood; also consists of stream bed areas subject to recurrent overflow, or inundation.

Floodway: The channel of a river, stream or other watercourse and the adjacent land area that must be reserved to discharge the 100-year flood without cumulatively increasing the water surface elevation more than one foot (1 ft.) at any point.

Fps: Feet per second.

Frontage: Distance of lot as measured along the right-of-way.

Georgia DOT or GDOT: The (State of) Georgia Department of Transportation.

Gph: Gallons per hour.

Gpm: Gallons per minute.

Governing Body: The Mayor and City Council of Stockbridge, Georgia.

Gradient: The rate of vertical change between two distance points, determined by dividing the vertical distance by the horizontal distance (i.e., rise over run).

Grading: The movement, removal or addition of earth and the altering the shape of ground surfaces on a site by the use of mechanical equipment. This shall include stripping, cutting, filling, stockpiling and shaping or a combination thereof. Grading is a land disturbing activity.

Grease: A material composed primarily of fats, oil, and grease from animal or vegetable sources. The terms fats, oil, and grease shall be deemed as Grease by definition. Grease may also include petroleum-based products.

Greenway: A linear park or open space conservation area that provides recreational opportunities, pedestrian and/or bicycle paths, and/or conservation and preservation of open spaces or natural areas.

Grubbing: The removal of stumps, roots and/or vegetation from the site by methods such as digging, raking, dragging or otherwise disturbing the roots of vegetation. Grubbing is a land disturbing activity.

Habitat for endangered or threatened species: An area verified by the Georgia Department of Natural Resources as 1) actually containing naturally occurring individuals of a species that has been listed as endangered or threatened under the Federal Endangered Species Act, as amended, and 2) being likely to support the continued existence of that species by providing for a significant portion of that species' biological requirements.

Headwater: The water upstream from a structure; or may also be the source of a stream.

Health Department: The Henry County Health Department.

Homeowners Association: An organization formed for the maintenance and operation of the common areas of a development, where membership in the association is automatic with the purchase of a dwelling unit or lot within the development, with the ability to legally assess each owner of a dwelling unit or lot and which has authority to place a lien against all dwelling units and lots within the development. These associations are sometimes referred to as the HOA.

Hydrology: The science of dealing with the waters of the earth in their various forms, precipitation, evaporation, runoff and ground water.

Imperviousness: The quality or condition of a material that minimizes percolation.

Impervious Surface: Areas which do not permit natural infiltration of rainfall, including, but not limited to rooftops, paved parking lots, driveways, paved roads and streets, patios, paved sidewalks, swimming pools, paved tennis courts and basketball courts, and any other exposed area surfaced in concrete or asphalt, except of gravel and pervious or porous paving materials.

Invert: The floor, bottom or lowest part of the internal cross-section of conduit.

Land Disturbing Activity: Any activity including grading, scraping, clearing, dredging, excavating, and transporting or filling of land; clearing and grubbing of vegetation; any other alteration of land that may cause land and stream bank erosion, siltation or water pollution from water or wind but not including agricultural practices; and any construction, rebuilding or alteration of a structure.

Land Disturbance Permit: A permit issued to authorize clearing, grading, excavating, transporting and filling of land.

Letter of Credit: A type of subdivision improvement guarantee whereby a subdivider secures an instrument from a bank or other institution or from a person with resources sufficient to cover the cost of improvements required by the City. The instrument pledges the creditor to pay the cost of improvements in case of default by the subdivider.

Licensed Landscape Architect (LA): A person who, by reason of his special knowledge of natural, physical and mathematical sciences and the principles and methodology of landscape architectural design acquired by practical experience and formal education or both, is qualified to engage in the practice of landscape architecture, as attested by the issuance to said person of a license as a landscape architect by the State of Georgia.

Licensed Land Surveyor/Registered Land Surveyor (RLS): A person who, by reason of his knowledge of the several sciences and of the principles of land surveying acquired by practical experience and formal education, is qualified to engage in the practice of land surveying as attested by the issuance to said person of a license as a land surveyor by the State of Georgia.

Licensed Engineer/Professional Engineer (PE): A person who, by reason of his knowledge of the several sciences and of the principles of engineering acquired by practical experience and formal education, is qualified to engage in the practice of engineering as attested by the issuance to said person of a license as a professional engineer by the State of Georgia.

Lot: A portion or parcel of land intended as a unit for transfer of ownership or for development or both, intended to be devoted to a common use or occupied by a building or group of buildings devoted to a common use, and having principal frontage on a public street or an approved private street. In determining the area and dimension of a lot, no part of the right-of-way may be included.

Lot of Record: A parcel of land within the city limits which was properly platted and recorded in the Superior Court Clerk of Henry County's Plat and Deed records as of the effective date of this ordinance, or which was lawfully subdivided prior to annexation into the City limits.

Lot of Record, Nonconforming: A historically defined parcel of land that does not meet the current standards for a lot as defined by the Zoning Ordinance. Nonconforming Lots of Record may be allowed a function consistent with adjoining lots provided that in case of division, boundary adjustment, or consolidation, no lot shall be created which does not meet the requirements of the current Zoning Ordinance. The grant of an interest, for security or

other purpose, in real property for less than an entire lot, or the foreclosure or sale of such interest, shall not be deemed to create a legal lot unless properly approved by, or a variance granted by the Board of Adjustments, in accordance with this ordinance and the Zoning Ordinance. Nonconforming Lots of Record may consist of:

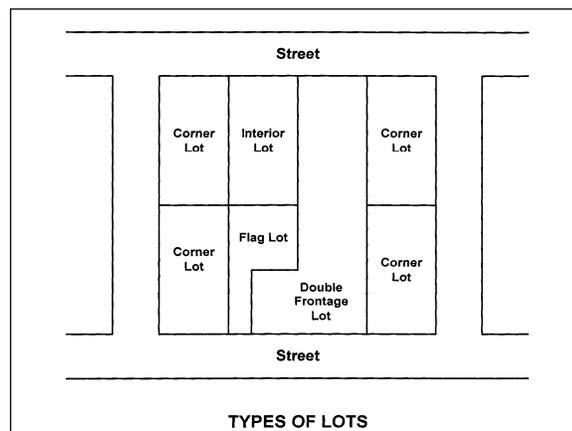
- A single lot of record.
- A portion of a lot of record.
- A combination of complete lots of record or complete lots of record and portions of lots of record or of portions of lots of record.
- A parcel of land described by metes and bounds.

Lot Area: The total horizontal area within the lot lines of a lot, exclusive of public street rights-of-way.

Lot, Corner: A lot abutting upon two or more streets at their intersection.

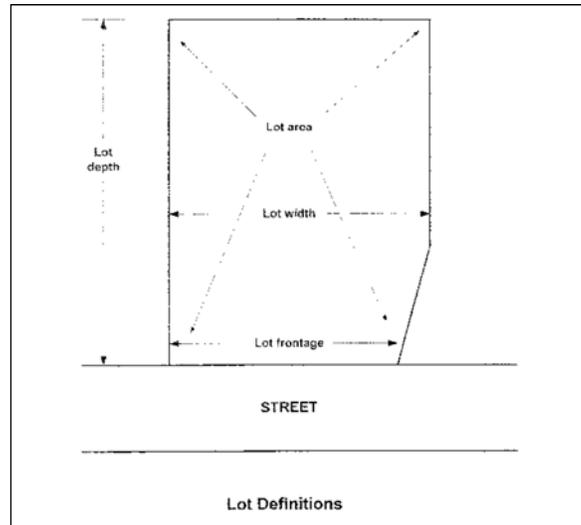
Lot, Depth: The average horizontal distance between the front and rear lot lines.

Lot, Double Frontage: A lot other than a corner lot which has frontage upon two or more streets that do not intersect at a point abutting the property.



Lot, Flag: A tract, or lot of land of uneven dimensions in which the portion fronting on a public street is less than the required minimum width for construction of a building or structure on that lot.

Lot, Frontage: The width in linear feet of a lot where it abuts the right-of-way of any public street.



**Lot, Interior:** A lot other than a corner lot with frontage on only one street.

**Lot, Width:** The distance between side lot lines measured at the regulatory/required building line.

**Mass Grading:** The grading of two (2) acres or more, for residential development, or twenty-five (25) acres or more, for Non-residential development, at one time to prepare multiple lots for construction, rather than lot-by-lot grading at the time of building construction. This definition does not include grading necessary to install required infrastructure such as roads and utilities.

**Master Plan:** A comprehensive plan, which may consist of multiple maps, data and other descriptive matter guiding the physical development of the City or any portion thereof. This includes any amendments, extensions or additions thereof recommended by the City Manager and adopted by the City Council indicating the general location for major roads, parks or other public open spaces, public building sites, routes for public utilities, zoning districts or other similar information.

**Mean Sea Level:** The average height of the sea for all states of the tide. It is used as a reference for establishing various property elevations, and for other purposes. For purposes of this ordinance, the term is synonymous with National Geodetic Vertical Datum (NGVD).

**Metes and Bounds:** A system of describing and identifying land by distances or measures (metes) and bearings or direction (bounds) from an identifiable point of reference, such as a monument or other marker or the corner of intersecting streets.

**National Geodetic Vertical Datum (NGVD):** Vertical control used as a reference for establishing varying elevations including areas within the floodplain as corrected in 1929.

**Owner(s) of Record:** The owner(s) of property as specified on the deed of the lot of record.

**Parking Lot:** A ground level open area that is used for the temporary parking of vehicles and does not include entry roads.

Pavement width: The width of a given lane, road, or other road pavement width, measured from back-of-curb to back-of-curb, or to the edge of pavement where no curbs are required or exist.

Pedestrian Way: Crosswalk or other areas designed and marked specifically for pedestrian traffic.

Performance bond: A type of subdivision improvement guarantee in the form of a bond, secured by the subdivider from a bonding company, in an amount specified by the City Engineer to cover the costs of required improvements, and payable to the City. The City may call in the performance bond in the event the subdivider defaults on required improvements.

Person: Any individual, partnership, firm, association, public or private corporation, trust, joint venture, estate, cooperative, political subdivision or other instrumentality of this state or other legal entity.

Plat, Final: A finished drawing of a subdivision showing completely and accurately all legal and engineering information, certification, and all other elements and requirements set forth in this ordinance and O.C.G.A. 15-6-7, prepared for filing for record with the Clerk of the Henry County Superior Court.

Plat, Preliminary: A drawing which shows the proposed layout of a subdivision in sufficient detail to indicate its general design.

Professional or Design Professional: An individual who meets state licensure requirements applicable to the profession or practice in which he/she is engaged.

Professional Engineer: See “Licensed Engineer”.

Project: A principal building or structure or group of buildings or structures planned and designed as an interdependent unit together with all accessory uses or structures, utilities, drainage, access and circulation facilities, whether built in whole or phases. Examples include: a principal building on a lot, a residential subdivision, a multi-family development, a shopping center or an office park.

Project Review Team: A team of individuals, consultants, professionals, and City employees representing the City in the review and approval of proposed developments. The Project Review Team is composed of the Administrative Officer as well as others including, but not limited to, the Public Works Director, the City Engineer, City Planner/Zoning Administrator, Fire Marshall, Municipal Planning Board, Building Inspector, Economic & Community Development Manager as well as other stakeholders.

Property Owner: Any person who owns fee title to a given area of land, excluding, however, any recorded easement or right-of-way.

Protective Covenants: Contracts made between private parties as to the manner in which land may be used, with the view toward protecting and preserving the physical and economic integrity of any given area.

Protected Zone: All lands that fall outside the buildable area of a parcel; all areas of a parcel required to remain in open space, and/or all areas required as yard areas, buffers, or landscaped areas according to provisions of the City of Stockbridge Zoning Ordinance or by conditions of zoning and variance approval.

Psi: Pounds per square inch.

Recreation, active: Leisure activities that are facility oriented, such as swimming pools, tennis courts, and ball fields.

Recreation, passive: Leisure activities that are natural resource oriented, such as hiking trails, conservation areas, and nature preserves.

Reserve Strip: A strip of land across the end of, or along the edge of, a street, alley, or lot for the purpose of controlling access which is reserved or held until future street extension or widening.

Responsible party: In the context of enforcement procedures, a person who is alleged to have committed, causes, continued or created a violation of the terms, requirements, regulations, or provisions of this ordinance whether as a direct act, through lack of action or neglect, or at the direction of or on behalf of others. A responsible party may be the owner of a premises where a violation has occurred; an occupant whether through ownership, lease or other tenancy; a contractor, building or developer; an agent of or person otherwise acting on behalf of the aforementioned parties; or other person acting in violation of this ordinance.

Re-subdivision: The act of changing an existing lot created by a plat and recorded in the Office of the County Superior Court Clerk of Henry County, Georgia.

Retention: The permanent maintenance of stormwater on-site.

Retention pond: A pond or pool used for the permanent storage of stormwater runoff.

Right-of-way, public: That area, distinguished from an easement or private road right-of-way, which is owned in fee-simple title by the Governing Body or other government, for the present or future use of roads, roads and highways, together with its drainage facilities and other supporting uses and structures.

Right-of-way, private: That area, distinguished from an access easement or public right-of-way, dedicated to property owners of the subdivision involved or to other individuals, and which affords permanent access to abutting property or properties. A private right-of-way is distinguishable from a public road right-of-way in that maintenance and ownership of the road and accessory improvements is by private individuals or an association rather than the Governing Body or another government.

Riprap: Rocks, rubble, or stones, irregularly shaped and at least six inches in diameter, used for erosion control and soil stabilization.

Road Classification Map: Comprehensive plan of arterial, collector and minor streets and roads for all or a portion of the City.

Roadway drainage structure: A device such as a bridge, culvert, or ditch, composed of a virtually non-erodible material such as concrete, steel, plastic, or other such material that conveys water under a roadway by intercepting the flow on one side of a traveled way consisting of one or more defined lanes, with or without shoulder areas, and carrying water to a release point on the other side.

Runoff coefficient: Ratio of the amount of rain which runs off a surface to that which falls on it; a factor from which runoff can be calculated.

Sediment: Solid material, both organic and inorganic, that is in suspension, is being transported or has been moved from its site of origin by air, water, ice or gravity as product of erosion.

Sedimentation: The process by which eroded material is transported and deposited by the action of water, wind, ice, or gravity.

Sensitive natural areas: Any area, as identified now or hereafter by the Georgia Department of Natural Resources, which contains one or more of the following: habitat, including nesting sites, occupied by rare or endangered species; rare or exemplary natural communities; significant landforms, hydroforms, or geological features; or other areas so designated by the Department of Natural Resources; and which is sensitive or vulnerable to physical or biological alteration.

Septic tank: An approved watertight tank designed or used to receive sewage from a building sewer and to affect separation and organic decomposition of sewerage solids and discharging sewage effluent to an absorption field or other management system.

Sewer: A pipe located in a public right-of-way or easement which transports sewage, including manholes, connections, and all other appurtenances.

Sewer, storm: A sewer that carries storm, surface, and ground water drainage but excludes sewage and residential, commercial, and industrial wastes.

Shade Tree: A tree in a public place, street right-of-way, or special easement, planted to provide canopy that will obscure the sun and heat from the ground.

Sidewalk: A hard-surfaced pedestrian access area adjacent to or within the right-of-way of a public road.

Site: Any tract, lot or parcel of land where development is to be performed.

Site Work: Development activity to prepare a property for construction of buildings or finished structures, including clearing, grubbing, grading and installation of soil erosion and sedimentation control facilities.

Soil and Water Conservation Council: The Soil and Water Conservation Council of the State of Georgia.

Soil and Water Conservation District: The Henry County Soil and Water Conservation District.

Soil Erosion and Sedimentation Control Regulations: Regulations promulgated by the State of Georgia through the Georgia Erosion and Sedimentation Act of 1975 as amended to date.

Stream Bank Buffer: Georgia law requires a 25-foot undisturbed buffer, parallel to the stream, along both banks of all "Waters of the State" as measured from the "point of wrested vegetation". The City may have Stream buffers greater than what Georgia law requires.

Street: A public or private thoroughfare which is open to the general public and which affords the principal means of access to abutting property. Private streets are not allowed in new Development.

Street, Arterial: Unless otherwise specified by the Comprehensive Plan, transportation element of the Comprehensive Plan or Major Thoroughfare Plan, arterial streets are those streets and highway facilities, including full and partial access-controlled highways and major urban area entrance highways, which are designed to carry the highest traffic volumes and the longest trips through and within an urban area.

Street, Collector: Unless otherwise specified by the Comprehensive Plan, transportation element of the Comprehensive Plan or Major Thoroughfare Plan, collector streets are those streets that collect traffic from minor streets or other collector streets and channel it to the arterial system. Collector streets provide land access and traffic circulation within commercial and industrial areas.

Street, Local: Unless otherwise specified by the Comprehensive Plan, transportation element of the Comprehensive Plan or Major Thoroughfare Plan, local streets are used primarily for direct access to residential, commercial industrial or other abutting property.

Street, Private: A road or street that has not been accepted for maintenance by the City and that is not owned and maintained by a state, county, city, or another public entity. Private Streets are not allowed in new Developments.

Street, Public: A dedicated and accepted public right-of-way which affords the principal means of access to abutting properties. See definition for Local Street.

Storm Drainage System: Any structure used principally to retain, detain, collect, direct, transfer, carry, convey, distribute or treat, singularly or in combination, storm water or other surface water, including, but not limited to, aprons, basins, berms, BMP facilities, catchments, conduits, culverts, dams, dikes, ditches, drains, drops, filters, grates, infiltration devices, inlets, manholes, man-made channels, outlets, pipes, ponds, rip-rap, risers, spillways, storm sewers, swales and trenches; and also including any maintenance areas needed for such structures.

Structure: Anything constructed or erected, the use of which requires more or less permanent location on the ground, or which is attached to something having more or less permanent location on the ground, not including utility poles.

Subdivision: The division of a parcel or tract of land into two (2) or more lots for the purposes of creation of lots for development, the rearrangement of existing lot lines, or for the purpose of transfer of ownership.

Subdivision, Consolidation: The removal of common property lines between abutting lots in the same ownership. (See also boundary adjustment subdivision).

Subdivision, Consolidation Plan: A legal document, prepared by a qualified professional licensed to prepare such in the State of Georgia, for the purpose of the legal removal of common property lines between abutting lots in the same ownership.

Subdivision, major: Any subdivision which involves the construction of a new public or private street; and any subdivision, regardless of whether or not it involves a new public or private street, which contains more than three (3) lots.

Subdivision, minor: The subdivision of a tract of land into not more than three (3) lots, where each lot has minimum required frontage on an existing public street.

Time of concentration: The time it takes for runoff to travel from the hydraulically most distant part of the watershed to the point of reference. In hydrograph analysis, it is the time from the end of excessive rainfall to the point of inflection on the falling limb in the hydrograph.

Topography: The configuration of surface features of a region, including its relief, rivers, lakes, and showing relative elevations.

Tract: An area, parcel, site, piece of land or property that is subject of a development application.

Traffic Study: An analysis conducted to assess the impact of vehicular traffic generated by a new use or change in use on existing or future road network and to obtain the required information in evaluating any potential road network improvements.

Utilities: All lines and facilities related to the provision, distribution, collection, transmission, or disposal of water, storm and sanitary sewage, oil, gas, power, information, telecommunication and telephone cable, and including facilities for the generation of electricity.

Variance: A minimal relaxation or modification of the strict terms of this ordinance as applied to specific property when, because of particular physical surroundings, shape, or topographical condition of the property, compliance would result in a particular hardship upon the owner, as distinguished from a mere inconvenience or a desire to make a profit.

Vicinity map: A map, not necessarily to scale showing the general location of the proposed subdivision or land development in relation to major roads and/or natural features.

VPD: Vehicles per day.

Waters of the State: "Any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells, and other bodies of surface or subsurface water, natural or artificial, lying within or forming a part of the boundaries of the State which are not entirely confined and retained completely upon the property of a single individual, partnership, or corporation." As defined by the Erosion and Sedimentation Act of 1975. O.C.G.A. §12-7-3

Wetlands: Those areas that are inundated or saturated by surface or groundwater 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. Wetlands generally include swamps, marshes, bogs and similar areas. (33 CFR 32.93) The ecological parameters for designating wetlands include hydric soils, hydrophytic vegetation, and hydrological conditions that involve a temporary or permanent source of water to cause soil saturation. Freshwater wetlands do not include any areas defined as "coastal marshlands" by the State Coastal Marshlands Protection Act.

Zoning Administrator: The City Planner or other city staff person designated by the City Manager responsible for administering, interpreting, and enforcing the City's Zoning Ordinance, or his or her designee.

Zoning Ordinance: The zoning ordinance adopted by the City Council that govern all property located within the limits of the City of Stockbridge.

**END ARTICLE I**

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## **ARTICLE II: STANDARDS FOR DESIGN AND CONSTRUCTION SPECIFICATIONS FOR WATER**

### **Section 201: Purpose**

- A. This document contains information to assist planners and engineers with the design and construction of water distribution facilities. The City of Stockbridge’s intent is to ensure uniformity of design concepts, formats, methodologies, procedures, construction materials, types of equipment and quality of work products; however, this document is not a substitute for good Engineering. Sound engineering judgement must be exercised in all applications to create quality and cost-efficient facilities. The Developer shall be responsible for the design of an adequate water distribution system. The purpose of this section is to address the minimum requirements for design and construction of public water systems as defined by the City of Stockbridge and the Georgia Environmental Protection Division. The methods of design and construction shall be in accordance with all city codes, accepted engineering practices, Georgia EPD’s *Minimum Standards for Public Water Systems*, and this Article.
- B. The authority for discretionary provisions for design and construction of water systems shall vest with the Administrative Officer or his/her designee.
- C. This document is intended to convey the general design and construction requirements for a typical project. It also lists specific requirements relating to inspection, testing and acceptance of facilities. It is not intended as a substitute for site-specific engineering and construction techniques. Individual project conditions may require waivers from the provisions in this document.
- D. This Article is subject to periodic revision to meet changing requirements for materials, environmental regulations, etc. At the beginning of a project the user should verify that they have the latest edition. The Contractor and/or the Developer shall furnish all products and perform all labor necessary to fulfill the requirements of the specifications.

### **Section 202: General**

- A. **Applicable Standards:**

Supply all products and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), National Sanitation Foundation American National Standards Institution (ANSI), or other recognized standards. Latest revisions of all standards are applicable. If requested by the City, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two (2) years.

**B. Substitutions:**

Whenever a product is identified in the Specifications by reference to manufacturer's or vendor's names, catalog numbers, etc., the Contractor/Developer may freely choose from these reference products which ones he wishes to provide.

Any item or product other than those so designated shall be considered a substitution. The Contractor/Developer shall obtain prior approval for an approved equal from the City for all substitutions.

**C. Warranty:**

Water distribution systems installed by Contractor/Developers which are accepted by the City for ownership, operation and maintenance shall be warranted and guaranteed for a period of one year from the date of final acceptance that the completed system is free from all defects due to faulty products or workmanship, and that the Contractor/Developer shall make such corrections as may be necessary by reason of such defects upon notice by the City.

**D. Easements and Rights of Way:**

Water distribution systems installed by a Contractor/Develop which are accepted by the City for ownership, operation and maintenance shall be installed in either dedicated street right-of-way or easements. Easements shall be properly executed and recorded. The easements shall be cleared of all structures, trees, shrubs, brush, logs, upturned stumps and roots of downed trees and similar items.

No permanent structure shall be built on the easement. Temporary structures such as fence, driveway, etc. can be installed on the permanent easements; but it shall be the responsibility of the owner to remove, if necessary, or repair such structures if they are disturbed when the City works on the water mains within the easement. The Owner shall obtain a written permission of the City before the installation of such temporary structures.

The minimum easement width shall be (20) feet for a main up to 15 ft deep. The minimum easement width shall be (30) feet for a main up to 20 ft deep.

**Section 203: Construction Drawings**

- A. All projects which involve construction of lateral water lines, main water lines, or trunk lines shall have detailed construction plans and specifications prepared by a Registered Professional Engineer licensed in the State of Georgia or a Design Professional who meets state licensure requirements applicable to the profession or practice he is engaged in. Developments that only involve water systems for buildings may have plans and specifications prepared by the project architect.
- B. All site development plans involving water systems improvements shall be submitted to the City and GA EPD for technical review. The City shall facilitate the review and approval of all elements of the plan. Questions relating to availability of water and

proposed location of connection should be resolved at the conceptual and preliminary planning stages before submittal of the final plans. The submittal for preliminary plan review must include all land to be developed even though the land is to be developed in several phases or units. Availability determinations will be made for the total project.

C. All final plans for public water mains shall be prepared as required in regulations promulgated by the Georgia EPD. The Developer shall be responsible for submitting all necessary plans and other data to EPD for required approvals and for obtaining other permits, such as DOT, railroad, etc. For example, a completed *Drinking Water Project Submittal Form*, including a signed letter from the City of Stockbridge approving the proposed Water System Improvements, must be submitted to Georgia EPD.

D. The following information shall be provided on all site development plans and as-builts:

Project Name, Engineer/Owner Name and Contact, Land Lot, District, Zoning, Location Map with North Arrow

1. All proposed water lines and the location and size of all valves, fittings, air relief valves, meters, discharge lines, blow-off chambers and other appurtenances.
  2. On industrial and commercial developments, the water meter and service line size and location.
  3. Road names, property lines, storm drains, easements, contour lines, adjacent property owner names, other utilities, structures.
  4. Road names and lot numbers should be on plans.
  5. Sheet should be no larger than 24" x 36". May want to go with 22" x 34" (so ½ size can be printed from standard printer).
  6. Curbing and proposed water mains including size and type should be shown.
  7. Service and meter locations and sizes should be shown.
  8. Fire hydrants, gate valves, air release valves should be shown.
  9. Plan of fire meters or detector meters should be shown if applicable.
- E. At the completion of construction and prior to the final field inspection, "As-Built" drawings of the project shall be submitted to the City to serve as a permanent record of the project. A reproducible copy of the final plan in Adobe PDF and AutoCAD DWG and two (2) sets of as-builts shall be submitted. A digital copy of the as-built plans shall also be submitted in a format and coordinate system compatible with the City's Geographic Information System (GIS). Each sheet of these drawings shall bear the

words "As-Built" or "Record Drawings".

1. As-Built drawings will be same format as the original construction plans.
2. "As-Built" or "Record Drawing" is to be stamped in large clear print on plans.

#### **Section 204: Materials**

All materials used which come into contact with drinking water during its distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61). Any pipe, solder, or flux which is used in the installation or repair of the water distribution system shall be lead-free with not more than 8.0% lead in pipes and fittings and not more than 0.2% lead in solders and flux.

All materials, unless otherwise specified or approved equal, shall be in accordance with the Buy America requirements of Federal regulations 23 U.S.C. 313 and CFR 635.410. Acceptance will be on the basis of the City's inspection and receipt of the manufacturer's written certification that the material was manufactured and tested in accordance with the applicable standards. All pipe, fittings, valves, tapping sleeves, hydrants and all other materials required for completion of the work must comply with the following:

**NOTE:** Water mains less than 4 inches in diameter will not be allowed within the City of Stockbridge's Water Distribution System.

Products and materials used in the work shall conform to the following:

A. Pipe

1. Ductile Iron Pipe – Shall conform to ANSI A21.50 (AWWA C-150) latest revisions and ANSI A21.51 (AWWA C-151) latest revision. Minimum wall thickness of 6"-16" diameter pipe shall be Class 350. Minimum wall thickness for 18"-20" diameter pipe shall be Pressure Class 300. Minimum wall thickness for pipe larger than 20" in diameter shall be Pressure Class 250. Pipe shall have an outside asphaltic coating per AWWA C151, latest revision. It shall be standard cement lined and seal coated with approved bituminous seal coat in accordance with AWWA C104, latest revision. Pipe shall be in 18'-20' nominal lengths with standard deflection pipe sockets. Ductile iron shall be used on all water systems, including systems behind master meters. The systems behind master meters shall be pressure tested, disinfected and the results shall be available for the City of Stockbridge's review.
2. Copper Tubing – Tubing for service lines shall be copper service pipe, type "K", soft temper, seamless copper tubing conforming to ASTM B-88. Tubing shall be 20-foot straight lengths or 60-100-foot coils. Compression joints shall be used. Dielectric adaptors shall be provided where copper or brass pipe connect to steel. No joints shall be allowed under paved roadway. Tubing O.D. shall be compatible with accessories and fittings specified herein.

B. Joints

1. Flanged Joints – Shall conform to ANSI A21.15 (AWWA C-115) latest revision. Bolts shall conform to ANSI B18.2.1 and nuts shall conform to ANSI B18.2.2. Gaskets shall be rubber, either ring or full face, and shall be 1/8 inch thick. Gaskets shall conform to the dimensions recommended by AWWA C-115 latest revision.
2. Mechanical Joints – In ductile iron pipe shall conform to ANSI A21.11 (AWWA C-111) latest revision, and shall be EBAA Iron Mega Lug, MJ field Lok gasket or approved equal.
3. Push-On-Joints – In ductile iron pipes shall conform to ANSI A21.11 (AWWA C111) latest revision. The joints shall be equal to “Fastite”, “Bell-Tite”, “Tyton” or approved equal.
4. Restrained Joints – Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands or push-on type joints equivalent to “Flex-Ring”, “TR Flex”, Megalug or “Super Lock” and shall have a minimum rated working pressure of 250 psi. The joints shall be in accordance with the applicable portions of AWWA C111. The manufacturer of the joints shall furnish certification, witnessed by an independent laboratory, that the joints furnished have been tested at a pressure of 500 psi without signs of leakage or failure. Restrained joints shall be capable of being deflected after assembly.

#### C. Fittings

1. Fittings for Ductile Iron – All fittings shall be ductile iron furnished in accordance with the latest revision of ANSI A21.10 (AWWA C110) or ANSI A21.53 (AWWA C153) and have a minimum Pressure Class of 250 psi. Joints shall be mechanical joints with ductile iron retainer glands conforming to ANSI A21.11 (AWWA C-111), latest revision. Ductile iron retainer glands shall be equal to EBAA Iron Mega-Lug, MJ Field Lok gasket or approved equal. All fittings shall be furnished with a cement mortar lining.
2. Fittings for Flanged Pipe – Shall be manufactured in accordance with ANSI B 16.1, Class 125 flanges.

#### D. Polyethylene Encasement

1. Polyethylene encasement shall be in tube form conforming to the requirements of ANSI/AWWA C105/A21.5 latest revision. The polyethylene film shall have the following characteristics:

Tensile Strength	3,600 psi minimum
Elongation	800 percent minimum
Dielectric Strength	800 V/mil thickness minimum
Thickness	Normal thickness of .0008 in. (8 mil.)
Color	Blue

Polyethylene encasement shall be installed on ductile iron piping, fittings, and valves below grade whenever the water main crosses or is in close proximity to a steel gas main and where indicated on the drawings. Polyethylene encasement shall be V-Bio® Enhanced Polyethylene Encasement or Engineer Approved Equal.

E. Tracer Wire: Tracer wire shall be installed on ALL pipelines and service lines in a continuous fashion. It shall be brought to the surface at each locator post. It shall be accessible from surface at all valve and meter boxes. At locations tracer wire surfaces between valves, regular valve box with plain lid and collar shall be installed between a pipeline marker pair. Tracer wire shall be 12 GA single strand or up to 7 strands, copper with insulation UL rated for direct bury underground service. Splices shall be UL rated for direct bury and shall be minimized. Wire for directionally drilled bores shall be a minimum of #8 gauge. Color shall be blue.

F. Gate Valves

1. Shall be cast iron or Ductile iron body, bronze mounted, resilient wedge design, with non-rising stems, conforming to AWWA C-515. Valves shall be tested and certified to ANSI/NSF 61, be Underwriters Laboratories, Inc. Listed and be Factory Mutual approved. They shall have ends to match the pipe to which they are attached. Attachment to plastic pipe shall be made by special adapters. Valves shall be designed for a minimum working pressure of 250 psi and be tested at 500 psi. Gate valves sized 2" through 12" shall be Mueller Co. A-2361 Series with mechanical joints or approved equal. Mechanical joints shall be furnished with Megalugs. Stems shall be bronze; stainless steel stems will not be allowed.

Valves shall be furnished with "O" ring packing. Two (2) "O" rings shall be located above the thrust collar and one (1) "O" ring below. The thrust collar shall be permanently lubricated and have an anti-friction washer on top of the thrust collar.

Valves installed in pits or above ground shall be furnished with rising stem hand wheels. Buried valves shall be furnished with 2" square operating nuts. Valves shall open when turned counter-clockwise.

2. Valves at the end of the Main:

Where future water main extensions are anticipated, or are deemed possible, valves are placed so that no customers are out of service for the connection work. In all cases, this calls for a mechanical joint resilient gate valve with a MJ plug at the end of the main.

3. Valves are to be placed at street intersections and on each smaller main as it leaves other larger mains. In commercial, residential and industrial locations, all tees and crosses are valved on all sides.

Valves shall be placed at both ends of the crossing:

- a. Under a road, creek and railroad tracks.
- b. When crossing a bridge.

Maximum spacing of valves along a water main shall be no more than 1,000 feet.

#### G. Butterfly Valves

1. All butterfly valves shall be bubble-tight closing at the rated pressure with flow in either direction and shall be satisfactory for applications involving throttling service and frequent operations or operations after long periods of inactivity. Valves shall meet the full requirements of AWWA C504, latest revision, for 250 psi working pressure and shall be suitable for above ground or buried service.
2. All interior ferrous surfaces of valves larger than 16" shall have a special epoxy coating meeting the requirements of AWWA C550. Valve bodies shall be equipped with integrally cast mechanical joint ends meeting AWWA C111, latest revision. Mechanical joints shall be furnished with retainer glands as specified above.
3. Butterfly valves installed underground shall come equipped with a manual operator. This manual operator shall be of the traveling nut, self-locking type and shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering. Operators shall be equipped with mechanical stop-limiting devices to prevent over travel of the disc in the open and closed positions.
4. Valves shall open when turned counter-clockwise. Operators shall be fully enclosed and designed for buried operation.

#### H. Valve Boxes

1. Valve boxes for valves shall be approved standard cast iron adjustable shaft boxes having a minimum shaft diameter of 5-1/4". The casing shall be coated with two coats of coal tar pitch varnish. The lids of all boxes shall bear the word "WATER" or the letter "W". The valve boxes shall be adjustable to 6" up or down from the nominal required cover of pipe. Provide a 4" thick, 18" square concrete pad around the valve box. Valve stems extension is required for all valves that are over 3 feet in depth. Boxes shall be equal to Vulcan Pattern VVB-4 or approved equal.

#### I. Fire Hydrants

1. General – Hydrants shall be manufacturer's current model design and construction. All hydrant units are to be complete including joint assemblies.

- Physical characteristics and compositions of various metal used in the hydrant components shall meet the requirements as specified in AWWA C-502 latest revision. Hydrants shall meet all test requirements, be Underwriters Laboratories Listed and be Factory Mutual Inc. approved. Hydrants shall be suitable for working pressure of 250 psi. Hydrants shall be M & H Valve and Fitting Co., Traffic Model Style 129, Mueller Co., Centurion A-423 or approved equal.
2. Bonnet – Bonnet may have oil filled or dry reservoir. If oil filled, bonnet must have “O” ring packing so that all operating parts are enclosed in a sealed oil bath. Oil filter plug shall be provided in bonnet to permit checking of oil level and adding oil when required. If bonnet is the dry type, the hydrant top must have a lubricating hole or nut for ease of lubrication. All parts must be removable through top of hydrant without moving entire barrel section from safety flange.
  3. Nozzles and Caps – The hydrant shall have two (2) 2-1/2-inch connections and one (1) 4-1/2” steamer connection, National standard threads. Nozzles shall be bronze and have interlocking lugs to prevent blowout. Nozzle caps shall be secured to fire hydrant with non-kinking type chain with chain loop on cap ends to permit free turning of caps.
  4. Seat Ring – Seat ring shall be bronze.
  5. Drain Valves and Openings – Positive operating drain valves shall be provided to assure drainage of fire hydrant when the main valve is closed. Drain openings shall have bronze bushings.
  6. Main Valve – Valve shall be designed to close with the pressure and remain closed. Valve shall be made from material that will resist rocks or other foreign matter. Valve shall have a full 5-1/4-inch opening.
  7. Barrel and Safety Flanges – Hydrants shall have a safety-type vertical barrel and be designed with safety flanges and/or bolts to protect the barrel and stem from damage and to eliminate flooding when hydrant is struck. Bury depth shall be cast on barrel of hydrant. Hydrant shall be installed with a locked hydrant tee equal to American A-10180 and a locked hydrant adapter equal to American A-10895.
  8. Operating Stop and Nut – Hydrant shall have a positive stop feature to permit opening of hydrant without over travel of stem. Operating nut shall be bronze, 1-1/2”, point to flat, pentagon.
  9. Bolts and Nuts – Bolts, washers and nuts shall be corrosion resistant.
  10. Inlet – Bottom inlet of hydrant shall be provided with mechanical joint connection as specified and shall be 6-inch nominal diameter.
  11. Direction of Opening – Hydrant shall be designed to close “right” or clockwise

and open “left” or counter-clockwise.

12. Coatings – All inside and outside portions of hydrant shall be coated in accordance with AWWA C-502. The exterior portion of hydrant above ground level shall be painted with two (2) coats of best grade zinc chromate primer paint and with two (2) coats of approved hydrant enamel. Color shall be Silver only. The City color codes bonnets.
13. Joint Assemblies – Complete joint assemblies consisting of gland, gasket, bolts, and nut shall be furnished for mechanical joint inlets.
14. In general, fire hydrants are located at street intersections, but no more than 500 feet apart in single-family residential areas, nor more than 300 feet (or as specified on plans) apart in multi-family residential, commercial, and industrial areas. All fire hydrants shall be located on the backside of the ditch area one foot within the Right-of-Way. Fire hydrants are required at the ends of all water mains.

#### J. Tapping Sleeves and Valves

1. Shall be split sleeve Mechanical Joint Type sized to fit the intercepted pipe. They shall have duck-tipped end gaskets and shall be equal to Mueller H-615/715 with a tapping valve attached. Valves to be furnished in accordance with the above specifications. The outlet end of the valve shall have a joint suitable for the type of pipe to be used in the new branch. The Sleeve/Cross shall be sized to fit the intercepted pipe without leaking.
2. Include stainless steel in accordance with MWSA for mains less than 16 inches.

#### K. Metered Services

1. Service Connections
  - a. Taps in pipe larger than 3-inches shall be made with a tapping machine. A corporation stop shall be installed at the connection to the main for taps less than 2 inches and a wedge gate valve shall be installed for connections greater than or equal to 2 inches.
  - b. Service saddles shall be 1-inch AWWA taps, equal to Ford Styles 202B, Romac Style 202 or Smith-Blair 313. Contractor shall adhere to pipe manufacturer’s recommendations on maximum tap sizes for each main size.
  - c. Where connections to larger service pipes are required, multiple taps shall be made and connected by branch. The connection shall be capable of withstanding internal water pressure continuously at 200 psi. House service lines will be copper with a curb stop at the property line. Location of service line must appear on the “as-built” information and record drawings and will be located by the Owner using their GPS

system.

2. Curb Stops and Wyes

- a. All metal parts of curb stops shall be made of bronze. The stops shall be Ford model B43-232W or approved equal. The cock shall be operated with a combined cap and tee and shall open when turned counter-clockwise. All curb stops shall have locking device. The Contractor shall furnish and install all necessary couplings, adapters and fittings to plumb to service tubing.
- b. Wyes shall be Ford model Wye 44 or approved equal.

3. Service Tubing: Service tubing shall be ¾", 1" or 2" copper service pipe, type "K".

4. Corporation Stops

- a. Corporation stops shall be ground key type, shall be made of bronze conforming to ASTM B 61 or B 62, and shall be suitable for the working pressure of the system. Ends shall be suitable for grip type joint. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C800; compression nut for connection to copper tubing.
- b. The corporation stop shall be brass manufactured in conformance with AWWA C-800. Inlet and outlet threads shall conform to AWWA C-800.
- c. The key and body seating surfaces shall be accurately machined and fit to a taper of 1-3/4 inches per foot. The stem and retaining nut shall be so designed that failure from over tightening of the retaining nut results in thread stripping rather than stem fracture. Corporation stops shall be 1" or 5/8" equivalent to Mueller H-15008 or Ford F-1000 with a stainless-steel stiffener.
- d. Corporation stops shall be Ford F-1000 or approved equal.

5. PVC Casing for Freebore

- a. PVC casing pipe shall be used for long-side services. The PVC casing pipe shall be Schedule 40 and a minimum of 2" diameter extending a minimum of 3 ft. beyond the pavement on each side of the road.

L. Backflow Preventers:

1. General:

Backflow preventers shall be selected on the basis of impurities involved and the type of cross connection and shall be approved by the City Engineer.

2. Approval of Devices:

The backflow preventers shall be certified by the American Society of Sanitary Engineers, as having been tested by a nationally recognized laboratory in accordance with applicable ASSE standards. Each device shall bear the ASSE seal of approval and shall be individually factory tested.

3. Specifications and installation of Devices:

- a. Dual check backflow preventer (3/4 inch and 1 inch) shall have bronze body with two compact checks, a union, and “o” ring seals shall be installed at the downstream side of residential water meters to prevent backflow of polluted water into potable water supply. The device shall not be buried but may be installed in a pit below grade. A positive shut-off valve and a union shall be installed on the inlet side of the device.

The device shall meet or exceed the requirements of ANSI/ASSE

- b. Double check valve assembly backflow preventer (1 inch, 1 ½ inch and 2 inch) shall have brass body with replaceable seats, ball valve test cocks, and bronze strainers. The device shall be installed on the downstream side of all residential water meters to prevent backflow of polluted water into potable water supply. This device shall not be buried, but may be installed in a pit below grade, provided ball valve test cocks fitted with brass plugs are used, it should also include a positive shutoff valve and shall be equipped with three (3) leak proof test cocks. A fourth cock shall be provided on the upstream side of the inlet shutoff valve. A strainer with (20) mesh stainless steel screen shall be installed.

The device shall meet or exceed the requirements of ASSE, AWWA or USCFCC Manual for Cross Connection Control.

- c. Double check valve backflow preventer assembly (2 ½ inches, 3 inches, 4 inches, 6 inches, 8 inches, and 10 inches).

Shall have bronze body (2 ½ and 3 inches) epoxy coated. Cast iron or ductile iron (4 to 10 inches) body bronze seats, and stainless-steel internal parts. The device shall be installed on the downstream side of all water meters to prevent backflow or polluted water to potable water supply.

This device shall not be buried but may be installed in a pit below grade provided ball valve test cocks fitted with brass plugs are used. The assembly shall be equipped with three (3) leak proof test cocks, a fourth test shall be provided on the upstream side of the inlet shut-off valve. Also, a (20) mesh stainless steel screen shall be installed. The device shall meet or exceed the requirements of ASSE, AWWA or USCFCC Manual of cross connection control.

4. Double Detector Check Valve Backflow Preventer Assembly (DDC):

A double detector check valve assembly shall be installed at the property line for a building sprinkler system or private fire hydrant system installed for fire protection only. The DDC prevents reverse flow of fire protection system substances (stagnant water) from being pumped or siphoned into the potable water line, also provides a detection point for unauthorized water use.

Shall have a bronze body (3 inches) or epoxy coated cast iron body (4 to 10 inches) bronze seats, and stainless-steel internal parts. This device shall not be buried but may be installed in a pit below grade provided ball valve test cocks fitted with brass plugs are used. The unit shall be a complete assembly including US listed OS & Y shut off valves (Resilient seated) and test cocks, an auxiliary line consisting of an approved water meter and a backflow preventer. The device shall meet the requirements of AWWA of USCFCC Manual for cross connection control.

5. Reduced Pressure Zone Backflow Preventer (RPZ):

The RPZ backflow preventer shall be installed at the property line for a service which is considered as “hazardous” to prevent the back siphonage and back pressure backflow of contaminated water into the potable water supply.

Shall have bronze body (3/4 inch through 2 inches) or epoxy coated cast iron body (2 inches and above), and stainless steel internal springs The device shall consist of a pressure differential valve located in a zone between two tightly closing shut off valve (resilient seated) before and after the device, test cocks, protective strainer upstream of No. 1 Gate Valve. The device shall meet or exceed the requirements of AWWA or ASSE.

6. Reduced Pressure Zone Detector Double Check Valve Assembly:

A reduced pressure principle detector double check valve assembly shall be used to prevent the reverse flow of fire protection system substances (glycerin, wetting agents, water of non-potable quality) from being pumped or siphoned into the potable water line.

This device can detect leaks and provides a detection point for unauthorized use.

The unit shall have fused epoxy coated cast iron body, removable bronze sheets, stainless steel internal parts, maximum flow at low pressure drop with a 5/8” x 3/4” record all by-pass meter.

The unit shall be a complete assembly, including UL listed IS&Y shut-off valves with FM approval, including an auxiliary line consisting of an approved backflow preventer and a water meter. The device shall meet the basic requirements of AWWA or USCFCC Manual for cross connection control.

**M. Pipe Connection Couplings**

1. Pipe connections between new pipe and existing pipe shall be made with dresser Style 90 long steel couplings for pipe sizes 2” and below; for pipe sizes above 2”, M.J. solid sleeves (long style) shall be used. Spacer rings must be used at all solid sleeve locations. A spacer ring is defined as a short section of pipe cut to fit into the gap between the two plain ends of pipe at the sleeve location.

**N. Nitrile Gaskets**

1. In areas where underground fuel storage tanks are located or know to have been located and as directed by the Engineer, the D.I.P. water main joints shall use American Pipe “Nitrile (NBR)” (Acrylonitrile Butadiene) gaskets or approved equal.

**Section 205: Handling Materials**

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. All materials dropped or dumped will be subject to rejection without additional justification.
- B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front loader. Do not use material damaged in handling.
- C. Distribution: Distribute and place pipe and materials to not interfere with traffic. Do not string pipe more than 300 feet beyond the area where pipe is being laid. Do not obstruct drainage ditches.
- D. Storage: Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas. Do not interfere with other contractors right to access.

**Section 206: Construction Along Highway, Streets, and Roadways**

Install pipelines and accessories along highways, streets and roadways in accordance with the applicable regulations of the County, City, and/or the Department of Transportation with reference to construction operations, safety, traffic control, road maintenance and repair.

- A. Protection of Traffic: Provide and maintain suitable signs, barricades and lights for protection of traffic.

Replace all highway signs removed for construction as soon as possible. Do not close or block any highway, street, or roadway without first obtaining written permission from the proper authorities.

Provide flagmen to direct and expedite the flow of traffic in accordance with an approved traffic control plan.

- B. Construction Operations: Perform all work along highways, streets and roadways to least interfere with traffic.
1. Stripping: Where the pipeline is laid along road shoulders, strip and stockpile all sod, topsoil and other material suitable for shoulder restoration.
  2. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.
  3. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.
- C. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep or hose all scattered excavated material off of the pavement.
- D. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material and free to drain at all times.
- E. Maintaining Highways, Streets, Roadways and Driveways: Maintain streets, highways, and roadways in suitable condition for movement of traffic until completion and final acceptance of the work. Use steel running plates to maintain traffic until pavement replacement is completed. Steel running plates shall not be used for more than three consecutive calendar days.

NOTE: Traffic must be maintained at all times. When one lane is closed, flagmen must be utilized to maintain traffic flow.

Repair all driveways that are cut or damaged immediately. Maintain them in a suitable condition for use until completion and final acceptance of the work.

### **Section 207: Clearing**

- A. Clear areas only as required for access to site and execution of Work. Clearing shall consist of the felling and cutting of trees into sections, and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the area to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be burned or removed completely from the site, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inch or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the hole of the tree or main branches. Cuts more than 1-1/2 inch in diameter thus made shall be painted with approved tree wound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by the erection of timber barriers or by such other means as the circumstances

- require. Such barriers must be placed and be approved by the OWNER before construction can proceed (. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.
- B. Grubbing shall consist of the removal and disposal of stumps, roots larger than one (1) inch in diameter, and matted roots from the designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for building of pavement subgrade or building pads, shall be excavated and removed to a depth of not less than 18-inches below the original surface level of the ground in embankment areas and not less than 2-feet below the finished earth surface in excavated areas. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.
  - C. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. The work shall include the felling of such trees and the removal of their stumps and roots. Trees shall be disposed of as hereinafter specified.
  - D. Remove debris, rock, and other extracted plant life from site.
  - E. Partially remove paving, curbs; as indicated. Neatly saw cut edges at right angle to surface.

### **Section 208: Excavation**

- A. It is the responsibility of those performing excavation and trenching to conform to all State and Federal Laws and Regulations, and local ordinances relating to safety life, health and property including but not limited to OSHA regulations, 29 CFR PART 1926, Subpart P, Paragraph 1926.650 through 1926.652 during all excavations and trenching. All excavations shall be adequately guarded with barricades and light in compliance with all OSHA and Georgia Department of Transportation requirements so as to protect the public from hazard. Excavations adjacent to existing or proposed buildings and structures or in paved streets or alleys shall be sheeted, shored and braced adequately to prevent undermining or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition.
- B. Proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures in the trench zone may be determined before being damaged. The Contractor/Developer shall be held responsible for the repair or replacement of such structures when broken or otherwise damaged because of operations.
- C. Trenches shall be excavated to the designated lines and grades, beginning at the outlet end and progressing toward the upper end in each case. Trenches for pipe shall be shaped to the lower 1/3 of the pipe and provide uniform and continuous bearing. Bell holes shall be dug to allow ample room for working fully around each joint.
- D. Trenches shall be of minimum width to provide ample working space for making joints and shall be not less than 8 inches or more than 12 inches from outside barrel

of the pipe on any side at any point. Sides of trenches shall be closely vertical to top of pipe and shall be sheet piled and braced where soil is unstable in nature. Above the top of the pipe, trenches may be sloped. The ridge of the trench above this level may be wider for sheeting and bracing and the performance of the work.

- E. Excavation in excess of the depth required for proper shaping shall be corrected by bringing to grade the invert of the ditch with compacted coarse, granular material to achieve standard laying condition Type 4 in accordance with AWWA C151. Bell holes shall be excavated to relieve bell of all load, but small enough to ensure that support is provided throughout the length of the pipe barrel.
- F. Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a subfoundation of 1500 psi concrete.
- G. For ductile iron pipe, the trench shall need all requirements if standard laying conditions type 2 in accordance with AWWA C151. If trenches are excavated to widths in excess of those specified, or if the trench walls collapse, the pipe shall be laid in accordance with the next better class of bedding.

#### **Section 209: Existing Underground Utilities and Obstruction**

- A. It is the responsibility of the Contractor to call 811 at least 3 days prior to start of excavation. It is the responsibility of the Contractor/Developer to locate all existing utilities along the path of his construction. Where utilities are encountered, the location and alignment of the water main may be changed, upon written approval of the Engineer and City, to avoid interference.

#### **Section 210: Laying and Jointing Pipe and Fittings**

- A. General – Ductile iron pipe shall be laid in accordance with AWWA C-600; PVC pipe shall be laid in accordance with AWWA C 605, ASTM D 2774, UNI-Bell UNI-B 3 and the pipe manufacturer’s recommendations; HDPE pipe shall be laid in accordance with the AWWA C 906, ASTM D2321, and the pipe manufacturer’s recommendations.
- B. Construction Methods:
  - 1. Field Inspection: All pipe and accessories shall be laid, jointed, tested for defects and for leakage with pressure and chlorinated in the manner herein specified in the presence of the City or his authorized representative and subject to their approval.
  - 2. Handling Pipe and Accessories:
    - a. Care: Pipe, fittings, valves and other accessories shall be unloaded at the point of delivery, hauled to and distributed at the site of the project by the contractor; they shall at all times be handled with care to avoid damage. In loading and unloading they shall be lifted by hoists, slid, or towed on skid-ways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground.

- b. At Site of Work: In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench and shall be laid on high ground so that it will not be in a drainage way.
- c. Bell Ends, How Faced: Pipe shall be placed on the site of the work parallel with the trench alignment and with the bell ends facing the direction in which the work will proceed, unless otherwise directed by the Engineer.
- d. Pipe Kept Clean: The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times.
- e. Detection Tape: Marking tape shall be buried a minimum of 12” and a maximum of 18” below finish grade. The tape shall be placed during backfill.
- f. Tracing Wire: Tracer wire will be installed on the top of the pipe and looped up to surface level in all valve boxes and at all service laterals. Tracer wire shall be taped to the top of pipelines at a minimum of 5 ft intervals in a uniform, continuous manner. This tracing wire system shall be checked and tested by the Contractor, in the presence of the Engineer or OWNER, prior to acceptance of the water main installation. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor. Tracer wire shall be 12 GA single strand or up to 7 strands, copper with insulation UL rated for direct bury underground service. Splices shall be UL rated for direct bury and shall be minimized.
- g. Curb Marking: In projects with curb and gutter streets, all service laterals shall be clearly marked by embossing letters in curb perpendicular to the appurtenance. The embossed letter shall be stamped in the curb perpendicular to the appurtenance. The embossed letter shall be stamped in the curb during installation and shall consist of a minimum 3” tall letter indicating type of appurtenance. Lettering shall be “S” for sewer services, and “W” for water services.
- h. Locator Posts: Installation of posts shall be installed in a true vertical plane directly over the pipe. Post should be driven at a uniform anchoring depth of 18 to 24 inches. The tracing wire shall be brought to the surface and attached to the locator post with non-corrosive hardware. Specify material type and style (fiberglass – blue for water).
- i. Valve Markers: Valve markers shall be made of 3,000 psi concrete and shall be four (4) feet long and four (4) inches on each side, with two (2) No.4 reinforcing bars. The markers shall be set with an even number of

feet between the centerline of the valve and the centerline of the aluminum disc in the top of the marker and the distance in feet between the valve and marker shall be stamped in the marker at the time of setting.

C. Alignment and Grade:

1. General: All pipe shall be laid and maintained in the required lines and grades, with fittings and valves at the required locations, with joints centered and spigots home, and with all valve stems plumb.
2. Depth of Pipe: Where pipe is laid in roadways and parkways of streets, the top of the barrel of the pipe shall have a minimum cover of forty-eight inches (48”) below the curb line of the street or where not curb line has been established, below the existing ground line. Where the pipe is laid in open, unsubdivided areas, a minimum of forty-eight inches (48”) of cover is required. A greater depth of cover is required in certain sections of the main, such as railroad crossings, valve locations and other sections of special construction, and within State and Federal highway rights-of-way.
3. Prior Investigation – Prior to excavation, investigation shall be made to the extent necessary to determine the location of existing underground structures and conflicts. Care shall be exercised during excavation to avoid damage to existing structures. The pipe manufacturers recommendations shall be used when the water main being installed is adjacent to a facility that is cathodically protected.
4. Unforeseen Obstructions – When obstructions that are not shown on the plans are encountered during the progress of work and interfere so that an alteration of the plans is required, the design Engineer with Owner’s approval will alter the plans, or order a deviation in line and grade, or arrange for removal, relocation, or reconstruction of the obstructions. Owner and Engineer shall be notified immediately upon discovery of said inconsistency.
5. Clearance – When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the acceptance of the City, to provide clearance as required by federal, state, and local regulations or as deemed necessary by the City to prevent future damage or contamination of either structure.

B. Pipe Handling:

1. Manner of Hauling Pipe and Accessories: Proper implements, tools and facilities shall be provided and used by the contractor for the safe and convenient execution of the work. All pipe, fittings and valves shall be carefully lowered into the trench piece by piece by means of derrick ropes or other suitable tools or equipment, in such manner as to prevent damage to pipe or accessories. Materials dropped or dumped into the trench will be subject to

- rejection without additional justification.
2. Inspection: Before lowering and while still suspended, the pipe shall be inspected for defects. Any defective, damaged or unsound pipe shall be rejected.
  3. Pipe Kept Clean: All foreign matter or dirt shall be removed from the pipe, and it shall be kept clean by approved means during and after laying.
  4. Laying of the Pipe: The spigot shall be centered in the bell, the pipe forced "home" and brought into true alignment; it shall be secured there by earth carefully tamped under and on each side of it, excepting at the bell holes. Pipe shall not be belled beyond manufacturer's recommendation. Care shall be taken to prevent dirt from entering the joint space. No "blocking up" of pipe or joints will be permitted. The joint shall be made as hereinafter described.
  5. Trench Water Entering Pipe: At times when pipe laying is not in progress, the open ends of the pipe shall be closed by approved means and no trench water shall be permitted to enter the pipe.
  6. Cutting Pipe: Cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat workmanlike manner without damage to the pipe or lining.
  7. Bell Ends Face Direction of Laying: Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying; and for lines on an appreciable slope, bells shall, at the discretion of the engineer face up-grade.
  8. Permissible Deflections at Joints: Wherever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane to avoid obstructions, the degree of deflection shall not exceed two-third manufacturer's recommendations.
  9. Unsuitable Conditions for Laying Pipe: No pipe shall be laid in water, or when the trench conditions or the weather is unsuitable for such work.
- C. Jointing Pipe-Mechanical Joints: The following steps shall be taken in making mechanical joints:
1. All lumps, blisters and excess coal-tar enamel shall be removed from socket and spigot of the pipe.
  2. Wash socket and plain end with soapy water containing chloride solution; then slip gland and gasket over plain end. The small side of gasket and lip gland shall face bell.
  3. Paint gasket with soapy solution containing chlorine.
  4. Push gasket into position, being sure it is evenly seated in socket.

5. Slide gland into position; insert bolts and run nuts up finger tight.
  6. Tighten bolts to uniform tightness with correct ratchet wrench. The first bolt tightened shall be the bottom bolt, then top. All other bolts shall be tightened in sequence at 180 degrees apart.
- D. Setting Hydrants, Valves, Valve Boxes and Fittings:
1. General: Hydrants, valves and pipe fittings shall be set and jointed to new pipe in the manner heretofore specified for cleaning, laying and jointing pipe. Hydrants and valves shall be installed plumb. Valve-operating stems shall be oriented in a manner to allow proper operation.
  2. Valve Boxes: Cast iron valve boxes shall be firmly supported and maintained centered and plumb over the wrench nut of the gate valve, with box cover.
- E. Plugging Dead Ends: Standard plugs shall be inserted into the bells of all dead ends of pipes, tees or crosses and spigot ends shall be capped. Plugs or caps shall be jointed to the pipe or fittings in the manner specified above.

### **Section 211: Connections to Existing Pipe Lines**

- A. Before laying pipe, locate the points of connection to existing pipe lines and uncover as necessary for the City or Engineer to confirm the nature of the connection to be made. The Contractor/Developer shall furnish materials and make the connection to all existing pipelines. The City reserves the right to observe all tie-ins to the City's existing water system. Use all available practices and resources to minimize the time the customers are without water. The Contractor/Developer shall notify the City 48 hours in advance all affected customers at least 24 hours in advance of all water outages.

### **Section 212: Thrust Restraint**

- A. Thrust Blocking:
1. Concrete having compressive strength of not less than 3000 psi shall be used as a cradle or thrust blocking. Bends exceeding 22-1/4 degrees, crosses with one opening plugged, and all tees shall be backed with concrete as a thrust block. Blocking shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on ground in each instance shall be that shown on the plans. The blocking shall be so placed that the pipe fitting joints will be accessible for repair. Joint restraints equivalent to Megalugs manufactured by EBAA Iron may be used in lieu of concrete blocking, only as approved by Engineer.
  2. Anchorage for Hydrants – A concrete block 1' x 1' x 2' shall be poured between the back of the hydrant and undisturbed earth of the trench side without covering weep holes and bolts.

**Section 213: Backfilling**

- A. Backfilling consists of placing suitable materials removed during the excavation into the excavated areas, placing embedment materials and compacting the same to a density equal to or greater than what exists before excavation or as specified herein.
- B. All backfill material shall be free of stones, concrete and clay lumps larger than 1/3 cubic foot. Roots, stumps and rubbish which will decompose will not be permitted in the backfill. Backfill material shall have its moisture content corrected, as may be necessary before being placed in the trench to bring the moisture content to approximately "optimum" for good compaction. Any rock, stone, concrete, clay lumps larger than 1/3 cubic foot in volume, rubbish and debris shall be removed from the site and disposed of in a lawful manner.
- C. **Select Backfill:** Select backfill material shall be placed below, around each side, and over the top of the pipe in approximately horizontal layers not exceeding 6-inches in thickness to a minimum height of 6-inches above the pipe crown or greater as detailed herein and on the Drawings. This initial backfill shall be placed immediately after the pipes are laid and jointed to anchor and protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe. Select Material shall include Class I, II, III and other approved materials. If suitable select materials are not available from trench excavation, it is required to obtain select materials elsewhere. Backfill both sides of the pipe simultaneously to prevent side pressures and each layer shall be compacted thoroughly with mechanical tamping equipment in such manner as not to damage the pipe, pipe joints or shift the pipe alignment. Workmen shall not be permitted to walk over the pipe until at least 12 inches of compacted fill has been placed over the pipe.
- D. **General Backfilling:** After initial, select backfill material has been placed and tamped, the remainder of the trench may be backfilled with general excavated material, except that no rock, unless in small shattered fragments, will be permitted to be mixed with other backfill material.
1. **Backfilling under structures:** Backfilling under structures consists of placing sand and gravel or other select suitable materials excavated from the trench in the trench in 6 inch thick layers from a point 12 inches above the top of the pipe and mechanically tamped or compacted by rolling until the backfill density after compaction is equal to 98 percent of the maximum density obtainable at optimum moisture content as determined by the Standard Proctor Test (ASTM D698). No water shall be used to secure compaction except for adding water to the backfill material before placing in the trench to bring moisture content to approximately "optimum" for good compaction. Each 6-inch-thick layer shall be mechanically tamped before additional backfill material is placed in the excavated area.
  2. **Street and Road Right – of – Way, Parking Areas, Yards and Other Traveled Areas:** Backfill materials consists of placing sand and gravel or other select suitable material excavated from the trench in uniform layers not exceeding six inches (6") in thickness, with each layer thoroughly compacted with heavy

duty mechanical tampers (“Whacker” or equal) to a height of at least forty-eight inches (48”) above the top of the pipe barrel.

3. Backfill Under Roads: Backfill under roads shall be compacted to 95% up to top 2’ below grade and 98% for top of the maximum dry density as determined by the Standard Proctor Compaction Test (ASTM D698).
4. Other Area: In other areas, including woodland, fields, pastures and areas not open to vehicular travel, the remainder of the ditch may be backfilled by placing fill in ditch and “walking-in” with wheel loaded equipment. Backfill material may be windrowed and maintained in a suitable manner so as to concentrate and pond rainfall runoff over the trench. After sufficient settlement has been obtained, the surface shall be dressed, and surplus material removed. Wherever trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off and finally made to conform to the surface of the ground. Backfilling shall be carefully performed, and the original surface restored as specified herein. Surplus material shall be disposed of properly.

#### **Section 214: Removing and Replacing Pavement**

##### **A. Roadway Surface:**

The surface course for all pavement, including Paint or tack coat when required by the City, shall conform to the requirements of the Georgia State Highway Department Specifications for Asphaltic Concrete, Section 400, Type “E” (Modified Top). Use a Pug Mill Rotary Drum type mixer with minimum capacity of not less than 50 tons per hour for asphalt production. Apply and compact the surface course in a manner approved by the City. Immediately correct any high, low or defective areas by cutting out the course, replacing with fresh hot mix, and immediately compacting to conform and thoroughly bond to the surrounding area.

- B. Temporary Pavement: Where directed by the City, temporary pavement shall be placed with top matching the grade of existing pavement. The material shall be 1-1/2” of Hot Laid Asphaltic Concrete Surface Course and 6” of Stabilized Aggregate Base Course.

##### **C. Cutting Pavement**

1. Cut and remove pavement as necessary for installing the new pipe lines and appurtenances and for making connections to existing pipe lines.
2. Before removing pavement, the pavement shall be marked for cuts nearly paralleling pipe lines and existing street lines. Asphalt pavement shall be cut along the markings with a jackhammer, rotary saw or other suitable tool. Concrete pavement, and asphalt pavement on concrete base, shall be scored to a depth approximately two (2) inches below the surface of the concrete along the pavement may be broken below the scoring with a jackhammer or other suitable equipment.
3. No pavement shall be machine pulled until completely broken and separated

along the marked cuts.

4. The pavement adjacent to pipeline trenches shall neither be disturbed nor damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, the damaged pavement shall be removed and replaced.

D. Hot Mix Asphalt Pavement Construction, Repair and Replacement:

1. All existing pavement cut or damaged by construction shall be repaired to match the original surface material and original grade. Materials and construction procedures for base course and pavement repair shall conform to the Georgia Department of Transportation Specifications for the type of original surface.
2. New pavements shall be placed at the locations as shown on the Drawings.
3. The work for new or for repair of existing pavement shall include the placing and compacting of the base course, the placing of the Portland Cement Concrete at the thickness specified in the details, the application of prime and tack coats where required, the placing and maintaining of the hot mix asphalt surface course at the thickness specified in the details, and all special requirements specified herein.
4. The backfill shall be thoroughly compacted prior to concrete base.
5. The asphalt surface course shall be thoroughly rolled or tamped with a mechanical roller or tamper. Rolling of patches with truck tires will not be permitted.

E. Concrete Pavement

1. Where the installation of pipe involves the cutting of concrete, the cutting shall be kept to a minimum. Once the pipe is installed, trench shall be compacted to 98% density according to the modified proctor. After compaction, install and compact a 6" thick graded aggregate base course. The base shall be poured and finished. Concrete shall be 3,000 psi and shall be equal or better than original pavement.
2. When sidewalks are removed and replaced, match the existing dimensions and thickness.

F. Clean-up

1. After all repair and restoration of paving has been completed, all excess asphalt, dirt, rock and other debris shall be removed from the roadways. All existing storm sewers and inlets shall be checked and cleaned of any construction debris.

G. Maintenance of Repair

1. All wearing surfaces shall be maintained in good order and be suitable for traffic at all times for a period of one year after completion and acceptance of the work. Approximately at the end of the maintenance period a final inspection will be made of the repaired surface and any settlement or depression of the repaired surface shall be adjusted as specified by Engineer or previously noted herein.
2. Materials: Place material for pavement replacement to dimensions shown on the Drawings. Typical replacement details are included in Appendix A.
  - a. Graded Aggregate Sub-Base: Furnish graded aggregate sub-base in two sizes of such gradation that when combined in approximately equal quantities, the resulting mixture is well graded from coarse to fine, meeting the gradation requirements of Section 816 of the State Highway Department of Georgia Standard Specifications.
  - b. Black Base: The base for all paved roadways shall conform to the requirements of the Georgia State Highway Department Specifications for the Black Base (Hot Mix). Use a Pug Mill Rotary Drum type mixer with minimum capacity of not less than 50 tons per hour for asphalt production. Apply and compact the base in two courses by asphalt spreader equipment of design and operation approved by the Authority. After compaction, the black base shall be smooth and true to established profiles and Sections.
  - c. Surface Course: The surface course for all pavement, including paint or tack coat when required by the Authority, shall conform to the requirements of the Georgia State Highway Department Specifications for Asphaltic Concrete, Section 400, Type “E” (Modified Top). Produce surface course in an asphalt plant of the same type as noted above for Black Base. Apply and compact the surface course in a manner approved by the Authority. Immediately correct any high, low or defective areas by cutting out the course, replacing with fresh hot mix, an immediately compacting to conform and thoroughly bond to the surrounding area.
  - d. Concrete: Provide concrete and reinforcing for concrete pavement in accordance with the requirements of Georgia State Highway Department Specifications for Portland Concrete Pavement, Section 430.
3. Supervision and Approval: Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final inspection. Obtain the Authority’s approval for restoration of pavement such as private roads and drives.

Complete pavement restoration as soon as possible after backfilling.

4. Replacement: Prior to replacing pavement, make a final cut in concrete pavement nine inches back from the edge of damaged pavement. Make the cut using a rotary saw. Remove asphalt pavement nine inches back from the edge of damaged

pavement using jack hammers or other suitable tools.

Replace all street and roadway pavement as shown on the Drawings. Replace driveways, sidewalks, and curbs with the same material and to the same dimensions as existing.

5. Failure of Pavement: Should any pavement restoration or repairs fail or settle during the life of the contract, including the bonded and warranty period, promptly restore or repair defects.

**Section 215: Boring**

A. Jack and Boring

1. Materials and Construction:

- a. The casing pipe shall be new and unused steel pipe, conforming to ASTM A-139, Grade B, electric fusion welded steel pipe, having a minimum yield strength of 35,000 psi. The exterior and interior of the steel casing pipe shall be coated with a coal tar varnish.
- b. The thicknesses of casing shown below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired.
- c. The diameters of casing shown below are minimum. Railroad Owner to specify for all railroad crossings.

**UNDER RAILROADS**

Pipe Dia. (inches)	Casing Pipe (Inches)	Wall Thickness (inches)
4	10	.250
6	14	.250
8	18	.250
10	20	.281
12	22	.312
14	24	.344
16	30	.406
18	30	.406
20	32	.469
24	36	.469
30	42	.500

**UNDER HIGHWAYS**

Pipe Dia. (inches)	Casing Pipe (Inches)	Wall Thickness (inches)
4	10	.250

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6	12	.250
8	16	.250
10	16	.250
12	18	.250
16	24	.250
18	30	.312
20	30	.312
24	36	.375
30	42	.375

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d. Casing Spacers: Casing spacers shall meet one of the following requirements:

1) Casing spacers shall be a two-section, flanged bolted on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with 2-inch wide glass reinforced polyester insulating skids, heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of 85-90 durometer. Casing spacers shall be Cascade Waterworks Manufacturing Company or Advanced Products & Systems, Inc., or equivalent product approved by the Engineer.

2. Shaft:

a. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.

b. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to site and soil conditions. Keep preparations dry during all operations. Perform pumping operations as necessary.

c. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the Engineer due to soil conditions.

3. Jacking Rails and Frame

a. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.

b. Place backing between the heels of jacking rails and the rear of the shaft.

The backing shall be adequate to withstand all jacking forces and loads.

- c. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.
4. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing or wetboring.
5. Auger the hole and jack the casing through the soil simultaneously.
6. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.
7. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing piping penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.
8. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed, and the alignment and grade checked at minimum intervals of 60 feet.
9. Any casing pipe damaged in jacking operations shall be repaired, if approved by the City, or removed and replaced.
10. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire joint circumference, in accordance with AWS recommended procedures. Prior to welding the joints, ensure that both ends of the casing sections being welded are square.
11. Prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.
12. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor/Developer.
13. Care should be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.
14. Maintain and operate pumps and other necessary drainage system equipment

to keep work dewatered at all times.

15. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing should be left in place, cut off, or removed, as designated by the City.
16. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.
17. Grout backfill shall be used for unused holes or abandoned pipes.

### **Section 216: Stream and Ditch Crossing**

- A. Water lines crossing surface waters, both above and below the watercourse, present special problems and should be discussed with the City before plans are prepared for submission.
- B. Crossing of surface waters above the watercourse shall only be made when other methods are impractical.
- C. When crossings are permitted, they shall be as close to a right angle to the stream as possible. No more area shall be disturbed than is necessary to provide for the construction of the water line at that location.
- D. At all points where banks of streams or drainage ditches are disturbed by excavation or where natural vegetation is removed, carefully compact backfill and place rip rap or an approved erosion control fabric where applicable to prevent subsequent settlement and erosion.
- E. This requirement applies equally to construction alongside a stream or drainage ditch as well as crossing stream or drainage ditch. Place rip rap a distance of not less than 10 feet upstream and 10 feet downstream from any disturbed area. Extend rip rap from 1 foot below streambed to top of bank. Place to conform with the natural slope of the stream bank. Use only one method, either (a) or (b), throughout the job.

### **Section 217: Testing**

- A. Pressure and Leakage Tests:
  1. Pressure During Test: Immediately after the pipe has been laid and backfilled, but prior to the placement of pavement, each valved section of newly laid pipe shall be subjected to a leakage and pressure test. For any section being tested the pressure applied shall be such that at the highest point in the section, the pressure shall be 150 psi or 1.5 times the normal static pressure, whichever is greatest. Test Pressure shall not vary by more than 5 psi. This may require periodic pumping.
  2. Duration of Test: The duration of each pressure test shall be two (2) hours.

3. Procedures: Each valved section of pipe shall be slowly filled with water and the specified test pressure, measured at the point of highest elevation shall be supplied by means of a pump connected to the pipe in a satisfactory manner. The Contractor/Developer shall furnish all necessary equipment, labor and assistance in conducting the tests. The City will furnish, through connections made by the contractor to existing mains, water for filling the lines for making the test.
4. Expelling Air Before Tests: Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points of highest elevation and afterward tightly plugged.
5. Examination Under Pressure: At intervals during the test, the route of the pipeline shall be inspected to locate any leaks or breaks. Any cracked or defective joints, cracked or defective pipe, fittings or valves discovered in consequence of this pressure test shall be removed and replaced with sound material in the manner provided and the test shall be repeated until satisfactory results are obtained.
6. Permissible Leakage: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, of any valved section thereof, to maintain the specified leakage test pressure after the pipe has been filled with water and the air in the pipeline has been expelled. No installation will be accepted if leakage is greater than that determined by the formula:

For Ductile Iron Installations: 
$$L = \frac{ND(P)^{0.5}}{133,200}$$
 Where:

L is the allowable leakage in gallons per hour; N is the length of pipeline tested in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test in pounds per square inch gauge.

Leakage values determined by the above formula are to be found in the following Table.

Allowable Leakage for Water Main Installation (Per 1,000 ft) in Gallons per Hour

Nominal Pipe Diameter, Inches	Average Test Pressure in Pipeline	
	150 PSI DI	200 PSI DI
4"	0.37	0.43
6"	0.55	0.64
8"	0.74	0.85
10"	0.92	1.06
12"	1.10	1.28

7. Tapping Sleeve or Tapping Valve: All tapping sleeves and tapping valves shall

be air or water tested to a pressure of 200 psi prior to making the tap into an existing main. Any leaks shall be detected by applying a soap solution to all sealing surfaces. The seal and the valve shall be adjusted and retested as necessary until no leaks are observed. After the sleeve and valve have been tested satisfactorily, the existing main can be tapped. All testing and tapping shall be done in the presence and at the discretion of a representative of the City.

8. If leaks are detected, locate, repair and retest. If results are not totally satisfactory, the City may require additional testing.

### **Section 218: Disinfection of Water Mains**

- A. The contractor shall disinfect all new mains, in accordance with AWWA C651 furnishing all labor, equipment and material necessary for the complete disinfection of the mains as hereinafter provided prior to being placed in service. Mains shall be disinfected by the application of a chlorinating agent into the water used for the initial filling of the mains. The chlorinating agent may be chlorine gas-water mixture, calcium hypochlorite in water, or chlorinated lime of known chlorine content in water and shall be fed through a suitable solution feed device. Before the main is chlorinated, it shall be filled to eliminate air pockets and flushed to remove particulates. Potable water shall be supplied through a temporary connection that shall include an appropriate cross-connection device for backflow prevention to the active distribution system. The flushing velocity in the main shall not be less than 2.5 ft/s. For mains 24-inches and larger, an acceptable alternative to flushing is to broom sweep the main, carefully removing all sweeps prior to chlorination. The chlorinating agent shall be applied at a point not more than 10 feet from the beginning point from which the main is being filled and shall be injected at a constant measured rate into the new main through a corporation cock tapped into the newly laid main. The water being used to fill the line shall be controlled to flow into the section to be sterilized very slowly and the rate of application of the chlorinating agent shall be in such proportion to the rate of the water entering the pipe that the chlorine dose applied to the water shall be at least 25 ppm. The chlorine treated water shall be retained in the new main at least 24 hours and a 10 ppm of residual chlorine shall remain after the 24-hour period. During the 24-hour period, all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. Following chlorination all treated water shall be flushed from the mains until replacement water shall have a chlorine content of not more than 0.1 ppm in excess of the residual in water from the supplying main and in any event not less than 0.2 ppm. Samples of the water shall be taken from several points in the new lines and sent to the City who will submit them to a State Approved lab for bacteriological analysis. The City will pay for all costs associated with the first bacteriological testing of each section of pipeline tested. Should the analysis show contamination, the system shall be re-chlorinated and further samples taken and submitted for analysis until no contamination is indicated. The Developer shall pay for all costs associated with re-chlorinating and re-testing of water samples including, but not limited to, the cost of additional bacteriological testing.

**Section 219: Protections and Restoration of Work Area**

**A. Protection**

1. All trees on the site will be saved except those marked specifically on the site by the City’s representative for removal during construction. No trees, either those marked for removal on the site or any other tree, may be removed from the site prior to the preconstruction conference. All trees not to be removed will be protected from injury to their roots and to their top to a distance of three (3’) feet beyond the drip-line and no grading, trenching, pruning, or storage of materials may go in this area. The Contractor/Developer will pay a penalty for any tree removed from the site which has not been marked specifically for removal. The Contractor/Developer also will pay for any tree which dies due to damage during construction.
  
2. The Contractor/Developer shall not be held accountable for damages to trees resulting from placement of fill or removal of soils where such action is required. Any tree, the trunk of which is within 10 feet of any footing or trench, shall be exempt from these penalties. However, all reasonable precautions to preserve these trees shall be taken. The contractor agrees to pay penalties as established below in the event that he or any of his subcontractors causes the loss or removal of trees designated to be saved under the provisions of the Agreement.

The penalty is as follows:

<u>Tree Diameter at a Point 4 Feet Above Existing Grade</u>	<u>Penalty</u>
6” – 7”	\$300.00
7” – 8”	\$375.00
8” – 11”	\$550.00
12” – 20”	\$800.00
21” and larger	\$1,000.00

3. Trees to be graded by the City as to variety, condition and site importance with the above figures acting as a maximum penalty with the lowest assessment amount to be no less than one-half of the above penalty figures.
  
4. Protect property pins, bench marks, survey control points, and existing structures from damage or displacement.
  
5. Protect all utilities that remain.
  
6. Clearing operations shall be conducted so as to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and so as to provide for the safety of employees and others.

**B. Removing and Resetting Fences**

1. Remove existing fences as necessary to permit construction. As construction progresses, reset the fences in their original location and to their original condition as soon as practical.
- C. Protecting Trees, Shrubbery, and Lawns
1. Trees and shrubbery along trench lines shall not be disturbed unless absolutely necessary. Trees and shrubbery necessary to be removed shall be properly heeled-in and re-planted. Heeling-in and re-planting shall be done under the direction of an experienced nurseryman.
  2. Where utility trenches cross established lawns, sod shall be cut, removed, stacked and maintained in suitable condition until replaced. Topsoil underlying lawn areas shall likewise be removed and kept separate from general excavated materials. Removal and replacement of sod shall be done under the direction of an experienced nurseryman.

**Section 220: Bedding**

- A. Stone Stabilizer for subgrade where needed shall be either approved crushed stone or gravel, uniformly graded from 3/4" to 1 1/4" in size.

**END ARTICLE II**

## **ARTICLE III: STANDARDS FOR DESIGN AND CONSTRUCTION SPECIFICATIONS FOR WASTEWATER COLLECTION**

### **Section 301: Purpose**

- A. The purpose of this Article is to address the minimum requirements for design and construction and describe the products to be incorporated into public sanitary sewerage systems with gravity sewer mains, pump stations and sewer force mains. All products shall be supplied, and all work performed in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable. When the standards set forth in these Articles are more restrictive than those required by any statute, ordinance or regulation applicable within the City of Stockbridge, the requirements of this Article shall govern. When the provisions of any other statute, ordinances, or regulation require more restrictive standards than required by this Article, the more restrictive standards shall apply.
- B. The authority for discretionary provisions for design and construction of public sewer systems shall vest with the City Engineer or his/her designee.
- C. On-site sewage disposal systems for more than one individual residence or one stand-alone business will not be allowed.
- D. This Article is subject to periodic revision to meet changing requirements for materials, environmental regulations, etc. At the beginning of a project the Developer should verify that he has the latest edition.

### **Section 302: General**

- A. This document is intended to convey the general design and construction requirements for a typical project. It also lists specific requirements relating to inspection, testing and acceptance of facilities. It is not intended as a substitute for site-specific engineering and construction techniques. Individual project conditions may require waivers from the provisions in this document.
- B. Sewerage systems shall be designed in accordance with the densities and intensities reflected in the Long-Range Future Land Use Map of the Adopted City of Stockbridge Comprehensive Plan and the City's Wastewater Management Plan.
- C. The approximate location and character of proposed public sewer facilities shall correspond with the Existing and Proposed Sewer System Map, as amended.
- D. Sewer systems shall be designed for the estimated future population from all contributing points under consideration. The estimated future population shall be based on the adopted Comprehensive Plan and/or the existing zoning of the land for the watershed to be served, whichever is greater.

- E. Except as provided below, all future buildings within the City's corporate limits that are to be utilized for human occupancy or any other use such as commercial or industrial purposes that requires sanitary sewerage facilities shall be connected to the public sanitary sewer system.
- F. Waiver of the requirement to connect to public sanitary sewers will be considered on a case-by-case basis for non-subdivided, single-lot buildings when the nearest connection point to a public sanitary sewer is more than 200 feet from the property line, when such buildings are to be used for single-family dwelling or some other use where the wastewater loading is no more than that of a single-family dwelling. Requests for waiver must be accompanied by appropriate documentation as may be required by local public health officials.
- G. Sewer Connections - All sewers and service laterals located outside of dedicated rights-of-way or public easements are regulated by the International Plumbing Code (IPC), and shall be privately owned and maintained.
- H. There shall be no physical connections between a drinking water supply and a sewer, or appurtenance thereof.
- I. The City has an Industrial Pre-Treatment Program and a Commercial Wastewater Pre-treatment Program for the purposes of protecting the City's sanitary sewerage system. Industries that discharge wastewater to the City's sanitary sewer collection system are required to comply with the City's Industrial Pre-Treatment Permit Requirements. Industrial and Commercial facilities that discharge fats, oils, and grease into the City's sanitary sewer collection system are required to comply with the Commercial Wastewater Pre-treatment Program. The City's Commercial Pre-treatment Program rules and regulations can be found in the Sewer Use Ordinance. See Standard 800-13 for the Grease Interceptor Detail.
- J. All installation and maintenance activities for sewerage systems must comply with all Federal, State and local erosion and sediment control regulations. A detailed erosion and sediment control plan is required to be submitted and approved prior to initiating any construction activities.
- K. Bypassing of raw wastewater onto the ground or a receiving stream is prohibited at all times.
- L. No part of these specifications is intended to relieve the Developer of his responsibility to comply with requirements of the Georgia DOT, the Georgia EPD or other appropriate regulatory agency.
- M. Photographs of the area should be taken and submitted to the City prior to initiation of any land disturbance or construction activities to show that final site conditions will be the same or better than original conditions as a result of restoration activities.
- N. All unsuitable excavated material must be properly disposed of in a manner acceptable to the City and in a manner that will not adversely impact the environment.

**Section 303: Drawings and Submittals**

- A. All projects which involve construction of lateral sewers, main sewers, trunk sewers, interceptor sewers or pumping facilities shall have detailed construction plans and specifications prepared by a Registered Professional Engineer licensed in the State of Georgia. Developments that only involve gravity sanitary sewers and small connecting sewers less than 1,000 linear feet may have plans and specifications prepared and stamped by a Registered Land Surveyor licensed in the State of Georgia.
- B. All development plans proposing a sewer system shall be submitted to the City of Stockbridge's Development Department. The Development Department shall coordinate the review and approval of all elements of the plan in accordance with these Minimum Development Standards.
- C. Preliminary plans will be prepared and submitted for review as described in this Document. Questions relating to availability of sanitary sewers and proposed location of connection should be resolved at this stage before proceeding with final planning. A submittal for preliminary plan review must include all land to be developed even though the land is to be developed in several phases or units. Availability determinations will be made for the total project.
- D. All final plans for public sanitary sewer facilities shall be prepared in accordance with the requirements described in these Development Standards and as required in regulations promulgated by the Georgia Environmental Protection Division (EPD). The Developer (not the City) shall be responsible for submitting all necessary plans and other data to EPD for required approvals and for obtaining other permits, such as DOT, railroad, wetlands, etc.
- E. Sanitary sewer design calculations shall be submitted for all proposed mains as part of the development plans along with a sewer-shed map. Deviations from the flow rates of the below table shall be included in the submission of the development plan, with a description of the procedure used for the calculations and must be approved by the Public Works Director.

1. Peak Flows based on Future Flows:

Sewer systems shall be designed to carry the peak flows generated by the estimated future population from all contributing points under consideration. The estimated average daily flow will be computed using the unit flows from the below table. In the absence of actual data, sewer peak flows should be determined by consulting the latest edition of the *Recommended Standards for Wastewater Facilities* (Ten State Standards) .

Peak flows will be determined using Table 3-1.

Considerations will be given to domestic, commercial, institutional and industrial wastes plus groundwater infiltration in determining the necessary capacity of the sewer system.

Table 3.1:

<b>AVERAGE DAILY WASTEWATER FLOWS BY FUTURE LAND CATEGORY</b>			
Land Use Category	Density SU/Ac	Unit*	Flow/Unit (gpd/unit)
Residential: Low Density	2	DU	400
Residential: Medium Density	5	DU	375
Residential: High Density	9	DU	350
Neighborhood: Commercial	--	Acre	2,000
Office/Professional	--	Acre	2,000
Commercial	--	Acre	2,000
Light Industrial	--	Acre	1,500
Office/Distribution/Technology	--	Acre	1,750
Heavy Industrial	--	Acre	2,000
Quasi-Public/Institutional/Churches	--	Acre	2,000
Public Land	--	Acre	**

\* Acres refer to gross acreage minus the floodplain area as established.

\*\* Design of sewer facilities to serve these land uses shall be on a case-by- case basis depending on specific uses.

- F. The design of cross-country (undeveloped property) sanitary sewer lines and force mains shall be based on field-run surveys. Contours and profiles shall be based on mean sea level elevation. Site plans shall show existing and proposed contours.
- G. In the event the subdivision is developed in phases, the final construction plans for sanitary sewers may be submitted in phases.
- H. Profiles should have a horizontal scale of not more than 1" =100' for cross-country lines and 1"=50' for (existing and proposed) developed areas, and a vertical scale of not more than 1"=10'. The plan view should be drawn to the corresponding horizontal scale. The plan view should normally be shown on the same sheet as the profile. In any case, both the plan and profile view should have line designations, station numbers, manhole numbers and any other indexing necessary to easily correlate the plan and profile view. The vertical datum used should be the elevation above mean sea level with benchmarks shown on the plan and the horizontal datum should be tied to State Plane coordinates. Plans and profile shall show location of streets, storm sewer, water lines and their easements.
- I. Final plans and specifications shall include appropriate soil erosion and sediment control practices and BMP's which shall comply with the City of Stockbridge ordinances, the Georgia Department of Natural Resources Environmental Protection Division regulations, the Georgia Erosion and Sedimentation Act of 1975 as amended, and the latest edition of the manual for Erosion and Sediment Control in Georgia as published by the Georgia Soil and Water Conservation Council.
- J. Detailed engineering design drawings shall be furnished that are drawn to scale to clearly show the nature of the design, and shall include the following:

1. All stream and storm drain crossings with elevations of the stream bed and of normal and extreme high and low water levels and storm drain inverts.
  2. Details of special sanitary sewer joints and cross sections.
  3. Details of special sanitary sewer appurtenances such as manholes, service connections, elevated sanitary sewers, piers, pipe bedding, special highway crossings, railroad crossings, drop manhole connections, etc.
  4. The developer's design professional shall furnish appropriate drawings for submittal by the City to any state or federal highways, railroads, power lines, water lines, gas lines, petroleum lines or any other utility lines on which the sanitary sewer construction will encroach.
    - a. The encroachment drawings shall be 8 ½ " x 11" and shall show a plan view and profile view. The drawing shall show the same information required for easement drawings.
    - b. The encroachment drawing shall also show the right-of-way of the existing street or utility, the owner's designation of the line, the name or number of the nearest intersection or milepost or tower number and the distance to that appurtenance; clearance distance between the street surface, or the bottom of the rail, or the utility and the sanitary sewer; the type of material to be used for the sanitary sewer and the method of construction to be used; any other special information required by the owner of the facility on which the sanitary sewer is encroaching.
    - c. Two (2) copies of the utility encroachment drawing will be furnished with the plans when they are submitted for approval.
    - d. The developer's design professional shall prepare and handle the submittal. Construction permits shall not be issued until the utility encroachment permit has been obtained any special conditions such as insurance requirements have been complied with, and connection fees have been paid.
- K. At the completion of construction (and preferably prior to the final field inspection) Record Drawings of the project shall be submitted to the City to serve as a permanent record of the project. A reproducible copy, in Adobe PDF format, of the final plan and two (2) sets of Record Drawings shall be submitted. A digital copy of the Record Drawings shall also be submitted in a format and coordinate system compatible with the City of Stockbridge's Geographic Information System (GIS). Each sheet of these drawings shall bear the words "As-Built" or "Record Drawings".
1. As-Built drawings will be same format as the original construction plans.
  2. Existing contour lines are not required; however, the final contour lines should

- be shown.
3. Road names and lot numbers should be on plan.
  4. "As-Built" or "Record Drawing" is to be stamped in large clear print on each sheet.
  5. Sheet should be no larger than 24" x 36".
  6. Lateral wye locations must show distance from the downstream manhole.
  7. Ends of lateral lines must show distance from downstream manhole and offset distance from the main line. Approximate depth of end of lateral should be shown.
  8. Show elevations of manhole inverts and tops.
  9. Show field-measured distance between manholes.
  10. For all sanitary sewers, show the field-measured azimuth or bearing of the line from manhole to manhole.
  11. Show actual slope of pipe.
  12. When a phase of a subdivision is completed, a location sketch of the entire subdivision with said phase outlines shall appear on plans.
  13. Maximum error of as-built measurements shall be:
    - a. Manhole inverts measure to 0.01' with maximum vertical error of 0.05' per 1,000 feet of horizontal traverse.
    - b. Manhole tops measure to 0.10' with maximum vertical error of 0.05' per 1,000 feet of horizontal traverse.
    - c. Horizontal Locations: Measure to nearest 1.0' with allowable error of 0.10' per 1,000' of traverse.

### **Section 304: Pipe and Accessories**

Products and materials used in the work shall conform to the following:

#### **A. Sanitary Sewer Pipe**

1. Ductile Iron Pipe – Shall conform to ANSI A21.50 (AWWA C-150) latest revision, ANSI A21.51 (AWWA C-151) latest revision, and ASTM A746. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. All ductile iron pipes and fittings shall be bituminous coated on the outside and lined with Protecto 401 Ceramic Epoxy or Engineer approved equal on the inside. Sizes shall be as shown on the drawings. All pipe shall have a Pressure

Class 350 pressure rating.

- a. Coating on the outside shall be an asphaltic coating approximately 1 mil thick. The finished coating shall be continuous, smooth, neither brittle when cold or sticky when exposed to the sun and shall be strongly adherent to the iron.
- b. Protecto 401 Ceramic Epoxy or equivalent interior lining is a two component, modified epoxy formulated for corrosion control and shall conform to the following requirements:
  - 1) Conform to ASTM E96, ASTM D714, ASTM D2794, and ASTM G53.
  - 2) The ability to build at least 50 mils dry in one coat.
  - 3) The material shall be re-coatable with itself for at least seven days with no additional surface preparation when exposed to direct summer sun and a temperature of 90 degrees F.
  - 4) The material shall contain at least 20 percent by volume of ceramic quartz pigment.
  - 5) A test and service history demonstrating the ability of the material to withstand the service expected.
  - 6) Possess a minimum solids volume content of 88 percent, ± one percent.
  - 7) Possess a maximum drying time to allow recoating as follows: 50 degrees F-72 hours; 75 degrees F-18 hours; 90 degrees F-8 hours. If recoating cannot be accomplished within seven days, a light brush blast shall be performed to improve inter-coat adhesion.
- 2. Polyvinyl Chloride (PVC) Pipe – Shall be unplasticized polyvinyl chloride with integral wall bell and spigot joints with a rubber ring gasket. Pipe and fittings shall meet the requirements of ASTM-D 3034 SDR 35 for use as a gravity sewer conduit, except for depths greater than ten feet (10’) where ductile iron pipe or PVC pipe meeting the requirements of ASTM 3034 SDR 26 must be used. All pipe must be installed in accordance with ASTM D 2321, with additional bedding as required in these specifications or project details. Sizes and dimensions shall be as shown in the following table.

Nominal Size	Outside Diameter		Minimum Wall Thickness SDR-35	Minimum Wall Thickness SDR-26
	Average	Tolerance		

4”	4.215	±0.007	0.120	0.162
6”	6.275	±0.009	0.180	0.241
8”	8.400	±0.010	0.240	0.323
10”	10.500	±0.013	0.300	0.404
12”	12.500	±0.016	0.360	0.481
15”	15.300	±0.210	0.437	

- a. Minimum pipe stiffness (F/Y) at 5% deflection shall be 46 psi for all sizes when tested in accordance with ASTM D2412.
- b. PVC gravity sewer pipe shall be supplied in lengths no longer than 13 feet.
- c. Each length of pipe shall be marked with the manufacturer’s name, trade name, nominal size, class, hydrostatic test pressure, manufacturer’s standard symbol to signify it was tested, and date of manufacture. Each rubber ring shall be marked with the manufacturer’s identification, the size, the year of manufacture, and the classes of pipe with which it can be used.

**B. Pipe Joints (Gravity Sewer)**

- 1. Ductile Iron Pipe (D.I.) – Shall be flexible rubber gasket Type II, or mechanical joint Type III, conforming to ASA Specification A21.11.
- 2. Polyvinyl Chloride (PVC) Pipe – Shall be flexible gasket joints for PVC sewer pipe and shall be compression type conforming to ASTM D-3212. The gasket shall conform to ASTM F-477.
- 3. Transition Joints – The transition between sewer pipes of different materials shall be made by special adapters made for that purpose. Transition couplings used to join Ductile Iron or ASTM D-3034 PVC sewer pipe shall be Ductile Iron, deep bell, push on joint, and air test rated. Ductile Iron material shall comply with ASTM A536, Grade 65-45-12 or 80-55-06. Bell depths shall meet the minimum socket depth requirements of ASTM F1336. Gasket grooves shall be machined. Gaskets shall be of SBR rubber and comply with ASTM F477. All couplings shall have pipe stops and a flow way tapered to allow a smooth transition between the pipes so as to not obstruct flow or inspection. Interior lining shall be Protecto 401 or engineer approved equal. Fittings shall be manufactured by the Harrington Corporation or Engineer approved equal.

**C. Force Main**

- 1. Polyvinyl Chloride (PVC) Pipe shall conform to ASTM D 2241. The pipe shall have a Standard Dimensional Rating (SDR) of 26 and be of Class 160 psi. PVC pipe shall be the color green and be supplied in 20-foot nominal lengths.

2. Pipe shall be extruded from clean rigid, approved class 12454-A PVC compound conforming to ASTM resin Specification D-1784. Pipe shall have single rubber gasket push-on joint conforming to ASTM D3139.
3. Ductile Iron Pipe (D.I.) shall be in accordance with paragraph 2.1-A of this section and conform to ASTM A 377. Joints shall be flexible rubber gaskets Type II, or mechanical joint Type III, conforming to ASA Specification A21.11.
4. All fittings shall be ductile iron, compact in weight and size, meeting the requirements of AWWA C110/ANSI A21.10, or AWWA C153/ANSI A21.4, and with a minimum rated working pressure of 250 psi. Fittings shall be mechanical joint and have a nominal wall thickness of Class 54 Ductile Iron Pipe. They shall be furnished with a bituminous outside coating and Protecto 401 or Engineer approved equivalent interior coating. Special adapters shall be provided, as recommended by the manufacturer, to adapt the PVC pipe to mechanical jointing with cast or ductile iron pipe, fittings or valves.
5. Thrust Blocking – Concrete having compressive strength of not less than 3000 psi shall be used as a cradle or thrust blocking where shown on the plans or where directed by the Engineer. Bends exceeding 22-1/4 degrees, crosses with one opening plugged, and all tees shall be backed with concrete as a thrust block. Blocking shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on ground in each instance shall be that shown on the plans. The blocking shall be so placed that the pipe fitting joints will be accessible for repair.
6. Restrained Joints – Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands equivalent to “Megalug” or push-on type joints equivalent to “Lok-Ring”, “TR Flex” or “Super Lock” and shall have a minimum rated working pressure of 250 psi. The joints shall be in accordance with the applicable portions of AWWA C 111. The manufacturer of the joints shall furnish certification, witnessed by an independent laboratory, that the joints furnished have been tested at a pressure of 500 psi without signs of leakage or failure. Restrained joints shall be capable of being deflected after assembly.

#### D. Plug Valves

1. Valves shall be 90 degree turn, non-lubricated, eccentric type with resilient faced plugs. Design of the valve shall provide that contact between the seat and the plug shall only occur in the final degrees of plug movement. Valves shall be suitable for throttling service and service where valve operation is infrequent.
2. Valves shall provide drip-tight shut-off up to the full pressure rating with pressure in either direction. Pressure ratings shall be established by hydrostatic tests conducted in accordance with ANSI B16.1. Valves shall be rated at a minimum of 150 psi.
3. Valves shall have a port area equal to at least 80 percent of the full pipe area.

4. Bodies shall be cast-iron, conforming to ASTM A 126, Class B (carbon steel for 2-inch valves).
5. Valve ends shall be a mechanical joint type, except where flanged or restrained joint ends are shown on the Drawings. Mechanical joint valves shall have bell ends conforming to applicable requirements of AWWA C111/ANSI A21.11. Flanged joints shall meet the requirements of ANSI B16.1, Class 125. Flanged valves with flange-to-MJ adapters shall not be acceptable in lieu of MJ valves.
6. Valves seats shall be a raised, welded-in overlay of not less than 90 percent pure nickel, machined to mate with the resilient faced plug. Overlay shall be minimum of 1/8-inch thick.
7. The plug shall be of semi-steel, conforming to ASTM A 126, Class B. The plug facing shall be a synthetic rubber compound of approximately 70 durometer hardness bonded to the plug. Facing material shall be abrasion resistant and suitable for service in sewage and sludge applications.
8. Valves shall be furnished with replaceable, sleeve-type bearings in the upper and lower journals. Bearings shall comply with applicable requirements of AWWA C517. Bearing materials shall have a proven record of service of not less than five years.
9. The valve body shall be fitted with a bolted bonnet incorporating a stuffing box and pull-down packing gland. Packing shall be the split chevron type. Design of exposed valves shall allow visible inspection of the shaft seal, adjustment of the packing, and replacement of the packing, all without disturbing the bonnet or valve operator. The shaft seal shall comply with the requirements of AWWA C517.
10. Actuators
  - a. Valves for exposed service, 3 through 8-inches in diameter, shall be lever operated. Hand levers shall be steel with a non-metallic grip.
  - b. Actuators for buried service and valves 10-inches and larger, shall be equipped with manual operated geared actuators. Geared actuators shall be totally enclosed, oil lubricated, worm and gear type. Shaft seals shall be provided to prevent entry of dirt and water into the actuator. All shaft bearings shall be permanently lubricated bronze bushings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. Construction of actuator housing shall be semi-steel. Gear actuators shall comply with requirements of AWWA C517.
  - c. Gear actuators for buried valves 10-inches and larger in diameter shall be mounted above ground on an extended bonnet.

- d. Motorized actuators shall be provided where shown on the Drawings and as specified in this Section.
  - e. Valves and operators for submerged or buried service shall have seals on all shafts and gaskets on valve operator covers to prevent the entry of water. Operator mounting brackets for submerged service shall be totally enclosed and shall have gasket seals.
11. Operators
- a. Valves for non-buried service, six feet or more above the operating floor shall be furnished with a chainwheel operator and chain for operation from floor level. All other valves shall be equipped with handwheel operator.
  - b. Valves, 3 through 8-inches, for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension required to bring the operation nut within 6-inches of finished grade. Valve boxes and extension stems shall be as specified in this Section.
12. All exposed bolts, nuts, and washers for buried or submerged valves shall be stainless steel. All exposed nuts, bolts, springs, washers, and miscellaneous hardware shall be zinc coated in accordance with ASTM A 153 unless specified otherwise.
13. Acceptable Manufacturers: All plug valves shall be products of a single manufacturer who must submit evidence of five years satisfactory service in sewage applications of the same design and of the sizes required. Valves shall be manufactured by DeZurik or Keystone.
14. Two (2) tee handle wrenches shall be provided to the Owner in order to operated buried plug valves in the valve boxes.
- E. Service Tees
- 1. Tees shall be 6-inches and the same diameter as the run of the pipe. They shall be of the same material as the sewer main.
- F. Laterals
- 1. Shall be Ductile Iron Pipe conforming to Paragraph 304.A.1 with push-on joints, or Polyvinyl Chloride pipe with bells and natural rubber rings for jointing, conforming, to Paragraph 304.A.2.
- G. Valve Boxes (VB)
- 1. Valve boxes for valves shall be approved standard cast iron adjustable shaft

boxes having a minimum shaft diameter of 5-1/4". The casing shall be coated with two coats of coal tar pitch varnish. The lids of all boxes shall bear the word "SEWER". Boxes shall be equal to Vulcan Pattern VVB-4 or approved equal.

#### H. Air Release Valves

1. Combination air valves shall be installed in accordance with these Specifications, and construction drawing details.
2. Valves shall be automatic air release valves designed to allow escape of air under pressure and close water-tight when liquid enters the valve. Valve shall have a 1-inch NPT inlet and a maximum orifice diameter of 3/32-inch. The valve body shall be cast iron, designed to facilitate disassembly for cleaning and maintenance. The float shall be stainless steel; the valve seat and all working parts shall be of corrosion-resistant materials. Valves shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without dismantling the valve.
3. Air/Vacuum Valves - Valves shall be automatic air and vacuum valves designed to allow escape of air, close water-tight when liquid enters the valve, and allow air to enter in the event of a vacuum. The valve body shall be cast iron, designed to facilitate disassembly for cleaning and maintenance. The float shall be stainless steel; the valve seat and all working parts shall be of corrosion-resistant materials. Valves shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back-flushing after installation without dismantling the valve. The valves shall have an orifice diameter of 2-inches and MPT inlet and outlet diameters of 2 x 2-inches.
4. Combination air valve shall consist of an air release valve tapped into the body of an air and vacuum valve.
5. Single Body Valve: In lieu of 4. above, a single body, double orifice, sewage combination valve may be used. Materials of construction, orifice size, venting capacity and accessories shall meet the requirements of 2 and 3 above.
6. Valves shall be recommended by the manufacturer for wastewater service with normal operating pressures to approximately 60 psig, and frequent surge pressures of approximately 175 psig and shall be equal to APCO Valve Corporation or Val-Matic.

#### Section 305: Location and Grade

- A. The Drawings shall show the alignment and grade of the sewer and the position of manholes and other appurtenances. The grade line shown on the profile and/or called for in the plan shall be the grade of the invert of the pipe. The grade shall be sufficient to maintain a minimum gravity flow velocity of two feet per second when the pipe is

flowing half-full.

### **Section 306: Existing Underground Utilities and Obstructions**

- A. It is the responsibility of Contractor to call 811 at least 3 days prior to start up excavation. It is the responsibility of the Contractor to locate all existing utilities along the path of his construction. The drawings shall indicate underground utilities or obstructions that are known to exist. Where these or unforeseen underground utilities are encountered, the location and alignment of the sewer main may be changed, upon written approval of the Engineer and City, to avoid interference.

### **Section 307: Construction Along Highways, Streets, and Roadways**

- A. Install pipelines and accessories along highway, streets and roadways in accordance with the applicable regulations of the County, City and/or the Department of Transportation with reference to construction operations, safety, traffic control, road maintenance and repair.
1. Protection of Traffic: Provide and maintain suitable signs, barricades and lights for protection of traffic.
  2. Replace all highway signs removed for construction as soon as possible. Do not close or block any highway, street, or roadway without first obtaining permission from the proper authorities.
  3. Provide flagmen to direct and expedite the flow of traffic.
  4. Construction Operations: Perform all work along highways, streets and roadways to least interfere with traffic.
    - a. Stripping: Where the pipe line is laid along road shoulders, strip and stockpile all sod, topsoil and other material suitable for shoulder restoration.
    - b. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.
    - c. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.
  5. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Remove all scattered excavated materials from pavement.
  6. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material and free to drain at all times.

7. Maintaining Highways, Streets, Roadways and Driveways: Maintain streets, highways, and roadways in suitable condition for movement of traffic until completion and final acceptance of the work. Use steel running plate to maintain traffic until pavement is completed. Steel running plates shall not be used for more than 3 consecutive calendar days.

### **Section 308: Clearing**

- A. Clear areas only as required for access to site and execution of Work. Clearing shall consist of the felling and cutting of trees into sections, and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the area to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be burned or removed completely from the site, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inch or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the hole of the tree or main branches. Cuts more than 1-1/2 inch in diameter thus made shall be painted with approved tree wound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by the erection of timber barriers or by such other means as the circumstances require. Such barriers must be placed and be approved by the CITY before construction can proceed. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.
- B. Grubbing shall consist of the removal and disposal of stumps, roots larger than one (1) inch in diameter, and matted roots from the designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for building of pavement subgrade or building pads, shall be excavated and removed to a depth of not less than 18-inches below the original surface level of the ground in embankment areas and not less than 2-feet below the finished earth surface in excavated areas. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.
- C. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. The work shall include the felling of such trees and the removal of their stumps and roots. Trees shall be disposed of as hereinafter specified.
- D. Remove debris, rock, and other extracted plant life from site.
- E. Partially remove paving, curbs; as indicated. Neatly saw cut edges at right angle to surface.

### **Section 309: Excavation**

- A. It is the responsibility of those performing excavation and trenching to conform to all State and Federal Laws and Regulations, and local ordinances relating to safety, life, health and property including but not limited to OSHA regulations, 29 CFR PART

- 1926, Subpart P, Paragraph 1926.650 through 1926.652 during all excavations and trenching. All excavations shall be adequately guarded with barricades and light in compliance with all OSHA and Georgia Department of Transportation requirements so as to protect the public from hazard. Excavations adjacent to existing or proposed buildings and structures or in paved streets or alleys shall be sheeted, shored and braced adequately to prevent undermining or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition.
- B. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures in the trench zone may be determined before being damaged. He shall be held responsible for the repair or replacement of such structures when broken or otherwise damaged because of his operations.
- C. The Contractor shall make explorations and excavations at no additional charge to the Owner to determine the location of existing underground structures.
- D. Utilities and other piping shall be laid in open trenches as shown and specified. Trenches shall be excavated to the designated lines and grades, beginning at the outlet end and progressing toward the upper end in each case. Trenches for pipe shall be shaped to the lower 1/3 of the pipe and provide uniform and continuous bearing. Bell holes shall be dug to allow ample room for working fully around each joint.
- E. Trenches shall be of minimum width to provide ample working space for making joints and shall be not less than 8 inches or more than 12 inches from outside barrels of the pipes on any side at any point. Sides of trenches shall be closely vertical to top of pipe and shall be sheet piled and braced where soil is unstable nature. Above the top of the pipe, trenches may be sloped. The ridge of the trench above this level may be wider for sheeting and bracing and the performance of the work.
- F. Trenches shall be excavated to the depth and grade necessary to accommodate the pipes.
- G. Excavation in excess of the depth required for proper shaping shall be corrected by bringing to grade the invert of the ditch with compacted coarse, granular material to achieve standard laying condition type 4 in accordance with AWWA C151. Bell holes shall be excavated to relieve bell of all load, but small enough to insure that support is provided throughout the length of the pipe barrel.
- H. Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a subfoundation of 1500 psi concrete.
- I. If trenches are excavated to widths in excess of those specified, or if the trench walls collapse, the pipe shall be laid in accordance with the next better class of bedding.

**Section 310: Bedding for Sewer**

- A. Stone Stabilizer for subgrade where needed shall be either approved crushed stone

or gravel, uniformly graded from 3/4" to 1 1/4" in size.

### Section 311: Backfill Material

A. Stone backfill shall be graded crushed granite with the following gradation:

Square Opening Size	Percent Passing
1"	100%
3/4"	90 to 100%
3/8"	0 to 65%
No. 4	0 to 25%

B. Sand backfill shall be clean sand free of clay and organic material. Not more than 10% shall pass the No. 100 sieve.

### Section 312: Sewer on Piling

A. Sewers laid on piling across ravines or streams shall be allowed only when it can be demonstrated that no other practical alternative exists.

### Section 313: Manholes

A. Precast Concrete Manholes shall be precast reinforced concrete manholes that meet the requirements of ASTM C478 and the details contained in the project drawings. The minimum compressive strength of the concrete in Precast sections shall be 4000 psi. Manholes may be inspected prior to installation to ensure the structure is free of all defects such as honeycomb and cracks. Any structure having defects shall not be installed and must be removed from the site immediately.

1. Joints – shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or Type A or B “Tylox” equivalent to ASTM C443; mastic shall be “Ram-nek” with primer. The “Ram-nek” primer shall be applied to all contact surfaces of the manhole joint at the factory in accordance with the manufacturer’s instructions.
2. Manhole Boots – Provide flexible, water tight boot connections meeting the requirements specified herein where sewer pipes enter and connect to manholes. Holes for pipes entering and leaving the manholes shall be core-drilled at the plant location or in the field. Cutting or chipping holes in the manholes is not allowed.

B. Brick and Mortar: brick shall be whole and hard burned, conforming to ASTM C 32 Grade MS. Mortar shall be made of one-part Portland cement and two parts clean sharp sand. Cement shall be Type I and shall conform to ASTM C 150. Sand shall meet ASTM C 144.

C. Frames and Covers – Cast iron manhole frames and covers shall meet the requirements of ASTM A 48 for Class 30 gray iron and all applicable local standards. All castings shall be tough, close grained, smooth and free from blow holes, blisters, shrinkage, strains, cracks, cold shots and other imperfections. No casting will be accepted which weighs less than 95 percent of the design weight. All castings shall be

- thoroughly cleaned in the shop and given two coats of approved bituminous paint before rusting begins.
1. Manhole frames and covers shall be as shown on the Standard Detail Drawings.
  2. All frames and covers shall have machined horizontal bearing surfaces.
  3. All manholes shall have standard frames and covers except where specifically shown otherwise on the Drawings.
- D. Manhole Steps: provide steps in bases, risers, cones, transition cones, and transition top sections aligned vertically on 12" centers. Secure steps to the wall with a compression fit in tapered holes or cast in place. Steps shall not be vibrated or driven into freshly cast concrete or grouted in place. The steps shall be Copolymer Polypropylene plastic reinforced with ½" diameter grade 60 bar and have serrated tread and tall end lugs. Step pullout strength shall be a minimum of 2000 lbs. when tested according to ASTM C497. The manhole steps shall meet the requirements of ASTM C478, A615 and D4101.
- E. Pipe Connections shall have flexible, watertight boot connection at the point of entry of any sewer main into the manhole. The boot shall be made of resilient EPDM or Polyisoprene rubber conforming to ASTM C923. The inner and outer bands shall be made of a minimum of 304 stainless steel conforming to ASTM A167. The rubber boot shall be as manufactured by Kor-N-Seal, Lock-Joint, PSX or Engineer approved equal. The pipe shall stop flush with the inside face of the manhole. The void between the pipe and rubber boot shall be completely filled with grout and smoothed such that the pipe forms to be an integral part of the manhole and does not encroach into the pipe opening or hang over the pipe opening. There shall only be 3 penetrations in one single vertical plane. Service laterals shall be a minimum of 6" above the bottom invert of the manhole.
- F. Coatings: new manholes requiring a force main tie-in shall have all interior surfaces coated with a factory applied coal tar epoxy. The coating shall be 300 M as manufactured by Koppers Company, Inc. or an accepted equivalent. The coating shall be applied in two coats to achieve a dry film thickness of at least 10 mils per coat in accordance with the manufacturer's recommendations. Surfaces shall be cleaned of dust, form oils, curing compounds and other foreign matter prior to the coating application.
- G. Existing manholes requiring a force main tie-in shall also be coated. The interior surfaces shall be cleaned and prepared according to the paint manufacturer's recommendations. Paint type, thickness and applications shall conform to the above-mentioned specifications.

### **Section 314: Pumping Stations**

A. Capacity and Size Determinations:

In determining the required capacities of sanitary sewers, the following factors should be

considered:

1. Peak hourly sewage flow
2. Average daily
3. Additional maximum sewage or waste flow from industrial plants
4. Groundwater infiltration
5. Topography of area
6. Depth of excavation

B. Design Features:

1. No gravity sewer main shall be less than 8". No service lateral shall be less than 6".
2. Wet Well Volume:

The wet well volume shall be sized to limit pump cycles to no more than six (6) cycles per hour under peak conditions.

3. Ventilation:

The minimum requirement for wet wells shall be one (1) gravity vent pipe design for natural ventilation. Vents shall be elevated to a minimum of two (2) feet above the 100-year flood elevation. Where conditions are conducive to formation of hazardous conditions (in the design engineer's opinion), mechanical ventilation shall be provided. Mechanical ventilation shall be required for dry wells.

4. Structures:

Submersible lift stations shall have a wet well structure and a separate valve pit. Both structures shall be pre-cast concrete with a monolithic base, however, cast-in-place will be considered on a case-by-case basis. The valve pit shall be a minimum of 4' x 4' x 5' deep with manhole steps, floor drain pipe with a "p" trap and backflow preventer, and a minimum 3' x 3' lockable aluminum access hatch. Wet wells may be either round or rectangular and shall have a diameter or width of at least five feet (5'). Wet wells shall be sized to meet cycle requirements with a draw down (i.e. the distance between high water level and low water level) of not more than three (3) feet. The wet well shall have a lockable aluminum hatch large enough for easy removal of pumps.

- a. Riser sections in pre-cast units shall be sealed watertight using butyl rubber sealant or other approved sealant. Mastic shall not be used. Structures shall be adequately reinforced for all loading conditions normally encountered during shipping, construction and service. All openings (for pipes, hatch, conduits, etc.) shall be cast-in-place or cored. Sanitary sewer pipe connections shall utilize rubber boot connectors and be watertight. The wet

well will be equipped with either manhole steps or an aluminum ladder, whichever is the City's preference.

5. Accessories:

All materials inside the wet well and valve pit shall be corrosion resistant. Mechanical equipment requiring ferrous metals shall have a coal tar epoxy coating. Guide rails for pumps shall be stainless steel. Miscellaneous including fasteners shall be aluminum or stainless steel; hatches shall be aluminum; anchor bolts shall be stainless steel. All stainless steel must be Grade 316.

6. Pressure Gauge:

Pressure gauges shall be installed on the force main inside the valve pit and visible from ground level as follows: between each pump and its check valve and one (1) downstream of the plug valves. A corporation stoop shall be installed on each tap to allow removal of the gauge.

7. Valves:

The discharge pipe of each pump shall have a check valve followed by a plug valve before the two pipes join into a common force main.

8. Surge Control Valves:

The pumping system shall be checked to determine if a surge control valve is required. If a valve is required, it shall be located within the valve pit on the common force main and a drain line installed to drain to the wet well.

9. Bypass Pump Connection:

Each pump station shall be equipped with a bypass pump connection constructed of flanged and/or restrained joint ductile iron pipe, plug valve and camlock fitting. The bypass pump connection shall be installed downstream of the valve vault and allow for the connection of a temporary pump.

C. Pumps shall have the following features:

1. Non-clog impeller
2. Be capable of passing a three (3) inch sphere (except grinder pumps)
3. Be capable of dry operation without overheating
4. Have dual mechanical seals with seal leak indicator light in the control panel
5. Pump and motor casing shall be cast iron and all fasteners shall be stainless steel (Grade 316)
6. Motor shall be selected to be non-overloading under all operating conditions.

7. Motor winding shall have a heat sensor with auto reset to prevent overheating. Three phase motors shall have two sensors.
8. The operating speed of the pump shall not exceed 1800 rpm without special approval. The motor shall have upper and lower roller bearings. The pump shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter pump well. A simple linear downward motion of the pump shall accomplish sealing of the pumping unit to the discharge elbow. Each pump shall be equipped with a stainless-steel chain or cable for easy removal and a hoist shall be provided for easy removal.

### **Section 315: Laying Pipe**

#### **A. Pipe Installation:**

1. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings and valves shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to sewer materials and protective coatings and linings. Under no circumstances shall sewer materials be dropped or dumped into the trench.
2. All pipe, fittings, valves and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the City, who may prescribe corrective repairs or reject the materials.
3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe which contains dirt shall be laid.
4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
5. As each length of pipe is placed in the trench, the joint shall be assembled, and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
6. It is common practice to lay pipe with the bells facing the direction in which work is progressing.
7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted.
8. Polyethylene Encasement: Installation shall be in accordance with AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the

satisfaction of the City.

B. Alignment and Gradient:

1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than 2/3 the maximum deflection recommended by the manufacturer.
2. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowance is not exceeded.
3. The Contractor shall check the invert elevation at each manhole and the gravity sewer invert elevation at least three times daily: start, mid-day and end of day. Elevations shall be checked more frequently if more than 100 feet of pipe is installed in a day or if the gravity sewer is being constructed at minimum slope.
4. The Contractor shall check the horizontal alignment of the gravity sewer at the same schedule as for invert elevations.
5. Should any installed pipe have its alignment, grade, or joints disturbed after placement, it shall be taken up and re-laid.
6. Any pipe with less than 36 inches of cover shall be ductile iron pipe only.

C. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary, to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the City.

D. Joint Assembly:

1. Push-on, mechanical, flange and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.
2. Each restrained joint shall be inspected by the Contractor to ensure that it has been "homed" 100%.

E. Cutting Pipe:

1. Cut ductile iron pipe using an abrasive wheel saw.
2. Cut PVC pipe using a suitable saw.
3. Remove all burrs and smooth the end before jointing.
4. The Contractor shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves,

accessories and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut.

- F. House Connections: Install wyes or tees in locations designated by the Owner and/or Engineer for future connection of service lines. Plug the branch of the wye or tee. Record the location of fittings installed on the Record Drawings.
- G. Valve, Fitting and Pressure Gauge Installation:
1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the City. Valves shall be closed before being installed.
  2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve.
  3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 30-inches beneath finished grade so as to set the top of the operating nut  $\leq$  30-inches below finished grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the City.
  4. Pressure gauges for installation in valve vault shall have bronze or stainless bourbon tube elements. Lens shall be heavy glass, with an oil-resistant gasket seal. The dial shall be a minimum of 4.5 - inches in diameter with white coated metal lithographed with black metal graduations and numerals; graduations shall be in feet; mount as required. Connection shall be  $\frac{1}{2}$ -inch NPT with square wrench surface. Provide cartridge snubber, diaphragm seal unit and polished brass gauge cock. Range shall be 0 to 150 feet. Accuracy shall be  $\pm$  0.5 percent.
  5. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
- H. Air Valve Manholes:
1. Construct the vault or manhole as shown in the Details.

2. The frame and cover shall be cast into the top slab or cone.
3. Where vent pipe is required, vents shall be of one-piece, welded steel construction. Vent pipes shall equal air valve size, but no less than 4-inches. The vent pipe shall be grouted into a Precast hole in the vault. The discharge of the vent pipe shall be provided with a 3/16-inch PVC coated mesh screen.

### **Section 316: Concrete Blocking**

- A. Concrete having compressive strength of not less than 3000 psi shall be used as a cradle or thrust blocking. Bends exceeding 22-1/4 degrees, crosses with one opening plugged, and all tees shall be backed with concrete as a thrust block. Blocking shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on ground in each instance shall be that shown on the plans. The blocking shall be so placed that the pipe fitting joints will be accessible for repair.

### **Section 317: Backfilling**

- A. Backfilling consists of placing suitable materials removed during the excavation into the excavated areas, placing embedment materials and compacting the same to a density equal to or greater than what exists before excavation or as specified herein.
- B. All backfill material shall be free of stones, concrete and clay lumps larger than 1/3 cubic foot. Roots, stumps and rubbish which will decompose will not be permitted in the backfill. Backfill material shall have its moisture content corrected, as may be necessary before being placed in the trench to bring the moisture content to approximately "optimum" for good compaction. Any rock, stone, concrete, clay lumps larger than 1/3 cubic foot in volume, rubbish and debris shall be removed from the site and disposed of in a lawful manner.
- C. Select Backfill: Select backfill material shall be placed below, around each side, and over the top of the pipe in approximately horizontal layers not exceeding 6-inches in thickness to a minimum height of 6-inches above the pipe crown or greater. This initial backfill shall be placed immediately after the pipes are laid to anchor and protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe. Select Material shall include Class I, II, III and other approved materials. If suitable select materials are not available from trench excavation, the Contractor will be required to obtain select materials elsewhere. The Contractor shall backfill both sides of the pipe simultaneously to prevent side pressures and each layer shall be compacted thoroughly with mechanical tamping equipment in such manner as not to damage the pipe, pipe joints or shift the pipe alignment. Workmen shall not be permitted to walk over the pipe until at least 12 inches of compacted fill has been placed over the pipe. The Contractor shall not use water to obtain compaction except for adding water to the backfill material before placing in the trench to bring the moisture content to approximately "optimum" for good compaction.
- D. General Backfilling: After initial, select backfill material has been placed and tamped, the remainder of the trench may be backfilled with general excavated material, except that no rock, unless in small shattered fragments, will be permitted to be mixed with other backfill material.

1. Backfilling under structures: Backfilling under structures consists of placing sand and gravel or other select suitable materials excavated from the trench in the trench in 6 inch thick layers from a point 12 inches above the top of the pipe and mechanically tamped or compacted by rolling until the backfill density after compaction is equal to 98 percent of the maximum density obtainable at optimum moisture content as determined by the Standard Proctor Test (ASTM D698). No water shall be used to secure compaction except for adding water to the backfill material before placing in the trench to bring moisture content to approximately "optimum" for good compaction. Each 6-inch-thick layer shall be mechanically tamped before additional backfill material is placed in the excavated area.
2. Street and Road Right - of - Way, Parking Areas, Yards and Other Traveled Areas: Backfill materials consists of placing sand and gravel or other select suitable material excavated from the trench in uniform layers not exceeding six inches (6") in thickness, with each layer thoroughly compacted with heavy duty mechanical tampers ("Whacker" or equal) to a height of at least thirty six inches (36") or forty-eight inches (48") above the top of the pipe barrel.

The remainder of the ditch may be backfilled and tamped in the same manner or if the Contractor so elects, he may place backfill in layers not exceeding twelve inches (12") and use wheel loading or heavy-duty mechanical tamping equipment ("Hydra-Hammer" or equal). Pipe shall have at least thirty-six inches (36") of cover before wheel loading and at least forty-eight inches (48") of cover before using heavy duty tamping equipment ("Hydra-Hammer" or equal). The density of the backfilled material after compaction shall be equal to 95 percent of the maximum density obtainable at optimum moisture content as determined by the Standard Proctor Test (ASTM D698). Except in the upper 12 inches, water shall be added to backfill material only before being placed in the trench in order to bring the moisture content to approximately "optimum" for good compaction.

3. Backfill under root:
4. Other Area: In other areas, including woodland, fields, pastures and areas not open to vehicular travel, the remainder of the ditch may be backfilled by placing fill in ditch and "walking-in" with wheel loaded equipment. Backfill material may be windrowed and maintained in a suitable manner so as to concentrate and pond rainfall runoff over the trench. After sufficient settlement has been obtained, the Contractor shall complete surface dressing, remove surplus material and clean up in accordance with these Specifications. Wherever trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off and finally made to conform to the surface of the ground. Backfilling shall be carefully performed, and the original surface restored as specified herein. Surplus material shall be disposed of properly by the Contractor

**Section 318: Pump Station Instrumentation, Control Equipment, and Grounding**

- A. Lift station controls and electrical components shall be factory-wired in weatherproof NEMA 4X stainless steel metal cabinets. The cabinet shall be provided with condensate heaters. Spare fuses of each type used in the electrical/control system shall be furnished.
- B. A main circuit breaker shall be installed that is designed to disconnect power to the entire station.
- C. Three-phase power shall be provided for all motors exceeding five (5) horsepower. Phase converters will not be allowed; however, the City may consider variable frequency drives (VFD).
- D. Protection against voltage surge and loss of a phase shall be provided.
- E. The panel shall be equipped with a ground bus and neutral bus. The terminal shall be suitable for either aluminum or copper wire. All internal panel wiring shall be copper.
- F. Motors shall be suitable for either 230 or 460-volt operation. The design engineer shall consult with the local power company to verify specifics pertaining to electrical power availability.
- G. Four seated float switches shall control the wet well level. All floats shall be provided with 25-feet of Type KO flexible cord and shall be attached to a bracket mounted at the top of the wet well. Float functions shall be as follows:
  - 1. Float no. 1 Low Level (Pumps Off)
  - 2. Float no. 2 High Level (Lead Pump On)
  - 3. Float no. 3 Extra High Level (Lag Pump On)
  - 4. Float no. 4 Surcharge Level (Alarm Activated)
- H. The pump control system shall include the following features:
  - 1. Level transducer or ultrasonic level indicator
  - 2. Lead pump/lag pump alternator
  - 3. Alarm light and horn to indicate high water level
  - 4. Seal failure indicating light
  - 5. Pump failure indicating light
  - 6. Condensate failure
  - 7. Lead pump selector switch

8. H-O-A switch and run light for each pump
  9. Control voltage shall be 120V
  10. The wiring shall be neatly tied, and number coded to facilitate maintenance and a schematic diagram furnished with panel.
  11. A 120 V GFCI type electrical receptacle shall be located at the control panel.
  12. Pump stations shall be equipped with a remote transmitting unit and telemeter circuitry connected to the City's SCADA system.
  13. Manufacturer's warranties to be supplied with a minimum of 100% coverage for five (5) years with no pro-rating.
- I. All conduit entering the pump station should be sealed air tight at the wet well and at the control panel or the motor control center.
  - J. Regardless of the manufacturer's warranty terms, the Developer will be responsible for all repairs necessary within two (2) years from the date the station is completed and approved by the City. The Developer will be required to furnish such assurances to the City as deemed appropriate by the City to ensure prompt action.

### **Section 319: Removing and Replacing Pavement**

#### **A. Roadway Surface:**

The surface course for all pavement, including Paint or tack coat when required by the City, shall conform to the requirements of the Georgia State Highway Department Specifications for Asphaltic Concrete, Section 400, Type "E" (Modified Top). Use a Pug Mill Rotary Drum type mixer with minimum capacity of not less than 50 tons per hour for asphalt production. Apply and compact the surface course in a manner approved by the City. Immediately correct any high, low or defective areas by cutting out the course, replacing with fresh hot mix, and immediately compacting to conform and thoroughly bond to the surrounding area.

#### **B. Temporary Pavement:** Where directed by the City temporary pavement shall be placed with top matching the grade of existing pavement. The material shall be 1-1/2" of Hot Laid Asphaltic Concrete Surface Course and 6" of Stabilized Aggregate Base Course.

#### **C. Cutting Pavement**

1. Cut and remove pavement as necessary for installing the new pipe lines and appurtenances and for making connections to existing pipe lines.
2. Before removing pavement, the pavement shall be marked for cuts nearly paralleling pipe lines and existing street lines. Asphalt pavement shall be cut along the markings with a jackhammer, rotary saw or other suitable tool.

Concrete pavement, and asphalt pavement on concrete base, shall be scored to a depth approximately two (2) inches below the surface of the concrete along the pavement may be broken below the scoring with a jackhammer or other suitable equipment.

3. No pavement shall be machine pulled until completely broken and separated along the marked cuts.
4. The pavement adjacent to pipeline trenches shall neither be disturbed nor damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, the damaged pavement shall be removed and replaced.

D. Hot Mix Asphalt Pavement Construction, Repair and Replacement:

1. All existing pavement cut or damaged by construction shall be repaired to match the original surface material and original grade. Materials and construction procedures for base course and pavement repair shall conform to the Georgia Department of Transportation Specifications for the type of original surface.
2. New pavements shall be placed at the locations as shown on the Drawings.
3. The work for new or for repair of existing pavement shall include the placing and compacting of the base course, the placing of the Portland Cement Concrete at the thickness specified in the details, the application of prime and tack coats where required, the placing and maintaining of the hot mix asphalt surface course at the thickness specified in the details, and all special requirements specified herein.
4. The backfill shall be thoroughly compacted prior to concrete base.
5. The asphalt surface course shall be thoroughly rolled or tamped with a mechanical roller or tamper. Rolling of patches with truck tires will not be permitted.

E. Concrete Pavement

1. Where the installation of pipe involves the cutting of concrete, the cutting shall be kept to a minimum. Once the pipe is installed, trench shall be compacted to 98% density according to the modified proctor. After compaction, install and compact a 6" thick graded aggregate base course. The base shall be poured and finished. Concrete shall be 3,000 psi and shall be equal or better than original pavement.
2. When sidewalks are removed and replaced, match the existing dimensions and thickness.

F. Clean-up

1. After all repair and restoration of paving has been completed, all excess asphalt, dirt, rock and other debris shall be removed from the roadways. All existing storm sewers and inlets shall be checked and cleaned of any construction debris.

G. Maintenance of Repair

1. All wearing surfaces shall be maintained in good order and be suitable for traffic at all times for a period of one year after completion and acceptance of the work. Approximately at the end of the maintenance period a final inspection will be made of the repaired surface and any settlement or depression of the repaired surface shall be adjusted as specified by Engineer or previously noted herein.

**Section 320: Boring**

A. Jack and Boring

1. Shaft:
  - a. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.
  - b. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to site and soil conditions. Keep preparations dry during all operations. Perform pumping operations as necessary.
  - c. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the Engineer due to soil conditions.
2. Jacking Rails and Frame
  - a. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.
  - b. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.
  - c. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a

uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

3. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing or wetboring.
4. Auger the hole and jack the casing through the soil simultaneously.
5. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.
6. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing piping penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.
7. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed, and the alignment and grade checked at minimum intervals of 60 feet.
8. Any casing pipe damaged in jacking operations shall be repaired or removed and replaced.
9. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire joint circumference, in accordance with AWS recommended procedures. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.
10. The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.
11. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.
12. Care should be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.
13. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.
14. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work

proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing should be left in place, cut off, or removed, as designated by the Owner and/or Engineer.

15. Trench excavation, all classes and type of excavation, the removal of rock, muck, debris, the excavation of all working pits and backfill requirements of Section 02260 – Trench Excavation and Support are included under this Section.
16. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.
17. Grout backfill shall be used for unused holes or abandoned pipes.

**B. Free Boring**

1. Where pipeline is to be installed by boring without casing, the Contractor shall construct the crossing by the free bore method. The free bore method shall be accomplished by the dry auger boring method without jetting, sluicing, wet boring, or by “punching”.
2. The diameter of the free bore shall not exceed the pipe bell outside diameter or the pipe barrel outside diameter plus 1-inch, whichever is greater.
3. Free boring, is to be performed at the Contractor’s option. The Contractor may choose to construct the crossing by the conventional bore and jack casing methodology.
4. The Contractor shall be responsible for any settlement of the roadway caused by the free bore construction activities.
5. If the Contractor elects to free bore, and an acceptable installation does not result for any reason, the Contractor shall install a casing pipe by the bore and jack method.

**Section 321: Stream and Ditch Crossing**

- A. Sewer lines crossing streams or standing bodies of water, both above and under water, present special problems, and should be discussed with the City's Development Department before final plans are prepared for submission.
- B. Cross-country sanitary sewers adjacent to state waters shall be designed and constructed to comply with the buffer requirements, including Georgia DNR Rules 391-3-7, the Georgia Erosion and Sediment Control Act OCGA 12-7-1, and any other ordinances the City of Stockbridge may have enacted. In cases where these regulations differ, the most protective (greatest distance from the edge of the stream) will serve as the standard. Sanitary sewers crossing streams shall be kept to a practicable minimum. Where sewers parallel state waters, the sewers and their respective easements shall be located outside the buffer area. Reasons for requesting sewer lines to be located within stream buffers shall be provided in the preliminary

plan application and a Stream Buffer Variance application must be made by the Developer to Georgia EPD.

- C. At all points where banks of streams or drainage ditches are disturbed by excavation or where natural vegetation is removed, carefully compact backfill and place rip rap or an approved erosion control fabric where applicable to prevent subsequent settlement and erosion.

This requirement applies equally to construction alongside a stream or drainage ditch as well as crossing stream or drainage ditch. Place rip rap a distance of not less than 10 feet upstream and 10 feet downstream from any disturbed area. Extend rip rap from 1 foot below streambed to top of bank. Place to conform with the natural slope of the stream bank. Use only one method, either (a) or (b), throughout the job.

- D. Stone Rip Rap: Use sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or higher.

Maximum weight of individual stones shall be 50 pounds. The maximum allowable dimension for an individual stone is 6 inches. At least 50% of the stones shall have a minimum dimension of 12 inches. A geotextile fabric shall be placed over the entire ditch and extend outward on either side a minimum of 10 feet.

Rip rap shall be placed on a (6) inch layer of soil, crushed stone, or sand overlaying the fabric. Rip rap shall be placed with its top elevation conforming with the finished grade or the natural existing slope of the stream bank and stream bottom. The stone shall be dropped no more than three feet during construction.

Embed stone rip rap by hand so as to form a compact layer at least 12 inches thick. Place rip rap in such a way that the smaller stones are not segregated but evenly distributed. Place chinking stones in the crevices between the larger stones so that a dense, well graded mass is produced.

- E. Sand-Cement Bag Rip Rap: Use cement sacks or burlap bags having a capacity of from 1 to 2 cubic feet. Do not use bags previously used for sugar or chemicals. Fill bags with a mixture of one-part Portland Cement to five-parts sand.

Embed bags by hand to form a compact layer at least 12 inches thick. Place with overlapping joints. The finished surface shall not deviate from that specified by more than 3 inches at any point.

- F. When the depth of cover on the pipe at the bottom of the creek is less than 24 inches, encase the pipe with concrete. The width and depth shall be a minimum of pipe OD+16" or as directed by the Engineer.

### **Section 322: Inspection and Testing**

- A. Clean and flush lines prior to testing. Clean and test lines before requesting final acceptance. Where any obstruction is met, clean the sewers by means of rods, swabs

or other instruments. When requested by the Owner and/or Engineer, flush out lines and manholes before final inspection.

1. Pressure and Leakage Tests:

- a. Pressure During Test: Immediately after the pipe has been laid and backfilled, but prior to the placement of pavement, each valved section of newly laid pipe shall be subjected to a leakage and pressure test. For any section being tested the pressure applied shall be such that at the highest point in the section, the pressure shall be a minimum of 1.5 times the working pressure, but not less than 200 psi, whichever is greater. The test pressure shall not vary by more than  $\pm 5$  psi for the duration of the test. This may require periodic pumping.
- b. Duration of Test: The duration of each pressure test shall be two (2) hours.
- c. Procedures: Each valved section of pipe shall be slowly filled with water and the specified test pressure, measured at the point of highest elevation shall be supplied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connection, and all necessary apparatus, gauges, and meters shall be furnished by the contractor. The contractor shall furnish all necessary labor and assistance in conducting the tests. The owner will furnish, through connections made by the contractor to existing mains, water for filling the lines for making the test.
- d. Expelling Air Before Tests: Before applying the specified test pressure, all air shall be expelled from the pipe through ARV's.
- e. Examination Under Pressure: At intervals during the test, the route of the pipeline shall be inspected to locate any leaks or breaks. Any cracked or defective joints cracked, or defective pipe, fittings or valves discovered in consequence of this pressure test shall be removed and replaced with sound material in the manner provided and the test shall be repeated until satisfactory results are obtained.
- f. Permissible Leakage: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, of any valved section thereof, to maintain the specified leakage test pressure after the pipe has been filled with water and the air in the pipeline has been expelled. No installation will be accepted if leakage is greater than that determined by the formula:

$$\text{For PVC Installations: } L = \frac{ND(P)^{0.5}}{7,400} \quad \text{Where:}$$

L is the allowable leakage, in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

For Ductile Iron Installations: 
$$L = \frac{ND(P)^{0.5}}{133,200}$$
 Where:

L is the allowable leakage in gallons per hour; N is the length of pipeline tested in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test in pounds per square inch gauge.

Leakage values determined by the above formulas are to be found in the following Table.

Allowable Leakage for Water Main Installation (Per 1,000 ft) in Gallons per Hour

Average Test Pressure in Pipeline

Nominal Pipe Diameter, Inches	150 PSI		200 PSI	
	PVC	DI	PVC	DI
4"	0.33	0.37	0.38	0.43
6"	0.50	0.55	0.57	0.64
8"	0.66	0.74	0.76	0.85
10"	0.83	0.92	0.96	1.06
12"	0.99	1.10	1.15	1.28
14"	1.16	1.29	1.34	1.48
16"	1.32	1.47	1.53	1.70
18"	1.49	1.66	1.72	1.91
20"	1.66	1.84	1.91	2.12
24"	1.99	2.21	2.29	2.55

B. Gravity Sewers: Pipe lines shall be straight and show a uniform grade between manholes. Correct any discrepancies discovered during inspection.

1. Infiltration Tests: Use only when groundwater is more than two feet above the top of the pipe.

a. Install suitable weirs in manholes selected by the City to determine the leakage of ground water into the sewer. The maximum length of line for each infiltration test shall be 5,000 feet. Measurement shall be performed on any lines with a visible flow of water. Measure leakage only when all visible leaks have been repaired and the ground water is two feet above the top of the pipe. If leakage in any section of the sewer line exceeds 25 gpd/inch diameter/mile, locate and repair leaks. All

visible or audible leaks must be dug up and repaired unless the leak is found to be in a joint and can be repaired by chemical grouting. Repair methods must be approved by the City. After repairs are completed, re-test for leakage. The test procedure shall be in accordance with ASTM C1091 (Infiltration Testing) (vitrified clay pipe) or ASTM C969 (concrete pipe).

- b. Furnish, install, and remove the necessary weirs, plugs, and bulkheads required to perform the leakage tests. Where continuous monitoring of flow level is required, the City will provide and operate monitoring equipment.
2. Exfiltration Tests: Choose one of the following when groundwater is less than two feet above the top of the pipe.

- a. Hydrostatic Test:

- 1) Test pipe between manholes with a minimum of 10 feet hydrostatic pressure, measured at the center of the pipe at the upstream manhole.
- 2) The ends of the pipe in the test section shall be closed with suitable watertight bulkheads. Inserted into the top of each bulkhead shall be a 2-inch pipe nipple with an elbow. At the upper end of the test section, a 12-inch riser pipe shall be connected to the 2-inch nipple. The test section of pipe shall be filled through the pipe connection in the lower bulkhead which shall be fitted with a valve, until all air is exhausted and until water overflows the riser pipe at the upper end.

Water may be introduced into the pipe 24 hours prior to the test period to allow complete saturation. House service lines, if installed, shall also be fitted with suitable bulkheads having provisions for the release of air while the test section is being filled with water.

- 3) During the test period, which shall extend over a period of two hours, water shall be introduced into the riser pipe from measured containers at such intervals as are necessary to maintain the water level at the top of the riser pipe. The total volume of water added during the test period shall not exceed that specified for infiltration.

- b. Low-Pressure Air Test:

- 1) Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning

or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor's option, sewers may be tested in lengths between manholes or in short sections (25 feet or less) using inflatable balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and the pressure allowed to stabilize (approximately two to five minutes), the pressure may be reduced to 3.5 psi before starting the test. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs, and retest the line. Minimum test time for various pipe sizes, in accordance with ASTM F 1417 is as follows:

Pipe Diameter (in)	Minimum Time (min:sec)	Length for Minimum Time (ft)	Time for Longer Length (sec)
4	3:46	597	.380L
6	5:40	398	.854L
8	7:34	298	1.520L
10	9:26	239	2.374L
12	11:20	199	3.418L
15	14:10	159	5.342L
18	17:00	133	7.692L
21	19:50	114	10.470L
24	22:40	99	13.674L

- 2) Required test equipment, including inflatable balls, braces, air hose, air source, timer, rotameter as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of  $\pm$  two percent, shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing Systems.
- 3) The Contractor shall keep records of all tests made. Copy of such records will be given to the City. Such records shall show date, line number, MH numbers, line length and diameter and stations, operator, and such other pertinent information as required by the City.

- 4) The Contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.

c. Deflection Test:

- 1) Test PVC gravity sewer for excessive deflection by passing a mandrel through the pipe. Deflection of the pipe shall not exceed the following:

Nominal Pipe Diameter	Maximum Allowable Deflection
< 12-inches	5%
15 to 30-inches	4%
> 30-inches	3%

- 2) The mandrel size shall be based upon the maximum possible inside diameter for the type of pipe being tested, taking into account the allowable manufacturing tolerances of the pipe. The mandrel shall have an odd number of legs, or vanes, with a quantity of such equal to or greater than nine. The legs of the mandrel shall be permanently attached to the mandrel. A mandrel with variable sizes shall not be allowed. The mandrel shall be constructed of steel aluminum or other material approved by the City and shall have sufficient rigidity so the legs of the mandrel will not deform when pulling through a pipe. The mandrel dimensions shall be checked by the City before use by the Contractor.
- 3) Excavate and install properly any section of pipe not passing this test. Re-test until results are satisfactory.
- 4) The test shall be performed within the first 30 days of installation and during final inspection, at the completion of this contract.
- 5) The mandrel shall be performed in accordance with ASTM D 3034, F679, or 2122.

- d. Closed Circuit Television: The interior of the gravity sewers shall be subjected to a televised inspection. Prior to Final Acceptance, the City shall be provided with one copy of the TV inspection report and DVD showing the entire length of gravity sewer being tested. The report shall contain the condition of pipe, type of pipe, depth, location of services, length, joint type, roundness, and distance between manholes. Any pipe found to be cracked, leading, misaligned, bellied or otherwise defective shall be removed and replaced.

3. Manholes: Prior to testing manholes for water tightness, all lift holes shall be plugged with a non-shrink grout, all joints between Precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced. Each manhole shall pass one of the following tests:
  - a. Exfiltration Tests: The manhole, after proper preparation as noted above, shall be filled with water. The maximum allowable leakage shall be eight gallons per foot of depth per 24 hours for 48-inch diameter manholes. Tests shall last a minimum of eight hours. The manholes may be backfilled prior to testing.
  - b. Vacuum Tests: The manhole, after proper preparation as noted above, shall be vacuum tested in accordance with ASTM C 1244 prior to backfilling. The test head shall be placed at the inside of the top of the cone section and the compression head inflated to 40 psi to affect a seal between the vacuum base and the manhole structure. Connect the vacuum pump to the outlet port with the valve open. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the time for the vacuum reading to drop from 10 in. to 9 in. of mercury meets or exceeds the values below:.

**Minimum Test Times for Various Manhole Diameters  
in Seconds**

Depth (ft)	Diameter, in.									
	30	33	36	42	48	54	60	66	72	
	Time, in seconds									
8	11	12	14	17	20	23	26	29	33	
10	14	15	18	21	25	29	33	36	41	
12	17	18	21	25	30	35	39	43	49	
14	20	21	25	30	35	41	46	51	57	
16	22	24	29	34	40	46	52	58	67	
18	25	27	32	38	45	52	59	65	73	
20	28	30	35	42	50	53	65	72	81	
22	31	33	39	46	55	64	72	79	89	
24	33	36	42	51	59	64	78	87	97	
26	36	39	46	55	64	75	85	94	105	
28	39	42	49	59	69	81	91	101	113	
30	42	45	53	63	74	87	98	108	121	

- c. If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc.
4. Re-Testing: Any alterations made to pipeline or manholes performed after

initial testing shall be re-tested and pass again, regardless of initial test results.

5. Notification: City shall be notified 24-hours in advance prior to Contractor performing any testing.

### **Section 323: Protection and Restoration of Work Area**

- A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.
  1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
  2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
  3. Handwork, including raking and smoothing, shall be required to ensure that roots, sticks, rocks, and other debris are removed in order to provide a neat and pleasing appearance.
  4. The Department of Transportation's engineer shall be authorized to stop all work by the Contractor when restoration and cleanup are unsatisfactory and to require appropriate remedial measures for work conducted within the DOT's right-of-way or affecting their right-of-way.
- B. Man-Made Improvements: Protect or remove and replace with the City's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the work.
- C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the City. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage by equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area

and disposed of off-site by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.

- E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate city and/or county, state and federal regulatory agencies.
- F. Swamps and Other Wetlands:
1. The Contractor shall not construct permanent roadbeds, berms, drainage structures or any other structures which alter the original topographic features within the easement.
  2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the Contractor.
  3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland or stream which may be temporarily divided by construction.
  4. The Contractor shall not spread, discharge or dump any fuel, oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

#### **Section 324: Tracing Wire**

- A. Tracer wire shall be installed on all pipelines and service lines in a continuous fashion. It shall be brought to the surface at each manhole and clean-out location. At locations tracer wire surfaces between manholes, regular valve box with plain lid and collar shall be installed between a pipeline marker pair. Tracer wire shall be 12 GA single strand or up to 7 strands, copper with insulation UL rated for direct bury underground service. Splices shall be UL rated for direct bury and shall be minimized.

#### **Section 325: Underground Utility Marking Tape**

- A. Marking tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Sanitary Sewerage Systems, Safety Green, "Caution: Sewer Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be minimum 2-inches when buried less than 10-inches below the surface. Tape width shall be minimum 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

**END ARTICLE III**

## **ARTICLE IV: STANDARDS FOR DESIGN AND CONSTRUCTION SPECIFICATIONS FOR ROADS AND DRAINAGE**

### **Section 401: Purpose**

- A. This section provides the requirements for designing, furnishing, installing, and placing in satisfactory service all public roads. The arrangement of local streets shall permit practical patterns, shapes and sizes of development parcels. Street layout must strike a balance with proposed land use so as not to unduly hinder the development of land. All public roads shall be designed and constructed in accordance with the requirements contained in this section.
1. All public roads constructed in the City shall be shown on a set of engineering plans. The Plans shall include a plan view of the road showing the road layout to scale, adjacent property owners, right-of-way width, location of ditches and streams, location, size and material type of culverts, location of utilities, typical road cross-section including curb and gutter, and pavement profile or specification.
  2. Upon successful completion of construction of the road, the developer/builder shall provide the City with a deed (including a proper legal description and/or reference to a recorded plat). The deed must be acceptable to and accepted by the City Attorney.
  3. The road must be named with a name not otherwise used in Henry County. The road name must be acceptable to the Henry County 911 program.
  4. Road sections shall generally conform to the "Typical Section" contained herein.

### **Section 402: Traffic Analysis**

- A. New developments that will generate a significant amount of traffic may be required to perform a traffic analysis. The City will review each proposed development on a case-by-case basis to determine if a traffic study is required. If the City deems the size of the project warrants a traffic study, then the developer's design professional, who is qualified to do this type of work, will be required to perform a traffic study. Three (3) copies of the Traffic analysis, if required, should accompany the applications for proposed development.

Traffic studies must describe the extent, nature, and location of traffic impacts for all property for which the application is being sought and further all contiguous property owned by the applicant. The study area shall include the entire site being developed, future phases of multi-phase development, and the surrounding roadways, which are likely to be significantly impacted. At a minimum, the surroundings roadways to be included are:

1. The expected routes of access to the site as far as the nearest major arterials serving the site from each direction;
2. The routes and site access to major intersections expected to carry fifteen (15) percent of the project's traffic;
3. Other roadways expected to carry 1,000 additional daily vehicles as a result of the development.

It is recommended that a preliminary traffic assignment be performed to establish the scope of the study before beginning the inventory of existing conditions.

B. Traffic studies must include the following elements:

1. Conceptual plan or site plan of the proposed developers.
2. Inventory of existing conditions including adjacent land users, existing travel lanes and rights-of-way, existing pavement conditions, existing peak hour volumes and turning movement data with six (6) months of applications data, levels of service for peak hour period, and existing problems of deficiencies in curvature, sight distance, drainage, etc.
3. Trip generation;
4. Trip distribution;
5. Trip assignment;
6. Planned transportation improvements;
7. Identification of traffic impacts, problems, and deficiencies; and
8. Recommended transportation improvements and other impact mitigation measures, including but not limited to, entrance requirements, number of entrances, traffic circulation with the project, etc.

C. Trip Generation

The traffic study will include trip generation data for each phase of the overall project. Trip generation data will include the total number of vehicles computed to be entering and exiting the site on an average weekday and during a.m. and p.m. peak hours. Trip generation rates will usually be based on the peak hour of adjacent roadways described in the latest edition of Trip Generation (ITE). If the planned development includes more than 250,000 square feet of retail space, include similar trip generation data for Saturdays. If the existing site is zoned for a use other than single-family residential, include trip generation data for the site developed as zoned.

Trip generation rates must be taken from the latest edition of the ITE Trip Generation publication unless suitable documented local data are provided from the last three

similar developments collected within the past five (5) years. Suitable documentation includes the type, location, and size of each development; the dates and hours of data collection; the availability of public transportation; and the vacancy rate for the development. Copies of actual trip data may be required.

Vehicle trip will be computed by multiplying appropriate trip generation rates by the appropriate units for which the rates were intended. There are exceptions of this procedure:

1. When mixed-use developments are designed to encourage a significant number of internal trips, the total vehicle trips may be reduced by the estimated number of internal person trips, divided by the average auto-occupancy rate. The study must provide adequate published documentation or evidence of its assumptions concerning internal trips.
2. When retail developments are located along an arterial where a significant number of passerby traffic is reasonable, an appropriate adjustment may be made if adequate published documentation or evidence is provided in the study.

#### D. Trip Distribution

The trip distribution process will estimate the directional distribution of travel to and from the site for the approximate year of occupancy. Note that trip distribution for residential development (home-based work trip productions) and office development (home-based work trip attractions) are different. Retail distribution process may be accomplished by one of three means:

1. Use appropriate trip distribution rates from trip tables prepared by state or regional planning agencies; or
2. Prepare a custom trip distribution based on the “area of influence” method described in the American Planning Association publication Traffic Impact Analysis by Greenberg and Hecimovich (PAS Advisory Service Report No. 387, 1984); or
3. Prepare another acceptable distribution and assignment using data approved in advance by the City of Stockbridge Planning Department in the Preliminary Conference.

#### E. Vehicle Trip Assignment

The traffic analysis study will prepare vehicle trip assignments for the peak hour period of periods which represent the worst case in terms of the sum of existing traffic and the traffic generated by the overall proposed development. Normally this would be the p.m. peak hour. If the trip generation for the a.m. peak hour exceeds 75 percent of the traffic generated by the p.m. peak hour, then both a.m. and p.m. peak hour trip assignments should be prepared. Two trip assignments will be prepared for each peak hour period stipulated above:

1. Generated vehicle trips added to existing traffic assigned on the existing roadway system; and
2. Generated vehicle trips added to existing traffic and to traffic from other planned developments near the site, assigned on the system of existing roadways including recommended improvements; include other nearby large developments which have been rezoned or issued a development permit during the past 24 months. When information about nearby developments is not available, growth factors may be used to inflate existing traffic from other developments. Growth factors should be computed from the forecast population and employment of the Census tract which include the site.

These trip assignments will be prepared and illustrated for the internal roadways and driveways within the overall development, along with the surrounding roadways, intersections, and interchanges in the study area. Trip assignments will describe the peak hour directional vehicle volumes and turning movements at intersections.

### **Section 403: Access**

- A. Access to every subdivision and land development shall be provided over a public street. Private streets are prohibited. Each lot shall have access to a public street and a minimum of thirty (30) feet of lot frontage on a public street.
- B. When a subdivision consists of thirty (30) or more lots, it is required, that the subdivision have more than one entrance/exit to/from the subdivision. The City shall consider the amount of existing city street frontage and the configuration of the site in approving whether more than one entrance/exist is required for preliminary plat approval.

### **Section 404: Conformance to Adopted Major Thoroughfare and Other Plans**

- A. All streets and other features of the adopted comprehensive plan shall be platted by the subdivider in the location and if any, to the dimensions indicated on the Major Thoroughfare Plan or transportation component or element of a comprehensive plan adopted by the City Council.

### **Section 405: Continuation of Existing Streets**

- A. Existing streets shall be continued at the same or greater width, but in no case less than the required width.

### **Section 406: Street Plans for Future Phases of the Tract**

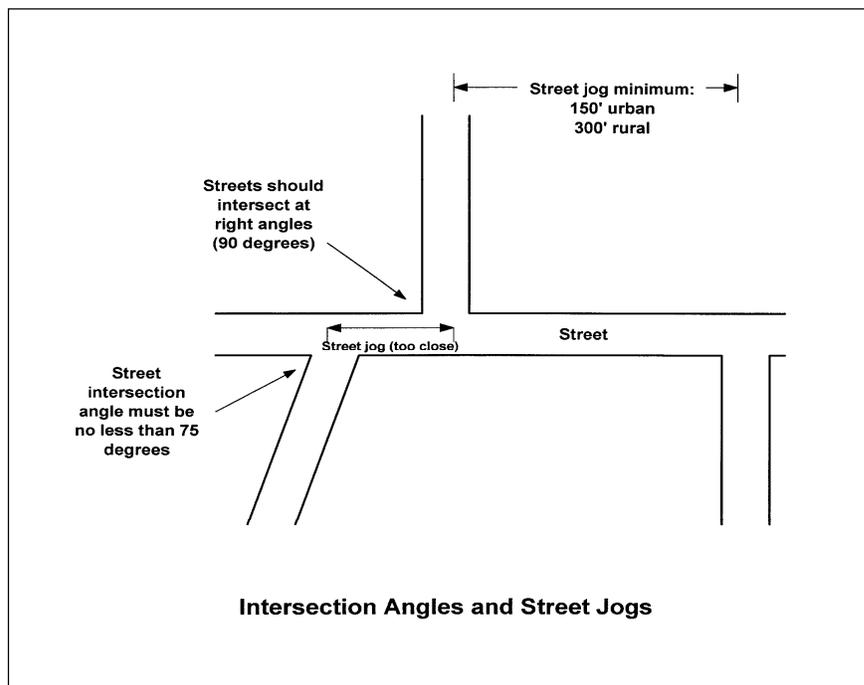
- A. Where the plat or site plan proposed to be subdivided or developed includes only part of the tract owned or intended for subdivision or development by the subdivider or land developer, a tentative plan of a future street system for the portion not slated for immediate subdivision consideration may be required by the Administrative Officer and if required shall be prepared and submitted by the subdivider or land developer at the time of submission of an application for preliminary plat or land development plan approval, whichever occurs first.

**Section 407: Street Names**

- A. Street names shall be approved by the Administrative Officer. Streets that are in alignment with existing named streets shall be given the name of the existing street. Names of new streets shall not duplicate or closely approximate those of existing streets in the City or County.

**Section 408: Street Alignment, Intersections, and Jogs**

- A. Streets shall be aligned to join with planned or existing streets. Under normal conditions, streets shall be laid out so as to intersect as nearly as possible at right angles (90 degrees), but in no case shall such a street intersection be less than 75 degrees. Where street offsets or jogs cannot be avoided, offset "T" intersections shall be separated by a minimum centerline offset of 150 feet (i.e., the "urban" standard in the following illustration shall apply).

**Section 409: Development Along Arterial Street or Limited Access Highway**

- A. Where a subdivision abuts or contains an arterial street or a limited access highway, the Administrative Officer shall require a street approximately parallel to and on each side of such right-of-way either as a marginal access street or, at a distance suitable for an appropriate use of the intervening land, with a non-access reservation suitably planted. Lots shall have no access to major streets (or limited access highways) but only to access streets.

**Section 410: Alleys**

- A. Alleys may be required at the rear of all lots used for multi-family, commercial or industrial developments, and may be provided in one or two-family residential developments.

**Section 411: Reserve Strips**

- A. Reserve strips controlling access to streets, alleys, or public grounds shall not be permitted unless their control is placed in the hands of the City Council, under conditions approved by the City Council.

**Section 412: Cul-de-sacs**

- A. Streets that dead-end shall terminate in a cul-de-sac or other approved turn-around. Streets that are planned to continue at some future date shall provide a temporary cul-de-sac. Except where topographic or other conditions make a greater length unavoidable, cul-de-sacs or dead-end streets shall not be greater in length than 750 feet and shall provide at the closed end with a turn-around radius of fifty (50) feet and be approved by the City Engineer.

**Section 413: Access to Property**

- A. Openings for vehicular access to lots from public streets, referred to as curb cuts or driveways, shall be in accordance with the following requirements:
1. Size and Spacing – In no case shall a curb cut or other access point be less than ten (10) feet or more than thirty (30) feet in width. Except in residential zoning districts no two (2) curb cuts or other access points shall be closer than 50 feet from each other.
  2. Location – At street intersections, no curb cut or other access points shall be located closer than 35 feet from the intersecting point of the street right-of-way lines.
  3. Visibility – At any street intersection or at the intersection of any private driveway with a street, no fence, wall, sign, planting or other structure or object shall be permitted that will form an impediment to the point of intersection of the driving surfaces.
  4. Visibility at Intersections – On corner lots, no fence, shrubbery or other obstruction to the traffic sight vision, except utility poles or traffic lights or sign standards, shall exceed a height of three (3) feet within a triangular area formed by the intersection of the right of way lines of two (2) streets or a street intersection with a railroad right-of-way line and a diagonal line which intersects the right-of-way lines at two (2) points, each a minimum of 20 feet from the intersection of the right-of-way lines, or in the case of a rounded corner, from the point of intersection of their tangents; provided however, signs, lights or similar objects which are totally located at least ten (10) feet above the finished grade shall be permitted.
  5. Permit Required – No person shall be authorized to open any curb cut, grade or otherwise make any improvements upon the public right-of-way of any street, road or highway, except with approval of the City. The City reserves the right to require the applicant to indemnify and hold the City harmless for any injury or damage to public utilities and improvements existing within said right-of-way over which any driveway or other improvement is to be built. The

City further reserves the right to require the property owner, at his expense, to remove any permitted improvement or to relocate or repair the same as necessary for the maintenance and future improvement of said right-of-way, including the location, relocation, repair or removal of utilities existing therein.

- 6. New Subdivision or Developments Fronting Upon the State Highway System: Whenever a new subdivision or development is proposed, which fronts the state highway system and requires access therefrom, no final approval of the site plan shall be given by the Municipal Planning Board until the developer has submitted the final plat to the Georgia Department of Transportation, received approval and submitted this approval to the Municipal Planning Board.

**Section 414: AASHTO Standards**

- A. Road design shall conform to AASHTO (American Association of State Highway and Transportation Officials) requirements, unless otherwise noted.

**Section 415: Minimum Design Speed and Maximum Grade**

- A. Minimum design speeds and maximum grades for proposed streets in the City of Stockbridge by street classification shall be as follows:

Street Type	Maximum Allowable Grade	Minimum Required Design Speed
Arterial	7%	55 MPH
Major Collector	10%	45 MPH
Minor Collector	14%	35 MPH
Unclassified	15%	25 MPH
Alley & Dead-End Streets	14%	Varies

Minimum grade including cul-de-sacs shall be 1.5% to maintain 1% in curb lines.

**Section 416: Sight Distance at Entrances to New Development**

- A. The sight distance along existing city roads at proposed entrances for both subdivisions and individual commercial/industrial sites shall be designed according to "A Policy on Geometric Design of Highways and Streets", most current edition, by AASHTO. The design professional should refer to the chapter entitled "At-Grade Intersections", and the "Sight Distance" section of this chapter.
- B. A general guide is provided below for sight distances at entrances. This guide does not relieve the design professional from complying with all aspects of AASHTO sight distance requirements for entrance designs.

Minimum sight distances shall be as follows:

Street Type	Minimum Sight Distance
Arterial	500 ft. @ 4 ft. above ground level
Major Collector	300 ft. @ 4 ft. above ground level

Minor Collector	200 ft. @ 4 ft. above ground level
Unclassified	200 ft. @ 4 ft. above ground level
Alley & Dead-End Streets	200 ft. @ 4 ft. above ground level

Each traffic movement through the intersection should be checked for vertical and horizontal sight distance. Any object high enough above the roadway to constitute an obstruction should be shown on the plans and noted to be removed or lowered. Such obstructions include signs, ground cover (vegetation), cut slopes, hedges, buildings, etc.

**Section 417: Minimum Length of Vertical Curves**

- A. Interior subdivision streets: crest vertical curves  $K=10$ , sag vertical curves  $K=20$ . Curve length equals the product of the  $K$  value and the algebraic difference in the road grades. Minimum vertical curve length shall be as follows:

Street Type	Minimum Length
Arterial	200 ft.
Major Collector	100 ft.
Minor Collector	60 ft.
Unclassified	60 ft.
Alley & Dead-End Streets	60 ft.

**Section 418: Widening for Development Entrances**

- A. The following widening is required for new developments in both subdivision and individual commercial/industrial site development entrances.

Street Classification	Street Width (ft.)	Minimum Pavement Width (Ft)
Arterial	24+	50+
Major Collector	24	40
Minor Collector	20	30
Local	12	25

- B. Street width is measured from centerline to the edge of the pavement.
- C. Right-of-way is measured from the existing centerline.
- D. Lane length is measured 150 feet from tangent point of radius to beginning of taper. Tapers are 50 feet. Vertical curb and gutter is required through the radii. The additional lane can be stopped at the projected property line if there is inadequate right-of-way or excessive cut or fills to install the lane. In this case, the tapers would start at the projected property line unless excessive cut or fills would encroach on the right-of-way limits of the abutting property.
- E. Paving section shall correspond to the street classification of the existing road the entrance connects to:

1. Arterial — Industrial Paving Section
2. Major Collector — Industrial Paving Section
3. Minor Collector — Commercial Paving Section
4. Local — Commercial Paving Section

The cost of any catch basins, which must be constructed when an existing City or County road is required to be modified, will be paid by the developer.

- F. Existing storm sewers located in the area of the entrance widening shall be extended and connected to the proposed storm sewer system at the developer's expense.
- G. See Standard Detail Drawings for widening at entrances.

**Section 419: Residential Street Section**

- A. Residential streets shall be a minimum of 22 feet of paved width within the curb and gutter. There shall be a minimum shoulder section behind both curbs as shown in the Standard Detail Drawings and based on the City's sidewalk requirements.

Pavement width shall be no less than as follows:

Street Types	Minimum Right-of-Way	Minimum Pavement Width (Ft)
Arterial	70 ft.	50 ft. or as shown in the Major Thoroughfare Plan
Major Collector	60 ft.	12-ft lanes + curb & gutter=24 ft.
Minor Collector-Residential & Dead-End	60 ft.	22-ft + curb & gutter
Alley	20 ft.	16 ft.
Cul-de-sacs	50 ft.	50 ft. radius

Cul-de-sac radius shall be as shown in the Standard Detail Drawings.

**Section 420: Industrial/Commercial Streets**

- A. Pavement width for industrial/commercial streets shall be no less than as follows:

Type Street	Minimum Right-of-way	Minimum Pavement Width (Ft)
Arterial	100 feet	52 ft. + w/13+foot lane
Major Collector	80 feet	52 ft. w/13 foot lane
Minor Collector	80 feet	28 ft. w/14 foot lane
Cul-de-sac	80 feet radius	55 ft. radius

- B. Paving standard shall be as shown in Standard Detail Drawings for industrial/commercial streets.
- C. See Typical Industrial curbing detail in Standard Detail Drawings.
- D. Cul-de-sac radius shall be as shown in the Standard Detail Drawings.

**Section 421: Horizontal Curvature**

- A. The minimum radii of centerline curvature shall be as follows:

Type Street	Minimum Radii
Arterial Streets	≥ 800 ft.
Major Collector	≥ 300 ft.
Minor Collectors, Alleys & Dead-Ends	≥ 100 ft.

**Section 422: Dam Supporting Road**

- A. No city road shall be designed to cross an existing or proposed dam.

**Section 423: Dead End Roads**

- A. No new developments shall have dead-end roads or streets.

**Section 424: Curb-line Radius**

- A. The curb-line radius at street intersections shall be at least 20 feet. Where the angle of street intersection is less than 90 degrees, a longer radius may be required. For commercial and industrial subdivision streets, a minimum 25 foot curb-line radius shall be provided.

**Section 425: Bridges**

- A. Bridges on public right-of-way shall meet current American Association of State Highway and Transportation Officials and the Georgia Department of Transportation standards, or as may be determined by the City Engineer.

**Section 426: Right-of-Way Clearance**

- A. All trees, brush, stumps, rocks, or other debris shall be cleared from the street right-of-way as required; provided, however, that efforts should be made and the city may accept proposals to save suitable vegetation in the right-of-way that will not pose a public safety hazard.

**Section 427: Grading of Streets**

- A. All streets shall be graded to lines, grades and cross-sections approved on the plans.

**Section 428: Street Paving and Base**

- A. Base and sub-base shall be installed in compliance with specifications of the City Engineer. Residential streets shall be built to the following standards.

1. The following types of base material may be used:
    - a. Six-inch graded aggregate base meeting the requirements of Georgia State Department of Transportation specification 815.
    - b. Graded aggregate base course: The base course shall consist of mineral aggregate and may be a combination of natural deposit or a blend of the materials specified. All materials are subject to approval by the City Engineer. If a blend of materials is used, it shall be blended through a base plant which meets the latest specifications of the Georgia State Department of Transportation specification 815. Minimum depth of base course shall be six (6) inches under a minimum of 2 inches asphaltic concrete type "E."
    - c. Black base: The base course shall consist of asphaltic concrete as approved by the City Engineer and shall conform to applicable specifications of the Georgia Department of Transportation. Minimum base course shall be four inches under minimum two inches asphaltic concrete.
  2. Prime: After the base has been placed, mixed, compacted, shaped, inspected and accepted, it shall be primed with suitable asphaltic materials as specified in Georgia Department of Transportation Standard Specification Section 412.
  3. Tach coat shall be applied a prepared road surface according to the requirements of GDOT Specification 413.
  4. Roadway surfaces: After the prime has been inspected and accepted, the roadway or street shall be surfaced with a minimum 1 1/2 inches of type "E," asphaltic concrete wearing surface. No surface treatment pavement as a finished wear surface will be accepted. All asphaltic concrete will be mixed in an asphalt plant meeting the latest requirements of the Georgia Department of Transportation.
- B. Final top course to be applied after development is approximately 95% complete.
- C. For commercial and industrial street paving base, use 8 inches GAB base, prime and place 3.5 inches of plant mix asphaltic binder Type "B" and surface with 1.5 inch of compact hot plant mix topping, Type "E" or "F".

**Section 429: Curb and Gutter**

- A. Curb and gutter shall be installed along both sides of all paving. All curb and gutter, valley, gutter, driveway aprons and sidewalks shall conform to City specifications. Concrete shall be Class "A" as defined by GDOT and have a minimum compressive strength of 3,000 psi at 28 days. All gutters shall drain positively with no areas of ponding.
1. Residential curbing:

- a. Concrete shall have a minimum strength of 3,000 psi at 28 days.
  - b. Typical minimum section shall be 6" x 24" x 9".
2. Industrial or commercial curbing:
- a. Concrete shall have a minimum strength of 3,000 psi at 28 days.
  - b. Typical section shall be 6" x 30" x 12".
  - c. Vertical faced curbing only.
3. Construction methods:
- a. Line and grade shall be set by developer's engineer, landscape architect, or surveyor and approved by the City Engineer.
  - b. One-half inch expansion joints or pre-molded bitumastic expansion joint material shall be provided at all radius points and at intervals not to exceed 50 feet in the remainder of the curb and gutter. When the development ties into existing curbing, the curb and gutter shall match the existing width.

**Section 430: Street Signs**

- A. Street signs shall be furnished and installed at all street intersections on the right-of-way by the developer and shall be white "scotchlite" with black legends mounted on 10 foot square posts, or as otherwise approved by the City Engineer. Exact locations shall be approved by the City Engineer prior to installation.

**Section 431: Street Right-of-Way Improvements**

- A. All street rights-of-way outside of the paved portions shall be graded to conform to approved cross section and shall be soiled with a material acceptable to the City Engineer. These areas shall be landscaped as required by this ordinance.

**Section 432: Street Trees**

- A. Street trees and other shrubbery that may be retained or planted shall be placed or retained so as not to obstruct sight distances at street intersections.
- B. Street tree planting is required along all new local, collector, and arterial streets in the City of Stockbridge and within commercial, industrial, or residential subdivisions. Street tree planting shall be required along all the property road or street frontage for each new land development in the city, except for existing lots of record developed for a detached, single-family dwelling, within the street right-of-way if sufficient room exists, or if such room does not exist, on private property within a street tree or general purpose easement.
- C. The subdivider, owner of land to be dedicated as a public street, shall at the time of preliminary plat, development permit, or building permit approval submit a plan for

the provision of street trees along all said roads or road frontages. It is the intent of this section that the subdivider or land developer carefully position street trees on the plan while taking into account future driveway and sidewalk locations if not constructed simultaneously with the construction of the public street or land development. In the cases of subdivisions, suitable arrangements must be made for either the subdivider/ developer or individual builders to install street trees according to a plan approved by the Administrative Officer as a part of preliminary plat approval, prior to dedication or opening of said street. It is the preference of the city that the subdivider shall install said street trees prior to the dedication or opening of the public street; however, the Administrative Officer may accept an agreement where the responsibility for street tree planting is shifted to the owners or individual builders of the lots to be subdivided. Any such responsibility shall be legally transferred in a form acceptable to the City Attorney.

- D. Trees must be planted within the public right-of-way or, if right-of-way width is insufficient to accommodate said street trees, then on private property abutting the public right of way within a street tree easement dedicated to the city.
- E. The guidelines below in Table 5.1 are intended to avoid conflicts with infrastructure; they are recommendations only and are subject to the approval of the Administrative Officer. See Article XII for additional information.

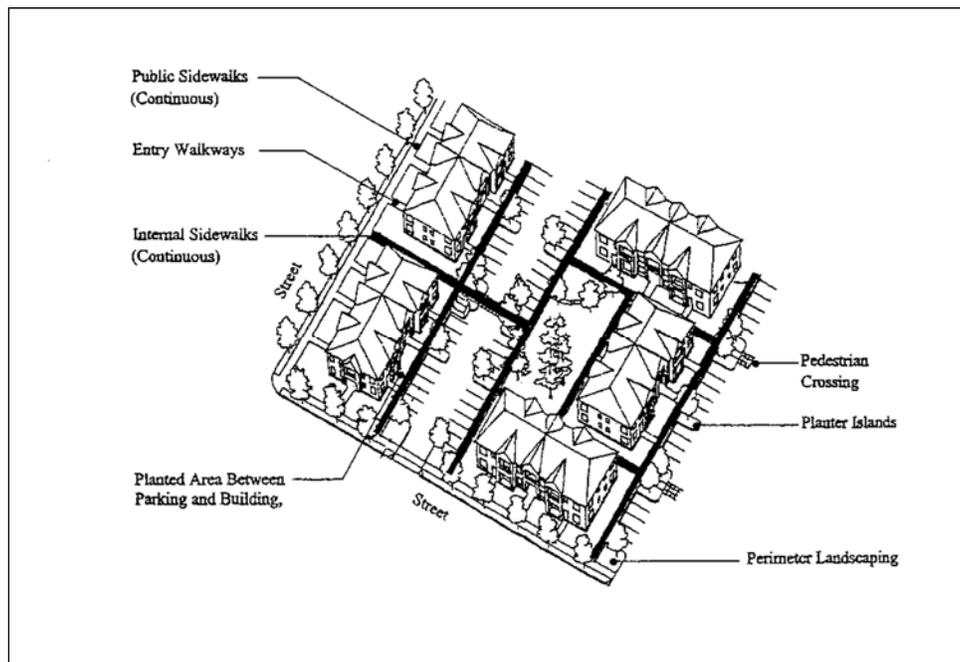
Table 5.1:

MATURE SIZE	MINIMUM WIDTH OF TREE LAWN	SPACING BETWEEN TREES	OVERHEAD UTILITIES IF PERMITTED	DISTANCE FROM SIGNS, UTILITY POLES, DRIVEWAYS, FIRE HYDRANTS	DISTANCE FROM INTER-SECTION	DISTANCE FROM UNDER-GROUND UTILITIES
Large 50-70 Feet	8 Feet	60 Feet	Do Not Plant	10 Feet	30 Feet	5 Feet
Medium 30-40 Feet	5 Feet	40 Feet	Okay	10 Feet	30 Feet	5 Feet
Small 15-20 Feet	3 Feet	20 Feet	Okay	10 Feet	30 Feet	5 Feet
Evergreen 40-50 Feet	Yards Only	30 Feet	Do Not Plant	30 Feet	30 Feet	5 Feet

**Section 433: Sidewalks**

- A. Sidewalks shall be installed in street rights-of-way in all residential, commercial and industrial developments along one side of the proposed street. When sidewalks are required, the subdivider shall furnish and install all required paving materials without cost to the City, in accordance with City Specifications including the following:
  - 1. Sidewalks shall have a minimum width of five (5) feet in residential areas and seven (7) feet in commercial areas.
  - 2. Sidewalks along streets in residential areas shall not be less than two (2) feet from street curbs or the edge of pavement.

3. All driveway aprons over sidewalk areas shall be paved with concrete by the developer or builder.
  4. Sidewalks shall be four (4) inches thick and consist of concrete (2,500 psi at 28 days) and shall be located sides of streets.
  5. Sidewalk systems and multi-use trails shall be constructed in accordance with requirements of Americans with Disabilities Act (ADA).
- B. In addition to the above requirements, on private properties, individual land developments, except for detached, single-family lots, shall provide direct pedestrian access ways to all public sidewalks or multi-use trails when located on a public street abutting the property to be developed.



Source: OTAK. 1999. Model Development Code and User's Guide for Small Cities. Salem: Oregon Transportation and Growth Management Program.

### Section 434: Streetlights

- A. Streetlights shall be provided in accordance with City specifications by the developer of a subdivision prior to the approval of a final plat. Fixtures and standards/poles installed or used shall be approved by the utility company which will be responsible for the maintenance of the facilities and by the City. The fixtures shall be mounted no more than thirty (30) feet above the ground and shall have appropriate arm length to place the light over the street. No arm shall be less than two and one-half (2-1/2) feet long unless approved by the City Engineer. Streetlights shall be serviced by underground electrical utilities. Post top luminaries may be permitted when approved by the City Engineer. Fixtures shall be located no more than five hundred (500) feet apart, unless approved by the City Engineer, and at least one light shall be located at each street intersection within the subdivision or land development.

- B. The developer shall pay all costs for standard poles, fixtures and any other related items or materials necessary for the installation, as well as arrange an agreement with the utility company for complete maintenance of all installations. The City of Stockbridge shall assume the responsibility and make the monthly payments to the power company for electrical energy for each street light only after these requirements have been accomplished and improvements accepted. The City of Stockbridge shall accept responsibility for power bills for streetlights no earlier than one year after the streetlights have been installed, and the developer or Homeowners Association will be responsible until that time.

### **Section 435: Acceleration/Deceleration Lanes**

- A. For subdivisions or land developments accessing state routes, the Georgia Department of Transportation may require the installation of acceleration/deceleration lanes.
- B. The City Engineer may require the installation of a deceleration lane for a distance of 200 feet and a 50 foot taper from all project entrances serving commercial and industrial subdivisions, and residential subdivisions serving fifty lots or more. For all commercial properties, if an acceleration/ deceleration lane is not required, the subdivider or land developer may be required to construct a wide flare entrance according to specifications of the City Engineer.

### **Section 436: Improvements to Abutting Streets**

- A. For subdivisions and land developments that abut and access an abutting public street, the subdivider or land developer shall install sidewalk, street lights, street trees, other road improvements, and if required a deceleration lane, according to standards and specifications of the City Engineer along all abutting public streets. When a subdivision or land development uses an unpaved public right-of-way for access, the subdivider or land developer shall improve that right-of-way to a pavement width consistent with city street design standards. Said improvements shall be from the subdivision or land development entrance to the paved city street which the City Engineer determines will be the primary direction of travel for residents of the subdivision or occupants of the land development.
- B. Where an impact on the safety of the motoring public may be in question as determined by the Administrative Officer, the Administrative Officer may require the developer to have a traffic impact study submitted and reviewed prior to issuance of a permit.

### **Section 437: Traffic Signs**

- A. The design professional shall show the location of all required traffic signs. Unless otherwise noted, design of traffic signs shall conform to the Manual on Uniform Traffic Control Devices.
- B. Stop signs shall be located from the signs edge six (6) feet off the back of curb or edge of gravel at the beginning of the intersection radius. The sign shall be located on the right side of the intersection. The bottom of the sign shall be at least five (5) feet above

the edge of pavement or back of curb. This standard applies to typical residential interior street intersections.

- C. All other intersections shall have stop signs located according to the Manual on Uniform Traffic Control Devices.
- D. Stop signs shall be sized so that their overall dimensions are 30" x 30".
- E. All other signs shall be sized according to the Manual on Uniform Traffic Control Devices.

#### **Section 438: Utility Locations**

- A. All utility locations shall correspond to the typical layout shown in the Standard Detail Drawings.

#### **Section 439: Apartments and Condominiums**

- A. Streets shall be constructed to residential street standards as set forth in these specifications.

#### **Section 440: Mobile Home Parks**

- A. Streets shall be constructed to residential street standards as set forth in these specifications.

#### **Section 441: Site Design for Individual Commercial/Industrial Lots**

- A. Site design for Individual Commercial/Industrial lots shall conform to above Sections 416, 418 and 420.
- B. Width of entrances shall be limited to those shown in the Standard Design Drawings. Entrances with several lanes for different traffic movement with concrete or painted islands shall be reviewed on a case-by-case basis.
- C. Spacing of entrances and distance of entrances to property lines shall be limited to distances shown in the Standard Design Drawings.
- D. Entrances shall comply with valley gutter requirements shown in the Standard Detail Drawings (Georgia Department of Transportation Standard 9031U).

#### **Section 442: Proposed Grading**

- A. Proposed grading shall have positive drainage.
- B. Swales lined with grass or stone shall be designed with a minimum 1.0% slope. Concrete lined swales shall be designed with a minimum 0.5% slope.

#### **Section 443: Automobile Parking**

- A. Automobile parking shall be designed with maneuvering aisles and parking spaces to the minimum dimensions as shown in the Standard Detail Drawings.
- B. The number of parking spaces required for each development shall be as required in

the City of Stockbridge Zoning Ordinance.

- C. All off street automobile parking, accesses and maneuvering aisles shall be paved unless approval is given for a Low Impact Development alternative. Off street automobile parking and the access and maneuvering aisles that serve this parking shall be defined as those areas that are open to the general public.
- D. Parking for the handicapped shall be designed as shown in the Standard Detail Drawings.

#### **Section 444: Retaining Walls**

- A. Retaining walls shall be designed by a structural engineer, registered in the State of Georgia.

#### **Section 445: Infrastructure Materials**

- A. All materials shall comply with Georgia Department of Transportation Standard Specifications Construction of Roads and Bridges with Supplemental Specifications and Standard Details current edition, unless noted otherwise.

#### **Section 446: Construction**

- A. All construction shall comply with Georgia Department of Transportation Standard Specifications Construction of Road and Bridges, with Supplemental Specifications and Standard Details, current edition, unless noted otherwise.

#### **Section 447: Clearing and Grubbing**

- A. The entire area within the right-of-way shall be cleared and grubbed of all trees, bushes, stumps and debris and other objectionable materials. Grubbing depth shall be two (2) feet below subgrade. Rock shall be scarified to a depth of twelve (12) inches below subgrade. Prior to any grading, the entire right-of-way area shall be cleared of all bushes, stumps, debris and other questionable materials, as well as all trees not intended for preservation. All debris shall be disposed of in a lawful manner. There shall be no burial in the road right-of-way.

#### **Section 448: Grading**

- A. Grading shall be accurately done to the lines and grades shown on the plans. Embankments shall be placed in uniform layers not to exceed six inches and compacted to a density of 95% of the maximum laboratory dry weight per cubic foot as determined by ASSHTO Method T-99. If necessary in order to obtain this compaction, the contractor shall add moisture to the material as it is placed.

<b>Depth of Cut or Fill</b>	<b>Cut Slopes</b>	<b>Fill Slopes</b>
2 feet or less	4 to 1	4 to 1
2 feet to 5 feet	3 to 1	3 to 1
5 feet to 10 feet	2 to 1	2 to 1
Over 10 feet	2 to 1	2 to 1

- B. The depth of cut referred to shall be constructed to the maximum cut or fill occurring

in any one section of cut or fill. The slope on cut or fill slopes shall be uniform throughout for each section of cut or fill. When a cut is made in rock that requires blasting, the slope may be changed upon the approval of the City's engineer. Shoulder sections behind the curb on typical streets shall be as shown in the Standard Detail Drawings.

#### **Section 449: Subgrade**

- A. After the earthwork has been completed and all storm drainage, water, sanitary sewer and other underground utilities have been installed within the right-of-way, as appropriate, and the backfill in all such ditches has met all compaction requirements of this Ordinance and the City's representative (as appropriate), the subgrade shall be brought to the lines, grades and typical roadway sections shown on the plans.
- B. A surveyor must certify grade within six (6) inches of final or submit an "as-graded" profile for review by the City Manager or his representative.
- C. When the roadway is to be used for construction traffic before the paving work is completed, a layer of #3 stone can be laid as a traffic surface if the developer so desires. This material shall not be used as part of the base material. It may be worked into the subgrade; or it shall be removed before the base course is set up for paving.
- D. Provision shall be made to drain low points in road construction when the final paving surface is delayed. A break in the berm section is required when the curbing has not been constructed. After installation, drainage under the curb is required.

#### **Section 450: Local and Minor Collector Streets**

- A. Any and all roadway construction shall meet the minimum specifications of the Georgia Department of Transportation, unless otherwise noted.
  - 1. The base material for local and minor collector streets shall consist of a minimum of 8" of graded aggregate base. The base material shall be spread uniformly and with the grade of the road with a crown or super elevated depending on the cross section shown on the plans. The base shall be fine graded and compacted to 100 percent of maximum dry density. Compaction determined by modified proctor test in accordance with Georgia Department of Transportation (GDOT) specifications. Compaction tests will be done randomly, but not to exceed 500 feet apart. In addition, the road base shall be proof rolled in the presence of the City's authorized representative. Any areas not meeting these requirements shall be reworked until proper compaction is achieved. The cost of compaction testing shall be the responsibility of the developer.
  - 2. After passing all compaction requirements and brought to proper section, the base shall be primed with 0.25 gallons or R.C. 70 per square yard, according to GDOT standards, the same day it is compacted. After the prime has been properly cured, two (2) inches of modified "B" binder shall be applied. Prior to applying wearing course, a tack coat shall be applied to the binder course at a rate of no less than 0.05 gallons per square yard. Type of tack shall be approved

by the City's authorized representative prior to placement. After placing tack, an additional one and one-half (1 'A) inch of type "F" wearing course shall be applied.

3. Field determination of asphalt density by the nuclear method (ASTM D 2950 latest edition) every 5,000 square feet, shall be required. The cost of testing shall be the responsibility of the developer.
4. After a reasonable curing time, asphalt extraction testing can be done in lieu of nuclear method testing to ensure compliance with GDOT and City specifications for the asphalt section required. The asphalt shall be cored for thickness verification at the inspector's discretion. Areas with failing asphalt tests shall be corrected by a method approved by the City. The cost of testing shall be the responsibility of the developer.

#### **Section 451: Construction Standards for Major Thoroughfares and Streets**

- A. Minor collectors and major thoroughfares shall be constructed in accordance with the designs approved or prepared by the Georgia Department of Transportation or the City's Engineer.

#### **Section 452: Underground Utilities**

- A. All utilities located within street rights-of-way within the curbs shall be installed and the trenches backfilled and thoroughly compacted before any pavement or base is installed. All utilities otherwise located within street rights-of-way, shall be installed and trenches backfilled and compacted to 95% of the maximum laboratory dry density except for the top twelve (12) inches which shall be compacted to 98%, standard proctor.
- B. All utility manholes and valve boxes shall be brought to the finished grade within the roadway section.

#### **Section 453: Shoulders and Easements**

- A. All shoulders and easements shall be clear of limbs and debris, graded smooth and established in grass.

#### **Section 454: Foreign Material on Streets**

- A. The developer, builders and/or homeowners shall be responsible for keeping dirt, mud, building materials, concrete, etc., off of the pavement and curbing of existing City or County roads during construction of buildings in all developments covered by these regulations.
- B. Before the streets are accepted by City of Stockbridge all litter and trash shall be removed from the dedicated right-of-way and surrounding areas.

#### **Section 455: Testing**

- A. All tests shall comply with the Standard Specifications Construction of Roads and Bridges by the Georgia Department of Transportation, most current edition.

- B. Compaction testing shall be done on road embankments, trench backfill and road subbase.
- C. Asphalt testing including density testing by Nuclear Methods shall be done for roads. Coring for pavement thickness shall be done at the discretion of the inspector.

**Section 456: Contractor Qualifications**

- A. Licensing and Safety - All contractors who work on water systems that will be owned by the City of Stockbridge must meet the requirements for Utility Licensing accordance with State of Georgia law and local ordinance. Compliance with applicable safety regulations is the responsibility of each company engaged in the work; the city assumes no responsibility for the actions of others on the job site. It is the responsibility of those installing water mains and related appurtenances to conform to OSHA regulations, 29 CFR Part 1926, Subpart P, Paragraph 1926.650 through 1926.653. Publications from OSHA can be obtained by contacting OSHA Publications Distribution, Washington, D.C.
- B. Contractors performing road and storm sewer construction must be approved by the City and should be completely familiar with the procedures and contract requirements associated with this type project.
- C. Unsatisfactory work may result in the loss of privilege to obtain a permit for future work in the City of Stockbridge.

**Section 457: Construction Inspection**

- A. The developer's contractor will be responsible for the quality, accuracy and workmanship of his completed work.
- B. The City may employ the services of an Engineer or a Consulting Engineer for inspection of the project. If the City does so, the City has the option of billing the developer the same rate or amount that the City has been billed or invoiced by their Engineer.
- C. City personnel and/or their authorized representative will visit the job site on a periodic basis and will make spot checks, as they deem appropriate. The City of Stockbridge shall have the right to review and inspect all construction and may reject any work that does not meet quality control standards.
- D. Authorized representatives of the City of Stockbridge, which may include city employees, the city engineering consultant, and state or federal agencies, shall have access to the site for inspection at any time.
- E. All written communications regarding road and storm sewer construction will be to:

**CITY OF STOCKBRIDGE  
4640 North Henry Blvd.  
Stockbridge, GA 30281  
Phone: (770) 389-7900**

**Fax: (770) 389-7912**

The developer, contractor(s) and the developer's professional responsible for inspection will be required to attend a pre-construction conference with the City. At the pre-construction conference, the contractor will submit to the city, in writing, the date they propose to begin construction. The contractor will provide notification by phone any time the work is to be vacated and will provide notice by phone prior to resuming work.

- F. The applicable Administrative Officer, staff or consultants may have informal verbal communications with the contractor foreman or superintendent at any time during construction. The City will not direct the actions of contractor's workmen.
- G. The contractor shall notify the City and receive inspection approval prior to concealing certain work such as storm sewers and bedding, storm drainage structures, road fill, etc.
- H. Minimum Inspection by Developer's Professional The following minimum compaction tests and inspections will be performed and certified by professionals employed by the developer and approved by the City to perform quality control checking on the construction of the project while it is in progress. The City's authorized representative shall have the right to choose locations for the tests and to determine the number of tests taken above the minimum requirements. The city shall be notified at least one day prior to testing in order to be present during testing if so desired.
  - 1. Roadway Compaction Testing - Frequency of testing shall be determined by project conditions, the minimum test requirements are one per 5000 cubic yards of material placed, one per four feet of fill or at the discretion of the City's representative. All areas failing compaction test shall be reworked as necessary until compaction is achieved.
    - a. Sub-base Compaction Testing and Test Rolling Compaction tests of the sub-base should be done randomly not exceeding 500 feet apart. In addition, the road sub-base shall be test rolled with the City inspector present. Areas failing compaction testing shall be reworked until compaction is achieved.
    - b. Asphalt Pavement — Field determination of asphalt density by the nuclear method (ASTM D 2950 latest edition) every 5,000 square feet, to ensure compliance with GA DOT Specifications for the asphalt section required. The asphalt shall be cored for thickness at the discretion of the Inspector. Extraction testing can be done on the asphalt to ensure compliance with GA DOT Specifications for the asphalt section required. Areas with failing asphalt tests shall be corrected by a method approved by the City.
    - c. Concrete — Testing for concrete shall be done where concrete is used

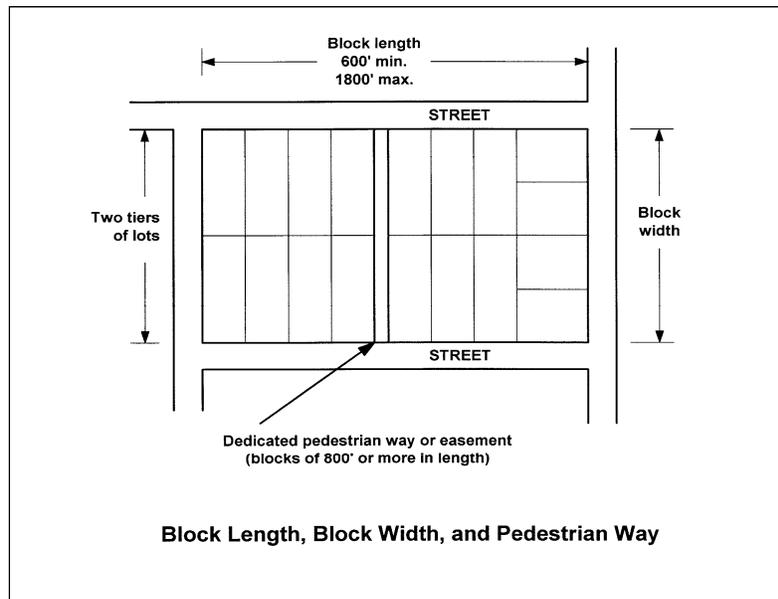
on the project for retaining walls, culverts and headwalls and bridges, Testing shall include slump tests, compressive strength tests and air entrainment tests. Testing shall comply with GA DOT testing standards for concrete.

#### **Section 458: Final Inspection and Conditional Acceptance**

- A. The developer's design engineer shall furnish the City with as-built drawings and easements. An affidavit shall be furnished to the City stating the work on the project has been completed in accordance with the approved plans and specifications. After receipt of this affidavit, the City will schedule a final inspection. A representative of the developer's professional and the contractor will be present during this final inspection, this final inspection will generally include spot checks of storm sewers, drainage system, drainage easements, roads, water system and sanitary sewer system and a complete overview of the project,
- B. After any discrepancies are corrected, the city will issue a letter certifying conditional acceptance of the water system. This letter shall commence the start of the 24-month warranty period, which is required of the contractor.
- C. On projects having phased development, this letter will allow the developer to apply for a permit for the next phase of development.
- D. At the end of 24 months, the City will re-inspect the entire development. When any discrepancies have been corrected, the city will issue an acceptance letter and will begin perpetual maintenance and operation of the roads and storm sewer system within the right-of-way.

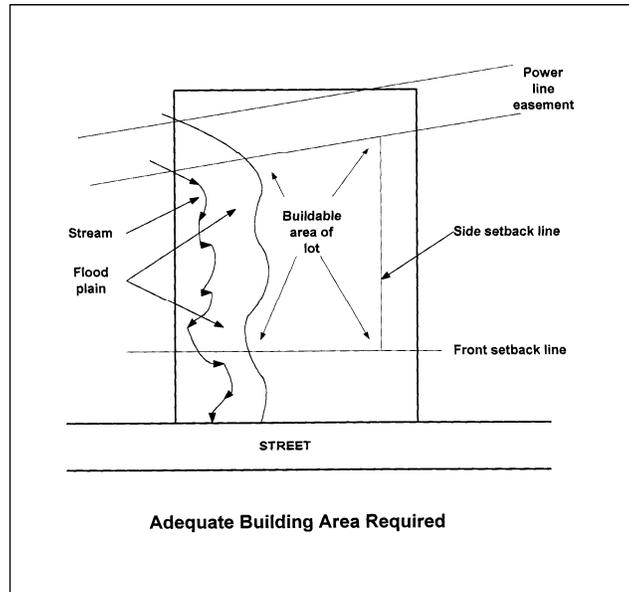
#### **Section 459: Block Lengths and Widths**

- A. Intersecting streets shall be provided at such intervals so as to provide adequate cross traffic. Blocks in residential subdivisions should not exceed one thousand eight hundred (1800) feet nor be less than six hundred (600) feet in length, except where topography or other conditions justify a departure from these standards. In blocks longer than eight hundred (800) feet, pedestrian ways and/or easements through the block shall be required by the Administrative Officer near the center of blocks.
- B. The width of the block shall normally be sufficient to allow two (2) tiers of lots of appropriate depth. Blocks intended for business or industrial use shall be of such width as to be considered most suitable for their respective use, including adequate space for off-street parking and deliveries.



### Section 460: Lot Width and Size

- A. Residential lots shall meet the lot width and lot area requirements of the Zoning Ordinance of the City of Stockbridge. Residential lots should have a depth not greater than 3 times the width of the lot at the building line, unless unusual circumstances make these limitations not practicable. Residential corner lots shall have adequate width to meet building setback requirements from both abutting streets.
- B. Where individual septic tanks are used, the Henry County Health Department shall approve minimum lot sizes to conform to health standards of the Georgia Department of Public Health.
- C. Commercial and industrial lots shall be adequate to provide service areas and off-street parking suitable to use intended.
- D. Each lot shall contain an adequate building site not subject to flooding and outside the limits of any existing easements or required yards/ building setback lines.



### Section 461: Lot Lines

- A. All lots lines shall be perpendicular or radial to street lines, unless not practicable because of topographic or other features

### Section 462: Building Lines

- A. A building line meeting the front yard/building setback requirements of the Zoning Ordinance, as a minimum, shall be established on all lots.

### Section 463: Double and Reverse Frontage Lots

- A. Double (or multiple) frontage and reverse frontage lots shall be avoided except where essential to provide separation of residential development from traffic arteries or overcome specific disadvantages of topography or orientation. A planting screen easement of at least ten (10) feet, across which there shall be no right of access, shall be provided along the line of lots abutting such a traffic artery or other disadvantageous use.

### Section 464: Flag Lots

- A. Flag lots which meet minimum lot area requirements and meet the minimum lot width at the front building setback line where the building is placed may be allowed where terrain makes standard design or frontage impossible or impractical. Where such lots are allowed, the street frontage of each panhandle portion of the lot shall not be less than thirty (30) feet wide, and the panhandle portion of the lot shall be not more than two hundred (200) feet long. Not more than two (2) such panhandle access points shall adjoin each other.

### Section 465: Lot Remnants Not Permitted

- A. All remnants of lots below any minimum lot size which may be required, left over after subdividing of a larger tract, must be added to adjacent lots, rather than allowed to remain as unusable parcels. The Administrative Officer may permit a lot remnant for a specific purpose such as a detention pond, provided that access and design is

appropriate and the lot remnant is restricted to specific non-building use.

**Section 466: Monuments**

- A. For all subdivisions, a Georgia registered land surveyor shall install permanent survey monuments at all property corners and land lot lines prior to final plat approval. Lot corners shall be marked with metal rods not less than 1/2" in diameter and 18" in length and driven so as to be stabilized in the ground. Permanent survey monuments shall also be installed in accordance with the most recent edition of the Rules of The Georgia State Board of Registration for Professional Engineers & Land Surveyors and the Georgia Plat Act (O.C.G.A. 15-6-67).

**Section 467: Additional Technical Specifications**

- A. As provided in Section 303 of this ordinance, the City Engineer is authorized to prepare and enforce technical specifications for various improvements, including streets. Unless otherwise indicated in such technical specifications, all of the materials, methods of construction, and workmanship for the work covered in reference to street construction shall conform to one or more of the following as appropriate and applicable:
1. The latest standard specifications of the Georgia Department of Transportation;
  2. The latest edition of AASHTO Policy on Geometric Design of Highways and Streets; and/or
  3. The Manual on Uniform Traffic Control Devices for Streets and Highways published by the Federal Highway Administration of the U.S. Department of Transportation.

**Section 468: Drainage Design Criteria**

- A. This section provides minimum and maximum values, and methodologies accepted by the City of Stockbridge in the preparation of plans for stormwater management and drainage systems. The latest edition of the Manual for Erosion and Sediment Control of Georgia shall be consulted for the proper design procedures in meeting the standards of this section.
- B. Sizing and location of all existing and proposed storm sewers shall be the responsibility of a professional engineer registered in the State of Georgia. They shall be shown on a topographic map with two foot contour intervals. Existing and proposed contours shall be shown. Profiles of the storm sewers shall be shown on plan and profile sheets labeled with structure numbers, pipe length and materials, invert elevations, and hydraulic grade line (HGL).
- C. Storm drainage pipes shall be sloped so as to maintain a minimum velocity of 3 feet/second (fps) during the 2-year storm event so that sediment will not collect. The slopes shall be designed and the storm sewers constructed such that there is no standing water in any pipe or drainage structure that would promote mosquitos breeding.

- D. The Rational Method may be used to estimate stormwater runoff peak flows for the design of gutter flows, drainage inlets, storm drain pipes, culverts and small ditches draining small, highly impervious areas less than or equal to 25 acres. The Rational Method may not be used for storage design or any other application where a more detailed routing procedure is required because The Rational Method can significantly underpredict detention volumes; however, The Modified Rational Method may be used for detention design for drainage areas up to 5 acres. The Rational Method should not be used for calculating peak flows downstream of bridges, culverts or storm sewers that may act as restrictions and impact the peak rate of discharge. The SCS Method or USGS Regression Method may be used for estimating stormwater peak runoff rates and the generation of hydrographs for routing of stormwater flows in areas draining more than 25 acres. The Simplified SCS Method can be used for drainage areas up to 2,000 acres.
- E. The 25-year storm event shall be used in sizing storm drains that serve public streets and rights-of-way. Storm sewers and culverts conveying water under public streets shall be sized to carry runoff from the 100-year storm event without overtopping the road. All other storm-sewer systems shall be sized for the 50-year storm event.
- F. Storm sewers and cross drain pipes shall not be less than 18 inches in diameter. No storm drain can be designed or installed under proposed acceleration/deceleration lanes. The Administrative Officer or his designee, upon recommendation by the City Engineer, may modify or waive this requirement if unusual circumstances exist.
- G. Storm drainage shall be collected in storm sewers at or near the perimeter of the property on the upstream end and piped to an existing storm drainage system. This extension requirement can be waived for collection of storm water upstream of roadways where topographic conditions warrant placing the inlet at the toe of the roadway fill.
- H. Maximum continuous length of pipe shall be 300 feet for pipes less than 42 inches in diameter and 500 feet for pipes >42 inches.
- I. All storm drainage pipes shall extend to the detention facility.
- J. Drainage Easements shall be at least 20 ft wide along all storm drain systems and around all detention ponds where sanitary sewer and storm sewer are contained in the same easement, the easement shall be at least 30 ft. wide..
- K. Exit velocities from storm-drain pipes shall not exceed 10 fps during the 25-year storm event without the design of additional energy dissipaters (not including required rip-rap). Energy dissipation devices, such as splash pads, stilling basins, etc., shall be designed in accordance with sound engineering practices. Rip-rap shall be designed in accordance with the Manual for Erosion and Sediment Control in Georgia.
- L. It is the developer's and/or the contractor's responsibility to ensure that all structures built on individual lots or sites have positive drainage and are built at an elevation to adequately avoid being flooded by the 100-year storm and that runoff from their

project does not adversely affect downstream or upstream property. The City is not responsible for damages resulting from improper design or inadequate runoff control.

- M. Maximum velocity of runoff in swales lined with vegetation shall be 5.0 feet/second during the 25-year storm event. Swales with runoff velocities in excess of 5.0 fps shall be lined with stone, concrete, or approved synthetic matting.

#### **Section 469: Storm Sewers**

- A. Georgia DOT Standard 1030D shall be used in determining class concrete or gauge of pipe under fill, method of backfilling and pipe installation. A certification by the supplier of the pipe specification for each pipe shall be required prior to installation.
- B. All concrete pipe shall be reinforced. Reinforced concrete pipe shall be used under all public streets, where pipe slopes are less than or equal to 10% and for all live streams. Double wall high-density polyethylene pipe may be used in all other instances.
- C. Where a wet weather drainage ditch exists between the proposed road and 20 feet into the lot, the design professional shall size the driveway culvert as if the driveway was at the lowest point on that lot. The construction plans shall show the minimum driveway pipe size required. Driveway culverts may be reinforced concrete or HDPE as specified herein. The inlet and outlet end of all driveway culverts shall have either flared end sections or concrete headwalls that meet the standards of Georgia Department of Transportation 1120 or 1125.
- D. Pipe installation shall conform to GDOT Standard Specifications for Construction of Roads and Bridges. Before any traffic over a storm drain is allowed, the developer shall provide an adequate depth and width of compacted backfill to protect the structure from damage or displacement. Any debris or silt that constricts the flow through a pipe shall be removed by the developer as often as necessary to maintain drainage. All pipe structures shall be cleaned before the work is conditionally approved. Any damage or displacement that may occur due to traffic or erosion shall be repaired or corrected at the developer's expense.
- E. Minimum Clearances Are:
1. Eighteen (18) inches between the bottom of the base or sub-base, if used, and the exterior crown of the culvert. In all cases, at least 24 inches of cover shall be provided.
  2. A minimum of one (1) foot clearance between existing and proposed underground utilities and exterior crown of culverts.
- F. Trench construction for storm drainage pipe shall be in accordance with GDOT Standard 1030D and current manufacturer's specifications. A typical detail shall be provided on the construction drawings.
- G. The storm sewer bedding shall be designed according to the latest manufacturer's specifications and GDOT Standards and a typical detail shall be provided on the

- construction drawings.
- H. All pipe joint connections and connections to manholes shall be made according to the latest manufacturer's specifications and GDOT Standards. At a minimum, all connections to manholes shall be grouted with cement.
- I. Storm Sewer Trench Backfill Compaction Testing — Frequency of testing shall be determined by project conditions. The minimum test requirements are once per road cut or once per one hundred fifty (150) feet if the trench line lies within the roadway as is in the case of a storm sewer running parallel to and under the pavement or at the discretion of the Administrative Officer or his authorized representative. Any areas failing the compaction tests shall be reworked as necessary to achieve compaction.

### **Section 470: Drainage Structures**

- A. The design professional shall check the hydraulic capacity of each drainage structure designed as an inlet point in the drainage system. The actual storm water flows shall be compared with the structure's flow capacity to ensure the capacity is not exceeded. Calculations shall be included in the hydrology study.
- B. Catch basins shall be designed by the design professional to GDOT Standards 1033D and/or 1034D. Alternate catch basins complying with the standards of the Georgia DOT are subject to approval by the City.
- C. Catch basins shall be located outside of intersection radii unless unusual circumstances cause undue hardship, in which case the City may waive this requirement.
- D. Inlet Spacing shall be limited to a maximum distance as follows:
1. 500' on grades up to 7%
  2. 400' on grades from 7% to 10%
  3. 250' on grades over 10%
  4. Or as specified in Section 472
- E. Maximum gutter spread shall be one half of the travel lane, as measured from the face of curb, for the 25-year storm event. The inlets shall be spaced in order to intercept a minimum of 85% of the flow during the 25-year storm event without exceeding the above gutter spread.
- F. Drop inlets shall be designed to GDOT Standards 1019A. Weir drop inlets shall be provided in landscape areas. Grated drop inlets shall be provided in paved areas.
- G. Junction boxes or manholes having access to the pipe shall be constructed to meet the requirements of GDOT Standard 9031U or 1011A. Manholes shall be provided with eccentric cone sections.

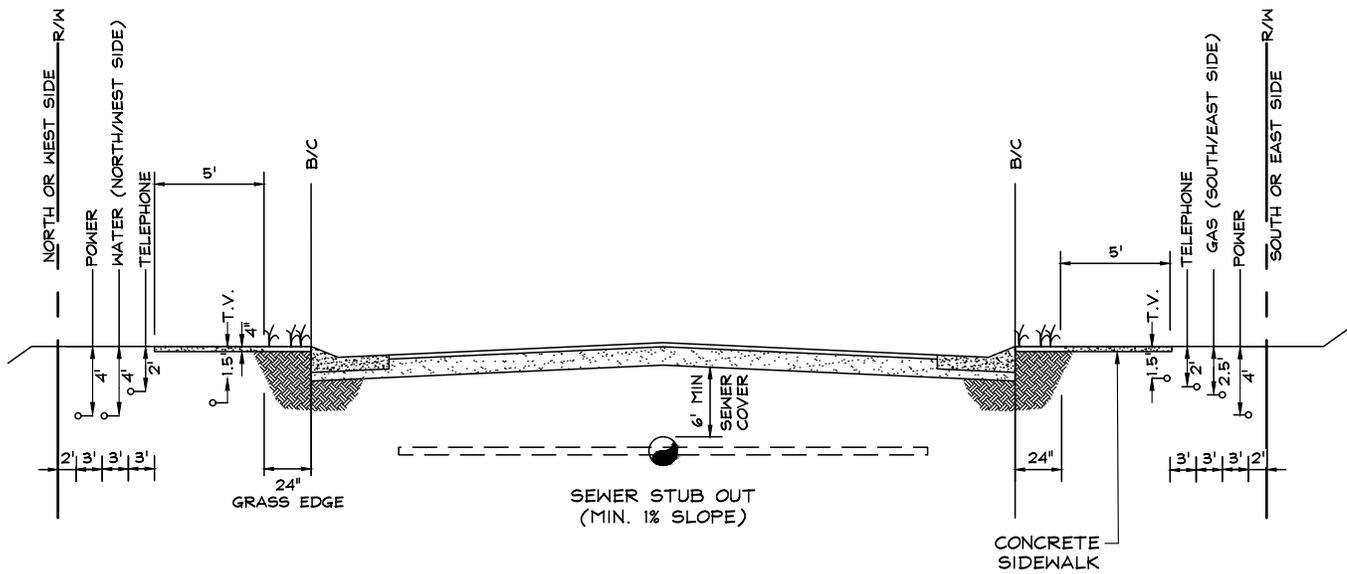
- H. Detention pond riser structures shall be designed to GDOT standards. These structures shall be checked for flotation.
- I. Cul-de-sacs on downhill street grades shall require catch basins throat design and cul-de-sac grading detail.
- J. Provide a minimum 0.2 feet drop between inverts across structures.
- K. The materials used for storm drainage structures shall comply with the standards of the Georgia Department of Transportation.

#### **Section 471: Storm Detention Facilities**

- A. All development plans, except those that are exempt, will require a hydrology study certified by a professional engineer registered in the State of Georgia qualified to do work in the field of hydrology. The study shall be in accordance with the Georgia Stormwater Management Manual, latest edition and should include a downstream peak flow analysis using the ten percent rule necessary to show safe passage of post-development flows downstream. Permanent detention facilities are required for every development project that has a one (1) cfs increase in post-development discharge for the 25-year storm for the project site. In the instance where the downstream analysis indicates that detention has an adverse impact on the watershed, the developer must pay an impact fee of a value equal to the cost of the detention pond that the City will use to make improvements to the stormwater system.
- B. Detention ponds shall be designed for the 2, 5, 10, 25, 50, and 100-year storm events. The SCS Method is the only acceptable method that can be used for developing hydrographs to be used for detention pond routing.
- C. An emergency overflow device for a detention pond shall be designed to pass the 100-year peak developed inflow without overtopping the dam in the event the primary outlet control structure becomes obstructed. There shall be at least 2 ft of free board between the 100-year elevation in the emergency spillway and the top of the berm.
- D. Pond discharge locations shall be in defined drainage ditches or piped systems. The developer's engineer shall include in the hydrology study a discussion of existing conditions downstream of the detention pond and an explanation of how downstream property owners will not be adversely affected by the "concentrated" runoff. If there is an existing storm drainage system within 150 feet of the discharge point of the outlet pipe for the pond, then the developer shall extend the outlet pipe and tie-in to the existing system.
- E. The steepest fill slopes shall be 3:1 and cut slopes shall be no steeper than 3:1. Vegetated embankments shall be less than 20 feet in height. Riprap-protected embankments shall be no steeper than 2.5:1. Geotechnical slope stability analysis is recommended for embankments greater than 10 feet in height and is mandatory for embankment slopes steeper than those given above. All embankments must be designed to State of Georgia Rules for Dam Safety (Chapter 391-3-8) and are subject

- to the provisions of the Georgia EPD Safe Sam Program. The maximum depth shall not exceed 10 ft. Outlet pipes shall be RCP installed with a concrete cradle.
- F. A 10 feet wide access road that runs on top of the dam shall be required around the circumference of the pond except where topography prohibits this, and the exception is approved by the Administrative Officer.
- G. A high-quality fence made of durable materials including wood, iron or other metal shall be required around all detention facilities. Metal fences prone to rust or deterioration, such as chain link fence, are acceptable only if coated with black Teflon or similar material to protect it from deterioration. The fence must also comply with the following standards:
1. The fence shall be at least 6 feet high.
  2. Fence posts shall be set in concrete 10 feet on center.
  3. There shall be a minimum 12 feet wide gate located for access.
  4. The fence shall not be installed across the slope of the dam or berm. But installed completely around the pond and containing the dike and access road entrance.
- H. The Owner of the property on which the detention facility is located shall be responsible for properly operating, maintaining and cleaning-out all storm water detention facilities.

**END ARTICLE IV**



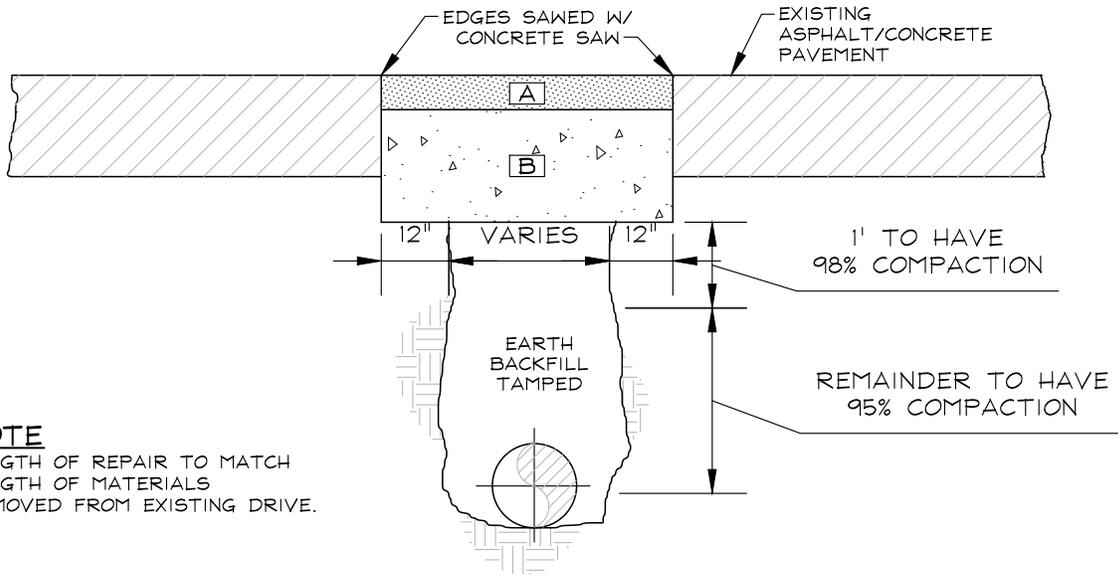
TYPICAL CROSS SECTION  
RESIDENTIAL STREET UTILITY LOCATION

STANDARD DETAILS  
ROAD & SITE CONSTRUCTION

DATE: SEPTEMBER 2019

SCALE: N.T.S.

STANDARD R1



**NOTE**

LENGTH OF REPAIR TO MATCH  
LENGTH OF MATERIALS  
REMOVED FROM EXISTING DRIVE.

**CONCRETE ROADWAY**

- A: 8" CLASS "B" CONCRETE  
PER GDOT SPEC 500
- B: N/A

**ASPHALT ROADWAY**

- A: TOP 2" OF PATCH TO BE REPLACED WITH SAME MATERIAL AS EXISTING SURFACE. BITUMINOUS TACK COAT OR PRIME APPLIED BEFORE PLACEMENT OF ASPHALTIC TOP.
- B: 8" CLASS "A" PORTLAND CEMENT CONCRETE

**CONCRETE DRIVEWAY**

- A: 6" CLASS "B" CONCRETE  
PER GDOT SPEC 500
- B: N/A

**GRAVEL DRIVEWAY**

- A: 6" GRAVEL
- B: N/A

**ASPHALT DRIVEWAY**

- A: 2" TYPE F ASPHALT
- B: N/A



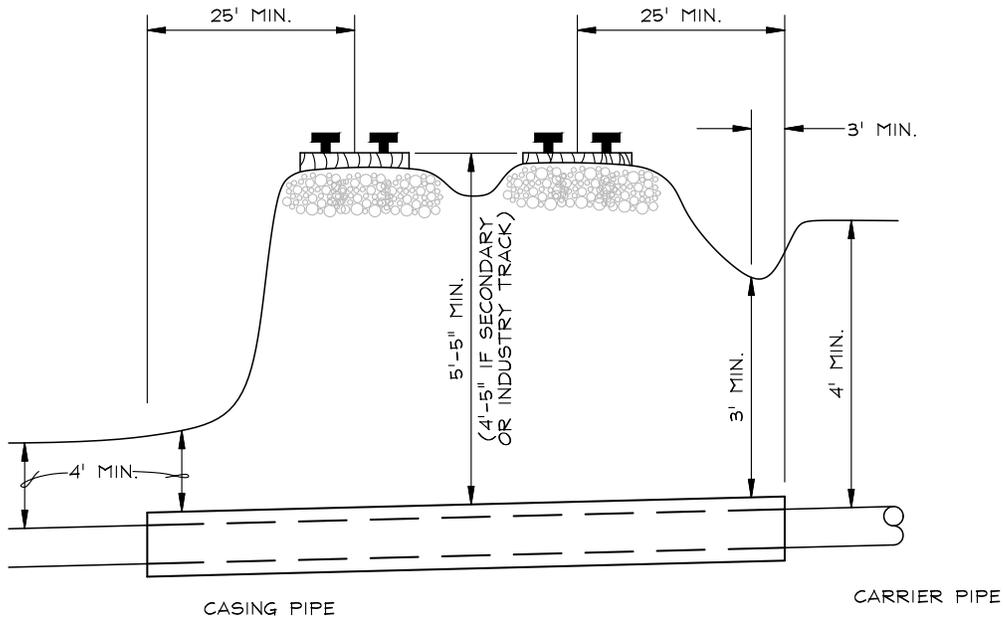
**TYPICAL STREET ROAD REPAIR**

**STANDARD DETAILS  
ROAD & SITE CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD R2

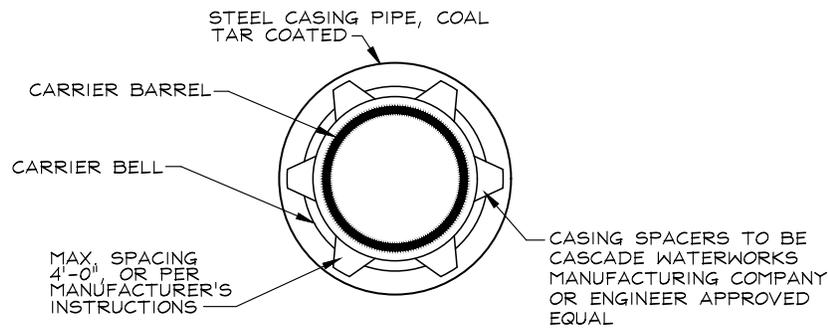
NOTE: CONSTRUCTION IN GEORGIA DEPARTMENT OF TRANSPORTATION  
RIGHT-OF-WAY SHALL CONFORM TO D.O.T. STD. SPECIFICATIONS



NOTE: CONSTRUCTION IN RAILROAD RIGHT-OF-WAYS  
SHALL CONFORM TO AMERICAN RAILWAY ENGINEERING  
SPECIFICATIONS AND CASING SHALL BE SUPPLIED AS  
SPECIFIED IN THE DEVELOPMENT STANDARDS.

NOTE: BOTH ENDS OF CASING SHALL BE  
PROTECTED AGAINST ENTRANCE  
OF FOREIGN MATERIAL.

PLAN



CROSS SECTION  
CARRIER IN CASING



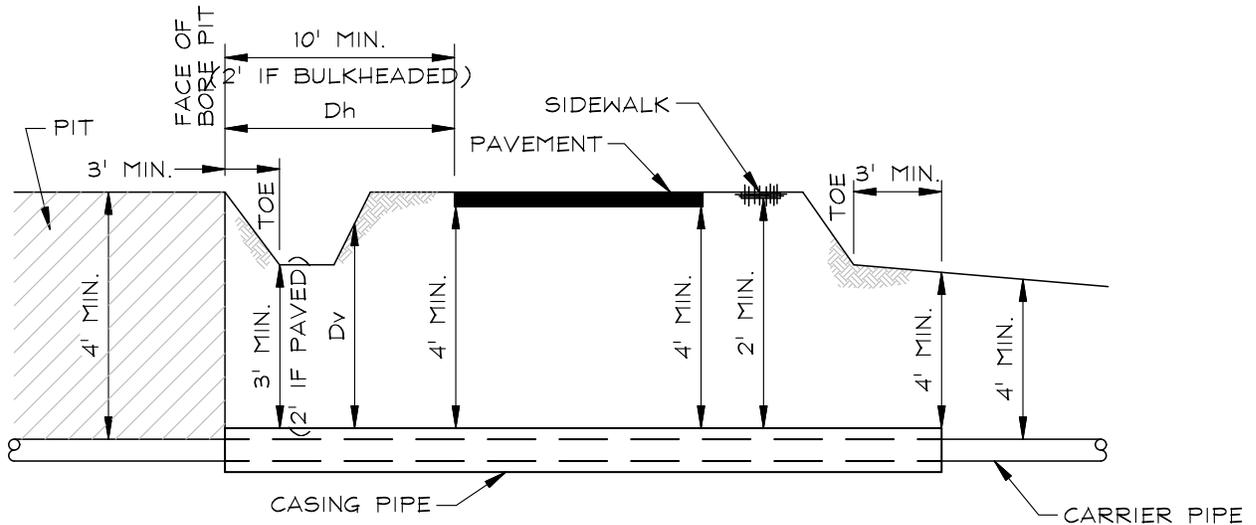
**RAILROAD UTILITY CROSSING**

**STANDARD DETAILS  
ROAD & SITE CONSTRUCTION**

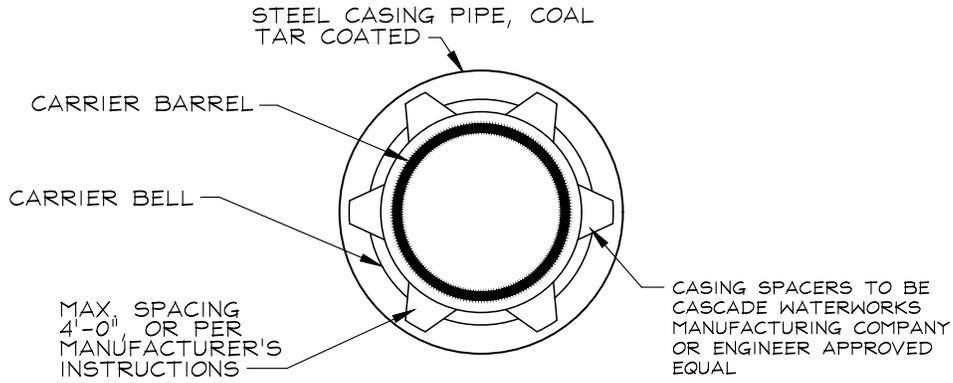
DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD R3

NOTE: CONSTRUCTION IN GEORGIA DEPARTMENT OF TRANSPORTATION  
RIGHT-OF-WAY SHALL CONFORM TO D.O.T. STD. SPECIFICATIONS



NOTE:  $D_h$  SHALL NOT BE  
LESS THAN  $D_v$   
UNLESS BULKHEADED



CROSS SECTION  
CARRIER IN CASING

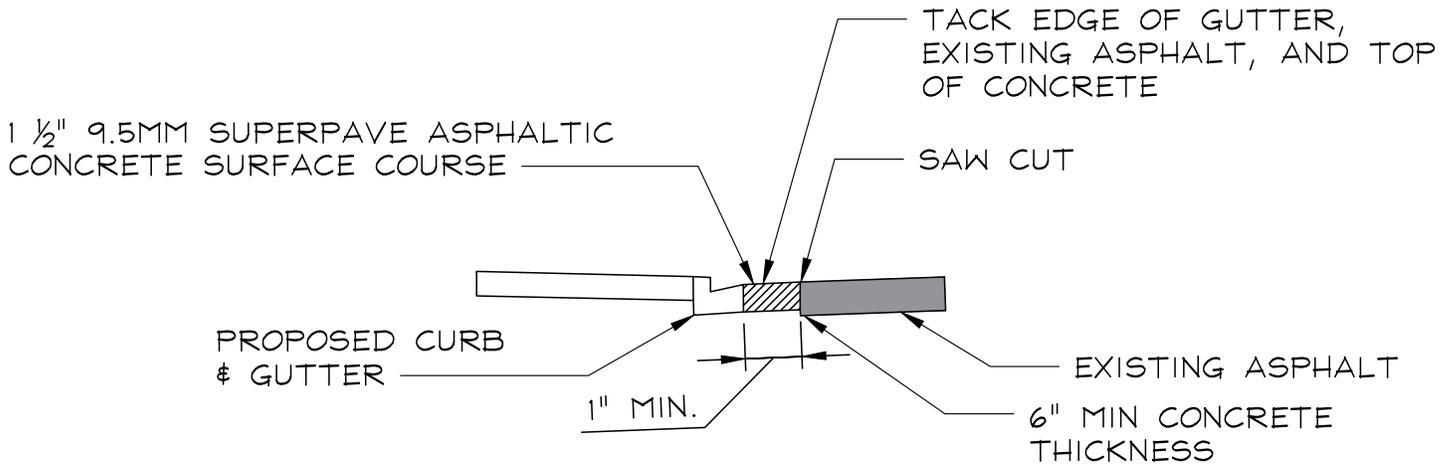


HIGHWAY UTILITY CROSSING

STANDARD DETAILS  
ROAD & SITE CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD R4



NOTES:

1. IN EXCAVATED AREAS BETWEEN THE EXISTING PAVING AND NEW CURB AND GUTTER THAT ARE 5'-0" OR LESS IN WIDTH CONCRETE SHALL BE PLACED IN LIEU OF THE BASE AND PAVING SPECIFIED BY THE TYPICAL SECTION.
2. IN EXCAVATED AREAS GREATER THAN 5'-0" IN WIDTH, THE CONTRACTOR SHALL PLACE BASE AND PAVING AS SPECIFIED ON THE TYPICAL SECTION.

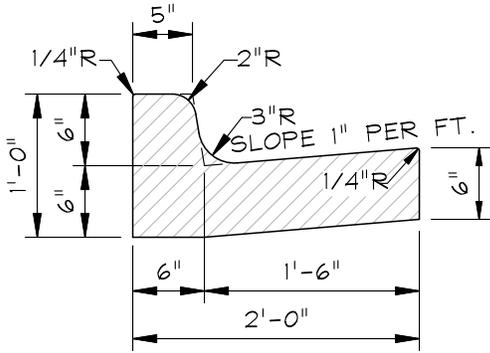


ROAD WIDENING DETAIL

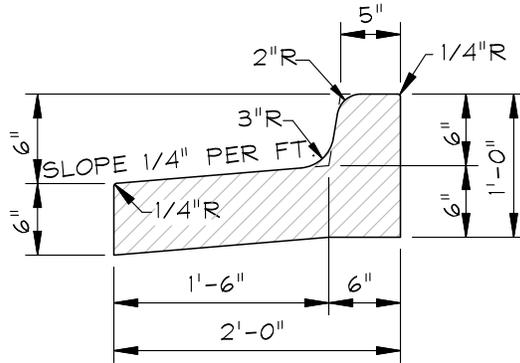
STANDARD DETAILS  
ROAD & SITE CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

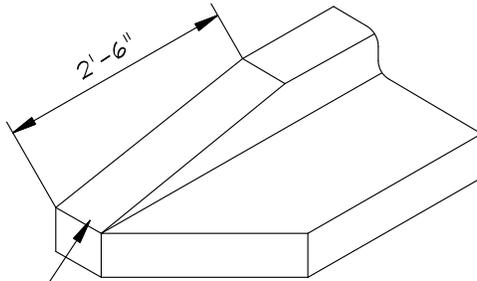
STANDARD R5



NORMAL GUTTER



PITCHED GUTTER



TYPICAL CURB TERMINATION

TYPICAL TERMINATION

NOTES:

1. PROVIDE 1/2" EXPANSION JOINT @ 10'-0" O.C.
2. ALL EXPOSED SURFACES SHALL BE STRIPPED GREEN, TROWELED & CURB EDGING RUBBED SMOOTH.

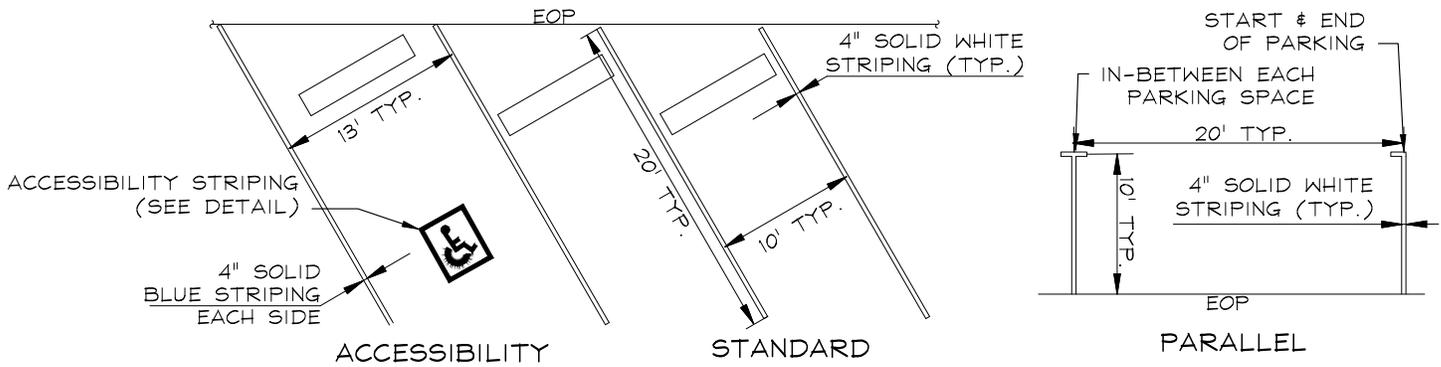


TYPICAL CURB AND GUTTER DETAIL

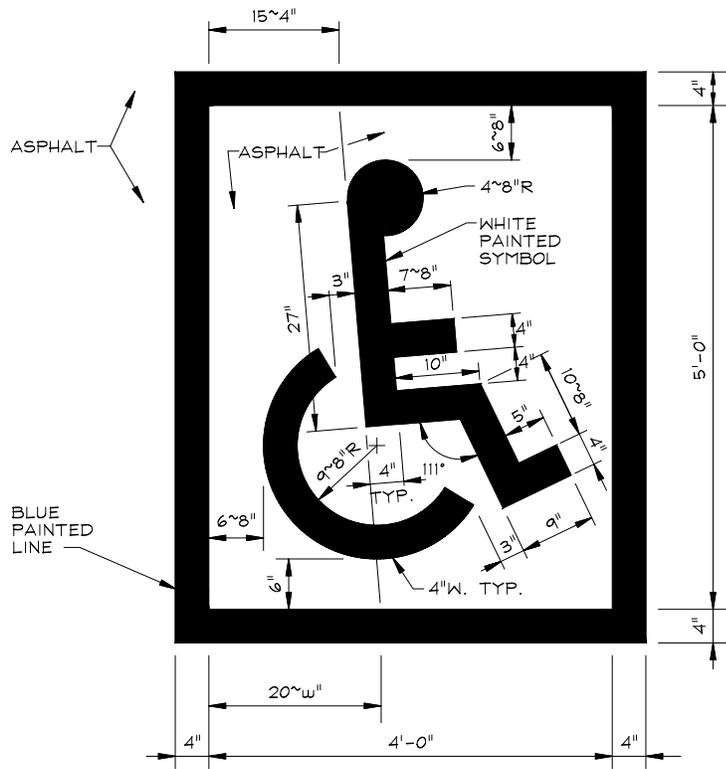
STANDARD DETAILS  
ROAD & SITE CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD R6



**PARKING TYPICAL STRIPING DETAIL**

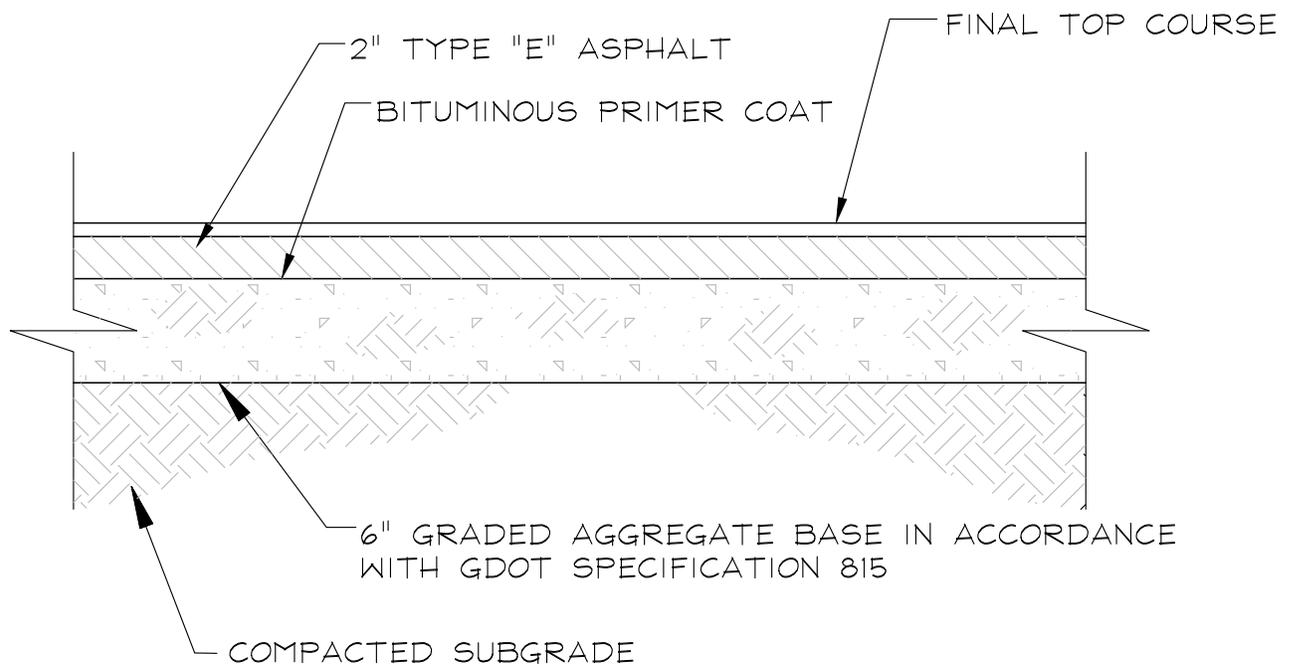


**PARKING LOT WITH ACCESSIBILITY  
DETAIL**

**STANDARD DETAILS  
ROAD & SITE CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD R7

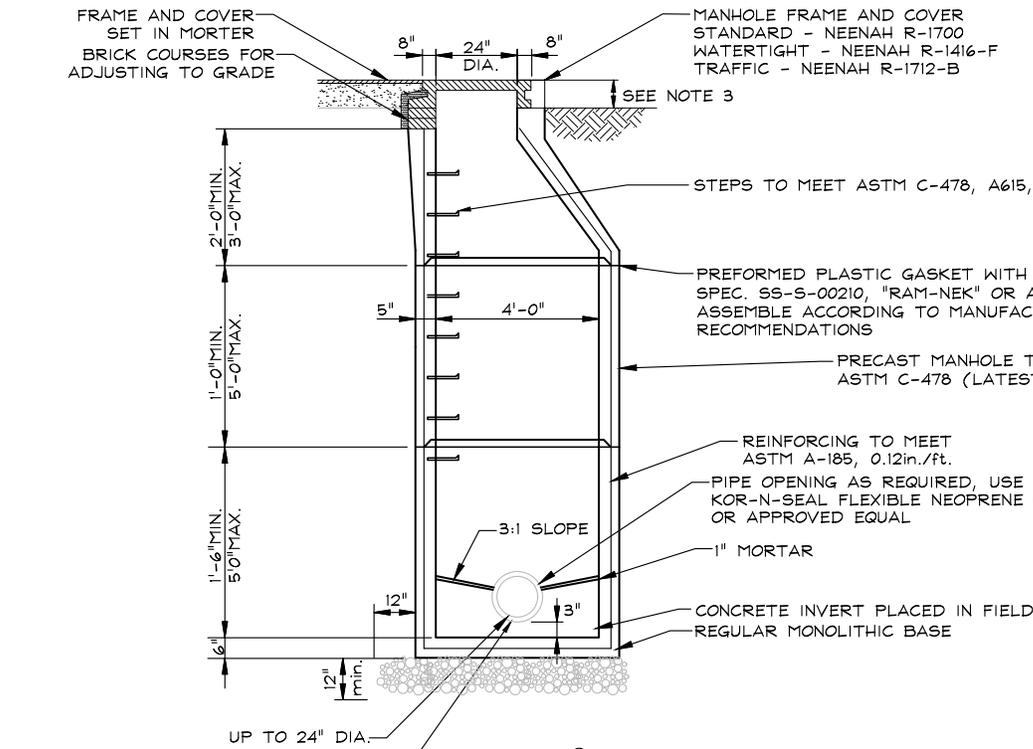


PAVING STANDARD DETAIL -  
SUBDIVISION STREETS

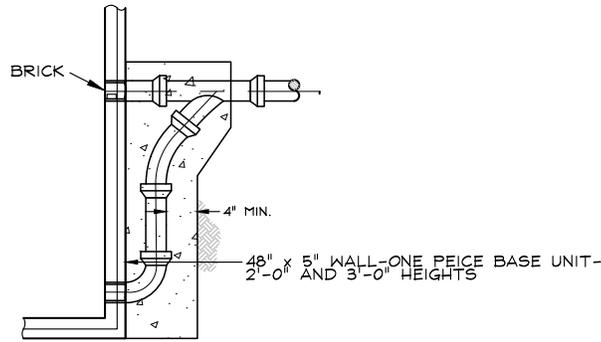
STANDARD DETAILS  
ROAD & SITE CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD R8



PIPE OPENING AS REQUIRED, USE DUKOR, KOR-N-SEAL FLEXIBLE NEOPRENE BOOT BY DUKOR, OR APPROVED EQUAL

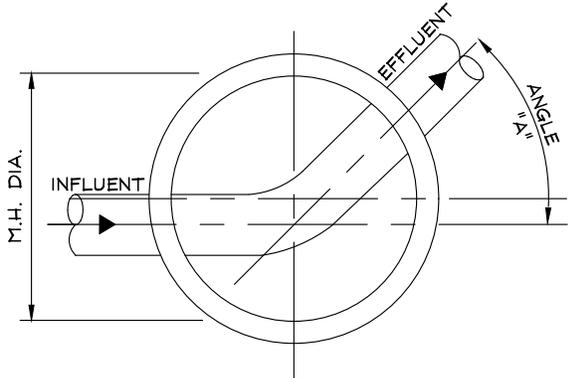


DROP CONNECTION

- NOTE:
- 1) ALL MANHOLES SHALL BE ECCENTRIC CONE TYPE. VERTICAL SIDE WITH STEPS TO BE POSITIONED OVER INVERT SHELF AND AWAY FROM DROP CONNECTIONS.
  - 2) 8" FOOTING REQUIRED ON DEPTHS OVER 12' WITH ADEQUATE REBAR ON A 12" GRANULAR FOUNDATION.
  - 3) 12" IN ROAD SHOULDERS/MAINTAINED RIGHT-OF-WAY; 24" MIN. IN CROSS COUNTRY EASEMENTS.
  - 4) OUTSIDE DROP CONNECTION REQUIRED FOR DROPS OVER 2'-0".
  - 5) WATER-TIGHT MANHOLE FRAME SHALL BE DESIGNATED ON PLAN AND PROFILE, AND SHALL BE REQUIRED IN FLOOD PLAINS ON AREAS SUBJECT TO FLOODING (SUBMERGED DURING RAINFALL). VENT REQUIRED FOR WATERTIGHT MANHOLES. SEE STANDARD S9.
  - 6) FOR MANHOLES IN PAVEMENT, USE A 2" ADJUSTABLE RING, NEENAH R-1979 SERIES OR ENGINEER APPROVED EQUAL.

STANDARD MANHOLE SCHEDULE OF GOVERNING DIMENSIONS		
PIPE SIZE	ANGLE "A"	MH. DIA.
8" TO 15"	0° TO 90°	4'-0"
18" TO 24"	0° TO 60°	4'-0"
18" TO 24"	60° TO 90°	5'-0"
27" TO 30"	0° TO 30°	5'-0"
27" TO 30"	30° TO 60°	5'-0"
27" TO 30"	60° TO 90°	6'-0"
36"	0° TO 90°	6'-0"
42"	0° TO 60°	7'-0"
42"	60° TO 90°	8'-0"
48"	0° TO 45°	8'-0"

NOTE:  
 MINIMUM  $\phi$  RADIUS OF M.H. INVERT  
 = 1.5 x PIPE DIAMETER

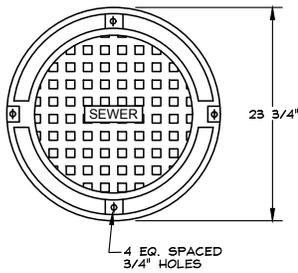


PRECAST DROP MANHOLE DETAIL

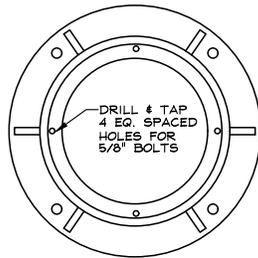
STANDARD DETAILS  
 SEWERAGE SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
 SCALE: N.T.S.

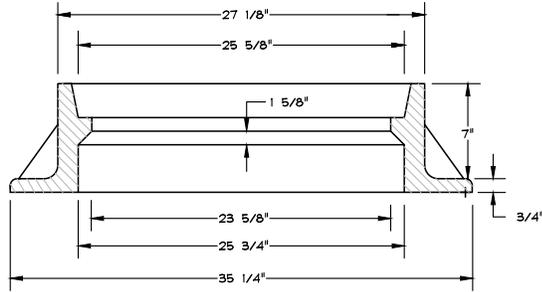
STANDARD S1



**COVER FACE**  
N.T.S.

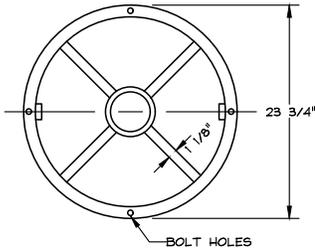


**FRAME PLAN**  
N.T.S.

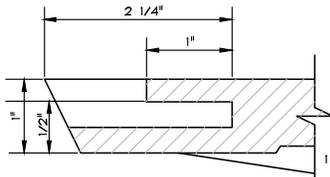


NOTE: PICKHOLES SHALL BE NON-PENETRATING AND WATER TIGHT CORRUGATION AND TWO PICKHOLES IN COVER. NO PERFORATION SEATING SURFACE OF FRAMES AND COVERS TO BE MACHINED TO FIT. FRAME AND COVER SHALL WEIGH 280 POUNDS MINIMUM.

**FRAME SECTION**  
N.T.S.

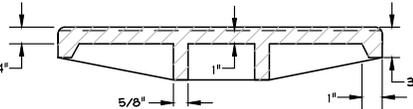


**COVER BACK**  
N.T.S.

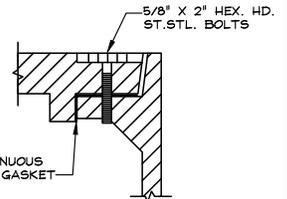


NOTE: PICKHOLE SHALL BE MIN. 1 1/4" WIDE, TWO PER COVER

**PICKHOLE DETAIL**  
N.T.S.



**COVER SECTION**  
N.T.S.



**WATERTIGHT DETAIL**  
N.T.S.

- NOTE:
- 1) ONLY BOLT DOWN MANHOLE REQUIRES "O" RING GASKET & BOLTS.
  - 2) BOLT-DOWN MANHOLE COVERS REQUIRED IN FLOOD PLAINS, AREAS SUBJECT TO FLOODING, OR AS SPECIFIED

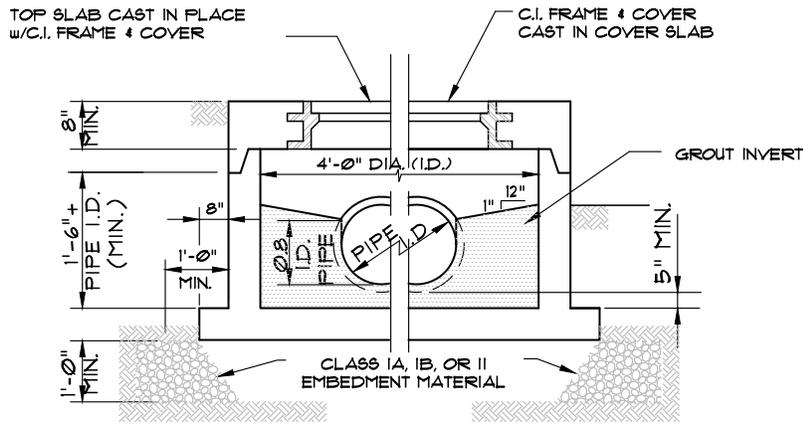


**FRAME AND COVER DETAIL**

**STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S2



TOP AT GRADE

TOP ABOVE GRADE

NOTE: MANHOLE SHALL BE  
LINED & COATED

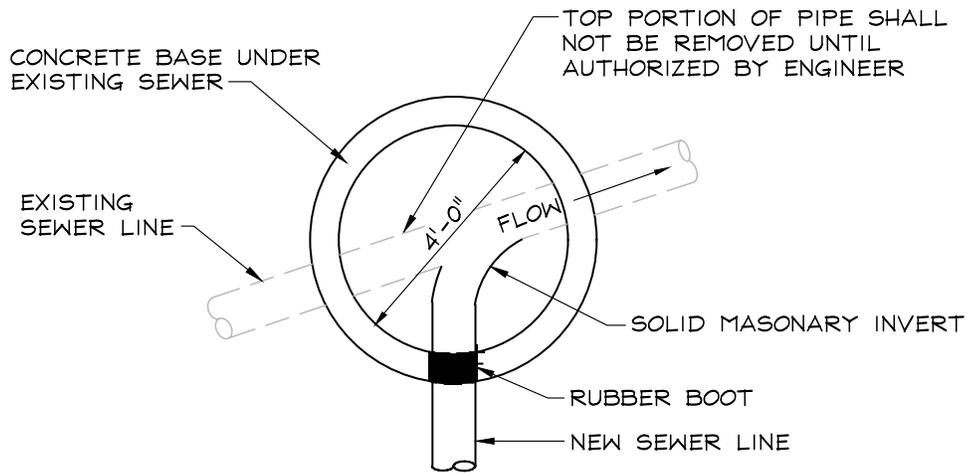


PRECAST CONCRETE  
SHALLOW MANHOLE

STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION

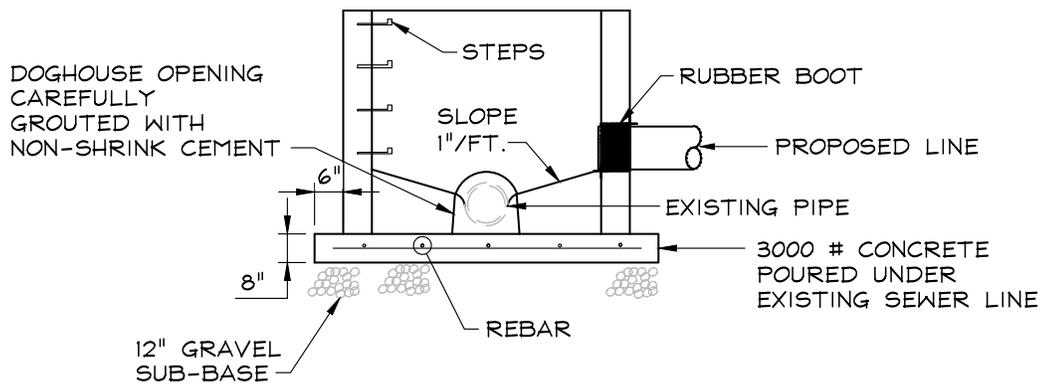
DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S3



**NOTES**

1. PROVIDE PRECAST MANHOLE RISER COMPLETE WITH UP-SIDE DOWN U-SHAPED OPENING TO SUIT EXISTING LINES.
2. CORED AND BOOTED OPENINGS TO SUIT PROPOSED PIPELINES.
3. TABLES ARE TO BE GENTLY SLOPED AND TROWELED SMOOTH FROM MANHOLE WALL TO INVERT WALL HEIGHT AND CONSTRUCTED OF SOLID MASONRY.

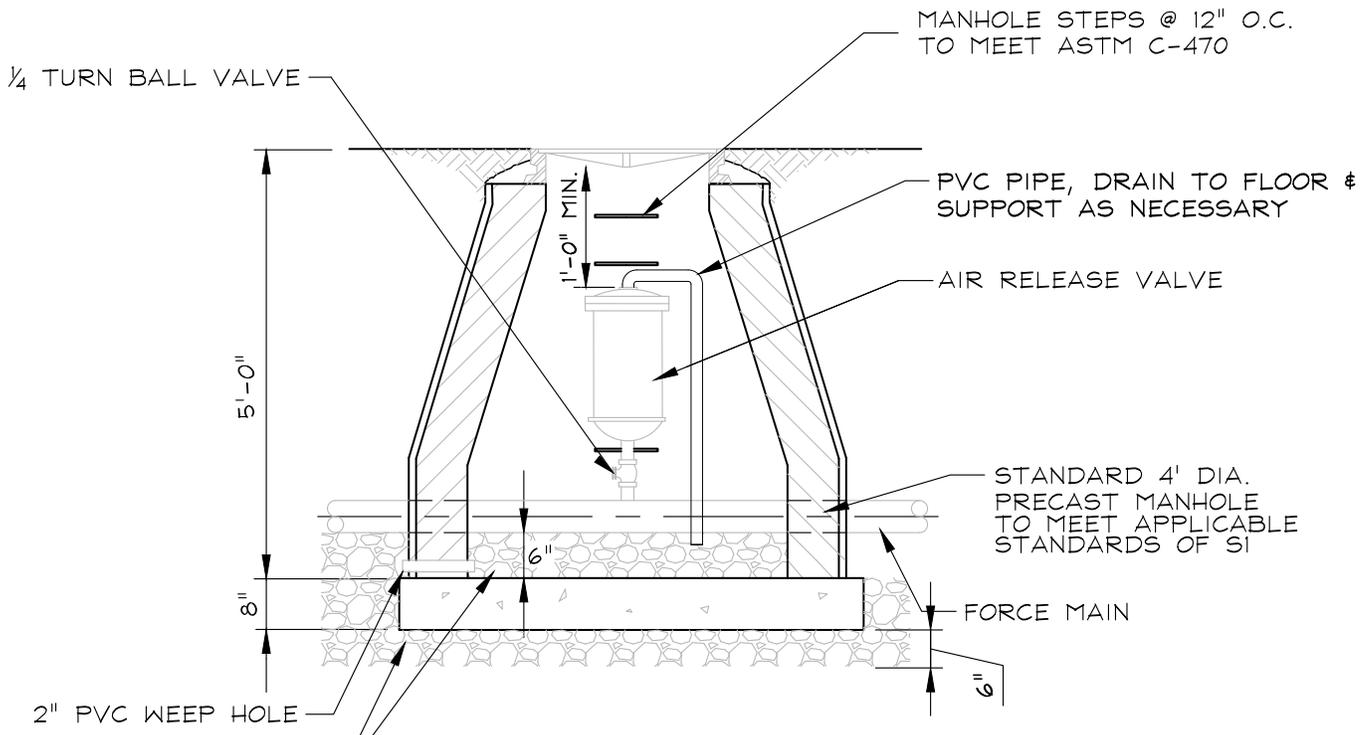


**DOGHOUSE MANHOLE**

**STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S4



NOTE:

- 1) AIR RELEASE VALVE SHALL INCLUDE VALVE ACCESSORIES, TAPPING, AND STANDARD MANHOLE.
- 2) NO PIPE JOINTS ALLOWED WITHIN MANHOLE

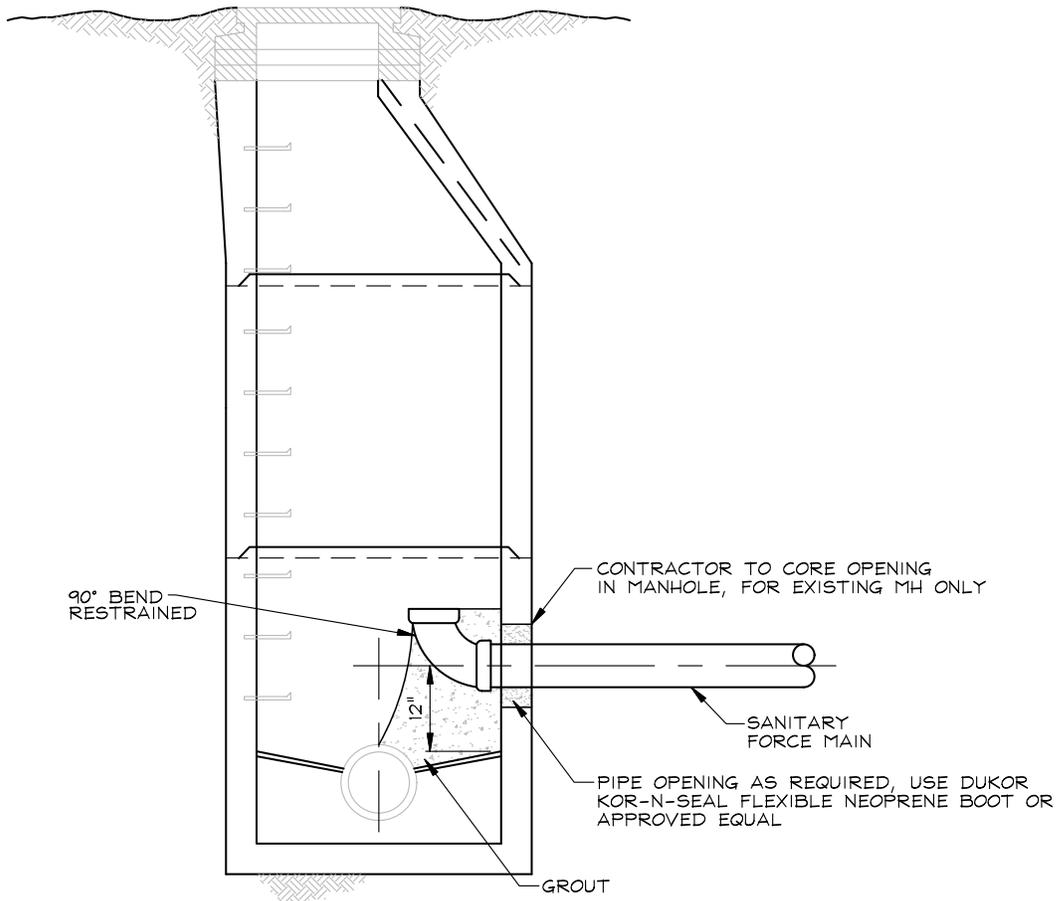


AIR RELEASE VALVE DETAIL

STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S5

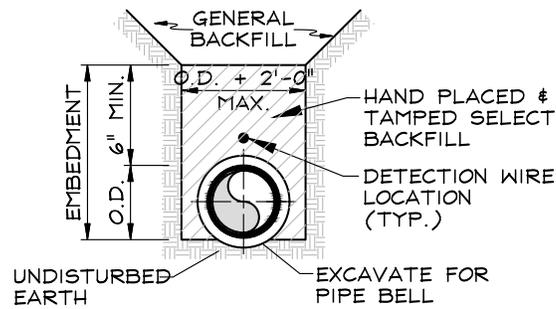


**FORCE MAIN CONNECTION**

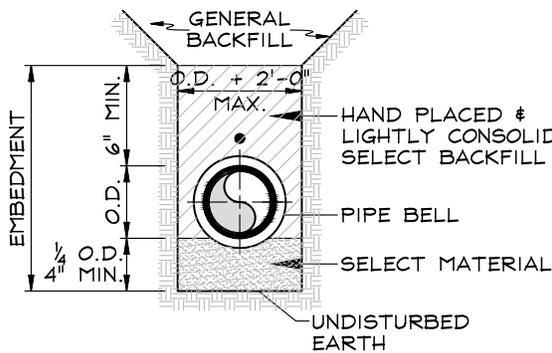
**STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

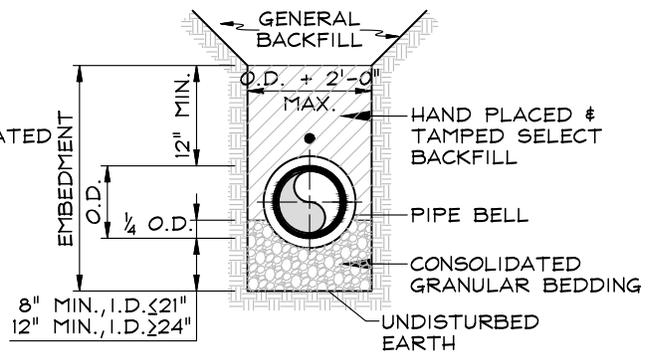
**STANDARD S6**



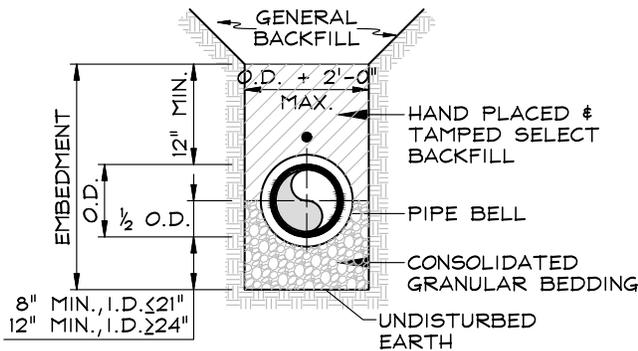
**TYPE 2**  
(FLAT BOTTOM TRENCH)



**TYPE 3**  
(LOOSE SOIL BEDDING)



**TYPE 4**  
(GRANULAR BEDDING)



**TYPE 5**  
(GRANULAR BEDDING)

**NOTES**

1. TYPE 2 CAN ONLY BE USED IN DRY EARTH TRENCHES.
2. TYPE 2 SHALL BE USED FOR PVC & D.I. FORCE MAINS UNLESS ROCK IS ENCOUNTERED OR OVER EXCAVATION OCCURS, IN WHICH CASE 6" MIN. OF GRANULAR CRUSHED STONE SHALL BE USED AS BEDDING.
3. TYPE 1 DOES NOT APPLY TO FORCE MAINS & SANITARY SEWER MAINS AND IS NOT SHOWN.



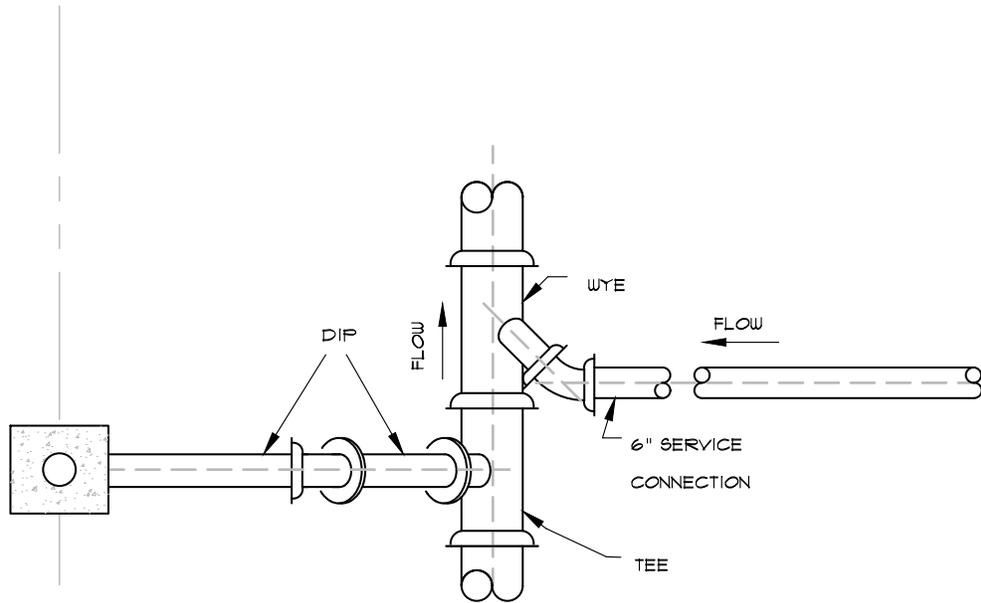
**PIPE BEDDING AND HAUNCHING**

**STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION**

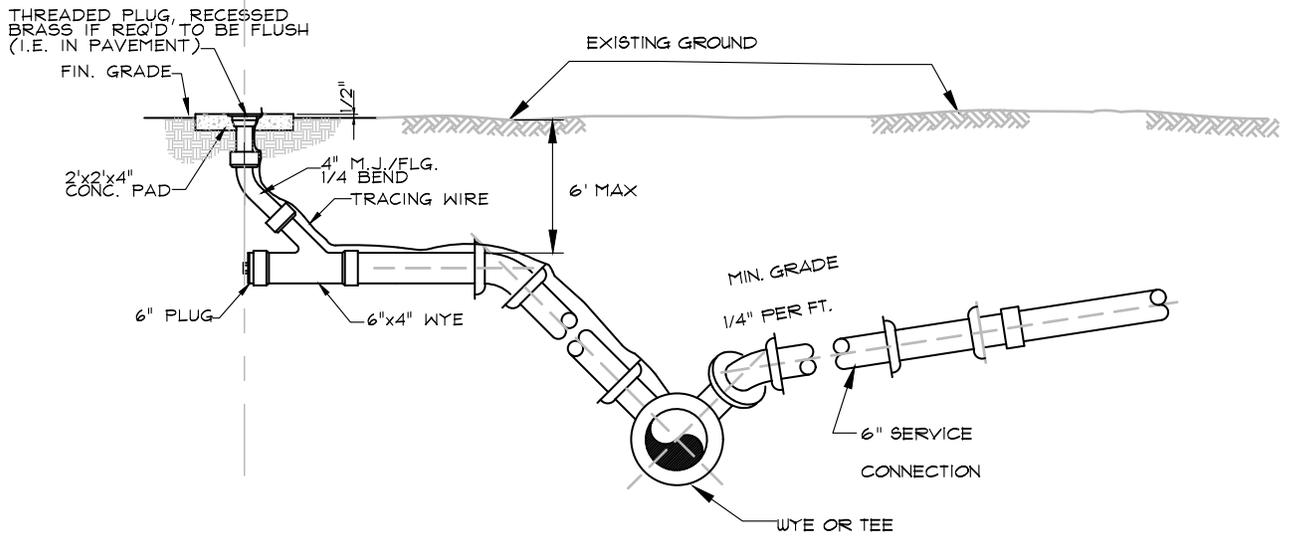
DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S7

RIGHT-OF-WAY



PLAN



ELEVATION

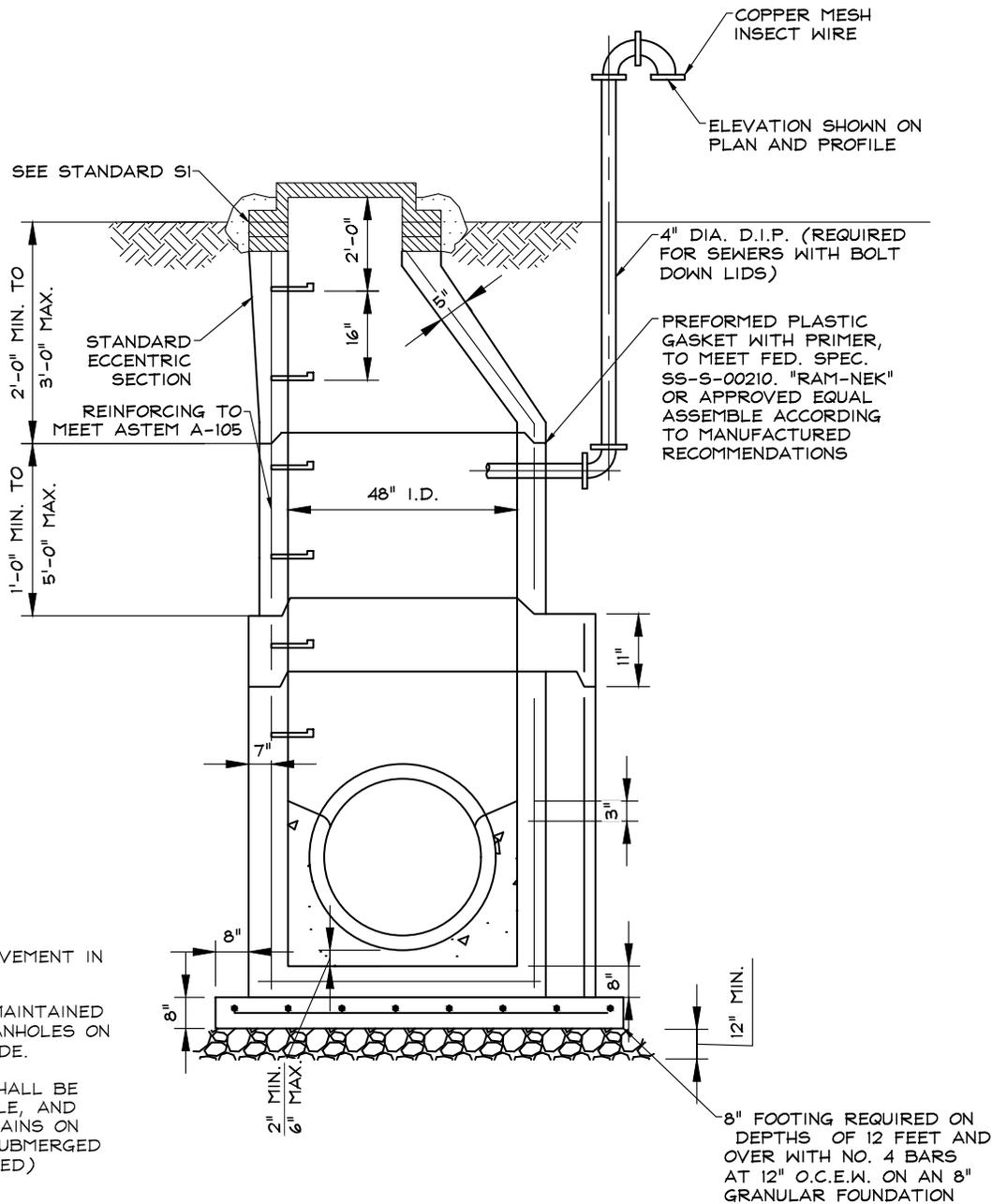


SERVICE CONNECTIONS

STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S8



**NOTES:**

1. MANHOLES TO BE FLUSH WITH PAVEMENT IN PAVED AREAS.
2. MANHOLES IN ROAD SHOULDERS/MAINTAINED R/W TO BE 12" ABOVE GRADE; MANHOLES ON OUTFALLS TO BE 24" ABOVE GRADE.
3. WATER-TIGHT MANHOLE FRAME SHALL BE DESIGNATED ON PLAN AND PROFILE, AND SHALL BE REQUIRED IN FLOOD PLAINS ON AREAS SUBJECT TO FLOODING (SUBMERGED DURING RAINFALL, OR AS SPECIFIED)

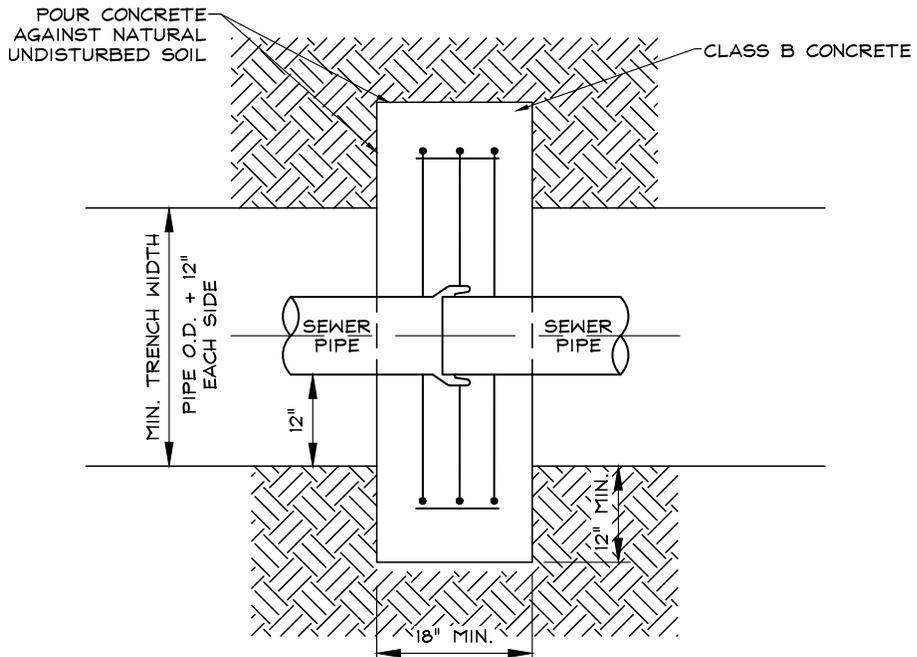


**STANDARD VENTED MANHOLE  
(FOR PIPE LARGER THAN 18")**

**STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION**

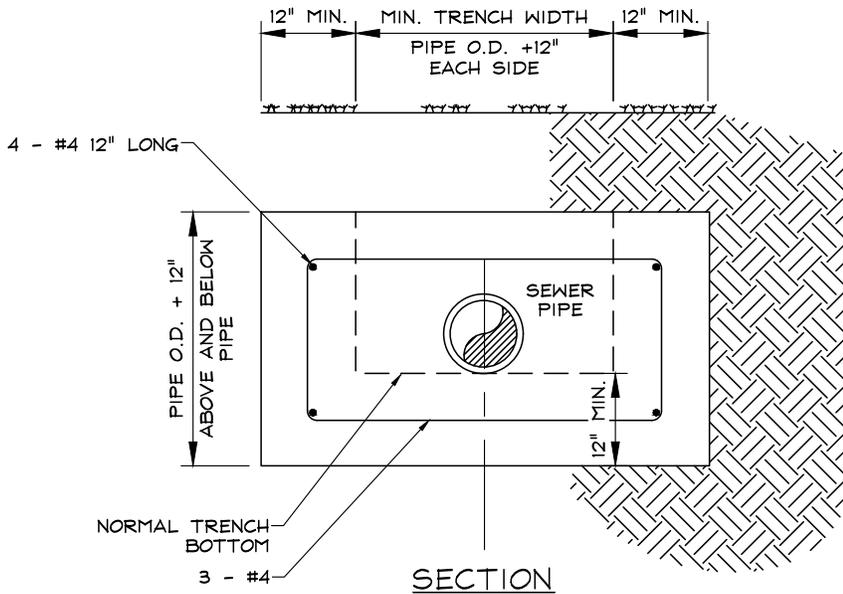
DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S9



PLAN

NOTE:  
COLLAR REQUIRED AT EVERY PIPE JOINT

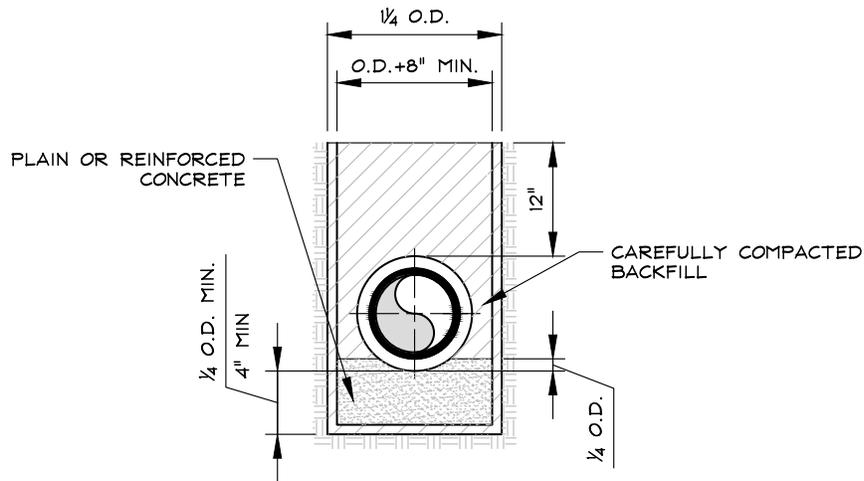


SEWER PIPE ANCHOR  
(SLOPES 20% OR MORE)

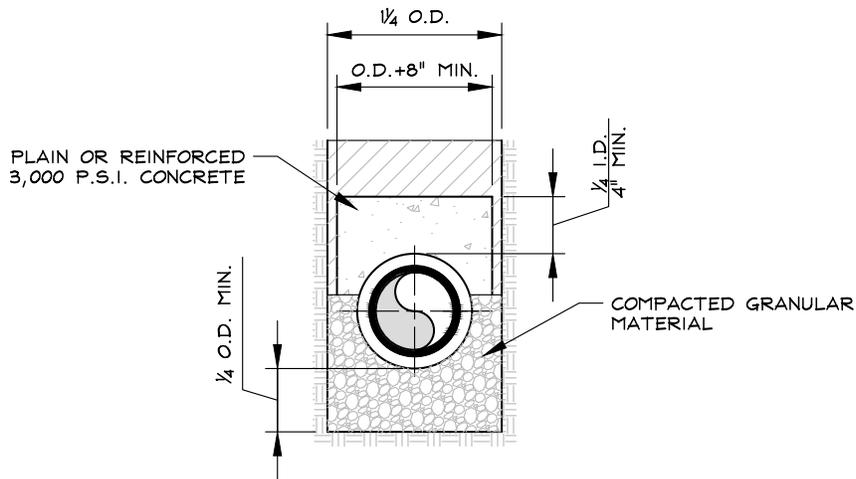
STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S10



CONCRETE CRADLE



CONCRETE ARCH

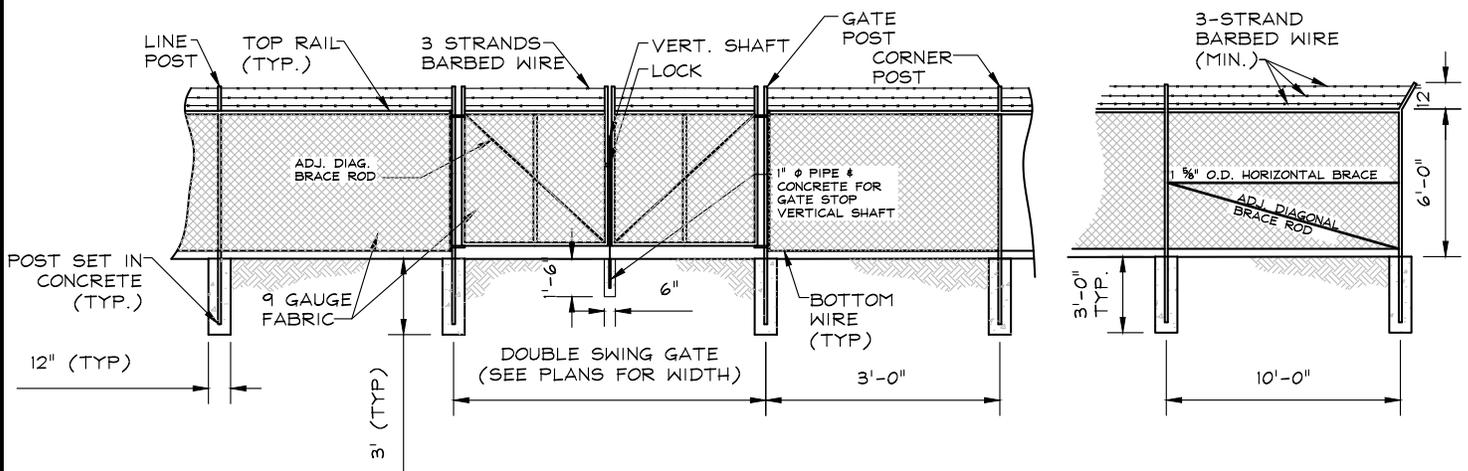


PIPE CLASS  
"A" BEDDING

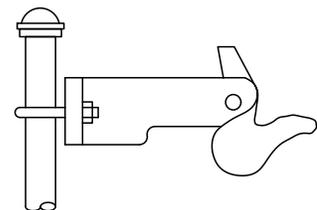
STANDARD DETAILS  
SEWERAGE SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S11



**NOTE**  
 PROVIDE GATE KEEPERS FOR ALL GATES.



**GATE KEEPER**  
 N.T.S.

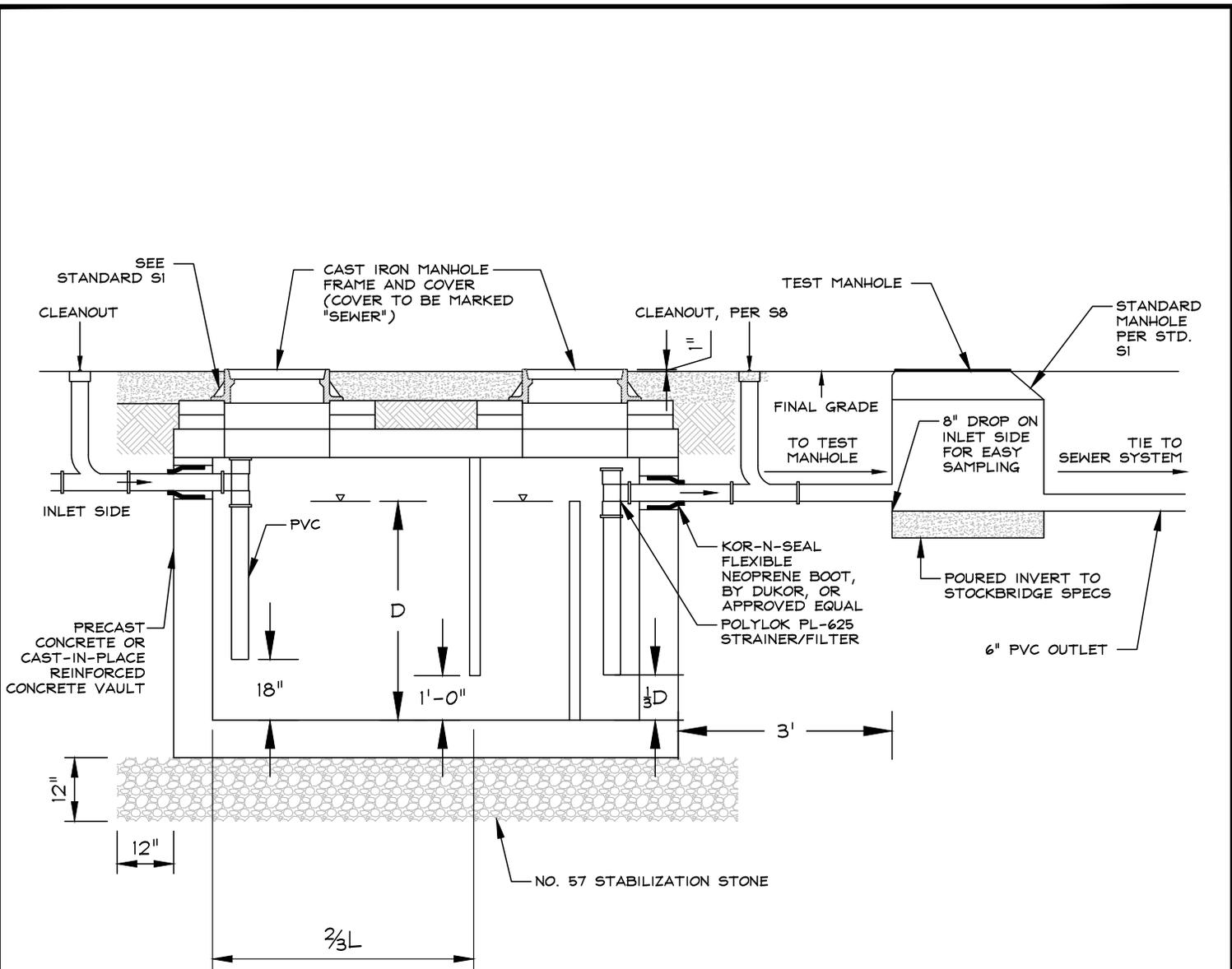


**FENCE & GATE DETAIL**

**STANDARD DETAILS  
 SEWERAGE SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
 SCALE: N.T.S.

STANDARD S12



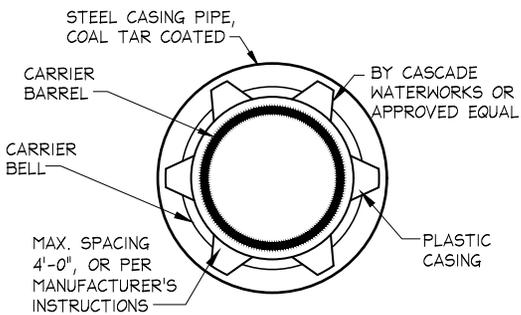
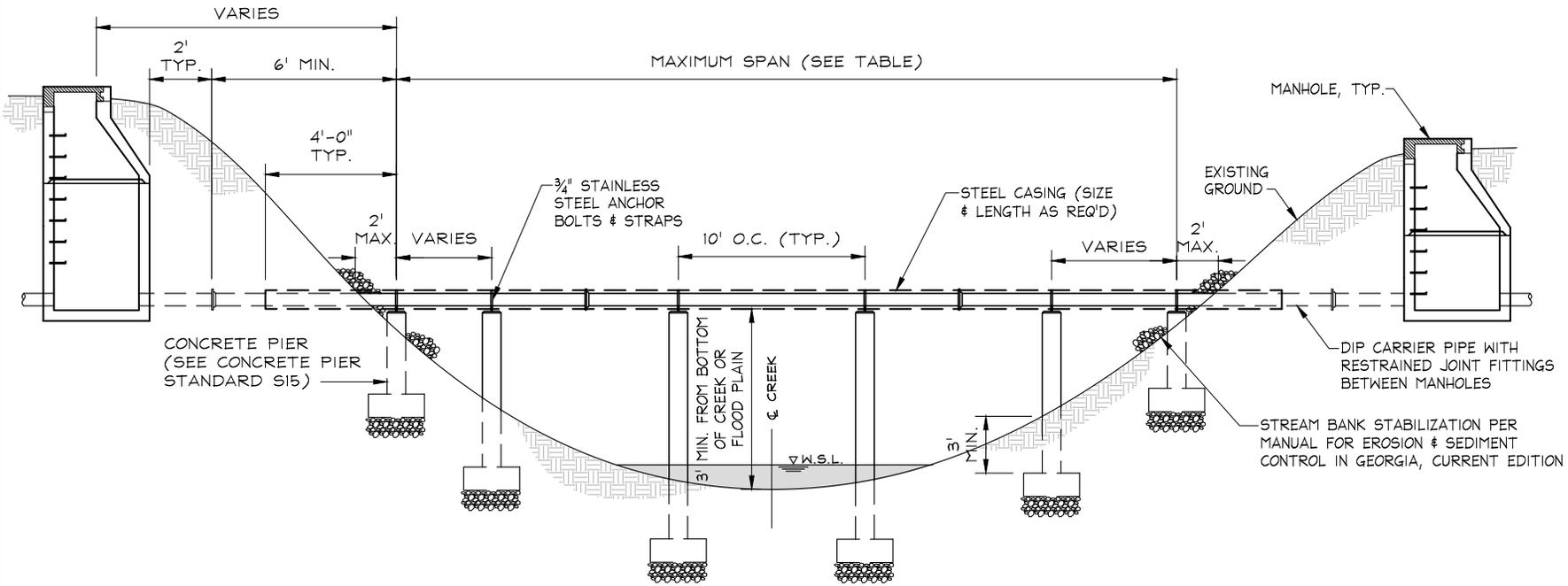
**NOTES:**

1. GREASE INTERCEPTOR SHALL HAVE A MINIMUM CAPACITY OF 1,500 GALLONS AND A MAXIMUM CAPACITY OF 3,000 GALLONS. IF REQUIRED CAPACITY IS GREATER THAN 3,000 GALLONS, MULTIPLE GREASE INTERCEPTORS SHALL BE USED.
2. CONCRETE DESIGN STRENGTH SHALL BE 4,000 PSI @ 28 DAYS.
3. GREASE INTERCEPTOR SHALL BE HS-20 LOAD RATED.
4. FRAME & COVER SHALL MEET REQUIREMENTS OF S1 & S2.
5. NO RESTROOM SEWAGE IS ALLOWED TO FLOW THROUGH THE GREASE TRAP.



**GREASE INTERCEPTOR DETAIL**  
**STANDARD DETAILS**  
**SEWERAGE SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.  
STANDARD S13



CROSS SECTION  
CARRIER IN CASING

**NOTES**

1. STEEL PIPE SHALL BE EITHER SPIRAL WELDED OR SMOOTH WALL SEAMLESS WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI. PAINTING AND LINING SHALL BE AS REQUIRED BY THE CITY OF STOCKBRIDGE.
2. DUCTILE IRON PIPE SHALL BE SUPPORTED WITH TWO SPACERS AT EVERY JOINT WITHIN THE CASING PIPE USING APPROVED PIPE ALIGNMENT GUIDE. ALL JOINTS SHALL BE RESTRAINED JOINT.
3. SUPPORT TYPE FOR PIERS SHALL BE DETERMINED BY ENGINEER BASED ON SUB-GRADE CONDITIONS AT THE SITE.
4. BOTTOM OF PIPE TO BE AT A MINIMUM OF 1' ABOVE THE 25 YEAR FLOOD ELEVATION.
5. CASING SPACERS PER THE MANUFACTURER SHALL BE PROVIDED.
6. THE CONTRACTOR SHALL PROVIDE & INSTALL AN ADDITIONAL CONCRETE PIER AT A MAXIMUM DISTANCE OF 2' FROM WHERE THE PIPE PENETRATES THE GROUND ON BOTH SIDES OF THE CREEK.
7. WHERE THE PIPE PENETRATES THE GROUND ON BOTH SIDES OF THE CREEK CROSSING, THE CONTRACTOR SHALL INSTALL STREAM BANK STABILIZATION PER THE MANUAL FOR EROSION & SEDIMENT CONTROL IN GEORGIA, CURRENT EDITION.

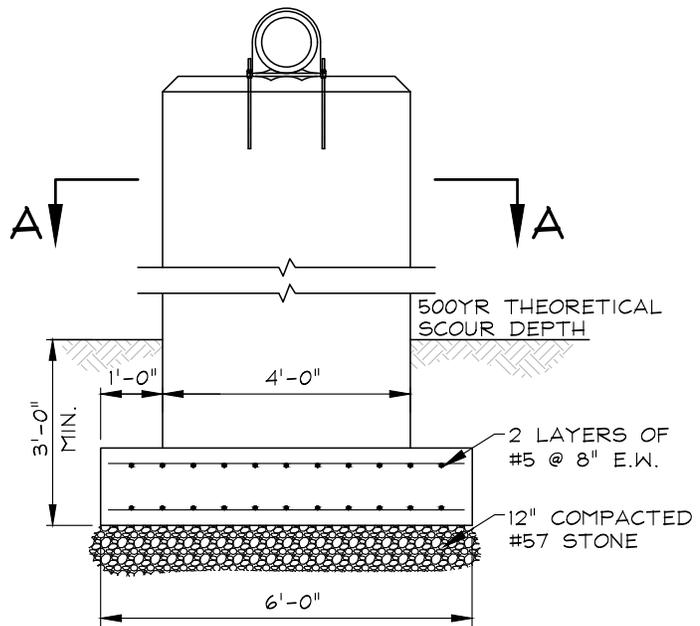
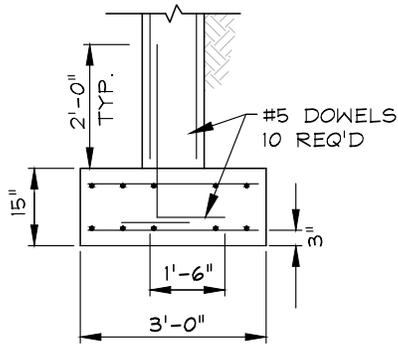
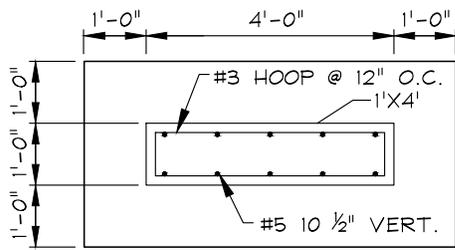
ALLOWABLE SPANS FOR STEEL CASING PIPE			
CARRIER PIPE, DIP DIAMETER (IN.)	CASING PIPE, STEEL DIAMETER (IN.)	MIN. CASING PIPE WALL THICKNESS (IN.)	ALLOWABLE SPAN (FT.)
4	10	0.250	40
6	12	0.250	40
8	16	0.281	45
10	18	0.312	50
12	20	0.344	50
14	24	0.375	55
16	24	0.375	55
18	30	0.469	60
20	30	0.469	60
24	36	0.531	65
30	42	0.625	65
36	48	0.625	65
42	56	0.625	65

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD S14

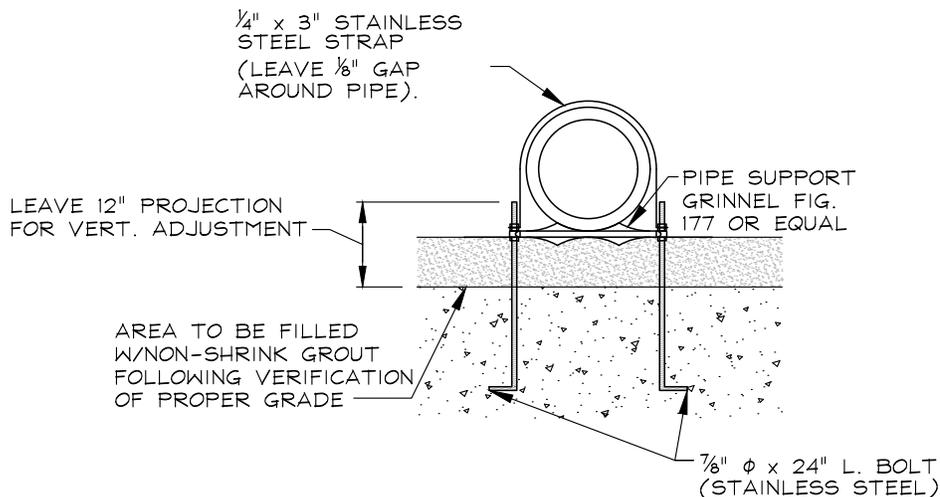
AERIAL PIPE CROSSING  
STANDARD DETAILS  
PIPING SYSTEM CONSTRUCTION





- NOTES: 1. SOIL BEARING CAPACITY BELOW FOOTING OF PIERS SHALL BE 2000 P.S.F.. THE CONTRACTOR SHALL VERIFY SOIL BEARING CAPACITY BEFORE PLACING CONCRETE FOR FOOTING.
2. STEEL REINFORCING BARS SHALL BE ASTM A 615 GRADE 60.

## CONCRETE PIER DETAIL



## PIPE SUPPORT DETAIL FOR CONCRETE PIER DETAIL

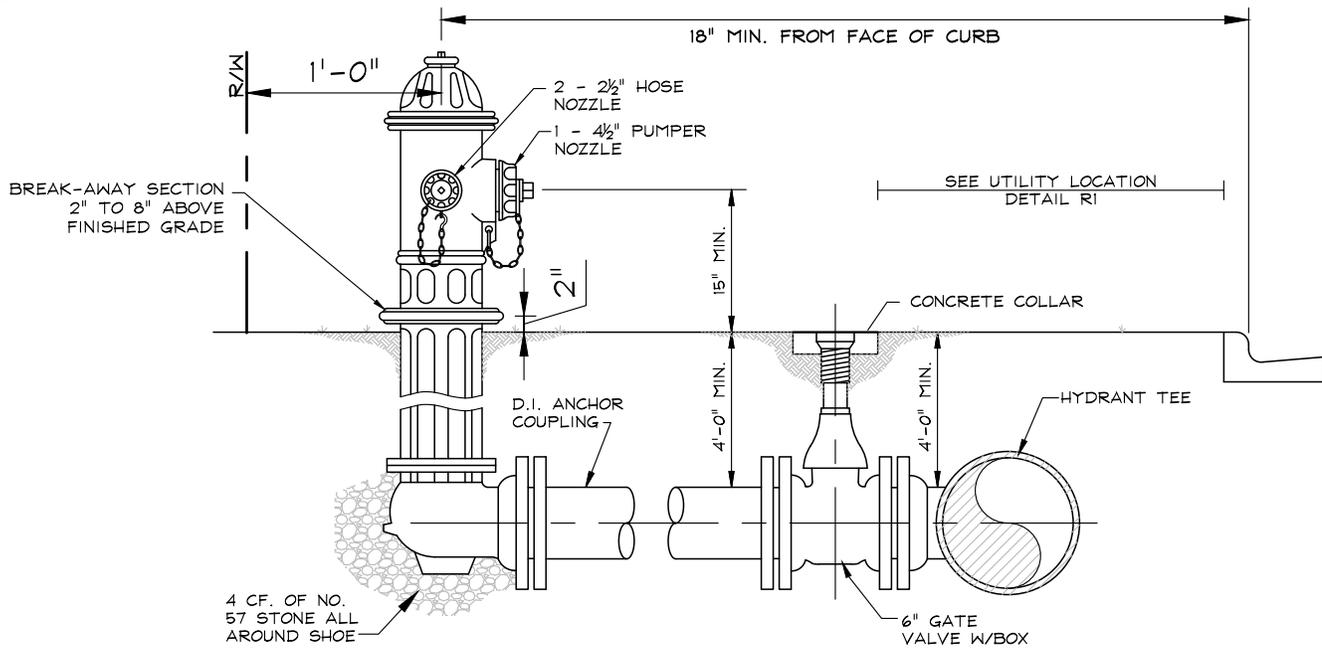


CONCRETE PIER DETAILS

STANDARD DETAILS  
PIPING SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

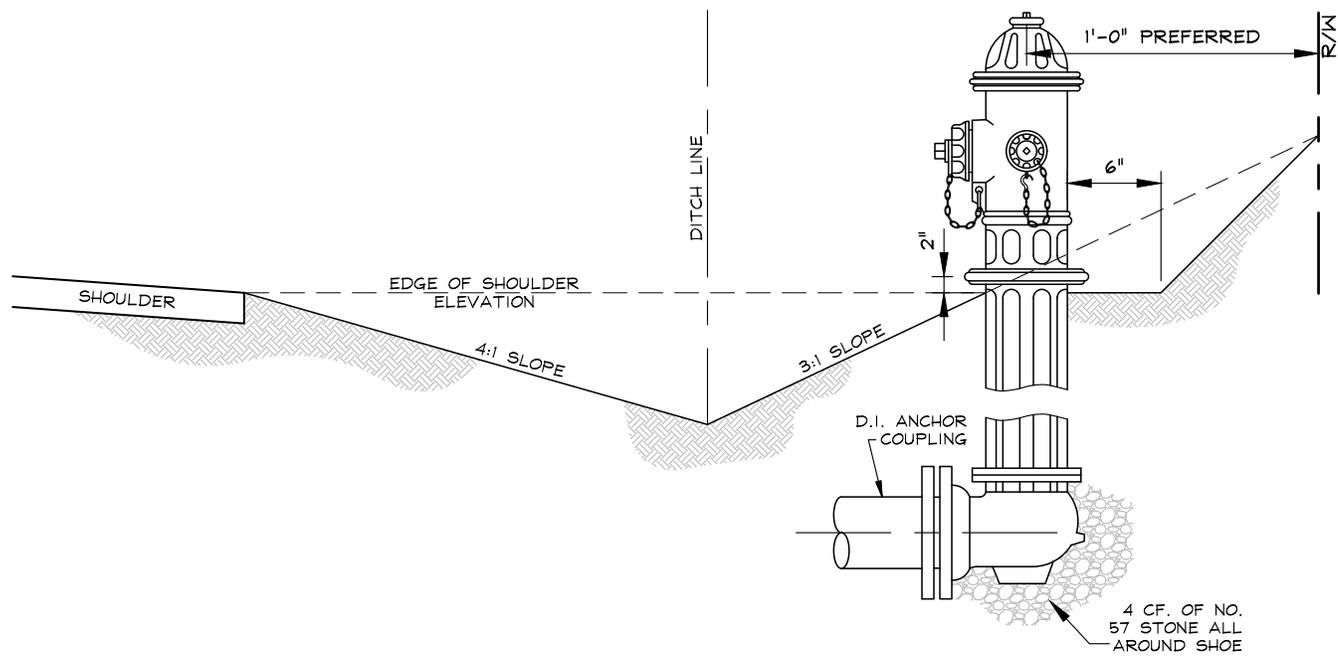
STANDARD S15



**TYPICAL SECTION W/  
CURB & GUTTER**

**NOTES:**

1. PUMPER NOZZLE TO FACE STREET.
2. HYDRANT SHALL NOT BE SET ON THE ROAD SIDE OF WATER MAIN.
3. ADJUST VALVE BOX TO FINISHED GRADE.
4. CONCRETE COLLAR REQ'D AROUND VALVE BOX EXCEPT IN PAVED AREAS.
5. GRAVEL TO BE PLACED AROUND HYDRANT DRAIN, MINIMUM 2 FT. x 1 FT. x 2 FT.
6. NO HYDRANT SHALL BE INSTALLED SO THAT ANY PART OF THE HYDRANT IS IN CONFLICT WITH A SIDEWALK.



**TYPICAL SECTION WITHOUT  
CURB & GUTTER**

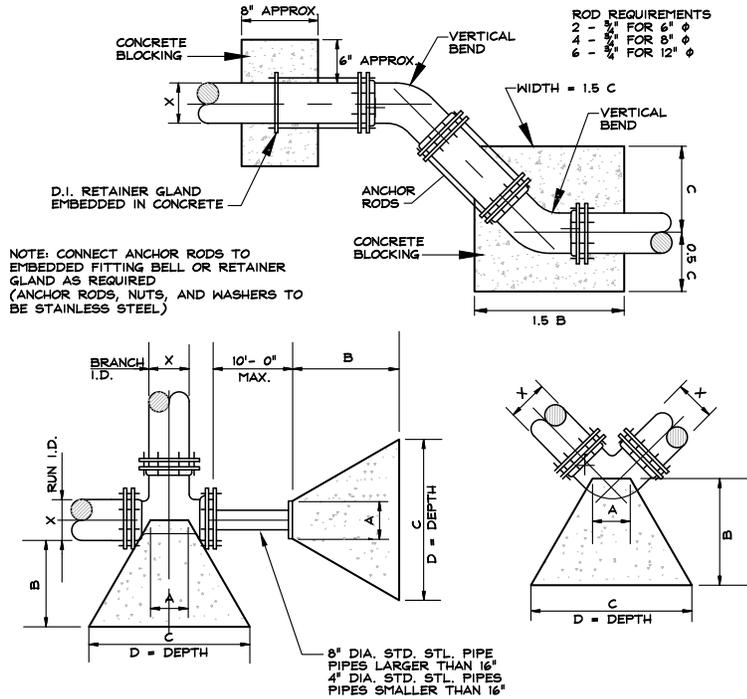


**TYPICAL FIRE HYDRANT SETTING**

**STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W1



BLOCKING DIMENSIONS											
	BENDS						BENDS				
	X	A	B	C	D		X	A	B	C	D
90° BEND	30"	2'-0"	11'-6"	15'-3"	6'-0"	11-1/2° BEND	30"	1'-0"	2'-10"	4'-3"	3'-0"
	24"	2'-0"	7'-9"	10'-9"	5'-6"		24"	1'-0"	2'-6"	3'-8"	2'-6"
	20"	1'-9"	6'-0"	8'-6"	5'-0"		20"	10"	2'-0"	3'-0"	2'-0"
	16"	1'-3"	4'-0"	6'-0"	4'-6"		16"	16"	1'-8"	2'-6"	1'-6"
	12"	10"	2'-9"	4'-0"	4'-0"		12"	8"	1'-0"	1'-6"	1'-6"
	10"	10"	2'-6"	3'-9"	3'-0"		10"	10"	1'-0"	1'-6"	1'-0"
	8"	8"	1'-9"	2'-6"	2'-6"		8"	8"	1'-0"	1'-6"	1'-0"
	6"	6"	1'-3"	2'-0"	2'-0"		6"	6"	1'-0"	1'-0"	1'-0"
	4"	4"	1'-0"	1'-6"	1'-6"		4"	4"	1'-0"	1'-0"	9"
45° BEND	30"	1'-6"	7'-6"	10'-0"	5'-0"	TEES & DEAD ENDS					
	24"	1'-3"	5'-9"	8'-0"	4'-0"	X	A	B	C	D	
	20"	1'-0"	4'-9"	6'-8"	3'-6"	30"	3'-0"	8'-9"	13'-0"	5'-0"	
	16"	1'-3"	3'-3"	5'-0"	3'-3"	24"	2'-6"	7'-3"	10'-8"	3'-9"	
	12"	10"	1'-9"	3'-0"	2'-9"	20"	2'-0"	5'-3"	8'-0"	3'-6"	
	10"	10"	1'-9"	3'-0"	2'-9"	16"	1'-0"	4'-8"	6'-4"	3'-0"	
	8"	8"	1'-6"	2'-0"	2'-0"	12"	10"	2'-9"	4'-6"	2'-6"	
	6"	6"	1'-3"	1'-6"	1'-6"	10"	10"	2'-0"	3'-3"	2'-6"	
4"	4"	1'-0"	1'-0"	1'-0"	8"	8"	1'-9"	2'-6"	2'-0"		
					6"	6"	1'-3"	2'-0"	1'-6"		
22-1/2° BEND	30"	1'-0"	4'-8"	6'-4"	4'-0"	NOTE: 200 P.S.I. TEST PRESSURE SOIL BEARING OF 2500 P.S.F. 3000 P.S.I. CONCRETE PIPE LESS THAN 4" IN DIAMETER SHALL HAVE THE SAME REQUIREMENTS AS 4" DIAMETER PIPE					
	24"	1'-0"	3'-0"	5'-0"	3'-6"						
	20"	1'-0"	2'-6"	4'-4"	3'-0"						
	16"	1'-0"	1'-9"	3'-0"	2'-6"						
	12"	10"	1'-3"	2'-3"	2'-0"						
	10"	10"	1'-0"	2'-0"	1'-6"						
	8"	8"	1'-0"	1'-9"	1'-9"						
	6"	6"	1'-0"	1'-6"	1'-6"						
4"	4"	1'-0"	1'-3"	1'-3"							

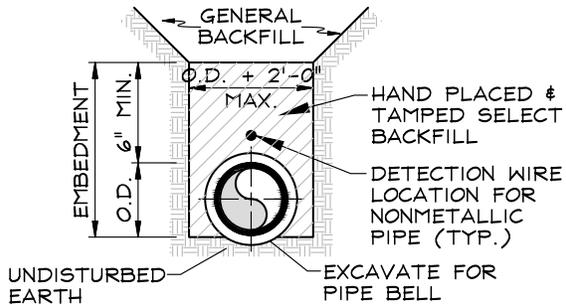


THRUST BLOCK DETAIL

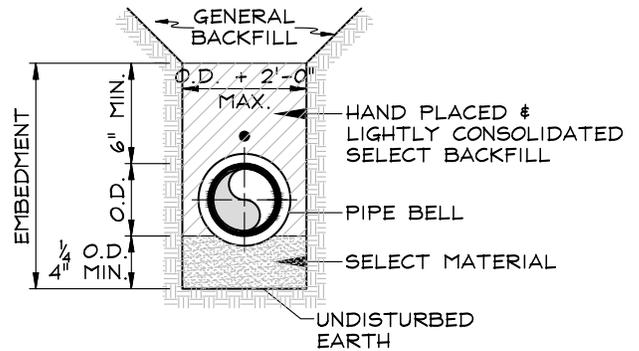
STANDARD DETAILS  
 WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
 SCALE: N.T.S.

STANDARD W2



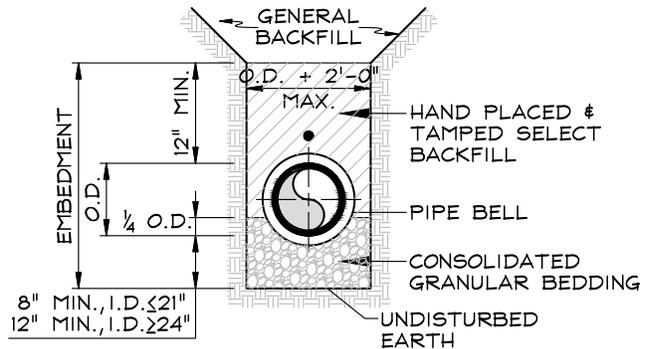
**TYPE 2**  
(FLAT BOTTOM TRENCH)



**TYPE 3**  
(LOOSE SOIL BEDDING)

**NOTES**

1. TYPE 2 CAN ONLY BE USED IN DRY EARTH TRENCHES.
2. IF ROCK IS ENCOUNTERED OR OVER EXCAVATION OCCURS, TYPE 4 SHALL BE USED.
3. TYPE 1 & TYPE 5 DO NOT APPLY TO WATER MAINS AND ARE NOT SHOWN



**TYPE 4**  
(GRANULAR BEDDING)



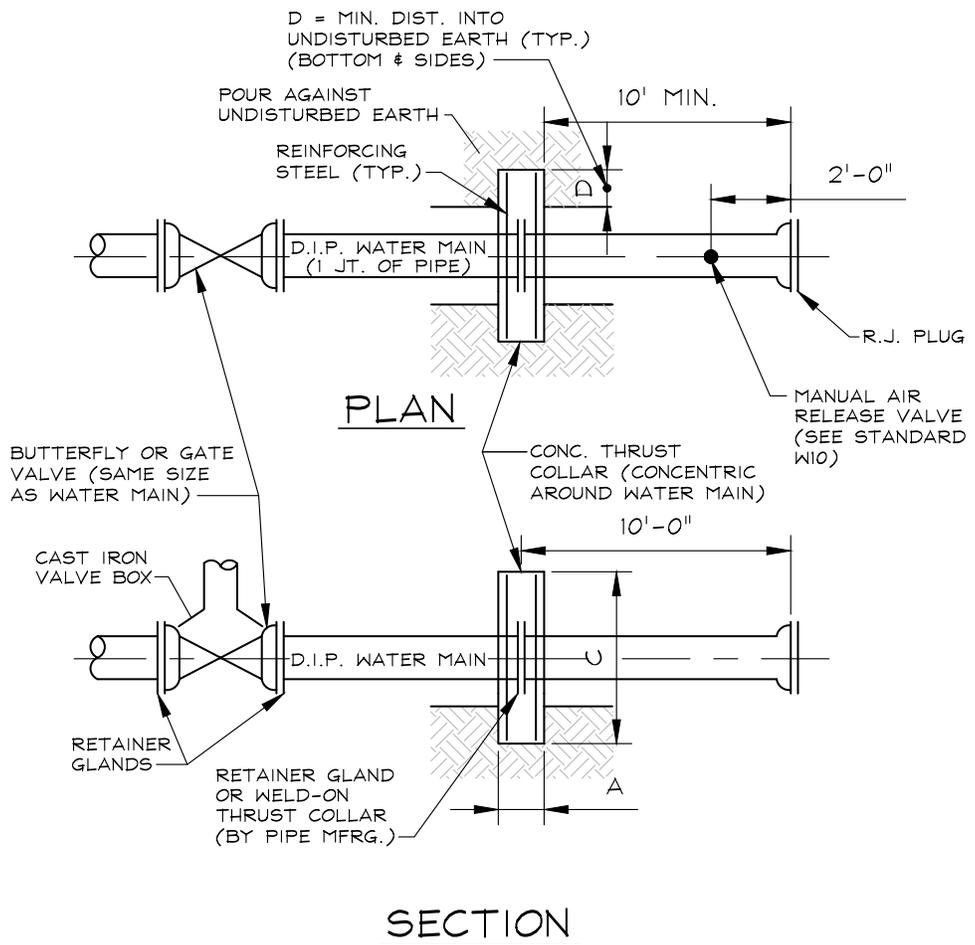
**PIPE BEDDING AND HAUNCHING  
PRESSURE PIPES**

**STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W3





MAIN DIA	CONCRETE COLLAR DIM.				REINFORCING STEEL
	A	B	C	D	
16"	1'-3"	6'-6"	6'-6"	1'-6"	#8 @ 12" O.C. E.W.E.F.
12"	1'-2"	5'-3"	5'-3"	1'-0"	#7 @ 12" O.C. E.W.E.F.
6" or 8"	1'-0"	4'-0"	4'-0"	0'-8"	#6 @ 12" O.C. E.W.E.F.

TEST PRESSURE: 200 P.S.I.  
 SOIL BEARING PRESSURE: 3000 P.S.F.



**WATER MAIN TERMINATION**

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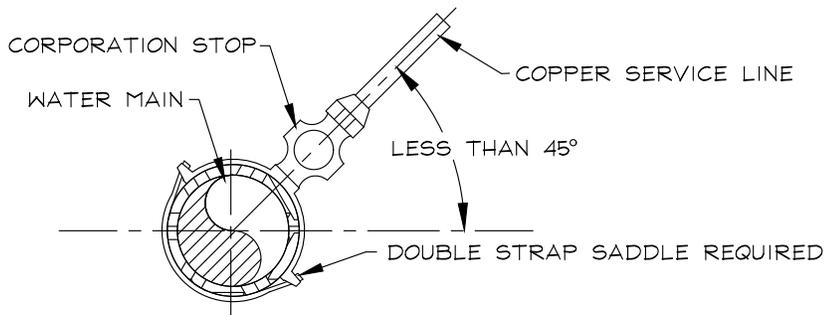
**STANDARD DETAILS**

**WATER SYSTEM CONSTRUCTION**

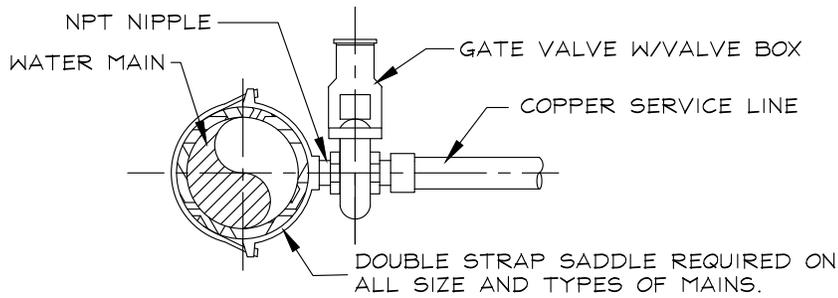
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 SCALE: N.T.S.

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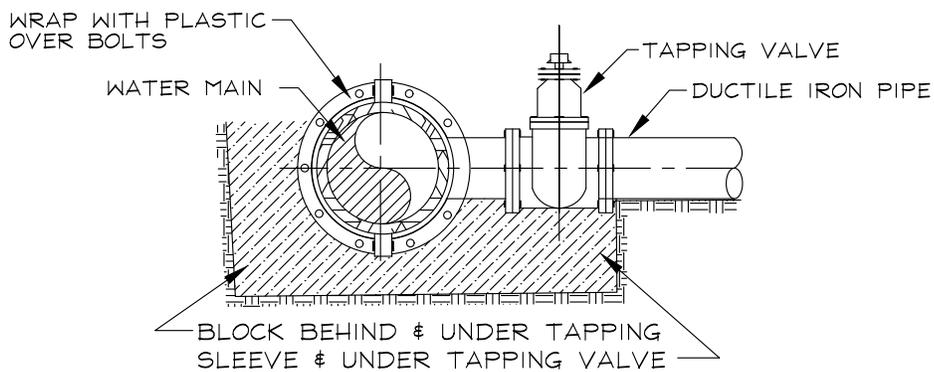
STANDARD W5



3/4" & 1" SERVICE CONNECTIONS



1 1/2" & 2" SERVICE CONNECTIONS



3" AND GREATER SERVICE CONNECTIONS

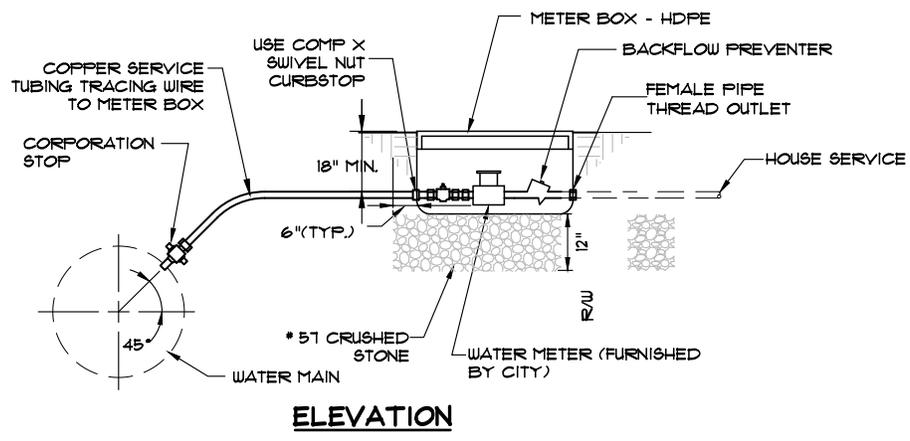
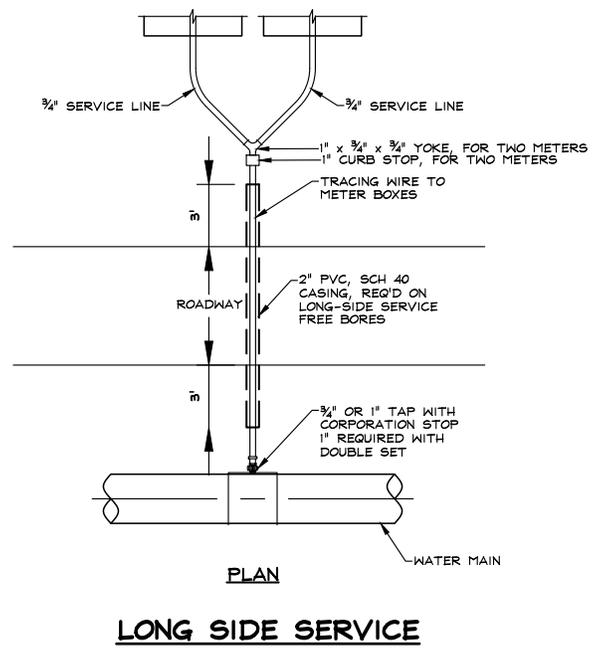
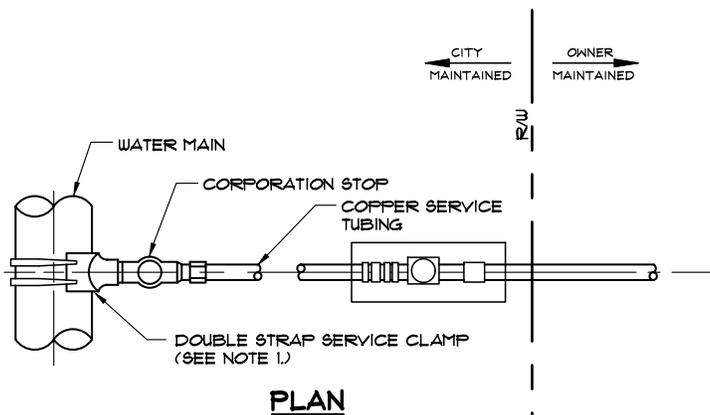


CONNECTIONS TO WATER MAIN

STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W6

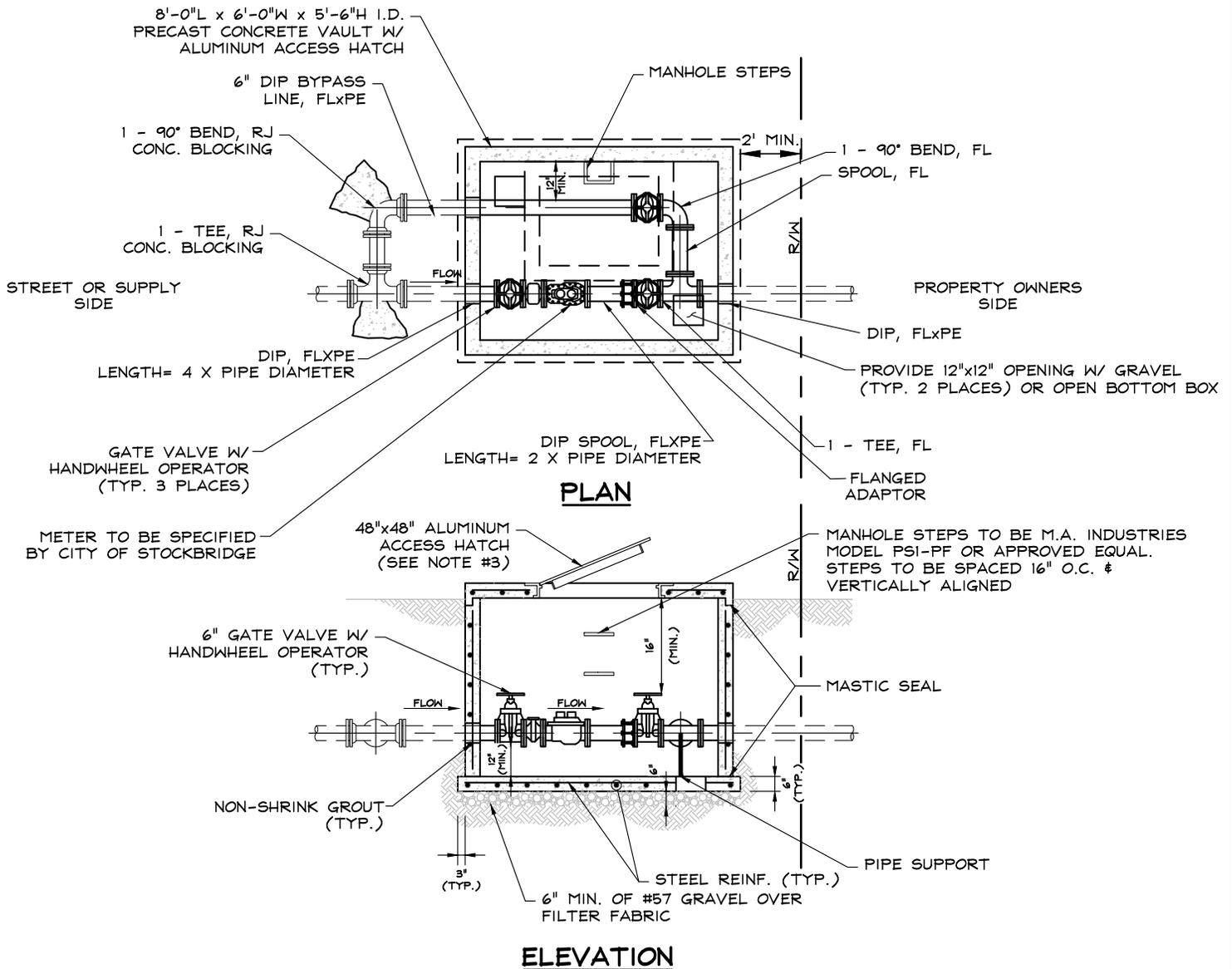


3/4" OR 1" WATER SERVICE & METER CONNECTION

STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W7



**NOTES:**

1. VAULT - 4,000 PSI REINFORCED PRECAST CONCRETE, CONTRACTOR'S OPTION.
2. TOP OF VAULT ELEVATION TO BE 3" - 6" ABOVE FINISHED GRADE.
3. ALUMINUM HATCH EQUAL TO BILCO, 300 PSF, STAINLESS STEEL HARDWARE WITH RECESSED PADLOCK HASP.
4. VAULT MFR. SHALL CAST HATCH FLUSH IN TOP SLAB.
5. PROVIDE MIN. 4'-0" COVER OVER LINES OR PER APPROVED SITE DRAWINGS.
6. CLASS 350 DIP REQ'D; RESTRAIN MJ WITH MEGA-LUGS FOR BURIED SERVICE, FIELD-LOK OR TR-FLEX RJ FOR PUSH-ON JOINTS.
7. CLASS 125 FLANGE JOINTS INSIDE VAULT: FLANGE DIP = THICKNESS CLASS 53.
8. JOINTS IMMEDIATELY UPSTREAM OR DOWNSTREAM OF VAULT SHALL BE RESTRAINED JOINT
9. PRESSURE TEST AND DISINFECT IN ACCORDANCE W/ AWWA.
10. TESTABLE PER AWWA STANDARDS.
11. BACK FLOW PREVENTION, SHALL BE INSTALLED AS SPECIFIED, ON PROPERTY OWNER'S SIDE OF METER.

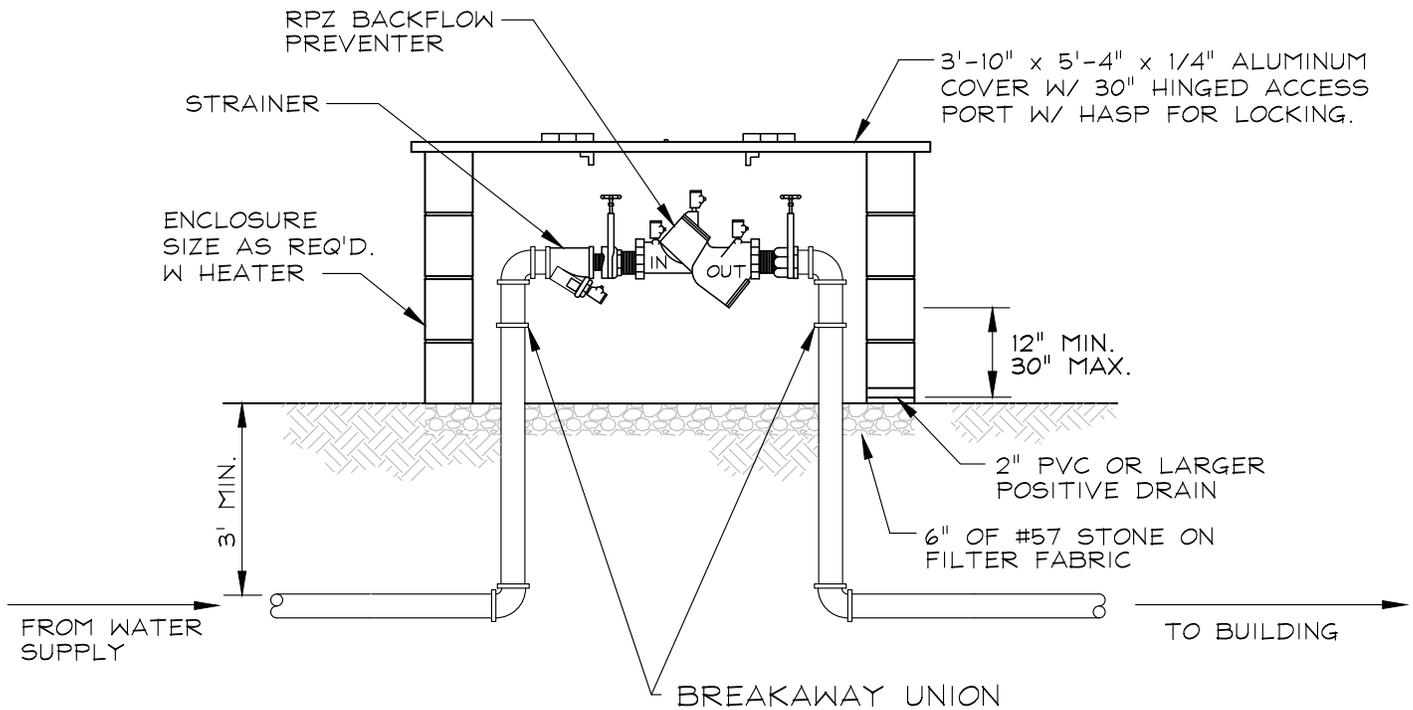


**METERS 3" & LARGER**

**STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: 3/8"=1'-0"

STANDARD W8



**NOTE:**

- 1) RPZ TO BE OWNER MAINTAINED
- 2) ENCLOSURE SHOULD BE HEATED OR INSULATED TO PROTECT FROM FREEZING
- 3) ENCLOSURE SHALL HAVE GROUND ANCHOR CAPABILITIES AND BE KEPT LOCKED AT ALL TIMES
- 4) AT OWNER'S OPTION, A BYPASS LINE MAY BE INSTALLED FOR SERVICING THE RPZ. BYPASS SHALL HAVE A VALVE THAT IS LOCKABLE BY THE CITY.

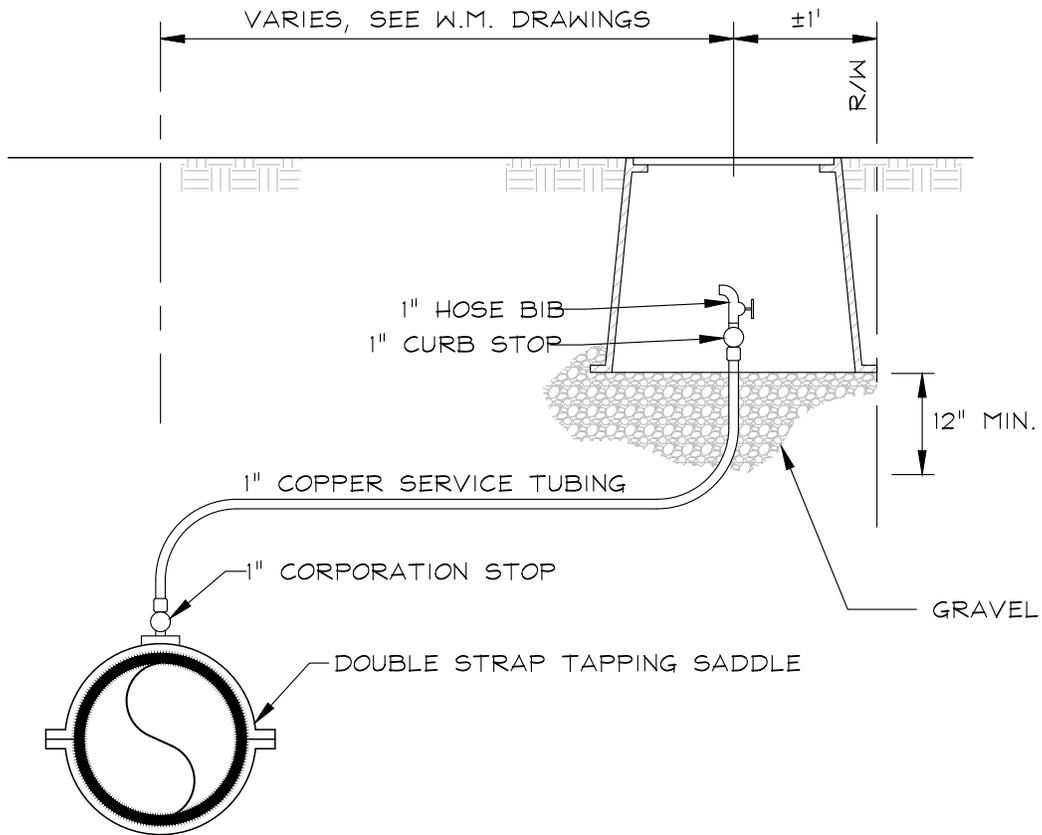


**RPZ BACKFLOW PREVENTER FOR  
1 1/2" & GREATER SERVICES**

**STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W9

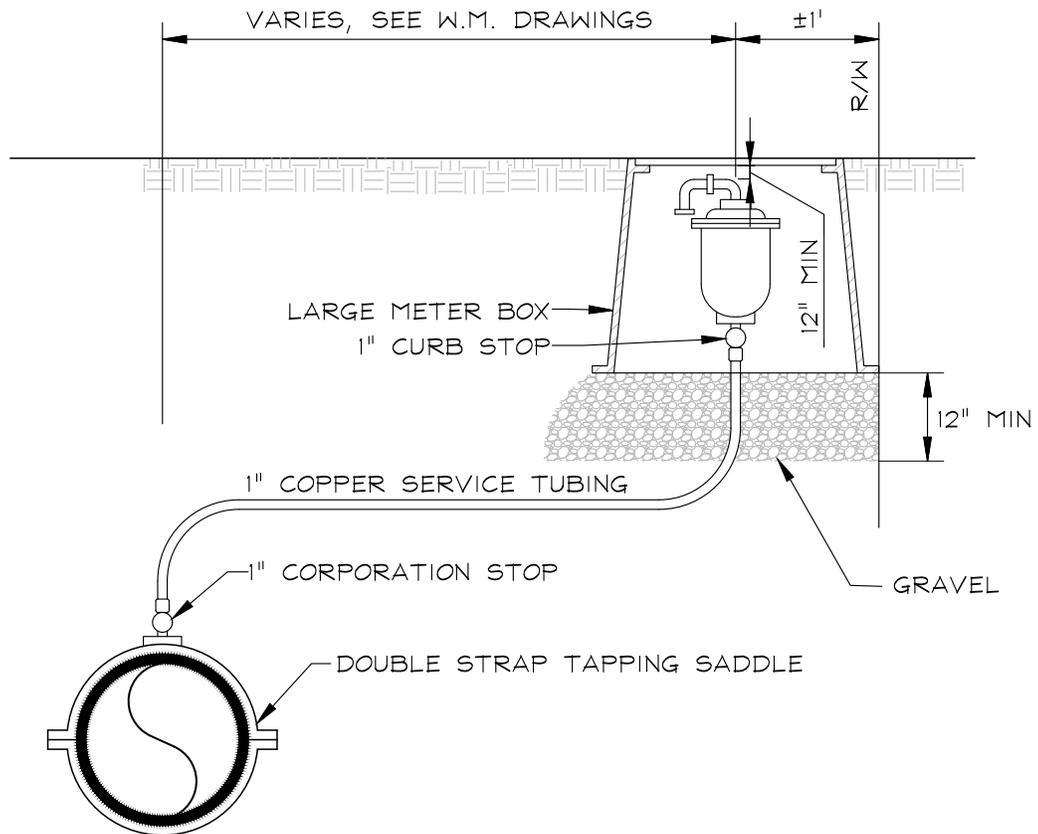


MANUAL AIR RELEASE / SAMPLE TAP

STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W10

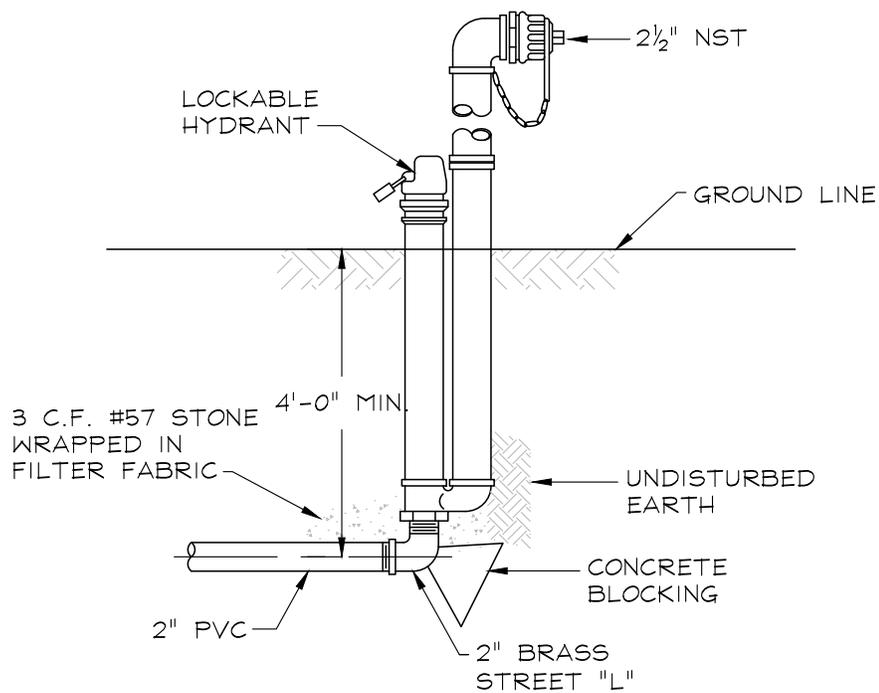


AIR RELEASE VALVE

STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W11



POST HYDRANTS SHALL BE NON-FREEZING, SELF DRAINING TYPE WITH 4' BURY. THESE HYDRANTS WILL BE FURNISHED WITH A 2" FIP INLET, A NON-TURNING OPERATING ROD, AND SHALL OPEN TO THE LEFT. ALL OF THE WORKING PARTS SHALL BE OF BRONZE-TO-BRONZE DESIGN, AND BE SERVICABLE FROM ABOVE GRADE WITH NO DIGGING. THE OUTLET SHALL ALSO BE BRONZE AND BE 2-1/2" NST. HYDRANTS SHALL BE LOCKABLE TO PREVENT UNAUTHORIZED USE AS MANUFACTURED BY ZURN Z-1385 OR APPROVED EQUAL.

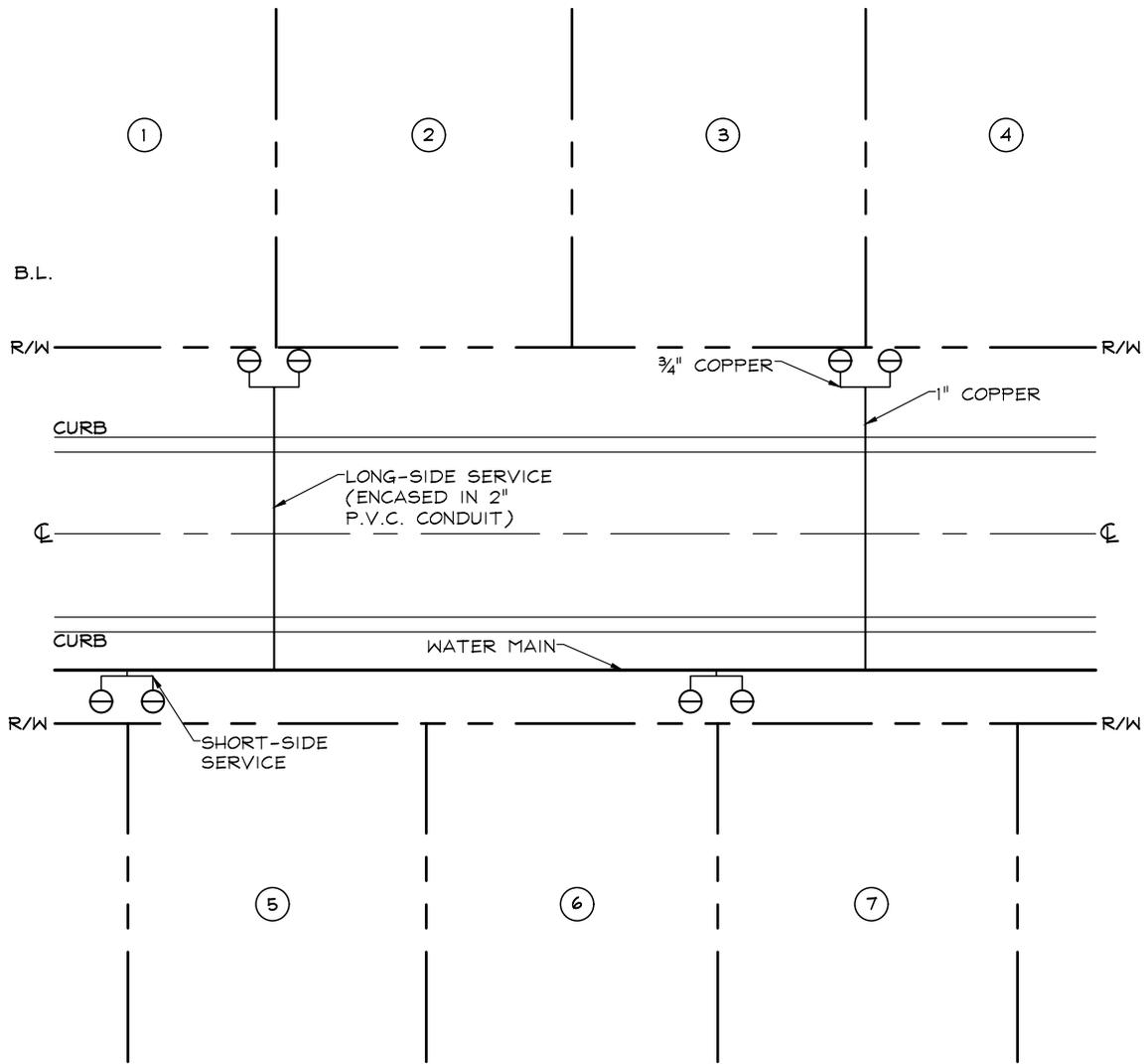


FLUSHING HYDRANT

STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W12

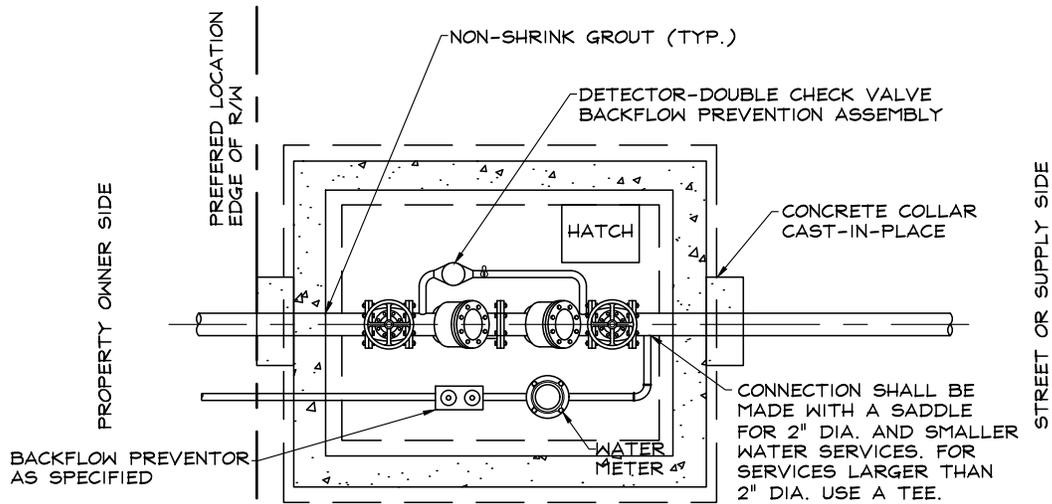


3/4" WATER METER LOCATION  
FOR SUBDIVISIONS

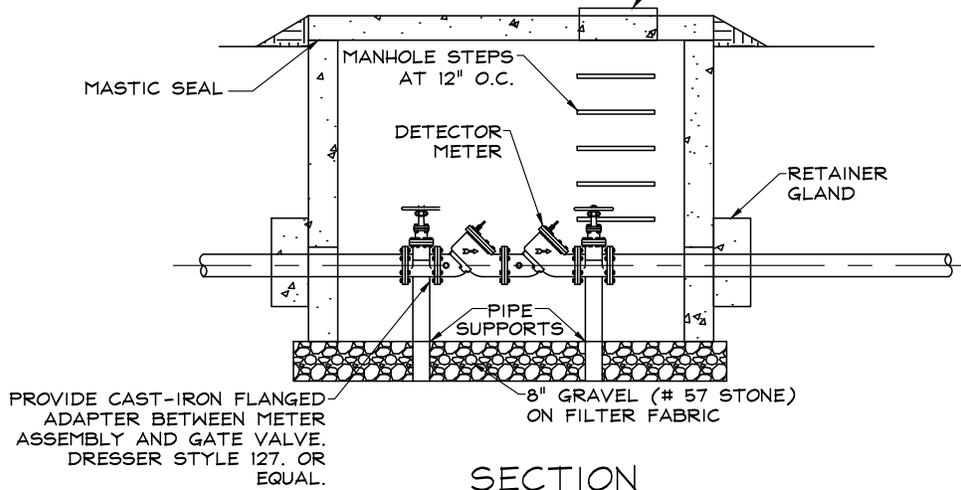
STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W13



PRE-CAST METER VAULT (RATED FOR H-20 LOADING) **PLAN** 3' x 3' ALUMINUM HATCH (SEE NOTE #6)



**SECTION**

**NOTES:**

1. BOXES EXCEEDING 7' IN DEPTH MUST BE APPROVED BY THE CITY.
2. WHEN METER BOX CANNOT BE LOCATED ENTIRELY ON R/W, A PERMANENT EASEMENT SHALL BE OBTAINED TO PREVENT FENCES OR OTHER OBSTRUCTION FROM BEING ERECTED AROUND THE METER BOX.
3. COVER OPENING & STEPS TO BE PLACED NEAREST THE METER REGISTER.
4. THESE BOXES ARE NOT TO BE INSTALLED IN TRAFFIC AREAS WITHOUT PRIOR PERMISSION FROM THE CITY.
5. ALL VALVES AND FITTINGS INSIDE THE VAULT SHALL BE FLANGED.
6. ALUMINUM HATCH EQUAL TO BILCO, 300 PSF, STAINLESS STEEL HARDWARE WITH RECESSED PADLOCK HASP.

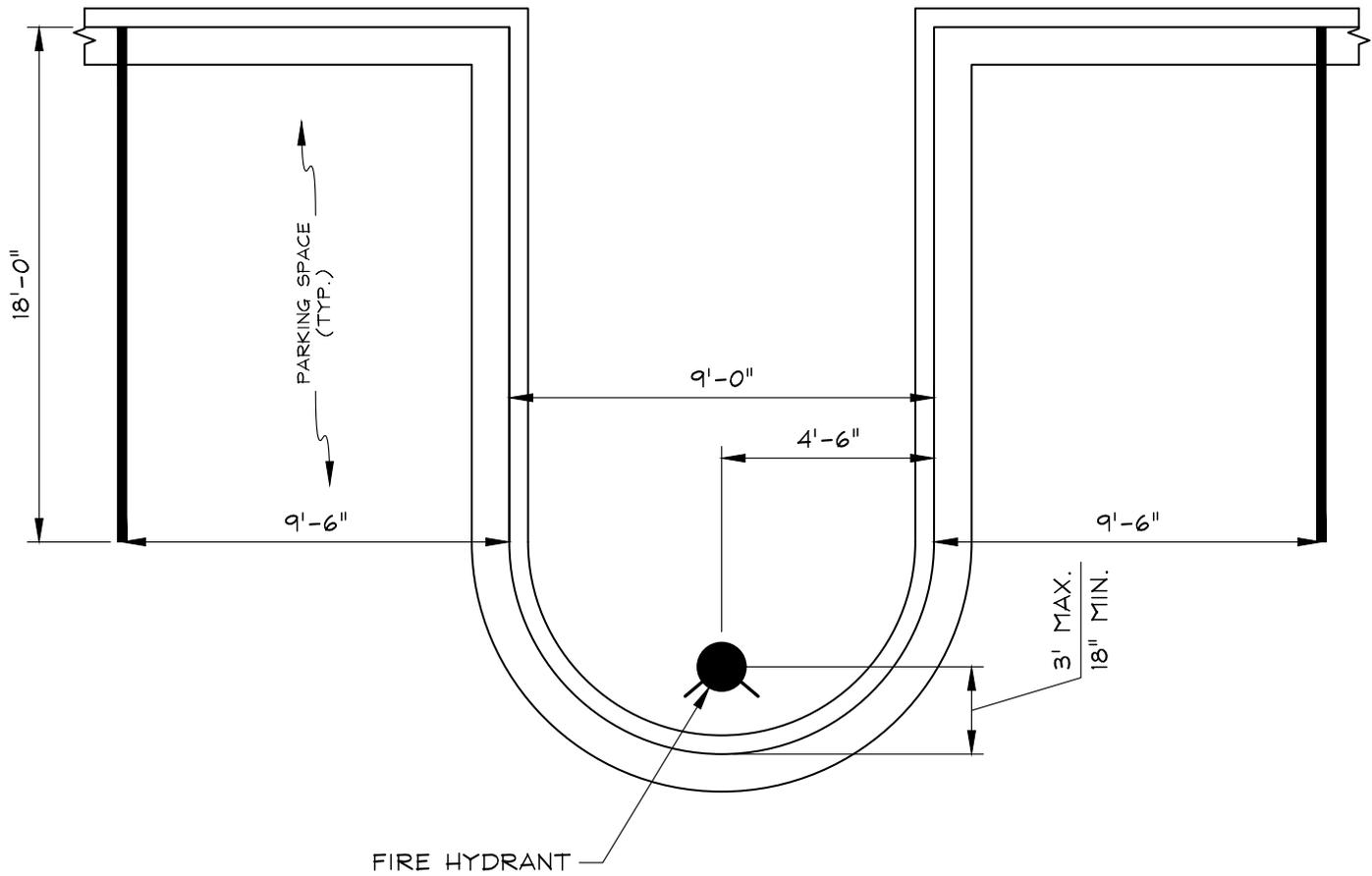


**DETECTOR/WATER METER AND VAULT**

**STANDARD DETAILS WATER SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W14

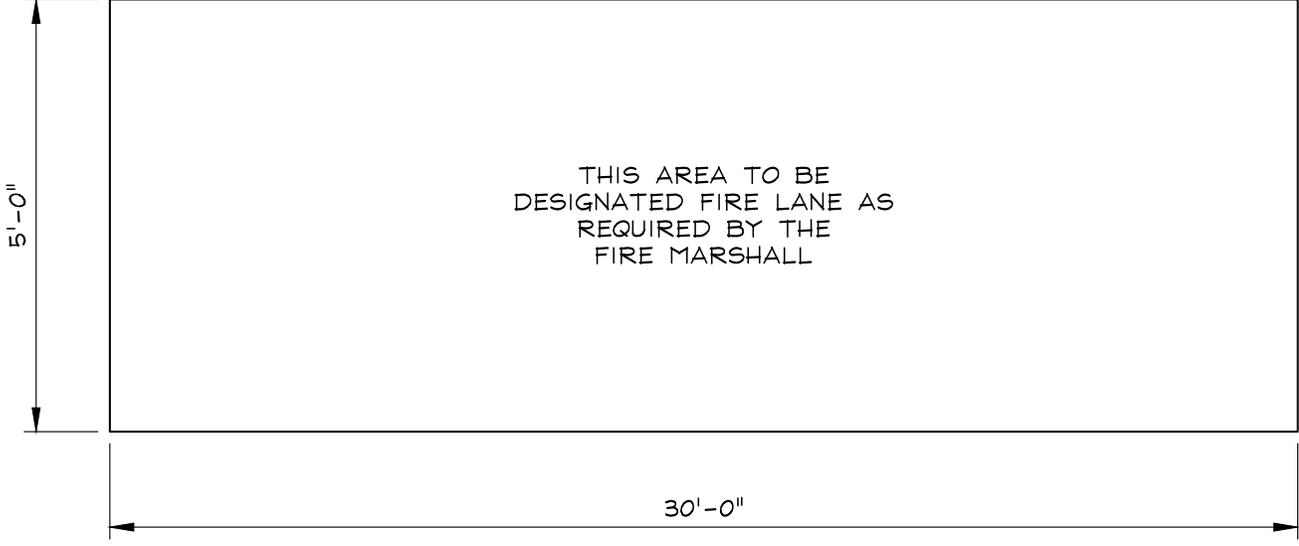
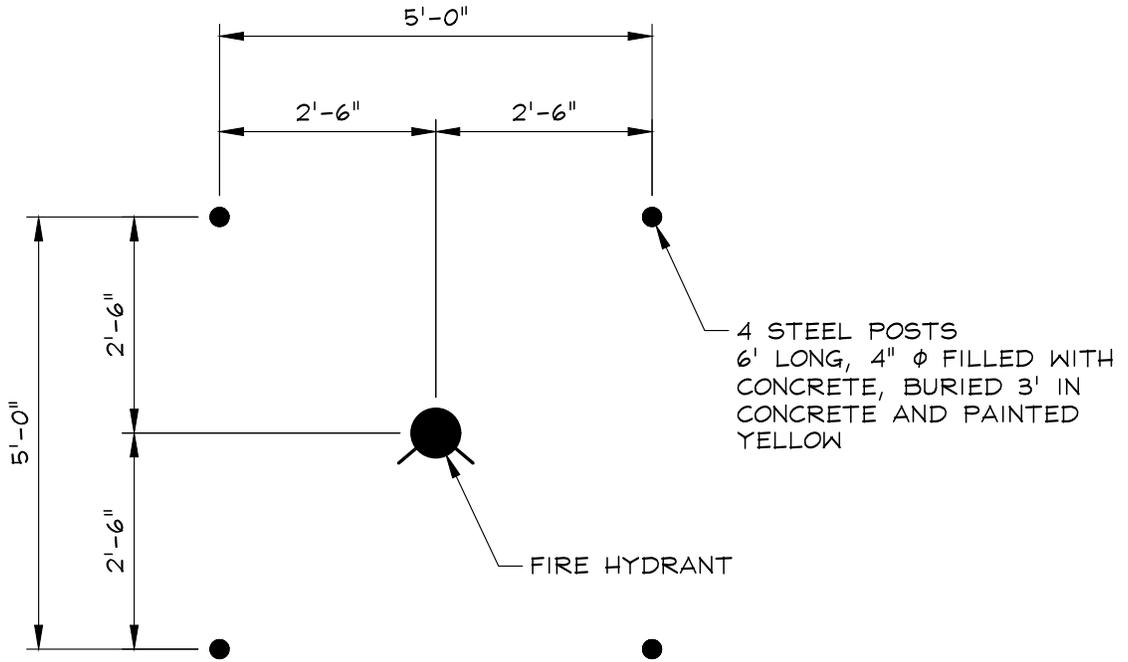


TYPICAL FIRE HYDRANT ISLAND -  
PARKING AREA

STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W15

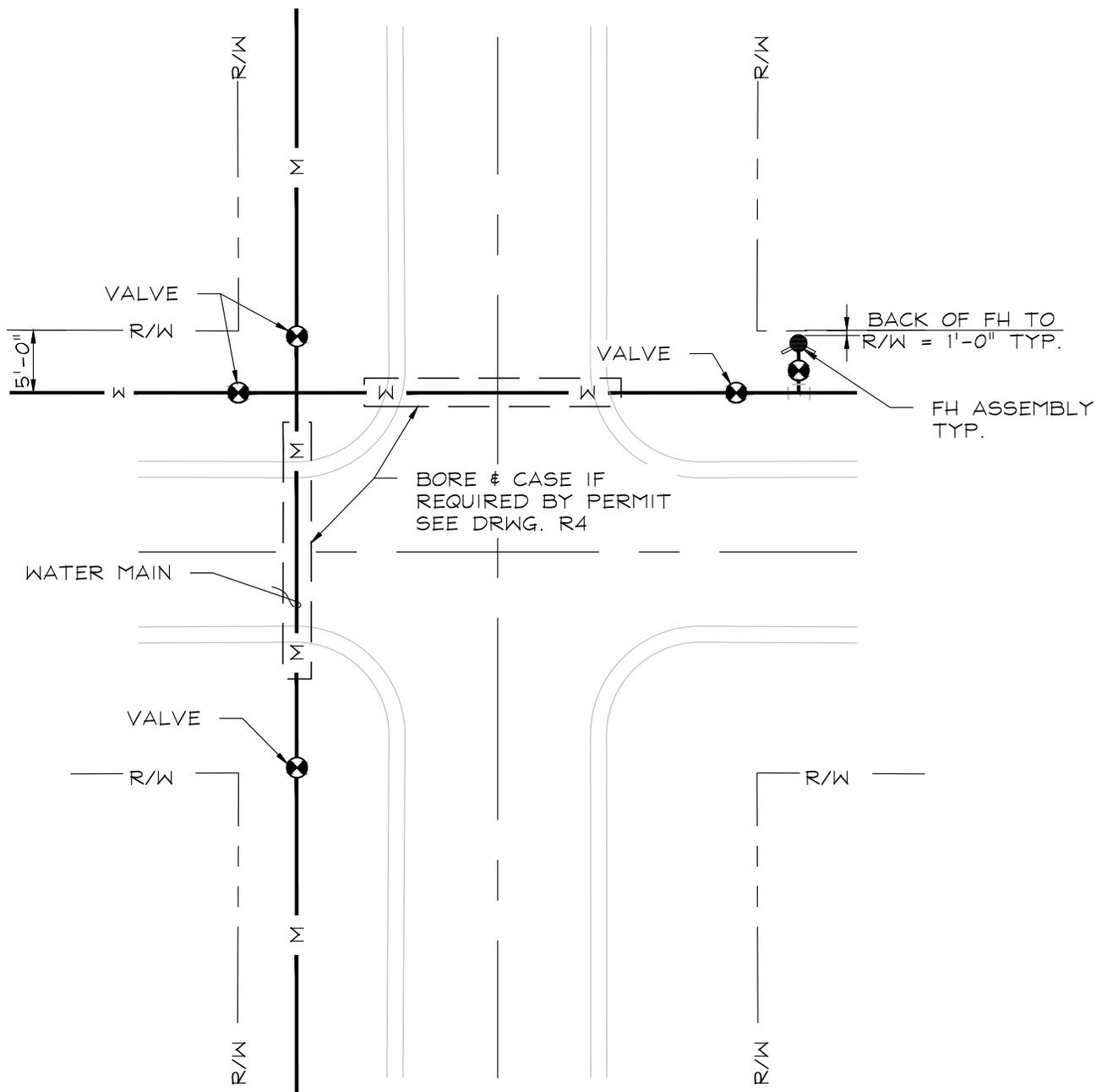


TYPICAL FIRE HYDRANT -  
POST PROTECTION

STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W16



INTERSECTION

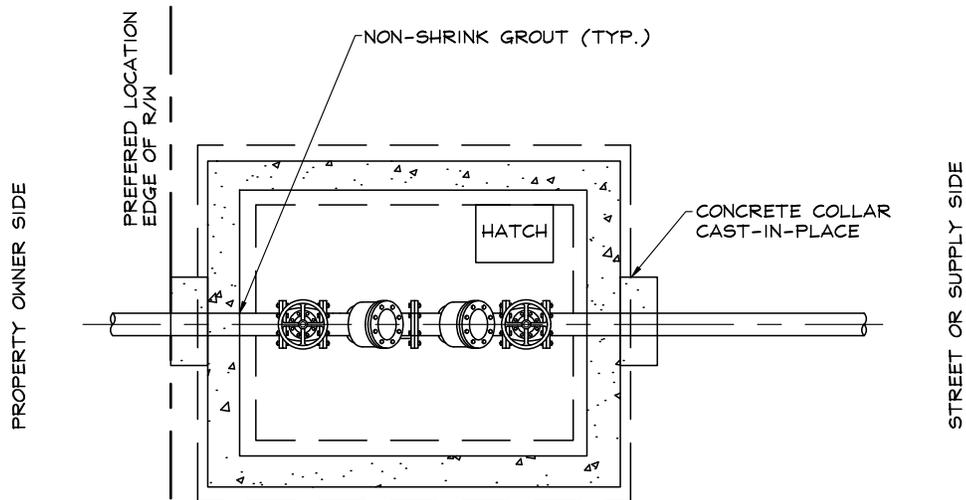


WATER MAIN LOCATION  
 GDOT & COUNTY ROAD

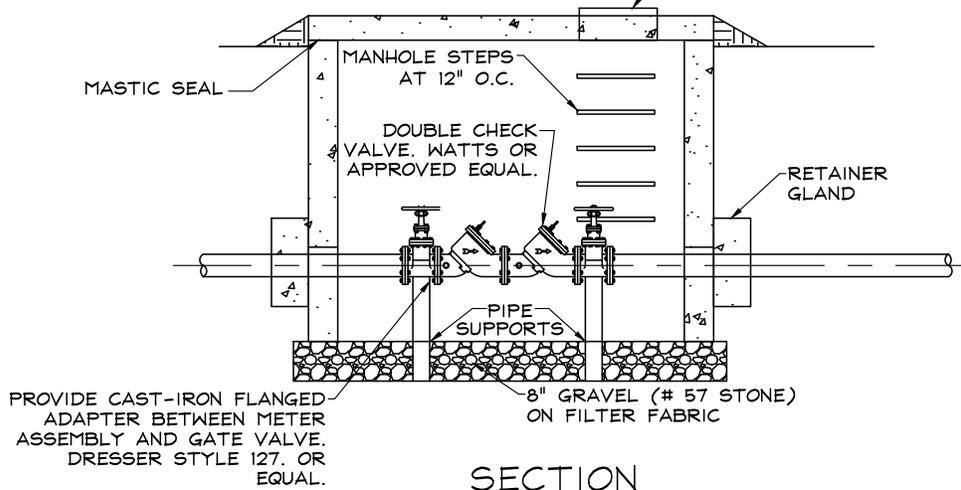
STANDARD DETAILS  
 WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
 SCALE: N.T.S.

STANDARD W17



PRE-CAST METER VAULT (RATED FOR H-20 LOADING) **PLAN** 3' x 3' ALUMINUM HATCH (SEE NOTE #6)



**SECTION**

**NOTES:**

1. BOXES EXCEEDING 7' IN DEPTH MUST BE APPROVED BY THE CITY.
2. WHEN METER BOX CANNOT BE LOCATED ENTIRELY ON R/W, A PERMANENT EASEMENT SHALL BE OBTAINED TO PREVENT FENCES OR OTHER OBSTRUCTION FROM BEING ERECTED AROUND THE METER BOX.
3. COVER OPENING & STEPS TO BE PLACED NEAREST THE METER REGISTER.
4. THESE BOXES ARE NOT TO BE INSTALLED IN TRAFFIC AREAS WITHOUT PRIOR PERMISSION FROM THE CITY.
5. ALL VALVES AND FITTINGS INSIDE THE VAULT SHALL BE FLANGED.
6. ALUMINUM HATCH EQUAL TO BILCO, 300 PSF, STAINLESS STEEL HARDWARE WITH RECESSED PADLOCK HASP.

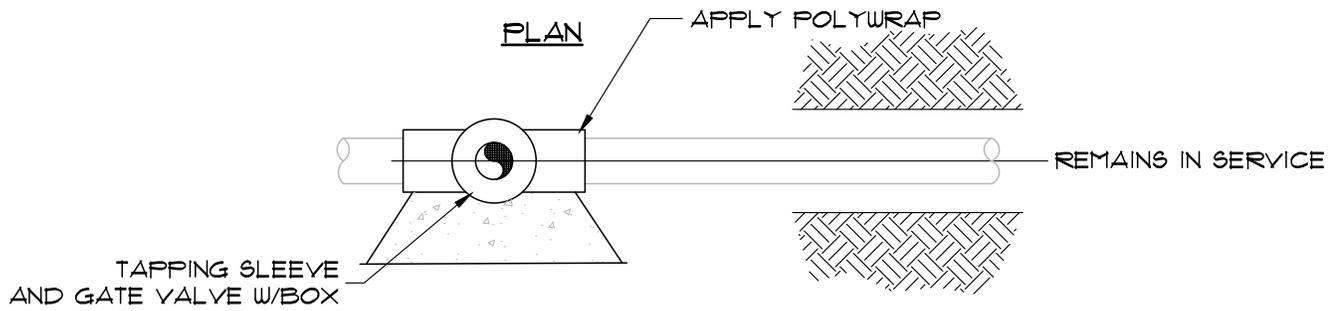
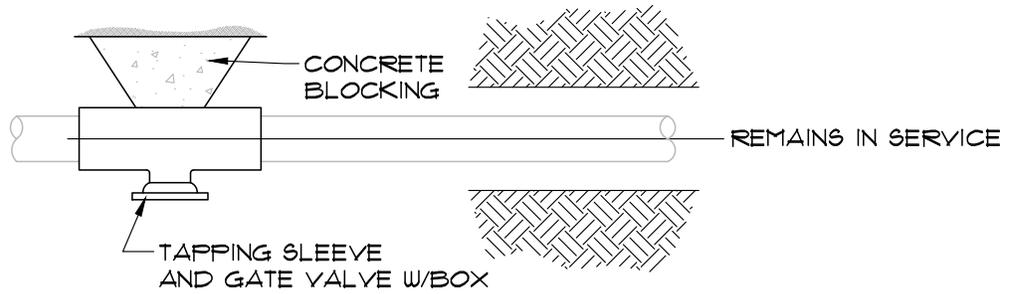


**DOUBLE CHECK BACKFLOW PREVENTER DETAIL**

**STANDARD DETAILS WATER SYSTEM CONSTRUCTION**

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W18



TAPPING SLEEVE TIE-IN  
DETAIL

STANDARD DETAILS  
WATER SYSTEM CONSTRUCTION

DATE: SEPTEMBER 2019  
SCALE: N.T.S.

STANDARD W19