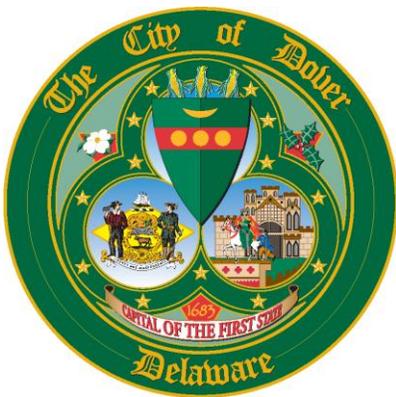


City of Dover

Water/Wastewater Handbook



Public Utilities Department
Effective Date: 03/22/2010

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Introduction and Contact Information

Dear Customer:

The City of Dover Public Utilities Department provides public water and wastewater services to our customers within the City limits and to some customers just outside the City limits. As of the effective date of this Handbook, we currently register over 13,000 water accounts and over 11,500 wastewater accounts. In order to ensure that our current and future customers, as well as developers and consultants, are informed of our policies and procedures, we are pleased to provide this Handbook which details design, construction and operation and maintenance aspects of both the water and wastewater systems.

The City of Dover operates and maintains all components of the water system. The determined safe capacity for the water system is currently 10.64 MGD (million gallons per day). In addition, staff performs over 1,800 routine analyses per month to ensure the provided water meets all State and Federal requirements.

The infrastructure elements of the City of Dover water system as of the effective date of this Handbook include the following:

- Fifteen (15) deep production wells (micro-plants) which deliver potable water directly to the distribution system.
- A shallow well field consisting of seven (7) production wells that supply water to the water treatment plant. The water treatment plant in turn delivers potable water directly to the distribution system.
- Six (6) elevated storage tanks with a combined capacity of 3.75 million gallons.
- Approximately 195 miles of water main ranging in size from one and one-half inches (1-1/2") to sixteen-inches (16").
- The distribution system also contains over 1,600 fire hydrants and 1,800 division valves.

The City of Dover operates and maintains all components of the wastewater collection system. The wastewater that is collected is then sent to the Kent County wastewater system for treatment. The average daily flow from the City of Dover system to the Kent County system is approximately 4.5 MGD (million gallons per day). Industrial waste lab analyses are performed to ensure compliance with Kent County regulations for treatment. The County has established regulations, which are herein adopted by reference, prohibiting various discharges to the system, that could threaten protect public safety and

the physical integrity of the system, violate any of its permit requirements or preclude the use of the most cost-effective alternatives for treatment and disposal.

The infrastructure elements of the City of Dover wastewater system as of the effective date of this Handbook include the following:

- Forty-one (41) pumping stations.
- Approximately 185 miles of gravity sanitary sewer main and force main ranging in size from four-inches (4") to thirty-six inches (36").

Due to the extent of the City of Dover's water and wastewater system, we hope that this Handbook will assist customers, developers, contractors and consultants in understanding the policies and procedures associated with the water and wastewater utility systems. In turn, this will help make it easier for you to do business with the City of Dover Public Utilities Department. If you have any questions, please don't hesitate to contact us through our website, www.dover.de.us, or by phone, at 302.736.7070. Additional contact information is also provided on the following page for your use.

Thank you for your interest in the City of Dover and for allowing us to serve your needs.

Sincerely,

Ronald Lunt

Ronald Lunt
Public Utilities Director

Sharon Duca

Sharon Duca, P.E.
Water/Wastewater Manager

ACKNOWLEDGEMENTS

<i>Mayor:</i>	Carleton E. Carey, Sr.	<i>City Manager:</i>	Anthony J. DePrima, AICP
<i>City Council:</i>	Kenneth L. Hogan Thomas J. Leary James G. McGiffin William P. McGlumphy Eugene B. Ruane Sophia R. Russell Reuben Salters Timothy Slavin Beverly Williams	<i>Utility Committee:</i>	Eugene B. Ruane, Chairman Kenneth L. Hogan James G. McGiffin Major Richard Kosior Richard Snaman

The *Water Wastewater Handbook* Project Team:

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<i>City of Dover Customer Service Department:</i>	Kathy Divver, Customer Service Manager Corinne Mosher, Customer Service Supervisor

WATER / WASTEWATER UTILITY CONTACT INFORMATION

<p>CUSTOMER SERVICE 5 East Reed Street Dover, DE 19901 302.736.7035</p>	<p>Customers can contact this Department to obtain information regarding rates, billing questions, meter costs, deposits, credit information, and application for service.</p>
<p>MISS UTILITY 800.282.8555 or 811</p>	<p>Contractors must contact Miss Utility prior to performing excavation to ensure that utilities are field located.</p>
<p>PLANNING & ZONING City Hall – The Plaza P.O. Box 475 Dover, DE 19903 302.736.7010</p>	<p>Owners, developers and consultants can contact this Department regarding site development and subdivision plans, the administrative review and Development Advisory Committee process and related issues.</p>
<p>PUBLIC SERVICES – INSPECTIONS City Hall – The Plaza P.O. Box 475 Dover, DE 19903 302.736.7010</p>	<p>Owners, developers, consultants and contractors can contact this Department regarding plumbing permits, building permits, impact fees and related issues.</p>
<p>PUBLIC UTILITIES – DISPATCH Emergency Service – 24/7 302.736.7060</p>	<p>Customers can contact this Division of the Public Utilities Department 24 hours a day, 7 days a week to report water leaks, sewer backups or other concerns or service problems.</p>
<p>PUBLIC UTILITIES – WATER TREATMENT & PRODUCTION 860 Buttner Place Dover, DE 19904 302.736.7070</p>	<p>Customers can contact this Division of the Public Utilities Department regarding the annual water quality report and other aspects of the City’s drinking water.</p>
<p>PUBLIC UTILITIES – WATER / WASTEWATER CONSTRUCTION & INSPECTIONS 860 Buttner Place Dover, DE 19904 302.736.7070</p>	<p>Owners, developers, consultants, contractors and customers can contact this Division of the Public Utilities Department regarding projects currently under construction by the Department as well as private construction projects.</p>
<p>PUBLIC UTILITIES – WATER / WASTEWATER ENGINEERING 860 Buttner Place Dover, DE 19904 302.736.7070</p>	<p>Owners, developers, consultants, contractors and customers can contact this Division of the Public Utilities Department regarding any aspect of this Handbook, particularly the plan review process.</p>
<p>PUBLIC UTILITIES – WATER / WASTEWATER MAINTENANCE 860 Buttner Place Dover, DE 19904 302.736.7070</p>	<p>Customers and contractors can contact this Division of the Public Utilities Department regarding existing water and wastewater infrastructure including repairs and other maintenance activities.</p>

I. Definitions

Acceptable Materials Checklists – Checklists provided in Appendices D through G which must be completed and submitted in conjunction with the Water / Wastewater Pre-Construction Meeting Checklist. The Acceptable Materials Checklists contain materials which have been approved for use by projects involving work related to the water utility system and/or wastewater utility system as well as projects proposing wet well mounted or recessed wet well mounted pump stations. When the notation “Full Specification Required” or similar language appears within the Acceptable Materials Checklists, or when required materials do not appear within said lists, complete shop drawing submittals are required for review by Public Utilities Department personnel.

Administrative Review Process – Site development projects which do not require submission to the Planning Commission, as determined by the City Planner, shall be subject to the Administrative Review Process. This process is administered through the City of Dover Planning Department and is not subject to review through the Development Advisory Committee.

Business Day - Shall mean any day except Saturday or Sunday, a legal holiday prescribed by statute, or recognized operator holidays. A business day begins at 7:00 a.m. and ends at 3:30 p.m.

Check Print - Plan submitted for any proposed renovation, site development or subdivision project subsequent to the initial plan submission. One (1) complete set of construction plans, the scope of which may vary depending upon the scale of the proposed project, must be submitted to the Water / Wastewater Manager of the Public Utilities Department for review. Plans must meet all requirements of the Water / Wastewater Handbook.

Development Advisory Committee (DAC) Review Process – Projects which require submission to the Planning Commission, as determined by the City Planner, shall be subject to the Development Advisory Committee (DAC) Review Process. This process is administered through the City of Dover Planning Department.

Final Inspection - Following the completion of all work, the developer shall request a final inspection through the Public Services Manager or Public Utilities Construction & Inspections Manager as established through the pre-construction meeting. The final inspection will be scheduled within five (5) to ten (10) days of the request. At the final inspection, all items of work, if any, which must be completed, replaced or repaired, will be identified.

Final Plan Submittal - Upon receipt of notification from the Public Utilities Department, four (4) complete sets of plans, signed and sealed by either a Delaware licensed Professional Engineer, or

Delaware licensed Professional Land Surveyor, as per Delaware State Code, in addition to a digital copy of the plans compatible with AutoCAD in addition to all current City GIS requirements, and a digital copy of the plans in .pdf format shall be submitted to the Water / Wastewater Manager for water and wastewater utility plan approval. The Water / Wastewater Final Plan Submission Checklist shall also be submitted in this package, this checklist can be found in Appendix B. Final plan approval is typically provided from the Public Services and Planning & Zoning Departments.

Initial Plan - Initial plan submitted for any proposed renovation, site development or subdivision project. Plans requiring Administrative review or Development Advisory Committee review are submitted through the City of Dover Planning & Zoning Department. All other plans are submitted directly to the Water / Wastewater Manager of the Public Utilities Department. One (1) complete set of plans must be submitted for review.

Notice to Proceed - The Public Services Manager or Public Utilities Construction & Inspections Manager, in accordance with the pre-construction meeting requirements, will issue a Notice to Proceed for the project once all requirements established in the pre-construction meeting have been met. All water and wastewater utility work must be scheduled directly with the Public Utilities Construction & Inspections Manager.

Pre-Application Meeting (Public Utilities) – Unless waived by the Public Utilities Department, developers / owners shall meet with Departmental staff to discuss utility availability and approval requirements prior to the filing of an application and/or the submission of plans for review.

Pre-Construction Meeting - Following the receipt of all approvals, the developer shall request a Pre-Construction Meeting through the Public Services Manager. This meeting will be scheduled to ensure the attendance of all relevant City staff including Public Utilities Department personnel, the Developer, his/her Engineer and Contractor, utility firms and other agencies as may be deemed appropriate. All requirements set forth in the meeting must be met prior to the start of construction. A minimum of five (5) business days notice is required to schedule this meeting for typical projects. A minimum of ten (10) business days notice is required to properly schedule this meeting for large projects. Projects which do not meet the project scope and scale requirements of a typical pre-construction meeting will be identified in the Water / Wastewater Utility Plan Approval letter. These projects must schedule the pre-construction meeting with the Public Utilities Construction & Inspections Manager.

Public Infrastructure Dedication - The Public Infrastructure Dedication procedure shall commence upon satisfactory completion of every prior step and receipt of recommendations to accept infrastructure from the Public Services and Public Utilities Departments. City Council shall grant final approval of dedication. This approval will authorize the acceptance and ownership of all public infrastructure associated with the project.

Renovation - A renovation project, for the purposes of this Handbook, consists of any project which proposes to change the character of the water and/or wastewater service at the subject location. Examples of such changes include, but are not limited to, changes in plumbing fixture quantity, changes to the size of the water line serving the location, changes to the size of the sanitary sewer line serving the location, and/or relocation of the water meter, water line and/or sewer line serving the location.

Request for Public Infrastructure Acceptance – The Request for Public Infrastructure is required for all projects which contain components which are to be dedicated to the City of Dover. Upon completion of the final inspection, and when all resulting punch list items have been completed to the satisfaction of the Public Utilities Department, the Developer shall submit a written Request for Public Infrastructure Acceptance to the Public Services Manager with copy to the Water / Wastewater Manager. This request will be reviewed by the Public Services and Public Utilities Departments.

Site Development - The improvement of one or more parcels of land for residential, commercial or industrial structures or groups of structures.

Subdivision - A division, or redivision, or any tract of land into two or more lots, plots, sites or parcels for immediate or future sale or for building development.

Water / Wastewater Initial Plan Submission Checklist - Checklist provided in Appendix A that must be submitted with all initial plan submissions. The checklist provides a listing of all principle requirements that must be included as part of the plan set, or supplemental design material, that must be submitted for review.

Water / Wastewater Pre-Construction Meeting Checklist - Checklist provided in Appendix C that must be submitted to the Public Utilities Department representative at the pre-construction meeting. All supplemental materials noted within the checklist must be included with the submission.

Water / Wastewater Utility Plan Approval - Approval granted by the Public Utilities Department following receipt of final plans. This approval is valid for two (2) years.

II. Process Outline

A. Applicable Projects

1. Renovation to Existing Building or Developed Site

- i. All renovation projects are required to bring the component of the water and/or wastewater service to be changed up to current standards and specifications as part of the proposed project.
- ii. All projects requiring review through the Administrative review process or through the DAC (development advisory committee) review process must submit a plan for review. Plans shall be submitted in accordance with the appropriate process requirements. For all other projects, the Water / Wastewater will evaluate whether a plan is required or not based upon the size and scope of the project. Should a plan be required, it shall be submitted directly to the Water / Wastewater Manager.
- iii. Approval for the water and/or wastewater utilities must be obtained from the Water / Wastewater Manager prior to the start of work.
- iv. Plumbing permit and building permit applications will be assessed for applicability through the use of forms or similar means provided to the applicant in conjunction with the appropriate application. These forms will be forwarded to the Public Utilities Department to allow a representative of the Department to contact the applicant directly regarding specific requirements and additional information that may be required. All requirements will be provided under separate cover to the applicant from the Water / Wastewater Manager and copied to the Public Services Department in order to confirm completion with the Public Utilities Department prior to final inspection by the Public Services Department. All projects subject to these requirements shall not be closed out until all requirements have been met.

2. Site Development

- i. A plan must be submitted for any site development project proposed.
- ii. These plans may be submitted directly to the Water / Wastewater Manager, through the Administrative review process or through the DAC (development advisory committee) review process, as applicable.
- iii. Plan approval for the water and wastewater utilities must be obtained from the Water / Wastewater Manager prior to the start of work.

3. Subdivision

- i. A plan shall be submitted for any subdivision proposed.
- ii. These plans may be submitted directly to the Water / Wastewater Manager, through the Administrative review process or through the DAC (development advisory committee) review process, as applicable.
- iii. Plan approval for the water and wastewater utilities must be obtained from the Water / Wastewater Manager prior to the start of work.

B. Waivers and Extensions

1. Administrative Waivers

- i. The Public Utilities Director and/or Water / Wastewater Manager may waive the requirements of this Handbook for any project when such requirements are clearly not applicable for a project due to the project scope.
- ii. The Public Utilities Director and/or Water / Wastewater Manager may accept, for review, waiver requests from requirements within this Handbook when implementation infeasibilities exist. They must ensure, however, that the alternatives proposed are technically superior for the subject location, in no way negate the overall intent of this Handbook, and represent options that are in the best interest of the utility and the public in order to grant approval to such requests.
- iii. All waiver requests, other than those referenced in II.B.1.i., must be submitted in writing with justification and alternatives provided.

2. Administrative Extensions

- i. Water and wastewater utility approval is valid for two (2) years from the date of issuance.
- ii. All projects which have not started prior to the expiration date of the approval must submit a request for an extension prior to the expiration date. Justification for the request must be provided.
- iii. All projects with expired approvals are subject to resubmission for review and approval.

C. Approvals Required

In addition to approval from the Water / Wastewater Manager for the water and wastewater utilities, approval from the following agencies may be required prior to the start of work, depending on the scope of work for the project.

1. City of Dover Public Services and Planning & Zoning Departments - Approval from the City of Dover Public Services and Planning & Zoning Departments is required for all projects requiring Administrative plan review / approval or Development Advisory Committee (DAC) / Planning Commission review / approval as per the City of Dover Code. Approval from the Public Services and Planning & Zoning Departments, respectively, is typically obtained after receiving approval from the Water / Wastewater Manager.
2. State of Delaware Health and Social Services, Division of Public Health, Office of Drinking Water - After all Public Utilities Department comments have been addressed, and prior to water and wastewater utility approval, the water system plans must be submitted to the Office of Drinking Water for review and approval. The owner/developer will be responsible for providing all completed forms and plan sets, as required, to the Public Utilities Department for submission to the Office of Drinking Water. Plans will not be submitted to the Office of Drinking Water until review has been completed by the Public Utilities Department. Applicability of this requirement will be determined by the Public Utilities Department during the initial plan review.
3. State of Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Water Resources, Surface Water Discharges Section - Prior to water and wastewater utility approval, the sanitary sewer system plans must be submitted to the Surface Water Discharges Section for review and approval. The owner/developer is responsible for providing all application fees, completed forms and plan sets directly to the Surface Water Discharges Section. Applicability of this requirement will be determined by the Public Utilities Department during the initial plan review.
4. State of Delaware Department of Transportation (DelDOT) District Public Works Section - All water and/or wastewater utility work proposed within State roads requires a utility permit to be issued by the District Public Works Section of the Department of Transportation. All completed forms and plan sheets required must be submitted to the Public Utilities Department representative at the Pre-Construction Meeting. All utility permit applications must be submitted directly by the utility.

5. The owner / developer is responsible for obtaining all permits necessary to complete the work required by the project. These include, but are not limited to, DNREC subaqueous lands / wetlands permits, US Army Corps 404 permits, sediment and stormwater permits and railroad crossing permits.

D. Time Line

The following chart is an organizational tool to better understand the process from pre-application meeting to plan approval through construction and dedication of utilities.

PROJECT TIME LINE

ACTION	BY	TIME FRAME
1. Pre-Application Meeting (Public Utilities)	Developer	Recommended
2. Application and Initial Plan Submission <ul style="list-style-type: none"> • Water / Wastewater Initial Plan Submission Checklist (Appendix A - required with all initial plan submissions) • Public Utilities submission; • Administrative review submission; or • Development Advisory Committee (DAC) submission 	Developer	n/a
3. Initial Plan Review	Public Utilities	4 weeks
4. Check Print Submission <ul style="list-style-type: none"> • Public Utilities submission 	Developer	n/a
5. Check Print Review	Public Utilities	4 weeks
6. Final Plan Submission <ul style="list-style-type: none"> • Water / Wastewater Final Plan Submission Checklist (Appendix B – required with all final plan submissions) • Public Utilities submission 	Developer	n/a
7. Final Plan Approval	Public Utilities Public Services Planning & Zoning (as required)	2 weeks (Public Utilities only)
8. Pre-Construction Meeting Request	Developer	n/a

PROJECT TIME LINE (continued)

ACTION	BY	TIME FRAME
9. Pre-Construction Meeting <ul style="list-style-type: none"> Submit Water / Wastewater Pre-Construction Meeting Checklist and Acceptable Materials Checklists to Public Utilities personnel at meeting 	Public Services or Public Utilities (as required)	1-2 weeks
10. Notice to Proceed <ul style="list-style-type: none"> Upon completion of all pre-construction meeting requirements. 	Public Services or Public Utilities	n/a
11. Construction	Developer	n/a
12. Inspections and Testing <ul style="list-style-type: none"> The Contractor must provide a minimum two (2) business days notification. 	Public Utilities	48 hours
13. Final Inspection Request	Developer	n/a
14. Final Inspection	Public Services or Public Utilities (as required)	1-2 weeks
15. Request for Public Infrastructure Acceptance <ul style="list-style-type: none"> Submit request and all required materials to the Public Services Manager and Water / Wastewater Manager 	Developer	n/a
16. Public Infrastructure Dedication	Public Services Public Utilities City Council	upon completion of all requirements

III. Plan Requirements

All plan submissions shall be neat and legible. The following are minimum requirements to be instituted for each plan submission and are subject to change. The Water / Wastewater Manager may waive certain plan requirements for certain projects if warranted by the scope of the project. In an effort to ensure complete plan submissions a checklist has been created to assist the submitter with meeting plan requirements. The Water / Wastewater Initial Plan Submission Checklist provided in Appendix A must be submitted with all initial plan submissions. Subsequent plan submissions will not be reviewed unless all previous comments have been clearly addressed within the plan set and accordingly identified within an itemized response letter.

A. General Plan Data

1. Sheet dimensions shall be no larger than twenty-four (24) by thirty-six (36) inches.
2. Plan sheets shall be at a scale no smaller than 1" = 60'. Index sheets shall be at a scale no smaller than 1" = 200'. (Whenever two (2) or more sheets are used to illustrate the plan view, an index sheet is required, illustrating the entire project on one (1) sheet.)
3. Location map at a scale of 1" = 400'.
4. Title block.
5. Plan date and all revisions dates.
6. North arrow, scale, datum and benchmark.
7. Name and address of owner, developer (if applicable) and engineer or surveyor.
8. Seal and license number of the professional engineer or surveyor including a certification as to the accuracy of the plan and survey.
9. Property lines of abutting land including property address and name of owner.
10. Existing and proposed boundaries of the property including easements and rights-of-way.
11. Existing and proposed contours at intervals of one foot or less as well as significant existing features. Finish floor elevations shall be included.

B. Utility Plan Data

1. A seven and one-half feet (7.5') wide public utility easement shall be provided along all side lot lines, to be unoccupied by buildings or other structures.
2. A fifteen feet (15') wide public utility easement shall be provided along all rear lot lines, to be unoccupied by buildings or other structures.
3. A ten feet (10') wide public utility easement shall be provided along all front lot lines, to be unoccupied by buildings or other structures.
4. All water and wastewater mains not located in the right-of-way shall be located within five feet (5') of the center of a twenty feet (20') wide public utility easement.
5. A master phasing plan must be provided for all projects to be constructed in phases. The phasing plan must be reflected throughout the plan set.
6. The size, type and location of all existing and proposed water mains, service lines, valves, fire hydrants and other appurtenances must be shown on the plan.
7. The size, length, slope, type, flow direction and location of all existing and proposed sanitary sewer mains and laterals must be shown on the plan. The size, type and location of all existing and proposed sanitary structures (including manholes, cleanouts, and pumping stations) must be shown on the plan. Rim and invert elevations must be labeled on all sanitary structures.
8. Profiles of all sanitary sewer mains must be provided on the plans. All water, sanitary sewer and storm sewer crossings, including services, must be shown on the profiles.
9. The proposed location of grease traps, if applicable, must be provided on the plans. In addition, a construction detail for the structure proposed must also be provided.
10. A materials listing table for all proposed water and wastewater utility infrastructure (including, but not limited to, water mains and services, fire hydrants, valves, sanitary sewer mains and laterals, and manholes) must be provided on the plan.
11. Utility schedules for all wastewater utility infrastructure and storm water infrastructure must be provided on the construction plans. At a minimum, the following must be included:
 - i. Sanitary Sewer Manhole Schedule: manhole number, rim elevation, diameter, depth, invert(s) in, and invert out.
 - ii. Sanitary Sewer Pipe Schedule: pipe number, size, material, length, slope, invert in, and invert out.

- iii. Storm Drain Manhole Schedule: manhole number, rim elevation, diameter, depth, invert(s) in, and invert out.
 - iv. Catch Basin Schedule: catch basin number, inlet box type or size, cover slab size, top unit type, frame/grate type, grate elevation, invert(s) in, and invert out.
 - v. Storm Drain Pipe Schedule: pipe number, size, material, length, slope, invert in, and invert out.
12. A public infrastructure dedication table listing all proposed water and wastewater utility infrastructure, storm water infrastructure, streets and alleys to be dedicated to the City of Dover must be provided on the construction plan. At a minimum, the following must be included:
- i. Length, material and size of water and sanitary sewer mains.
 - ii. Quantity, length, material and size of water services and sanitary sewer laterals (as measured to the right-of-way).
 - iii. Quantity of fire hydrants.
 - iv. Quantity and size of valves.
 - v. Quantity, size and vertical feet of manholes.
 - vi. Length, material and size of storm drain lines.
 - vii. Quantity, size and vertical feet of storm drain manholes and catch basins.
 - viii. Streets and alleys with stationing.

C. Standard Water / Wastewater Notes and Requirements

1. Hydrant connections by the contractor are prohibited. This method may not be utilized during any phase of the project.
2. The site contractor shall contact the City of Dover Public Utilities Construction & Inspections Manager at (302) 736-7070 prior to the start of construction. A representative from the City of Dover Public Utilities Department must observe and approve all water and sanitary sewer interconnections and testing. All water taps and sanitary sewer connections must be performed by a City of Dover approved contractor. The proposed location for the connection may need to be adjusted in the field due to conditions of the existing main. Possible conditions that would require tapping / connection relocation include proximity to pipe joints, other taps, concrete encasements, conflict with other utilities, and the like. Test holes must be performed by the contractor to determine the best tapping / connection location. The City of Dover will not be held responsible for field conditions requiring adjustment of the tapping /

connection location or for any work required by the contractor to make an appropriate and lawful connection.

3. All water and wastewater utility construction and materials shall meet all City of Dover standards and specifications as well as current requirements and practices.
4. All existing utilities shall be field verified prior to the start of construction.
5. All existing utilities shall be adjusted to grade, and repaired or replaced when deemed necessary by the Public Utilities Department, in all areas of disturbance associated with construction.
6. Any existing water or wastewater utility lines not to be utilized by the proposed project shall be properly abandoned at the mains by the developer / owner.
7. All non-metallic water lines (mains and services) shall be installed with a tracer wire and identification tape. The wire shall be a minimum of twelve (12) gauge blue coated solid copper wire, wrapped around the pipe, and extending up into all valve and curb boxes. The identification tape shall be six-inches (6") wide, laid one foot (1') above the pipe, with the following text: "Caution: Buried Water Line Below".
8. All non-metallic wastewater lines (mains and laterals) shall be installed with a tracer wire and identification tape. (Tracer wire is not required on gravity mains.) The wire shall be a minimum of twelve (12) gauge green coated solid copper wire, wrapped around the pipe. The identification detector tape shall be six-inches (6") wide, laid one foot (1') above the pipe, with the following text: "Caution: Buried Sewer Line Below".
9. Part II, Chapter 180, Article III, Section 180-10 of the Code of Kent County requires that "No person shall discharge or cause to be discharged any stormwater, surface water, uncontaminated groundwater, roof runoff, subsurface drainage, uncontaminated noncontact cooling water or unpolluted industrial process waters to any sanitary sewer", this shall include condensate. Section 110-231 of the City of Dover Code defines storm sewer as "...any system used for conveying rain water, surface water, condensate, cooling water or similar liquid wastes, exclusive of sewage." The contractor, developer, owner and designers shall ensure during construction that no illegal discharges to the sanitary sewer system are created as a result of the site improvements.
10. No trees may be planted within ten feet (10') of water and wastewater utility infrastructure.
11. No structures, including permanent signage, may be located within ten feet (10') of water and wastewater utility infrastructure.
12. Water and wastewater lines may not be located near any potential source of contamination.

IV. Design and Installation Standards

A. General

All water and wastewater utility construction and materials shall meet all City of Dover standards and specifications as well as current requirements and practices. In addition to the standards and specifications contained herein, the following are incorporated by reference. In the event of a conflict, the most stringent requirement shall apply.

1. City of Dover, Delaware Code of Ordinances and Charter, as revised
2. American Water Works Association (AWWA) Standards, as revised
3. Recommended Standards for Water Works, as revised (Ten States Standards)
4. Recommended Standards for Wastewater Facilities, as revised (Ten States Standards)
5. Delaware Department of Transportation Utilities Manual, as revised
6. Kent County, Delaware Code of Ordinances, Part II, Chapter 180 Sanitary Standards, as revised
7. State of Delaware Administrative Code, Title 7, Section 7200 Surface Water Discharge Section, as revised
8. State of Delaware Administrative Code, Title 16, Section 4462 Public Drinking Water Systems, as revised
9. Delaware State Fire Prevention Regulations, as applicable, as revised
10. American National Standards Institute (ANSI) standards, as applicable, as revised
11. American Society for Testing and Materials (ASTM) / ASTM International standards, as applicable, as revised

B. Water

1. Design Requirements

- i. Sizing calculations must be submitted for all water mains, as required by the Public Utilities Department.
- ii. Design Capacities
 - In general, water lines shall be designed for the estimated contributory demand to be served in the future as defined by the Public Utilities Department.

- Provisions shall be made to extend water service / mains to all adjoining properties, parcels or lots, regardless of ownership or control of adjoining properties, parcels or lots, as required by the Public Utilities Department.
 - The design of extensions to the existing water system shall be based on data if adequate records are available. In the event that adequate records are not available, or when new systems are being established, the design criteria shall not be less than 250 gpd per equivalent dwelling unit (EDU).
- iii. Sizing calculations must be submitted for all water service lines greater than one-inch (1”).
 - iv. Water usage projections (peak flows and plumbing fixture data) must be submitted for all uses other than single-family dwellings. Projections for domestic use and irrigation (if applicable) must be provided. All meters will be sized by the Public Utilities Department. Meter sizes must be provided on all plans prior to approval.
 - v. Any other data determined during review to be necessary to justify the design.
 - vi. All water mains located within public right-of-ways shall be offered for dedication to the City of Dover and thereafter will be maintained by the City of Dover.
 - vii. The owner / developer is responsible for all costs associated with all water infrastructure upgrades or extensions required to provide adequate fire and domestic service and capacity in relation to the project proposed.
 - viii. Connections and Taps
 - All connections / taps to existing water mains shall be performed by the Public Utilities Department or by an approved utility contractor.
 - All connections / taps required for Site Plan and Subdivision projects shall be completed by the Developer, at his / her expense, through an approved utility contractor in accordance with the approved plans.
 - All connections / taps required for existing, developed residential lots shall be performed by the Public Utilities Department, or by an approved utility contractor, as determined by the Department. When work is to be performed by the Public Utilities Department, the property owner shall submit the necessary funds, prior to installation, to the City of Dover for all labor, material and equipment required to install new connections from the main to the curb stop. The charge for making a

water tap and installing a service line to and including the curb box shall be in accordance with a schedule set by City Council and set forth in the rules and regulations of the water system. These charges shall be due and payable prior to installation.

2. Infrastructure Components

i. All materials shall be in conformance with the Acceptable Water Materials Checklist provided in Appendix D.

ii. *Water Mains*

- The minimum size for all water mains shall be eight-inches (8”).
- Larger mains may be required to meet service requirements. This shall be determined by the Public Utilities Department and conveyed during the plan review process.
- All water mains shall be cement lined Class 52 ductile iron pipe. All ductile iron pipe shall be in accordance with AWWA C151, latest revision (ANSI A21.51) and shall be in eighteen to twenty feet (18'-20') lengths with single rubber gasket (push-on) joints in accordance with AWWA C111, latest revision (ANSI A21.11). All Class 52 ductile iron pipe shall be in accordance with AWWA C150, latest revision (ANSI A21.50).
- A minimum of forty-eight inches (48”) of cover shall be provided over all water mains.
- Water mains shall be located under the street, a minimum of four feet (4') horizontally from the face of the curb.
- A minimum ten feet (10') horizontal and eighteen-inch (18”) vertical separation, as measured from the outside of each pipe, shall be provided for all water mains from sanitary sewer (gravity lines and force mains). This shall be the case whether the water main is above or below the sewer. Wherever possible the sewer shall be beneath the water main. Crossings shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.
- A minimum eighteen-inch (18”) vertical separation, as measure from the outside of each pipe, shall be provided for all water mains from storm sewer. Due to the limiting width of some streets, the horizontal separation between all water mains and storm sewer shall be provided to the maximum extent possible. When feasible, a minimum ten feet (10') horizontal separation, as measured from the outside of each pipe,

shall be provided for all water mains from storm sewers in accordance with Ten States Standards.

- Water mains shall have a minimum of eighteen-inch (18") clearance from electric lines, gas mains, and all other utilities.
- No water line (mains, services, etc.) shall pass through or come in contact with any part of a sewer manhole.
- All water mains must be looped. Dead end mains are not permitted. The utility plan must incorporate the appropriate termination valves on the water system between construction phases.

iii. *Division Valves and Boxes*

- The maximum spacing between division valves shall be 800 feet.
- Valves shall be provided at all water main intersections. The quantity of valves shall be as determined necessary by the Public Utilities Department to properly maintain and operate the water system.
- Sufficient valves shall be provided to ensure that inconvenience and hazards are minimized during repairs and to allow for effective flushing and other maintenance practices.
- All valves shall be right hand, resilient wedge gate valves.
- Valve stem extensions shall have a two-inch (2") square operating nut and self-centering rock plate support. Valves with an operating nut more than four feet (4') below grade shall have a valve stem extension to raise the operating nut to within three feet (3') of the ground surface.
- Valves shall be set vertical with a cast iron valve box provided for each valve.
- Valve boxes shall be centered and plumbed over the operating nut. The valve box may not transmit shock or stress to the valve. All valve boxes shall be set to the required grade (final grade).
- Screw type adjustable valve boxes shall be adjusted to final grade by excavating around the valve box, as necessary, and turning it to achieve the required grade. Drop in valve box riser rings are not allowed.

iv. *Fire Hydrants*

- The minimum size for all fire hydrant leads shall be six-inches (6").
- The maximum spacing between fire hydrants shall be 600 feet, as measured along the curb.

- Fire hydrants shall be placed between the curb and sidewalk at intersections or centered on lot lines.
- The minimum spacing between fire hydrants and hydrant valves shall be fifteen feet (15'). (See construction detail W-3.)
- All hydrant valves shall be right hand, resilient wedge gate valves.
- Fire hydrants shall be set to stand plumb with the nozzles parallel with or at right angles to the curb. The steamer nozzle shall face the curb.

v. *Fire Mains*

- All structures requiring provision of a sprinkler system shall be served with a combined, minimum eight-inch (8") fire/domestic service.
- The domestic water service shall be tapped off the fire/domestic service line within five to ten feet (5'-10') of the building. (This distance may be expanded to allow adequate room for meter installation.)
- A valve must be provided at the tee on the domestic water service line to isolate it from the fire main.
- The proposed restraining system for the fire main located within the buildings must be clearly shown on the plans. The Public Utilities Department will test and inspect all fire mains to a blind flange located inside the buildings. The blind flange with tap is used for hydrostatic pressure testing (200 psi for two (2) hours) and dechlorination. The flange must be restrained in the direction of the pipe entering the building. A pipe entering horizontally through a wall sleeve shall be restrained with rods through the wall. A pipe entering vertically through a slab shall be restrained through the floor to the ninety degree (90°) bend and thrust block. All rods shall be a minimum of ¾" all thread. All pipes through walls and slabs must be Class 52 cement lined ductile iron pipe.

vi. *Service Lines*

- The minimum size of all water service lines shall be one-inch (1").
- Water service lines, from the main to the meter pit, shall extend perpendicular to the main.
- Water service lines shall be installed five feet (5') to the right of the sewer lateral as viewed from the center line of the street (or as per the most recent Plumbing Code adopted by the City of Dover). This requirement may be waived by the Water / Wastewater Manager for non-residential applications if deemed appropriate.

- Each property shall be served by a single water service line which shall be furnished and installed by the property owner. In the event a property contains multiple principle structures, such as shopping centers or apartment complexes, the property shall be served by a single water main where a water service line may be provided to each principle structure. Each structure, which is capable of being offered for sale, shall have its own separate water facilities.

vii. *Curb Stops and Boxes*

- Curb stops shall be installed one foot (1') outside of the right-of-way or easement line for each lot, in a non-traffic bearing location.
- Curb boxes shall be centered and plumbed over the curb stop. The curb box may not transmit shock or stress to the curb stop. All curb boxes shall be set to the required grade (final grade).

viii. *Water Meters*

- Each water service line from the main to a property or principle structure shall be metered by a single water meter so as to control the entire domestic supply.
- The Public Utilities Department shall determine the size, location, and type of meter to be used for all applications.
- All water meters shall be installed outside, in a meter pit or vault, on the domestic water service, in a non-traffic bearing location (which includes vehicular, bicycle and pedestrian traffic). Meter pits shall be located within two feet (2') of the right-of-way or easement line. In cases where water mains are not located along the street frontage, or in non-residential settings, the location of the meter pit or vault shall be determined by the Public Utilities Department. The size, type and dimensions of the pit or vault shall be approved by the Public Utilities Department and shall give adequate access to the meter and permit its installation, removal and maintenance.
- All meter pits and vaults shall be set to the required grade (final grade).
- All meter vaults shall be pre-cast or cast-in-place reinforced concrete. Appropriate piping support and an access hatch centered over the meter must be provided. All vaults deeper than four feet (4') must also be provided with a ladder.
- All water meters, regardless of location, shall be accessible to the Public Utilities Department and City of Dover meter reading personnel, at all

times. This requirement applies to all meters, existing and proposed, regardless of location prior to the effective date of this Handbook. All meters shall have a minimum clear area around the meter of three feet long by three feet wide by six feet high (3'L x 3'W x 6'H) for accessibility purposes. Existing non-pit meters shall not be blocked from access by walls, equipment or any other materials.

- All water meters must be installed per manufacturer's recommendations. All interior installations, should interior meter replacement be permitted by the Public Utilities Director, shall be in a horizontal position with the register upright and not more than twenty-four inches (24") above the floor line. (New interior meter installations are not permitted.) All meter pit or vault installations shall have the meter register located not more than twelve-inches (12") or less than six-inches (6") below finished grade. The Water / Wastewater Manager may approve additional distance between the meter register and finish grade only if determined necessary due to the size of the meter.
- In the event that an irrigation system is to be installed at a property, a dual meter pit shall be required to house both the irrigation service and the domestic service.
- All meters shall be installed with backflow prevention. At a minimum, this shall consist of an angle ball valve at the inlet and an angle cartridge dual check valve at the outlet. Vault meters shall be provided with an outside screw and yoke (OS&Y) valve at the inlet and a dual check valve at the outlet. In addition, all installations, regardless of location, shall include the most current remote metering devices in use by the City at the time of installation.

3. Installation Requirements

- i. All installations shall be in conformance with the Construction Details provided in Appendix H.
- ii. All existing utilities shall be field verified prior to the start of construction.
- iii. All existing utilities shall be adjusted to grade, and repaired or replaced when deemed necessary by the Public Utilities Department, in all areas of disturbance associated with construction.
- iv. Any existing water utility lines not to be utilized by the proposed project shall be properly abandoned at the mains by the developer / owner.

v. Excavation and Trenching

- The bottom of the trench shall be cut true and even so the barrel of the pipe will have a bearing for the full length to provide a minimum cover of four feet (4') from finished grade and shall be excavated to such a depth as will provide pipe elevations as indicated on the plans.
- The Contractor shall keep all excavation free from water or other liquids during the progress of the work.
- The trenches for water service connections shall be excavated to the minimum standard depth or to such depth as required to connect to existing mains or service pipes.
- No water service lines shall be laid in the same trench with gas pipe, storm drain or sanitary sewer pipe or within three feet (3') of any open excavation or vault.

vi. Bedding

- Continuous and uniform bedding shall be provided in the trench for all buried pipe. Stones found in the trench shall be removed for a depth of at least six inches (6") below the bottom of the pipe.
- The pipe shall be laid in the trench and secured in place with compacted backfill up to the crown of the pipe thus ensuring adequate support for the entire circumference of the pipe. Twenty-four inches (24") of uncompacted backfill cover shall then be laid above the pipe to adequately protect the pipe before further compaction layers. Trench backfill shall then be placed and compacted in eight-inch (8") minimum and twelve-inch (12") maximum lifts.
- Trench compaction shall be 95% maximum dry density. Compaction shall be tested once per lift for each run of pipe.

vii. Installation of Pipe and Fittings

- The laying and jointing of water main shall be in accordance with all applicable standards and manufacturer's recommendations.
- All pipe and fittings shall be thoroughly cleaned before laying and shall be kept clean until acceptance of work.
- At the end of each work day, the end of the pipe shall be tightly closed to prevent dirt, foreign substances or small animals from entering the line.
- Pipe and fittings shall be carefully handled and lowered into the trench. Special care shall be taken to make sure all pipes are well bedded on a

solid foundation. Any defects due to settlement shall be corrected by the Contractor at his/her expense.

- Where the manufacturer's recommended pipe joint deflection is exceeded, mechanical joint bends shall be required and installed to the satisfaction of the Public Utilities representative.
- Thrust blocks of Portland Cement Concrete Class B of adequate size and weight shall be used on all pressure piping for all fittings and all bends, including and in excess of eleven and one-quarter degrees (11-1/4°) unless specifically called for otherwise on the plan. Thrust blocks (buttresses) shall conform to the details shown on the plan and/or construction details contained herein.
- All tapping sleeves, tees, bends, plugs and hydrants shall be provided with reaction blocking, tie rods and retainer glands designed to prevent movement.
- No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Public Utilities representative shall deem there is danger of frost penetration at the bottom of the excavation, unless all requirements as to the minimum length of open trench and promptness of refilling are observed.

C. Wastewater

1. Design Requirements

- i. Sizing (flow) calculations must be submitted for all sanitary sewer mains showing that velocity and all other requirements are met. Any projected future flow requirements must be clearly identified.
- ii. Design Capacities
 - In general, sewer lines shall be designed for the estimated contributory population to be served in the future, plus adequate allowance for infiltration, institutional and industrial flows for the basin as defined by the Public Utilities Department.
 - Provisions shall be made to extend sewer service to all adjoining properties, parcels or lots, regardless of ownership or control of adjoining properties, parcels or lots.
 - The maximum hourly quantity of domestic wastewater, maximum hourly quantity of wastewater from industrial plants and groundwater

infiltration shall be considered in determining the capacities of sanitary sewers.

- The design of extensions to existing wastewater collection systems shall be based on data if adequate records are available. In the event that adequate records are not available, or when new systems are being established, the design criteria shall not be less than 250 gpd per equivalent dwelling unit (EDU).
- Laterals shall be designed, when flowing full, assuming flow equivalent to three (3) times the average daily flow. Main sewers shall be designed based on Ten States Standards as represented by the following equation:

$$Q_{\text{peak hourly}}/Q_{\text{design avg}} = (18 + [P]^{1/2}) / (4 + [P]^{1/2})$$

where: $Q_{\text{peak hourly}}$ = maximum rate of wastewater flow
(peak hourly flow)

$Q_{\text{design avg}}$ = design average daily wastewater flow

P = population in thousands

- iii. Sizing (flow) calculations must be submitted for all sanitary sewer laterals (other than for single-family dwellings) showing that velocity and all other requirements are met.
- iv. Any other data determined during review to be necessary to justify the design.
- v. All sanitary sewer mains located within public roadways shall be offered for dedication to the City of Dover and thereafter will be maintained by the City of Dover.
- vi. The owner / developer is responsible for all costs associated with all wastewater infrastructure upgrades or extensions required to provide adequate service and capacity in relation to the project proposed.
- vii. Connections and Taps
 - All connections / taps to existing sanitary sewer mains shall be performed by the Public Utilities Department or by an approved utility contractor.
 - All connections / taps required for Site Plan and Subdivision projects shall be completed by the Developer, at his / her expense, through an approved utility contractor in accordance with the approved plans.
 - All connections / taps required for existing, developed residential lots shall be performed by the Public Utilities Department, or by an

approved utility contractor, as determined by the Department. When work is to be performed by the Public Utilities Department, the property owner shall submit the necessary funds, prior to installation, to the City of Dover for all labor, material and equipment required to install new connections from the main to the cleanout. The charge for making a sanitary sewer tap and installing a lateral to and including the cleanout shall be in accordance with a schedule set by City Council and set forth in the rules and regulations of the wastewater system. These charges shall be due and payable prior to installation.

2. Infrastructure Components

- i. All materials shall be in conformance with the Acceptable Wastewater Materials Checklist provided in Appendix E.
- ii. *Sanitary Sewer Mains*
 - The minimum size for all sanitary sewer mains shall be eight-inches (8").
 - All sanitary sewer mains shall be designed and constructed to give mean velocities, when flowing full or half full, of not less than two feet per second (2 ft/s) as per Ten States Standards. Full flow velocities shall not exceed ten feet per second (10 ft/s).
 - The minimum slopes for sanitary sewer mains shall be as follows (or as revised by current Ten States Standards):

Nominal Sewer Size	Minimum Slope (feet/foot)
Eight-inch (8")	0.0040
Ten-inch (10")	0.0028
Twelve-inch (12")	0.0022
Fifteen-inch (15")	0.0015
Eighteen-inch (18")	0.0012
Twenty-one inch (21")	0.0010
Twenty-four inch (24")	0.0008
Twenty-seven inch (27")	0.00067
Thirty-inch (30")	0.00058
Thirty-six inch (36")	0.00046

- Larger mains may be required to meet service requirements. This shall be determined by the Public Utilities Department and conveyed during the plan review process.
- Main sewers shall be designed at minimum slope and maximum depth.
- A minimum of three feet (3') of cover shall be provided over all sanitary sewer mains.
- Sanitary sewer mains shall be located under the street, a minimum of four feet (4') horizontally from the face of curb.
- A minimum ten feet (10') horizontal and eighteen-inch (18") vertical separation, as measured from the outside of each pipe, shall be provided for all water mains from sanitary sewer (gravity lines and force mains). This shall be the case whether the water main is above or below the sewer. Wherever possible the sewer shall be beneath the water main. Crossings shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.
- Sanitary sewer mains shall have a minimum of eighteen-inch (18") clearance from drains, electric lines, gas mains, and all other utilities.
- Poly Vinyl Chloride (PVC) pipe shall be used for gravity sanitary sewer eight-inch (8") through fifteen-inch (15") diameter with a maximum cover of eighteen feet (18'). PVC pipe shall conform to the size, standard dimension ratio (SDR) and strength requirements of ASTM D-3034 and ASTM F-679. The grade used shall be resistant to aggressive soils or corrosive substances in accordance with the requirements of ASTM D-543. SDR35 pipe shall be used for depths to twelve feet (12'). SDR26 pipe shall be used for depths from twelve feet to eighteen feet (12' – 18').
- All PVC gravity sanitary sewer pipe and related fittings shall be manufactured in accordance with ASTM C3034, SDR 35 and/or SDR 26, Type PSM polyvinyl chloride wastewater pipe and fittings. PVC gravity sewer pipe shall be supplied in twelve and one-half feet (12.5') lengths with bell-and-spigot joints. All fittings shall use rubber gaskets which conform to the requirements of ASTM F477.
- Ductile iron pipe (DIP) shall be used for all sanitary sewer lines with a maximum cover greater than eighteen feet (18'). The DIP and fittings used in sanitary sewer construction shall be mechanical joint and conform to the applicable dimensions and tolerances of ANSI A21.50 and A21.51. Unless otherwise specified, DIP shall conform to ANSI

A21.51 standard thickness class 53. Every pipe and fitting shall be tar coated on the outside and shall be cement lined on the inside. Cement mortar lining shall be in accordance with ANSI A21.4. An approved water stop gasket shall be used at manhole connections as directed by the Public Utilities representative. DIP shall be grade 60-42-10 with 40/90 metal strength and shall be tested in accordance with ASTM A339. Fittings for ductile iron pipe shall conform to ANSI A21.10. Twelve-inch (12") lines and smaller shall be Class 250. Sixteen-inch (16") lines and larger shall be Class 150.

- All DIP shall be supplied in eighteen to twenty feet (18'-20') lengths with single rubber gasket (push-on) joints in accordance with ANSI A21.11/AWWA C111.

iii. *Manholes*

- One-tenth of a foot (0.1') drop must be provided across all manholes.
- The maximum spacing between manholes shall be 400 feet.
- Manholes shall be placed at the points of all changes in alignment, grade or size of sewer, intersection of sewers, and junction of streets.
- Watertight manholes are required at all times.
- Manhole frame covers may only be adjusted to finish grade with a maximum of twelve-inches (12") of non-porous, "red sewer" brick above the manhole cone. Additional adjustment will require the replacement of manhole sections or reconstruction of the cone.
- Adjustable rings may not be used.
- Flow channels shall be made to conform as closely as possible to the shape of the connecting sewers to not obstruct maintenance, inspection or flow in the sewers. Concrete channels shall be smooth and semi-circular in section. When brick channels are used, the invert shall be brick laid on edge. Precast channels may be utilized with the approval of the Public Utilities Director with the understanding that if the alignment of flow is off, the channel must be removed and a brick channel installed to correct the flow alignment.
- All manhole frames and covers shall be installed flush to the pavement, or to final grade if located outside of the roadway.
- Manholes shall be State of Delaware Department of Transportation certified. Manholes shall be manufactured in accordance with ASTM C478-80 and shall be precast with monolithic base and eccentric cone.

All manholes with a four foot (4') inside diameter shall have five-inch (5") thick walls. All manholes with a five foot (5') inside diameter shall have six-inch (6") thick walls.

- Manholes shall be waterproofed on the exterior with a bituminous coating. Inlet and outlet pipes shall be joined to the manhole with a gasketed flexible watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place. Connections to existing manholes shall be made by core drilling and a water tight pipe to manhole connector must be used.
- A drop manhole should be provided for a sewer entering a manhole at an elevation of twenty-four inches (24") or more above the manhole invert. If the drop is less than twenty-four inches (24"), the invert should be filleted to prevent the deposit of solids.
- All manholes over fourteen feet (14') deep (top of rim to lowest point) shall be at least five feet (5') in diameter. All manholes with twenty-one inch (21") or larger pipes shall be at least five feet (5') in diameter. The standard joint shall be sealed with hydraulic cement meeting ASTM C109 specifications. "O" ring joints shall conform to the requirements of ASTM C443. A neoprene rubber flexible gasket shall be cast in the manholes to tie the pipe to the manhole, in new manhole applications.
- All manholes deeper than four feet (4') shall have steps. Manhole steps will be press set plastic, or approved equal. Steps will also be provided on the outside of raised manholes when the top elevation is greater than three feet (3') above the existing ground elevation. Raised manholes shall also be provided with a slab top to provide adequate work area for access, maintenance and inspection purposes.
- All industrial discharges shall provide an easily accessible monitoring manhole. All discharge from the property must pass through one monitoring manhole before entering the public sewer system.
- Manholes in flood plains shall extend two feet (2') above the 100-year flood elevation or be provided with sealed covers.
- All manhole frames and covers for new installations shall be of the hinged, locking variety.
- "Dog house" manholes are not permitted. In the event a manhole is required on an existing line, a standard manhole must be installed on the line in conjunction with bypass pumping operations.

iv. Laterals

- The minimum size of all sanitary sewer laterals shall be six-inch (6").
- The minimum slope for all sanitary sewer laterals shall meet the current plumbing standard accepted by the City of Dover, typically 0.0104 feet/foot for a six-inch (6") sewer lateral.
- Sanitary sewer laterals, from the main to the first cleanout located one-foot (1') outside the right-of-way or easement line, shall extend perpendicular to the main.
- Sanitary sewer laterals shall be installed to the center of each lot. This requirement may be waived by the Water / Wastewater Manager for non-residential applications if deemed appropriate.
- Sanitary sewer laterals shall be connected directly to the main, not manholes, unless impracticable, as determined by the Public Utilities Department.
- Sewer laterals are to be installed to one foot (1') beyond the right-of-way line at a typical depth of three feet (3'), preferably not exceeding five feet (5').
- Each property shall be served by a single sanitary sewer lateral which shall be furnished and installed by the property owner. In the event a property contains multiple principle structures, such as shopping centers or apartment complexes, the property shall be served by a single sanitary sewer main where a sanitary sewer lateral may be provided to each principle structure. Each structure, which is capable of being offered for sale, shall have its own separate wastewater facilities.

v. Cleanouts

- Cleanouts must be installed on sanitary sewer laterals within five feet (5') of the building, one foot (1') outside of the right-of-way and at all bends. The maximum spacing between cleanouts shall be 100 feet.
- All cleanouts shall be constructed with a wye connection. Tee connections are not acceptable.
- A supporting, twelve-inch (12") diameter concrete collar must be provided in accordance with the Standard Details.
- Cleanouts located within a traffic bearing location shall be installed with a heavy duty cast iron frame and cover to prevent damage to the cleanout and lateral. Applicable material is provided by East Jordan Iron Works, part number 1566.

vi. *Grease Traps*

- All structures containing food service facilities require the installation of a minimum 1,000 gallon, two chamber grease trap.
- All grease traps shall meet all current Kent County, Delaware Code of Ordinances requirements (Article III, § 180-13)

3. Installation Requirements

- All installations shall be in conformance with the Construction Details provided in Appendix H.
- All existing utilities shall be field verified prior to the start of construction.
- All existing utilities shall be adjusted to grade, and repaired or replaced when deemed necessary by the Public Utilities Department, in all areas of disturbance associated with construction.
- Any existing wastewater utility lines not to be utilized by the proposed project shall be properly abandoned at the mains by the developer / owner.
- Excavation and Trenching*
 - The bottom of the trench shall be cut true and even so the barrel of the pipe will have a bearing for the full length to provide a minimum cover of three feet (3') from finished grade and shall be excavated to such a depth as will provide pipe elevations as indicated on the plans.
 - The Contractor shall keep all excavation free from water or other liquids during the progress of the work.
 - The trenches for sanitary sewer lateral connections shall be excavated to the minimum standard depth or to such depth as required to connect to existing mains or service pipes.
- Bedding*
 - Continuous and uniform bedding shall be provided in the trench for all buried pipe. Stones found in the trench shall be removed for a depth of at least six inches (6") below the bottom of the pipe.
 - The pipe shall be laid in the trench and secured in place with compacted backfill up to the crown of the pipe thus ensuring adequate support for the entire circumference of the pipe. Twenty-four inches (24") of uncompacted backfill cover shall then be laid above the pipe to adequately protect the pipe before further compaction layers. Trench

backfill shall then be placed and compacted in eight-inch (8") minimum and twelve-inch (12") maximum lifts.

- Trench compaction shall be 95% maximum dry density. Compaction shall be tested once per lift for each run of pipe.

vii. *Installation of Pipe and Fittings*

- All sanitary sewer mains shall terminate at manholes between construction phases. This may require sewer lines to extend beyond proposed phase lines to the next manhole.
- For any connection to an existing sanitary sewer manhole, the manhole must be core drilled and a water tight pipe to manhole connector must be used. The connector must be approved by the Public Utilities Department prior to installation. The existing manhole flow channel shall be reconstructed accordingly.
- The laying and jointing of sanitary sewer main shall be in accordance with all applicable standards and manufacturer's recommendations.
- All pipe and fittings shall be thoroughly cleaned before laying and shall be kept clean until acceptance of work.
- At the end of each work day, the end of the pipe shall be tightly closed to prevent dirt, foreign substances or small animals from entering the line.
- Pipe and fittings shall be carefully handled and lowered into the trench. Special care shall be taken to make sure all pipes are well bedded on a solid foundation. Any defects due to settlement shall be corrected by the Contractor at his/her expense.
- No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Public Utilities representative shall deem there is danger of frost penetration at the bottom of the excavation, unless all requirements as to the minimum length of open trench and promptness of refilling are observed.
- When making a lateral connection directly to an existing main line, the following shall apply: on PVC main, cut hole in pipe using appropriate saw, glue and Geneco (or approved equal) service saddle over hole.

D. Wastewater – Pumping Stations

1. Design Requirements

- i. The Public Utilities Department shall determine during the initial plan review phase as to whether pumping stations are to be offered for dedication to the City of Dover or remain private. All stations dedicated to the City will be maintained by the City of Dover and shall be turned over to the City immediately following final acceptance.
- ii. A hydraulic system analysis shall be provided for each pumping station including force mains. It shall include the calculation of the system-head curves and the use of these curves in conjunction with the characteristic curves of available pumps. The criteria provided in C.1.ii. for average and peak flow shall be used to determine the influent peak flow.
- iii. Any other data determined during review to be necessary to justify the design.
- iv. The owner / developer is responsible for all costs associated with all wastewater infrastructure upgrades or extensions required to provide adequate service and capacity in relation to the project proposed.

2. Infrastructure Components

- i. All materials shall be in conformance with the Acceptable Wastewater Materials Checklist provided in Appendix E, the Acceptable Wet Well/Dry Well Pump Station Materials Checklist provided in Appendix F, and the Acceptable Vacuum Primed Pump Station Materials Checklist provided in Appendix G.
- ii. *General*
 - In the selection of a site for a pumping station, consideration shall be given to its accessibility and its potential nuisance aspects. The station shall not be subject to flooding. The 100-year flood plain elevation and stormwater management pond elevation must be shown on the plan when adjacent to the station. All equipment, electrical and mechanical structures shall be located above the 100-year elevations. The station shall be accessible during all types of weather with mobile equipment. Stations shall be located at the lowest elevation including adjoining areas. Adequate provisions must be made for continuous operation, and for emergency treatment or storage of the wastewater in the event of an unanticipated breakdown of the pumping station facilities or power failures.

- All pump stations to be dedicated to the City of Dover shall be located on lots to be dedicated to the City of Dover. Stations may be located within permanent public utility easements if site limitations exist with approval from the Public Utilities Director.
- All pump station sites shall include a paved driveway, fencing along the perimeter of the site with a twelve feet (12') double gate, and either stone covering of entire site or landscaping as determined appropriate by the Water / Wastewater Manager based upon the size of the station.
- In general, all pumping stations shall be Wet Well / Dry Well Stations or Smith & Loveless Vacuum Primed Stations. Grinder pump stations shall be reserved primarily for single-family dwellings. Exceptions may be made with the approval of the Water / Wastewater Manager. Ejector stations are not permitted.
- Ventilation shall be provided for all pumping stations, including both wet wells and dry wells. Mechanical ventilation shall be provided for all dry wells where equipment is located. The ventilating system and lights shall be turned on by a switch located near the entrance, as well as automatic, when feasible. The ventilation system of the wet well and dry well of the station should be entirely separate, provide positive ventilation and conform to Ten State Standards. All openings for pipes or electric cables shall be caulked gastight. All pumping stations, except those entirely below ground, shall be supplied with automatically controlled heaters to prevent freezing in cold weather.
- On stations pumping a minimum of 500,000 gpd, a channel grinder shall be provided prior to the wastewater being pumped. The Muffin Monster by JCM Environmental, or approved equal, shall be specified. A bypass channel with a manually cleaned bar screen with openings not exceeding two and one-half inches (2-1/2") shall be provided where channel grinders are utilized to provide screening while maintenance is performed on the channel grinder. Manually cleaned screens should be provided with stairway access, adequate lighting and ventilation, and convenient and adequate means for removing screenings. If there is not adequate room in the wet well for a channel grinder, a separate station should be used.
- Three (3) copies of station manuals and all other equipment manuals for operations and maintenance shall be provided to the City of Dover.

iii. Pumps and Valves

- Except where grinder pumps are used in order to minimize clogging, open impeller or non-clog-type pumps capable of passing spheres of at least three-inches (3") in diameter shall be provided.
- At least two (2) pumps shall be provided at all pumping stations. If no more than two (2) pumps are provided, both should have the same capacity and each shall be capable of pumping the maximum flow with the standby pump out of service. It is desirable for three (3) or more pumps to be provided which are designed for actual flow conditions and of such capacity that with any one (1) pump out of service, the remaining will be of sufficient capacity to handle maximum flows.
- Each pump shall have an individual flow intake and suction line. Wet well design should be such as to avoid turbulence near the intake. Intake piping shall be a minimum of four-inches (4") and shall be as straight and short as possible.
- Full-closing shutoff valves shall be placed on the suction line of each pump except on vacuum primed pumps. Suitable shutoff and check valves shall be placed on the discharge line of each pump. The check valve shall be located between the shutoff valve and the pump. Valves shall be capable of withstanding normal pressure and water hammer. Valves shall not be located in the wet well.
- In the event that all pumps are inoperable and must be pulled for service a shutoff valve shall be provided downstream of the discharge header and a blind flange provided on the discharge header or between this shutoff valve and the individual pump shutoff valves.

iv. Electrical and Emergency Power Supply

- Three-phase, two-hundred-and-eight-volt (3P, 120/208V Grounded Y) service is recommended for use at stations requiring less than forty horsepower (40 hp) motors. Where the stations have higher horsepower requirements, three-phase, four-hundred-eighty-volt (3P, 277/480V Grounded Y) service is required.
- The power panel shall typically include the meter pan, main breaker, transfer switch (based upon generator type), generator hook-up (based upon generator type), and a separate breaker for the RTU and radio to be fed by normal power only.
- All stations shall have a minimum ninety-five percent (95%) power factor.

- All pumping stations, except for single-family dwelling grinder pump stations, shall be provided with emergency power supply. Portable generator hookups and manual transfer switches and electric outlets will be accepted for stations with a capacity of less than fifty (50) gpm. Larger stations shall be provided with on-site emergency power generation equipment and an automatic transfer switch. The automatic transfer switch shall be provided with a bypass to allow for service of the switch without shutting down the station. All on-site emergency power generation equipment shall be provided with diesel engines and comply with all federal, state and local regulations. Generator fuel storage tanks shall be double walled, above ground and sized for forty-eight (48) hours of operation at full load. The fuel tank shall be filled prior to acceptance and a diesel fuel stabilizer added when appropriate for the size of the tank. The on-site emergency power generation equipment shall also be provided with a critical silencer / muffler, weatherproof housing, battery charger, block heater and standard monitoring and control panel. The installation shall be on a concrete pad and in accordance with the manufacturer's written requirements and recommendations.

v. *SCADA and Alarms*

- All stations shall be provided with a remote telemetry unit (**RTU**) that shall be a panel-mount TG5700 RTU TELEGYR 5700.
- The **RTU Station Manager** shall be equipped with RS232 Master Station communication port equipped with TG6500 communication protocol, RS485 I/O LAN communication port, and maintenance/diagnostic communication port.
- The **RTU Combination Controller Card** shall consist of eight (8) status/SOE/accumulator input points, six (6) bipolar DC analog input points, and four (4) trip/close point of on board (expandable to thirty-two (32) with add-on relay assemblies).
- **General requirements of the RTU** shall also include: SBO controller for management of communications on I/O LAN; 125 VDC/120 VAC power converter (100 watts); a 120 VAC battery charger with battery cables and two (2) twelve volt (12V), seventeen amp hour (17AH) batteries; mounting panel measuring twenty-inches high by twenty-inches wide (20"H x 20"W); null modem cable to connect Station Manager to MDS radio; and configuration/maintenance hardware manual.

- The **radio** shall be a Microwave Data Systems MDS 9710, 900 mHz SCADA radio. A battery charger with a twelve volt (12V), seven amp hour (7AH) battery shall be provided. An antenna shall be mounted on a pole of sufficient height to allow reliable communications with the Public Utilities Department's master station.
- The RTU **cabinet** shall be a NEMA 4X cabinet, thirty-six inches high by thirty-inches wide by eleven-inches deep (36"H x 30"W x 11"D). The cabinet shall include a communications/power interface panel and heater.
- The alarm system shall be activated in cases of power failure, pump failure or any cause of pump station malfunction as determined by the Public Utilities Department. Alarms shall be connected to Public Utilities System Operations.

vi. *Metering and Controls*

- A magnetic flow meter and a seven-day circular, or strip, chart recorder shall be provided at all pumping stations deemed necessary by the Public Utilities Department. The flow meter shall provide flow totalization and digital instantaneous flow rate in gpm. The flow tube shall be sealed and suitable for continuous submergence. The magnetic flow meter primary device shall not be located in the wet well. The primary device shall be located in the dry well, above ground structure, valve pit or separate metering pit. A separate sump pump shall be provided to drain the flow meter location. The primary device shall be located the appropriate number of straight upstream pipe diameters from any bend, valve, "T" or other turbulence producing fitting as required / recommended by the manufacturer. The primary device shall be located where the pipe remains full at all times and shall not be located on a vertical downward flowing pipe. The primary device shall be provided with a bypass. Shutoff valves shall be provided on the bypass and upstream and downstream of the primary device. The chart recorder shall be located in an enclosure adjacent to the SCADA enclosure.
- The wet well must be large enough so that excessive pump starting and stopping will not take place, which may result in overheating of motors and controls. For constant speed pumps the minimum time interval at peak flow between pump stop and lead pump start shall be five (5) minutes. Soft starts shall be provided for all pumps of twenty horsepower or greater and/or with peak flows greater than 500 gpm.

Variable speed pumps and variable frequency drive controls shall be provided for all pumps discharging into a shared or transmission force main or as deemed necessary by the Water / Wastewater Manager. Except with suction lift pumps, the high-water level should never be below the top of the pump casing and the impeller to ensure that the pump will prime. The low-level setting should be twice the diameter of the suction pipe but not be less than six-inches (6") above the suction pipe.

- Control systems shall be of the encapsulated-float type or the electronic-transducer type. Float-tube type and bubbler type controls are not permitted. These devices shall be located so that they will not be affected by flow currents created by the entering sewage or pump suction. Provision shall also be made to prevent floating material in the wet well from interfering with the operation of the controls. The pump control unit shall automatically alter the pumps in use and provided with a manual override. The pump control cabinet shall be provided with on-off-automatic switches and a green run light (preferred) for each pump.

vii. Wet Well / Dry Well Stations

- **Pumps** shall be of the centrifugal type, capable of passing a three-inch (3") sphere, located in the vertical position. They shall be self-cooling (sewage cooled not preferred) and provided with covers for the volutes for use during repairs. Extended shaft configurations are not preferred.
- Full flow OS&Y resilient wedge gate **valves** shall be provided on the suction piping and discharge side of the check valve. Check valves shall be weighted swing arm types that accept air cushion and oil control devices.
- Support structures, thrust blocking and restraining systems shall be provided for all piping and equipment. The motor control room and dry well shall be climate controlled by an HVAC system. Dehumidification must also be provided. Coatings and wall finishes shall be appropriately selected based upon the application. All grating shall be non-skid fiberglass material. An above grade pump around connection, station bypass, must also be provided.
- **Wet wells** shall be provided with sloped bottoms (minimum 1 to 1) to prevent the buildup of grit and debris. The pump intake basin should be long and narrow trench type to facilitate self cleaning. A fixed catwalk

shall be provided for easy cleaning of the wet well. Fall protection devices shall be included in the wet well design. A wet well lining system, poly-triplex or approved equal, shall be provided to prevent deterioration of the wet well. Surface coatings and paint will not be permitted.

- The **wet well** and **dry well** shall be separated by a watertight and gas-tight wall with separate entrances provided to each. Equipment requiring regular or routine inspection and maintenance shall not be located in the wet well.
- A separate **sump pump** shall be provided for removal of leakage or other water from the dry well floor. The sump pump shall be capable of delivering twenty gallons per minute (20 gpm) discharge. The pump shall discharge into the wet well with two check valves and ball valve on discharge side of the check valve.
- **Stairwells** shall be provided for dry well and wet well access, to allow for inspection and maintenance of equipment, when station size permits. Ladders may be provided in small stations where it is impractical to install stairways. Manhole steps are not acceptable.
- Wet well **ventilation** duct work shall be PVC and all mounting hardware shall be corrosion resistant stainless steel. Wet well ventilation shall be controlled by a percentage timer and hatch activated limit switch or activated by the wet well light switch. Dry wells and motor control rooms shall be ventilated to the outside supplied by fresh air.
- All heavy equipment, in excess of 100 pounds shall be accessible for removal or lifting by a **crane** or **hoist**. Hoists shall be positioned to allow access to all major pump station equipment. Hatches in the floor shall be positioned above the dry well to allow for easy removal of each pump and other large equipment. Structural beams shall be provided in the drywell where the lifting of equipment is out of reach from a hoist. Cranes, hoists and lifting devices shall be electrically operated. Where possible cranes shall extend to the exterior of the building for easy loading of equipment on to a truck.
- **Lights** and switches will be properly provided for all stations. All fixtures shall be located so that they are easily accessible for maintenance with a ladder. Adequate lighting shall be provided for convenience and safety of operation.

- **Exterior security lighting** shall be provided to function on a photo-cell or timer. Additional lighting to operate manually should be provided anywhere work might need to be performed (i.e. bypass connection, loading dock, generator, etc.).
- **Interior lighting** shall be come on instantly (high pressure sodium are not preferred). Switches shall be located at all access points. At least two light fixtures shall be provided at all interior locations no matter what the size of the room. Lighting shall provide illumination for all areas in the station and control panels. In dry wells lighting fixtures shall be provided at different elevations to prevent shadowing from structural supports and stairways. Wall mounted lights shall be provided six feet (6') above the floor level to provide additional illumination at the floor. A vapor tight light fixture with lamp guard and a one-hundred-watt incandescent bulb shall be installed in wet wells. All lighting located where gases exist shall be explosion proof.
- One-inch (1") **water service** hose connections shall be provided at all locations where cleaning may be required. Proper backflow prevention and vacuum breaks (above flood level) shall be provided. A bathroom with toilet and washing facilities shall be provided when station size permits.
- The level of **noise control** shall be considered based on the location of the station. The safety of the worker and nuisance to neighbors should be taken into consideration during the design. All combustion engines such as generator sets and standby pumps shall be provided with a minimum of Type 2 critically silenced enclosures and exhaust systems. Noise reduction measures shall include specifying the quietest equipment and installing sound proofing materials, acoustical linings and enclosures.

viii. Vacuum Primed Stations

- Wet well mounted vacuum primed package pump stations may be used for up to eighteen and one-half feet (18-1/2') of suction pipe. Recessed wet well mounted vacuum primed package pump stations may be used for over eighteen and one-half feet (18-1/2') of suction pipe.
- All wet wells shall have a minimum diameter of eight feet (8'). **Wet wells** shall be provided with sloped bottoms (minimum 1 to 1) to prevent the buildup of grit and debris. A wet well lining system, poly-

triplex or approved equal, shall be provided to prevent deterioration of the wet well. Surface coatings and paint will not be permitted

- **Standard Equipment** to be incorporated in the vacuum primed package pump station shall include: automatic alternator, vacuum pumps, duplex 120V GFI receptacle, spare Smith & Loveless mechanical seal, control circuit breaker, three (3) original copies of the Smith & Loveless operations and maintenance manuals, spare volute and seal gaskets, and ventilation fan with thermostat.
- **Pre-Engineered Options** to be incorporated in the vacuum primed package pump station shall include: phase monitor relay, auxillary heater, running time meter (totalizing and individual), NEMA starters, 3 KVA transformer (where required), selector switch (either Auto, Base 1 or Base 2), wet well blower, pump running lights, insulated hood, separate pump valves for each pump (preferred if available), and timer with two (2) second delay for electrode relay. Wet well mounted stations shall also be provided with a wet well ladder to extend to the normal wastewater level. Recessed wet well mounted stations shall also be provided with a recessed wet well manway ladder, to extend to the normal wastewater level, with ladder assist extensions and a dehumidifier.
- **Special Modifications** to be incorporated in the vacuum primed package pump station shall include: remote contacts (pump #1 run, pump #2 run, high water alarm, lead pump (FS/LL), lag pump (FS/HL), and phase monitor relay), additional one and one-quarter inch (1-1/4") auxiliary conduit, additional float switch for redundant high water alarm, and spare sonic start probe and relay (if sonic start specified). Recessed wet well mounted stations shall also be provided with an eight and one-half feet (8'-6") diameter layout, a shell height two feet (2') above grade and a switch in the manway entrance hatch that will turn on the wet well blower when the hatch is opened.
- Additional components to be included on the site shall include the following: a one-inch (1") water service as per standard details for the cleaning of wet wells and other infrastructure, security/work light with photo eye and manual override, flush mount safety equipment for wet and dry well access and four-inch (4") bypass pump hook-up with valves as per standard details.

ix. Force Mains

- All force mains shall be appropriately sized based upon the design requirements for the pump station. All force mains four-inches (4") and larger shall be ductile iron pipe including an epoxy lining meeting all current Kent County Department of Public Works requirements. Non-metallic force main shall be AWWA C-900, minimum SDR18, or HDPE DR11 (directional drilling applications) when warranted by the application and approved by the Water / Wastewater Manager. The following values of "C" are recommended for use in the Hazen-Williams equation for computing the friction losses in a force main for design conditions:

C Value	Pipe Characteristics
100	Unlined cast iron, ductile iron and steel pipe: twenty-four inches (24") and larger (existing).
96	Unlined cast iron, ductile iron and steel pipe: twelve-inches (12") and larger (existing).
89	Unlined cast iron, ductile iron and steel pipe: four-inches (4") and larger (existing).
120	Cement-lined ductile iron pipe.
130	Various types of gasketed plastic pipe.
140	HDPE pipe.

- For friction loss in pipe fittings the Hazen-Williams Minor Loss Coefficients (K) are to be used as a multiplier of the velocity head evaluated at the downstream velocity.
- The minimum velocity shall not be less than two feet per second (2 fps) for force main design. In general force main velocities shall not exceed five and one-half feet per second (5-1/2 fps) for force main design. If the total dynamic head at the pump discharge exceeds 100 feet, a larger diameter force main will be used, provided that a velocity of two feet per second (2 fps) can be maintained. Air release valves shall be provided on lines at all high points in the profile. Blowoff valves shall be provided at all low points in the profile. Grinder pump force mains shall be laid on a rising profile as proceeding downstream. Where force mains are constructed of material which might cause the force main to

be confused with potable water mains, the force main shall be appropriately identified.

- A minimum ten feet (10') horizontal and eighteen-inch (18") vertical separation, as measured from the outside of each pipe, shall be provided for all water mains from sanitary sewer (gravity lines and force mains). This shall be the case whether the water main is above or below the sewer. Wherever possible the sewer shall be beneath the water main. Crossings shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.
- Force mains shall have a minimum of eighteen-inch (18") clearance from drains, electric lines, gas mains, and all other utilities.
- All ductile iron pipe shall be in accordance with AWWA C151, latest revision (ANSI A21.51) and shall be in eighteen to twenty feet (18'-20') lengths with single rubber gasket (push-on) joints in accordance with AWWA C111, latest revision (ANSI A21.11). All Class 52 ductile iron pipe shall be in accordance with AWWA C150, latest revision (ANSI A21.50).

3. Installation Requirements

- i. All installations shall be in conformance with the Construction Details provided in Appendix H.
- ii. All existing utilities shall be field verified prior to the start of construction.
- iii. All existing utilities shall be adjusted to grade, and repaired or replaced when deemed necessary by the Public Utilities Department, in all areas of disturbance associated with construction.
- iv. Any existing wastewater utility lines not to be utilized by the proposed project shall be properly abandoned at the mains by the developer / owner.
- v. *Excavation and Trenching*
 - The bottom of the trench shall be cut true and even so the barrel of the pipe will have a bearing for the full length to provide a minimum cover of four feet (4') from finished grade and shall be excavated to such a depth as will provide pipe elevations as indicated on the plans.
 - The Contractor shall keep all excavation free from water or other liquids during the progress of the work.
 - The trenches for water service connections shall be excavated to the minimum standard depth or to such depth as required to connect to existing mains or service pipes.

vi. *Bedding*

- Continuous and uniform bedding shall be provided in the trench for all buried pipe. Stones found in the trench shall be removed for a depth of at least six inches (6") below the bottom of the pipe.
- The pipe shall be laid in the trench and secured in place with compacted backfill up to the crown of the pipe thus ensuring adequate support for the entire circumference of the pipe. Twenty-four inches (24") of uncompacted backfill cover shall then be laid above the pipe to adequately protect the pipe before further compaction layers. Trench backfill shall then be placed and compacted in eight-inch (8") minimum and twelve-inch (12") maximum lifts.
- Trench compaction shall be 95% maximum dry density. Compaction shall be tested once per lift for each run of pipe.

vii. *Installation of Pipe and Fittings*

- The laying and jointing of force main shall be in accordance with all applicable standards and manufacturer's recommendations.
- All pipe and fittings shall be thoroughly cleaned before laying and shall be kept clean until acceptance of work.
- At the end of each work day, the end of the pipe shall be tightly closed to prevent dirt, foreign substances or small animals from entering the line.
- Pipe and fittings shall be carefully handled and lowered into the trench. Special care shall be taken to make sure all pipes are well bedded on a solid foundation. Any defects due to settlement shall be corrected by the Contractor at his/her expense.
- Where the manufacturer's recommended pipe joint deflection is exceeded, mechanical joint bends shall be required and installed to the satisfaction of the Public Utilities representative.
- Thrust blocks of Portland Cement Concrete Class B of adequate size and weight shall be used on all pressure piping for all fittings and all bends, including and in excess of eleven and one-quarter degrees (11-1/4°) unless specifically called for otherwise on the plan. Thrust blocks (buttresses) shall conform to the details shown on the plan and/or construction details contained herein.
- All tees, bends and plugs shall be provided with reaction blocking, tie rods and retainer glands designed to prevent movement.

- No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Public Utilities representative shall deem there is danger of frost penetration at the bottom of the excavation, unless all requirements as to the minimum length of open trench and promptness of refilling are observed.

V. Construction Phase

A. Pre-Construction Meeting and Requirements

1. Scheduling

- i. Following the receipt of all approvals, as outlined in this Handbook (Section II, B), the developer shall request a Pre-Construction Meeting.
 - For all projects which require final approval from the Public Services Department the developer shall request a Pre-Construction Meeting through the Public Services Manager.
 - For all projects which only require water / wastewater utility plan approval from the Public Utilities Department the developer shall request a Pre-Construction Meeting through the Public Utilities Construction & Inspections Manager.
- ii. The Public Services Manager or Public Utilities Construction & Inspections Manager, as per the above, will schedule the Pre-Construction meeting to ensure the attendance of all relevant City staff, the Developer, his/her Engineer and Contractor, utility firms and other agencies as may be deemed appropriate. A representative from the Public Utilities Department must be in attendance for all projects which have received Water / Wastewater final plan approval.
- iii. A minimum of five (5) business days notice is required to schedule this meeting for typical projects. A minimum of ten (10) business days notice is required to properly schedule this meeting for large projects.
- iv. All requirements set forth in the meeting must be met prior to the start of construction.

2. Submittals

- i. The Water / Wastewater Pre-Construction Meeting Checklist provided in Appendix C shall be completed in its entirety and submitted to the Public Utilities Department representative at the pre-construction meeting.
- ii. In conjunction with the Water / Wastewater Pre-Construction Meeting Checklist, the following items must be submitted:
 - Construction schedule.
 - List of subcontractors including contact information, as applicable.

- Completed DeIDOT Utility Construction Permit Application including 8-1/2" x 11" drawing, as applicable. This application must be submitted to DeIDOT by the Public Utilities Department.
- Completed Acceptable Water Materials Checklist provided in Appendix D. This checklist must be completed for all projects involving work related to the water utility system.
- Completed Acceptable Wastewater Materials Checklist provided in Appendix E. This checklist must be completed for all projects involving work related to the wastewater utility system.
- Completed Acceptable Wet Well/Dry Well Pump Station Materials Checklist provided in Appendix F. This checklist must be completed for all projects proposing a wet well mounted pump station.
- Completed Acceptable Vacuum Primed Pump Station Materials Checklist provided in Appendix G. This checklist must be completed for all projects proposing a recessed wet well mounted pump station.
- When the notation "Full Specification Required" or similar language appears within the Acceptable Materials Checklists, or when required materials do not appear within said lists, complete shop drawing submittals are required for review by Public Utilities Department personnel.

3. Notice to Proceed

- i. The Public Services Manager or Public Utilities Construction & Inspections Manager, in accordance with the pre-construction meeting requirements, will issue a Notice to Proceed for the project once all requirements established in the Pre-Construction Meeting have been met.
- ii. All water and wastewater utility work must be scheduled directly with the Public Utilities Construction & Inspections Manager.

B. Inspection Requirements

1. Accessibility and Notification

- i. The Developer shall provide the Public Utilities Construction & Inspection Manager or his/her representative (herein after referred to as Public Utilities representative), access to all parts of the work and furnish such information and assistance as is required to make a complete and detailed inspection.

- ii. During construction, the Developer shall provide the Public Utilities representative with at least two (2) working days notice prior to commencing all major constructions activities at (302) 736-7070. Contractors are subject to work stoppages and/or having work rejected if proper notification is not provided. Activities requiring notification shall include, but are not limited to, the following:
 - Installation of water or wastewater utilities.
 - Scheduling and testing of water or wastewater utility systems.
 - Restoration of utility trenches.
 - Placement of paving material. Underground utilities must be installed and utility permits closed out prior to placement of paving and seeding.
- iii. The site contractor shall contact the City of Dover Public Utilities Construction & Inspections Manager at (302) 736-7070 prior to the start of construction. A representative from the City of Dover Public Utilities Department must observe and approve all water and sanitary sewer interconnections and testing. All water taps and sanitary sewer connections must be performed by a City of Dover approved contractor. The proposed location for the connection may need to be adjusted in the field due to conditions of the existing main. Possible conditions that would require tapping / connection relocation include proximity to pipe joints, other taps, concrete encasements, conflict with other utilities, and the like. Test holes must be performed by the contractor to determine the best tapping / connection location. The City of Dover will not be held responsible for field conditions requiring adjustment of the tapping / connection location or for any work required by the contractor to make an appropriate and lawful connection.
- iv. All work requiring inspections shall be performed during the normal working hours of 7:00 a.m. to 3:30 p.m., Monday through Friday, excluding holidays. If it is required that work be performed outside this time frame, a request must be made in writing to the Public Utilities Construction & Inspections Manager a minimum of two (2) working days in advance. Approval must be received in advance of scheduling work. The Contractor is responsible for reimbursement to the City for all costs incurred as a result of providing the necessary Public Utilities representative(s) on site for such work outside of normal working hours.

2. Authority and Inspections

- i. Public Utilities representatives shall ensure that all work is completed in compliance with all local, state and federal requirements and the approved plans. The Public Utilities representatives shall have the authority to require any changes necessary to ensure all local, state and federal requirements are met, including any changes necessary to the approved plans.
- ii. Public Utilities representatives shall have the authority, but not the obligation, to require changes in work practices, up to and including the stoppage of work, if determined to be in the best interest of public safety and welfare.
- iii. All plans shall have been prepared based upon the best available information. Should existing facilities vary in size or any other characteristic from that shown on the plans when exposed, the Contractor shall provide the necessary fitting, or any other appurtenance necessary to connect and install the water or wastewater line at their expense. All modifications in work, and proposed appurtenance, shall be approved by the Public Utilities representative prior to use.
- iv. All existing water or wastewater lines, which are to be abandoned and are located within the limits of excavation, shall be removed and become the property of the Contractor after removal, unless otherwise noted. Pipe openings due to abandoned pipes shall be plugged as required by the Public Utilities Department.
- v. Proper and adequate implements, tools, and facilities satisfactory to the Public Utilities representative shall be provided and used by the Contractor for the safe and convenient implementation of work. During the process of unloading, all pipe and accessories shall be inspected by the Contractor for damage. The Contractor shall notify the Public Utilities representative of all material found to have cracks, flaws or other defects. The Public Utilities representative shall inspect the damaged materials and have the right to reject any materials found to be unsatisfactory. The Contractor shall promptly remove all rejected material from the site. All materials shall be handled carefully, so as to prevent damage to protective coatings, linings, and joint fillings; preclude contamination of interior areas; and avoid jolting contact, dropping, or dumping. All work and materials are subject to tests by the Public Utilities Department at such frequency as may be deemed appropriate. While suspended and before being lowered into laying position, each pipe section and appurtenant unit shall be inspected by the Contractor to detect damage or unsound conditions that may need corrective action or be cause for rejection. The Contractor shall inform the

Public Utilities representative of any defects discovered. The Public Utilities representative may require corrective actions or order rejection as deemed appropriate. Immediately before placement, the joint surfaces of each pipe section and fitting shall be inspected for the presence of foreign matter, coating blisters, rough edges or projections, and any imperfections so detected shall be corrected by cleaning, trimming, or repair as needed.

- vi. Trench excavation and bedding preparations shall proceed ahead of pipe placement to permit proper laying and joining of the pipe units at the prescribed grade and alignment without unnecessary deviation or hindrance. All foreign matter or dirt shall be removed from the inside of the pipe and fittings before they are lowered into position in the trench and they shall be kept clean by approved means during and after laying. Materials shall be carefully lowered into laying position by the use of suitable restraining devices. Under no circumstances shall the pipe be dropped into the trench. At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes. Bell holes shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate to support the pipe throughout its length. No pipe material shall be laid in water or when the trench or bedding conditions are otherwise unsuitable or improper. When in the Public Utilities representative's opinion, placement or handling precautions prove inadequate, the Contractor shall provide and install suitable plugs or caps effectively closing the open ends of each pipe section before it is lowered into laying position, and they shall remain so covered until removal is necessary for connection of an adjoining unit. Unless otherwise permitted by the Public Utilities representative, bell and spigot pipe shall be laid with the bell ends facing upgrade and the laying shall start on the downgrade end and proceed upgrade. As each length of bell and spigot pipe is placed in laying position, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material, which shall be thoroughly compacted by tamping around the pipe to a height of at least twelve-inches (12") above the top with hand operated mechanical tamping devices or by hand. Trench compaction shall be 95% of AASHTO T180. Compaction shall be tested once per lift for each run of pipe. The joint areas shall remain exposed and precautions shall be taken to prevent the soil from entering the joint space, until the joint seal is effective. Backfill in the bell area shall be left loose until the next section of pipe is placed. Connection of pipe to existing lines or previously constructed manholes shall be accomplished as

shown in the plans or as otherwise approved by the Public Utilities representative. Where necessary to make satisfactory closure or produce the required curvature, grade or alignment deflections at joints shall not exceed that which will assure tight joints and comply with any limitations recommended by the pipe manufacturer. Entrance of foreign matter into pipeline openings shall be prevented at all times to the extent that suitable plugs or coverings can be kept in place over the openings without interfering with the installation operations.

- vii. Public Utilities representatives shall have the right to limit the amount of trench opened in advance of pipe laid, and the amount of pipe laid in advance of backfilling, in order to ensure proper coordination of work and that all efforts are in the best interest of the public.
- viii. Public Utilities representatives shall be empowered at any time to require the refilling of open trenches over completed pipelines if, in their judgment, such action is necessary. The Contractor shall, therefore, have no claims for extra compensation, even though to accomplish such refilling, he/she is compelled to temporarily stop excavation or any other work.
- ix. If work is stopped on any trench or excavation for any reason and the excavation is left open for any unreasonable length of time in advance of construction, in the opinion of the Public Utilities representative, the Contractor shall, if so directed, refill such trench or excavation at his/her own expense and shall not again open said trench until he/she is ready to complete the work therein.
- x. The terms "auger", "boring", "jack", "jacking", and "tunneling" in the plans refers only to non-open cut construction. A Public Utilities representative must be on site while this work is taking place. The Contractor shall inspect and verify soil conditions to his own satisfaction in order to determine the type of construction to employ. During the construction, the Contractor shall be responsible for protecting all existing utilities above or below the pipe invert. The minimum inside diameter of the casing pipe shall be four-inches (4") greater than the outside diameter of the bell of the carrier pipe. For any installation beneath a railroad, the top of the casing pipe shall not be closer than the specified dimensions indicated in the railroad permit. No jacking/augering of pipe will be allowed below the water table unless the water table has been lowered sufficiently to keep the water below the pipe being installed. The use of water under pressure (jetting) will not be permitted to facilitate jacking/augering operations. If any installation is augered, the head shall be

approved by the Public Utilities representative and the auger shall be located six-inches (6") behind the lead edge of the casing or carrier pipe. Casing chocks shall be used as necessary to install the carrier pipe to the proper line and grade inside the casing pipe. Voids between carrier and casing pipes shall be filled with sand and the casing pipe sealed at both ends with a suitable material to prevent water or debris from entering the casing pipe.

- xi. Directional boring/drilling installation shall be accomplished where required on the plans to minimize disturbance of existing surface improvements. A Public Utilities representative must be on site while this work is taking place. The installer shall have a minimum of three (3) years of experience in this method of construction and have installed at least 1,000 feet of eight-inch (8") or larger diameter pipe to specified grades. The field supervisor employed by the Contractor shall have at least three (3) years of experience, shall be at the site at all times during the boring/drilling installation, and shall be responsible for all of the work. The Contractor shall submit boring/drilling pit locations to the engineer before beginning construction. The drilling equipment shall be capable of placing the pipe as shown on the plans. The installation shall be by a steerable drilling tool capable of installing continuous runs of pipe, without intermediate pits, a minimum distance of 200 feet. The guidance system shall be capable of installing pipe within one and one-half inches (1-1/2") of the plan vertical dimensions and two-inches (2") of the plan horizontal dimensions. The Contractor shall be required to remove and reinstall pipes which vary in depth and alignment from these tolerances. Pull back forces shall not exceed the allowable pulling forces for the pipe being installed. Drilling fluid shall be a mixture of water and bentonite clay and shall be designed to meet existing soil conditions. Disposal of excess fluid and spoils shall be the responsibility of the Contractor.

C. Water Testing Requirements

1. Pressure Testing

- i. Water main installations shall be pressure tested by the Contractor, utilizing individuals qualified to perform the testing, and approved by the Public Utilities representative. All pressure testing shall be performed under the Public Utilities representative's observation. All equipment and labor required to perform the tests shall be furnished by the Contractor.
- ii. The test shall be in accordance with AWWA C-600 and a pressure of 165 psi shall be maintained for two (2) hours with no variation. Fire mains shall be

tested to the blind flange located inside the building. Fire mains shall be tested at a pressure of 200 psi maintained for two (2) hours with no variation.

- iii. The Contractor shall install any taps required at all high points on the line to expel trapped air prior to conducting the pressure tests. Following the tests, all such taps shall be tightly plugged with suitable threaded brass plugs. All costs of tapping and plugging the line for this purpose shall be borne by the Contractor.
- iv. Water for testing purposes shall be furnished by the City unless a fill tank is required. The Contractor shall furnish and install adequate pumping and gauging equipment to develop the required hydrostatic pressure and to measure the pressure and amount of water lost by leakage. Duration of the pressure test shall not be less than two (2) hours. All visible leaks shall be repaired regardless of total leakage as shown by test.
- v. If inspection or test shows defects, including visible leaks, such defective work or material, shall be replaced at the expense of the Contractor, and inspection and tests shall be repeated. All repairs shall be made with new material; failure to meet the tests specified above will be sufficient cause to reject the work until the defects are satisfactorily repaired. All expenses and costs incurred in carrying out the specified tests shall be borne by the Contractor. The Public Utilities Department shall have sole authority and responsibility to determine if the tests are acceptable.

2. Sterilization Testing

- i. Prior to the final connection of the newly installed pipe into the existing water main, and with plugs used in the pressure test still in place on the installed pipe, the entire system shall be sterilized, using the procedures as specified in AWWA Standard C601-54 and as required by the Public Utilities representative. Dechlorination of super-chlorinated lines shall be the responsibility of the contractor.
- ii. All disinfection procedures shall be in accordance with AWWA C-652. The preferred method of chlorination is the installation of the appropriate amount of H.T.H. 65%-35% granular chloride during the installation of the water main.
- iii. Before the final connection is made, all surfaces of the relocated line, and the existing water main that are to become part of the closing joint, including all gaskets and glands, shall be thoroughly cleaned and shall be treated with a five percent (5%) solution of Sodium Hypochlorite. Extreme care is to be exercised in order to prevent the entrance of any contaminants into the main.

- iv. The Contractor shall provide an adequate blow-off for use in flushing of the main. The Public Utilities representative will collect water samples, for bacteriological tests, from the blow-off. All samples will be delivered to the Delaware State Laboratory by the Public Utilities representative for analysis. Each section of water main shall receive approval from the Public Utilities Department and Office of Drinking Water prior to being placed in service.
- v. If testing results do not meet the requirements necessary, the Contractor shall repeat sterilization procedures, and any other work determined necessary, as directed by the Public Utilities representative, and tests shall be repeated. Failure to pass the tests specified above will be sufficient cause to reject the work until satisfactory results have been obtained. The Public Utilities Department shall have sole authority and responsibility to determine if the tests are acceptable.
- vi. All expenses and costs incurred in carrying out the specified sterilization work and tests shall be borne by the Contractor.

D. Water Meter Inspections

1. All water meter installations shall be inspected by a Public Utilities representative to ensure compliance with all installation requirements, including completion of finish grading. (See construction detail W-1.)
2. Requests for a meter inspection shall be made to the Public Utilities Department providing at least two (2) working days notice.
3. Water service will not be turned on to the property or structure until the installation has passed meter inspection.

E. Wastewater Testing Requirements

1. Air Testing
 - i. Sanitary sewer main installations shall be air tested by the Contractor, utilizing individuals qualified to perform the testing, and approved by the Public Utilities representative. All air testing shall be performed under the Public Utilities representative's observation. Copies of the testing results must be provided to the Public Utilities representative. All equipment and labor required to perform the tests shall be furnished by the Contractor.
 - ii. Air testing shall be completed after all the utility pipes have been installed in the area to be tested and prior to commencement of the street construction.

- iii. Air testing shall be performed on each section of sanitary sewer main, including sewer laterals. A pressure of four (4) psi shall be maintained for five (5) minutes with no variation.
- iv. Disposal of any wastewater or test water into the City's sanitary sewer system is subject to charges in accordance with current wastewater rates and user fees. Discharge requests must be submitted in writing to the Water / Wastewater Manager. Written approval must be obtained prior to the occurrence of any discharge to the system.
- v. If inspection or test shows defects or testing failure, such defective work or material, shall be replaced at the expense of the Contractor, and inspection and tests shall be repeated. All repairs shall be made with new material; failure to meet the tests specified above will be sufficient cause to reject the work until the defects are satisfactorily repaired. All expenses and costs incurred in carrying out the specified tests shall be borne by the Contractor. The Public Utilities Department shall have sole authority and responsibility to determine if the tests are acceptable.

2. Hydrostatic Testing

- i. Sanitary sewer force main installations shall be hydrostatically tested by the Contractor, utilizing individuals qualified to perform the testing, and approved by the Public Utilities representative. All hydrostatic testing shall be performed under the Public Utilities representative's supervision. Copies of the testing results must be provided to the Public Utilities representative. All equipment and labor required to perform the tests shall be furnished by the Contractor.
- ii. Hydrostatic testing shall be completed after all the utility pipes have been installed in the area to be tested and prior to commencement of the street construction.
- iii. During the hydrostatic testing of force mains, a pressure of seventy-five (75) psi shall be maintained for two (2) hours with no variation.
- iv. Disposal of any wastewater or test water into the City's sanitary sewer system is subject to charges in accordance with current wastewater rates and user fees. Discharge requests must be submitted in writing to the Water / Wastewater Manager. Written approval must be obtained prior to the occurrence of any discharge to the system.
- v. If inspection or test shows defects or testing failure, such defective work or material, shall be replaced at the expense of the Contractor, and inspection and tests shall be repeated. All repairs shall be made with new material; failure to

meet the tests specified above will be sufficient cause to reject the work until the defects are satisfactorily repaired. All expenses and costs incurred in carrying out the specified tests shall be borne by the Contractor. The Public Utilities Department shall have sole authority and responsibility to determine if the tests are acceptable.

3. Infiltration Inspections

- i. Each manhole, wet well or similar structure installed within the sanitary sewer system shall be inspected for infiltration by the Public Utilities representative.
- ii. If inspections show any defects or signs of infiltration, such defective work or material, shall be repaired or replaced at the expense of the Contractor, and inspection shall be repeated. All repairs shall be made with new material; failure to prohibit infiltration into wastewater utility system will be sufficient cause to reject the work until the defects are satisfactorily repaired or replaced.

4. Video Inspections

- i. Within three (3) months of the Request for Public Infrastructure Acceptance, all sanitary sewer lines and manholes shall be televised. All lines must be flushed and cleaned by the Contractor prior to televising.
- ii. Video inspection reports shall be reviewed with the Public Utilities representative. Workmanship and cleanliness of the installation will be checked. All video inspection reports shall be compatible with current Public Utilities Department video inspection software and shall include the following:
 - All video inspections shall be performed utilizing the NASSCO PACP (National Association of Sewer Service Companies Pipeline Assessment Certification Program) methodology.
 - Reference the start and end of each video segment as it begins, by clearly identifying the manhole number where the video segment begins and the manhole number where the video segment ends.
 - Footages along the sewer line must be shown on the video report and zeroed out at the beginning of each segment starting from the center of the manhole.
 - The video camera shall be guided forward at a moderate to slow pace along the bottom of the pipe as per PACP guidelines.
- iii. If the video inspection shows any defects, such defective work or material shall be replaced at the expense of the Contractor, and the video inspection and any other required tests shall be repeated. All repairs shall be made with new

material; failure to meet testing requirements will be sufficient cause to reject the work until the defects are satisfactorily repaired. All expenses and costs incurred in carrying out the specified tests and video inspections shall be borne by the Contractor. No sanitary sewer infrastructure will be accepted by the City of Dover until all defects have been corrected. The Public Utilities Department shall have sole authority and responsibility to determine if the tests are acceptable.

F. Tracer Wire and Identification Tape Verification

1. All non-metallic water lines (mains and services) shall be installed with a tracer wire and identification tape. The wire shall be a minimum of twelve (12) gauge blue coated solid copper wire, wrapped around the pipe, and extending up into all valve and curb boxes. The identification tape shall be six-inches (6") wide, laid one foot (1') above the pipe, with the following text: "Caution: Buried Water Line Below".
2. All non-metallic wastewater lines (mains and laterals) shall be installed with a tracer wire and identification tape. (Tracer wire is not required on gravity mains.) The wire shall be a minimum of twelve (12) gauge green coated solid copper wire, wrapped around the pipe. The identification tape shall be six-inches (6") wide, laid one foot (1') above the pipe, with the following text: "Caution: Buried Sewer Line Below".
3. Within three (3) months of the Request for Public Infrastructure Acceptance, all mains, laterals, and services requiring tracer wire and identification tape shall be verified for the functionality of the same by a Public Utilities representative.
4. Requests for tracer wire and identification tape verification shall be made to the Public Utilities Department providing at least two (2) working days notice.
5. If the tracer wire and identification tape verification identifies any defects or non-functioning areas, such defective work or material shall be replaced at the expense of the Contractor, and the tracer wire and detector tape verification and any other required tests shall be repeated. All re-testing expenses shall be charged to the Contractor by the Department. All repairs shall be made with new material; failure to meet testing requirements will be sufficient cause to reject the work until the defects are satisfactorily repaired. All expenses and costs incurred in carrying out the specified tests shall be borne by the Contractor. No water or wastewater infrastructure will be accepted by the City of Dover until all defects have been corrected. The Public Utilities Department shall have sole authority and responsibility to determine if the tests are acceptable.

G. Final Inspection, Request for Acceptance and Dedication

1. Final Inspection

- i. The Developer shall request a final inspection when all work is complete. This request shall be made to the Public Services Manager or Public Utilities Construction & Inspections Manager as established through the pre-construction meeting.
- ii. The final inspection will be scheduled within five (5) to ten (10) days of the request.
- iii. The final inspection will be conducted by all relevant City staff. City staff shall be accompanied by the Developer, and/or his/her representative, and inspect the site. All items of work, if any, which must be completed, replaced or repaired, will be identified.
- iv. The Public Utilities Construction & Inspection Manager will provide the Public Services Manager or the Developer, in accordance with F.1.i. above, a punch list of the remaining work to be completed within ten (10) working days of the final inspection. The punch list will include information required under Request for Acceptance.
- v. Should the Developer fail to request a final inspection, the Public Utilities Construction & Inspection Manager may provide the Developer with a punch list of all remaining work to be completed for the project at his/her discretion.

2. Request for Public Infrastructure Acceptance

- i. A Request for Public Infrastructure Acceptance is required for all projects which contain components which are to be dedicated to the City of Dover.
- ii. Upon completion of the final inspection, and when all resulting punch list items have been completed to the satisfaction of the Public Utilities Department, the Developer shall submit a written Request for Public Infrastructure Acceptance to the Public Services Manager with copy to the Water / Wastewater Manager.
- iii. In conjunction with the written request, the following items must be included:
 - As-Built Infrastructure Plans including strike through corrections to the materials listing table, utility schedules, and public infrastructure dedication table.
 - Final Sanitary Sewer Line and Manhole Video Inspection Reports. Video inspections and reports can be submitted on CD-ROM or DVD-ROM. The video report will be used to view the condition of the sanitary sewer

pipe prior to acceptance. All defects shall be repaired by the Contractor prior to submission. All video inspection reports shall become the property of the City of Dover.

- Release from Unpaid Bills (To be submitted to Public Services Manager only.)
 - Ten percent (10%) Maintenance Bond (To be submitted to Public Services Manager only.)
 - Verification of Installation of Street Signs (To be submitted to Public Services Manager only.)
 - Verification of Installation of Permanent Monuments (To be submitted to Public Services Manager only.)
- iv. The Request for Public Infrastructure Acceptance will be reviewed by the Public Services and Public Utilities Departments.
- v. The Water / Wastewater Manager will provide a recommendation to accept or deny acceptance of the water and wastewater utility infrastructure associated with the Request for Public Infrastructure Acceptance to the Public Services Manager.

3. Public Infrastructure Dedication

- i. The Public Infrastructure Dedication procedure shall commence upon satisfactory completion of every prior step and receipt of recommendations to accept infrastructure from the Public Services and Public Utilities Departments.
- ii. The Public Services Manager shall be responsible for all necessary forms and documentation to be submitted to the appropriate Council Committee and to City Council to request dedication of public infrastructure.
- iii. City Council shall grant final approval of dedication. This approval will authorize the acceptance and ownership of all public infrastructure associated with the project. In addition, private infrastructure will also be identified. Private infrastructure shall be maintained by others in accordance with any special conditions associated with the project.
- iv. Until dedication approval is granted by City Council, the Developer is responsible for all costs associated with the repair and maintenance of all public infrastructure. This includes, but is not limited to, reimbursement to the City for repairs and maintenance performed when determined to be in the best interest of public health, safety and welfare.

VI. Operations and Maintenance

A. Water

1. General

- i. The City does not guarantee any special service, pressure, capacity or facility other than is permitted by the ordinary and changing operating condition of the City's water system, as the same exists from day to day. The city shall be free and exempt from any and all claims for injury to any person or property damage by reason of fire, water, and failure to supply water pressure or capacity.
- ii. In case of breakdown, emergency or for any other unavoidable cause, the City shall have the right to cut off the water supply temporarily in order to make necessary repairs or connections. In such case, the City shall not be liable for any damage or inconvenience suffered by the customer; or any claim against it at any time for interruption in service, lessening of supply, inadequate pressure, poor water quality, or any cause beyond its control. The same rule shall apply if the City discontinues service pursuant to any other provision of this Handbook or the City Code.
- iii. The Public Utilities Department shall maintain all water utility facilities dedicated to the City of Dover. All dedicated facilities shall be located within a public right-of-way, public utility easement, or on City of Dover Property.
- iv. It shall be unlawful for any person, other than Public Utilities Department personnel, to open or close any curb stop or valve on the public water mains or service lines.
- v. The property owner shall maintain all water utility facilities that have not been dedicated to the City of Dover.
- vi. The City of Dover shall have the power to regulate all water utility infrastructure, whether dedicated or undedicated, including that located on private property at the present time and all infrastructure to be located on private property in the future. Public Utilities Department and/or Fire Marshal's Office shall periodically inspect water utility infrastructure located on private property, or undedicated, to see that it is functioning properly. If any defects are discovered, the property owner shall be directed to correct such defects or make such improvements, additions or alterations as deemed necessary to

make the water utility infrastructure functional at his/her expense. The property owner shall be provided with a set time within which such repairs shall be made. If the property owner shall fail to comply with the directive, water service shall be discontinued until such time as the location reaches compliance to the satisfaction of the Public Utilities Department, but in no event shall water supply to fire hydrant(s) be discontinued. The Public Utilities Director may proceed with the necessary repairs utilizing Department personnel or other authorized independent contractors, if determined in the best interest of public health, safety, and welfare. The property owner shall be billed for the work and labor performed and materials and equipment furnished. In the event that the property owner fails to pay said bills or expenses within 30 days from the date the same are mailed to the owner, then such bills shall be entered in the municipal lien docket as a lien owing the City and the same may be turned over to the city solicitor for collection.

- vii. Water service shall be resumed after discontinuance only when the conditions under which such service was discontinued are corrected to the satisfaction of the Public Utilities Department and upon the payment of all proper charges or amounts. The customer or property owner shall pay a fee covering service charges incident to discontinuance and resumption of water service.
- viii. The City Manager and his/her authorized agents shall have the authority to enter any building or premises within the City or service territory at reasonable times to inspect all pipes, valves, spigots or other attachments or to make necessary and reasonable tests consistent with good engineering practice to determine condition or to determine if any violations of this Handbook or City Code exist.
- ix. The Public Utilities Department shall be responsible for the operations of all water utility facilities to ensure that all local, state and federal laws and requirements are met, including Drinking Water Standards.
 - In the event maintenance activities, repairs, replacements or upgrades are determined necessary to dedicated facilities in order to meet the requirements noted above, such activities shall be completed within the time frame required.
 - When such activities are required of undedicated facilities, the property owner shall perform such activities as directed by the Public Utilities Department within the time frame required at his/her expense. If the property owner shall fail to comply with the directive, all response shall occur in accordance with Section VI.A.1.vi.

- x. The customer will give immediate written notice to the Water / Wastewater Manager of any proposed substantial increase or decrease in demand, or change of use or purpose of the customer's location. The water service connection, sanitary sewer lateral connection and water meters for each customer have a maximum capacity and no additional demand will be permitted except by the written consent of the Department. Failure to give notice to additions or changes will render the customer liable for upgrades required or performed by the Department on behalf of the location.
- xi. No trees may be planted within ten feet (10') of water utility infrastructure.
- xii. No structures, including permanent signage, may be located within ten feet (10') of water utility infrastructure.
- xiii. Water lines may not be located near any potential source of contamination.

2. Repairs and Replacement

i. Public Utilities Department Responsibilities

- The Public Utilities Department will immediately repair all water utility infrastructure, including water mains, valves and fire hydrants, dedicated to the City of Dover whenever leaks, breaks or other failures are identified.
- The Public Utilities Department will repair water services between the main and the curb stop (when installed within one foot (1') of the right-of-way or easement line as per requirements), whenever leaks, breaks or other failures are identified. For all other water service cases, repairs or replacement shall be made to the right-of-way or easement line only.
- The Public Utilities Department reserves the right to charge any party responsible for damage to water utility infrastructure for labor, equipment, materials and other expenses incurred due to the repair of such facilities.
- The Public Utilities Department will replace water utility infrastructure dedicated to the City of Dover only when determined appropriate by the City.

ii. Property Owner Responsibilities

- The property owner shall immediately repair all undedicated water utility infrastructure, including but not limited to water mains, valves, fire hydrants, fire mains and service lines whenever leaks, breaks or other failures are identified at his/her expense. Inspections shall be

performed by a Public Utilities representative in accordance with all requirements of this Handbook. All said facilities, including fixtures and other attachments furnished by the customer or property owner on the property, shall be maintained in good order and condition and free from leaks. The City shall in no event be responsible for maintaining any portion of the water utility infrastructure owned by the customer (infrastructure located outside of the right-of-way or easement), or for damage done by water escaping there from.

- The property owner shall have seventy-two (72) hours to complete all repairs required to a standard water service line. Repairs required to all other water utility infrastructure components (such as water mains) shall be initiated within two (2) hours. If the Public Utilities Department is aware of an issue, notice shall be provided at the property directly to either the property owner or customer. If the property owner shall fail to comply with the directive, all response shall occur in accordance with Section VI.A.1.vi.
- The property owner shall be responsible for the replacement and maintenance of undedicated water utility infrastructure at his/her expense. All replacement activities shall meet the requirements of this Handbook including plan development.

3. Water Distribution System Flushing Program

- i. Water system flushing is performed on a regular basis as a critical part of normal system maintenance. The goal of this program is to ensure water quality is maintained at its optimal level.
- ii. Water mains are typically sized to allow adequate and safe flows for fire protection. Under normal demand conditions, water moves through the mains at a low velocity. This slow movement allows mineral deposits, to build up and accumulate in pipes over time. The buildup can restrict water flow in the pipes and contributes to corrosion, water color problems, and inadequate fire flow.
- iii. The Public Utilities Department systematically utilizes fire hydrants, and other outlets, throughout the system to perform the Water Distribution System Flushing Program. This allows water to move through a water main at a high velocity, creating a scouring action. The water is discharged through the hydrant, or other outlet, which in turn removes settled particles, such as iron, from the system. System evaluation is also performed during the flushing operation.

- iv. All water system flushing operations shall be scheduled by the Water / Wastewater Manager to ensure the water distribution system is optimally maintained based upon current practices.
- v. Water system flushing shall be performed on all dedicated water mains on a regular basis. Water system flushing on water mains which are not dedicated to the City of Dover is the responsibility of the property owner. The City reserves the right to require water system flushing to be performed, upon request, by the owner / operator. Public Utilities Department personnel will perform private system flushing, in conjunction with regular flushing operations, upon request. Requests must be made in writing to the Water / Wastewater Manager. The property owner shall reimburse the Public Utilities Department for labor, materials and equipment perform water system flushing. The City shall be free and exempt from any and all claims due infrastructure defects that may be identified or repairs which may be required as a result of flushing operations. Should the property owner opt to utilize an independent contractor to perform flushing, these operations must be scheduled with the Water / Wastewater Manager in conjunction with regular flushing operations.

4. Fire Hydrant Flow Testing and Fire Suppression System Testing

- i. The Public Utilities Department performs fire hydrant flow testing to determine the flow pressure and volume of water that is expected from each hydrant. Flow testing is one of the ways the Department uses to ensure that hydrants are operable and to determine any system limitations that may need addressed. All hydrants are color coded following testing so Fire Department personnel can identify what water flow a certain fire hydrant can deliver during an emergency situation. Flow testing results are also utilized by sprinkler system designers to ensure a system for a structure is appropriately designed.
- ii. Flow testing on fire hydrants dedicated to the City of Dover shall be performed by Public Utilities Department personnel only.
- iii. Flow testing on fire hydrants which are not dedicated to the City of Dover is the responsibility of the property owner. The City reserves the right to require flow testing to be performed, upon request, by the owner / operator. Public Utilities Department personnel will perform these tests upon request. Requests must be made in writing to the Water / Wastewater Manager. The property owner shall reimburse the Public Utilities Department for labor, materials and equipment to flow test and appropriately mark the hydrant. Should the property owner opt to utilize an independent contractor to perform these tests, the testing operations must be scheduled with the Water / Wastewater Manager and flow

testing results must be submitted for review within five (5) business days of testing completion.

- iv. Sprinkler system designers may also request flow testing data through the Public Utilities Department. Should more recent testing data be required, the flow test shall be scheduled by the Water / Wastewater Manager.
- v. All fire hydrant flow testing, whether performed by the Public Utilities Department or through an independent contractor for dedicated and undedicated facilities, shall be scheduled through the Water / Wastewater Manager in order to maintain the integrity of the system and minimize system disturbance. All requests to perform fire hydrant flow testing on undedicated facilities by an independent contractor must be submitted in writing to the Water / Wastewater Manager.
- vi. Fire suppression systems are inspected and tested by an independent contractor for the building owner or occupant. Testing activities to be performed on systems connected to the water system, that will required water usage, must be scheduled through the Water / Wastewater Manager in order to maintain the integrity of the system and minimize system disturbance. Scheduling requests must be made in writing. Within five (5) business days of testing completion, a water usage report, including calculations must be submitted to the Water / Wastewater Manager.

5. Fire Hydrants

- i. It shall be unlawful for any person other than members of a Fire Department engaged in the performance of their duties, any person in the event of an emergency endangering life or property, or the Public Utilities Department for authorized purposes to open, use or take water from any fire hydrant.
- ii. Fire hydrants shall not be used for the filling of swimming pools. This shall be accomplished only through the metered supply that serves the property.
- iii. Fire hydrant connections by contractors are prohibited. This method may not be utilized during any phase of a construction project.
- iv. Fire hydrants shall not be used for the filling of tank trucks. The City has provided a filling station for such use at the William Street municipal facility. All tank trucks shall use this facility. Tickets can be purchased at 5 East Reed Street for use of this service.

6. Water Meters

- i. All water meters, regardless of location, shall be accessible to the Public Utilities Department and City of Dover meter reading personnel, at all times. This requirement applies to all meters, existing and proposed, regardless of location prior to the effective date of this Handbook. All meters shall have a minimum clear area around the meter of three feet long by three feet wide by six feet high (3'L x 3'W x 6'H) for accessibility purposes. Existing non-pit meters shall not be blocked from access by walls, equipment or any other materials.
- ii. The Public Utilities Department shall maintain all water meters within the system as far as ordinary wear and tear are concerned.
- iii. All water meters should be routinely tested by the Public Utilities Department. Should a customer contest the results of a routine test, all costs to retest the meter shall be incurred by the customer. Should a customer desire to have their meter tested before its next scheduled test date and the meter is found to be correct within established tolerances as identified in this Handbook, all costs to test the meter shall be incurred by the customer.
- iv. Damage to any non-pit meter or radio read due to external causes due to negligence, freezing, or hot water, or to any pit or vault meter or radio read due to external causes due to negligence, shall be the responsibility of the property owner. The owner shall reimburse the Public Utilities Department for labor, materials and equipment required to repair or replace the meter or radio read.
- v. All water meters and appurtenances shall be purchased by the customer through the City of Dover. For all non City stocked meter sizes, the meters shall be purchased by the customer through an approved vendor as directed by the City. All new and replacement meters require authorization from the Water / Wastewater Manager or his/her designated representative prior to purchase to ensure appropriate sizing and location of the meter. (The customer shall be responsible for the purchase and installation of the initial meter for a site as well as any replacement meter that may be required due to a change in demand. The Public Utilities Department will be responsible for the purchase and installation of any replacement meter due to age or normal wear and tear.)
- vi. Once water service is established through the initial service application, all water meters registered with the City of Dover shall become the property of the City.
- vii. The City of Dover reserves the right to relocate water meters from inside a facility or structure to outside the facility or structure. Said meters will be

installed within a meter pit or vault in accordance with the provisions of this Handbook. This shall include the provision that each property or principle structure shall be metered by a single water meter so as to control the entire domestic supply.

7. Backflow Prevention

- i. Backflow prevention is required at all connections to the City of Dover water utility system to prevent contamination of the public water system from backflow.
- ii. All backflow prevention shall be provided through the use of dual check valves to prevent against backsiphonage and backpressure. The dual check valve shall be manufactured in full conformance with the standards established by the American Water Works Association titled AWWA C510-07 (Standard for Double Check Valve Backflow Prevention Assembly).
- iii. Backflow prevention shall be provided on all domestic supply lines through the installation of a dual check valve at the meter.
- iv. Backflow prevention is required on all Class 3, Class 4, Class 5 and Class 6 fire protection systems. Backflow prevention can be waived by the Water / Wastewater Manager on Class 1 and Class 2 fire protections systems if all AWWA requirements are met.
- v. In all cases backflow prevention shall be installed before the first branch line leading off the service line.
- vi. The property owner shall be responsible for the testing, maintenance, repair and replacement of all backflow prevention devices.
- vii. Locations identified without the required backflow prevention assembly, or with assemblies which do not function properly, will be provided written notice to install / replace said device as per the requirements of this Handbook. The property owner shall have fourteen (14) business days to complete all work required. If the property owner shall fail to comply with the directive, all response shall occur in accordance with Section VI.A.1.vi.

8. Concerns and Problems

- i. Customers may contact the Public Utilities Department during the normal working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, excluding holidays, at 302-736-7070 with any questions or concerns regarding the City of Dover Water Utility.

- ii. Customers may contact the Public Utilities Department System Operations at 302-736-7060 or 302-736-7086 (twenty-four (24) hours a day, seven (7) days a week) with any problems or emergencies relating to the City of Dover Water Utility.
- iii. The customer shall immediately notify the Public Utilities Department of damage to or malfunction of the water meter as soon as it comes to his/her knowledge.

B. Wastewater

1. General

- i. The Public Utilities Department shall maintain all wastewater utility facilities dedicated to the City of Dover. All dedicated facilities shall be located within a public right-of-way, public utility easement, or on City of Dover Property.
- ii. The property owner shall maintain all wastewater utility facilities that have not been dedicated to the City of Dover.
- iii. The City of Dover shall have the power to regulate all wastewater utility infrastructure, whether dedicated or undedicated, including that located on private property at the present time and all infrastructure to be located on private property in the future. Public Utilities Department shall periodically inspect wastewater utility infrastructure located on private property, or undedicated, to see that it is functioning properly. If any defects are discovered, the property owner shall be directed to correct such defects or make such improvements, additions or alterations as deemed necessary to make the wastewater utility infrastructure functional at his/her expense. The property owner shall be provided with a set time within which such repairs shall be made. If the property owner shall fail to comply with the directive, water service shall be discontinued until such time as the location reaches compliance, but in no event shall water supply to fire hydrant(s) be discontinued. The Public Utilities Director may proceed with the necessary repairs utilizing Department personnel or other authorized independent contractors, if determined in the best interest of public health, safety, and welfare. The property owner shall be billed for the work and labor performed and materials and equipment furnished. In the event that the property owner fails to pay said bills or expenses within 30 days from the date the same are mailed to the owner, then such bills shall be entered in the municipal lien docket as a lien owing the City and the same may be turned over to the city solicitor for collection.

- iv. The City Manager and his/her authorized agents shall have the authority to enter any premises within the City or service territory at reasonable times to inspect, repair or replacement wastewater utility infrastructure or to make necessary and reasonable tests consistent with good engineering practice to determine condition or to determine if any violations of this Handbook or City Code exist.
- v. The Public Utilities Department shall be responsible for the operations of all wastewater utility facilities to ensure that all local, state and federal laws and requirements are met.
 - In the event maintenance activities, repairs, replacements or upgrades are determined necessary to dedicated facilities in order to meet the requirements noted above, such activities shall be completed within the time frame required.
 - When such activities are required of undedicated facilities, the property owner shall perform such activities as directed by the Public Utilities Department within the time frame required at his/her expense. If the property owner shall fail to comply with the directive, all response shall occur in accordance with Section VI.B.1.iii.
- vi. No trees may be planted within ten feet (10') of wastewater utility infrastructure.
- vii. No structures, including permanent signage, may be located within ten feet (10') of wastewater utility infrastructure.
- viii. Wastewater lines may not be located near any potential source of contamination.

2. Repairs and Replacement

- i. Public Utilities Department Responsibilities
 - The Public Utilities Department will repair all wastewater utility infrastructure, including sanitary sewer gravity lines, force mains, manholes and pumping stations, dedicated to the City of Dover whenever breaks or other failures are identified.
 - The Public Utilities Department will repair sanitary sewer laterals between the main and the cleanout (when installed within one foot (1') of the right-of-way or easement line as per requirements), whenever breaks or other failures are identified. In the event a cleanout is not available, the property owner is responsible for installing said cleanout

as required by this Handbook. Once the cleanout has been installed, the location of any failures or defects can then be identified.

- The Public Utilities Department reserves the right to charge any party responsible for damage to wastewater utility infrastructure for labor, equipment, materials and other expenses incurred due to the repair of such facilities.
- The Public Utilities Department will replace wastewater utility infrastructure dedicated to the City of Dover only when determined appropriate by the City.

ii. Property Owner Responsibilities

- The property owner shall repair all undedicated wastewater utility infrastructure, including but not limited to sanitary sewer gravity lines, force mains, manholes, sanitary sewer laterals, cleanouts, grease traps and pumping stations whenever breaks or other failures are identified at his/her expense. Inspections shall be performed by a Public Utilities representative in accordance with all requirements of this Handbook. All cleanouts are the full responsibility of the property owner. All said facilities, including fixtures and other attachments furnished by the customer or property owner on the property, shall be maintained in good order and condition. The City shall in no event be responsible for maintaining any portion of the wastewater utility infrastructure owned by the customer (infrastructure located outside of the right-of-way or easement), or for damage done by or penalties resulting from wastewater escaping there from.
- The property owner shall have seventy-two (72) hours to complete all non-critical repairs. All critical repairs shall be initiated within two (2) hours. If the Public Utilities Department is aware of an issue, notice shall be provided at the property directly to either the property owner or customer. If the property owner shall fail to comply with the directive, all response shall occur in accordance with Section VI.B.1.iii.
- The property owner shall be responsible for the replacement and maintenance of undedicated wastewater utility infrastructure at his/her expense. All replacement activities shall meet the requirements of this Handbook including plan development.

3. Maintenance

i. Public Utilities Department Responsibilities

- The Public Utilities Department shall clean and maintain all sanitary sewer gravity lines, manholes and pumping stations dedicated to the City of Dover (see also Sanitary Sewer Main Jetting Program) on a regular basis to ensure a functioning wastewater system.
- The Public Utilities Department shall video inspect all sanitary sewer gravity lines and manholes dedicated to the City of Dover on a regular basis to analyze pipe and manhole condition.

ii. Property Owner Responsibilities

- The property owner shall clean and maintain all undedicated wastewater utility infrastructure, including but not limited to sanitary sewer gravity lines, manholes, sanitary sewer laterals, cleanouts, grease traps and pumping stations on a regular basis to ensure a functioning wastewater system at his/her expense.
- All dedicated / undedicated sanitary sewer gravity lines shall be cleaned and maintained to the point of connection to the City of Dover sanitary sewer main line. Any blockage occurring in a dedicated / undedicated sanitary sewer gravity main or lateral, to the point of connection at the main, shall be the sole responsibility of the property owner unless a blockage is found within the City of Dover sanitary sewer main line.
- All sanitary sewer laterals shall be cleaned and maintained from the structure receiving wastewater service to the point of connection to the City of Dover sanitary sewer main line by the property owner. The property owner is responsible for ensuring adequate cleanouts are located on the lateral, including one (1) cleanout one foot (1') outside the right-of-way or easement line as per this Handbook, to allow for proper maintenance in conformance with the requirements of this Handbook. Any blockage occurring in a sanitary sewer lateral, to the point of connection at the sewer main, shall be the sole responsibility of the property owner unless a blockage is found within the City of Dover sanitary sewer main line.
- In the event repairs are required to the sanitary sewer lateral within the right-of-way or easement, the Public Utilities Department shall perform such repairs only after obtaining first hand evidence that the problem is located within the right-of-way and that the problem requires repair or

replacement of the lateral. This shall ensure that the City road or right-of-way is restored properly.

4. Sanitary Sewer Main Jetting Program

- i. Sanitary sewer main jetting is performed on a regular basis as a critical part of normal system maintenance. The goal of this program is to remove debris, grease and other deposits to ensure a functioning wastewater system.
- ii. Sanitary sewer mains are typically sized to allow adequate conveyance of peak flow conditions. Flow occurring under non-peak conditions can move through the mains at lower velocities resulting in material deposits and build up in pipes. The buildup can restrict flow in pipes and if not removed can contribute to line blockages.
- iii. The Public Utilities Department utilizes a jetting truck at manholes throughout the system to perform the Sanitary Sewer Main Jetting Program. The jet truck sends water through the main at a high velocity, creating a scouring action, which removes build up within the lines.
- iv. All sanitary sewer main jetting operations shall be scheduled by the Water / Wastewater Manager to ensure the wastewater system is optimally maintained based upon current practices.
- v. Sanitary sewer main jetting shall be performed on all dedicated sanitary sewer mains on a regular basis.

5. Wastewater Meters

- i. Wastewater meters shall be permitted only with approval from the Public Utilities Director.
- ii. Design calculations, installation and site plans must be submitted to the Water / Wastewater Manager for review and approval prior to receiving final approval from the Public Utilities Director.
- iii. All wastewater meters shall be installed outside in a pit or vault as appropriate. All wastewater meters, regardless of location, shall be accessible to the Public Utilities Department at all times for inspection. All meters shall have a minimum clear area around the meter of three feet long by three feet wide by six feet high (3'L x 3'W x 6'H) for accessibility purposes. Existing non-pit meters shall not be blocked from access by walls, equipment or any other materials.
- iv. The property owner shall be responsible for maintaining, repairing and replacing individual wastewater meters at his/her expense. Certificates of calibration,

meeting NIST (National Institute of Standards and Technologies) requirements, shall be submitted to the Water / Wastewater Manager annually.

- v. The City of Dover reserves the right to discontinue direct read wastewater billing service in the event the property owner is not properly maintaining the wastewater meters.

6. Prohibited Discharges

- i. It shall be unlawful for any person or group of persons to throw, place, or deposit, or attempt to throw, place or deposit, or cause to be thrown, placed or deposited, any article, object or substance into any wastewater utility infrastructure, which object, or substance would injure, damage or curtail flow in any manner in said wastewater system or pumping station into which wastewater utility infrastructure empties.
- ii. It shall be unlawful to pour, drain or run into the wastewater utility infrastructure of the City, by any method whatsoever, any tar or tar product, or petroleum or petroleum product, or any flammable substance or material.
- iii. It shall be unlawful to pour or drain into or permit the drainage into the wastewater utility infrastructure of the City any substance or chemical which would damage the machinery or equipment, or hinder the proper functioning or flow of the wastewater system or of pumping stations, owned and operated by the City.
- iv. Prohibited discharges shall include that contained within Part II, Chapter 180, Article III, Section 180-10 of the Code of Kent County, as revised. This Code requires that "No person shall discharge or cause to be discharged any stormwater, surface water, uncontaminated groundwater, roof runoff, subsurface drainage, uncontaminated noncontact cooling water or unpolluted industrial process waters to any sanitary sewer". This shall include condensate as Section 98-161 of the City of Dover Code defines storm sewer as "...any system used for conveying rain water, stormwater, surface water, condensate, cooling water or similar liquid wastes, exclusive of sewage".
- v. Trucks carrying sanitary sewer waste may discharge into the sanitary sewer system, in accordance with this Section, only upon approval by the Public Utilities Director or Water / Wastewater Manager. Requests shall be submitted in writing and reviewed on a case by case basis. All waste proposed to be discharged must have been generated by a customer of the City of Dover Wastewater System and meet all requirements of this section.

7. Concerns and Problems

- i. Customers may contact the Public Utilities Department during the normal working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, excluding holidays, at 302-736-7070 with any questions or concerns regarding the City of Dover Wastewater Utility.
- ii. Customers may contact the Public Utilities Department System Operations at 302-736-7060 or 302-736-7086 (twenty-four (24) hours a day, seven (7) days a week) with any problems or emergencies relating to the City of Dover Wastewater Utility.

C. Customer Services

1. Application for Service

- i. In order to receive water and/or wastewater service, each customer is required to apply at the Customer Service Department and if approved the customer shall enter into a contract with the City for water and/or wastewater service, as appropriate for the location, which is subject to the terms of service. Any prior outstanding debts to the City of Dover will result in service not being granted until the debt is paid in full.
- ii. When requesting service, individuals need to complete an application for utility service at least twenty four (24) hours or one (1) business day before the requested service date. The City requires a signed lease agreement or proof of ownership, a Social Security card, and one form of photo identification. The City will obtain credit reports to determine the amount of a deposit, if required. Charges for water and/or wastewater service, as applicable for the account, shall begin at the time service is made available to the customer.
- iii. The application form must be completed and approved to engage in a contract for service. This Handbook and any Rules and Regulations adopted by the City shall be part of every contract for water and/or wastewater service.
- iv. The City Manager is empowered to create and enforce all rules and regulations in order to maintain and operate the City's water and wastewater systems. The City Manager, or designee, is authorized to review every contract for water and/or wastewater service. Additional information regarding policies and regulations may be obtained by contacting the City of Dover's Customer Service Department.
- v. The City may reject any application for service if the applicant does not meet all the requirements of the City.

- vi. The City does not charge a service fee to establish or discontinue service. However, the City reserves the right to charge a service fee to process changes or cancellations to any type of work order requests. An individual requesting to establish service without providing the required notice shall be subject to a service fee according to the published connect and disconnect service fees.
- vii. The City may require a service deposit for all utility (electric, water and/or wastewater) accounts. This amount varies depending on the customer's credit rating. The requested deposit can be as much as three times the average monthly bill at the residence in question or as little as zero. Service deposits are held in an interest bearing account. Interest is paid on the deposit at a rate set by the City Council. When the customer account is terminated the deposit will be applied to the final bill. Any credit remaining on the account after the final bill is satisfied will be refunded to the customer once it has been determined that the customer has no other outstanding balances with the City of Dover.
- viii. As long as a residential customer (owner or renter) maintains a good credit standing, they will never be asked for an additional deposit. A customer who fails to pay their bill and has services disconnected or who has a returned check, and either occurs twice in a twelve month period, will be charged an additional deposit. Additional deposits may be required for any reason the City may deem appropriate.

2. Transference, Discontinuance and Suspension of Service

- i. When requesting a service transfer, individuals must apply at Customer Service and complete an application for utility service. A signed lease document or proof of ownership, a Social Security card, and one form of photo identification is required.
- ii. Establishment of water and/or wastewater service to a customer at a new location or transference of water and/or wastewater service to a new location shall be rendered only when all City of Dover outstanding debts are paid in full. Any delinquent balance must be paid in full and the account must be brought current in order to have service established at another location. At this time, the deposit for both locations will be reviewed. Any deposits will be transferred and an additional deposit may be required. The final bill is due and payable when rendered.
- iii. The customer shall give the City at least (1) business day, or twenty-four (24) hours, written notice to discontinue water and/or wastewater service unless otherwise agreed upon and shall be liable for water and/or wastewater service

used, as applicable for the account, until the meter is disconnected or final reading is recorded.

- iv. If, by reason of any act, neglect or default of a customer, the City's water and/or wastewater service is suspended or the City is prevented from supplying water and/or wastewater service in accordance with the terms of any water and/or wastewater service contract it shall have entered into, the minimum charge for the unexpired portion of the water and/or wastewater service contract term shall become due and payable immediately as liquidated damages in lieu of the anticipated returns from the water and/or wastewater contract.
- v. Regular meter readings shall be made monthly for all customers, by City personnel, during normal working hours. Failure to have meter accessible for this purpose could result in termination of service.
- vi. Water and/or wastewater service may be disconnected by the City pursuant to this Handbook and shall be reconnected only upon advance payment of published service fees in addition to all arrearage due under the customer's utility service contract.
 - There will be no charge for turning on or off any service for maintenance or repair purposes if done during normal working hours. Service calls after normal working hours are subject to charges at the rate approved by City Council.
 - Prior to turning on any service discontinued for nonpayment, a service charge at the rate approved by City Council must be paid, together with all current and overdue charges.
- vii. The City reserves the right to discontinue water and/or wastewater service without notice for the following reasons:
 - For shortages or interruptions in the City's source of water supply or in other cases of emergency such as the performance of repairs as referenced in VI.A.1., VI.A.2., IV.B.1. and IV.B.2.
 - Whenever an unsafe condition, or condition that may affect public health, safety and welfare, is found to exist on the customer's premise that is related to or would be affected by water and/or wastewater service. (For example, if a site is discharging wastewater from the site due to a sewer backup or other cause the City may turn off water service to the site to prevent further wastewater discharge from the site in the interest of public health, safety and welfare until the necessary repairs are performed.)

viii. The City may discontinue water and/or wastewater service to a customer with notice upon a determination by the City Manager, or designee, that the Notice of Termination is correct or that the customer has waived his right to dispute the Notice of Termination for the following reasons:

- Failure to repair conditions having a detrimental effect on the City's water and/or wastewater service or public health, safety and welfare as referenced in VI.A.1., VI.A.2., IV.B.1. and IV.B.2.
- Violation or noncompliance with this Water / Wastewater Handbook and/or Federal, State, or Local rules and regulations.
- Nonpayment of water / wastewater bill upon a determination by the City Manager, or designee, following the regulation as adopted by the City which may follow the guidelines as adopted by the Public Service Commission of the State of Delaware.

3. Water and Wastewater Rates, Tariffs and Charges

- i. Copies of the Water and Wastewater Rates, Tariffs and all rules and regulations adopted by City Council are available for the public review at the Customer Service Center, Public Utilities Department, City Clerk's office and on the City of Dover website. The rules and regulations apply to every customer or applicant for utility service. Revisions and amendments may occur from time to time, and customers are encouraged to contact the City for updates.
- ii. The failure by the City of Dover to enforce any of the provisions of the Tariffs shall not be deemed a waiver of its right to do so.

4. Billing

- i. Deduction meters, for irrigation or any other purpose, are not permitted.
- ii. All water service connections must be metered. The water meter will be utilized to generate both water and wastewater usage. A separate meter may be utilized for irrigation purposes which will not generate a wastewater billing. All meter planning questions should be directed to the Public Utilities Department.
- iii. Meter readings are obtained by the City's meter reading staff on a monthly basis on a pre-determined route. The area of the service address determines the date the meter is read, billed and due and requests for a specific billing date cannot be accommodated. The water and/or wastewater bill, as applicable for the account, shall be due and payable within twenty-one (21) days after the water and/or wastewater bill is dated.

- iv. When the City's meter reader is, at any regular meter reading date unable to gain access to the customer's premises the City may render an estimated utility bill based on prior usage.
- v. When terminating services, the customer must make a request to the City one (1) business day, or twenty-four (24) hours, prior to the termination date. The final bill will be due and payable when rendered. Any service deposit on file will be applied to the final bill. If unpaid, the City may refer the account to a collection agency. The customer will be responsible for any fees, penalties, legal expenses and attorney fees incurred during the collection process.
- vi. The City Manager, or his/her authorized agents, are hereby authorized to discontinue the water supply to any premises for nonpayment of water and/or wastewater service fees, as applicable to the account, thirty-six (36) days after a statement of the amount due shall have been mailed to the owner or occupant of the premises. The overdue water and/or wastewater service fees shall be entered in the municipal lien docket as a lien against property owned by the chargeable.
- vii. When demands are reassessed as the result of an investigation made at the customer's request or by routine inspection when it is found that the customer has been miss-billed for any reason, the City has the option to render corrected bills to the customer. The corrections will begin with the month when it is established the error occurred, but will not exceed twelve (12) billings.
- viii. A billing adjustment will be made when a water meter is tested and found to be in excess of five percent (5%) fast / slow.
 - A meter that tests fast – the City will either credit or refund the customer any amount equal to the excess Tgal (thousand gallons) usage, for water and/or wastewater, as applicable for the account, for a period not to exceed the three (3) previous monthly billing periods unless the time at which the error first developed or occurred can be definitively identified. In this case, the estimated Tgals overcharged will be based on that date but will in no case be retroactive beyond a twelve (12) month period.
 - For a meter that tests slow – the customer may be charged any amount equal to the under-registered Tgal (thousand gallons) usage, for water and/or wastewater as applicable for the account, for a period not to exceed the three (3) previous monthly billing periods unless the time at which the error first developed or occurred can be definitively identified. In this case, the estimated Tgals under-charged will be based

on that date but will in no case be retroactive beyond a twelve (12) month period.

- ix. A billing adjustment will be made for stopped water meters, jammed registers or non-functioning water meters. The customer's consumption for water and/or wastewater, as applicable for the account, will be estimated based on the customer's usage during similar periods. The estimate will cover only the period subsequent to the last recorded meter consumption.
- x. Sewer (wastewater) meters are permitted to the benefit of the customer and as such the appropriate function and calibration of the meter is the responsibility of the customer. Should it be determined that the sewer meter is malfunctioning or cannot be read for any other reason the wastewater bill will either be estimated based upon the customer's usage during similar periods or be based upon the water meter reading as most appropriate for the subject location as deemed appropriate by the Public Utilities Department and Customer Service Department.
- xi. A billing adjustment for water and/or wastewater, as applicable for the account, will be made when water meter tampering and/or theft of service occurs. The usage will be based on the recorded registration of the meter if it is determined that all illegal usage went through the meter. If the usage was not recorded through the meter, the usage will be estimated based on the consumption during similar periods. In cases that only part of the usage passed through the meter, both metered and estimated usages will be used to calculate the total consumption.

5. Payments

- i. To better serve our customers the City of Dover offers a variety of payment options. Cash, checks, money orders, cashier's check, certified checks, credit cards, and bank drafting are some accepted forms of payment. Payments can be mailed, brought to the office during normal business hours (8:30 AM to 5:00 PM, Monday through Friday), or placed in the drop box located at Customer Service. Cash payments cannot be accepted in the drop box. For complete details on payment options, please contact Customer Services.
- ii. It is important to maintain a good payment record. Payment is due (21) twenty-one days from the billing date indicated on the bill. Before disconnecting water and/or wastewater service for nonpayment, a disconnection notice shall be mailed to the customer giving an additional (14) days to make the payment or make arrangements with Customer Service, if the customer meets eligibility

requirements. Delinquent balances are subject to penalties at the percentage approved by City Council. More details on the City's credit policy are available by contacting Customer Service.

- iii. All property owners shall be responsible for the fees for water and/or wastewater service, as applicable, on their property and shall not be relieved of the payment of water and/or wastewater service fees because of any agreement between themselves and any tenants in possession. Should a tenant become in arrears for water and/or wastewater service, as applicable for the account, the property owner is ultimately responsible for the payment of the water and/or wastewater bills for the property. Due to this obligation, the property owner may call the Customer Service Department to determine if any water and/or wastewater account for the subject property is in arrears.
- iv. The City will charge an established service fee for any check or electronic funds transfer returned unpaid for any reason from the bank. In the event the item returned was used for the payment of reconnection of water and/or wastewater service the City may terminate the water and/or wastewater service, without written notice, until the matter is resolved. All returned check payments must be made in cash, credit card or money order at Customer Service, during normal business hours. If the returned check resulted in water and/or wastewater service interruption, an additional service fee will apply. To be reconnected after hours contact the City of Dover Public Utilities Dispatch Center. Only money orders or cashier's checks will be accepted.
- v. An equalized payment plan will be permitted for residential customers, property owners only, meeting the requirements. Monthly payments for the service address will be based on the estimated cost of total consumption for the eleven month period October through August, with additional billing being made in the remaining one (1) month. Adjustments in monthly payments may be made after each quarterly review, and may indicate that the original estimate consumption was too high or too low. Additional information can be obtained by contacting Customer Service.

6. Tampering

- i. Tampering with the infrastructure, appurtenances or equipment of the water and wastewater systems of the City of Dover Public Utilities Department is prohibited.
- ii. It is unlawful for any person to tamper or interfere with the City's water meter. It is unlawful for any person, except a duly authorized representative of the City,

to make any modifications to the City's meter. The City is not liable for any injury or damage as a result of unlawful activity.

- iii. In the event that the City's water meters or other property are tampered or interfered with, the customer receiving service through that equipment shall pay the amount which the City estimates is due for water and/or wastewater service, but not registered on the City's water meter, for any repairs or replacements required, and for changes in the customer's installation that the City may require.
- iv. The City may file Criminal or Civil charges against the responsible party and the customer is subject to arrest for tampering and/or theft of service. Before the service can be restored, all repairs must be made with inspections obtained (if necessary) and full payment for all monies owed the City must be made, including any additional security deposits that may be required. In cases where it cannot be determined who was being supplied, the owner of the property may be held responsible for the tampering/theft.

Appendix A: Water / Wastewater Initial Plan Submission Checklist



**CITY OF DOVER PUBLIC UTILITIES DEPARTMENT
WATER / WASTEWATER INITIAL PLAN SUBMISSION CHECKLIST**

This form is intended for use by the owner, developer or design consultant for Renovation to Existing Building or Developed Site projects, Site Development projects or Subdivision projects. This form must be submitted with all initial plan submissions. An authorized representative of the owner / developer shall fill out this form in its entirety (including the checklist which starts on Page A2) and sign the certification statement below. If an item is not required as part of the project scope please note *Not Applicable* in the appropriate project description column. If a particular design aspect is not currently complete, but will be provided in the check print phase, please note *Check Print* in the appropriate project description column (typically pertains to DAC projects). Public Utilities Department personnel will review this form and all attachments. Review comments and/or approval will be provided under separate cover.

PROJECT NAME: _____ **SUBMISSION DATE:** _____ **CODPU #:** _____
(Provided by City of Dover)

DESCRIPTION OF PROJECT: _____

OWNER/DEVELOPER/APPLICANT INFORMATION

CONSULTANT INFORMATION

Name (Company)

Name (Company)

Contact Person / Title

Contact Person / Title

Mailing Address

Mailing Address

City, State, Zip

City, State, Zip

Telephone / FAX

Telephone / FAX

E-mail Address

E-mail Address

I hereby certify that to the best of my knowledge the attached plans meet all City of Dover Public Utilities Department standards and specifications including all applicable local, state and federal requirements.

Printed Name of Authorized Representative

Signature of Authorized Representative

Date

PROJECT NAME: _____

Item	Renovation	Site Development	Subdivision	Public Utilities Comments
Sheet dimensions shall be no larger than twenty-four (24) by thirty-six (36) inches.				
Plan sheet scale shall be no smaller than 1" = 60'. Index sheet scale shall be no smaller than 1" = 200'. (Index sheet provided whenever two (2) or more sheets are used to illustrate the plan view.)				
Location map at a scale of 1" = 400'.				
Title block.				
Plan date and all revisions dates.				
North arrow, scale, datum and benchmark.				
Name and address of owner, developer (if applicable) and engineer or surveyor.				
Seal and license number of the professional engineer or surveyor including a certification as to the accuracy of the plan and survey.				
Property lines of abutting land including property address and name of owner.				
Existing and proposed boundaries of the property including easements and rights-of-way.				
Existing and proposed contours at intervals of one foot or less as well as significant existing features including finish floor elevations.				
A seven and one-half feet (7.5') wide public utility easement provided along all side lot lines.				
A fifteen feet (15') wide public utility easement provided along all rear lot lines.				
A ten feet (10') wide public utility easement provided along all front lot lines.				
All water and wastewater mains not located in the right-of-way located within five feet (5') of the center of a twenty feet (20') wide public utility easement.				
A master phasing plan provided for all projects to be constructed in phases. Phasing plan reflected throughout the plan set.				

PROJECT NAME: _____

Item	Renovation	Site Development	Subdivision	Public Utilities Comments
The size, type and location of all existing and proposed water mains, service lines, valves, fire hydrants and other appurtenances shown.				
The size, length, slope, type, flow direction and location of all existing and proposed sanitary sewer mains and laterals shown. The size, type and location of all existing and proposed sanitary structures (including manholes, cleanouts, and pumping stations) shown. Rim and invert elevations labeled on all sanitary structures.				
Profiles of all sanitary sewer mains provided. All water, sanitary sewer and storm sewer crossings, including services, shown.				
The proposed location of grease traps, if applicable, provided on the plans. A construction detail for the structure proposed provided.				
A materials listing table for all proposed water and wastewater utility infrastructure provided.				
Utility schedules for all wastewater utility infrastructure and storm water infrastructure provided on the construction plans.				
A public infrastructure dedication table listing all proposed water and wastewater utility infrastructure, storm water infrastructure, streets and alleys to be dedicated to the City of Dover provided on the construction plans.				
Standard Water / Wastewater notes provided.				
Sizing calculations for all water mains provided including design capacities.				
Sizing calculations for all water service lines greater than one-inch (1") provided.				
Water usage projections (average and peak flows and plumbing fixture data) for domestic use and irrigation provided. (Irrigation only must be submitted for single-family dwellings.)				

PROJECT NAME: _____

Item	Renovation	Site Development	Subdivision	Public Utilities Comments
Sizing (flow) calculations provided for all sanitary sewer mains showing that velocity, design capacities and all other requirements are met. Any projected future flow requirements must be clearly identified.				
Sizing (flow) calculations provided for all sanitary sewer laterals showing that velocity and all other requirements are met. (Must be submitted for all uses other than single-family dwellings.)				
Hydraulic system analysis provided for each pumping station including force mains. Calculation of the system-head curves and the use of these curves in conjunction with the characteristic curves of available pumps included. Criteria provided in C.1.ii. for average and peak flow used to determine the influent peak flow.				
Pumping station site requirements provided including: power requirements and panels, one-inch (1") water service as per standard details, security/work light with photo eye and manual override, flush mount safety equipment for wet well access, steps/ladder within wet well to extend to normal wastewater level, four-inch (4") bypass pump hook-up with valves, flow meter / chart recorder (to be located in pit with bypass and associated valving), sump pump and electrical hook-up in flow meter pit with manual switch, pole and antenna for RTU, paved driveway, fencing with twelve feet (12') double gate along perimeter of site, and stone covering of entire site.				
Standard water details provided.				
Standard wastewater details provided.				

Appendix B: Water / Wastewater Final Plan Submission Checklist



**CITY OF DOVER PUBLIC UTILITIES DEPARTMENT
WATER / WASTEWATER FINAL PLAN SUBMISSION CHECKLIST**

This form is intended for use by the owner, developer or design consultant for Renovation to Existing Building or Developed Site projects, Site Development projects or Subdivision projects. This form must be submitted with all final plan submissions. An authorized representative of the owner / developer shall fill out this form in its entirety (including the checklist which starts on Page B2) and sign the certification statement below. If an item is not required as part of the project scope please note *Not Applicable* in the appropriate project description column. Public Utilities Department personnel will review this form and all attachments. Review comments and/or approval will be provided under separate cover.

PROJECT NAME: _____ **SUBMISSION DATE:** _____ **CODPU #:** _____
(Provided by City of Dover)

DESCRIPTION OF PROJECT: _____

OWNER/DEVELOPER/APPLICANT INFORMATION

CONSULTANT INFORMATION

_____ Name (Company)	_____ Name (Company)
_____ Contact Person / Title	_____ Contact Person / Title
_____ Mailing Address	_____ Mailing Address
_____ City, State, Zip	_____ City, State, Zip
_____ Telephone / FAX	_____ Telephone / FAX
_____ E-mail Address	_____ E-mail Address

I hereby certify that to the best of my knowledge the attached plans meet all City of Dover Public Utilities Department standards and specifications including all applicable local, state and federal requirements.

Printed Name of Authorized Representative Signature of Authorized Representative Date

PROJECT NAME: _____

Item	Renovation	Site Development	Subdivision	Public Utilities Comments
Four complete sets plans. Signed by owner and signed and sealed by either a Delaware licensed Professional Engineer or Delaware licensed Professional Land Surveyor as per Delaware State Code.				
Digital copy of the plans compatible with AutoCAD in addition to all current City of Dover GIS requirements and digital copy of the plans in .pdf format.				
Public Utilities Department meter sizing / verification completed.				
State of Delaware Health and Social Services, Division of Public Health, Office of Drinking Water Plan Approval received (water).				
State of Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Water Resources, Surface Water Discharges Section Plan Approval received (wastewater).				
State of Delaware Department of Transportation Plan Approval received with copy attached.				
Kent Conservation District Sediment and Stormwater Plan Approval received with copy attached.				

Appendix C: Water / Wastewater Pre-Construction Meeting Checklist



CITY OF DOVER PUBLIC UTILITIES DEPARTMENT

WATER / WASTEWATER PRE-CONSTRUCTION MEETING CHECKLIST

This form is intended for use by the developers or contractors constructing water or sewer facilities within the City of Dover service area. An authorized representative of the developer shall fill out this form in its entirety (including the checklist on Page C2 and all associated forms) and sign the certification statement below. If an item is not required as part of the project scope please note *Not Applicable* in the appropriate project description column. Public Utilities Department personnel will review this form and all attachments. Review comments and/or approval will be provided under separate cover.

PROJECT NAME: _____ **SUBMISSION DATE:** _____ **SUBMITTAL #:** _____ **CODPU PROJECT #:** _____
(Provided by City of Dover)

DEVELOPER INFORMATION

CONTRACTOR INFORMATION

SUPPLIER INFORMATION

Name of Developer (Company)

Name of Contractor (Company)

Name of Supplier (Company)

Contact Person

Contact Person

Contact Person

Mailing Address

Mailing Address

Mailing Address

City, State, Zip

City, State, Zip

City, State, Zip

Telephone

Telephone

Telephone

FAX

FAX

FAX

E-Mail Address

E-Mail Address

E-Mail Address

I hereby certify that the specific products indicated within the attached Acceptable Materials Checklists represent a true list of materials to be used within the project indicated above, and I acknowledge understanding of the requirements that follow. Any and all specified requirements detailed in the Water / Wastewater Handbook shall apply to all materials proposed for use on this project. When the notation "Full Specifications Required" or similar language appears within the attached Acceptable Materials Checklists, or when required materials do not appear within said lists, complete shop drawings submittals are required. All materials supplied to the job site shall conform in all ways to the requirements of the Water / Wastewater Handbook.

Printed Name of Developer or Contractor Representative

Signature of Developer or Contractor Representative

Date

Telephone

PROJECT NAME: _____

SUBMITTAL #: _____

Item	Renovation	Site Development	Subdivision	Public Utilities Comments
Construction Schedule				
List of Subcontractors including contact information				
Completed DelDOT Utility Construction Permit Application including 8-1/2" x 11" drawing				
Completed Acceptable Water Materials Checklist (Appendix E)				
Completed Acceptable Wastewater Materials Checklist (Appendix F)				
Completed Acceptable Wet Well Mounted Pump Station Materials Checklist (Appendix G)				
Completed Acceptable Recessed Wet Well Mounted Pump Station Materials Checklist (Appendix H)				
<i>Shop Drawing Submittals for Approval</i>				
(1)				
(2)				
(3)				
(4)				
(5)				
(6)				
(7)				
(8)				
(9)				
(10)				

Appendix D: Acceptable Water Materials Checklist



**CITY OF DOVER PUBLIC UTILITIES DEPARTMENT
ACCEPTABLE WATER MATERIALS CHECKLIST**

This form is intended for use by the developers or contractors constructing water facilities within the City of Dover service area. An authorized representative of the developer shall fill out this form in its entirety and submit it in conjunction with the Water / Wastewater Pre-Construction Meeting Checklist. Please check a single selection box per item for materials to be used in conjunction with the project. If an item is not required as part of the project scope please note *Not Applicable* in the Comments section. Please contact the Public Utilities Department if part numbers or models indicated are no longer available.

PROJECT NAME: _____ **SUBMISSION DATE:** _____ **SUBMITTAL #:** _____ **CODPU PROJECT #:** _____
(Provided by City of Dover)

Item Description	Manufacturer	Selection	Comments
Compression Connector Adapter			
ANSI/AWWA C800, I.P.T. to CTS O.D.tubing	Mueller 110 Compression Adapter	<input type="checkbox"/>	
Corporation Stop			
ground key corporation valve, ANSI/AWWA C800, inlet - AWWA taper (Mueller cc) thread, outlet - Mueller 110 conductive compression connection for CTS O.D. tubing	1"; Mueller, H-15008	<input type="checkbox"/>	
Corporation Stop			
Ori-Corp corporation valve, ANSI/AWWA C800, inlet - AWWA taper (Mueller cc) thread, outlet - Mueller 110 conductive compression connection for CTS O.D. tubing	1-1/4" to 2"; Mueller, H-15013	<input type="checkbox"/>	
Curb Stop Valve			
ANSI/AWWA C800	1" to 2", Mueller Oriseal, H-10291 F.I.P. (requires Mueller 110 compression connectors adapters to connect to CTS tubing)	<input type="checkbox"/>	

PROJECT NAME: _____

SUBMITTAL #: _____

Item Description	Manufacturer	Selection	Comments
Fire Hydrants			
AWWA C502 and UL236, 5-1/4" opening, 200 psi rating, 2-1/2" hose nozzles (2 ea.), 4-1/2" pumper nozzle (1 ea.), caps and operating nut shall have the "DOVER SPECIAL" taper	Darling Co. B-62-B Breakaway	<input type="checkbox"/>	
Fittings			
ductile iron, full body, 350 psi rating, ANSI/AWWA A21.10/C110	American Pipe	<input type="checkbox"/>	
	U.S. Pipe	<input type="checkbox"/>	
	Tyler Union	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Gate Valves			
resilient wedge, epoxy coated, 250 psi rating, domestic manufactured IAW ANSI/AWWA C509 / C515, NSF 61 Certified (right hand valves)	Mueller (A-2360)	<input type="checkbox"/>	
	AFC 2500 series	<input type="checkbox"/>	
	Kennedy 8571	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Retainer Glands			
manufactured of high strength ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12; wedging mechanisms shall be manufactured of ductile iron, heat treated to a hardness of 370 BHN minimum; dimensions of the gland shall be conforming to the requirements of ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153; the mechanical joint restraining device shall have a water working pressure rating of 350 psi minimum (in sizes 4" thru 16") with a safety factor of at least 2:1	Tyler Union	<input type="checkbox"/>	
	US Pipe	<input type="checkbox"/>	
	EBBA Iron	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	

PROJECT NAME: _____ SUBMITTAL #: _____

Item Description	Manufacturer	Selection	Comments
Service Valve (Curb) Box			
cast iron, ASTM A-48/AASHTO H20 wheel load, domestic manufactured	Tyler Union 6500, Cast Iron Screw Type W/WATER lid	<input type="checkbox"/>	
Street Valve Box			
cast iron, three piece, 5-1/4" shaft, screw type, domestic manufactured	Tyler Union (6860 3-piece, #6 Base) Other (Full Specifications Required)	<input type="checkbox"/> <input type="checkbox"/>	
Tapping Sleeve			
Type 304 (18-8) stainless steel per AWWA C115, Fabrications: Type 304 (18-8) Stainless Steel per ASTM A240, Bolts & Nuts: Type 304 (18-8) Stainless Steel per ASTM A193 and A194 for sleeves with stainless steel flange.	Powerseal 3490AS	<input type="checkbox"/>	
Tapping Valve			
resilient wedge, epoxy coated, 250 psi rating, domestic manufactured IAW ANSI/AWWA C509 / C515, NSF 61 Certified	Mueller (A-2360T) AFC 2500 series Kennedy 8572 Other (Full Specifications Required)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Tracer Wire and Detector Tape			
tracer wire shall be a minimum of 12 gauge blue coated solid copper wire; detector tape (warning/identification tape) shall be non-detectable, 6" wide, colored blue, with continuous warning "CAUTION: BURIED WATER LINE BELOW."	Calpico Type 1 Empire Level Proline Safety Other (Full Specifications Required)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Water Mains			
ductile iron, cement lined, Tyton joint, Class 52, domestic manufactured IAW ANSI/AWWA A21.5/C151, A21.4/C104	U.S. Pipe Atlantic States Tyler Union Other (Full Specifications Required)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

PROJECT NAME: _____

SUBMITTAL #: _____

Item Description	Manufacturer	Selection	Comments
Water Service			
type 'K' copper tubing coils, 1" to 2", ASTM B88, minimum 1"	SPECIFY DOMESTIC SUPPLIER	<input type="checkbox"/>	
Water Service			
SDR9 (poly tubing), permitted for use instead of 2" copper	SPECIFY DOMESTIC SUPPLIER	<input type="checkbox"/>	

Appendix E: Acceptable Wastewater Materials Checklist



**CITY OF DOVER PUBLIC UTILITIES DEPARTMENT
ACCEPTABLE WASTEWATER MATERIALS CHECKLIST**

This form is intended for use by the developers or contractors constructing wastewater facilities within the City of Dover service area. An authorized representative of the developer shall fill out this form in its entirety and submit it in conjunction with the Water / Wastewater Pre-Construction Meeting Checklist. Please check a single selection box per item for materials to be used in conjunction with the project. If an item is not required as part of the project scope please note *Not Applicable* in the Comments section. Please contact the Public Utilities Department if part numbers or models indicated are no longer available.

PROJECT NAME: _____ **SUBMISSION DATE:** _____ **SUBMITTAL #:** _____ **CODPU PROJECT #:** _____
(Provided by City of Dover)

Item Description	Manufacturer	Selection	Comments
Casing End Seal			
1/4" thick styrene butadiene rubber sheet end seal, use 1" wide stainless steel bands, zippered end seals with stainless steel bands may also be used	Advance Products & Systems	<input type="checkbox"/>	
	Pipeline Seal & Insulator	<input type="checkbox"/>	
	Powerseal	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Casing Spacer			
stainless steel casing spacer center restrained position type with PVC liner and non-metallic anti-friction runners	Advance Products & Systems	<input type="checkbox"/>	
	Pipeline Seal & Insulator	<input type="checkbox"/>	
	Powerseal	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Cleanout Frame and Cover			
10" nominal diameter cast iron frame and cover per ASTM A48, Class 30; cover: 14 lbs; frame: 39 lbs; marked with "S"	East Jordan Iron Works, #00156601	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Coupling, Flexible			
made of an elastomeric compound that meets the requirements of ASTM D5926, C1173 and applicable portions of ASTM C443 / C425 / C564 / CSA B602 / D1869; leak-proof, root-proof and are resistant to chemicals, ultraviolet rays, fungus growth, and normal sewer gases; stainless steel clamps are corrosion-resistant and rust-proof	Calder	<input type="checkbox"/>	
	DFW/HPI	<input type="checkbox"/>	
	Fernco	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	

PROJECT NAME: _____ SUBMITTAL #: _____

Item Description	Manufacturer	Selection	Comments
Damp-Proofing			
	Kop-Coat Bitumastic Super Service Black	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Fittings, PVC			
gasketed sewer fittings, wall thickness SDR 35/26, ASTM D-3034.D1784 / D3212 / F-477	Certainteed	<input type="checkbox"/>	
	Harco	<input type="checkbox"/>	
	J-M Pipe	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Liner System			
felt or fiberglass liner system for lining of precast manholes and sewer pipe	No Manufacturer Specified (Full Specifications Required)	<input type="checkbox"/>	
Manhole Frame and Cover			
31-1/2" nominal diameter cast iron frame and cover per ASTM A48, Class 30, with machined seats; inner cover: 152 lbs; frame: 165 lbs; marked with "CITY OF DOVER"	East Jordan Iron Works, #00196012 (frame), #00196029 (cover)	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Manhole Frame and Cover, Hinged / Locking			
31-1/2" nominal diameter cast iron frame and cover per ASTM A536, Class 30, with machined seats and bronze lock lugs; hinge to have 120 degree opening radius; marked with "CITY OF DOVER"	East Jordan Iron Works, #NCR08-1856F1	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Manhole Frame and Cover, Locking			
31-1/2" nominal diameter cast iron frame and cover per ASTM A48, Class 30, with machined seats and bronze lock lugs; inner cover: 152 lbs; frame: 165 lbs; marked with "CITY OF DOVER"	East Jordan Iron Works, #NCR08-1856C	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Manhole Joint Sealant Compound			
pre-formed, rubber gasket to form a watertight seal between manhole sections, ASTM C443	A-Lok	<input type="checkbox"/>	
	D-Lok	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	

PROJECT NAME: _____

SUBMITTAL #: _____

Item Description	Manufacturer	Selection	Comments
Manhole Pipe Connector (Existing Precast and Non-Precast Manholes)			
provides a flexible, watertight, environmentally safe joint that exceeds ASTM C923 specifications; (breaking into existing manholes)	Press-Boot	<input type="checkbox"/>	
	Kor-N-Seal	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Manhole Pipe Connector (Precast Manholes)			
rubber flexible type connector for pipe to manhole connection for precast manholes meeting ASTM C443	A-Lok X-Cell	<input type="checkbox"/>	
	Z lok	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Manhole, Precast Concrete			
access manholes for sewer mains; cones, risers, and bases designed for H-20 highway loading ASTM C478; exterior coating finish: 2 coats of Koppers bitumastic 300M water epoxy at 8.0-mil dry thickness (200 SFPG) per coat	Atlantic Concrete Products	<input type="checkbox"/>	
	Gillespie Precast	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Pipe, Ductile Iron			
cement lined, Tyton joint, Class 50, 51, or 52; domestic manufactured; IAW ANSI/AWWA A21.5/C151, A21.4/C104; for use on wastewater gravity and force mains	American Pipe	<input type="checkbox"/>	
	Atlantic States	<input type="checkbox"/>	
	U.S. Pipe	<input type="checkbox"/>	
	Tyler Union	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Pipe, PVC			
for sewers between 6" and 15", ASTM D 3034, SDR 35 and SDR 26 sewer pipe	Diamond Plastics	<input type="checkbox"/>	
	Certainteed	<input type="checkbox"/>	
	Johns-Manville	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Rock, Crushed			
Delaware 57 stone used for bedding sewer lines	DELDOT Approved (Provide Source) (Full Specifications Required)	<input type="checkbox"/>	

PROJECT NAME: _____

SUBMITTAL #: _____

Item Description	Manufacturer	Selection	Comments
Service Saddle			
6" minimum, used for connecting new sewer lateral to existing sanitary sewer mains, Sealtite Sewer stainless steel, Sealtite as manufactured by GENECO	GENECO Other (Full Specifications Required)	<input type="checkbox"/> <input type="checkbox"/>	
Tracer Wire and Detector Tape			
tracer wire shall be a minimum of 12 gauge green coated solid copper wire; detector tape (warning/identification tape) shall be non-detectable, 6" wide, colored green, with continuous warning "CAUTION: BURIED SEWER LINE BELOW."	Calpico Type 1 Empire Level Proline Safety Other (Full Specifications Required)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

Appendix F: Acceptable Wet Well/Dry Well Pump Station Materials Checklist



**CITY OF DOVER PUBLIC UTILITIES DEPARTMENT
ACCEPTABLE WET WELL/DRY WELL PUMP STATION MATERIALS CHECKLIST**

This form is intended for use by the developers or contractors constructing wet well/dry well pump stations within the City of Dover service area. An authorized representative of the developer shall fill out this form in its entirety and submit it in conjunction with the Water / Wastewater Pre-Construction Meeting Checklist. Please note that all selections under each item are required. Please contact the Public Utilities Department if components indicated are no longer available.

PROJECT NAME: _____ **SUBMISSION DATE:** _____ **SUBMITTAL #:** _____ **CODPU PROJECT #:** _____
(Provided by City of Dover)

Item Description	Manufacturer	Selection	Comments
Cabinet			
NEMA 4X cabinet, (Hoffman UU1008030 4X Enclosure) 36"H x 30"W x 11"D with communications/power interface panel and heater	Hoffman (Full Specifications Required)	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Chart Recorder			
Single Pen Chart Recorder (Honeywell DR4500 Trueline 12" Circular Chart Recorder) or Multipen Chart Recorder (Honeywell DPR100 Multipen Strip Chart Recorder)	Honeywell	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Flow Meter			
located in pit with bypass and associated valving; Siemens Flowmeter Mag 5100W Nema 6P and Siemens Convertor Mag 6000	Siemens	<input type="checkbox"/>	
Pump Station			
pump station specifications shall include the following: General (IV.D.2.ii) Pumps and Valves (IV.D.2.iii) Electrical and Emergency Power Supply (IV.D.2.iv) Metering and Controls (IV.D.2.vi) - unless otherwise specified Wet Well/Dry Well Stations (IV.D.2.vii)	Smith & Loveless (Full Specifications Required)	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	

PROJECT NAME: _____

SUBMITTAL #: _____

Item Description	Manufacturer	Selection	Comments
Radio			
MDS 9710, 900 mHz SCADA radio; battery charger with 12V, 7AH battery	Microwave Data Systems (Full Specifications Required)	<input type="checkbox"/>	
Remote Telemetry Unit (RTU)			
TG5700 RTU TEKEGYR 5700; RTU specifications shall include the following as per IV.D.2.v: Station Manager Combination Controller Card General Requirements	SIEMENS (Full Specifications Required)	<input type="checkbox"/>	
Safety Equipment			
flush mount for wet and dry well access; DBI Sala flush floor mounted sleeve c/w pins for fresh concrete, mild steel (Model #8510311); and DBI Sala sleeve cap, heavy duty, zinc plated, mild steel (Model #8510826)	DBI Sala	<input type="checkbox"/>	
Security/Work Light			
with photo eye and manual override; Hubbell Miniliter IV (Catalog #MHS-Y150S-568-1); Hubbell Slipfitter (Catalog #4024C); and Hubbell Pole (Catalog #SSS-10-40-1-XX-XX)	Hubbell Other (Full Specifications Required)	<input type="checkbox"/> <input type="checkbox"/>	

Appendix G: Acceptable Vacuum Primed
Pump Station Materials
Checklist



**CITY OF DOVER PUBLIC UTILITIES DEPARTMENT
ACCEPTABLE VACUUM PRIMED PUMP STATION MATERIALS CHECKLIST**

This form is intended for use by the developers or contractors constructing vacuum primed pump stations within the City of Dover service area. An authorized representative of the developer shall fill out this form in its entirety and submit it in conjunction with the Water / Wastewater Pre-Construction Meeting Checklist. Please note that all selections under each item are required. Please contact the Public Utilities Department if components indicated are no longer available.

PROJECT NAME: _____ **SUBMISSION DATE:** _____ **SUBMITTAL #:** _____ **CODPU PROJECT #:** _____
(Provided by City of Dover)

Item Description	Manufacturer	Selection	Comments
Cabinet			
NEMA 4X cabinet, (Hoffman UU1008030 4X Enclosure) 36"H x 30"W x 11"D with communications/power interface panel and heater	Hoffman (Full Specifications Required)	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Chart Recorder			
Single Pen Chart Recorder (Honeywell DR4500 Trueline 12" Circular Chart Recorder) or Multipen Chart Recorder (Honeywell DPR100 Multipen Strip Chart Recorder)	Honeywell	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	
Flow Meter			
located in pit with bypass and associated valving; Siemens Flowmeter Mag 5100W Nema 6P and Siemens Convector Mag 6000	Siemens	<input type="checkbox"/>	
Pump Station			
pump station specifications shall include the following: General (IV.D.2.ii) Pumps and Valves (IV.D.2.iii) Electrical and Emergency Power Supply (IV.D.2.iv) Metering and Controls (IV.D.2.vi) - unless otherwise specified Vacuum Primed Stations (IV.D.2.viii)	Smith & Loveless (Full Specifications Required)	<input type="checkbox"/>	
	Other (Full Specifications Required)	<input type="checkbox"/>	

PROJECT NAME: _____ SUBMITTAL #: _____

Item Description	Manufacturer	Selection	Comments
Radio			
MDS 9710, 900 mHz SCADA radio; battery charger with 12V, 7AH battery	Microwave Data Systems (Full Specifications Required)	<input type="checkbox"/>	
Remote Telemetry Unit (RTU)			
TG5700 RTU TEKEGYR 5700; RTU specifications shall include the following as per IV.D.2.v: Station Manager Combination Controller Card General Requirements	SIEMENS (Full Specifications Required)	<input type="checkbox"/>	
Safety Equipment			
flush mount for wet and dry well access; DBI Sala flush floor mounted sleeve c/w pins for fresh concrete, mild steel (Model #8510311); and DBI Sala sleeve cap, heavy duty, zinc plated, mild steel (Model #8510826)	DBI Sala	<input type="checkbox"/>	
Security/Work Light			
with photo eye and manual override; Hubbell Miniliter IV (Catalog #MHS-Y150S-568-1); Hubbell Slipfitter (Catalog #4024C); and Hubbell Pole (Catalog #SSS-10-40-1-XX-XX)	Hubbell Other (Full Specifications Required)	<input type="checkbox"/> <input type="checkbox"/>	

Appendix H: Standard Details

Table of Contents

Water Details

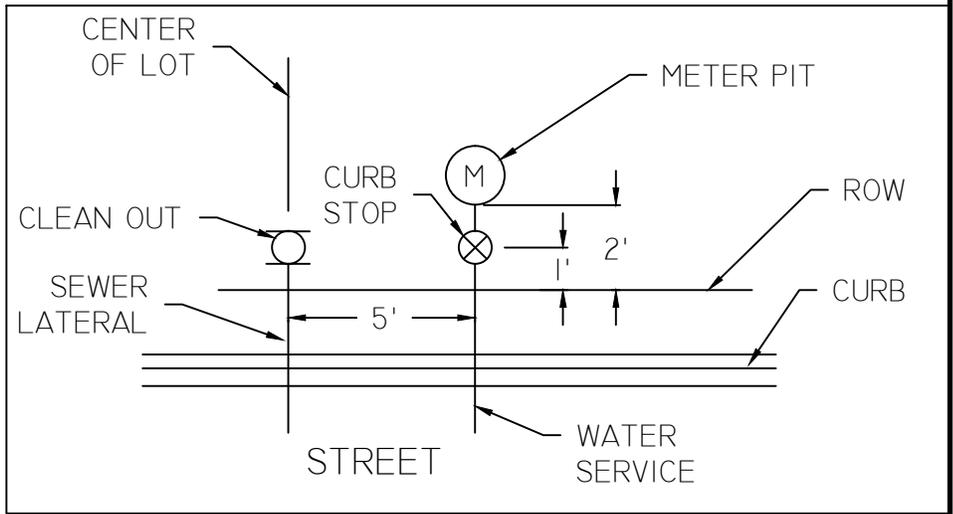
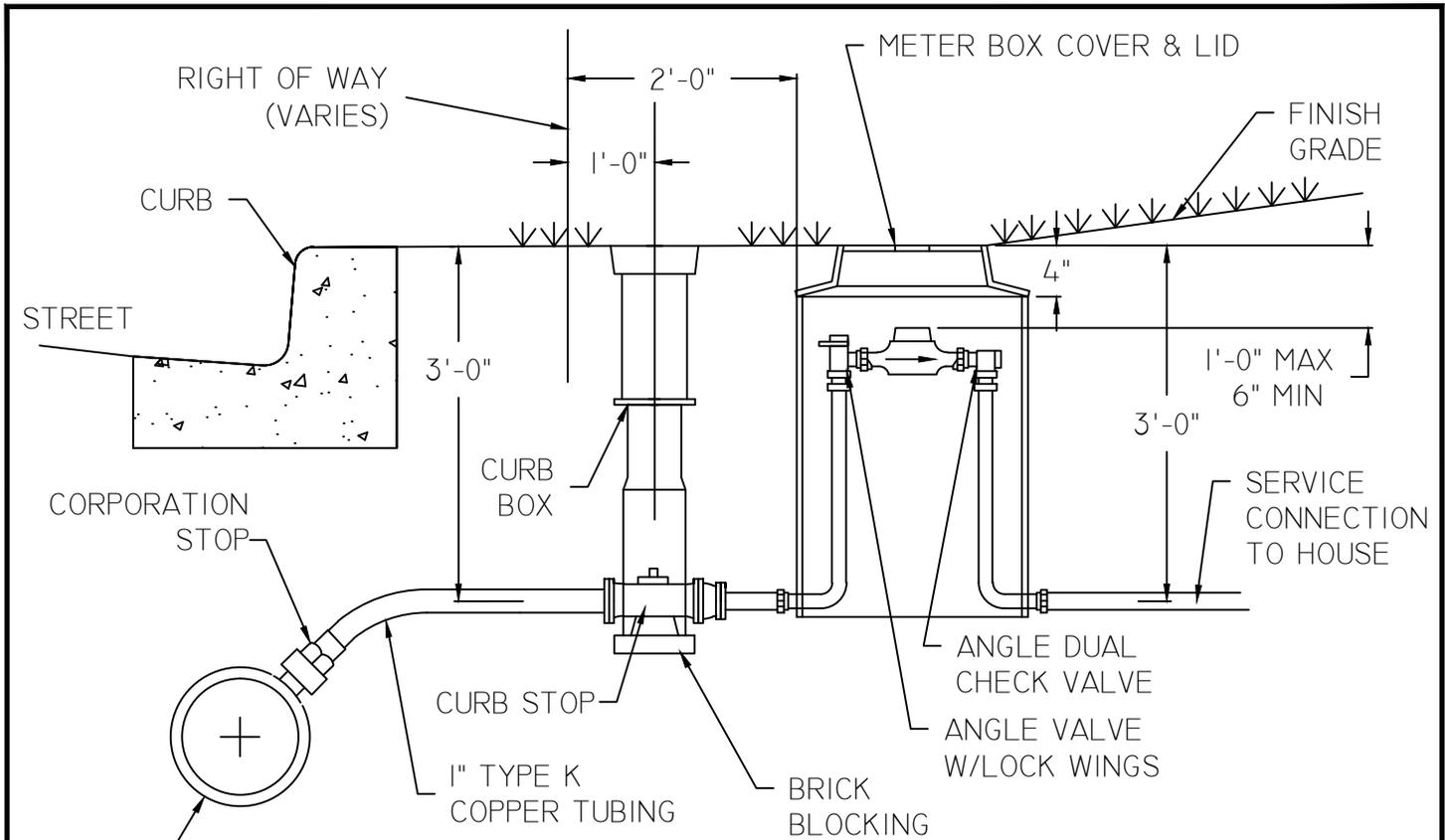
W-1	Residential Water Service & Meter Pit Installation
W-2	Valve Box-Screw Type
W-3	Fire Hydrant & Valve Box Detail
W-4	Fire Hydrant & Valve Box Detail without Curb and Gutter
W-5	2" Blow-Off Assembly for Water Mains
W-6	Buttresses for Water Mains
W-7	Domestic and Fire Service Connection
W-8	Fire Main Pipe Restraint

Wastewater Details

WW-1	Residential Sewer Lateral Depth up to 8'
WW-2	Residential Deep Sewer Lateral Depth Greater than 8'
WW-3	Manhole Type I
WW-4	Manhole Type II
WW-5	Manhole Type III
WW-6	Manhole Type Plan View
WW-7	Flow Channel Patterns
WW-8	Manhole Steps
WW-9	Sanitary Sewer Cleanout Detail
WW-10	Manhole Frame
WW-11	Manhole Cover
WW-12	Manhole Cover Locking
WW-13	Hinged Manhole
WW-14	Cast Iron Saddle for 6" Building Sewer Connection
WW-15	Trench Pavement Width
WW-16	Special Bedding and Embedment for PVC Sanitary Sewer Pipe
WW-17	Special Bedding for Ductile Iron Pipe
WW-18	Directional Drill Detail
WW-19	Casing Installation
WW-20	Outside Drop Manhole Type A & B
WW-21	Reliner Inside Drop System Manhole Detail (5' Diameter)
WW-22	Force Main Discharge Manhole Detail
WW-23	2" Air Release Valve Assembly
WW-24	Combination Sewage Air Release/Vacuum Relief Valve and Manhole Detail-Paved/Traffic Areas
WW-25	Combination Sewage Air Release/Vacuum Relief Valve and Manhole Detail-Grass/Non-Traffic Areas
WW-26	Emergency Pumping Connection Detail
WW-27	Sanitary Sewage Pumping Station Electric and Water Service
WW-28	Standard Sanitary Sewer Marker

Water / Wastewater Details

WWW-1	Utility Conflict Relocation Detail
-------	------------------------------------



ADJUSTABLE CURB BOX
 TYLER UNION SERIES 6500-92
 BUFFALO TYPE, COMPLETE
 (NO SUBSTITUTION)

1" COPPER PIPE OUTLET
 MUELLER H-15000, H-15008
 CORPORATION STOP ASSEMBLY
 MUELLER ORI SEAL CURBSTOP
 H-10291 I.P. I.P.
 H-15176 C.T. I.P.
 H-15201 C.T. C.T.

*: 1" SERVICE CONNECTION IS MINIMUM SIZE
 AS PER CITY OF DOVER REQUIREMENTS.

ALL WATER SERVICES FROM THE MAIN
 TO THE CURB STOP TO BE COPPER OF
 APPROPRIATE SIZE.

A DUAL METER PIT SHALL BE MANDATORY
 FOR ALL SERVICES THAT INCLUDE A DOMESTIC
 SERVICE AND AN IRRIGATION SERVICE.

City of



Dover

RESIDENTIAL WATER SERVICE & METER PIT INSTALLATION

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL

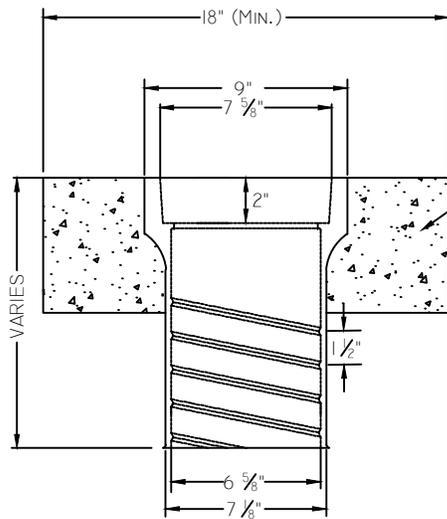
DATE: 12-09-03

CKD: RJH/REM

SCALE: NONE

APRVD: SJD

DWG. NO: W-1

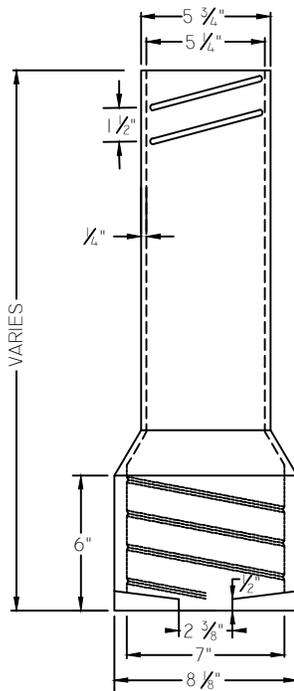
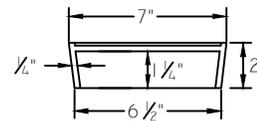


LEVEL TWO TOP

18" Ø x 6" (MIN.) CONCRETE COLLAR (TO BE USED IN NON-PAVED AREAS)



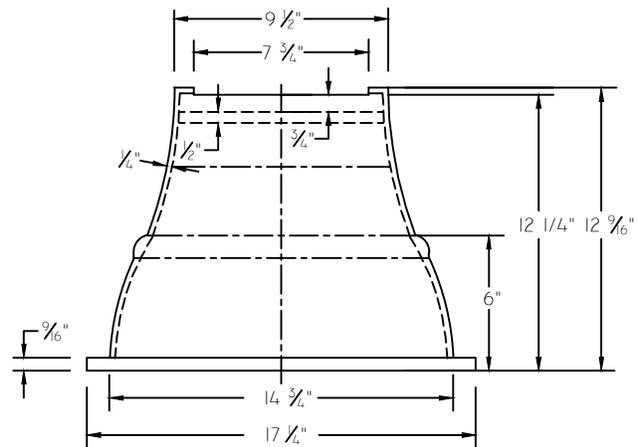
COVER



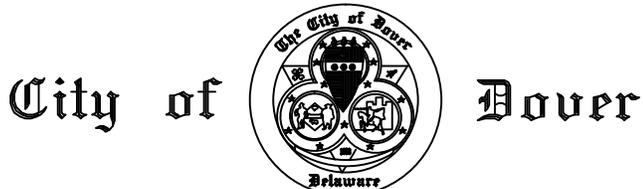
LEVEL TWO BOTTOM

ACCEPTABLE VALVE BOX

- TYLER UNION SERIES 6860, CAST IRON THREE-PIECE VALVE BOX (NO SUBSTITUTION)



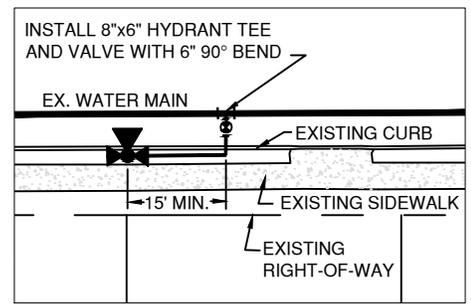
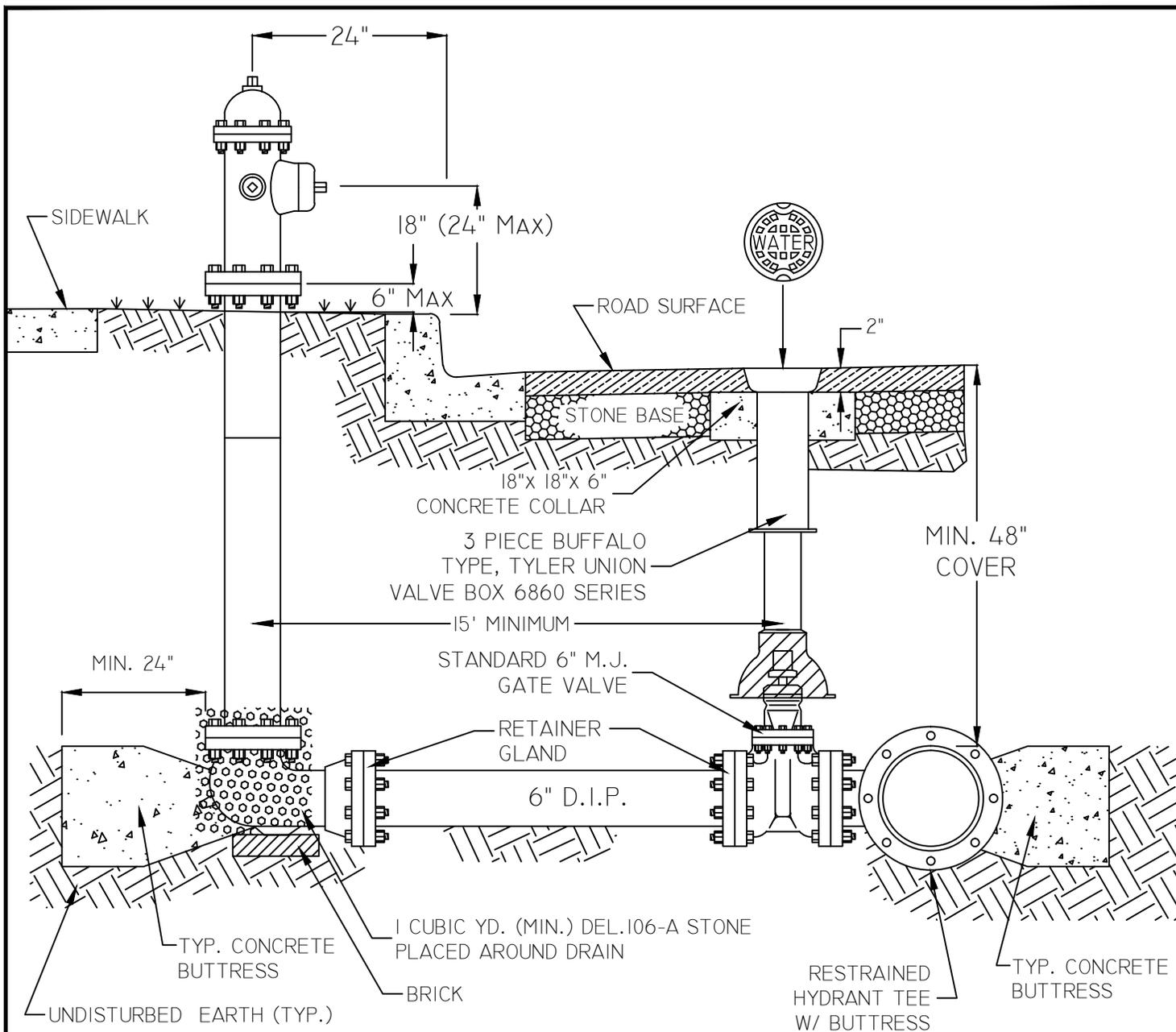
#6 BASE
(STANDARD)



VALVE BOX - SCREW TYPE

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 04.30.08
CKD: RJH/REM	SCALE: NTS
APRVD: SJD	DWG. NO: W-2



- NOTES:
1. ALL CONCRETE TO BE CLASS "B" MIX.
 2. A MINIMUM SPACING OF 15 FEET MUST BE MAINTAINED BETWEEN THE HYDRANT AND VALVE. FOR DOG-LEG APPLICATIONS, SEE INSET.
 3. INSTALL STONE AROUND VALVE TO SUPPORT THE VALVE AND VALVE BOX.
 4. ALL FITTINGS SHALL BE WRAPPED IN POLYETHYLENE PRIOR TO PLACEMENT OF CONCRETE BUTTRESS.
 5. MAXIMUM SPACING BETWEEN FIRE HYDRANTS IS 600 LF.

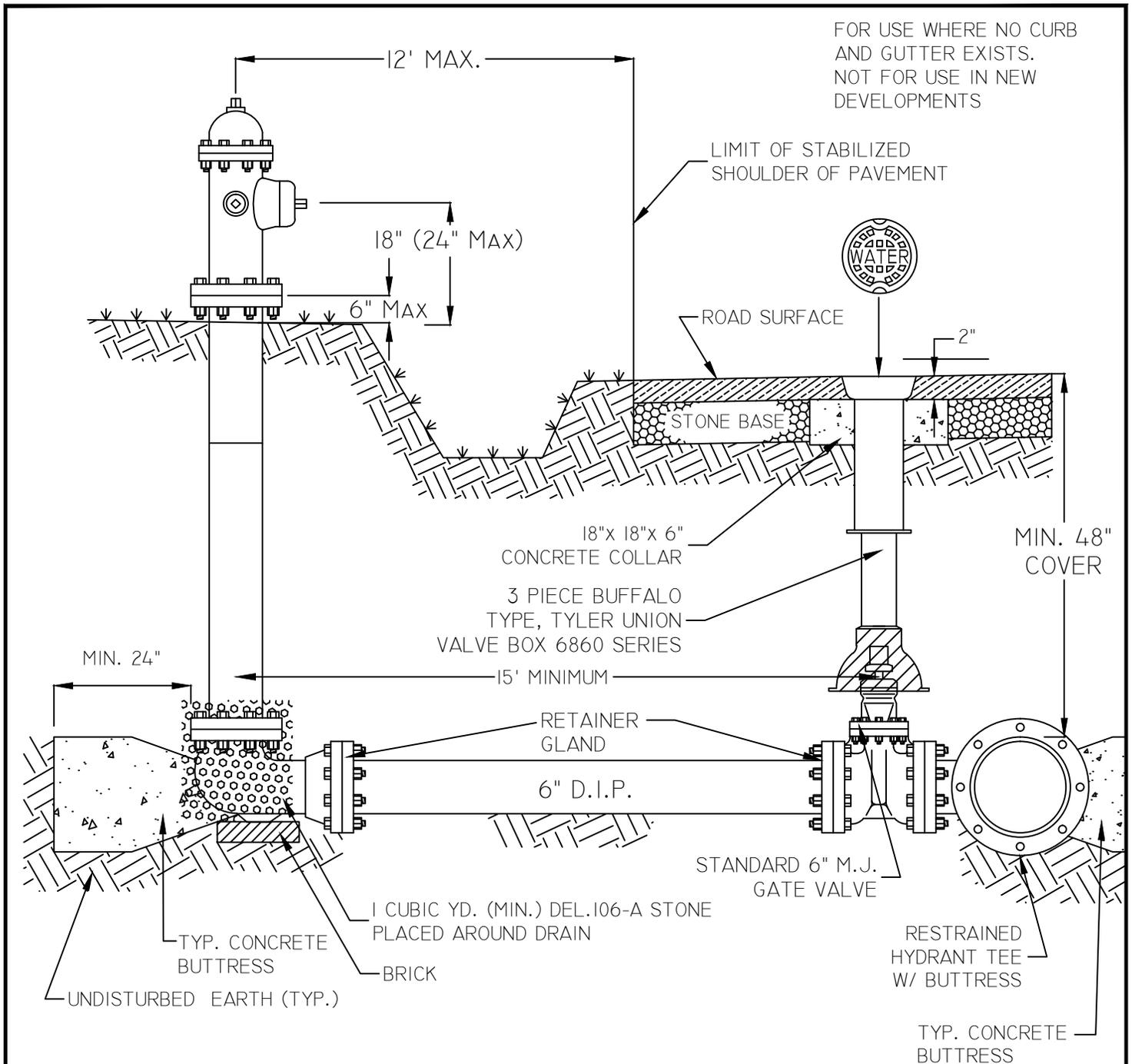
DOG-LEG FIRE HYDRANT DETAIL
N.T.S.



FIRE HYDRANT & VALVE BOX DETAIL

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 04.30.08
CKD: RJH/REM	SCALE: NTS
APRVD: SJD	DWG. NO: W-3



NOTES:

1. ALL CONCRETE TO BE CLASS "B" MIX.
2. A MINIMUM SPACING OF 15 FEET MUST BE MAINTAINED BETWEEN THE HYDRANT AND VALVE.
3. INSTALL STONE AROUND VALVE TO SUPPORT THE VALVE AND VALVE BOX.
4. ALL FITTINGS SHALL BE WRAPPED IN POLYETHYLENE PRIOR TO PLACEMENT OF CONCRETE BUTTRESS.
5. MAXIMUM SPACING BETWEEN FIRE HYDRANTS IS 600 LF.

City of

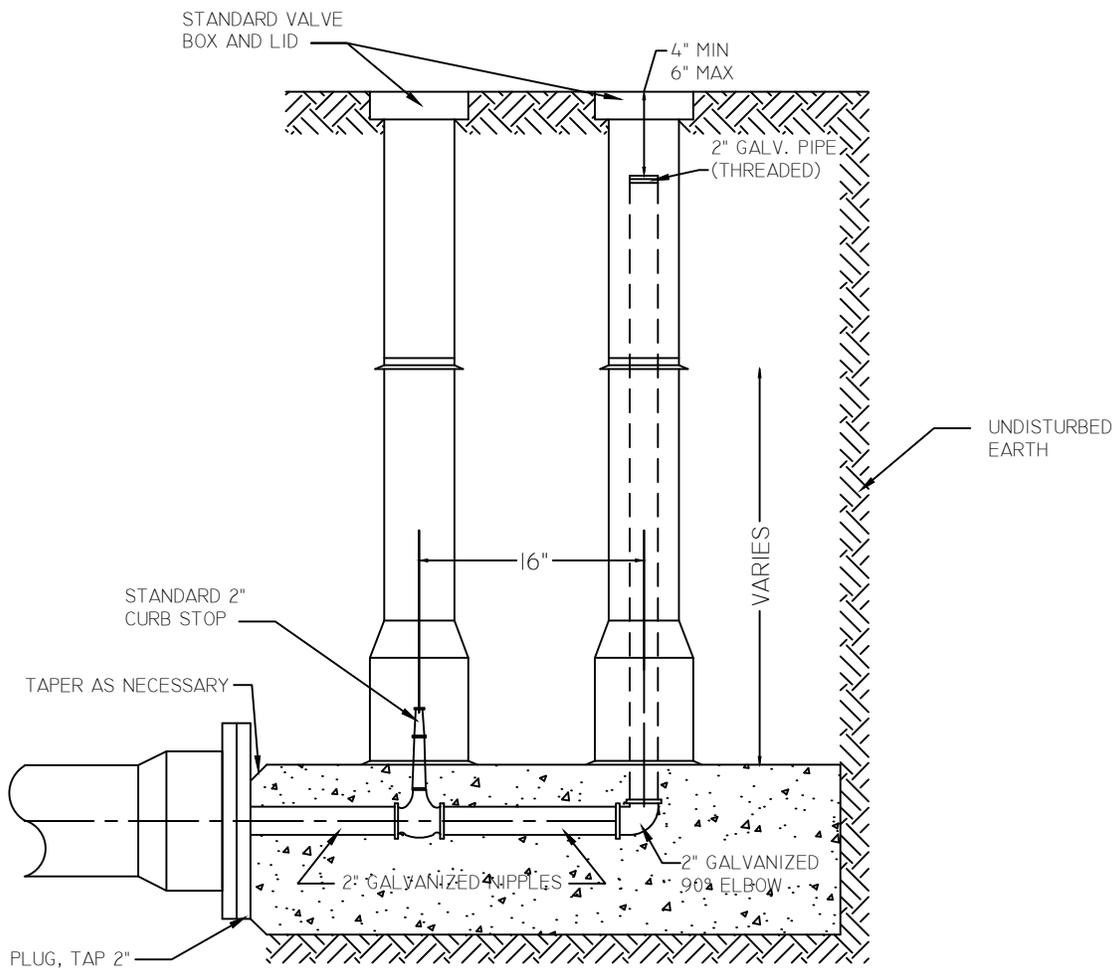
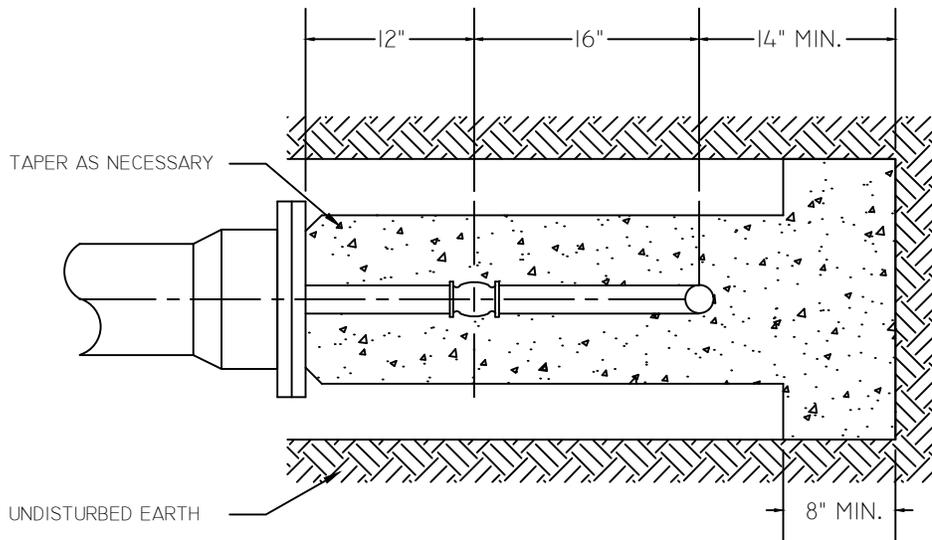


Dover

FIRE HYDRANT & VALVE BOX DETAIL
WITHOUT CURB AND GUTTER

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 04.30.08
CKD: RJH/REM	SCALE: NTS
APRVD: SJD	DWG. NO: W-4



2" BLOW-OFF ASSEMBLY FOR WATER MAINS

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL

DATE: 04.30.08

CKD: RJH/REM

SCALE: NTS

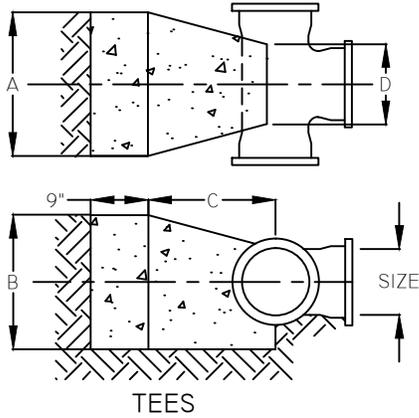
APRVD: SJD

DWG. NO: W-5

City of

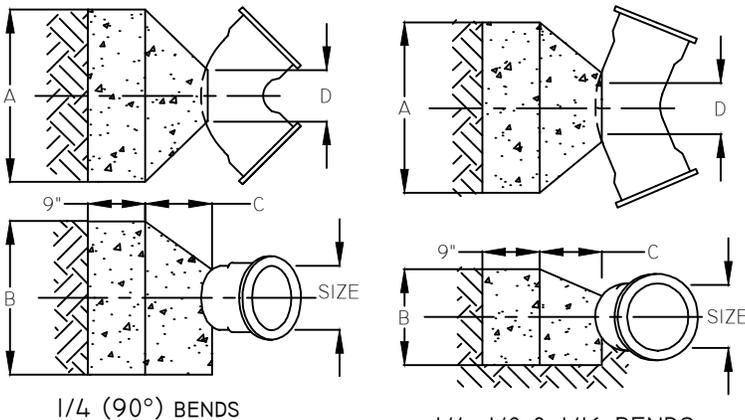


Dover



SIZE OF BEND	DIMENSIONS				CONC. CYD
	A	B	C	D	
6"	2'-6"	1'-0"	1'-3"	1'-0"	0.15
8"	3'-0"	2'-0"	1'-4"	1'-0"	0.33
12"	4'-0"	3'-0"	1'-10"	1'-4"	0.86
16"	5'-0"	4'-0"	2'-9"	1'-10"	1.95
20"	6'-0"	5'-0"	4'-0"	2'-6"	3.98

DETAIL OF STANDARD
THRUST BLOCKS FOR TEES & Y'S
NOT TO SCALE

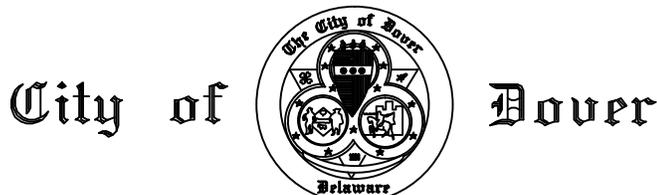


SIZE OF BEND	DEGREE OF BEND	DIMENSIONS				CONC. CYD
		A	B	C	D	
6"	90°	2'-6"	1'-9"	1'-0"	0'-9"	0.23
8"	90°	3'-4"	2'-6"	1'-0"	1'-2"	0.44
12"	90°	5'-0"	3'-0"	1'-4"	1'-8"	0.90
16"	90°	5'-6"	4'-6"	2'-0"	2'-3"	1.94
6"	45°	2'-4"	1'-8"	0'-10"	0'-9"	0.19
8"	45°	2'-4"	2'-0"	1'-0"	1'-4"	0.27
12"	45°	3'-6"	2'-6"	1'-4"	1'-4"	0.53
16"	45°	5'-0"	3'-0"	1'-9"	2'-0"	1.07
20"	45°	6'-0"	3'-9"	2'-0"	2'-0"	1.65
6"	22-1/2°	2'-0"	1'-6"	0'-9"	0'-9"	0.14
8"	22-1/2°	2'-2"	1'-6"	0'-9"	1'-2"	0.16
12"	22-1/2°	2'-6"	2'-0"	1'-0"	1'-4"	0.27
16"	22-1/2°	3'-4"	2'-6"	1'-9"	1'-2"	0.58
20"	22-1/2°	4'-0"	3'-0"	2'-0"	1'-8"	0.88
6"	11-1/4°	2'-0"	1'-3"	0'-9"	0'-9"	0.12
8"	11-1/4°	2'-0"	1'-3"	0'-9"	1'-2"	0.12
12"	11-1/4°	2'-3"	1'-9"	1'-0"	1'-4"	0.22
16"	11-1/4°	3'-0"	2'-3"	1'-6"	1'-4"	0.44
20"	11-1/4°	3'-6"	2'-6"	1'-6"	1'-8"	0.53

DETAIL OF STANDARD
THRUST BLOCKS FOR BENDS
NOT TO SCALE

STANDARD NOTES:

1. ALL FITTINGS SHALL BE RAPPED IN POLYETHYLENE PRIOR TO PLACEMENT OF BUTTRESS.
2. CARE MUST BE EXERCISED IN THE PLACING OF CONCRETE TO INSURE THAT SUFFICIENT SPACE IS ALLOWED FOR THE TIGHTENING AND OR REMOVAL OF ALL BOLTS IN THE MECHANICAL JOINT.
3. ALL REACTION BACKING TO BE A MINIMUM OF 3500 P.S.I. (CLASS "B") CONCRETE.
4. ALL REACTION BACKING TO EXTEND TO UNDISTURBED EARTH.

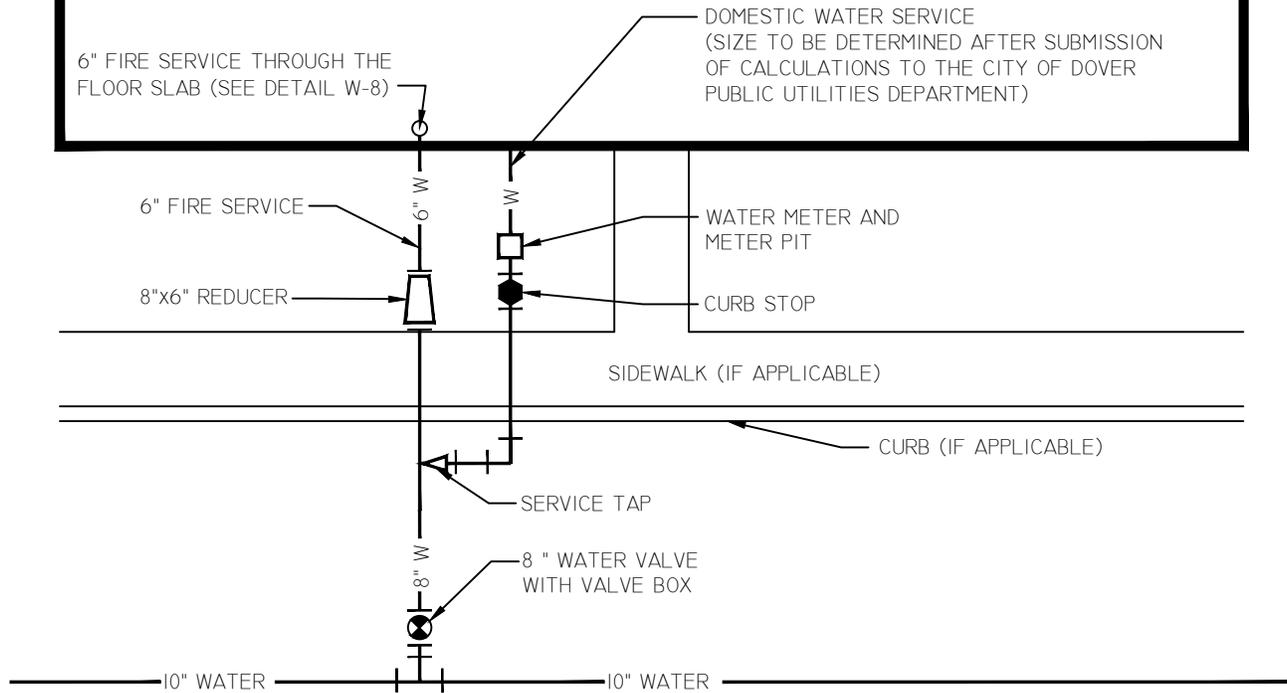


BUTTRESSES - FOR WATER MAINS

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 04.30.08
CKD: RJH/REM	SCALE: NTS
APRVD: SJD	DWG. NO: W-6

PROPOSED
BUILDING



NOTES:

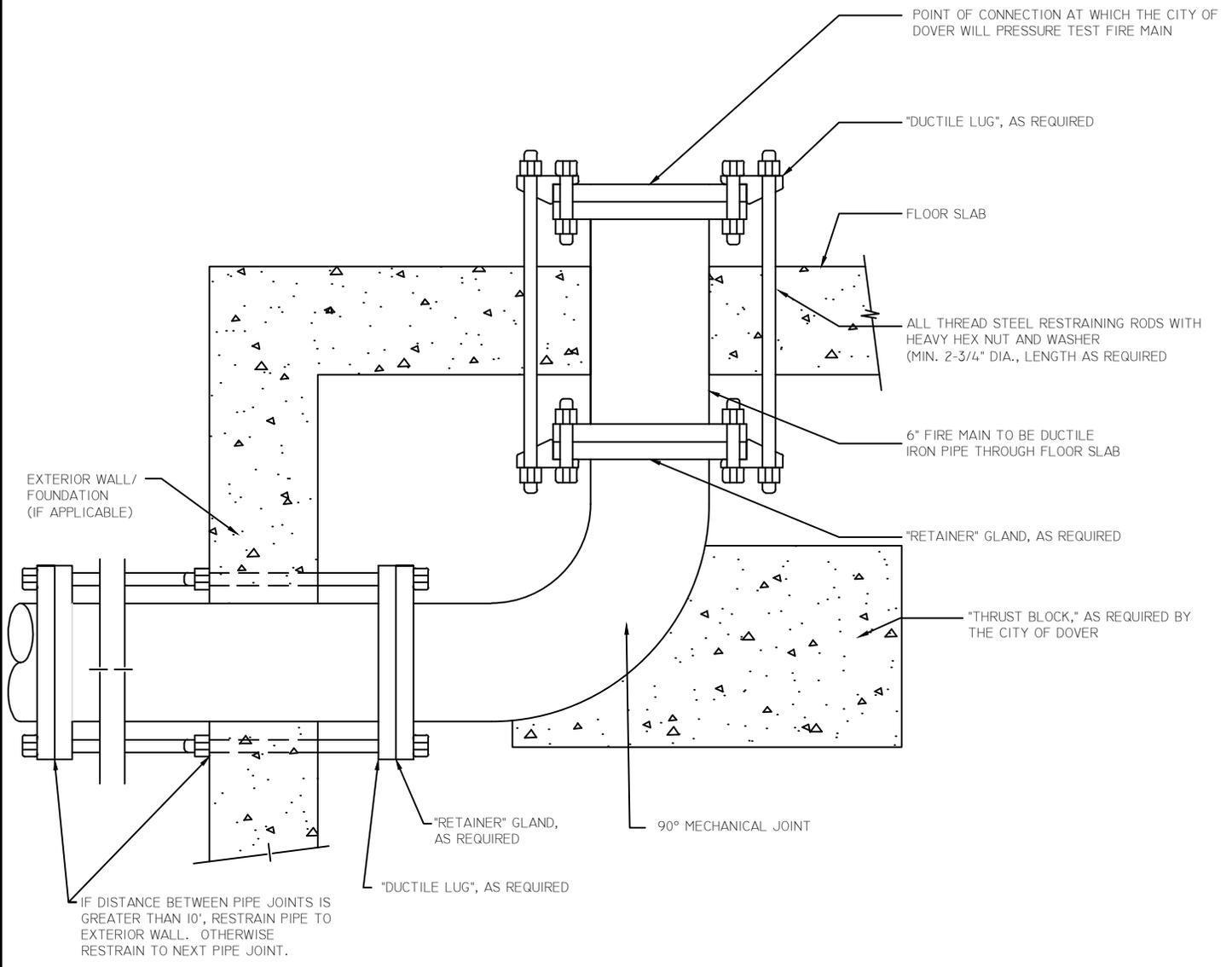
1. THE PURPOSE OF THIS DETAIL IS TO ILLUSTRATE A TYPICAL FIRE SERVICE CONNECTION. THE DESIGNER SHALL BE RESPONSIBLE FOR MODIFICATIONS OF THIS DETAIL PER THEIR PARTICULAR SITE PLAN.
2. THE CITY OF DOVER PUBLIC UTILITIES DEPARTMENT RESERVES THE RIGHT TO MODIFY THIS DETAIL PER THE LAYOUT OF THE SITE.



DOMESTIC AND FIRE
SERVICE CONNECTION

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 04.30.08
CKD: RJH/REM	SCALE: NTS
APRVD: SJD	DWG. NO: W-7



EXTERIOR WALL/
FOUNDATION
(IF APPLICABLE)

POINT OF CONNECTION AT WHICH THE CITY OF
DOVER WILL PRESSURE TEST FIRE MAIN

"DUCTILE LUG", AS REQUIRED

FLOOR SLAB

ALL THREAD STEEL RESTRAINING RODS WITH
HEAVY HEX NUT AND WASHER
(MIN. 2-3/4" DIA., LENGTH AS REQUIRED)

6" FIRE MAIN TO BE DUCTILE
IRON PIPE THROUGH FLOOR SLAB

"RETAINER" GLAND, AS REQUIRED

"THRUST BLOCK," AS REQUIRED BY
THE CITY OF DOVER

"RETAINER" GLAND,
AS REQUIRED

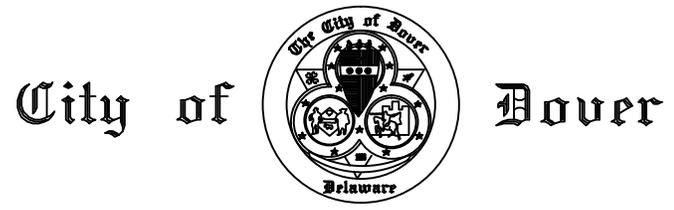
90° MECHANICAL JOINT

"DUCTILE LUG", AS REQUIRED

IF DISTANCE BETWEEN PIPE JOINTS IS
GREATER THAN 10', RESTRAIN PIPE TO
EXTERIOR WALL. OTHERWISE
RESTRAIN TO NEXT PIPE JOINT.

NOTES:

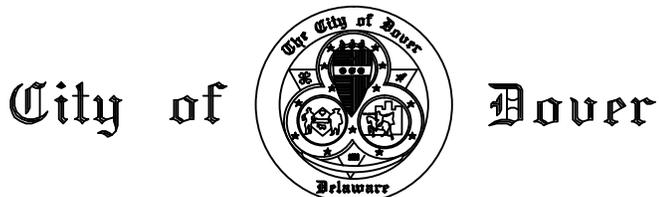
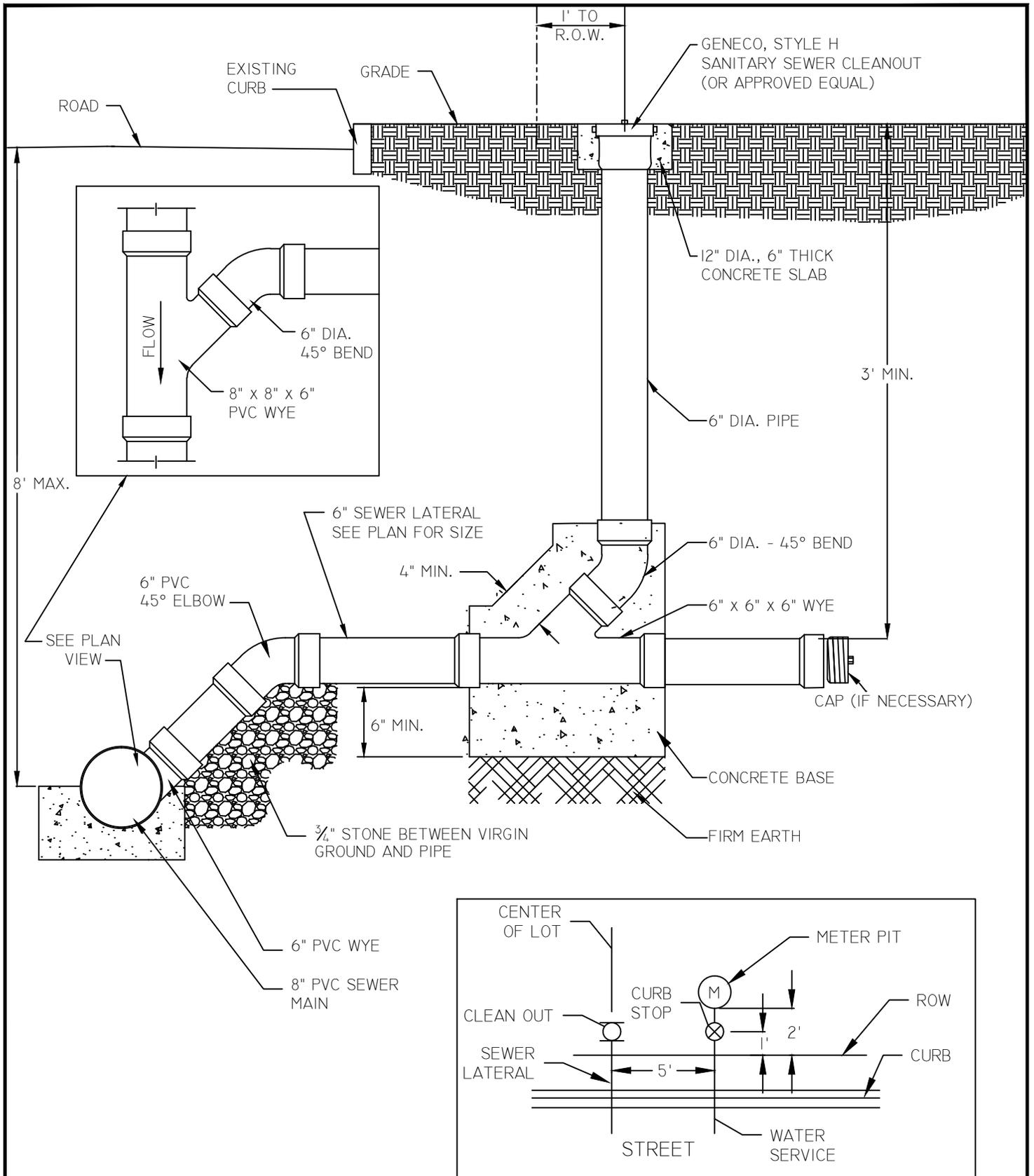
1. THE PURPOSE OF THIS DETAIL IS TO RESTRAIN THE FIRE MAIN COMING THROUGH THE FLOOR SLAB TO THE DEGREE NECESSARY TO ENSURE PIPE AND JOINT INTEGRITY DURING TESTING AND NORMAL CONDITIONS. THIS IS A GENERAL DETAIL, THE CITY OF DOVER PUBLIC UTILITIES DEPARTMENT RESERVES THE RIGHT TO MAKE MODIFICATIONS TO EACH SPECIFIC CASE.
2. WATER MAIN TO BE DUCTILE IRON PIPE, CEMENT LINED, CLASS 52 WHEREVER CROSSING THROUGH CONCRETE.



FIRE MAIN PIPE RESTRAINT DETAIL

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 04.30.08
CKD: RJH/REM	SCALE: NTS
APRVD: SJD	DWG. NO: W-8



RESIDENTIAL SEWER LATERAL DEPTH UP TO 8'

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL

DATE: 01.05.09

CKD: RJH/REM

SCALE: NTS

APRVD: SJD

DWG. NO: WW-1

CITY OF DOVER STANDARD
 CAST IRON FRAME & COVER BY
 CONTRACTOR ADJUST TO GRADE AS
 REQUIRED.

O-RING JOINT
 O-RING JOINT CONFORMS TO
 A.S.T.M. SPECIFICATIONS C361
 AND C443, LATEST REVISION.

MANHOLE DESIGN SPECIFICATIONS
 CONFORMS TO: "PRECAST REINFORCED
 CONCRETE MANHOLE SECTIONS -
 A.S.T.M. DESIGNATION C478", LATEST
 REVISION.

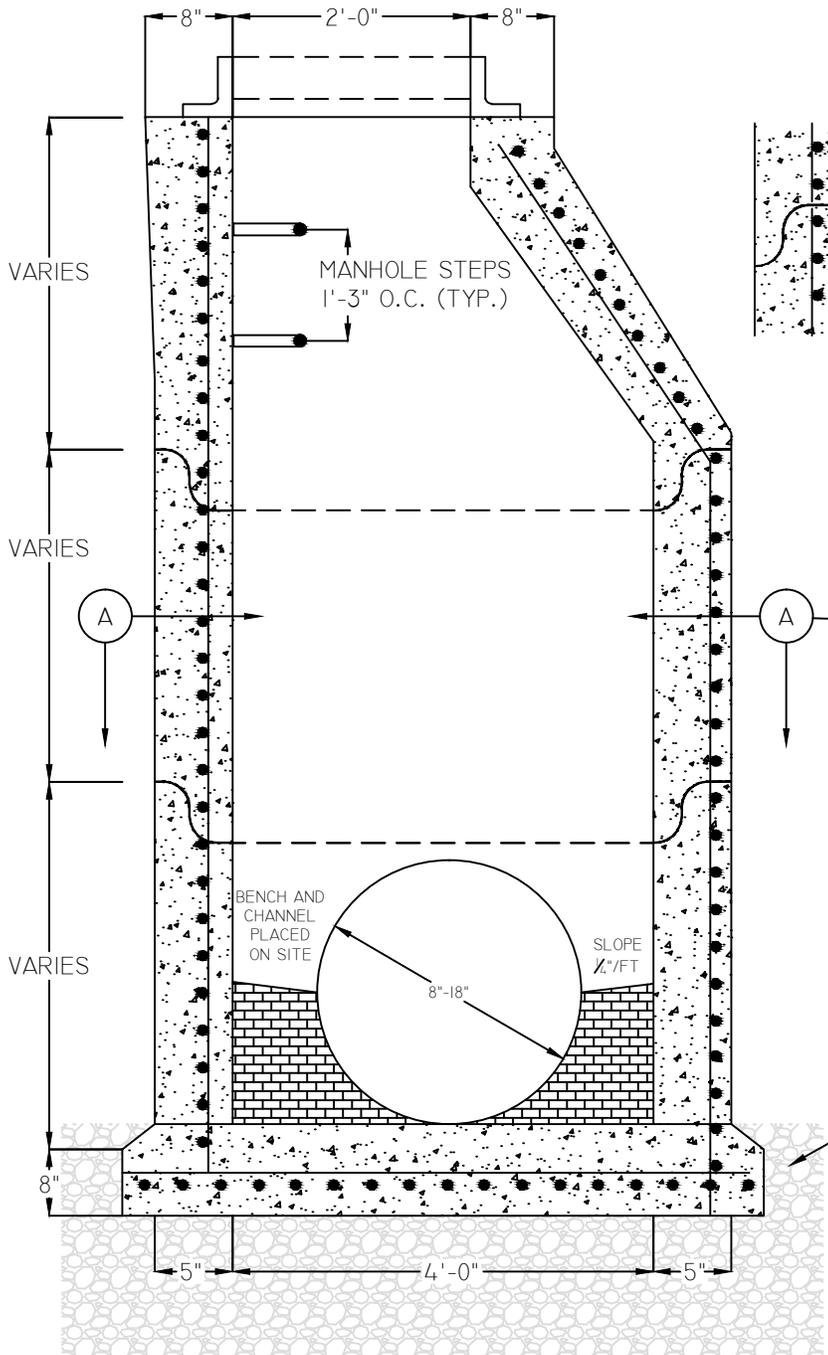
LIFT-PIN HOLES IN ALL
 PIECES FOR HANDLING

SEE SECTION ON SHEET WW-6

CONCRETE COMPRESSIVE
 STRENGTH 4,000 P.S.I.

PIPE OPENINGS AS REQUIRED FOR PIPE
 DIAMETERS 8" THROUGH 18"

AASHTO 57 STONE FOUNDATION UNDER
 ALL MANHOLES - 12" DEEP, EXTEND 12"
 BEYOND MANHOLE EXTERIOR WALL.



CHANNELING/ALL WASTEWATER MANHOLES - PRE-CAST

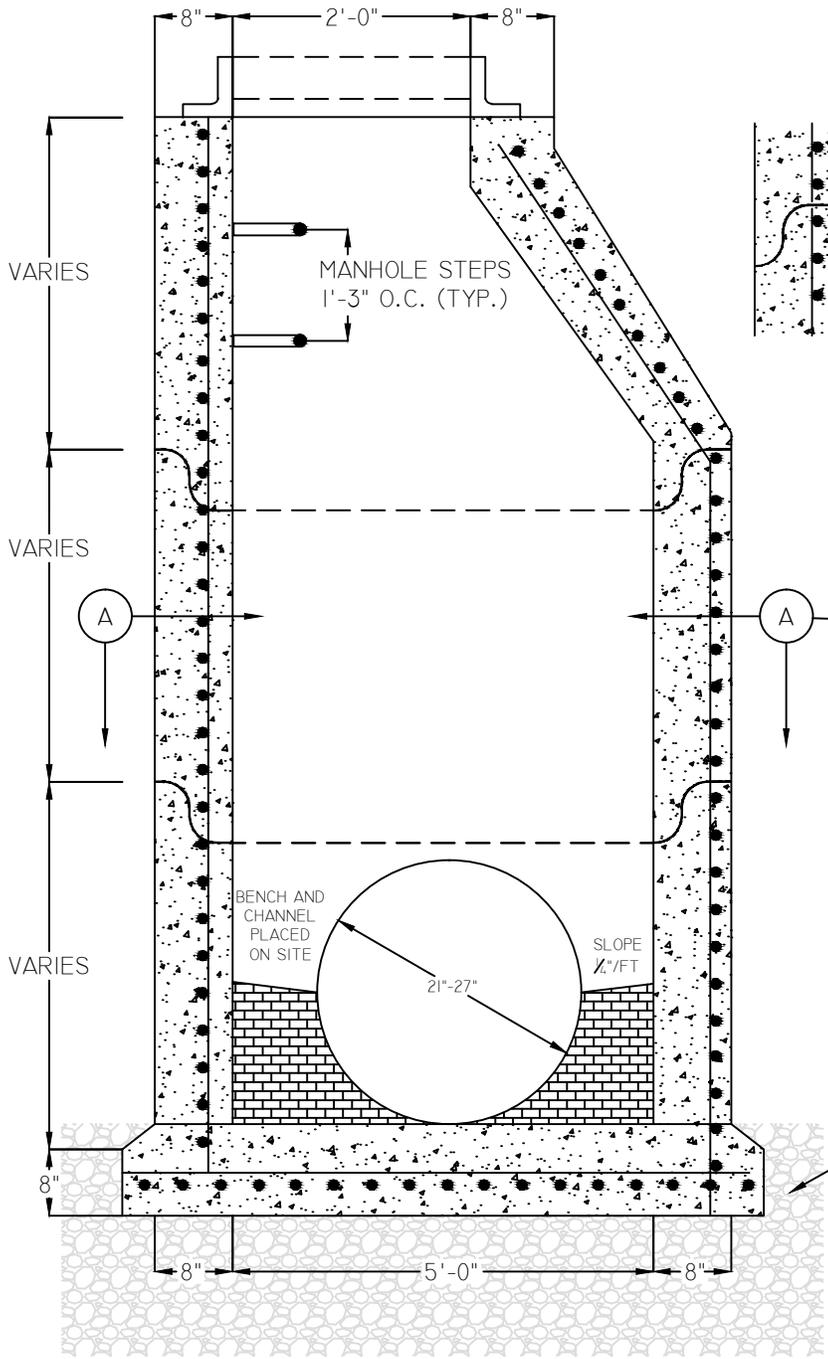
BOTTOM OF MANHOLE TO BE CHANNELLED AND BENCHED. MINIMUM CHANNEL DEPTH TO BE HALF THE DIAMETER OF INLET OR THROUGH-PIPE. CHANNELS TO BE SMOOTH, CONCRETE, AND SEMI-CIRCULAR IN SECTION. WHERE BRICK CHANNEL IS USED, INVERT SHALL BE BRICK LAID ON EDGE. SUBJECT TO APPROVAL OF CITY OF DOVER PUBLIC UTILITIES DIRECTOR, PRECAST CHANNELS MAY BE UTILIZED WITH THE UNDERSTANDING THAT IF ALIGNMENT OF FLOW IS OFF, CHANNEL WILL BE REMOVED AND BRICK CHANNEL INSTALLED TO CORRECT FLOW.



MANHOLE TYPE I

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 12.01.08
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-3



CITY OF DOVER STANDARD
 CAST IRON FRAME & COVER BY
 CONTRACTOR ADJUST TO GRADE AS
 REQUIRED.

O-RING JOINT
 O-RING JOINT CONFORMS TO
 A.S.T.M. SPECIFICATIONS C361
 AND C443, LATEST REVISION.

MANHOLE DESIGN SPECIFICATIONS
 CONFORMS TO: "PRECAST REINFORCED
 CONCRETE MANHOLE SECTIONS -
 A.S.T.M. DESIGNATION C478", LATEST
 REVISION.

LIFT-PIN HOLES IN ALL
 PIECES FOR HANDLING

SEE SECTION ON SHEET WW-6

CONCRETE COMPRESSIVE
 STRENGTH 4,000 P.S.I.

PIPE OPENINGS AS REQUIRED FOR PIPE
 DIAMETERS 21" THROUGH 27", AS WELL
 AS APPROVED INSIDE DROPS.

AASHTO 57 STONE FOUNDATION UNDER
 ALL MANHOLES - 12" DEEP, EXTEND 12"
 BEYOND MANHOLE EXTERIOR WALL.

CHANNELING/ALL WASTEWATER MANHOLES - PRE-CAST

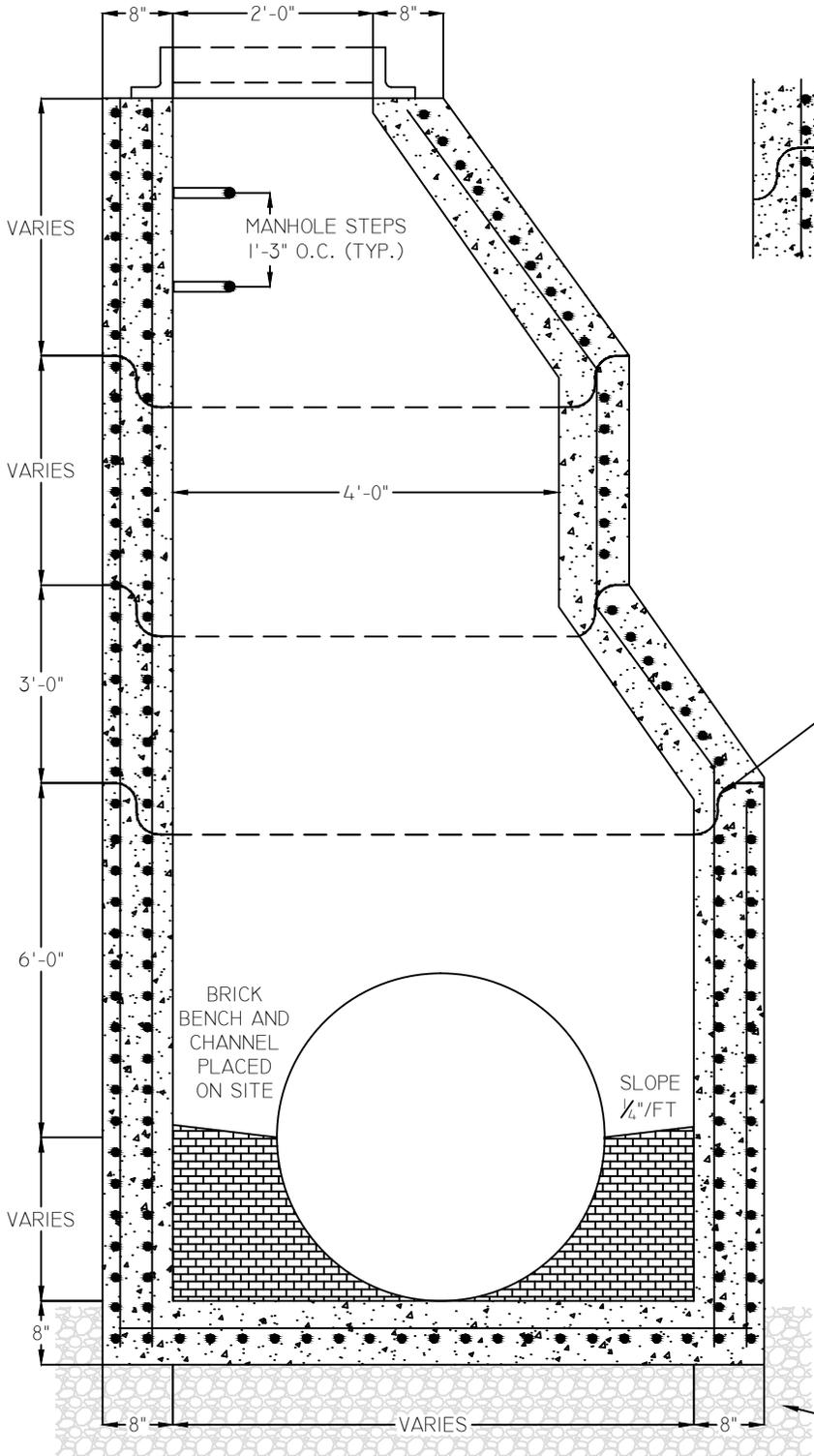
BOTTOM OF MANHOLE TO BE CHANNELLED AND BENCHED. MINIMUM CHANNEL DEPTH TO BE HALF THE DIAMETER OF INLET OR THROUGH-PIPE. CHANNELS TO BE SMOOTH, CONCRETE, AND SEMI-CIRCULAR IN SECTION. WHERE BRICK CHANNEL IS USED, INVERT SHALL BE BRICK LAID ON EDGE. SUBJECT TO APPROVAL OF CITY OF DOVER PUBLIC UTILITIES DIRECTOR, PRECAST CHANNELS MAY BE UTILIZED WITH THE UNDERSTANDING THAT IF ALIGNMENT OF FLOW IS OFF, CHANNEL WILL BE REMOVED AND BRICK CHANNEL INSTALLED TO CORRECT FLOW.



MANHOLE TYPE II

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 12.01.08
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-4



CITY OF DOVER STANDARD
CAST IRON FRAME & COVER BY
CONTRACTOR ADJUST TO GRADE AS
REQUIRED.

O-RING JOINT
O-RING JOINT CONFORMS TO
A.S.T.M. SPECIFICATIONS C361
AND C443, LATEST REVISION.

MANHOLE DESIGN SPECIFICATIONS
CONFORMS TO: "PRECAST REINFORCED
CONCRETE MANHOLE SECTIONS -
A.S.T.M. DESIGNATION C478", LATEST
REVISION.

LIFT-PIN HOLES IN ALL
PIECES FOR HANDLING

PIPE OPENINGS AS REQUIRED FOR ANY
PIPE DIAMETER GREATER THAN 27" OR
WHEN DICTATED BY ANGLE OF PIPE
PENETRATION.

CONCRETE COMPRESSIVE
STRENGTH 4,000 P.S.I.

MORTAR JOINTS
SECTIONS SET IN MORTAR
GROUT AT INSTALLATION

CHANNELING/ALL WASTEWATER
MANHOLES - PRE-CAST

BOTTOM OF MANHOLE TO BE CHanneled
AND BENCHED. MINIMUM CHANNEL DEPTH
TO BE HALF THE DIAMETER OF INLET OR
THROUGH-PIPE. CHANNELS TO BE
SMOOTH, CONCRETE, AND SEMI-CIRCULAR
IN SECTION.

WHERE BRICK CHANNEL IS USED, INVERT
SHALL BE BRICK LAID ON EDGE.
SUBJECT TO APPROVAL OF CITY OF
DOVER PUBLIC UTILITIES DIRECTOR,
PRECAST CHANNELS MAY BE UTILIZED
WITH THE UNDERSTANDING THAT IF
ALIGNMENT OF FLOW IS OFF, CHANNEL
WILL BE REMOVED AND BRICK CHANNEL
INSTALLED TO CORRECT FLOW.

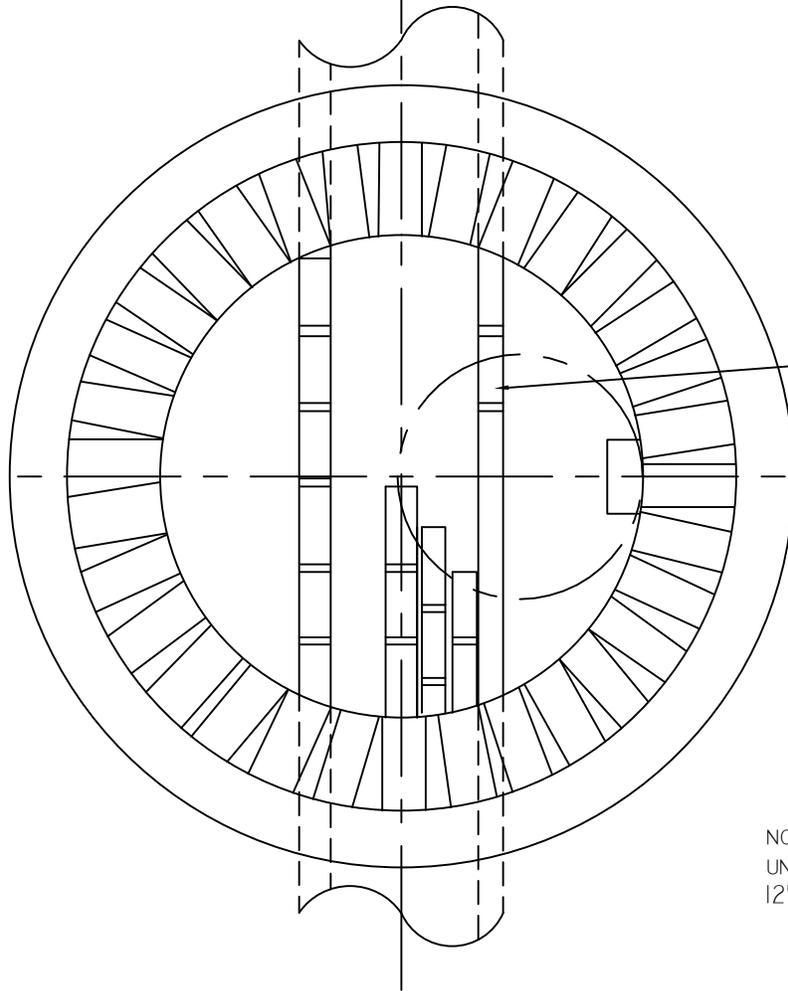
AASHTO 57 STONE FOUNDATION UNDER
ALL MANHOLES - 12" DEEP, EXTEND 12"
BEYOND MANHOLE EXTERIOR WALL.



MANHOLE TYPE III

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 12.01.08
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-5



FOR BRICK CHANNEL:
WHERE BRICK CHANNEL
IS USED, INVERT SHALL
BE BRICK LAID ON EDGE.

BENCH MAY BE BRICK LAID ON EDGE
OR LAID FLAT, AS SPECIFIED BY THE
CITY OF DOVER PUBLIC UTILITIES
DIRECTOR.

APPLICABLE TO BUILT-UP AND
PRE-CAST MANHOLES.

NOTE: AASHTO 57 STONE FOUNDATION
UNDER ALL MANHOLES - 12" DEEP, EXTEND
12" BEYOND MANHOLE EXTERIOR WALL

SECTION A-A
(SEE SHEETS WW-3 AND WW-4)

CHANNELING/ALL WASTEWATER MANHOLES - PRE-CAST

BOTTOM OF MANHOLE TO BE CHanneled AND BEnched. MINIMUM CHANNEL DEPTH TO BE HALF THE DIAMETER OF INLET OR THROUGH-PIPE. CHANNELS TO BE SMOOTH, CONCRETE, AND SEMI-CIRCULAR IN SECTION. WHERE BRICK CHANNEL IS USED, INVERT SHALL BE BRICK LAID ON EDGE. SUBJECT TO APPROVAL OF CITY OF DOVER PUBLIC UTILITIES DIRECTOR, PRECAST CHANNELS MAY BE UTILIZED WITH THE UNDERSTANDING THAT IF ALIGNMENT OF FLOW IS OFF, CHANNEL WILL BE REMOVED AND BRICK CHANNEL INSTALLED TO CORRECT FLOW.

City of

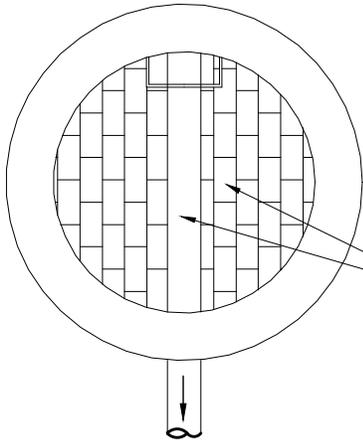


Dover

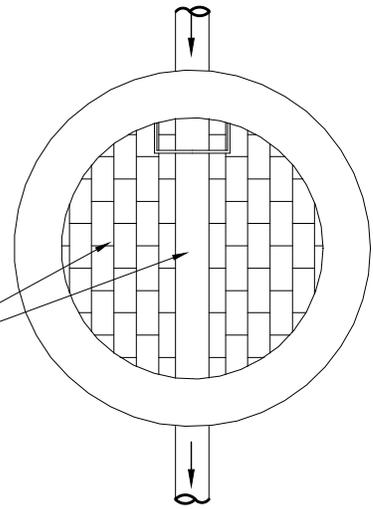
MANHOLE-PLAN VIEW

DEPARTMENT OF PUBLIC UTILITIES

DRAWN:	JAL	DATE:	12.01.08
CKD:	REM/RJH	SCALE:	NTS
APRVD:	SJD	DWG. NO:	WW-6

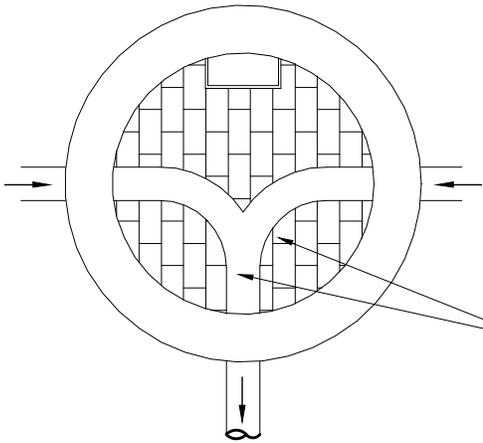


TERMINAL

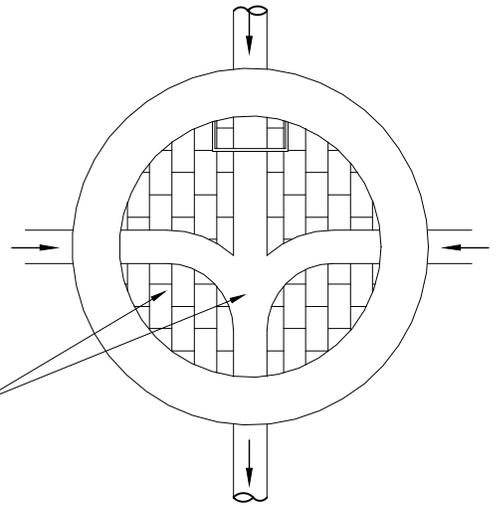


1-WAY

BRICK OR PRE-CAST
FLOW CHANNEL
AND BENCH



2-WAY



3-WAY

BRICK OR PRE-CAST
FLOW CHANNEL
AND BENCH

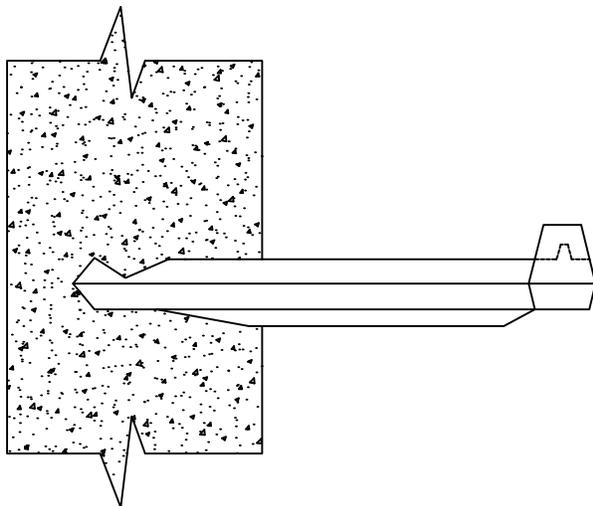
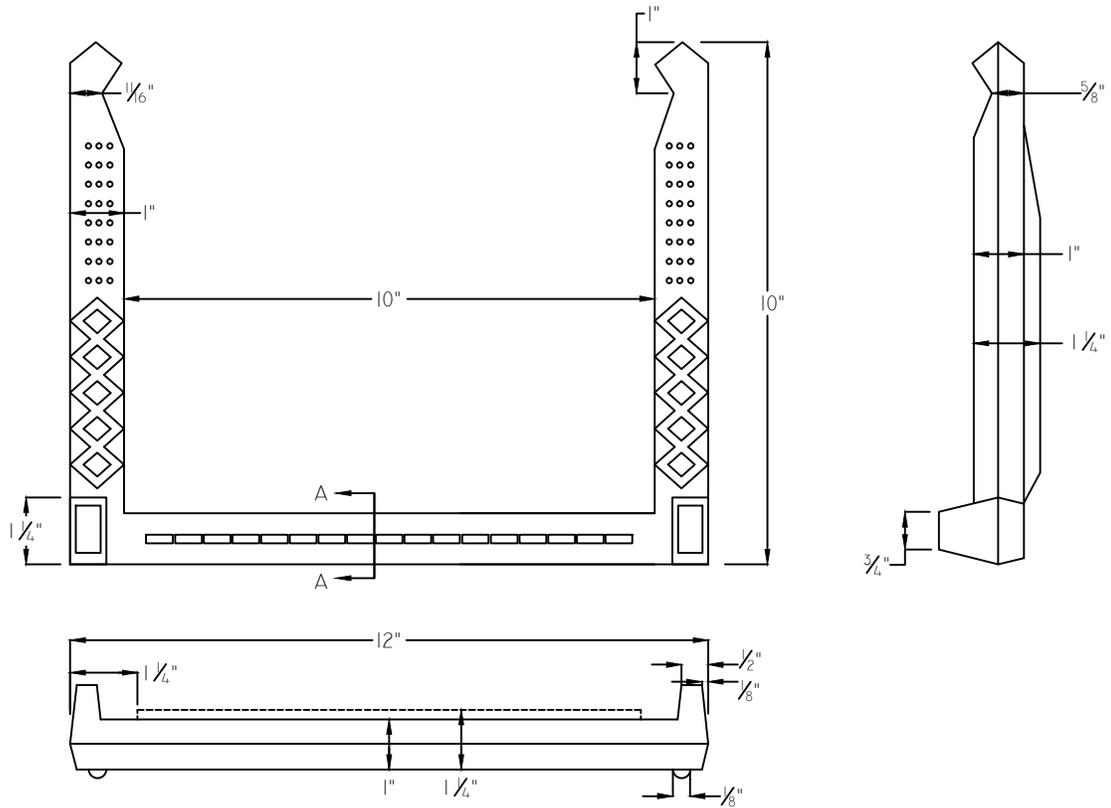
ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS



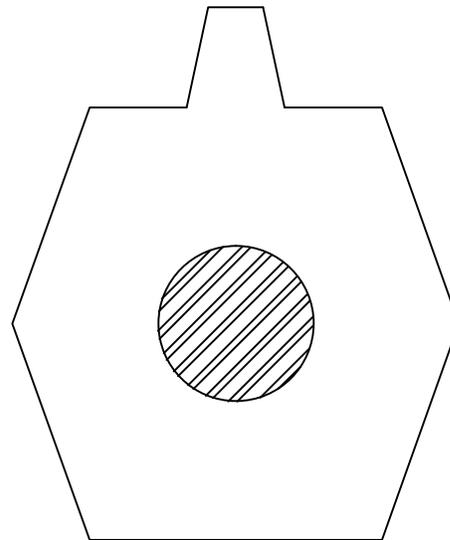
FLOW CHANNEL PATTERNS

DEPARTMENT OF PUBLIC UTILITIES

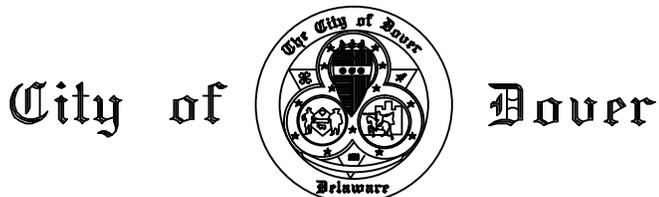
DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-7



STEPS SHALL BE PLACED INTO WET CONCRETE WALL DURING MANUFACTURE OR MORTED INTO HOLES AFTER CONCRETE HAS SET.



SECTION A-A
POLYPROPYLENE PLASTIC
NO. 3 DEFORMED STEEL ROD



MANHOLE STEPS

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL

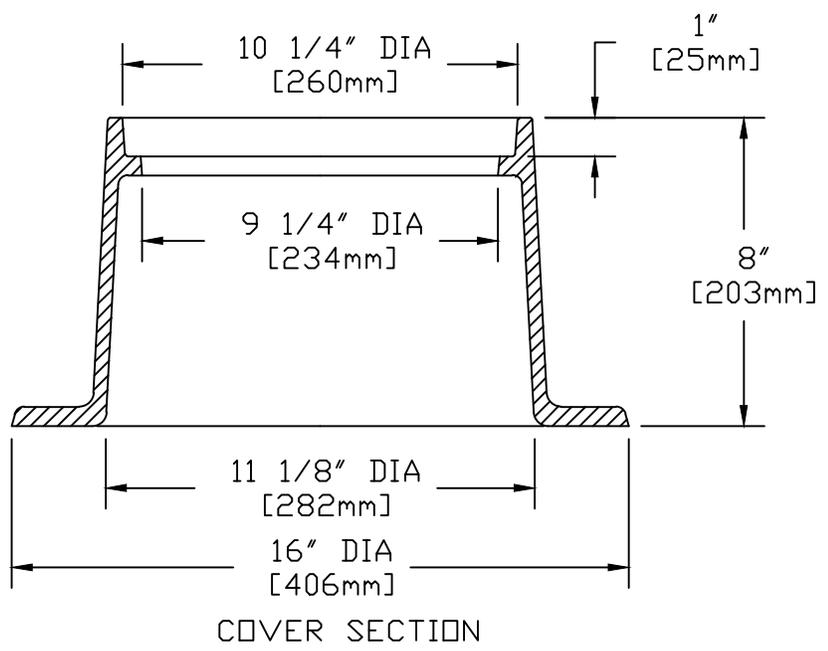
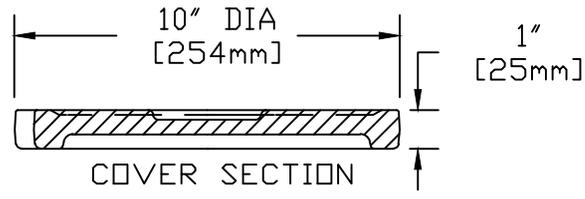
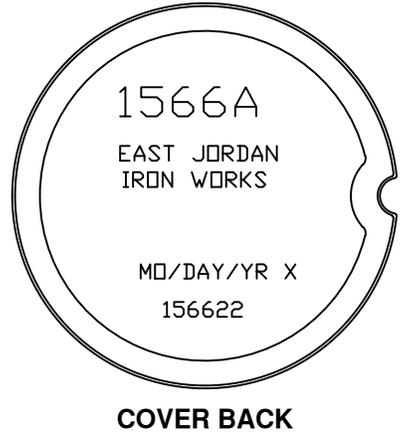
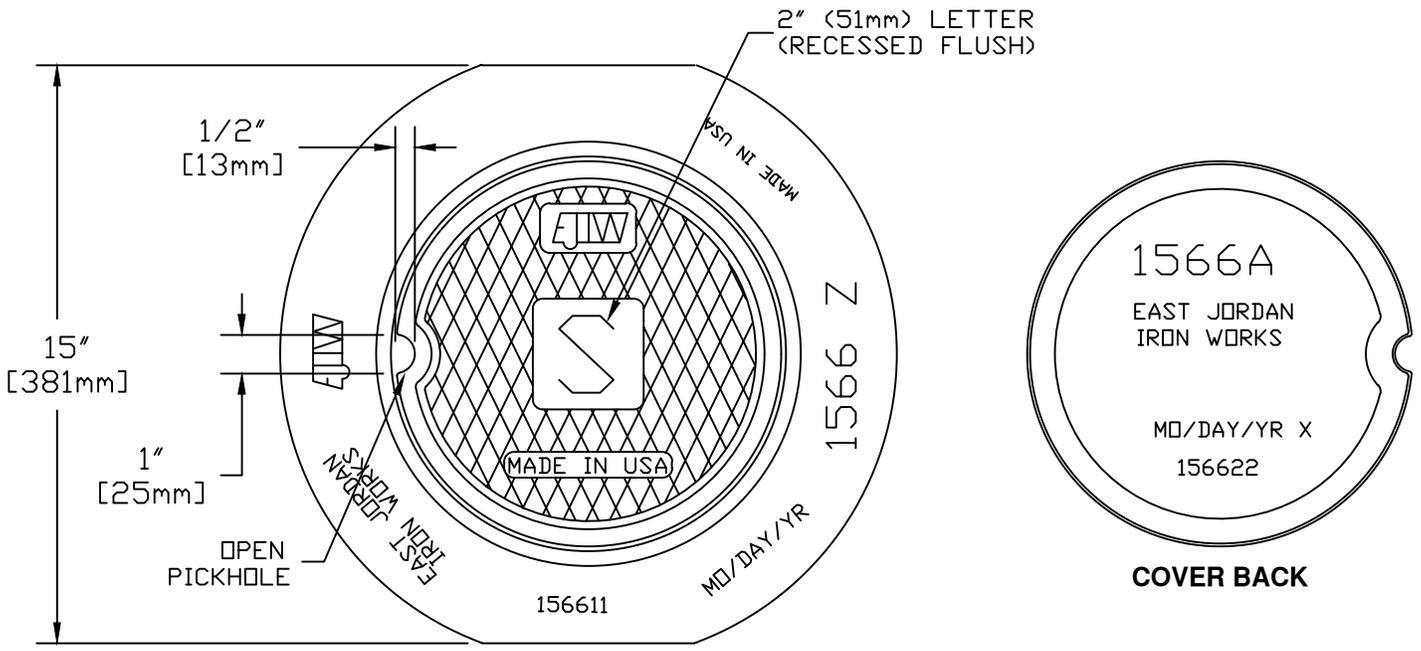
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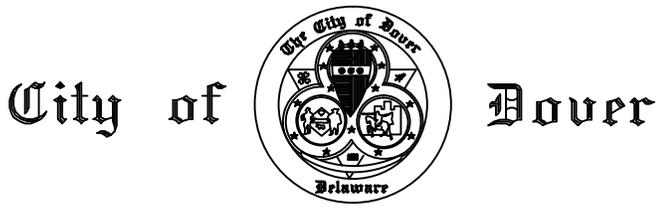
SCALE: NTS

APRVD: SJD

DWG. NO: WW-8

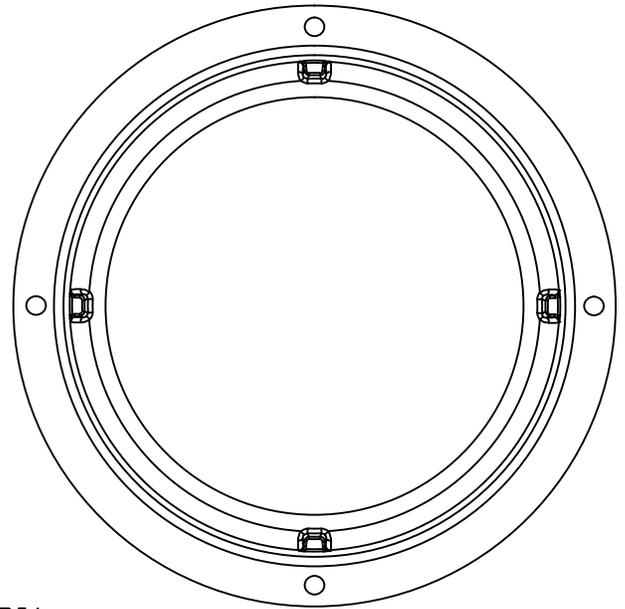
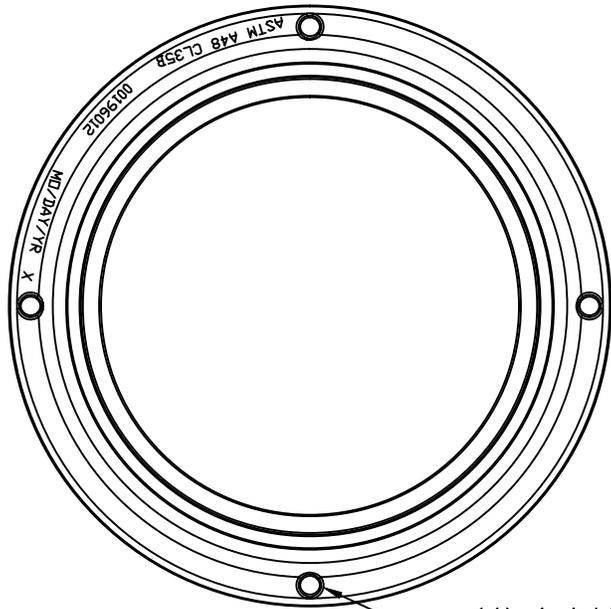


DETAIL HAS BEEN PROVIDED BY
EAST JORDAN IRON WORKS, INC.



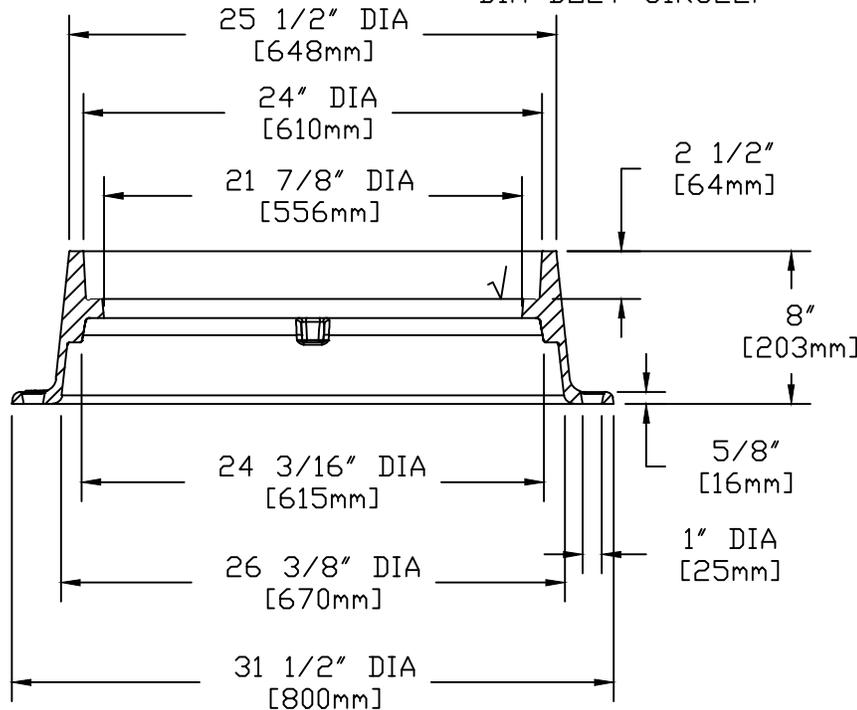
SANITARY SEWER CLEANOUT DETAIL

DEPARTMENT OF PUBLIC UTILITIES	
DRAWN: JAL	DATE: 12.01.08
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-9



(4) 1 1/4" (32mm) DIA
HOLES ON 29 1/4" (743mm)
DIA BOLT CIRCLE.

BOTTOM VIEW



FRAME SECTION

FRAME:	165 LBS / 75 KG
FRAME:	GRAY IRON, ASTM A48 CL35B

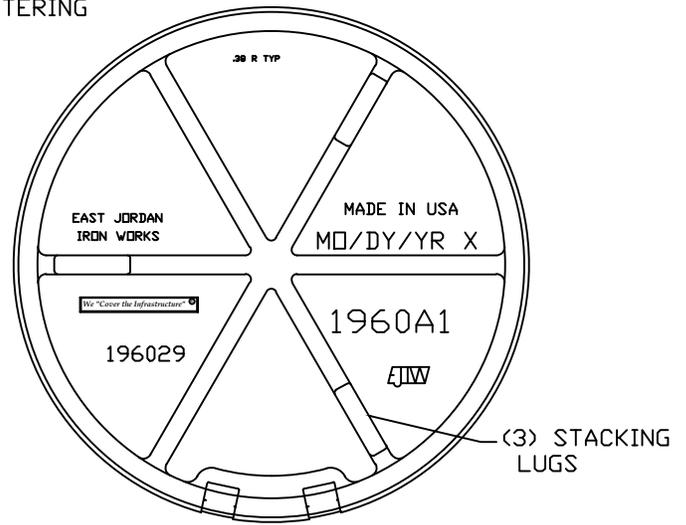
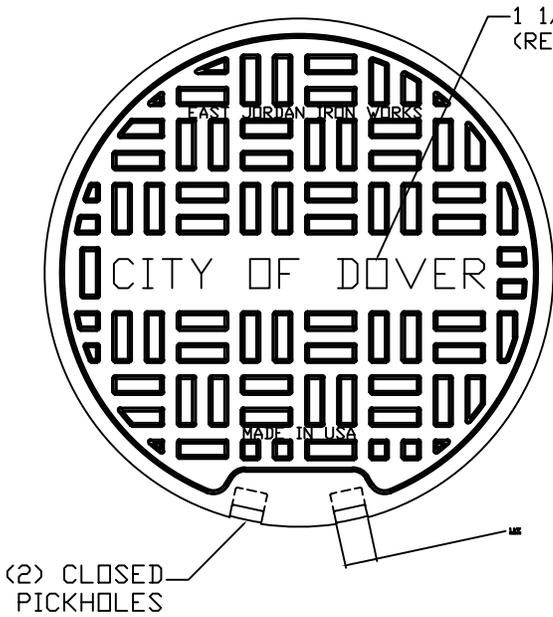
ORIGINAL DETAIL PROVIDED BY
EAST JORDAN IRON WORKS, INC.



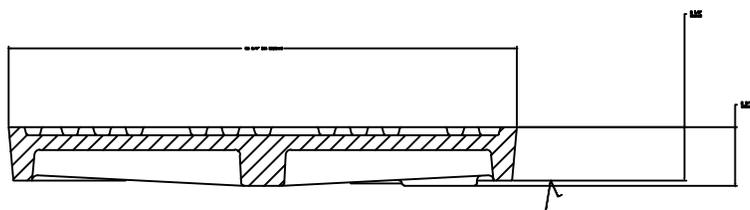
MANHOLE FRAME

DEPARTMENT OF PUBLIC UTILITIES

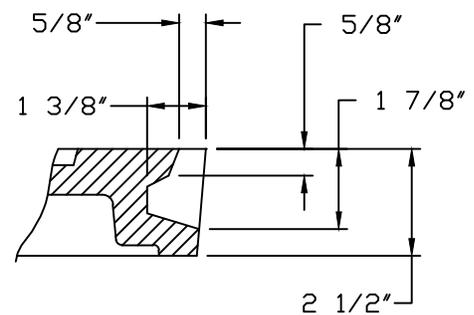
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CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-10



BOTTOM VIEW OF COVER



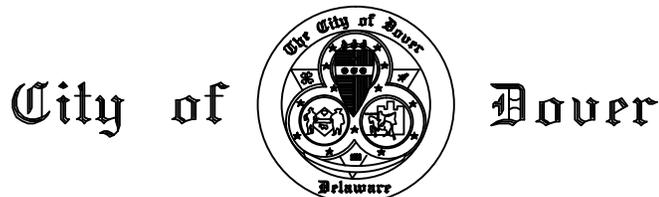
COVER SECTION



PICKHOLE DETAIL

COVER: GRAY IRON,
ASTM A48 CL35B

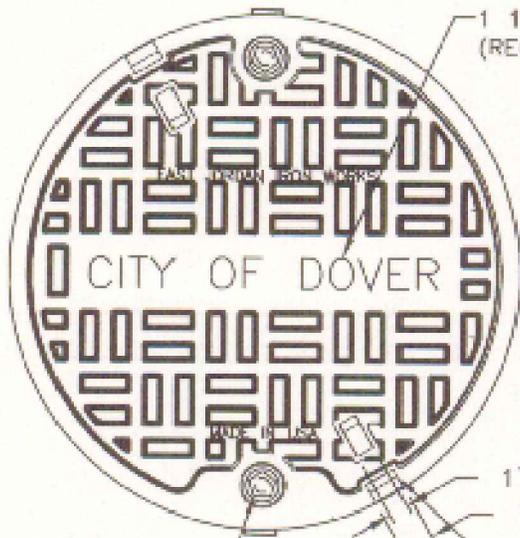
DETAIL HAS BEEN PROVIDED BY
EAST JORDAN IRON WORKS, INC.



MANHOLE COVER

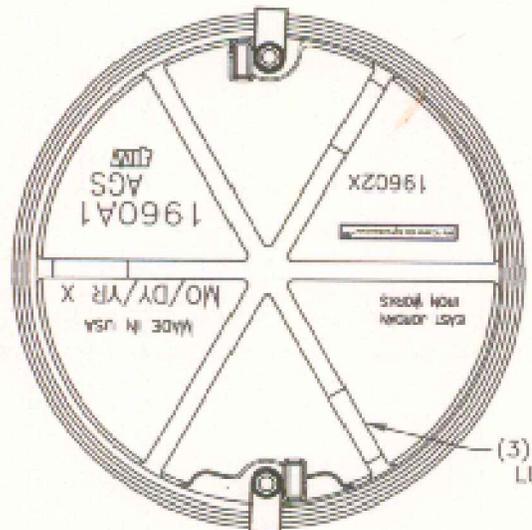
DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 12.01.08
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-II



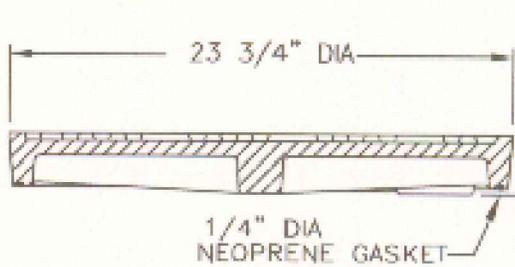
(2) CAM LOCKS
SEE DETAIL

(2) EPIC™
PICKHOLES

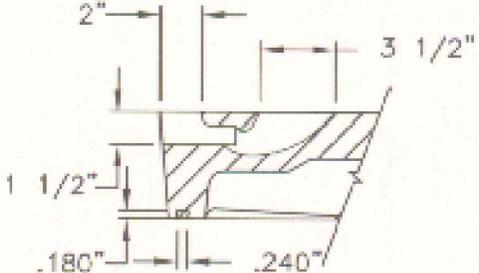


**BOTTOM VIEW
OF COVER**

(3) STACK
LUGS



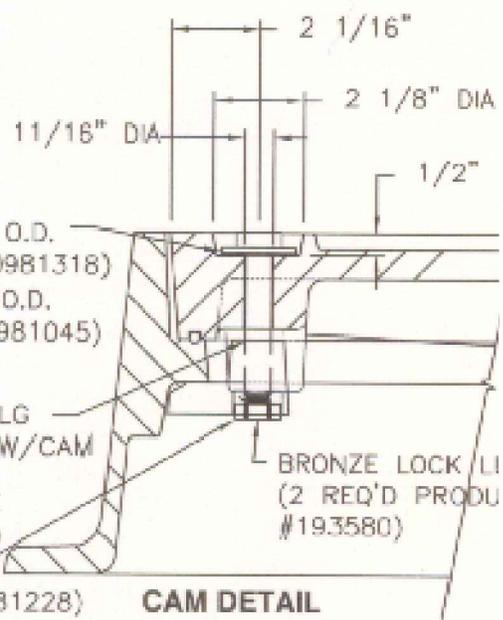
COVER SECTION



**EPIC & GASKET
GROOVE DETAIL**

(2) 5/8" I.D. 1 1/2" O.D.
SS FLAT WASHER (#00981318)
(2) 5/8" I.D. 1 1/2" O.D.
RUBBER WASHER (#00981045)

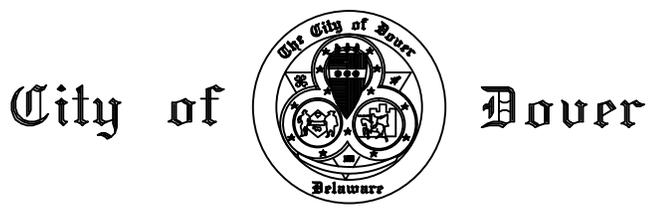
5/8"-11 X 4" LG
SS PENT BOLT W/CAM
(2 REQ'D)
(2) 5/8-11 ZN NYLOK
NUT (#00981284)
(2) 5/8-11 HX
JAM NUT ZN (#00981228)



CAM DETAIL

BRONZE LOCK/LI
(2 REQ'D PRODU
#193580)

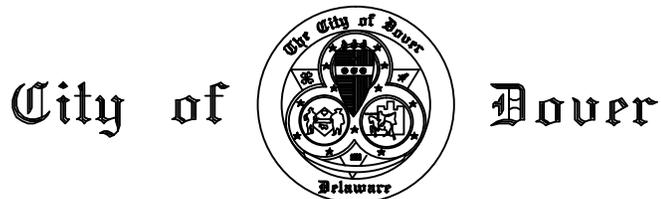
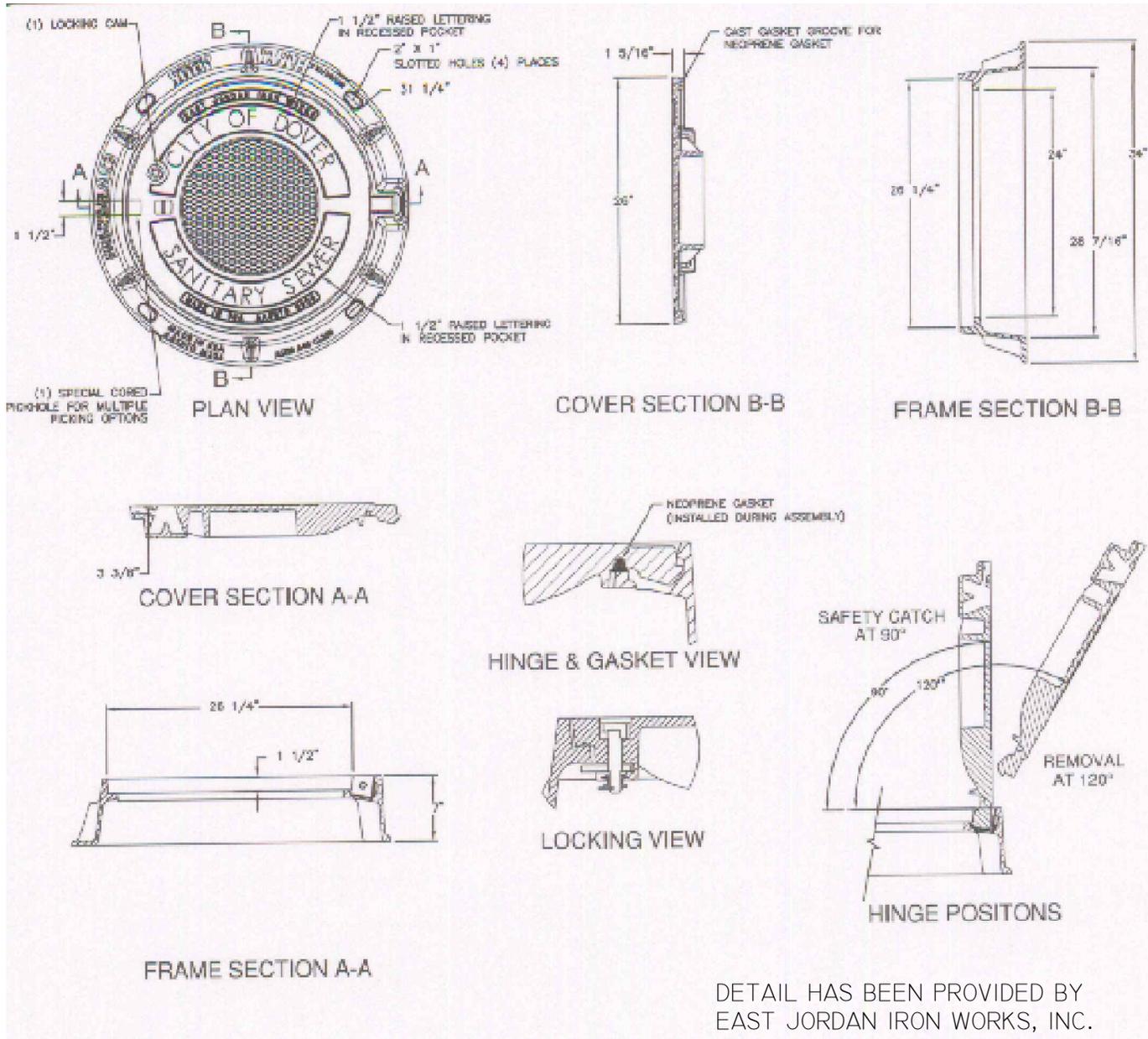
DETAIL HAS BEEN PROVIDED BY
EAST JORDAN IRON WORKS, INC.



MANHOLE COVER-LOCKING

DEPARTMENT OF PUBLIC UTILITIES

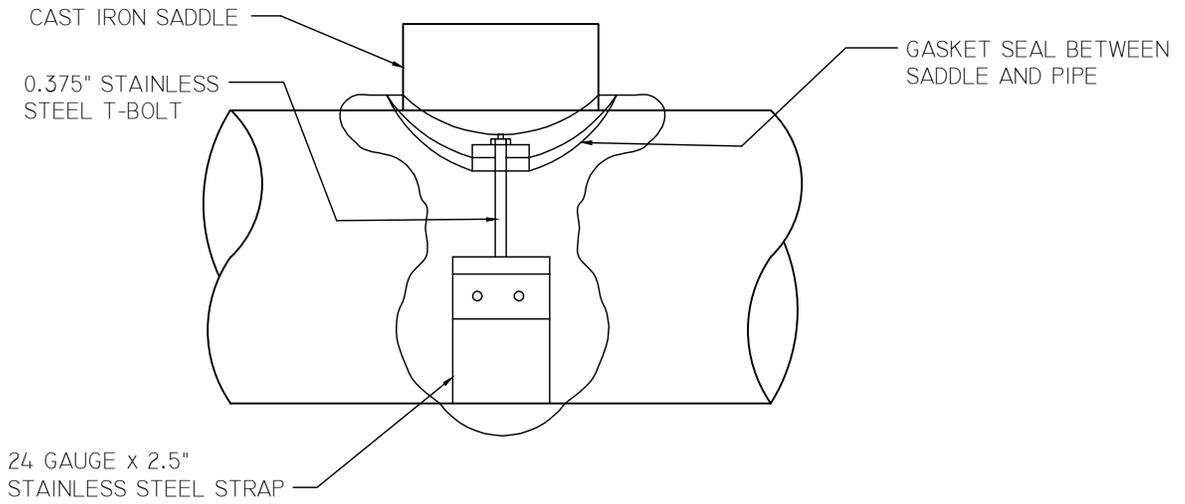
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CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-12



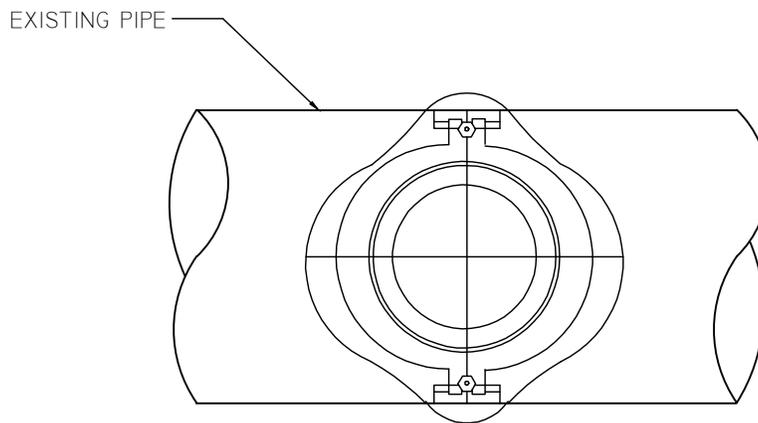
HINGED MANHOLE

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 12.01.08
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-13



ELEVATION



PLAN

NOTES:

1. CAST IRON SADDLE TO BE MADE BY THE GENERAL ENGINEERING COMPANY OR APPROVED EQUAL. SADDLE SUPPLIED WITH ASTM D-1869 RUBBER O-RING CEMENTED IN PLACE.
2. SADDLE SUPPLIED WITH AN ASTM D-1869 OR EQUAL RUBBER O-RING GASKET CEMENTED IN PLACE.

ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS

City of

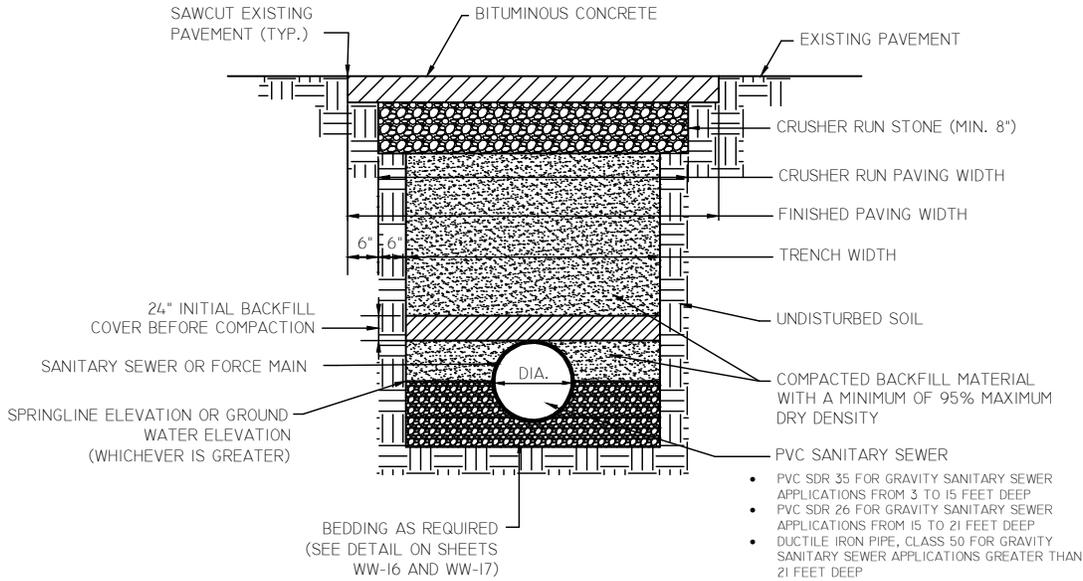


Dover

CAST IRON SADDLE FOR 6"
BUILDING SEWER CONNECTION

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-14



- PVC SDR 35 FOR GRAVITY SANITARY SEWER APPLICATIONS FROM 3 TO 15 FEET DEEP
- PVC SDR 26 FOR GRAVITY SANITARY SEWER APPLICATIONS FROM 15 TO 21 FEET DEEP
- DUCTILE IRON PIPE, CLASS 50 FOR GRAVITY SANITARY SEWER APPLICATIONS GREATER THAN 21 FEET DEEP

NOTES:

1. WHEN BOTTOM OF TRENCH IS IN ROCK, UNDERCUT 6" BELOW BOTTOM OF BARREL AND REPLACE WITH TAMPED SUITABLE MATERIAL.
2. FOR TRENCHES REQUIRING SHORING AND BRACING, ALL WIDTHS SHALL BE INCREASED BY 2 FT.
3. WHEN THE GEOTECHNICAL REPORT INDICATES A HIGH WATER TABLE OR SEASONAL CONDITIONS WARRANT, WELL POINTS SHALL BE INSTALLED TO MAINTAIN REQUIRED TRENCH WIDTHS AND SUITABLE BEDDING.
4. THE ENTIRE THICKNESS AND VERTICAL EDGE OF CUT SHALL BE TACKED.
5. THE SAME DEPTH OF PAVEMENT MATERIAL WHICH EXISTS SHALL BE REINSTALLED, BUT IN NO CASE SHALL THE ASPHALT PAVEMENT BE LESS THAN 2" THICK.
6. THE ASPHALT PAVEMENT MATERIAL SHALL BE INSTALLED AND COMPACTED THOROUGHLY TO ACHIEVE A SMOOTH LEVEL PATCH.
7. ALL MAXIMUM DRY DENSITY REQUIREMENTS ARE BASED ON STANDARD PROCTOR IN UNPAVED AREAS AND MODIFIED PROCTOR IN PAVED AREAS.
8. ONLY APPLY COMPACTED EFFORT OVER PIPE AFTER 24" INITIAL COVER REQUIREMENT IS MET.
9. LIFTS TO BE A MINIMUM OF 8", MAXIMUM OF 12", EXCEPT FOR FIRST LIFT OF COVER OVER PIPE.

PIPE DIAMETER	MINIMUM TRENCH WIDTH	CRUSHER RUN PAVING WIDTH	FINISHED PAVING WIDTH
6"	36"	48"	60"
8"	36"	48"	60"
10"	36"	48"	60"
12"	36"	48"	60"
15"	36"	48"	60"
18"	42"	54"	66"
21"	42"	54"	66"
24"	48"	60"	72"
27"	60"	72"	84"
30"	60"	72"	84"
33"	66"	78"	90"
36"	66"	78"	90"
42"	78"	90"	102"
48"	84"	96"	108"
54"	96"	108"	120"
60"	102"	114"	126"
66"	108"	120"	132"
72"	120"	132"	144"
78"	132"	144"	156"
84"	138"	150"	162"
90"	144"	156"	168"
102"	156"	168"	180"
108"	168"	180"	192"

ORIGINAL DETAIL PROVIDED BY KENT COUNTY DEPARTMENT OF PUBLIC WORKS



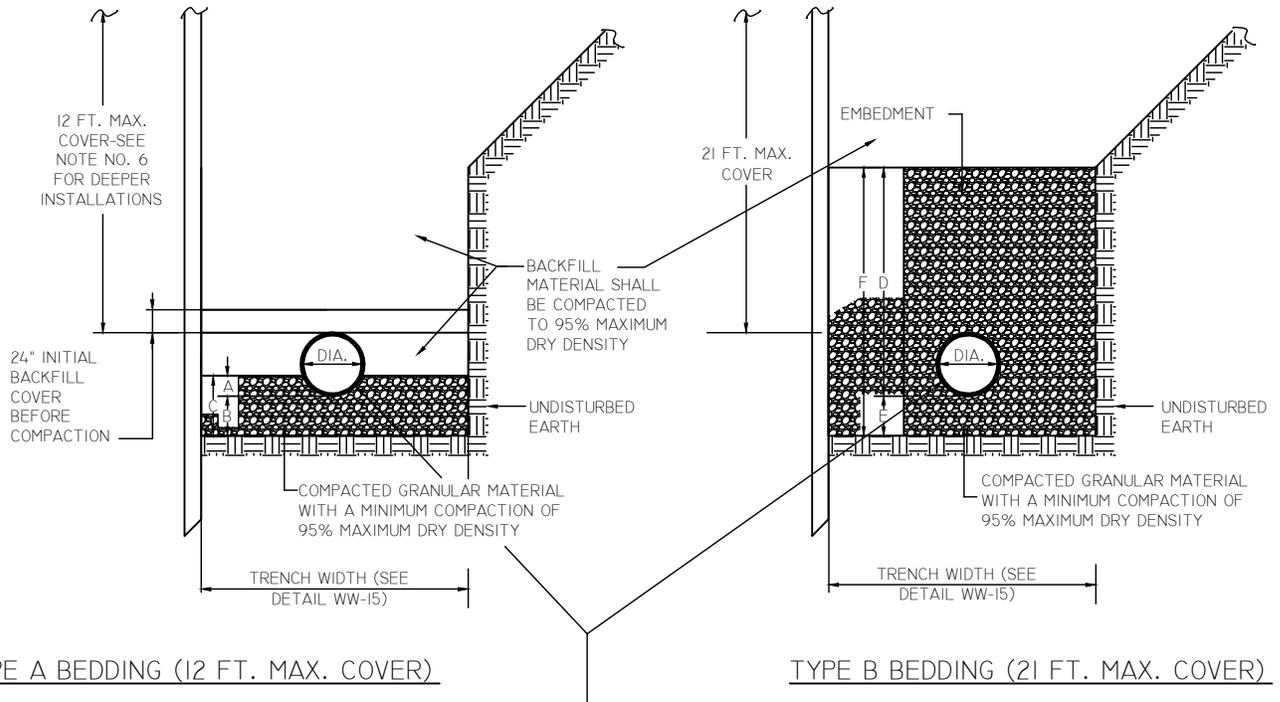
TRENCH PAVEMENT WIDTH

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-15

NOTES:

1. ALL MAXIMUM DRY DENSITY REQUIREMENTS ARE BASED ON STANDARD PROCTOR IN UNPAVED AREAS AND MODIFIED PROCTOR IN PAVED AREAS.
2. ONLY APPLY COMPACTED EFFORT OVER PIPE AFTER 24 INCH INITIAL COVER REQUIREMENT IS MET. ALL BACKFILL SHALL BE COMPACTED TO 95% MAXIMUM DRY DENSITY.
3. ALL TRENCHING OPERATIONS MUST FOLLOW OSHA GUIDELINES FOR EXCAVATION.
4. NO MATERIAL WILL BE ACCEPTED FOR BACKFILL THAT HAS A PLASTICITY INDEX GREATER THAN 30.
5. BEDDING MATERIAL MAY BE ASTM C33 COURSE AGGREGATE. IN WET PLACEMENT CONDITIONS, MATERIAL IS OPEN GRADED AND NO COMPACTION REQUIREMENT APPLIES.
6. WHEN DEPTH OF COVER MATERIAL IS GREATER THAN 12 FT. CONTRACTOR MAY ELECT TO EITHER UTILIZE TYPE B BEDDING OR INSTALL DUCTILE IRON PIPE OF EQUAL OR GREATER CONVEYANCE CAPACITY. SEE SPECIAL BEDDING DETAIL FOR DUCTILE IRON PIPE (WW-17).



TYPE A BEDDING (12 FT. MAX. COVER)

TYPE B BEDDING (21 FT. MAX. COVER)

PVC SANITARY SEWER

- PVC SDR 35 FOR GRAVITY SANITARY SEWER APPLICATIONS FROM 3 TO 15 FEET DEEP
- PVC SDR 26 FOR GRAVITY SANITARY SEWER APPLICATIONS FROM 15 TO 21 FEET DEEP
- DUCTILE IRON PIPE, CLASS 50 FOR GRAVITY SANITARY SEWER APPLICATIONS GREATER THAN 21 FEET DEEP

TYPE B BEDDING-SEE BEDDING DEPTH NOTES

BEDDING DEPTH NOTES:

- "DIA." DENOTES NOMINAL DIAMETER OF PIPE.
- ALL DIMENSIONS IN INCHES.

TYPE A BEDDING-SEE BEDDING DEPTH NOTES

DIA.	A	B	C
6	3	4	7
8	5	4	9
10	6	4	10
12	7	4	11
15	9	4	13
18	11	5	16
21	13	6	19
24	14	7	21
27	16	8	24
30	18	10	28

DIA.	D	E	F
6	24	6	30
8	28	6	34
10	30	6	36
12	33	6	39
15	36	6	42
18	40	6	46
21	44	6	50
24	48	8	56
27	52	8	60
30	56	10	66

ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS

City of



Dover

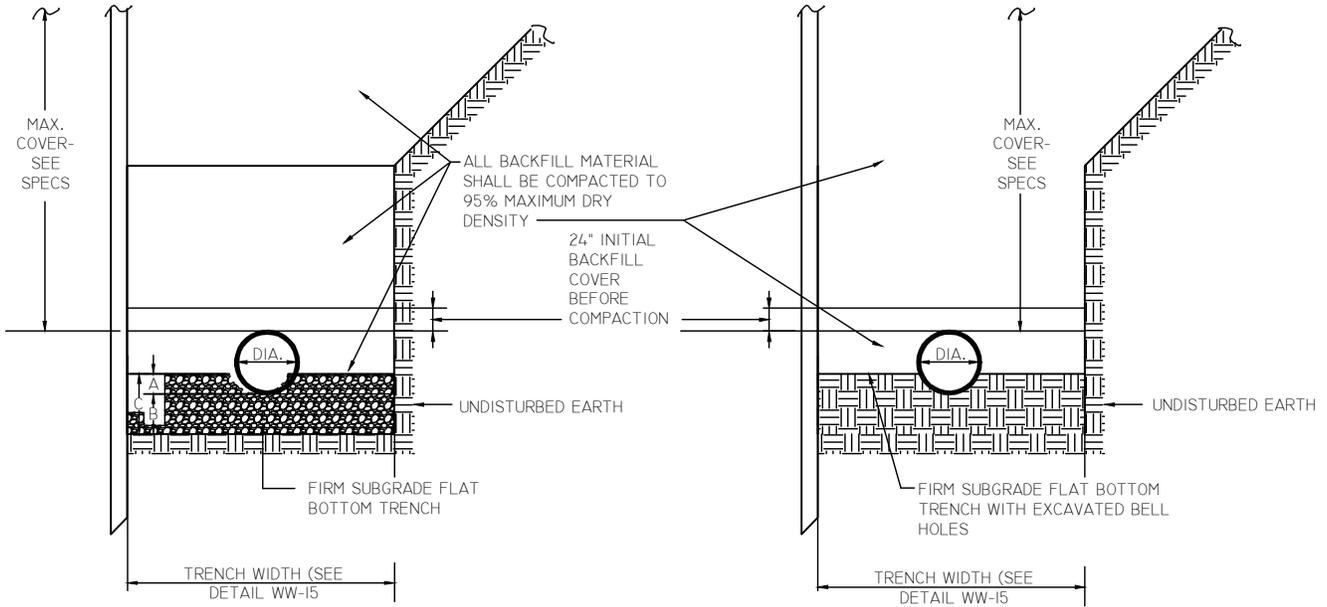
SPECIAL BEDDING AND EMBEDMENT
FOR PVC SANITARY SEWER PIPE

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-16

NOTES:

1. ALL MAXIMUM DRY DENSITY REQUIREMENTS ARE BASED ON STANDARD PROCTOR IN UNPAVED AREAS AND MODIFIED PROCTOR IN PAVED AREAS.
2. ONLY APPLY COMPACTED EFFORT OVER PIPE AFTER 24" INCH INITIAL COVER REQUIREMENT IS MET. ALL BACKFILL SHALL BE COMPACTED TO 95% MAXIMUM DRY DENSITY.
3. ALL TRENCHING OPERATIONS MUST FOLLOW OSHA GUIDELINES FOR EXCAVATION.
4. NO MATERIAL WILL BE ACCEPTED FOR BACKFILL THAT HAS A PLASTICITY INDEX GREATER THAN 30.
5. BEDDING MATERIAL MAY BE ASTM C33 COURSE AGGREGATE IN WET PLACEMENT CONDITIONS, MATERIALS IS OPEN GRADED AND NO COMPACTION REQUIREMENT APPLIES.



TYPE 4 LAYING CONDITION-
LARGER THAN 24" NOMINAL DIAMETER

TYPE 2 LAYING CONDITION-
24" AND SMALLER NOMINAL DIAMETER

TYPE 4 BEDDING-SEE BEDDING DEPTH NOTES

DIA	A	B	C
30	9	6	15
36	10	6	16
42	13	6	19
48	15	6	21
54	16	6	22

BEDDING DEPTH NOTES:

- "DIA." DENOTES NOMINAL DIAMETER OF PIPE.
- ALL DIMENSIONS IN INCHES.

SPECIAL BEDDING FOR DUCTILE IRON PIPE

NOT TO SCALE

ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS

City of



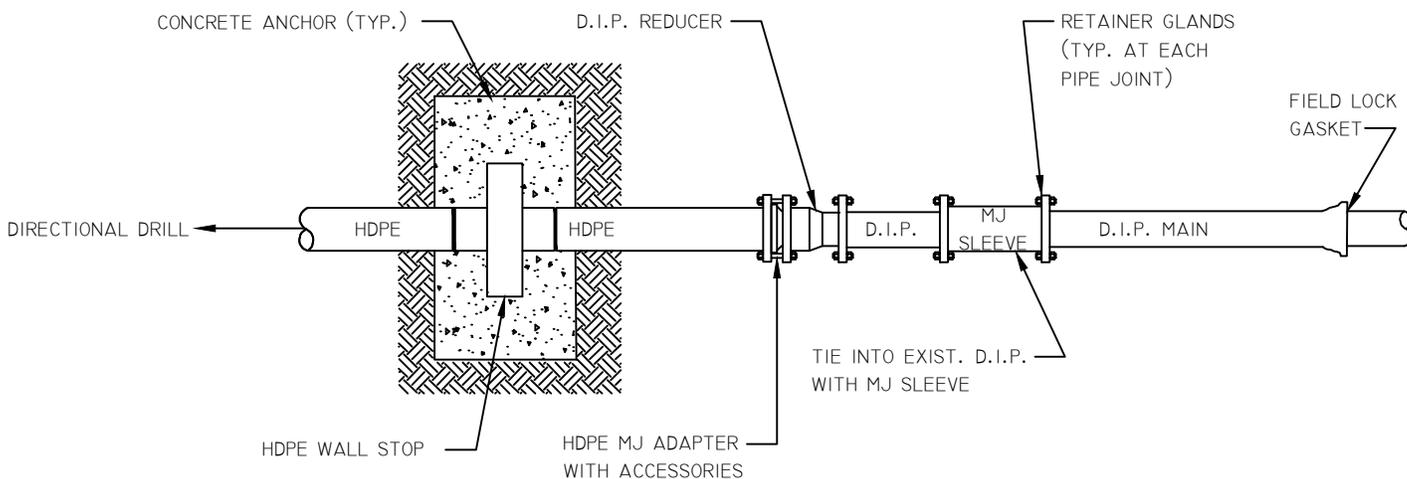
Dover

SPECIAL BEDDING FOR
DUCTILE IRON PIPE

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-17

FINISHED GRADE



TRANSITION FROM D.I.P. TO HDPE TYPICAL

ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS

City of

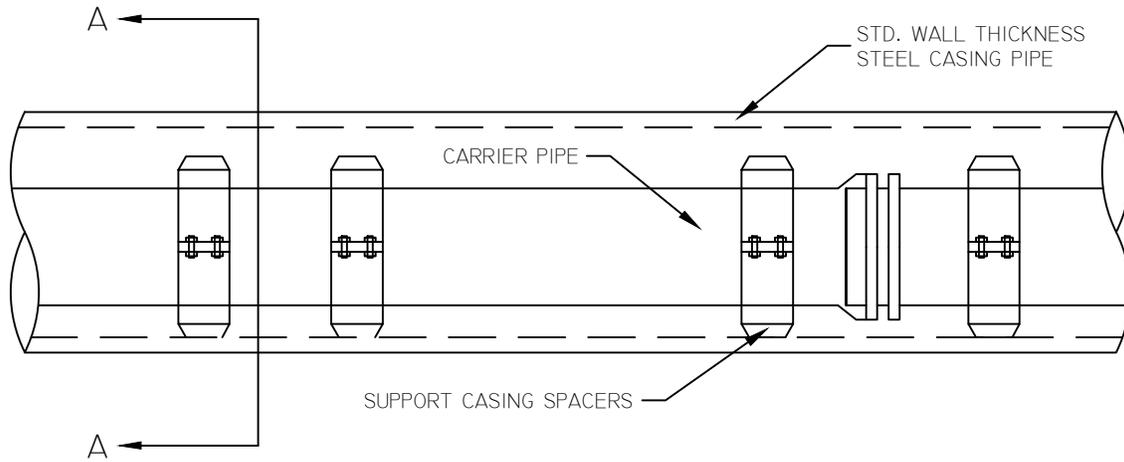


Dover

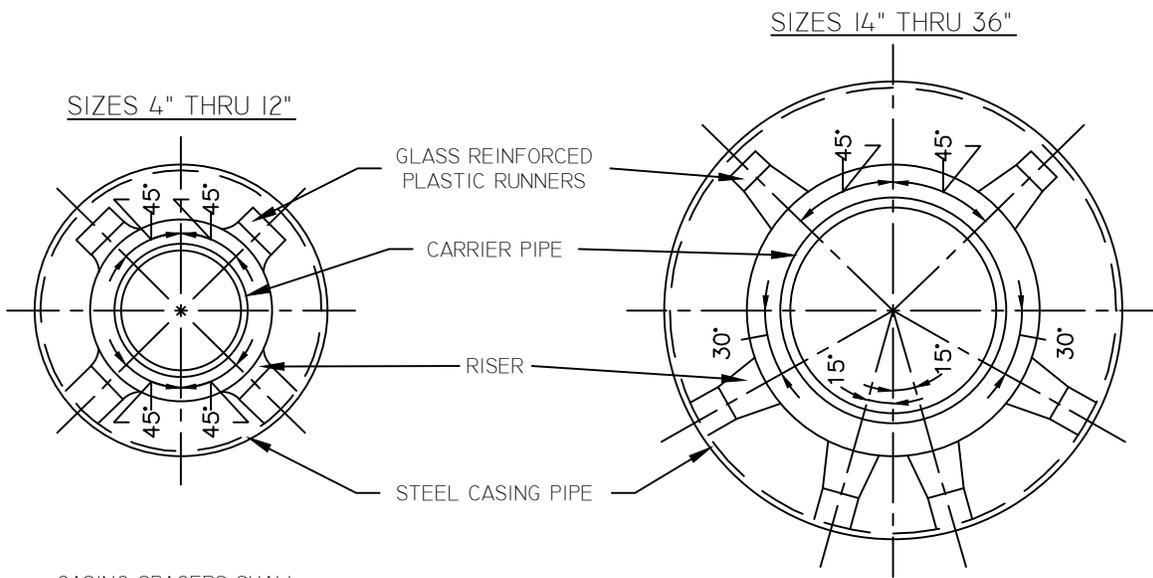
DIRECTIONAL DRILL DETAIL

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-18



SIDE VIEW

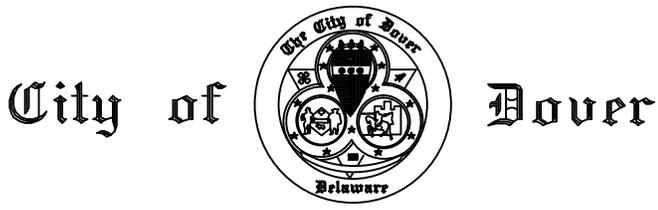


SECTION A-A

CASING SPACERS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.

NOTE:
ALL PIPE JOINTS WITH LIMIT OF CASING SHALL USE FIELD LOCK GASKETS.

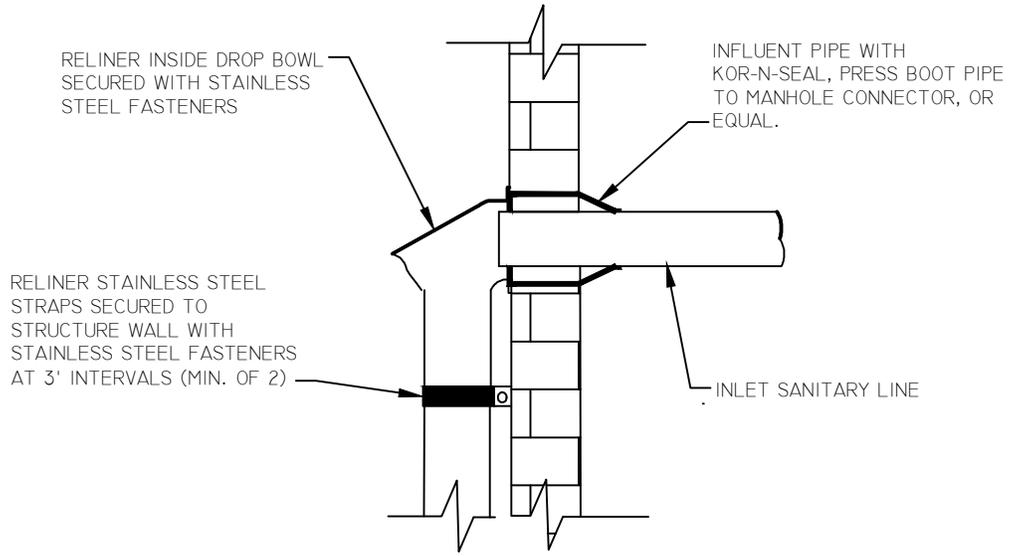
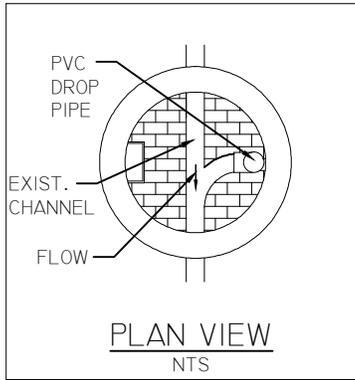
ORIGINAL DETAIL PROVIDED BY KENT COUNTY DEPARTMENT OF PUBLIC WORKS



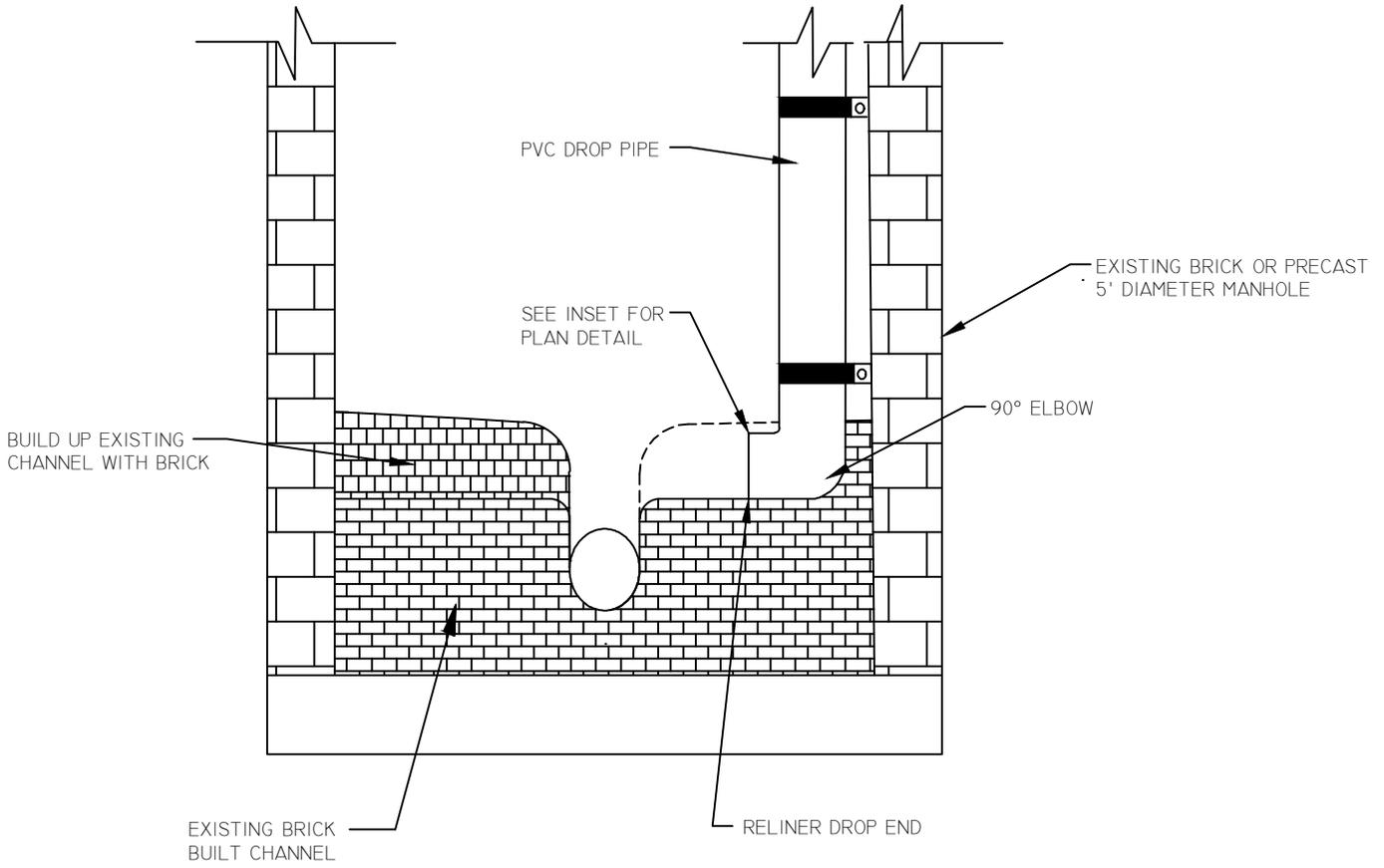
CASING INSTALLATION

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-19



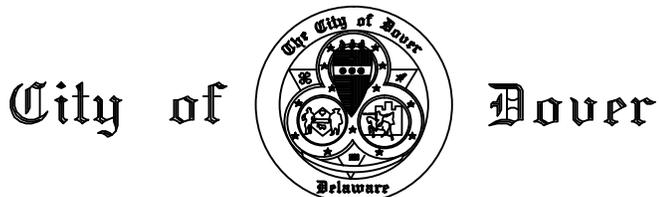
RELINER STAINLESS STEEL STRAPS SECURED TO STRUCTURE WALL WITH STAINLESS STEEL FASTENERS AT 3' INTERVALS (MIN. OF 2)



RELINER INSIDE DROP SYSTEM
MANHOLE DETAIL (5' DIAMETER)

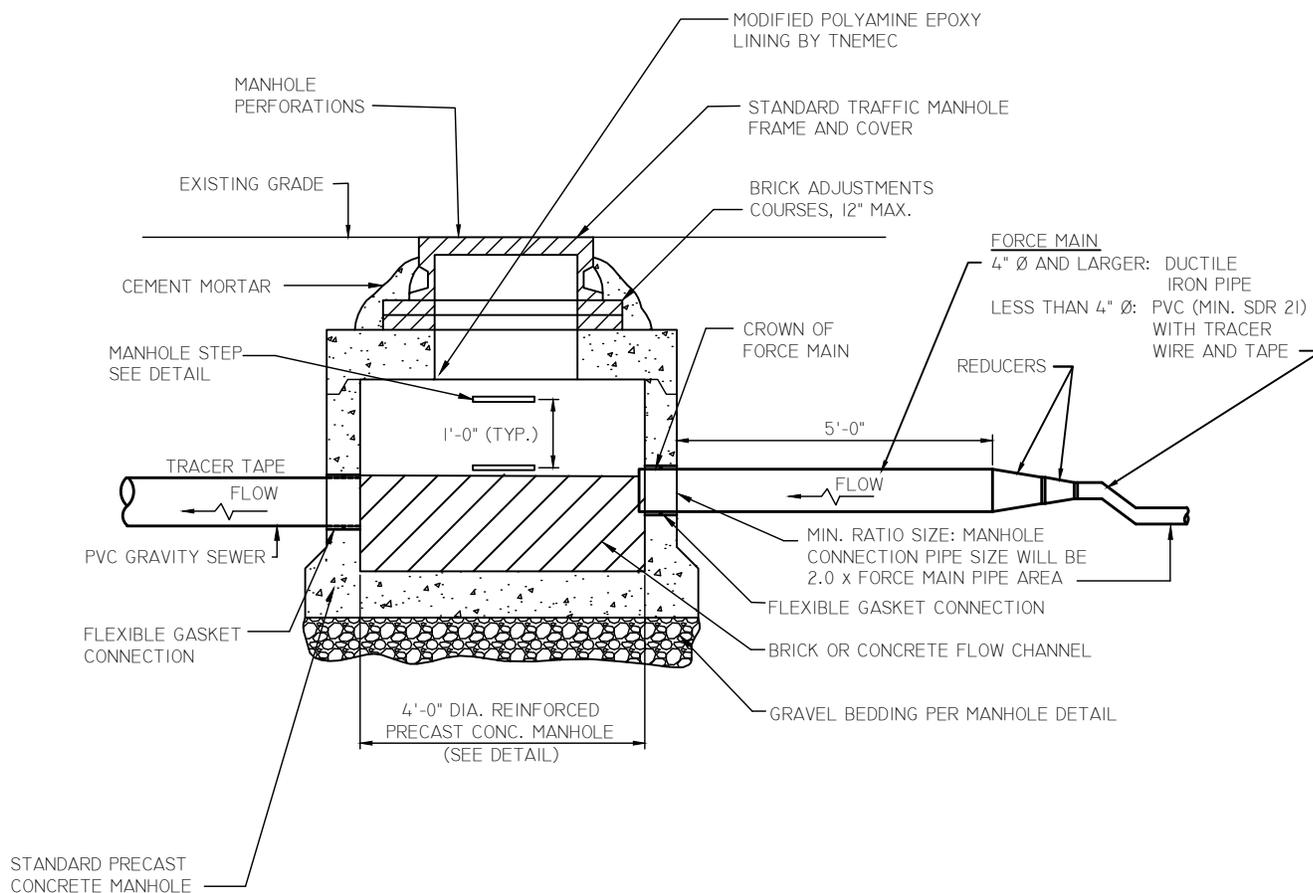
DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD:	SCALE: NTS
APRVD:	DWG. NO: WW-21

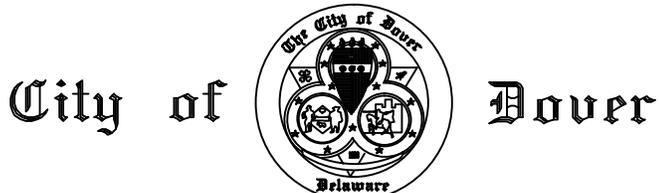


NOTES:

1. LINE MANHOLE INTERIOR 3 COAT SYSTEM MODIFIED POLYAMINE EPOXY BY TNEMEC.
2. ELEVATION OF GRAVITY SEWER INVERT SHALL BE MINIMUM OF 3" ABOVE ELEVATION OF FORCE MAIN CROWN.
3. PROVIDE SMOOTH UPWARD SLOPING BRICK OR CONCRETE CHANNEL FROM FORCE MAIN TO GRAVITY SEWER.

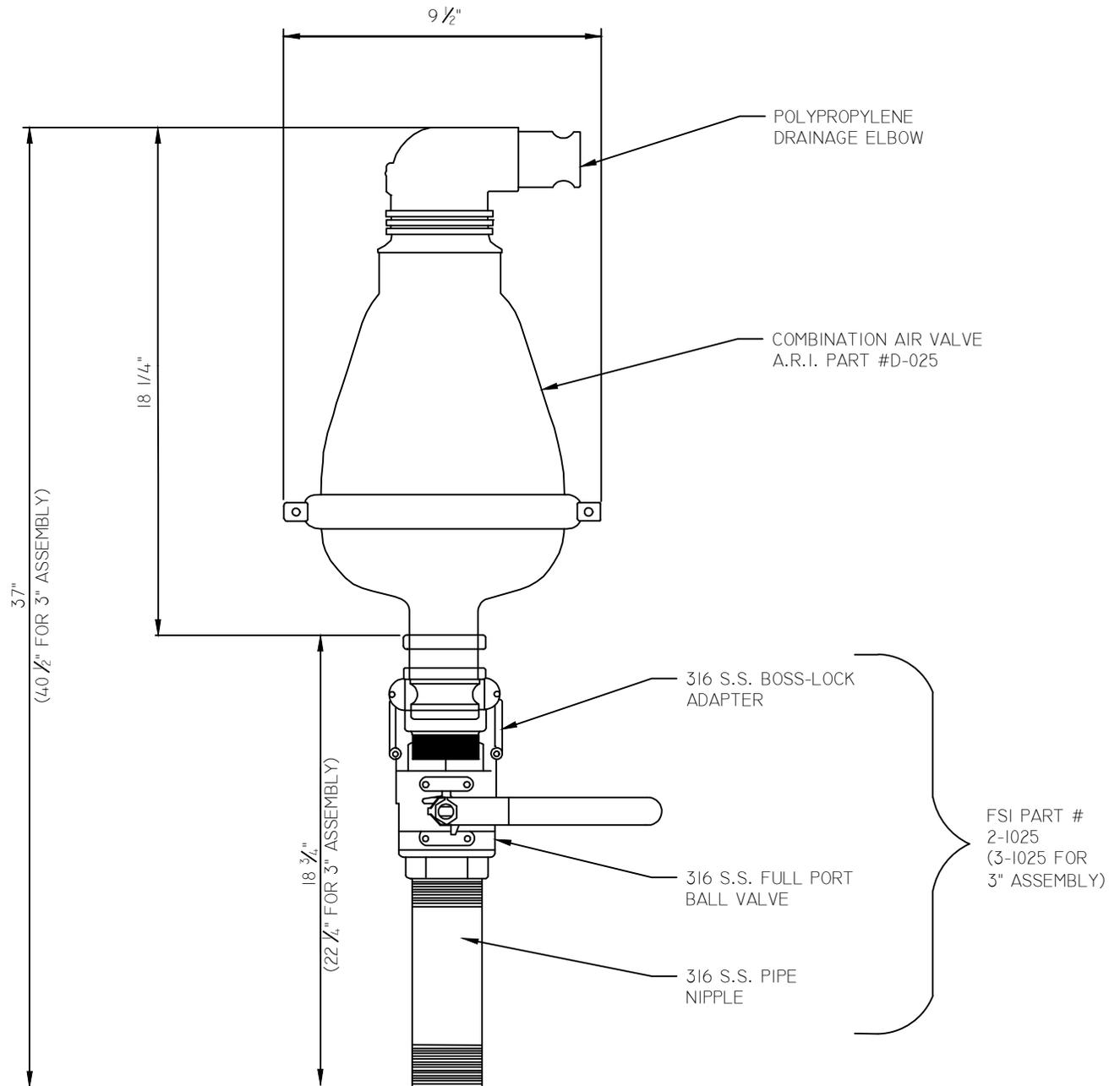


ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS



FORCE MAIN DISCHARGE
MANHOLE DETAIL
DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: RH	SCALE: NTS
APRVD:	DWG. NO: WW-22



NOTES:

1. IF AIR RELEASE VALVE IS A TIGHT FIT YOU CAN USE A SHORTEN NIPPLE LENGTH, PROVIDED THAT THE HAND ON BALL VALVE OPERATES CORRECTLY.
2. TO BE USED WITH 316 STAINLESS STEEL QUICK COUPLER ASSEMBLY.

ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS

City of

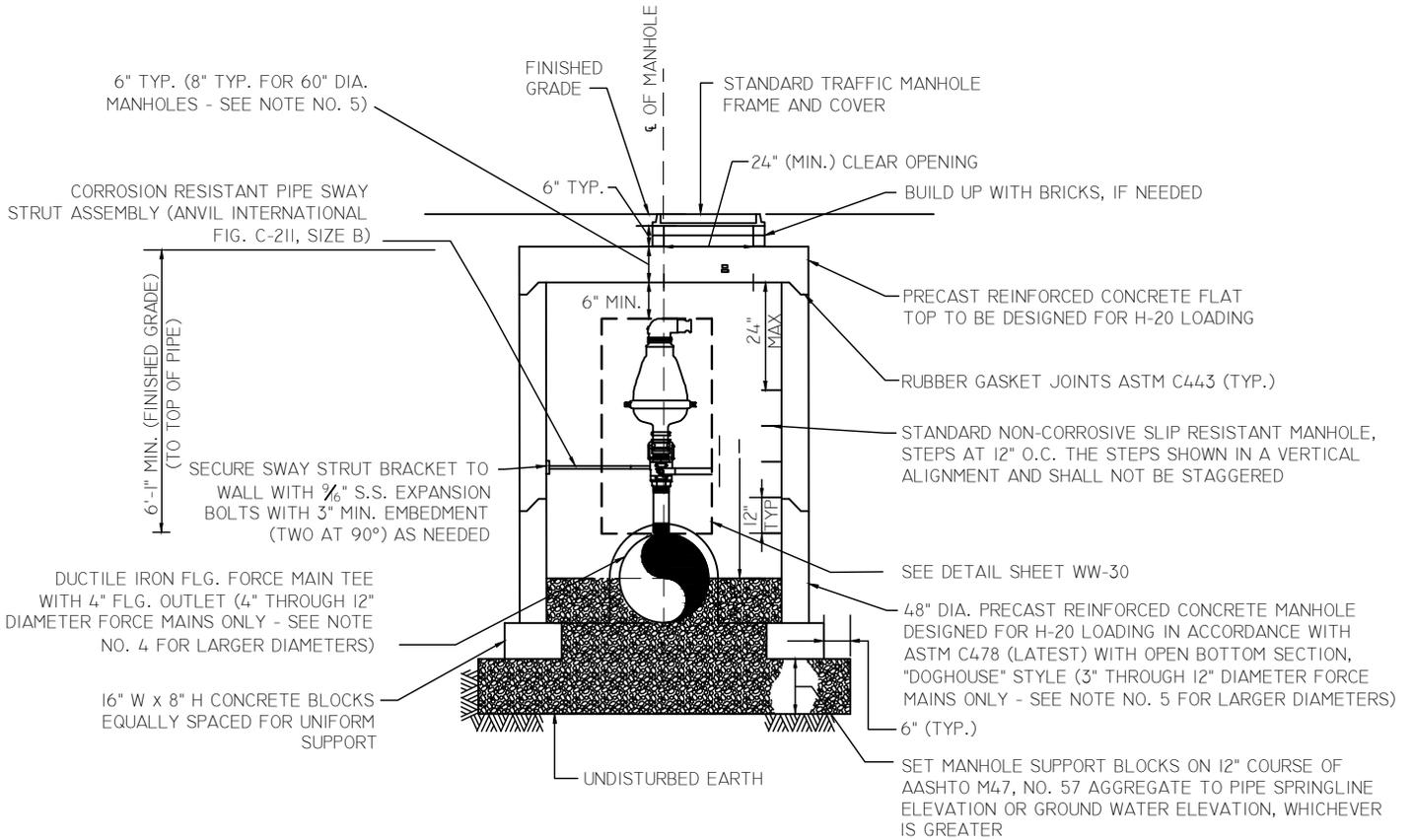


Dover

2" AIR RELEASE VALVE ASSEMBLY

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-23



NOTES:

1. COAT MANHOLE INTERIOR/EXTERIOR, FRAME AND COVER AND APPURTENANCES EXCEPT IRON PIPE WITH COAL TAR EPOXY COATING.
2. INSTALL COMPLETE SET OF MANUFACTURER-FURNISHED BACKWASH ACCESSORIES ON EACH VALVE PER MANUFACTURER SPECIFICATIONS.
3. ALL HARDWARE, RODS, TIES AND ASSEMBLIES SHALL BE STAINLESS STEEL.
4. 14" THROUGH 30" DIAMETER FORCE MAINS SHALL BE THICKNESS CLASS 55 DUCTILE IRON PIPE WITH A 4" DIAMETERS FLG. WELDED-ON OUTLET. DUCTILE IRON PIPE SHALL EXTEND THROUGH THE MANHOLE WALLS.
5. MANHOLE INSIDE DIAMETER SHALL BE 60" FOR 14" THROUGH 30" DIAMETER FORCE MAINS.
6. "DOGHOUSE" MANHOLE TO ONLY BE USED IN THIS APPLICATION.

ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS

City of



Dover

COMBINATION SEWAGE AIR RELEASE/VACUUM RELIEF
VALVE AND MANHOLE DETAIL-PAVED/TRAFFIC AREAS

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL

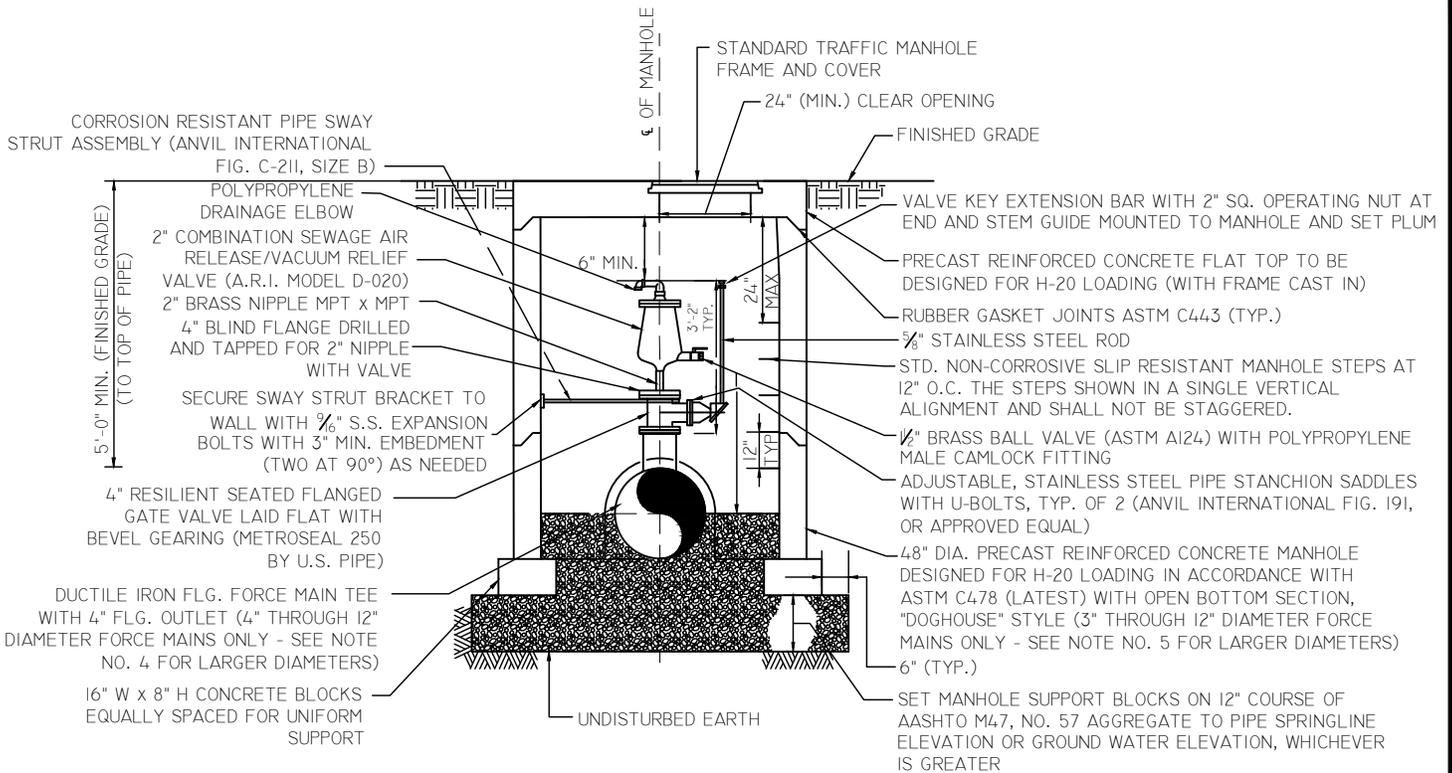
DATE: 03.03.09

CKD: REM/RJH

SCALE: NTS

APRVD: SJD

DWG. NO: WW-24



NOTES:

1. COAT MANHOLE INTERIOR/EXTERIOR, FRAME AND COVER AND APPURTENANCES EXCEPT IRON PIPE WITH COAL TAR EPOXY COATING.
2. INSTALL COMPLETE SET OF MANUFACTURER-FURNISHED BACKWASH ACCESSORIES ON EACH VALVE PER MANUFACTURER SPECIFICATIONS.
3. ALL HARDWARE, RODS, TIES AND ASSEMBLIES SHALL BE STAINLESS STEEL.
4. 14" THROUGH 30" DIAMETER FORCE MAINS SHALL BE THICKNESS CLASS 55 DUCTILE IRON PIPE WITH A 4" DIAMETERS FLG. WELDED-ON OUTLET. DUCTILE IRON PIPE SHALL EXTEND THROUGH THE MANHOLE WALLS.
5. MANHOLE INSIDE DIAMETER SHALL BE 60" FOR 14" THROUGH 30" DIAMETER FORCE MAINS.
6. "DOGHOUSE" MANHOLE TO ONLY BE USED IN THIS APPLICATION.

ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS

City of

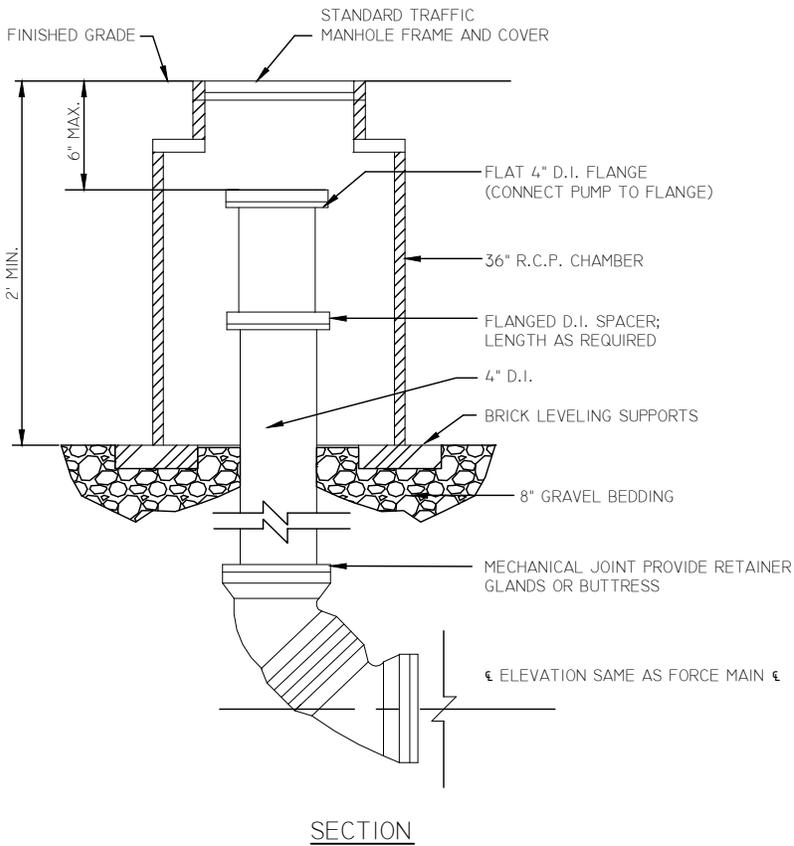
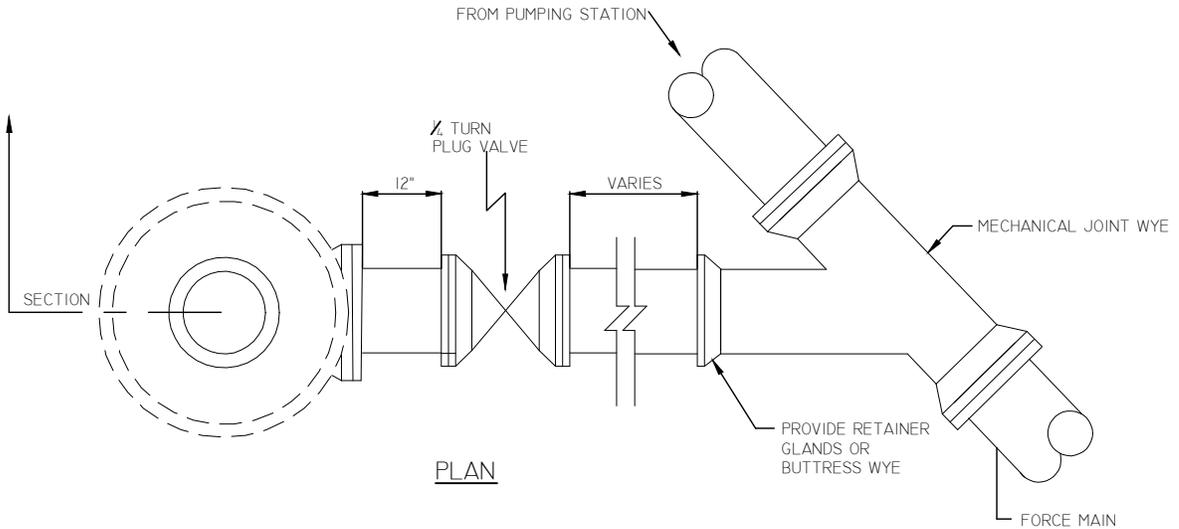


Dover

COMBINATION SEWAGE AIR RELEASE/VACUUM RELIEF
VALVE AND MANHOLE DETAIL-GRASS/NON-TRAFFIC AREAS

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-25



ORIGINAL DETAIL PROVIDED BY
KENT COUNTY DEPARTMENT OF
PUBLIC WORKS

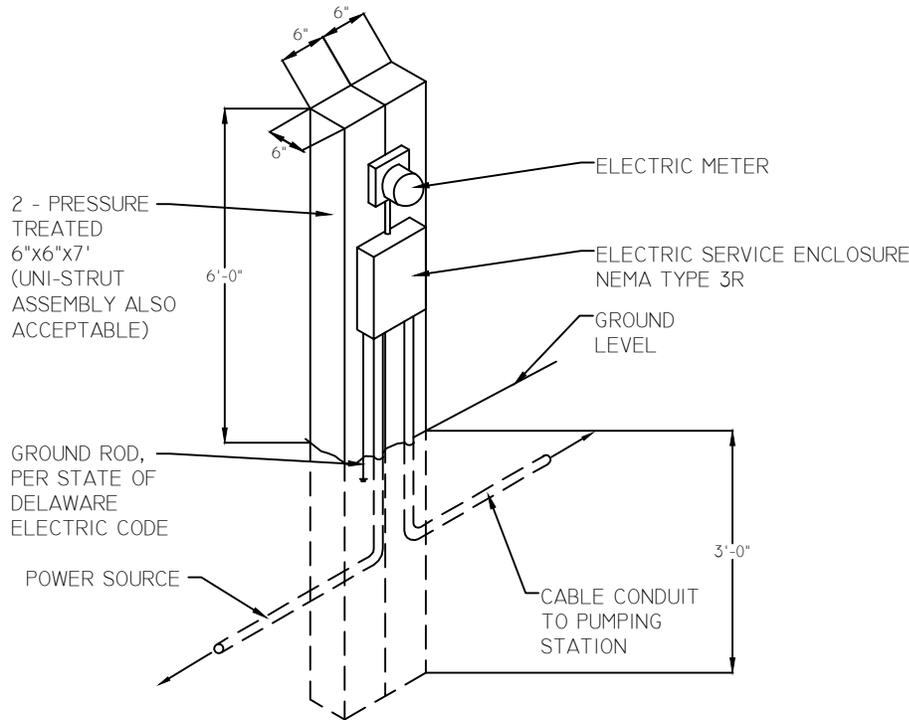


EMERGENCY PUMPING CONNECTION DETAIL

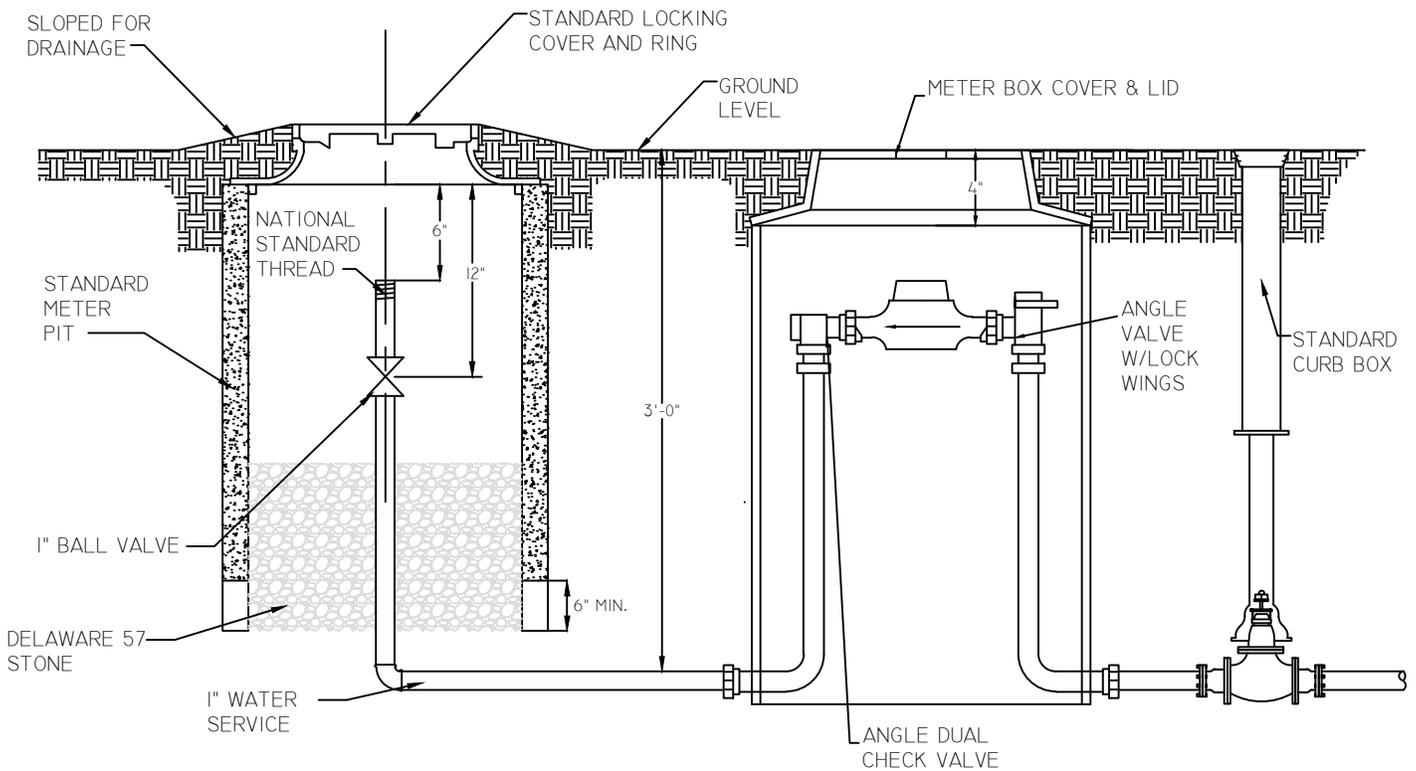
DEPARTMENT OF PUBLIC UTILITIES

DRAWN:	JAL	DATE:	03.03.09
CKD:	REM/RJH	SCALE:	NTS
APRVD:	SJD	DWG. NO:	WW-26

NOTE:
REFER TO CITY OF DOVER
ELECTRIC HANDBOOK FOR
METERING REQUIREMENTS.



ELECTRIC SERVICE



City of

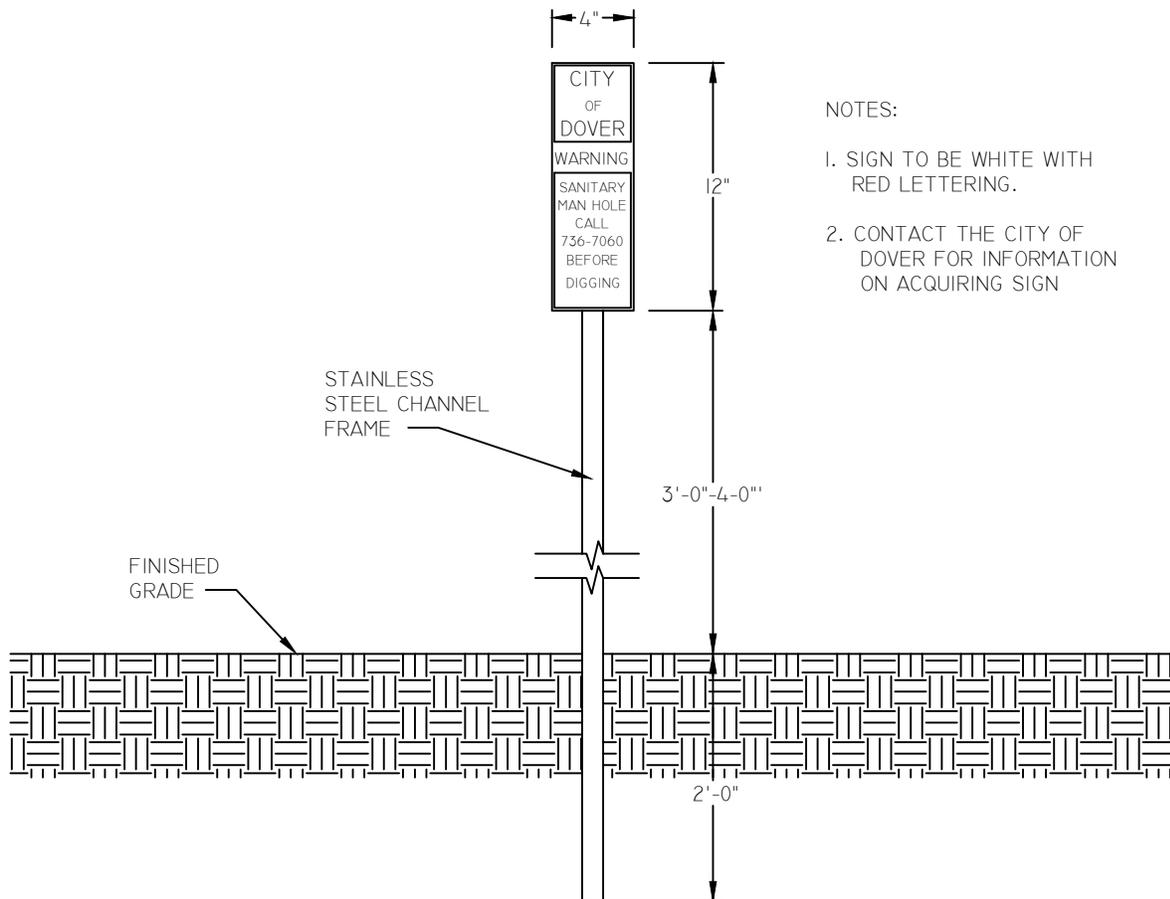


Dover

SANITARY SEWAGE PUMPING STATION
ELECTRIC AND WATER SERVICE

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 12.01.08
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-27



NOTES:

1. SIGN TO BE WHITE WITH RED LETTERING.
2. CONTACT THE CITY OF DOVER FOR INFORMATION ON ACQUIRING SIGN

City of

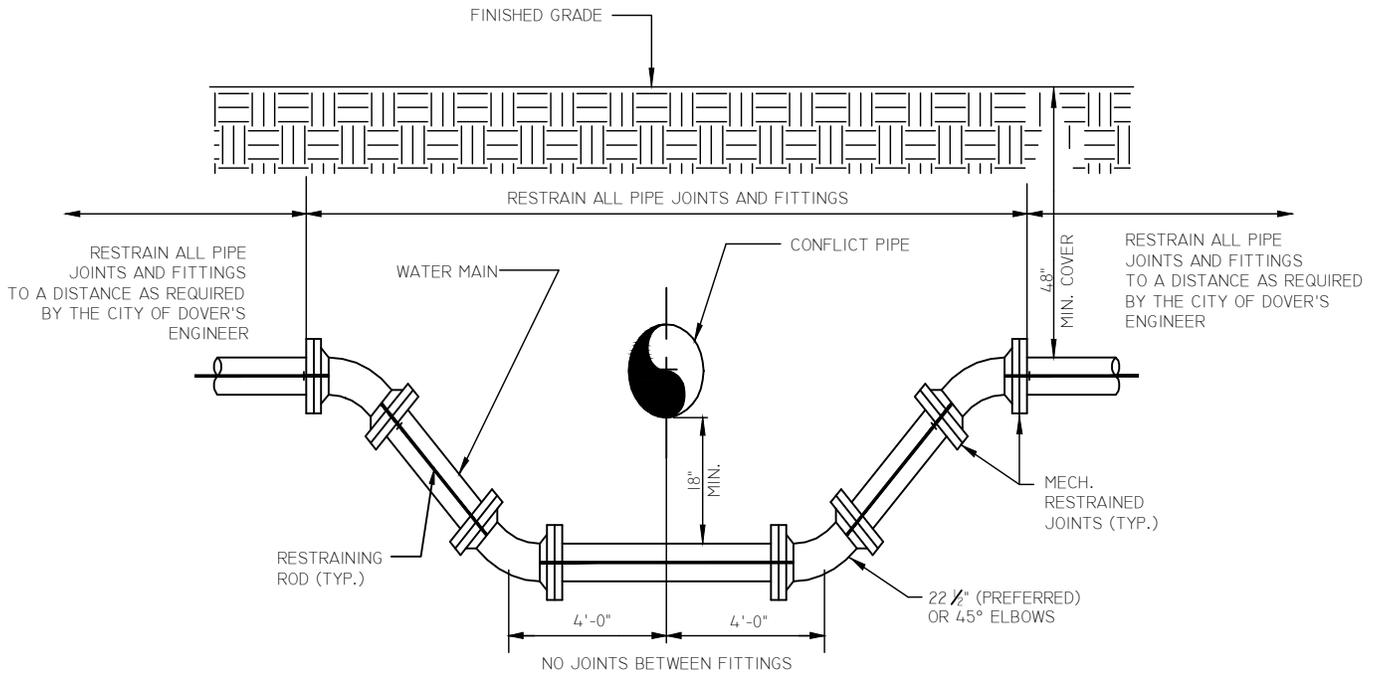


Dover

STANDARD SANITARY SEWER MARKER

DEPARTMENT OF PUBLIC UTILITIES

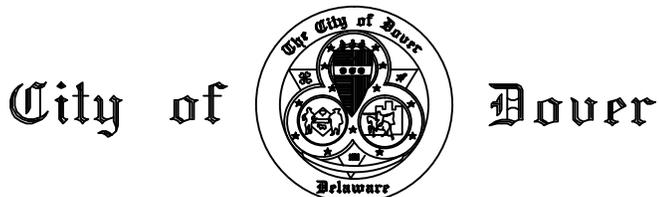
DRAWN: JAL	DATE: 12.01.08
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WW-28



SECTION

NOTES:

1. THESE METHODS ARE TO BE USED WHEN INSUFFICIENT COVER EXISTS TO ALLOW PRESSURE PIPE TO CROSS ABOVE/BELOW CONFLICT PIPE WHILE MAINTAINING A MINIMUM VERTICAL SEPARATION OF 18" AND A MINIMUM COVER OF 48" TO FINISHED GRADE.
2. ALL PRESSURE PIPE JOINTS AND FITTINGS SHALL BE RESTRAINED.



UTILITY CONFLICT RELOCATION DETAIL

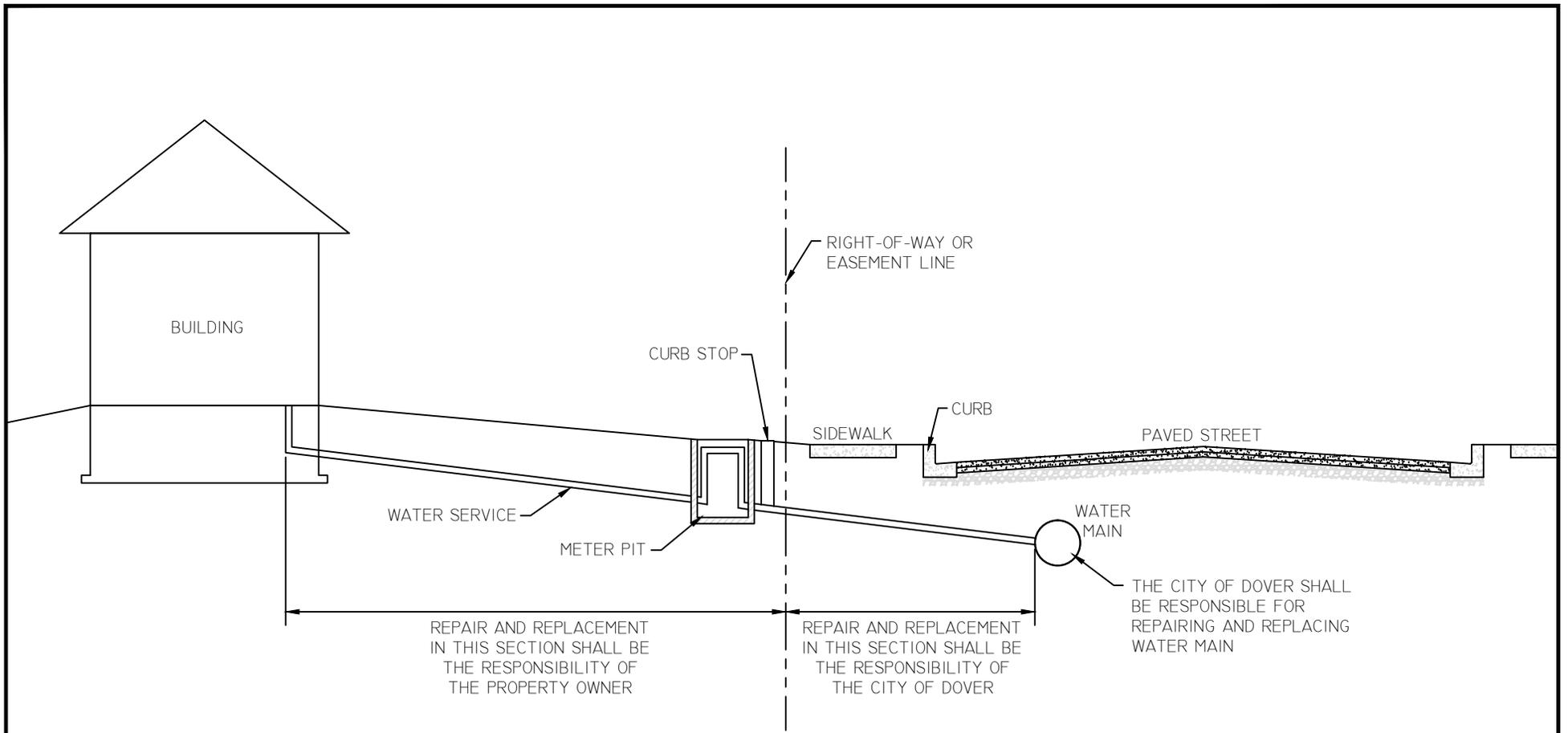
DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 03.03.09
CKD: REM/RJH	SCALE: NTS
APRVD: SJD	DWG. NO: WWW-1

Appendix I: Operation and Maintenance Exhibits

Table of Contents

- OM-1 Typical Water Service Repair and Replacement Responsibilities
- OM-2 Typical Sanitary Sewer Lateral Repair and Replacement Responsibilities
- OM-3 Typical Sanitary Sewer Maintenance Responsibilities



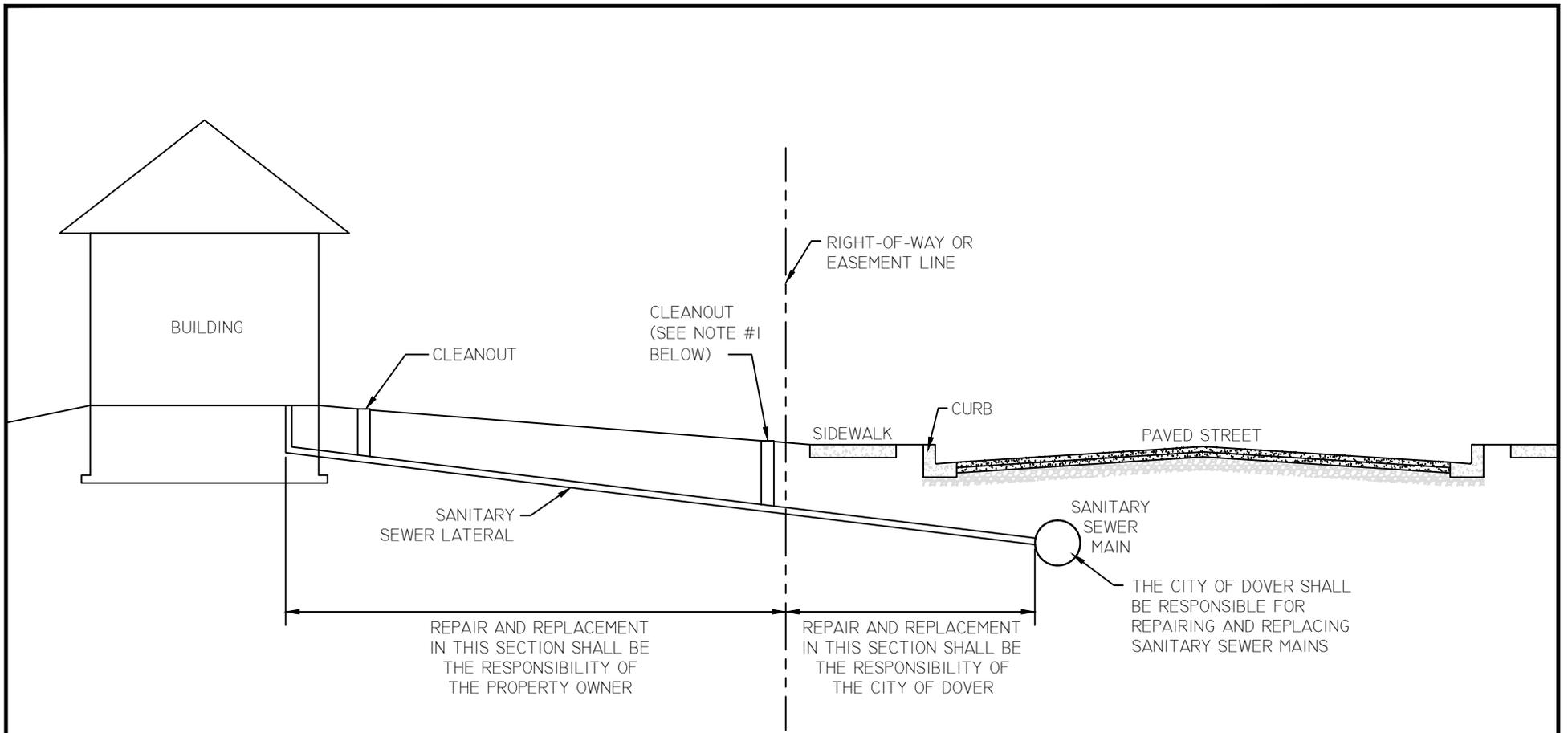
City of Dover



TYPICAL WATER SERVICE REPAIR AND REPLACEMENT RESPONSIBILITIES

DEPARTMENT OF PUBLIC UTILITIES

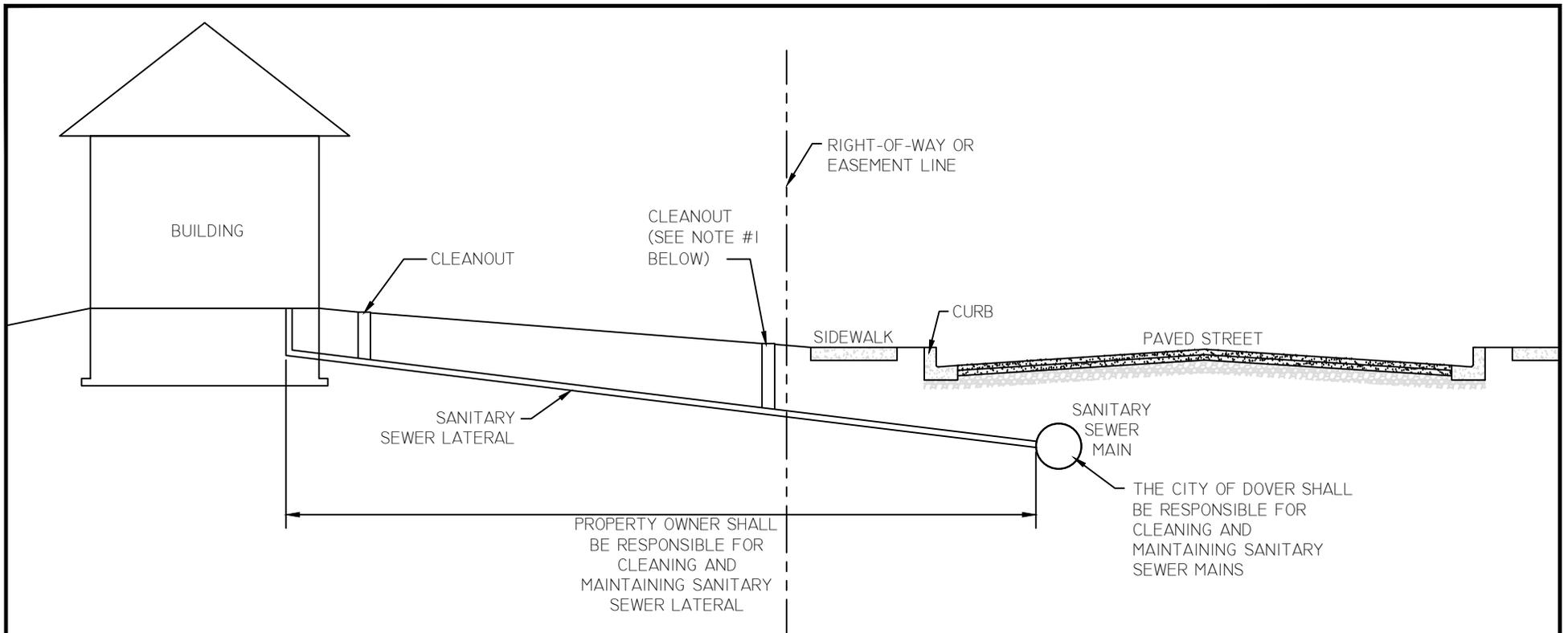
DRAWN: JAL	DATE: 01.25.10
CKD: RJH/REM	SCALE: NTS
APRVD: SJD	DWG. NO: OM-1



NOTES:

1. IN THE EVENT THAT THE CLEANOUT AT THE RIGHT-OF-WAY OR EASEMENT LINE IS NOT AVAILABLE, THE PROPERTY OWNER IS RESPONSIBLE FOR INSTALLING SAID CLEANOUT PER THE CITY OF DOVER STANDARDS.
2. THE CITY OF DOVER PUBLIC UTILITIES DEPARTMENT SHALL PERFORM REPAIRS TO THE SANITARY SEWER LATERAL ONLY AFTER RECEIVING FIRST HAND VISUAL CONFIRMATION THAT THE REPAIR IN QUESTION IS WITHIN THE RIGHT-OF-WAY OR EASEMENT.

	TYPICAL SANITARY SEWER LATERAL REPAIR AND REPLACEMENT RESPONSIBILITIES	
	DEPARTMENT OF PUBLIC UTILITIES	
DRAWN: JAL	DATE: 01.25.10	
CKD: RJH/REM	SCALE: NTS	
APRVD: SJD	DWG. NO: OM-2	



NOTES:

1. IN THE EVENT THAT THE CLEANOUT AT THE RIGHT-OF-WAY OR EASEMENT LINE IS NOT AVAILABLE, THE PROPERTY OWNER IS RESPONSIBLE FOR INSTALLING SAID CLEANOUT PER THE CITY OF DOVER STANDARDS.
2. ANY BLOCKAGE OCCURRING IN A SANITARY SEWER LATERAL, TO THE POINT OF CONNECTION AT THE SEWER MAIN, SHALL BE THE SOLE RESPONSIBILITY OF THE PROPERTY OWNER UNLESS A BLOCKAGE IS FOUND WITHIN THE CITY OF DOVER SANITARY SEWER MAIN LINE.
3. THE CITY OF DOVER PUBLIC UTILITIES DEPARTMENT SHALL PERFORM REPAIRS TO THE SANITARY SEWER LATERAL ONLY AFTER RECEIVING FIRST HAND VISUAL CONFIRMATION THAT THE REPAIR IN QUESTION IS WITHIN THE RIGHT-OF-WAY OR EASEMENT.

City of



Dover

TYPICAL SANITARY SEWER
MAINTENANCE RESPONSIBILITIES

DEPARTMENT OF PUBLIC UTILITIES

DRAWN: JAL	DATE: 01.25.10
CKD: RJH/REM	SCALE: NTS
APRVD: SJD	DWG. NO: OM-3