

CITY OF FAIRFIELD, OHIO

*Design, Construction
and
Materials Specification*

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SECTION 1
INTRODUCTION

SECTION 100

INTRODUCTION AND PROCEDURE

The Design, Construction and Materials Specification Handbook applies to all construction on City-owned property and within the public right-of-way in the City of Fairfield and all construction which the City has, or will assume, maintenance responsibility.

Unless modified, deleted, replaced or otherwise changed by requirements contained herein, or contained in the City of Fairfield Standard Construction Drawings, construction requirements and material specifications shall conform to the current edition of the “State of Ohio Department of Transportation – Construction and Material Specifications”, “State of Ohio Department of Transportation – Standard Construction Drawings”, and “State of Ohio Department of Transportation – Location and Design Manuals”.

Unless modified, deleted, replaced or otherwise changed by requirements contained herein, items pertaining to traffic control shall conform to the most current edition of the “Ohio Manual of Uniform Traffic Control Devices” and “State of Ohio Department of Transportation – Standard Sign Design Manual.”

Plans are approved subject to compliance with all applicable laws, rules, regulations, and standards. An approval of plans by the City of Fairfield does not constitute a waiver of such compliance.

The proposed construction project may be constructed only in accordance with approved plans. There will be no deviation from the approved plans without the expressed, written approval of the City of Fairfield.

Approval of plans does not constitute an assurance that the proposed project will properly function, operate, or meet compliance with Federal, State or City laws and regulations.

101.00 DESIGN

It is not the intent of this document to eliminate responsibility of the design engineer for the technical adequacy of his or her design or freedom to use their engineering judgment and discretion in the practice of their profession. It is recognized that matters of engineering design cannot be fully covered in every situation. Any design methods or criterion different than those listed herein will be given due consideration provided the proposed variances are submitted in writing to the City of Fairfield.

The City will, at any time during design or construction, have the authority to require the modification of any engineering or construction detail, whenever necessary for the protection of the public interests. Such modification does not relieve the design engineer of his or her responsibility.

102.00 INSPECTION OF CONSTRUCTION

At least two (2) working days prior to the start of any construction, the Developer or Contractor shall notify the Construction Services Division at (513) 867-4200 of their intent to commence work. Inspection services shall be provided by the City of Fairfield Construction Services Division for all construction projects including public work projects, subdivisions or any project which will be maintained in the future with public funds. When the extent of work in any project so justifies, the Public Works Director may provide for a full-time inspector for that project from his own forces. When a project does not require full-time inspection, the Public Works Director may provide for intermittent inspection and may use the inspector for more than one such project. The City shall send a monthly bill to the contractor for the time spent for inspection. Fees for the inspectors time will be billed to the Contractor at the hourly rate paid the inspectors by the City, plus thirty percent (30%), with a minimum billing of one-half (1/2) hour. If inspection is required at a time when the inspector is designated to receive overtime pay, the charge shall be at the overtime rate paid the inspector, plus thirty percent (30%) with a minimum billing of one-half hour. The city reserves the right to request testing on any material (i.e., concrete, asphalt, subgrade, or trench backfill, etc.) at any time it deems necessary. Fees for outside inspection and testing will be billed to the Contractor at 1.5 times the cost. All fees must be paid in full prior to the work being accepted by the City

~~The City may not provide for day by day inspection services and shall not have the inspector act as an agent of the Developer, Contractor or Engineer.~~ The work is under the control and supervision of the Developer or Contractor until written acceptance is given by the Public Works Director and/or the Public Utilities Director. The City's inspector shall check periodically as the work progresses and shall call to the attention of the person in charge of the work any deviations, omissions, or unsatisfactory work as noted. However, no acceptance of any portion of the work is to be inferred by the action or lack of action of the inspector.

103.00 AS BUILT PLANS

At the completion of construction, the plans shall be revised as necessary to provide "As Built" plans. This work shall be done by the Contractor's engineer who was responsible for setting grades and the staking for improvements. "As Built" plans containing any changes to elevations, major drainage ditches/swales, structures, retention/detention basins, water lines and appurtenances, sewer lines and appurtenances and buffering landscape mounds shall be submitted to the Public Works Director and/or the Public Utilities Director for review and approval. The following note shall be included on the as-built drawing:

"The planned contour lines on this grading plan do not necessarily reflect the final grading conditions for each individual lot. Please refer to ballooned spot elevations and individual plot plans for as-built data."

“As Built” plans shall be provided on reproducible ~~mylar~~ sheets measuring twenty-four (24”) inches by thirty-six (36”) inches and sealed and signed by the engineer to certify that the “As Builts” are per field conditions and along with an AutoCAD (.dwg or .dxf) or Microstation (.dgn), on CD or DVD.

104.00 PROCEDURE FOR ACCEPTANCE

The procedure for acceptance of public improvements that will be dedicated to and accepted for future maintenance by the City of Fairfield is as follows:

1. Subdivision improvements shall be dedicated and accepted in accordance with the Codified Ordinances of Fairfield Ohio relative to subdivisions of land. The provisions for inspection of construction and “As Built” plans shall apply to subdivisions and their related public improvements.
2. Other non-subdivision public improvements must meet City specifications for materials and construction methods and have been inspected by City inspectors/staff during construction as provided hereinabove.
3. The City of Fairfield may require a performance bond in an amount and with surety satisfactory to the Law Director to assure completion of a public improvement prior to issuance of a permit or permission to construct the public improvement. If deemed necessary to assure adequate operation and/or durability, the City may also require a one (1) year maintenance period with a maintenance bond for such improvement in an appropriate amount, generally ten percent (10%) of the cost of the public improvement.
4. If the maintenance bond period is required, the City of Fairfield will provide a punch list of any items requiring repairs prior to final acceptance and release of the maintenance bond.
5. “As Built” plans will be provided thirty (30) days after the public improvement becomes operable in accordance with the requirements hereinabove stated.
6. The City of Fairfield may take immediate action to correct any defect in materials, methods or workmanship which jeopardizes the public health, safety or welfare in the construction and/or maintenance of a public improvement. The installer of the public improvement shall be responsible for reimbursement to the City of its costs incurred.
7. The installer of the public improvement shall be responsible for the preparation, proper execution and recording of all legal documents necessary for the dedication of right-of-way, easements or other conveyances or legal title in conjunction with the public improvement, subject to the approval of the Law Director.

This procedure does not apply to public improvements performed under formal contract awarded by the City of Fairfield, the conditions for acceptance of which shall be specified in the contract documents.

SECTION 2
STORM DRAINAGE

SECTION 200
STORM DRAINAGE

201.00 STORM DESIGN BASIS

201.01 Frequency

storm sewers, open ditches, drive culverts	10 year frequency
roadway culverts	25 year frequency
protection for buildings	50 year frequency

[ORDINANCE 1117.05(Ord.167-95. Passed 11-13-95)]

201.02 Runoff

100 acres or less	Rational method, $Q = CIA$
More than 100 acres	S.C.S. TR-55 method

201.03 Overland Flow Time

Use Chart 201-A

first pavement inlet	min. 10 minutes
first ditch catch basin	min. 15 minutes

201.04 Rainfall Intensity

Use Chart 201-B

201.05 Detention/Retention Basin Design

Detention/Retention of storm water shall be required for each subdivision unless specifically exempted by the Planning Commission.

The objective of a detention/retention facility is to regulate the run-off from a rainfall and to control discharges to downstream areas in order to reduce the impact on downstream drainage systems.

- (a) Definitions. Unless the context specifically indicates otherwise, the meaning of the terms used in this section shall be as follows:
- (1) "Storm water detention/retention facility" means any structure or facility used to detain storm water run-off, and gradually release the stored run-off at an acceptable rate.
 - (2) "Detention basin" means dry surface areas created by constructing an excavated or embankment basin.
 - (3) "Retention basin" means permanent ponds where additional storage capacity is provided above the normal water level.
 - (4) "Storm water run-off" means that portion of rainfall that is not lost to infiltration, surface storage or evaporation.
- (b) Exemptions to Detention/Retention Requirements. The developer may apply for exemption from construction of detention/retention facilities. Each request will be

reviewed on its own merit and as it affects the entire drainage area in which it lays and into which it flows.

- (c) Design.
 - (1) Quantity of run-off. The peak rate of run-off during the 100 year post development storm cannot exceed the peak rate of run-off during the two year pre-development storm. For those areas where a study of the downstream area indicates the extended time of high discharge and/or velocity due to restricted release rate and storage may cause flooding and/or excessive erosion, the City Engineer may require additional controls.
- (d) Submission Requirements. Plans and supporting data to verify storage volumes, release dates, etc., shall be submitted to the City Engineer. The submission will include, but is not limited to, the following:
 - (1) A plan prepared by a registered professional engineer which may be the improvement plan, drainage and grading plan or similar plan at a scale of one inch to 100 feet or larger, shall be submitted and contain at least the following information:
 - A. All existing and proposed drainage facilities.
 - B. Existing and proposed contours.
 - C. Existing structures.
 - D. The detention/retention facility with outlet structures.
 - E. Cross section through detention/retention facility.
 - F. Pertinent elevations, e.g., water surface, flowline of flow control devices, etc.
 - G. Emergency spillway designed to pass a 100 year storm and with a minimum depth of one foot.
 - H. Any other information required by the City Engineer to clarify intent or design features.
 - (2) All calculations, outlines and designation of drainage areas, and other supporting data in sufficient detail and form to facilitate an expedient and accurate review.
- (e) Fees. Review work performed by professional consultants and other costs incurred by the City may be charged to the applicant at their billed cost plus ten percent (10%). The fee must be paid in full prior to approval of the plans by the Planning Director.

[ORDINANCE 1117.07(Ord.167-95. Passed 11-13-95)

201.06 Stormwater Management Requirements

GENERAL

(A) INTRODUCTION

- (1) ~~Detention/retention~~ of stormwater Management refers to the collection, safe conveyance and storage of excess storm runoff on a ~~the site of a development or~~ redevelopment site that involves use of a single or multiple stormwater

management facility(ies) to capture, temporarily store and treat runoff with ~~and~~ gradual release of the stored runoff at an acceptable flow rate into the downstream conveyance system. Stormwater management facilities include, but are not limited to detention basins or retention basins.

- (2) Detention basins are dry surface areas created by constructing an excavated or embankment basin.
- (3) Retention basins are permanent ponds where additional storage capacity is provided above the normal water level.
- (4) The objective of a detention/retention facility is to regulate the runoff from a rainfall and to control discharges to downstream areas in order to reduce the impact on downstream drainage systems.

(B) STORMWATER MANAGEMENT GENERAL REQUIREMENTS

- (1) **Quantitative Control.** Detention/retention of stormwater will be required for each subdivision or land development ~~and redevelopment~~ activity unless specifically exempted.
- (2) **Qualitative Control.** Stormwater quality control shall be implemented into sites within developing and redeveloping areas in accordance with general and specific requirements outlined in the latest edition of the Ohio EPA General (NPDES) permit for stormwater discharges associated with construction activity (see Part IIIIG2e of the Ohio EPA's NPDES permit (Permit No. OHC0004, or latest edition).)

EXEMPTIONS TO ~~DETENTION/RETENTION~~ STORMWATER MANAGEMENT QUANTITATIVE CONTROL REQUIREMENTS.

- (a) The developer may apply to the City Engineer for exemption from ~~requirement for~~ construction of ~~stormwater management quantitative control detention/retention~~ facilities.
- (b) Each request will be reviewed on its own merit and as it affects the entire drainage area in which it lies and into which it flows.

- (c) If an exemption for stormwater management quantitative control is granted by the City Engineer, the developer shall be required to pay a fee in lieu of the construction of the ~~detention/retention~~ stormwater management facilities. The fee shall be 75 cents per cubic foot of detention/retention volume that would have been required if an exemption had not been granted. This fee must be paid to the City prior to recording of the plat of a subdivision or issuance of the building permit if no subdivision plat is involved.
- (d) The developer may appeal the denial of an exemption to the Board of Zoning Appeals.

DESIGN.

(a) Runoff and Volume Calculation Methods. The methods outlined in the City Subdivision Rules and Regulations, as well as requirements contained in Section 1117.07, Section 1182.03, and requirements contained in the City of Fairfield Design, Construction and Materials Specification document (latest edition), shall be used to determine the runoff and storage volumes.

(b) Quantity of Runoff.

- (1) The peak rate of runoff during the 100 year post development storm cannot exceed the peak rate of runoff during the two year pre-development storm.
- (2) For those areas where a study of the downstream area indicates the extended time of high discharge and/or velocity due to restricted release rate and storage may cause flooding and/or excessive erosion, the City Engineer may require additional controls.

(C) Quality of Runoff

- (1) The design of stormwater quality controls, also known as Post-Construction Best Management Practices, shall comply with standards and requirements as contained in the latest edition of the Ohio EPA General (NPDES) permit for stormwater discharges associated with construction activity (See Part IIIG2e of the Ohio EPA's NPDES Permit).

(D) Basin Construction.

- (1) The side slopes of a detention/retention basin shall not exceed four to one and shall be seeded or sodded.
- (2) The bottom of the basin shall be seeded or sodded and sloped to the outlet flow control device. A method of carrying low flow through the basin shall be provided and include appropriate erosion control.

- (3) The maximum water depth for detention basins shall be six feet.
- (4) The top of the embankment shall have a minimum width of eight feet.
- (5) Outlet flow control devices may be either single-stage or multi-stage.
- (6) Other requirements may be imposed for specific cases.

SUBMISSION REQUIREMENTS.

Plans and supporting data to verify storage volumes, release rates, etc., shall be submitted. The submission shall include, but is not limited to, the following:

(a) A plan, which may be the Improvement Plan, Drainage and Grading Plan, or similar plan at a scale of 1" - 100' or larger, shall be submitted and contain at least the following information:

- (1) The outline and designation of the drainage area(s).
- (2) All existing and proposed drainage facilities.
- (3) Existing and proposed contours.
- (4) Existing structures.
- (5) The detention/retention basin with outlet structures.
- (6) Pertinent elevations (e.g. water surface, flowline of flow control devices, etc.)
- (7) A recommendation from a soils engineer for the foundation and design of the embankment to be used for the retention/detention basin.
- (8) Any other information required by the City to clarify intent or design features.

(b) All calculations and other supporting data in sufficient detail and form to facilitate an expedient and accurate review.

FEE.

Work performed by professional consultants and other costs incurred by the City will be charged to the applicant at their billed cost plus ten percent (10%). The fee must be paid in full prior to approval of the plans by the City Engineer.

[ORDINANCE 1182 (Ord. XXX. Passed XXX)]

201.07 Storm Drainage and Sedimentation Control

(a) Intent.

(1) No change shall be made in the contour of the land; no grading, excavating, removal or destruction of the topsoil, trees, or other vegetative cover of the land shall be commenced until such time that a plan for minimizing erosion and sedimentation has been processed with and approved by the City Engineer or Public Works Director or there has been a determination by the Planning Commission that such plans are not required.

(2) For sites regulated under the Ohio EPA General Construction Permit for storm water discharges (Ohio EPA permit no. OHC000004, or latest edition), the person seeking coverage under that Ohio EPA Construction permit, shall provide a copy of the "Notice of Intent" to do so and a copy of the Ohio EPA's related "Letter of Coverage Authorization", prior to start of construction.

(3) No subdivision shall be approved unless:

A. There has been a plan approved by the City Engineer or Public Works Director that provides for minimizing erosion and sediment as consistent with the intent of this chapter, and performance bond or other acceptable securities are deposited with the City in the form of escrow guarantee which will insure installation and completion of the required improvements; or

B. There has been a determination by the Planning Commission and the Ohio EPA that such plans are not required.

(b) Performance Principles and Standards.

(1) The following principles are effective in minimizing erosion and sedimentation and shall be ~~met included~~ where applicable for a developing site and included in the control plan.

A. Development or redevelopment sites that are covered under the Ohio EPA General Construction Permit shall develop a stand-alone Storm Water Pollution Prevention Plan (SWP3) per the requirements of the Ohio EPA Permit OHC000004 (or latest edition). This SWP3 shall be provided to the City Engineer for review when the plan for minimizing erosion and sedimentation is submitted for the development proposal. After the SWP3 is approved and during construction, it shall be made kept on the construction

site, along with a copy of the NOI and letter granting permit coverage under the Ohio EPA general construction permit.

- B.** Stripping of vegetation, regrading or other development shall be done in such a way that will minimize erosion. Whenever feasible, natural vegetation shall be retained, protected and supplemented.
- C.** Development plans shall preserve salient natural features, keep cut-fill operations to a minimum, and ensure conformity with topography so as to create the least erosion potential.
- D.** The smallest practical area of land shall be exposed at any one time, the topsoil shall be preserved and returned to the surface areas to be revegetated.
- E.** Disturbed soils shall be stabilized as quickly as practicable with temporary vegetation and/or mulching to protect exposed critical areas during development.
- F.** The permanent final vegetation and structural erosion control and drainage measures shall be installed as soon as practical in the development.
- G.** Provisions shall be made to effectively accommodate the increased run-off caused by changed soil and surface conditions during and after development. Where necessary, surface water run-off shall be structurally retarded.
- H.** Sediment in the run-off water shall be trapped until the disturbed area is stabilized by the use of debris basins, sediment basins, silt traps or similar measures.

(2) The following standards shall be followed in all water management and sediment control plans:

- A.** All lots shall be graded to provide proper drainage away from buildings and to dispose of it without ponding. All land within a development shall be graded to drain and dispose of surface water without ponding, except where waived by the Planning Commission.
- B.** All drainage provisions shall be of such design to adequately handle the surface run-off and to carry it to the nearest suitable outlet such as a curbed street, storm drain, or natural watercourse. Where drainage swales are used to divert surface waters away

from buildings, they shall be sodded, planted or paved as required and shall be of such slope, shape and size as to conform with the requirements of the City.
(Ord. 167-95. Passed 11-13-95.)

C. The installation of the specified water management and sediment control measures shall be accomplished in accordance with the most recent standards and specifications available from the Ohio Department of Natural Resources document entitled, "Rainwater and Land Development Manual". A copy of such standards and specifications will be kept on file in the offices of the Public Works Director and Development Services Director.
(Ord. 127-03. Passed 8-11-03.)

(3) The approved plan for water management and sedimentation control required of the landowner or his agent shall include, but not be restricted to, the following requirements:

A. A description of the nature and type of the construction activity.

B. Indicate the total area of the site and the area of the site that is expected to be disturbed (i.e., grubbing, clearing, excavation, filling or grading, including off-site borrow areas).

C. An estimate of the impervious area and percent imperviousness created by the construction activity.

D. A calculation of the runoff coefficients for both the pre-construction and post-construction site conditions.

E. Existing data describing the soil and, if available, the quality of any discharge from the site.

F. The name and/or location of the immediate receiving stream or surface water(s) and the first subsequent named receiving water(s) and the areal extent and description of wetlands or other special aquatic sites at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project. For discharges to the MS4, the point of discharge to the MS4 and the location where the MS4 ultimately discharges to a stream or surface water of the state shall be indicated.

G. A description of prior land uses at the site.

H. A site map identifying the following:

- (1.) Limits of earth-disturbing activity of the site including associated off-site borrow or spoil areas that are not addressed by a separate NOI and associated SWP3.
- (2.) Elevations and/or contours, dimensions, location and extent of all work proposed to be done, and the existing elevations and/or contours of the land all in two foot increments. A delineation of drainage watersheds expected during and after major grading activities as well as the size of each drainage watershed, in acres.
- (3.) Soils types for all areas of the site, including locations of unstable or highly erodible soils.
- (4.) Location of any buildings, structures, utilities, sewers, water and storm drains on the site where the work is to be performed.
- (5.) Location of any building or structure on land of adjacent property owners within 100 feet of the site.
- (6.) The location of all erosion and sediment control practices that are designed in accordance with the Ohio EPA General Construction Permit requirements and ODNR Rainwater and Land Development manual standards, including the location of areas likely to require temporary stabilization during the course of site development.
- (7.) Sediment and storm water management basins noting their sediment settling volume and contributing drainage area.
- (8.) For subdivided developments where the SWP3 does not call for a centralized sediment control capable of controlling multiple individual lots, a detail drawing of a typical individual lot showing standard individual lot erosion and sediment control practices.
- (9.) The location of designated construction entrances where the vehicles will access the construction site.
- (10.) The location of any in-stream activities including stream crossings.

(11.) Areas designated for the storage or disposal of solid, sanitary and toxic wastes, including dumpster areas, areas designated for cement truck washout, and vehicle fueling;

(12.) Detailed plans of all drainage provisions, retaining walls, cribbing, vegetative practices, erosion and sediment control measures, location of proposed fences around sediment basins, steep excavations, or ponding areas, and other protective devices to be constructed in connection with, or as a part of the proposed work, together with a map showing the drainage area of land tributary to the site, and estimated cubic foot per second run-off of the area served by any drain, computed in accordance with current City storm drainage criteria.

I. Structural practices shall be used to control erosion and trap sediment from a site remaining disturbed for more than 14 days. Sediment control structures shall be functional throughout the course of earth disturbing activity. Sediment basins and perimeter sediment barriers shall be implemented prior to grading and within seven days from the start of grubbing.

J. Temporary and permanent soil stabilization controls in accordance with the Ohio EPA General Construction Permit requirements and ODNR Rainwater and Land Development manual standards.

K. Detail drawings for all structural practices that include installation, inspection, and maintenance procedures.

L. A certification of the quantity of excavation and fill involved.

M. A timing schedule and sequence indicating the anticipated starting and completion dates of the development; stripping and/or clearing, rough grading and construction, final grading and vegetative establishment, and maintenance and the time of exposure of each area prior to the completion of effective erosion and sediment control measures.

N. The estimated cost of the grading and/or filling and the cost of the required erosion controls.

(c) Approval Procedures.

(1) Three backline copies of complete plans shall be filed with the office of the City Engineer.

(2) In order to insure that emergency measures could be taken by the City if the water management and sediment control measures were not implemented according to the agreed upon plan and schedule, a performance bond in the amount of the cost of the water management and sediment control measures shall be required to be filed with the City. Such performance bond shall authorize immediate payment to the City upon certification of the Planning Commission that necessary emergency work must be done immediately to ensure proper water management and sediment control as a result of the landowner's failure to complete or adhere to the approved water management and sediment control plan.

(3) The Planning Commission and the City Engineer shall make a continuing review and evaluation of the methods used and overall effectiveness of the storm water management and sediment control program.

(Ord. 167-95. Passed 11-13-95.)

(d) Enforcement.

(1) The Public Works Director or his designee shall enforce compliance with the approved sediment control plans for projects that involve the construction of public infrastructure, including residential and commercial subdivisions.

(2) The Development Services Director or his designee shall enforce compliance with the approved sediment control plans for individual lot development projects.

(3) The Public Works Director and Development Services Director have the authority to issue stop work orders to any person, firm or corporation performing work where sediment and erosion control measures are not provided in accordance with the approved site development plans.

[ORDINANCE 1117.06(Ord.XXX. Passed XXX)]

201.08 Special Storm Sewer Rules

(a) Permit; Fee. No connection shall be made to a public storm sewer within the City until the written permission of the Public Works Director or his designee has been obtained by the person, firm or corporation proposing to or employed to perform the work. An application for a permit shall be signed by the owner or agent of the property for which the connection is desired and by the person, firm or corporation employed to perform the work; shall describe the property and state the purpose for which the connection is desired; and shall be accompanied by a fee in accordance with the following schedule:

- | | | |
|-----|---|----------|
| (1) | Existing residential structure sump pump drain pipe | \$10.00 |
| (2) | Existing residential structure roof downspout | \$10.00 |
| (3) | Existing residential structure yard drain pipe
(6-inch diameter or less) | \$10.00 |
| (4) | Existing residential structure storm sewer pipe
(up to 12-inch diameter) | \$25.00 |
| (5) | All other connections | \$125.00 |

No permit shall be issued until the appropriate application is made and the applicable fee is paid.

(b) Discharges Into Storm Sewers Regulated. Storm water and all other unpolluted drainage shall be discharged to such sewers as are specifically designated as storm sewers, or to a natural outlet approved by the Public Works Director. Industrial cooling water or unpolluted process waters may be discharged upon approval of the Public Works Director to a storm sewer or natural outlet after obtaining the appropriate permits from the State, Environmental Protection Agency or any other required agencies.

(c) Prohibition of Illegal Discharges. No person, firm, or corporation shall discharge or cause to be discharged into a public storm sewer or watercourse any substance other than storm water, except as follows:

(1) Water line flushing or other potable water discharges, irrigation or lawn watering, diverted stream flows, rising ground water, uncontaminated ground water infiltration, uncontaminated pumped ground water, foundation or footing drains, water from crawl space pumps, air conditioning condensation, springs, individual residential vehicle washing, natural riparian habitat or wetland flows, dechlorinated swimming pool discharges, water from fire fighting activities, and any other water source not containing pollutants that are not otherwise identified by the Ohio EPA as a prohibited non-stormwater discharge source.

(2) Discharges specified in writing by the Public Works Director or his designee as being necessary to protect public health and safety.

(3) Any non-storm water discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharge is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations.

(d) **Prohibition of Certain Connections.** The construction, use, maintenance or continued existence of any drain or conveyance, whether on the surface or subsurface, which allows a prohibited substance to enter a public storm sewer or watercourse is prohibited. This prohibition expressly includes, without limitation, connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection. When a prohibited connection is discovered, the Public Works Director will provide written notice to the property owner ordering its disconnection from the storm sewer system or watercourse. No person, firm or corporation shall fail to eliminate such connection(s) to the storm sewer or watercourse within thirty days after being ordered to do so as provided herein.

(e) **Inspection of Storm Sewers.** After a connection to a public storm sewer is built, and before it is covered, it shall be inspected and approved by the Public Works Director or his designee.

(f) **Prohibition of Curb Line Discharges.** No roof downspout, sump drain, or other surface or groundwater drainage line may be constructed to discharge directly into the curb line of any public street. This prohibition expressly includes, without limitation, any curb line discharge established in the past, regardless of whether its construction was permissible under law or practices applicable or prevailing at the time. When such a curb line discharge is discovered, the Public Works Director will provide written notice to the property owner ordering its disconnection from the curb line. No person, firm, or corporation shall fail to eliminate such curb line discharge(s) within 30 days after being ordered to do so as provided herein.

(g) **Erosion and Sediment Control.** To minimize the entry of sediment and other pollutants into the City's storm sewer system that is caused by construction site runoff, erosion and sediment control measures must be provided on all new development and redevelopment projects. These measures are to be shown in a sedimentation plan that has been prepared in accordance with the applicable requirements of the subdivision rules and regulations. Construction activities disturbing one or more acres of total land, or that will disturb less than one acre of land but are a part of a larger common plan of development, redevelopment or sale that will ultimately disturb one or more acres of land, shall seek coverage under the Ohio EPA General Construction Permit for storm water discharges (Ohio EPA permit no. OHC000004, or latest edition). As such, any person seeking approval of a Plan for erosion and sediment control measures, shall submit to the City Public Works Director prior to start of construction, a copy of the "Notice of Intent" that seeks coverage under the State of Ohio Construction Permit that has been or will be filed with that state agency.

(h) **Stormwater Management Controls.**

(1) To minimize the impact of land development and redevelopment activities on storm runoff and drainage, stormwater management controls shall be required on new development and redevelopment sites, pursuant to requirements contained in Chapter 1182, 1117.07 and per the design requirements contained in The City Design, Construction and Materials Specification document, or any subsequent supplements to this document.

(2) Construction activities disturbing one or more acres of total land, or that will disturb less than one acre of land but are a part of a larger common plan of development, redevelopment or sale that will ultimately disturb one or more acres of land, shall seek coverage under the Ohio EPA General Construction Permit for storm water discharges (Ohio EPA permit no. OHC000004, or latest edition). As part of that compliance, Post-Construction Best Management Practices shall be made part of the stormwater management controls on land development sites, pursuant to the requirements of the Ohio EPA permit and per the requirements in Chapter 1182.

(I) Maintenance Responsibility for Detention/Retention Basins.

(1) Commercial, industrial, multi-family residential property. The property owner(s) shall fully maintain detention/retention basins located on private commercial, industrial, or multi-family residential property, whether such basins are located within a public easement or not. This maintenance responsibility shall include both routine maintenance such as mowing, cleaning, debris removal, and erosion repair and non routine maintenance such as the repair or replacement of damaged or missing structural components.

(2) Single family residential property. The property owner(s) and/or homeowner's association shall be responsible for routine maintenance such as mowing, cleaning, debris removal, and erosion repair for detention/retention basins located on private single family residential property, whether such basins are located within a public easement or not. The City shall be responsible for non-routine maintenance such as the repair or replacement of damaged or missing structural components of such basins.

(3) Notification. When the maintenance of a detention/retention basin is found to be in violation of this subsection, the Public Works Director will provide written notice to the appropriate property owner(s) and/or homeowner's association ordering that the necessary maintenance be performed within a reasonable period of time. No person, firm or corporation shall fail to perform the required maintenance within the required period after being ordered to do so as provided herein. (Ord. 127-03. Passed 8-11-03.)

(i) Storm Water Quality Management Plan. As a requirement of the City's NPDES Phase II Storm Water Permit, Council hereby adopts the "Storm Water Quality Management Plan" dated

~~January 2005-August 2013~~, prepared by City staff as the City's official planning document for addressing storm water quality and pollution prevention. All subsequent amendments to the "Storm Water Quality Management Plan" shall also be adopted by legislative action of Council. A copy of this plan is on file in the office of the Clerk of Council.
(~~Ord. 20-05. Passed 2-14-05.~~)

(j) Violation and Enforcement Costs. In addition to other penalties listed in this chapter, any person, firm or corporation who violates any provision of this chapter shall be liable to the City for any expense, loss or damage resulting from the cleaning, repair or replacement work caused by the violation. Any person, firm or corporation who violates any provision of this chapter shall also be liable for any fine or penalty incurred by the City caused by their violation. Any person, firm or corporation who must be monitored by the City for enforcement and/or compliance shall be liable for the associated costs.

(k) Compliance with Other Regulations. Compliance with the provisions of this chapter or other sections of City Code does not relieve the site owner from obtaining all other necessary permits and/or approvals from federal, state and/or county agencies. If requirements vary, the most stringent requirement shall apply. (Ord. 127-03. Passed 8-11-03.)
[ORDINANCE 925.07(Ord.XXX. Passed XXX)]

201.09 Drainage Maintenance and Abatement Procedure

ROUTINE AND REMEDIAL MAINTENANCE.

(a) Owners of properties with stormwater Best Management Practices (BMPs) are responsible for operation and maintenance as specified in Section 906.03. The Public Works Director shall provide for inspection and routine maintenance of facilities that have been accepted for maintenance by the City. City maintenance may include storm water conveyance- related structure cleaning and repair.

(b) The Public Works Director, in the Public Works Director's sole discretion, may provide for remedial maintenance of facilities based upon the severity of storm water problems and potential hazard to the public health and safety, through the abatement procedures described in Section 906.02. For purposes of this Chapter, maintenance associated with retention/detention basins including, but not limited to, mowing, rivulet repair, basin bottom fill, seeding, fertilizing and/or algae removal, are not considered "potentially hazardous" to the public nor "severe" storm water problems, and maintenance will not be provided by the City except in case of public emergency as determined by the Public Works Director.

ABATEMENT PROCEDURES.

(a) Notice To Correct Improper Drainage.

(1) Whenever the City shall find that (i) a tract of land not maintained by the City is inadequately drained, or (ii) there is excessive erosion or sedimentation upon such land, or (iii) there is an obstruction to a culvert or water course upon such land that interferes with water naturally flowing therein, or (iv) that such culvert, storm sewer or watercourse upon such land is of insufficient capacity to reasonably accommodate the flow of water, as required by the City, the City shall notify the owner or person having possession, charge, or management of such land to remove the obstruction, provide adequate drainage, fill or drain such land, enlarge the culverts, drains, or watercourses, mitigate excessive erosion or sedimentation, and/or accomplish any other act determined by the Public Works Director necessary to be necessary to further the purposes of this chapter. Such notice shall be served on such persons or entity in the same manner as provided by the Ohio Rules of Civil Procedure for service of Summons and the Public Works Director or his designee may post a Notice at the property. The address utilized for any service shall be the property address itself and the tax billing address for such premises as maintained on the records of the Butler County Auditor.

(2) The owner must comply with the City's orders within a reasonable time not to exceed 30 days, unless an extension is granted by the Public Works Director for good cause shown. Failure to comply with such order shall constitute an unlawful act. Each additional day thereafter during which the owner fails to carry out the order of the City shall constitute a separate offense.

A. In any case where a condition described above exists for more than 30 days after service of notice, the Public Works Director or his designee may issue an order to the property owner(s) stating that they are in violation; that the City may affect the necessary repairs per section 906.02 (b) or that the City may file criminal charges, or both.

B. In the event an owner fails or refuses to comply with the Public Works Director's directive, the City may provide the performance of the required work and charge the owner the abatement costs.

C. Each and every owner of real property in the City consents to the entry upon any real property in the City for all reasonable times during normal business hours for the purpose of inspection, repair or maintenance required by this chapter.

(3) Failure of the City to observe or recognize hazardous or unsightly conditions or to recommend denial of a permit/zoning change shall not relieve the owner or person having possession, charge, or management of such land from the responsibility for the condition or damage resulting therefrom, and shall not result in the City, its officers or agents from being responsible for any condition or damage resulting therefrom.

(4) Nothing in this chapter shall be construed as authorizing any person to maintain a private or public nuisance on his property, and compliance with the provisions of this chapter shall not be a defense in any action to abate such nuisance.

(5) Nothing in this chapter shall be construed to prevent immediate action by the City in emergency situations. In case of an emergency, the City may direct that action be taken immediately to correct the condition or abate the activity to protect the public health, safety, and welfare. The City may perform the required work and charge the owner the abatement costs.

(b) Abatement Costs.

(1) If the owner or occupant having the care of the lands mentioned in Section 906.01 fails to comply with the notice provided in for Section 906.02 (A), the City shall cause such abatement procedures to be implemented. The cost for such abatement procedures shall be immediately due and payable to the City, provided, however, that an administrative fee shall be charged in the amount of five hundred dollars. The cost of the administrative fee together with the cost of the abatement procedure together with any legal fees incurred by the City shall be assessed against the owner and, if unpaid, against the lot or land together with interest thereon at the then judgment rate in effect in the State of Ohio.

(2) Notice of such assessment shall be given to the owner of the lot or land charged therewith and the occupant by mailing such notice to the address utilized by the County Treasurer for billing purposes and by posting a notice of assessment at the subject premises. Service may also be made in any manner provided for service of summons by the Ohio Rules of Civil Procedure. All assessments not paid within ten days after such mailing and posting, after approval by Council, shall be certified by the Clerk of Council to the County Auditor to be placed on the tax duplicate and collected as other taxes are collected.

POST CONSTRUCTION STORMWATER BEST MANAGEMENT PRACTICE OPERATION AND MAINTENANCE

(a) Operation and Maintenance Plan.

(1) The developer/property owner shall prepare an Operation and Maintenance Plan meeting the minimum requirements of the latest version of the Ohio EPA NPDES Construction Stormwater Permit for redevelopment and new development projects wherein construction activities will result in the disturbance of one or more acres.

(2) The Operation and Maintenance Plan shall be submitted by the developer/property owner to City of Fairfield for review and approval prior to the City issuing the building permit.

(3) The Operation and Maintenance Plan must be a stand-alone document containing the following:

A. Designate the entity associated with providing the Best Management Practices (BMPs) inspection and maintenance.

- B. Indicate routine and non-routine maintenance tasks to be undertaken.
- C. Indicate a schedule for inspection and maintenance tasks.
- D. Provide proof of any necessary legally binding maintenance easements and agreements that are necessary to properly inspect and maintain the BMP(s).
- E. Provide a map showing the location of the BMP(s) that are indicated on the City of Fairfield approved Storm Water Pollution Prevention Plan (SWPPP) and necessary access and maintenance easements.
- F. Provide detailed BMP drawings and inspection and maintenance procedures.
- G. Ensure that the collected pollutants resulting from BMP maintenance activities are disposed of in accordance with local, state and federal guidelines.

(b) Declaration of Covenants and Restrictions. A Declaration of Covenants and Restrictions shall be made between the Owner and the City of Fairfield ensuring that the BMP(s) shall be properly inspected and maintained and shall be included within the Operation and Maintenance Plan.

(c) Inspection.

- (1) Personnel identified within the Operation and Maintenance Plan shall inspect the BMP(s) to ensure proper functionality and determine if maintenance is necessary.
- (2) At a minimum, inspections are to be conducted on an annual basis, or as specified in the Operation and Maintenance Plan.
- (3) Written inspection reports summarizing the BMP(s) inspection observations and maintenance requirements are to be submitted to the City of Fairfield upon request by the City.

(d) Maintenance.

- (1) All BMPs are to be maintained according to the measures outlined within the Operation and Maintenance Plan.
- (2) Ensure that the collected pollutants resulting from BMP maintenance activities are disposed of in accordance with local, state and federal guidelines.
- (3) The Owner shall make necessary repairs within fourteen days of their discovery as identified within the inspection reports or through a request from the City of Fairfield

resulting from City conducted inspections.

(4) Maintenance activities performed are to be documented on a written report and submitted to the City of Fairfield upon request.

(5) In addition to any applicable provisions of Sections 906.01 and 906.02, the Owner shall grant permission to the City of Fairfield to enter the property and inspect the BMP(s) whenever the City deems necessary. In an event of any default or failure by the Owner in properly maintaining the BMP(s) in accordance with the approved Operation and Maintenance Plan, or, in the event of an emergency as determined by the City of Fairfield, it is the sole discretion of the City, after providing reasonable notice to the Owner, to enter the property and take whatever steps necessary to correct deficiencies and to charge the cost of such repairs to the Owner. Nothing herein shall obligate the City to maintain the BMP(s).

PENALTY.

(a) Any person or entity having been determined to violate this chapter or who enters a plea to a violation thereof shall be guilty of a third degree misdemeanor. Each and every day during which such violation continues shall constitute a separate offense.

(b) The imposition of any fine or penalty pursuant to this chapter shall not preclude the Law Director from instituting any appropriate legal proceeding in a Court of proper jurisdiction to correct or abate a violation, require compliance with this chapter or other applicable chapters, ordinances, regulations or rules of the City or State of Ohio as determined to be appropriate by such Law Director.

[ORDINANCE 906(Ord.XXX. Passed XXX)]

201.10 Run-off Coefficients

Use Table 201-C

201.11 Declaration of Covenants and Restrictions

Use Attachment 201-D

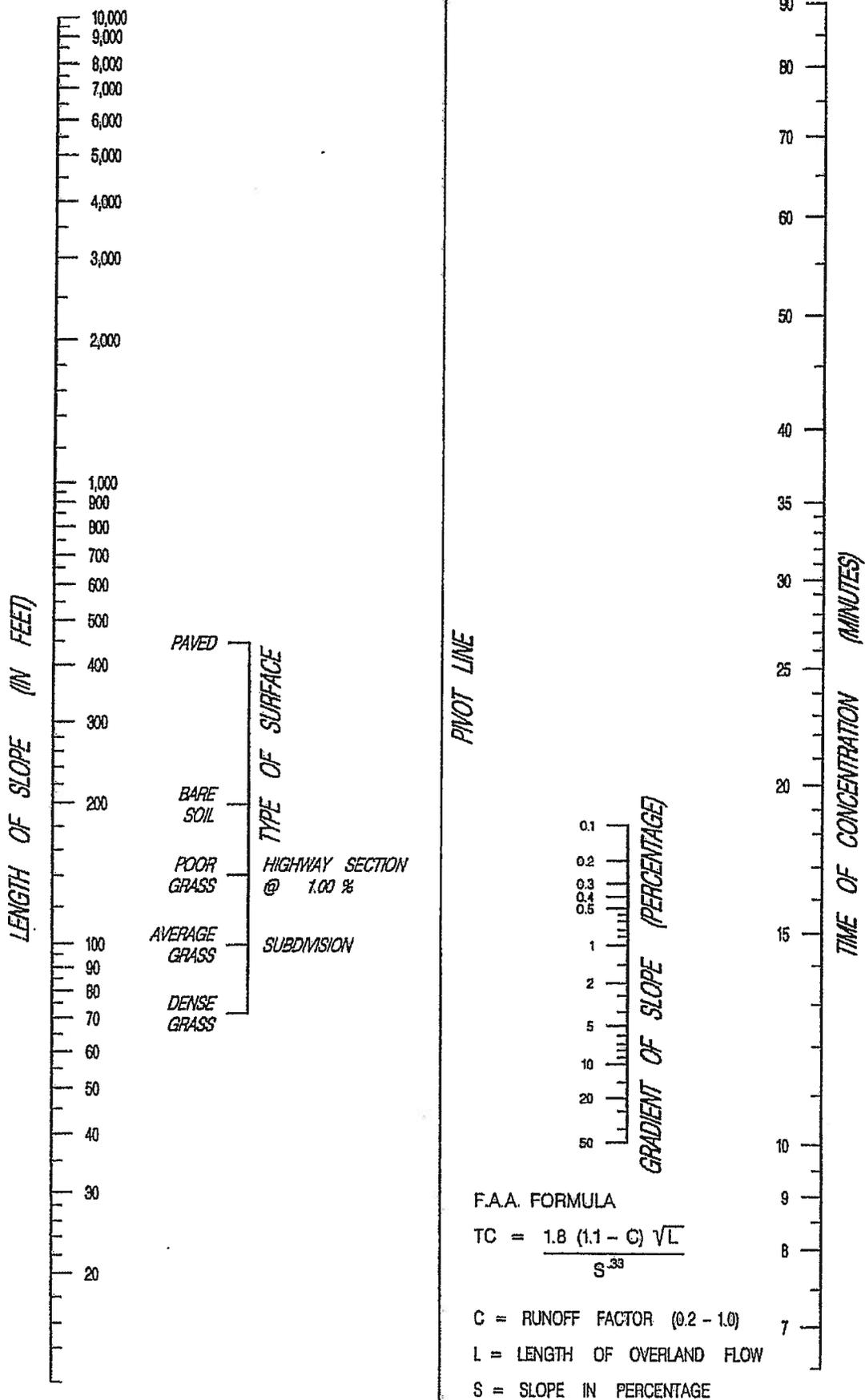
202.00 STORM SEWER

202.01 Pipe Size (Manning's Formula) $Q = A \left(\frac{1.486}{n} X R^{2/3} X S^{1/2} \right)$

202.02 Values of "n"

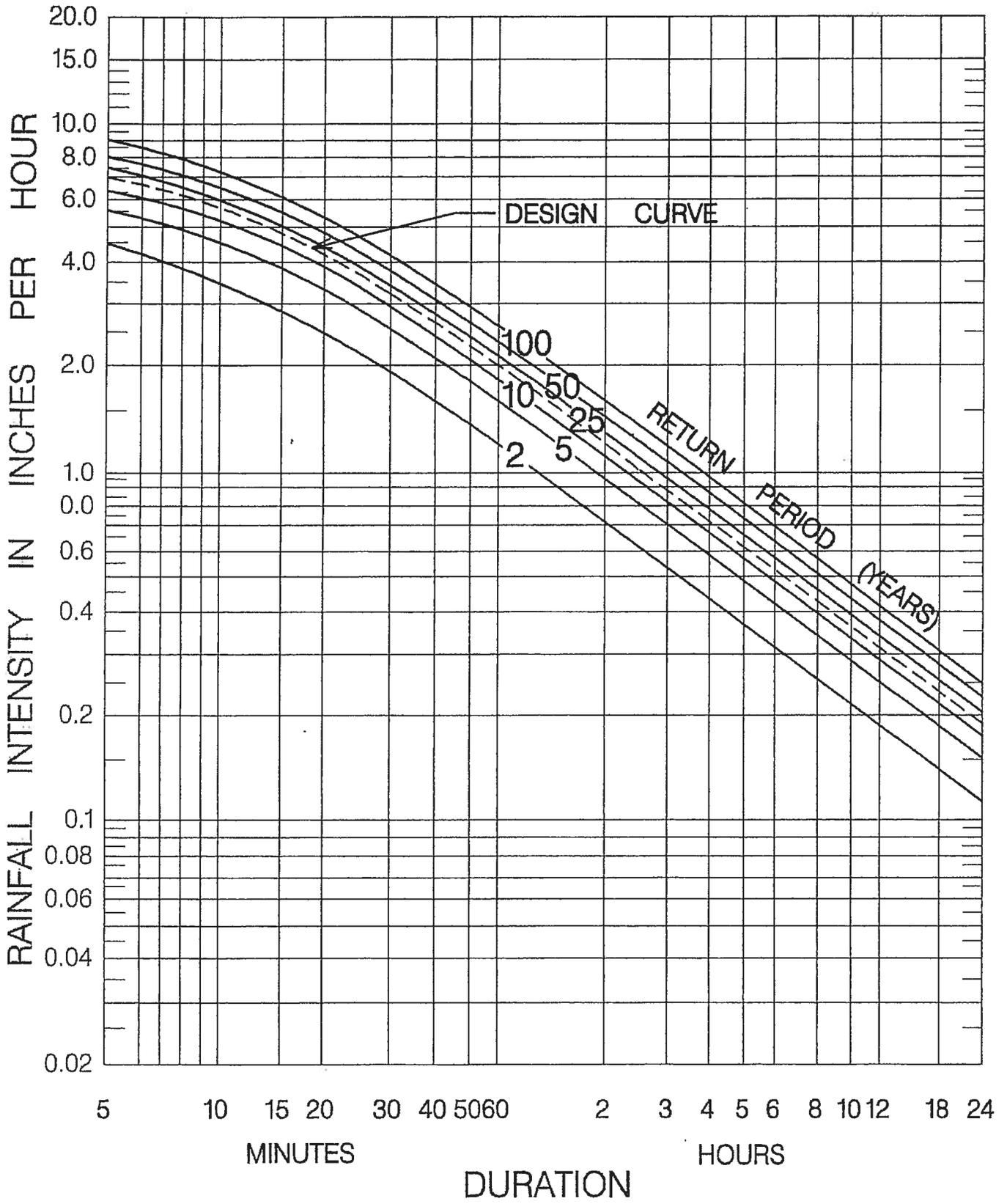
Refer to section 1104.4.5, and Figure 1105-2 of the **current** O.D.O.T., Location and Design Manual, Volume 2, Drainage Design.

CHART 201-A



OVERLAND FLOW TIME

FAIRFIELD, OHIO



RAINFALL INTENSITY - DURATION - FREQUENCY CURVES

TABLE 201-C

Run-off Coefficients Use Weighted Average

TYPE OF AREA	RUN-OFF COEFFICIENT
Business	0.60 - 0.75
Residential - Single Family	0.40 - 0.50
Residential - Multi-Family	0.60 - 0.75
Industrial – Light	0.60 - 0.80
Industrial – Heavy	0.70 - 0.90
Parks, Cemeteries	0.25 - 0.40
Playgrounds	0.35 - 0.45
Railroad Yard	0.30 - 0.40
Woodland	0.20 - 0.40
Grassland	0.25 - 0.45
Cropland	0.40 - 0.50
Pavement	0.95
Roofs	0.90
Lawns, Flat, 0-2%	0.20 - 0.25
Lawns, Average, 2%-6%	0.25 - 0.35
Lawns, Steep, over 6%	0.35 - 0.40

DECLARATION OF COVENANTS AND RESTRICTIONS

This Declaration of Covenants and Restrictions (this “Declaration”) is made on this ___ day of _____, 20__ by _____, an Ohio _____ (the “Declarant”).

Recitals:

A. Declarant owns certain property located in the City of Fairfield, Ohio as more particularly described on the legal description attached hereto as Exhibit A and incorporated herein by reference (the “Property”).

B. The Property is subject to Ohio EPA Permit No. OHCO00004, dated April 21, 2013, (hereinafter referred to as the “General Permit”), which General Permit requires Declarant to submit a post-construction operation and maintenance plan for storm water facilities and practices, and further requires implementation of the plan be ensured through recording of a legally binding easement, agreement and/or other document.

C. In accordance with the General Permit, Declarant hereby agrees to restrict the use of the Property as set forth in this Declaration, with the intent that such covenants and restrictions run with the land.

NOW, THEREFORE, for valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Declarant, for itself and its successors and assigns as owners of the Property, hereby agrees as follows:

§1. Covenants and Restrictions. Declarant hereby agrees, for itself and its successors and assigns as owners of the Property, that the Property shall be subject to the following covenants and restrictions:

1. Declarant has submitted, and the City of Fairfield has approved, a post-construction operation and maintenance for storm water facilities and practices (hereinafter referred to as the “Maintenance Plan”), a copy of which Maintenance Plan is attached hereto as Exhibit B and incorporated herein by reference. Declarant covenants that the owner of the Property shall be the designated entity for the storm water inspection and maintenance responsibilities set forth in the Maintenance Plan. The owner accordingly shall undertake any routine and/or non-routine inspection and maintenance tasks set forth in the Maintenance Plan in accordance with the schedule set forth in the Maintenance Plan.
2. Declarant hereby acknowledges that these covenants and restrictions run with the land and the declarant will note on the individual property deed that the subject parcel(s) have storm water management responsibilities as designated on the plat.

Specific storm water management responsibilities for this subdivision are as follows _____

3. Declarant hereby acknowledges and agrees that neither the City of Fairfield nor the Ohio Environmental Protection Agency is or shall be responsible for the inspection and maintenance tasks set forth in the Maintenance Plan.

§2. **Perpetual Restrictions.** The covenants and restrictions set forth in this Declaration shall be perpetual and shall run with the land for the benefit of, and shall be enforceable by the City of Fairfield. This Declaration and the covenants and restrictions set forth herein shall not be amended, released, extinguished or otherwise modified without the prior written consent of the City of Fairfield, which consent may be withheld in its sole and absolute discretion.

§3. **Enforcement.** If Declarant, or its successors or assigns as owner of the Property, should fail to observe the covenants and restrictions set forth herein, the City of Fairfield shall have the right to enforce, by any proceedings at law or in equity, all restrictions, conditions and covenants set forth herein. Failure by the City of Fairfield to proceed with such enforcement shall in no event be deemed a waiver of the right to enforce at a later date the original violation or a subsequent violation.

§4. **Severability.** Each provision of this Declaration and the application thereof to the Property are hereby declared to be independent of and severable from the remainder of this Declaration. If any provision contained herein shall be held to be invalid or to be unenforceable or not to run with the land, such holding shall not affect the validity or enforceability of the remainder of this Declaration.

§5. **Notices.** Notices or other communication hereunder shall be in writing and shall be sent certified or registered mail, return receipt requested, or by other national overnight courier company, or personal delivery. Notice shall be deemed given upon receipt or refusal to accept such delivery. Each party may change from time to time their respective address for notice hereunder by like notice to the other party. The notice addresses of the parties are as follows:

Declarant: _____

City : City of Fairfield
[address - line 1]
[address - line 2]
ATTN: [City responsible person]

§7. **Governing Law.** This Declaration shall be governed by, and construed in accordance with the law of the State of Ohio.

IN WITNESS WHEREOF, the Declarant has caused this Declaration of Covenants and Restrictions to be executed this ___ day of _____, 20__.

DECLARANT:

By: _____
Name: _____
Title: _____

STATE OF OHIO)
) SS
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ___ day of _____, 20__, by _____, the _____ of _____, a _____, on behalf of the _____.

Notary Public

This instrument was prepared by:

202.00 STORM SEWER

202.01 Pipe Size (Manning's Formula) $Q = A \left(\frac{1.486}{n} X R^{2/3} X S^{1/2} \right)$

202.02 Values of "n"

Refer to section 1104.4.5, and Figure 1105-2 of the current O.D.O.T., Location and Design Manual, Volume 2, Drainage Design.

202.03 Minimum Size 12 inches

202.04 Minimum Cover 2 feet to top of pipe or as recommended by the manufacturer.

202.05 Minimum Mean Velocity 3.0 feet per second

202.06 Maximum Mean Velocity 14.0 feet per second for Corrugated Metal Pipe and 20.0 feet per second for Plastic and Concrete Pipe.

202.07 Maximum Manhole Spacing 400 feet (36" and under)

202.08 Manhole Placement

Intersections, termini of sewers, changes in size and/or slope, changes in alignment (36" and under), places where inlet leads are to be connected.

Drop manholes are required at stream entrances for storm sewer outfalls if the difference between stream and pipe inverts is greater than 12". The manhole outlet pipe shall be directed with the flow of the stream.

202.09 Maximum Inlet Spacing (each side of street)

Flat (0.3% - 1.0%)	150' - 250' (normal conditions)
Normal (1.0% - 5.0%)	250' (normal conditions)
Steep (5% & greater)	150' - 250' (normal conditions)

Spacing shall be governed by a two (2") inch allowable depth of gutter flow based upon a ten (10) minute time of concentration and a ten (10) year design storm if it would be less than the above spacing.

All low spots, where the street grade changes to a flatter slope, dead end of descending streets, at P.C. or P.T. of all intersection radius curves where the curb and gutter grade descends toward radius curve, (locate on property line extended or at mid-lot).

Vane grates will be required for all street grades in excess of two (2%) percent.

See City of Fairfield Public Works Standard Drawing 2007001 for transition between modified catch basins and standard curb and gutter.

202.10 Outlet Protection

3 fps or less	No protection required
3 fps to 5 fps	Sodded ditch
5 fps to 18 fps	Rock channel protection

If the mean velocity is between 5 fps and 18 fps, dumped rock channel protection will be as per Figure 1107-1 of the current ODOT Location and Design Manual, Volume 2.

greater than 18 fps	Special outlet protection
---------------------	---------------------------

202.11 Steep Slope Protection

Sewers of a 15% slope or greater shall be anchored with concrete anchors spaced as follows:

- Grades from 15% to 35% shall be anchored on 36 feet center to center.
- Grades from 35% to 50% shall be anchored on 24 feet center to center.
- Grades from 50% and over shall be anchored on 16 feet center to center.

202.12 Headwalls

Headwalls or end sections will be per ODOT specifications. Full height headwalls will be required in rear and side yard areas.

203.00 CHANNEL DESIGN

203.01 Pipe Size (Manning's Formula) $Q = A (\frac{1.486}{n} X R^{2/3} X S^{1/2})$

203.02 Values of "n"

Rock Lined Channels	0.08
Grassed Channels	0.03
Concrete/Asphalt Lining	0.015

203.03 Side Slopes (grass)

Desired	4:1
Maximum	3:1

203.04 Minimum Freeboard 1 foot

203.05 Minimum Grade

Grass	1.0 %
Concrete	0.35 %

The minimum grade for all ditches shall be one percent (1%) except for streams, large channels with a paved bottom, and slopes paved to a height approved by the City Engineer. [ORDINANCE 1117.05(Ord.167-95. Passed 11-13-95)]

203.06 Channel Protection

Seeding	0% - 2%
Sodding	2% - 5%
Lining	> 5% and at all channel curves and at junctions with other channels.

Where possible, natural streams, including growth along the banks, shall not be disturbed. Roughness coefficients and increased peak flows and velocities shall be evaluated to determine stability. [ORDINANCE 1117.05(Ord.167-95. Passed 11-13-95)]

203.07 Policy

Open Ditches

Open ditches will be avoided wherever possible in a subdivision. Where pipe sizes are larger than sixty (60") inches, the requirements for storm sewer pipes may be waived in favor of ditches.

Sump Pumps and Footing Drains

Sump pumps are not permitted to be discharged into the sanitary sewer or the curb and gutter adjacent to the roadway. All subdivisions, unless waived by the Public Works Director or his/her Designee, shall provide satisfactory drainage facilities for the disposal of water generated by sump pumps and footing drains. Sumps and footing drains shall be directed to a storm sewer system, ditch or swale built as part of the drainage plan.

Roof Down Spouts

Roof down spout pipes are not permitted to be discharged into the curb and gutter adjacent to the roadway.

204.00 CONSTRUCTION REQUIREMENTS AND MATERIAL SPECIFICATIONS

204.01 Trench Excavation

Item ~~611~~ 603.03 of the **current** State of Ohio Department of Transportation Construction and Material Specifications and the following shall apply:

Open road cuts require an Open Road Cut permit approved by the Public Works Director or his/her Designee. Roadway restoration shall be per **Public Works** standard drawings for **typical restoration sections**. Trenches not backfilled and resurfaced by the end of the work

day shall be plated in accordance to standard drawing.

See City of Fairfield Public Works standard drawing for trenching.

Open no more trench in advance of pipe laying than is necessary to expedite the work.

Trench excavation will be performed according to OSHA and any State of Ohio regulations.

In existing street rights-of-way, a **Right-of-Way Permit** ~~permission~~ must be obtained from the Public Works Director or his/her Designee to lay back slopes in the public right-of-way.

204.02 Pipe Bedding

Item ~~611.02 603.04~~ and ~~611.06 603.06~~ of the **current** State of Ohio Department of Transportation Construction and Material Specifications will apply.

204.03 Pipe Laying

Item ~~611.05 603.05~~ of the **current** State of Ohio Department of Transportation Construction and Material Specifications and the following will apply:

Grade stakes shall be required prior to laying any pipe. Line and grade will be controlled by laser alignment. Pipe will be protected during handling against impact shocks and free fall. Do not permit hooks to come in contact with pre-molded joint surfaces. Handle pipe having pre-molded joint rings or attached couplings so that no weight, including the weight of the pipe itself, will bear on or be supported by the jointing material. Take care to avoid dragging the spigot ring on the ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects. After delivery alongside the trench, carefully examine each piece of pipe for roundness and specification compliance. Acceptable pipe may be marked with paint or other permanent marking material so that the marks are plainly visible after installation in the trench and before the pipe is covered.

A mandrel test will be required for Item 707 plastic and polyethylene type pipe to determine the pipe deflection prior to acceptance of the storm sewer by the City of Fairfield. When the development/subdivision has completed the one year maintenance period, the plastic and polyethylene pipe may be videotaped with a copy of the recording supplied to the City of Fairfield in lieu of a mandrel test; only with the permission of the Public Works Director. The maximum allowable pipe deflection is 5%.

204.04 Joints

Item ~~611.08 603.08~~ of the **current** State of Ohio Department of Transportation Construction and Material Specifications and the following shall apply.

In all jointing operations, the trench shall be dry.

204.05 Backfilling Trenches

Item ~~611.06 603.10~~ of the **current** State of Ohio Department of Transportation Construction

and Material Specifications and the following shall apply:

Unless other protection work is directed, backfill trenches immediately after the pipe is laid. In the case of concrete cradle bedding, delay backfilling until the concrete has set sufficiently to support the backfill load. Except for unusual circumstances such as sub-aqueous installations, permit no water to rise in non-backfilled trenches after the pipe is in place. Backfill material to be placed above pipe bedding shall be free of brush, debris and junk. Backfill under existing paved roadways will be flowable fill per ODOT item 613 unless waived by the Director of Public Works.

See Public Works standard drawing for plating and typical restoration sections.

Unless specifically authorized, place no rock or rock excavation detritus in the upper eighteen (18") inches (460mm) of the trench. Place no rock or stones having a dimension larger than four (4") inches (100mm) within three (3') feet (0.9m) of the top of the pipe. Large stones may be placed in the remainder of the trench as backfill only if well separated and arranged so that no backfill settlement will result. Use puddling, jetting, or water flooding for consolidating backfill material only when approved by the Public Works Director or his/her Designee.

204.06 Pipe Material Specification for Storm Sewer

Items ~~611 603~~, 706 and 707 of the **current** State of Ohio Department of Transportation Construction and Material Specifications shall apply.

All pipes that cross under road pavement/curbs shall be reinforced concrete pipe. The class of pipe shall be determined by a design engineer.

Corrugated/Smooth Metal Pipe

All corrugated/smooth metal pipes shall be aluminized type 2 coated, welded, seam pipe conforming to ODOT specifications unless approved by the Public Works Director.

204.07 Manholes, Catch Basins & Structures

See Item ~~611 604~~ of the **current** State of Ohio Department of Transportation Construction and Material Specifications.

204.08 Drywell

Drywells will not be approved within the City of Fairfield without supporting calculations provided by a licensed professional engineer based on a permeability test performed by a licensed geotechnical engineer.

See City of Fairfield Public Works standard drawings ~~79096~~ for dry wells.

If drywells are to be used for storm water drainage control or storm water detention/retention in any new subdivision or dedication of public improvements, the developer shall be required to execute an agreement with the City of Fairfield satisfactory to the Law Director prior to recording of the plat or dedication which provides a warranty by the developer of the proper

and efficient operation of all storm water drainage and retention/detention facilities of the subdivision in accordance with the requirements of this chapter for a period of five years after the recording of the plat or dedication. The agreement shall require the developer to take any and all corrective action, including, but not limited to, the installation of new or additional facilities in order for the subdivision or improvements to meet the requirements of this chapter. The developer's performance of the agreement shall be secured by an appropriate performance bond or other security approved by the Law Director. (Ord. 214-98. Passed 12-7-98.)

PUBLIC WORKS CONSTRUCTION STANDARDS*

**Refer to Section 200 for Complete Specification Details*

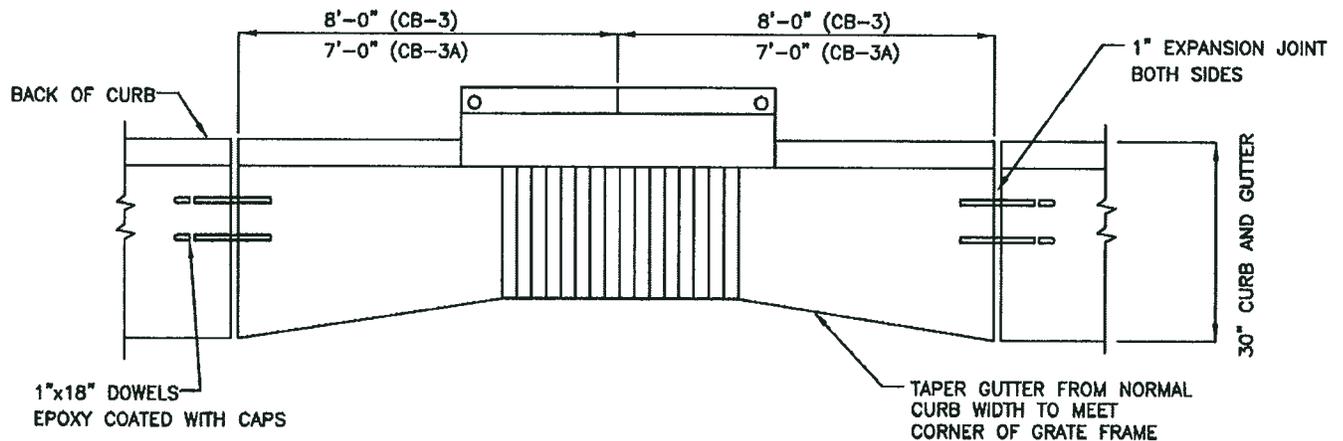
City of Fairfield
Construction Standards
Fairfield, Ohio



DATE: 01/23/2013 | SCALE: NONE | FILE: PUBLICWORKSDetails.DWG

New Drawing

MODIFIED TYPE-3 & TYPE-3A CATCH BASINS



PLAN VIEW

PUBLIC WORKS CONSTRUCTION STANDARDS*

*Refer to Section 200 for Complete Specification Details

City of Fairfield
Construction Standards
Fairfield, Ohio

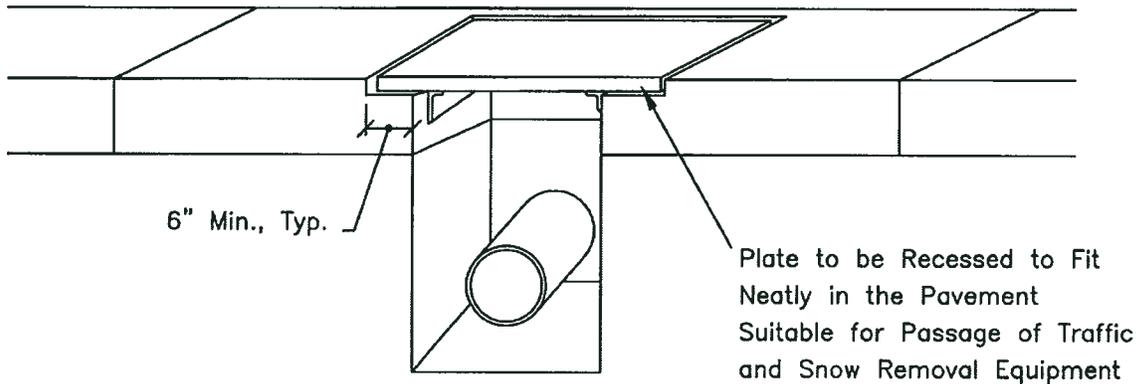


DATE: 01/23/2013 | SCALE: NONE | FILE: PUBLICWORKSDETAILS.DWG

Left out of old hand book

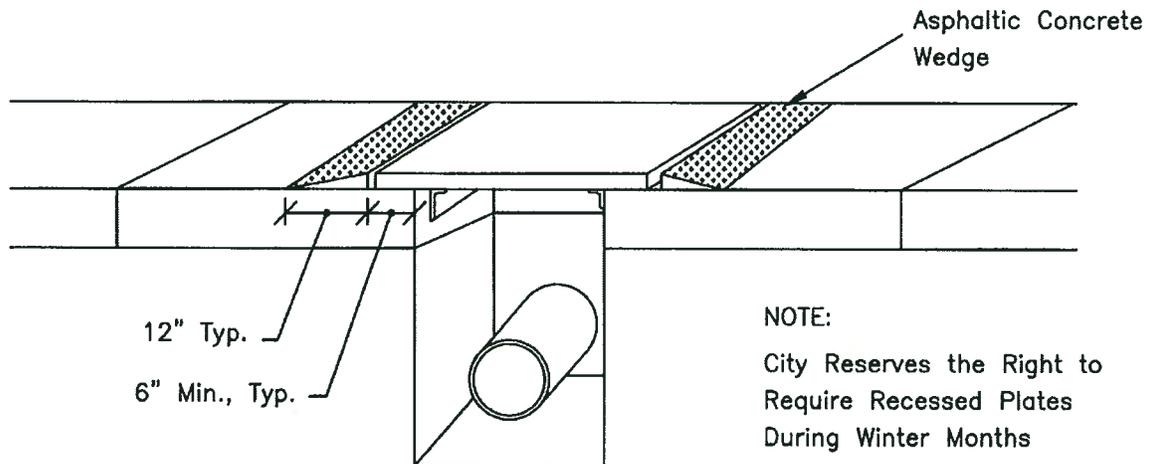
For trenches excavated within city roads, trenches shall be plated in accordance with the details shown below. The intent of the detail is to provide the availability of all traffic lanes especially during peak traffic periods.

* Excavation must be backfilled to the bottom of the plate if left unattended for over 4 hours.



HIGHER SPEED/ VOLUME APPLICATIONS

45 MPH or Greater
Greater Than 6000 ADT



LOWER SPEED/ VOLUME APPLICATIONS

40 MPH or Less
6000 ADT or Less

PUBLIC WORKS CONSTRUCTION STANDARDS*

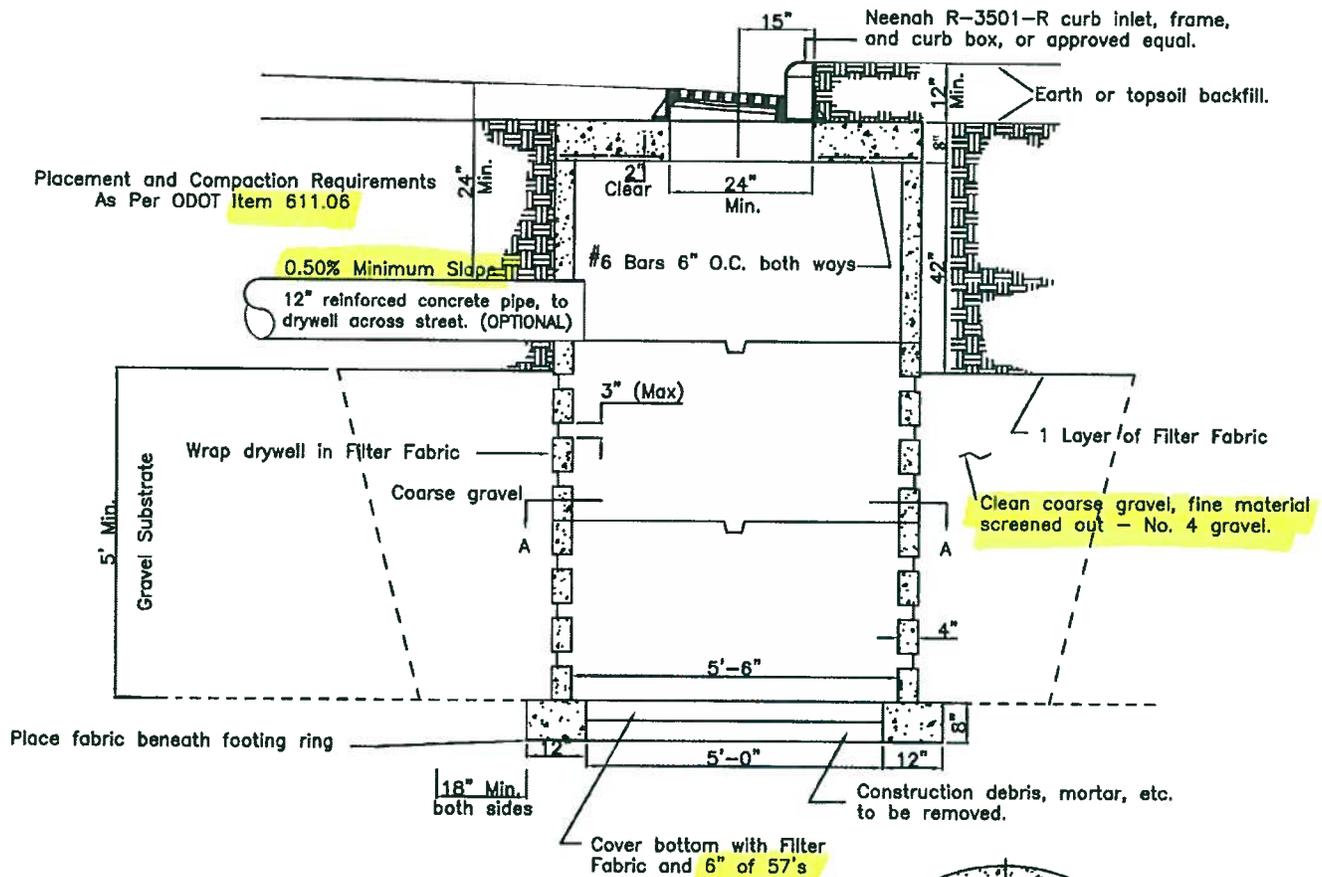
*Refer to Section 200 for Complete Specification Details

City of Fairfield
Construction Standards
Fairfield, Ohio



DATE: 01/23/2013 SCALE: NONE FILE: PUBLICWORKSDetails.DWG

STANDARD PRE-CAST CONCRETE DRYWELL

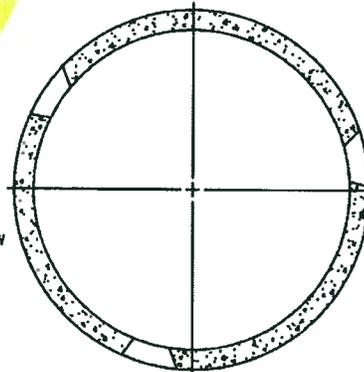


NOTE:

If drywell does not reach gravel substrate, under cut until existing gravel substrate is reached. If no gravel is reached, backfill below drywell with washed gravel. Depth to be determined by Geotechnical Engineer.

24" hole in top slab to be offset to allow for adjustments.

Section View of Keyways A-A



PUBLIC WORKS CONSTRUCTION STANDARDS*

*Refer to Section 200 for Complete Specification Details

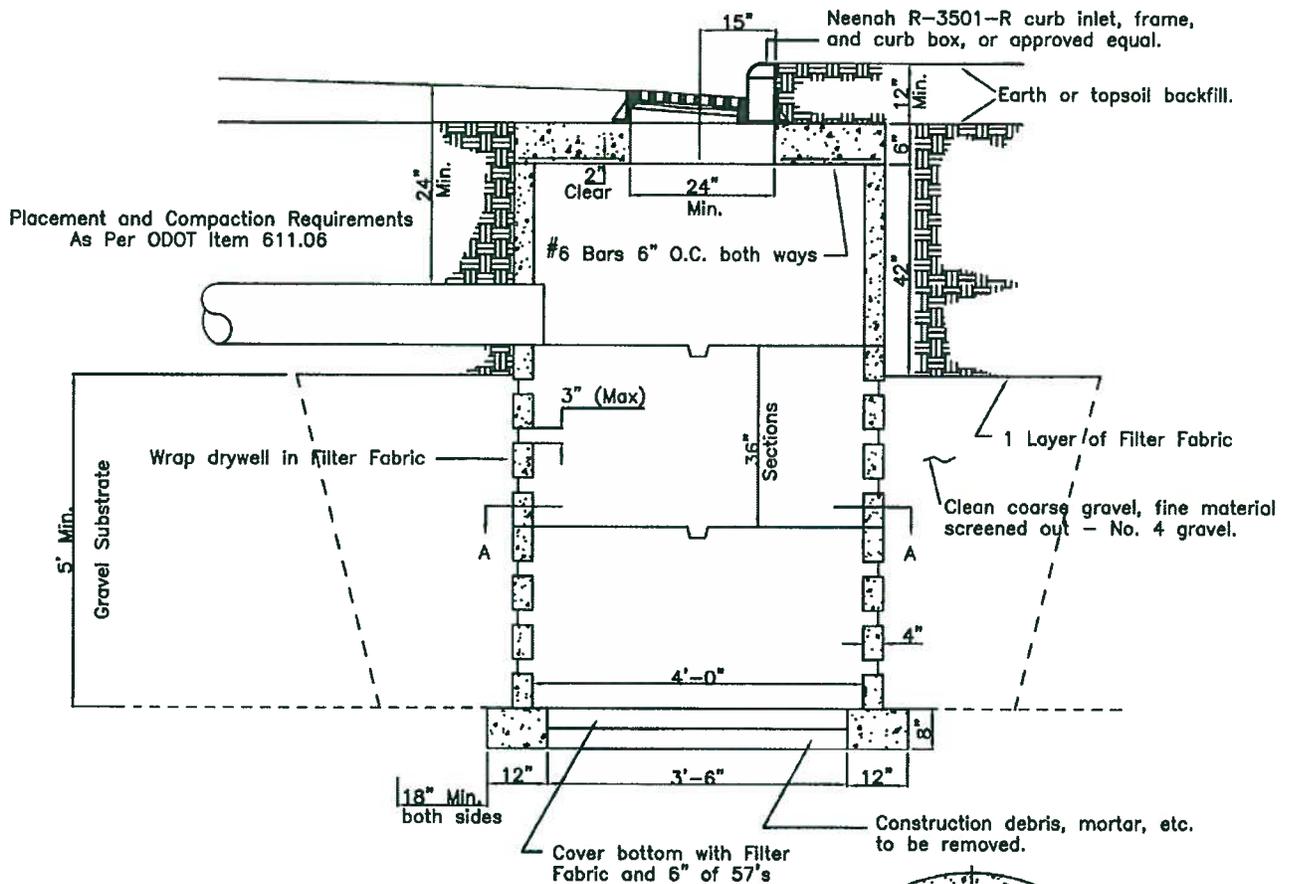
City of Fairfield
Construction Standards
Fairfield, Ohio



DATE: 01/23/2013 SCALE: NONE FILE: PUBLICWORKSDETAILS.DWG

New Drawing

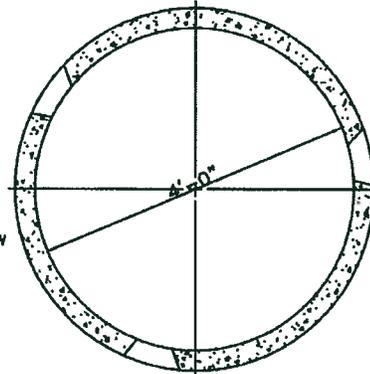
MINI PRE-CAST CONCRETE DRYWELL



NOTES:

- 24" hole in top slab to be offset to allow for adjustments.
- Each barrel section shall conform to ODOT CMS 706.13.

Section View of Keyways A-A



SECTION 3
ROADWAY

SECTION 300

ROADWAY

301.00 DESIGN INTERSECTIONS

- (a) At street and alley intersections, property line corners shall be rounded by an arc, the minimum radius of which shall be (15') fifteen and (10') ten feet respectively. In business districts, a chord may be substituted for such arc.
- (b) Street curb intersections shall be rounded by radii of at least twenty-five feet.
- (c) The above minimum radii shall be increased when the smallest angle of intersection is less than ninety degrees.

[ORDINANCE 1109.11(Ord.141-83. Passed 9-26-83)]

302.00 MINIMUM PAVEMENT WIDTHS

Minimum pavement widths, back to back of curb, required to be installed at the subdivider's expense, shall be as follows:

- (a) Primary and secondary thoroughfares, as shown on the Thoroughfare Plan.
- (b) Collector streets, thirty-eight feet.
- (c) Local and minor streets, twenty-eight feet.
- (d) The pavement of a turning circle at the end of a cul-de-sac street will have a minimum outside diameter of eighty feet. A "T" or "Y" shaped paved space, when approved by the Commission, in place of a turning circle, will extend entirely across the width of the street right of way and will be at least twenty feet wide with the flared portion rounded by minimum radii of twenty feet.
- (e) Alleys, full width of right of way, twenty feet.

[ORDINANCE 1109.13(Ord.141-83. Passed 9-26-83)]

303.00 STREET DESIGN STANDARDS

	Primary & Secondary	Industrial	Collector	Local & Cul-de-sac
Minimum centerline grade	0.50%	0.50%	0.50%	0.50%
Maximum centerline grade	5.0%	5.0%	10.0%	12.0%
Minimum length of vertical curve (See Note 2)	100'	100'	50'	50'
Minimum length of tangent between horizontal curves	100'	100'	50'	50'
Minimum edge of pavement radius	40'	50'	25'	25'
Minimum stopping sight distance (See Note 3)	Refer to ODOT L&D Manual	Refer to ODOT L&D Manual	Refer to ODOT L&D Manual	Refer to ODOT L&D Manual
Maximum centerline grade approaching an intersection (See Note 4)	2.0%	2.0%	4.0%	6.0%
Cul-de-sac pavement turnaround diameter from back-to-back of curb (See Note 5)	N/A	120'	N/A	80'
Minimum traffic lane width for multi-lane streets (See Note 6)	12'	12'	12'	11.5'
Minimum Centerline Radius	Refer to ODOT L & D Manual	Refer to ODOT L & D Manual	Refer to ODOT L & D Manual	100'
Maximum driveway grade (See Note 9)	15%	15%	15%	15%

1. Any exceptions to these standards must be approved in writing by the Public Works Director.
2. All changes in street grades shall be connected by vertical curves of a minimum length in feet equivalent to fifteen (15) times the algebraic difference between the rates in grade.

3. Vertical sight distance shall be measured from an eye level of three and one-half (3.5') feet to the top of a two (2) foot high object.
4. The grades shall be shown every ten (10') feet around the radius of intersecting streets to the point of curve or tangency for a distance of fifty (50') feet from an intersection with the front of curb or edge of pavement of another street.
5. A "T" or "Y" shaped turnaround shall not be used unless approved by the Planning Commission and the design has been approved by the Public Works Director.
6. Minimum pavement widths **as detailed in the Thoroughfare Plan** ~~shown on the Standard Construction Drawings~~ of the City of Fairfield shall be used for all two (2) lane streets except that all industrial streets shall have a minimum width of thirty-eight (38') feet as measured from back-to-back of the curb and all cul-de-sacs at the termini of said industrial streets shall be offset to eliminate the need for semi-trucks to negotiate an "s"-curve into and through the turning circle. Exit curves as measured along the edge of pavement within an industrial cul-de-sac shall be a minimum radius of forty-five (45') feet. Underdrains, when required by the Public Works Director, shall be eight (8") inch perforated plastic pipe and shall be installed two (2') feet behind, and parallel to the back of curb and two (2') feet below subgrade on both sides of the roadway. Under drains shall be used to drain the subgrade. The under drains shall be connected to a positive drainage outlet (i.e. curb inlets) and shall be backfilled with granular material.
7. As the city's Federal Aid Design Guidelines, ODOT's L&D manual shall be followed with the rewording of *A on chart 104-1 to indicate that the design speed shall not be construed to be the legal speed limit, with the AASHTO Green book guidelines as a minimum.
8. Sump **collector lines** ~~drains~~ are required in all developments. ~~The~~ **An** eight (8") inch sump **collector line** ~~drain~~ shall be located two (2') foot behind the curb and three (3') feet below grade. Tie-ins to sump lines shall be approved and inspected by the City of Fairfield Public Works Department. A minimum of two (2) working days notification is required for inspection request. Proposed tie in to be shown on the site plan. Tie to sump lines shall be accomplished with commercial fittings. Concrete collars shall not be permitted.

The 8" sump collector line shall be PVC (SDR-35, schedule 40, or approved equal). All private sump lines connecting to the 8" sump collector line shall be of same material and properly bedded within the public right-of-way.

See City of Fairfield Public Works standard drawing for typical sump or downspout drain.

9. All residential driveways which are new construction will be reviewed on a case by

case basis. For any design questions regarding these driveways, the City of Fairfield Public Works and Fire and Safety Departments shall make the final determination involving a workable driveway design.

10. Curb ramps shall be installed according to the most recent ODOT standard drawings SP-7.1. Detectable warnings shall be by Armor Tile, ADA Solutions, or approved equal.

304.00 PAVEMENT STANDARDS

304.01 Rigid Pavement

The use of rigid pavement in the City requires prior approval and acceptance by the Public Works Director or his/her designee. Portland Cement Concrete pavement shall be designed and as specified by the design engineer. If acceptable, concrete pavement shall be a minimum of seven (7") inches residential or nine (9") commercial of continuously reinforced Portland Cement Concrete with non integral curb and gutter in accordance with Item 451 (Class C concrete) of the ODOT Construction and Materials Specifications Handbook.

304.02 Flexible Pavement

Flexible pavement for commercial/industrial, primary, secondary and collector streets shall consist of minimum thickness of asphalt concrete base and asphalt surface course as designed and as specified by the design engineer, (based on traffic volumes and results of geotechnical investigation) over a uniformly compacted subgrade. Tack coat (ODOT Item 407) will be applied at a minimum rate of 0.1 gallon per square yard. Item 448 Asphalt Concrete, will be a minimum of three (3") inches thick applied in two (2) lifts, with the one and one-half (1-1/2") inch surface lift being installed just before the final acceptance.

A minimum design for local residential streets will be five (5") inches of Item 301 Asphalt Concrete Base, one and one half (1-1/2") of Item 448 Intermediate Course and one and one half (1-1/2") inches of Item 448 Surface Course.

A minimum design for industrial streets will be eight (8") inches of Item 301 Asphalt Concrete Base, one and one half (1-1/2") of Item 448 Intermediate Course and one and one half (1-1/2") inches of Item 448 Surface Course.

The City of Fairfield reserves the right to increase the pavement thickness, require underdrains or require additional subgrade preparation as typical traffic loadings are anticipated or if poor soils are encountered.

304.03 Asphalt Concrete Base Course

Item 301 of the current State of Ohio Department of Transportation Construction and Material Specifications.

304.04 Driveways, Culverts and Sidewalks

Concrete residential drive aprons within the public right-of-way shall be 7" thick. Concrete

commercial drive aprons within the public right-of-way shall be 9” thick. Concrete sidewalk within the public right-of-way shall be 4” thick. Concrete sidewalk that is part of the drive/apron shall be the same thickness as the drive apron.

See City of Fairfield Public Works standard drawings 97001.

304.05 Road Cut Restoration

See City of Fairfield Public Works standard drawings 97004 and 97005.

304.06 Trench Excavation

See Section 204.01.

305.00 Work Within the Public Right-of-Way

All work within the public right-of-way requires a permit to be approved by the Public Works Director or his designee.

PUBLIC WORKS CONSTRUCTION STANDARDS*

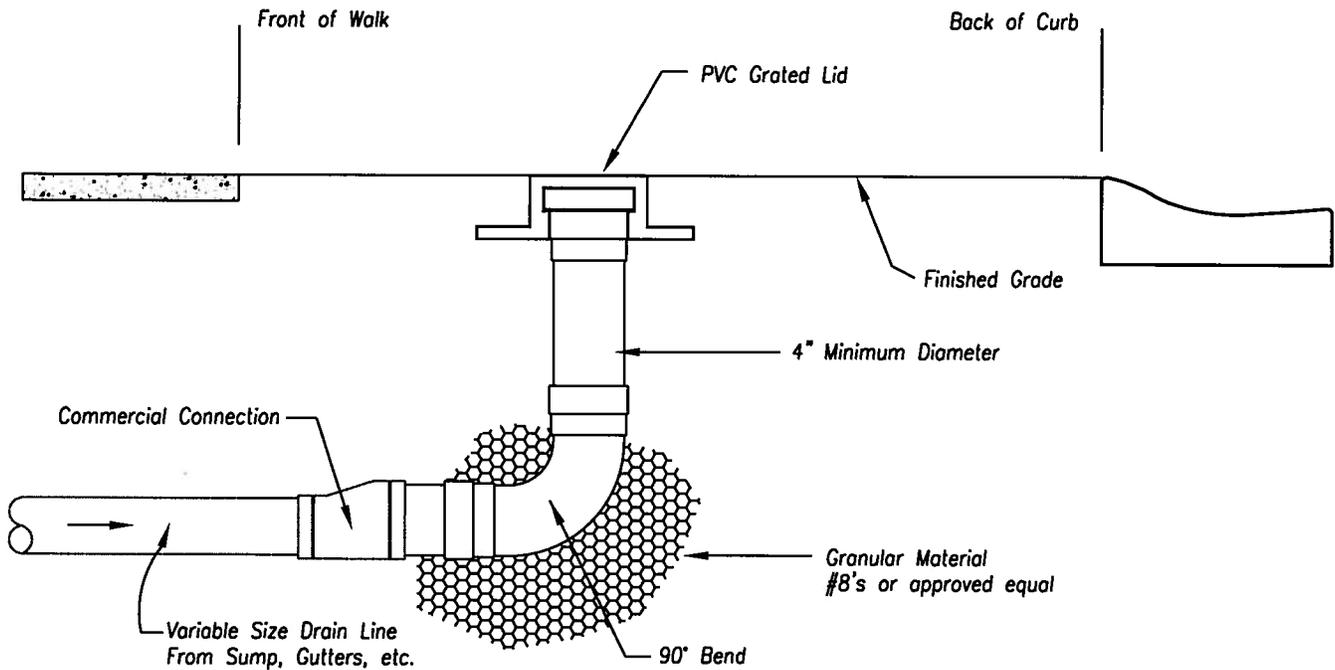
*Refer to Section 300 for Complete Specification Details

City of Fairfield
Construction Standards
Fairfield, Ohio



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New Drawing



TYPICAL SUMP OR DOWN SPOUT DRAIN

PUBLIC WORKS CONSTRUCTION STANDARDS*

*Refer to Section 300 for Complete Specification Details

City of Fairfield
Construction Standards
Fairfield, Ohio



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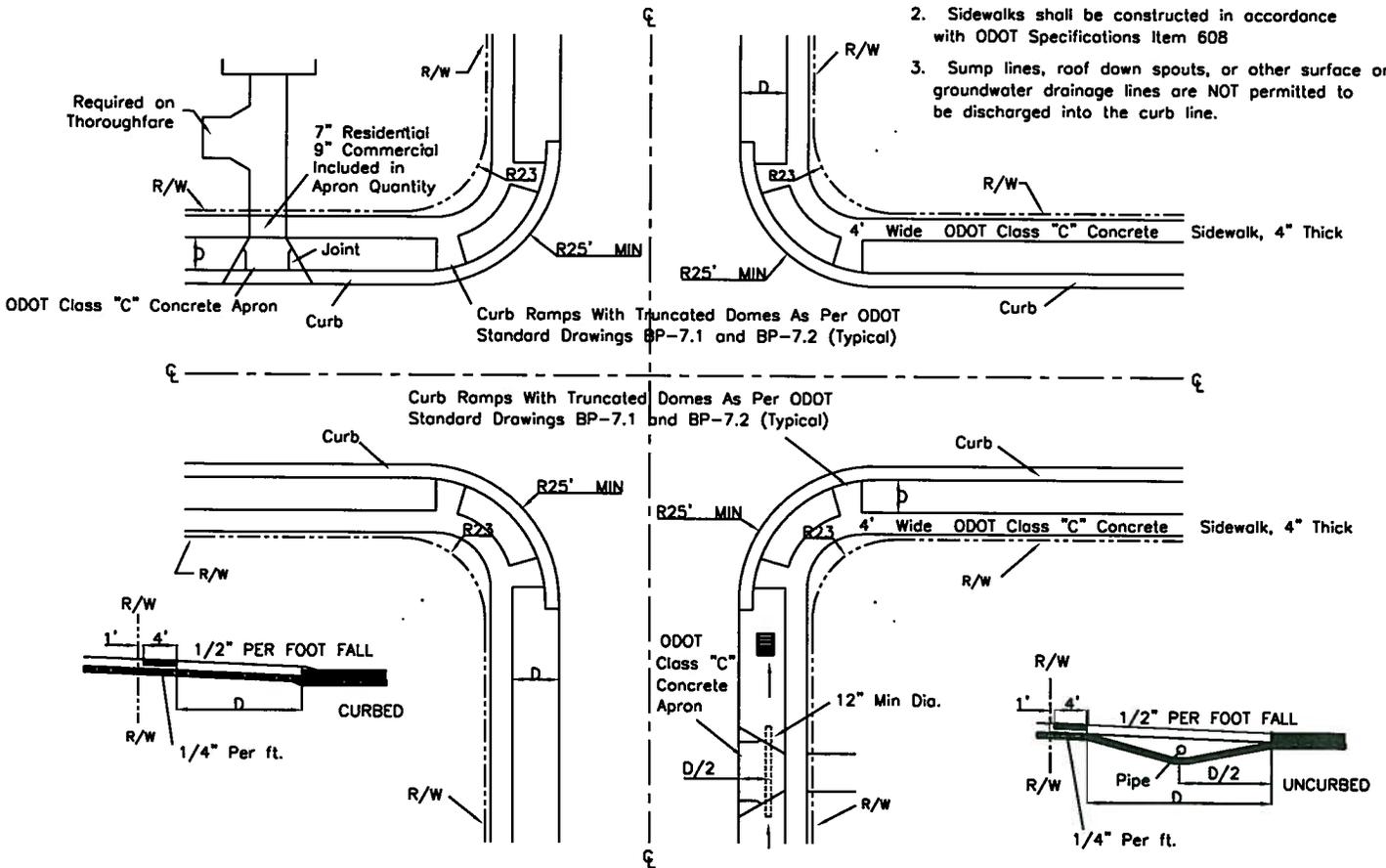
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old handbook

TYPICAL DRIVEWAY, CULVERT & SIDEWALK

NOTES:

1. See Plot Plan or Subdivision Construction drawing for pipe size and "D" dimension
2. Sidewalks shall be constructed in accordance with ODOT Specifications Item 608
3. Sump lines, roof down spouts, or other surface or groundwater drainage lines are NOT permitted to be discharged into the curb line.



PUBLIC WORKS CONSTRUCTION STANDARDS*

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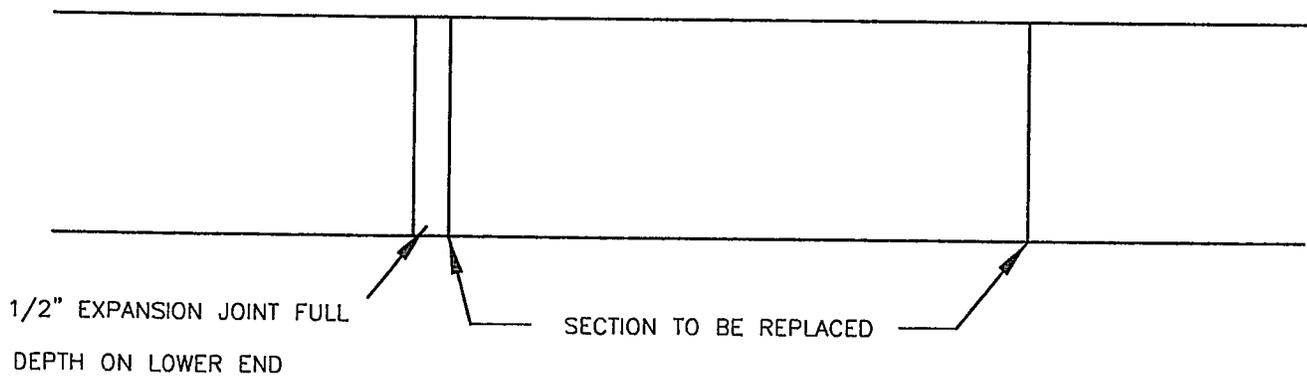
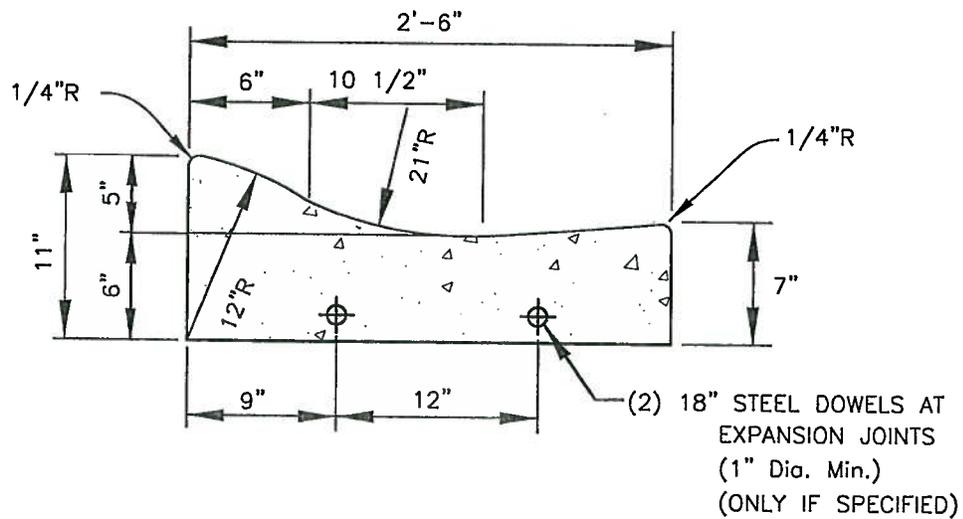
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New Drawing

STANDARD ROLL TYPE CURB AND GUTTER



Construct ramps to
meet required slopes
and existing
conditions.

PUBLIC WORKS CONSTRUCTION STANDARDS*

*Refer to Section 300 for Complete Specification Details

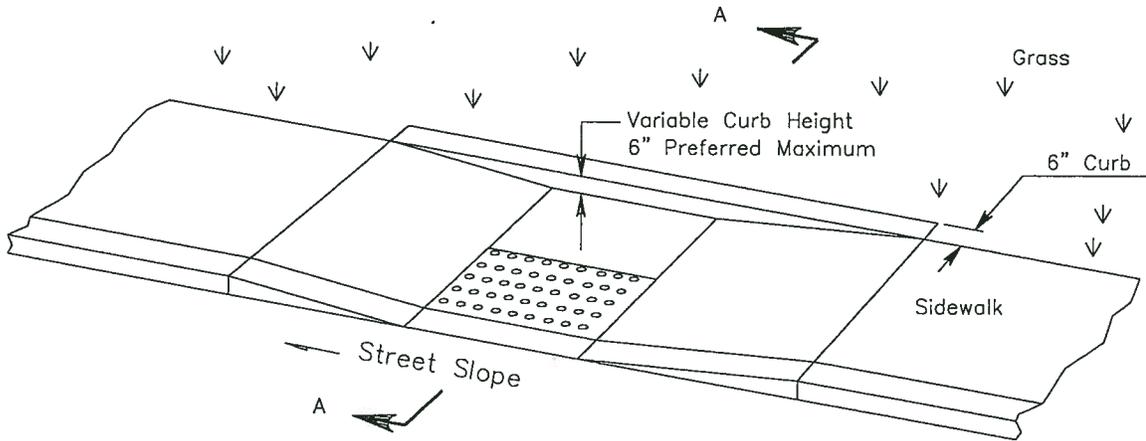
City of Fairfield
Construction Standards
Fairfield, Ohio



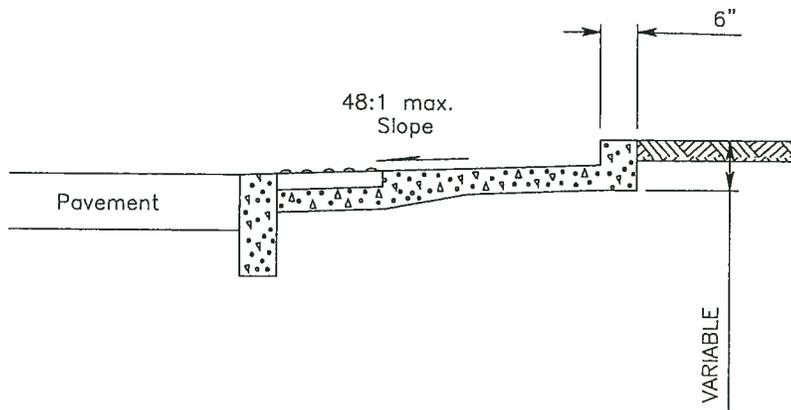
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MODIFIED TYPE 6 CURB

New Drawing



MODIFIED TYPE 6 CURB, AS PER PLAN



SECTION A-A

PUBLIC WORKS CONSTRUCTION STANDARDS*

*Refer to Section 300 for Complete Specification Details

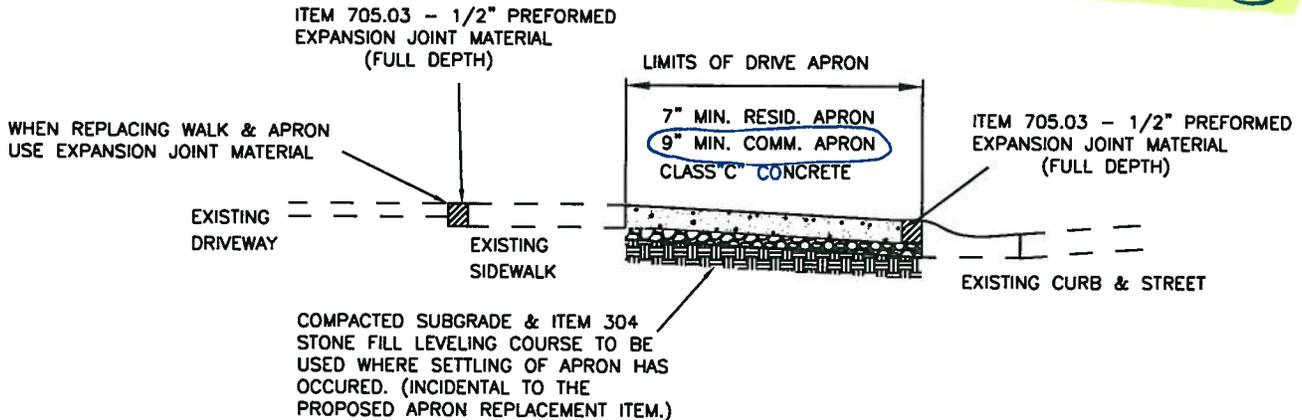
City of Fairfield
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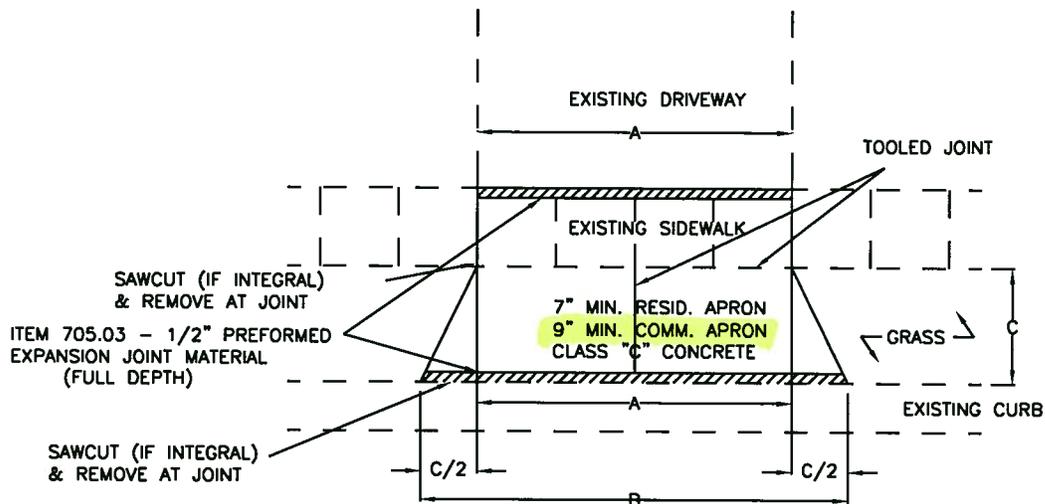
ITEM 452 - NON-REINFORCED CONCRETE PAVEMENT - DRIVE APRON DETAIL

New Drawing



NOTE:
THE NEW APRON SHALL MEET THE SIDEWALK AND CURB AT EXISTING ELEVATIONS

SECTION



NOTES:
THE DRIVEWAY SHALL BE REPLACED IN ITS EXISTING SIZE UNLESS THE OWNER REQUESTS THE REPLACEMENT IN ACCORDANCE WITH THE SUBDIVISION REGULATIONS LISTED BELOW.

CITY SUBDIVISION REGULATIONS:
THE DRIVEWAY WIDTH AT THE BACK OF THE CURB SHALL BE EQUAL TO THE (B=A+C) DRIVEWAY WIDTH AT THE FACE OF THE SIDEWALK PLUS THE WIDTH OF THE GRASS STRIP BETWEEN THE CURB AND SIDEWALK.

ALL DISTURBED YARD AREAS SHALL BE RESTORED TO GRADE, SEED, AND MULCHED BEFORE THE WORK IS APPROVED FOR PAYMENT AND SHALL BE INCIDENTAL TO ITEM 452 - NON-REINFORCED CONCRETE PAVEMENT.

THE FINISH APPLIED TO THE CONCRETE APRONS SHALL BE A LIGHT BROOM FINISH UNLESS THE RESIDENT REQUESTS A HAND FINISH. ALL JOINTS AND OUTSIDE EDGES OF THE PAVEMENT SHALL BE TOOLED WITH AN EDGER OR JOINT TOOL AFTER BROOMING OR HAND FINISHING OF THE FINAL FINISH.

PUBLIC WORKS CONSTRUCTION STANDARDS*

*Refer to Section 300 for Complete Specification Details

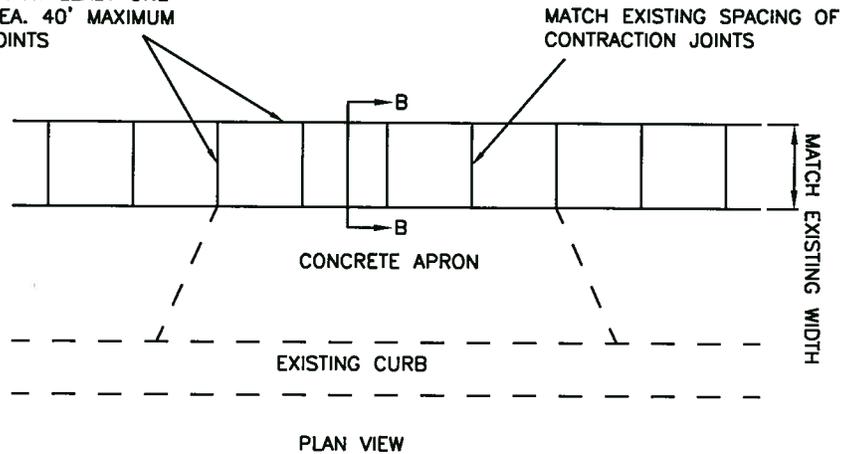
City of Fairfield
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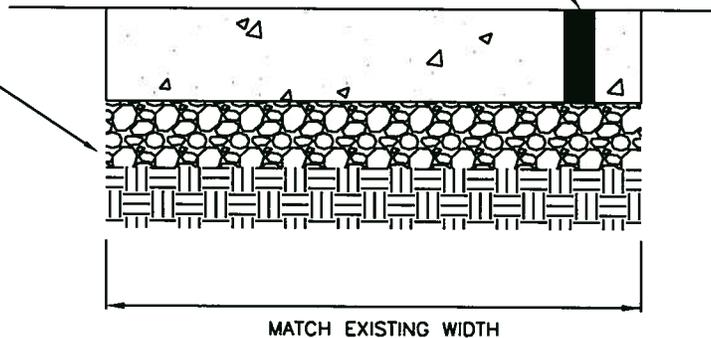
ITEM 608 - CONCRETE SIDEWALK DETAIL *New Drawing*

ITEM 705.03 - 1/2" PREFORMED EXPANSION JOINT MATERIAL PLACED ON AT LEAST ONE END OF THE REPAIRED AREA. 40' MAXIMUM SPACING OF EXPANSION JOINTS (FULL DEPTH)



COMPACTED SUBGRADE & ITEM 304 STONE (OR APPROVED EQUAL) FILL LEVELING COURSE TO BE USED WHERE SETTLING OF WALK HAS OCCURED. (INCIDENTAL TO THE PROPOSED WALK PAYMENT ITEM.)

4" MINIMUM DEPTH AT NON-APRON SECTIONS OR MATCH EXISTING - WHICHEVER IS GREATER
7" CONCRETE WALK REPLACEMENT - RESIDENTIAL
9" CONCRETE WALK REPLACEMENT - COMMERCIAL AT DRIVEWAY LOCATIONS.



NOTES:

THE CITY SHALL MARK IN THE FIELD THE WALK TO BE REPLACED. REPLACEMENT WALK SHALL MATCH THE LINE AND GRADE OF THE EXISTING WALK AND THE SAME JOINT PATTERN SHALL BE MAINTAINED. ITEM 705.03 - 1/2" PREFORMED EXPANSION JOINT MATERIAL SHALL BE PLACED ON AT LEAST ONE END OF THE REPAIRED AREA. ALL REPAIRS ARE TO BE MADE TO THE NEAREST JOINT. ANY DAMAGE TO ADJACENT WALK OR DRIVEWAY BY THE CONTRACTOR, THE COST SHALL BE INCURED BY THE CONTRACTOR.

THE FINISH APPLIED TO THE CONCRETE WALK SHALL BE CONSISTENT WITH THE EXISTING WALK IT IS TO MATCH AND BE APPROVED BY THE CITY. ALL JOINTS AND OUTSIDE EDGES OF THE WALK SHALL BE TOOLED WITH AN EDGER OR JOINT TOOL AFTER BROOMING OR HAND FINISHING OF THE FINAL FINISH.

THE REPLACEMENT SIDEWALK SHALL BE A MINIMUM THICKNESS OF 7" AT RESIDENTIAL APRONS AND A MINIMUM THICKNESS OF 9" AT COMMERCIAL APRONS.

ALL DISTURBED YARD AREAS SHALL BE RESTORED TO GRADE, SEEDED, AND MULCHED BEFORE THE WORK IS APPROVED FOR PAYMENT AND SHALL BE INCIDENTAL TO ITEM 608 - SIDEWALK, REMOVE AND REPLACE.

PUBLIC WORKS CONSTRUCTION STANDARDS*

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RESTORATION CLASS	TYPICAL RESTORATION SECTIONS	BACKFILL
CONCRETE ROADWAY	<p>Class "C" Conc. With 7B#/100 S.F. Road Mesh</p> <p>5/8" X 1'-0" Tie Bar @ 5'-0" OC or 5/8" Expn. Anchor Bolt</p> <p>Flowable Controlled Density Fill As Per ODOT Item 613</p> <p>Variable</p> <p>6"</p> <p>Saw Cut Both Edges - Full Depth</p> <p>Exst. Conc. Pvmt.</p> <p>* Unless of Exst. Jt. With A Minimum Of 3' Width</p>	FLOWABLE CONTROLLED DENSITY FILL
ASPHALTIC CONCRETE	<p>Item 448 - 1 1/2" Asphalt Concrete Surface Course</p> <p>Item 301- to Match Existing Depth Courses Asphaltic Concrete</p> <p>Flowable Controlled Density Fill As Per ODOT Item 613</p> <p>Variable</p> <p>NOTE: Vertical Edges of Existing Trench to be Coated With Liquid Asphalt Prior to Placing 301 and 448</p> <p>Saw Cut Both Edges (3" Min.) Joint Seal As Per ODOT 401.17</p> <p>Exst. Asphaltic Concrete</p>	FLOWABLE CONTROLLED DENSITY FILL
CONCRETE DRIVEWAY	<p>Class "C" Concrete</p> <p>Saw Cut Both Edges Full Depth</p> <p>Exst. Conc. Pavement</p> <p>Exst. Conc. Driveway</p> <p>5/8" X 1'-0" Tie Bar @ 5'-0" o.c. or 5/8" Expan. Anchor Bolt</p> <p>Variable</p> <p>6"</p> <p>3"</p> <p>Granular Backfill Item 304 or Flowable Controlled Density Fill As Per ODOT Item 613</p> <p>* Unless at Exst. Jt. With A Minimum Of 3' Width</p>	<p>FLOWABLE CONTROLLED DENSITY FILL</p> <hr/> <p>304 GRADATION OR FLOWABLE CONTROLLED DENSITY FILL</p>

PUBLIC WORKS CONSTRUCTION STANDARDS*

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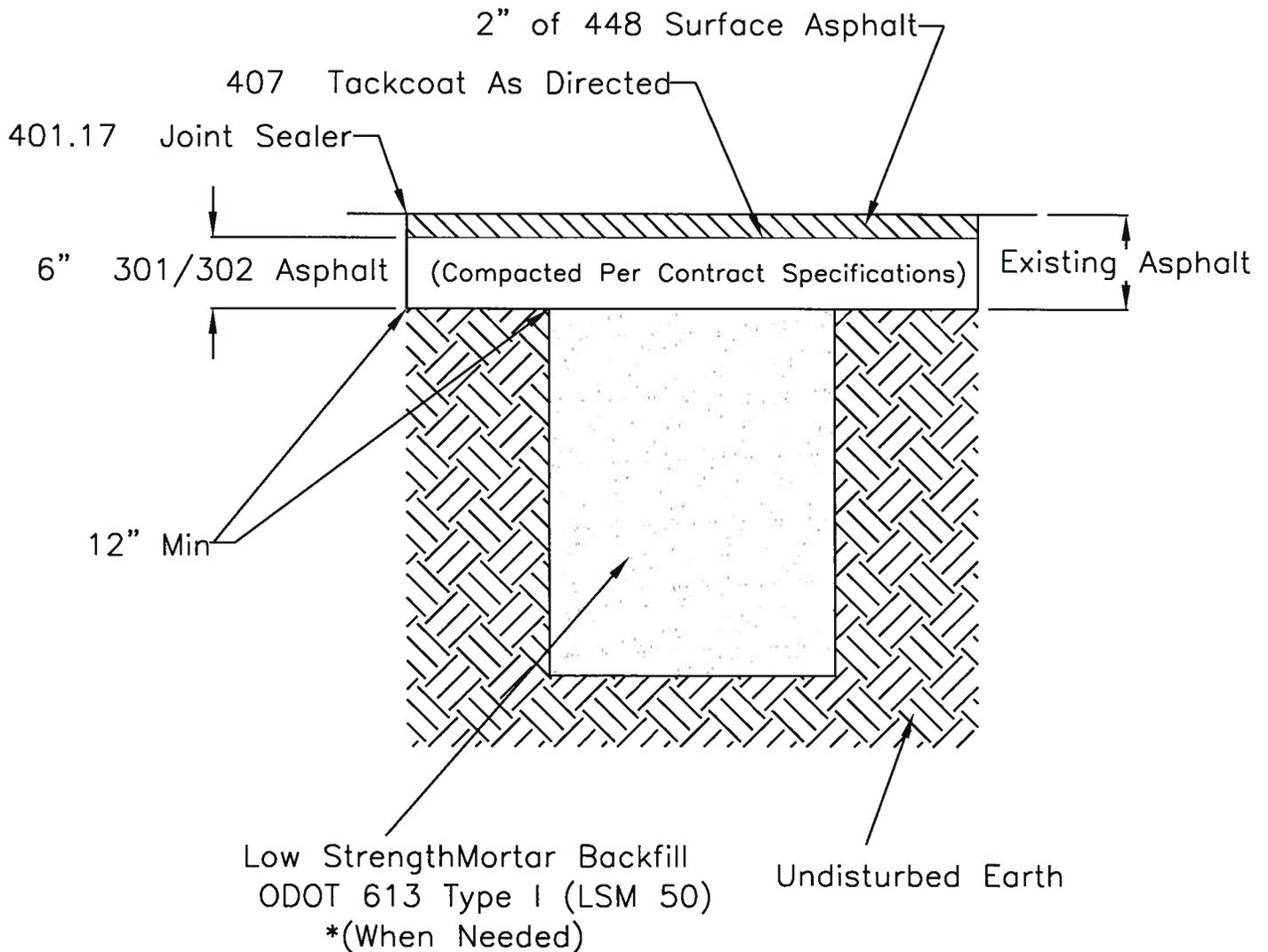
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New Drawing

Type I - 8" Repair

Full Depth Asphalt

Concrete Pavement



PUBLIC WORKS CONSTRUCTION STANDARDS*

*Refer to Section 300 for Complete Specification Details

City of Fairfield
Construction Standards
Fairfield, Ohio



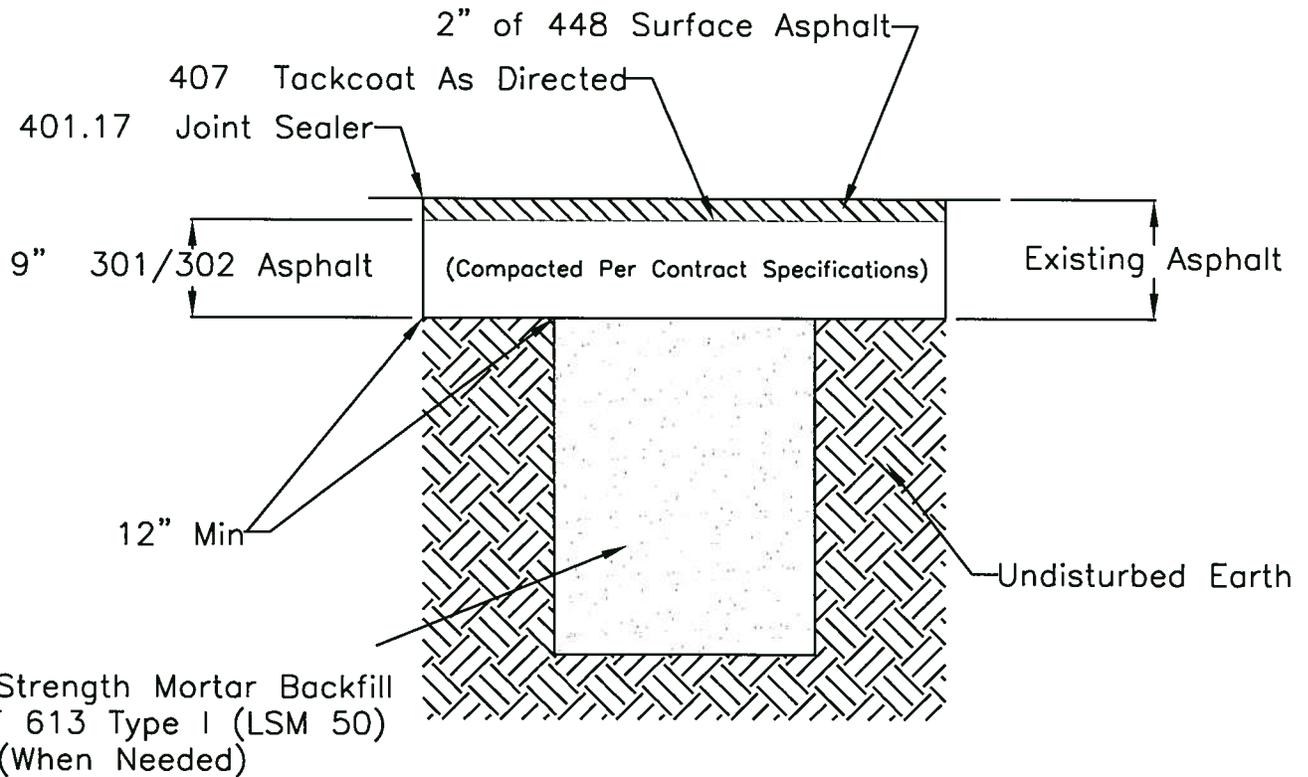
DATE: 01/23/2013 | SCALE: NONE | FILE: PUBLICWORKSDetails.DWG

New Drawing

Type II – 11” Repair

Full Depth Asphalt

Concrete Pavement



SECTION 4

WATER

SECTION 400

WATER SUPPLY

INTRODUCTION

The latest published edition of the following documents shall be the accepted standard for materials and/or procedures for the construction, modification, alteration, or expansion of the City of Fairfield's public water distribution system:

1. *City of Fairfield Design, Construction and Material Specification Handbook.*
2. *City of Fairfield Codified Ordinances.*
3. *Ohio EPA Laws and regulations (OEPA).*
4. *Ohio EPA Backflow Prevention and Cross Connection Control.*
5. *American Water Works Association Standards. (AWWA).*
6. *American National Standards Institute (ANSI).*
7. *National Sanitation Foundation (NSF) Standard 61.*
8. *Recommended Standards for Water Works; "The Great Lakes Upper Mississippi River Board" (G.L.U.M.R.B.) also known as the "Ten State Standards".*
9. *Safe Drinking Water Act (SDWA).*
10. *National Primary Drinking Water Regulation (NPDWR) "lead and copper rule".*
11. *American Public Health Association (APHA).*
12. *Water Pollution Control Federation (WPCF).*
13. *National Fire Protection Association (NFPA).*
14. *Insurance Service Office (ISO).*
15. *Ductile Iron Pipe Research Association (DIPRA)*

If a conflict shall exist between reference sources, the more restrictive requirement shall prevail. The Public Utilities Director shall provide interpretation as requested. All materials used in construction of the water systems components which come in contact with drinking water shall meet the NSF/ANSI 61 Standard.

Plan approval by the City of Fairfield does not imply nor assure approval by the Ohio EPA. Plans are approved subject to the conditions of compliance with all applicable laws, rules, regulations and standards. The proposed project may be constructed only in accordance with the approved plans. There may be no deviation from the approved plans without the written approval of the City. Approval of the plans does not constitute an assurance that the proposed project will operate in compliance with all Ohio laws and regulations. Plans should also note "All work within the right of way within City limits will require a permit from Public Works. Permits can be found at <http://fairfield-city.org/publicworks/rightofway.cfm>.

Plans shall be submitted to the Ohio EPA for approval, as required by the Public Utilities Director. The cost of submitting plans to the Ohio EPA and review by the Ohio EPA, shall be paid for by the developer. Construction shall not begin until such plans are approved by the Ohio EPA, or unless the Public Utilities Director issues a conditional release. Work

that is within a roadway or public right of way will require additional review by the City of Fairfield Public Works Department.

The contractor shall give the City of Fairfield advance notice before making any connection to an existing public water main. The City of Fairfield Water Department shall close the valves on the existing main for work requiring a non-pressure installation. The work shall be performed quickly and continuously until the connection is complete, and the water service can be restored.

Construction Requirements and Materials Specifications

401.00 Determination of Water Use. Water lines must be sized to meet present water consumption and projected average and maximum daily demands, including fire flow hazard. The design engineer shall provide calculations to establish water usage demands. Public water mains should be installed in the public right of way, or upon approval in a public utility easement. Using the water main as a centerline, there shall be a minimum total of fifteen (15) feet; and seven point five (7.5) feet off the center of the water main to include an open area for maintenance.

401.01 Dead Ends. Dead-ends shall be minimized by looping of water mains with multiple feed points. Where dead-ends occur, they shall terminate with a fire hydrant for flushing purposes. Water mains shall not exceed 750 feet without looping unless waived by the Public Utilities Director. Dead end mains shall be avoided if possible, by arranging for mains supplied from both directions.

401.02 Pipe Size. **The minimum size of public water mains shall be eight (8) inches in diameter.** Larger size mains will be required if necessary to allow withdrawal of required fire fighting flows while maintaining minimum pressure. Any change in sizing shall be justified by hydraulic analysis and only upon the approval of the Public Utilities Director.

401.03 Pressure. All water mains, including those not designed to provide fire protection, shall be designed to maintain a minimum pressure of 20 psi at ground level. All water mains shall have a maximum pressure of 200 psi at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 90 psi. Pressure reducing valves (PRV) are required to be installed on the water service when the static pressure is 80 psi or greater.

401.04 Control Valves. At least one control valve shall be installed in each source of water supply, except fire department connections. Where there is more than one source of water supply, a check valve shall be installed in each connection. A control valve shall be installed on each side of each check valve.

401.05 Depth of Cover. ~~The depth of the cover over water pipes shall be determined by the maximum depth of frost penetration.~~ The top of the pipe shall be buried by 4

feet of cover. ~~not less than one (1) foot below the frost line. Usually the frost line in this area is four feet.~~ Depth of covering shall be measured from the top of pipe to finished grade, and due consideration shall always be given to future or final grade, and nature of soil. ~~Fire mains usually require a deeper cover because of the lack of water circulation.~~

401.06 Polyethylene Encasement

Water main piping, fittings and valves shall be encased in polyethylene (PE wrap) as outlined in AWWA C105. On fire hydrant branches, the encasement shall be installed up to and including the flange at the fire hydrant foot valve. Where thrust blocking is required, encasement will be completed before any concrete is placed.

Water Main Pipe Materials

402.00 Ductile Iron Pipe. Only ~~ANSI/AWWA C104~~ Cement-Mortar Lined Ductile Iron Pipe shall be used for the construction of public water mains. All ductile iron pipe shall be designed and manufactured in accordance with ~~ANSI/AWWA C150 and C151.~~ **In no case shall less than Class 53 55 (ductile iron pipe wall thickness) be used.** All pressure pipe shall be clearly marked as to class by the manufacturer.

All buried pipe, fittings and flanged joints shall be wrapped with polyethylene encasement tubing and tape per ~~ANSI/AWWA C105.~~ Complete the “polywrap” prior to the placement of concrete anchors, collars, support or thrust blocks. Repair all polyethylene material damaged during construction.

Under no conditions shall pipeline deflection measured between joints exceed manufacturers published recommended standard for that type of pipe. The maximum deflection at push-on joints and/or mechanical joints shall be 5 degrees. If deflections of 5 degrees are closer together than the standard length of pipe (approximately 18 feet), concrete blocking shall be installed in accordance with the plans, or as directed by the Public Utilities Director. *See AWWA C600, Standard for the Installation of Ductile-Iron Water Mains, and Their Appurtenances. Pipe repairs shall conform to AWWA C104 guidelines.*

402.01 Pipe Joint. All pipe joints shall ~~be mechanical and~~ conform to AWWA C111/A21.11. Gasket material shall be standard styrene butadiene copolymer (SBR) per this standard. Bolts shall be high-strength, and corrosion resistant alloy conforming to AWWA C111.

402.02 Fittings. Ductile Iron, mechanical joint fittings, three (3) inch through twenty-four (24) inch shall conform to ANSI for ductile iron compact fittings, and AWWA C153/~~A21.53.~~ All fittings shall be supplied with ductile iron glands as per ASTM A536 and all required connecting bolts, nuts, glands, gaskets and accessories. Fittings are defined as those items, which are installed in a pipeline to

change direction and include all bends, tees, crosses, and wyes necessary to provide a smooth transition from one direction to another.

- 402.03 Tapping Sleeves and Tapping Valves.** Tapping sleeves shall be used for water services larger than two (2) inch in diameter. All tapping sleeves shall be either ductile iron body, mechanical joint, or 304 Stainless steel body, full circumferential seal with a ductile iron flange. Ductile iron body tapping sleeves shall be: American-Darling 1004 tapping sleeve; Clow F-5205 tapping sleeve; Kennedy tapping sleeve; or Mueller H-615 tapping sleeve. Stainless steel body tapping sleeves shall be: Ford "Fast"; Romac "SST"; or Mueller H-304 with ductile iron flange. All tapping valves shall conform to AWWA C509 and C515. Valves shall have a 2" square operating nut for key operation and "O" ring type stem seals. All valves shall open counterclockwise, and be of the non-rising stem type. The valve sealing mechanism shall be a wedge design of ductile iron completely encapsulated with a molded resilient covering permanently bonded to the iron wedge to meet ASTM D429 testing. Tapping sleeve and valve shall be tested per manufacturer's recommendations.
- 402.04 Tapping Saddle.** A tapping saddle shall be used on a water service sizes of one and half (1 ½) to two (2) inches in diameter. Tapping saddles shall be iron, bronze, brass, or stainless steel. They shall be band-type, or double strap type, with International Pipe Standard (IPS) tapping or AWWA tapered thread inlet.
- 402.05 Water Main Valve Boxes.** All buried valves shall be provided with 'Buffalo' type cast iron valve boxes. Valve boxes have a screw type extension sleeve and also designed for the size of valve on which it is to be used, and with the required depth of cover. Valve boxes shall be cast iron, furnished in two or three section styles, with cover and with a base corresponding to the size of the valve. There shall be an insulating centering device between the valve box and valve. Heavy-duty type shall be used then located within existing or proposed pavement, driveway or traffic areas. The water box shall be coated with an asphaltic coating by the manufacturer. The cover shall have the word "WATER" cast in it.
- 402.06 Gate Valves.** Valves of a size twelve (12) inches or smaller shall be AWWA C509 (resilient seated) for water supply service. Gate valves shall be of the iron body fusion bonded epoxy, bronze mounted type and shall have non-rising bronze stems. Gate valves shall open by opening to the left (counter-clockwise) and shall be fitted with a two- inch (2") square operating nut. All gland bolts and nuts for iron body valves shall be stainless steel bronze and fitted with brass nuts. Mechanical joint end connections shall conform to AWWA C111/A21.11. Adjust and test valve prior to backfill. Valve shall be certified to ANSI/NSF 61 Drinking Water System Components-Health Effects.
- 402.07 Butterfly Valves.** Valves of a size greater than (12) inches shall be a mechanical joint butterfly type. All butterfly valves shall conform to AWWA C504 standards. All valves shall be set in vertical position, and the box cover shall be flush with the grade of the ground or street surface. Whenever valve boxes fall outside of the roadway pavement, the top of the box shall be set in a concrete slab 24"x 24"x 6"

thick with the top of the slab and box flush with the top of the ground. Adjust and test valve prior to backfill. Valve shall be certified to ANSI/NSF 61 Drinking Water System Components-Health Effects.

- 402.08 Location Frequency.** Sufficient valves shall be provided on water mains so inconvenience and public health hazards are minimized during repairs. Valves shall be located no less frequently than one per block, or at 800 foot intervals. Valve clusters are required at street intersections **and in every direction from a tee or cross fitting.** The number of required valves and their location shall be approved by the Public Utilities Director.

Fire Hydrants

- 403.00 Fire Hydrants.** Fire hydrants shall conform to the “AWWA Standard for Dry-Barrel Fire Hydrants” **ANSI/AWWA C502 and subsequent revisions.** Fire hydrants shall be connected only to water mains adequately sized to carry fire flows. The minimum size for a public fire main shall not be less than eight (8) inch. All fire hydrants and auxiliary valves shall be positively locked to the water main by restrained mechanical joints. The thread sizing on the **2-1/2” hydrant ears barrel shall be 3.187x7, and 5.718x4.** **All hydrants shall conform to a “Harrington HPHA” type specification for 5” which has a built in permanent adapter and Storz cap, or approved equal.** Hydrants shall have a dual rating of AWWA and FM-1510 approval.

~~See City of Fairfield Standard Construction Drawing for Water Dept~~ **See City of Fairfield Water Division standard drawing for fire hydrants.**

All required fire department connections (**STORZ**) or hose couplings shall be placed within one hundred (100) feet of an accessible fire hydrant.

Hydrants shall be permanently marked with the following information, which should be cast into the barrel.

- Manufacturer’s name or trademark.
- Model or type designation.
- Maximum rated working pressure.
- Size of main valve opening.
- Year of manufacture.
- FM Approval mark.
- The hydrant top shall the word “OPEN” and an arrow, showing the counterclockwise direction for opening.
- The hydrant shall be a minimum rated working pressure of ~~175~~ **250** psi.

All hydrants shall stand plumb and shall have their nozzles parallel with, or at right angles to the curb, with the pumper nozzle facing the curb. The horizontal centerline of the large outlet port shall be a minimum of eighteen (18) inches and a maximum of thirty (30) inches above the final grade. In all cases the manufacturers recommended relative elevation of the break flange to the final

grade shall be maintained. The barrel shall have a breakable safety section and/or bolts just above the ground line. Hydrants shall have a main valve opening of 5 ¼ inches; a 6 inch mechanical joint inlet to be suitable for setting in a trench 4 feet deep. Each hydrant must be equipped with an auxiliary valve with valve box. The valve shall be a compression type, opening against the pressure so the main valve remains closed if the barrel is broken off. The hydrant shall provide automatic drainage when the valve is closed. Hydrants shall be effectively blocked by the placement of concrete thrust-blocking, or approved mechanical anchor. All underground water service pipe systems shall be thoroughly flushed before connection to any fire suppression system; *Refer to the "Disinfection of Water Mains" section 410.00.*

403.01 Color of Hydrants. Fire hydrants shall be ~~paint~~ **coated** by the manufacturer as per the City of Fairfield requirements with an industrial ~~enamel~~ **epoxy** exterior grade paint. Public fire hydrants shall be painted OSHA safety yellow. Private fire hydrants shall be painted OSHA safety red.

403.02 Spacing. ~~Fire Hydrants shall be spaced or located as follows:~~

- ~~• Fire Hydrants shall be spaced not more than three hundred (300) feet, if the required fire flow is higher than 2,000 gpm.~~
- ~~• Fire Hydrants shall be spaced at four hundred (400) feet, if the required fire flow is less than 2,000 gpm.~~
- ~~• Public and Private fire hydrants shall also be spaced by the determination of proper accessibility, maximum hose length requirements, and travel distances of the fire apparatus. Travel distance is defined as the route taken by fire apparatus on any surface to which it can support the weight of a fire apparatus not to be less than 75,000 lbs.~~
- Spacing of fire hydrants shall be 400' in public right of ways.
- In residential zoned areas, hydrants must be within 800' travel distance to a building with a flow rate of at least 1000 gpm.
- In commercial and industrial zoned areas, hydrants must be within 400' of travel distance to all areas of the building with a flow rate of at least 1000 gpm. If the building is equipped throughout with an approved sprinkler system, the distance may be increased to 600'.
- The number of hydrants to be provided shall be based on the required fire flow which also will be based on building construction and occupancy use.
- All dead end water mains shall have a hydrant. If the potential is there for an extension on the dead end water main, a main line T valve and auxiliary valve shall be installed.
- All the above mentioned requirements under hydrant spacing are subject to change by the authority having jurisdiction.

403.03 Location. Fire Hydrants shall be located to provide complete accessibility, and minimize the possibility of damage from vehicles or injury to pedestrians. When placed behind a curb, the hydrant barrel shall be set so that the pumper, or hose nozzle cap will be a maximum of five (5) feet from the curb area. All fire hydrants shall be installed not closer than two (2) feet from the curb, street,

driveway, or other traffic edge. No portion of the hydrant or nozzle cap shall cause an obstruction to a sidewalk, or pedestrian traffic.

Fire Services

- 403.04 Fire Protection.** When a structure requires a dedicated Fire Line and is more than 300 feet from the public water main, a fire line meter vault is required.

The Standard grading schedule of the American Insurance Association, the National Fire Protection Association Standards, and the ISO “*Guide for Determination of Needed Fire Flow*” should be followed in all cases for purposes of fire protection. Water mains that are not intended to carry fire flows, shall not be connected to fire hydrants.

Hydrants shall be provided in sufficient number and be located in a manner that will enable the needed fire flow to be delivered through hose lines to all exterior sides of any important structure. Hydrants shall conform to NFPA 24, or as directed by the City of Fairfield Fire Department. ~~See City of Fairfield Drawing for Water Division Construction Standards.~~ **See City of Fairfield Water Division standard drawing for fire hydrants.**

All required fire department connections (STORZ) or hose couplings shall be placed within one hundred (100) feet of an accessible fire hydrant.

- 403.05 Fire Line Meter Pit.** The meter pit shall be built of Class “C” concrete for the accommodation of a double check detector assembly, and shall conform to AWWA C510-92. All pipe and fittings shall be Ductile Iron class ~~53~~ 55 and conform to AWWA C151 and C110. The pit shall have a sump drain or floor drain. The access door to meter pit shall be a Bilco Aluminum double hatch door # JD-3AL-H2O. ~~See City of Fairfield Drawing for Water Division Construction Standards.~~ **See City of Fairfield Water Division standard drawing for fire line meter pit.**

When it’s determined a vault is not needed, two valves shall be installed at locations in front of the right of way and behind the right of way. This is for the purpose of public/private separation.

- 403.06 Detector Check.** When it is necessary for any customer to have full line flow for fire protection purposes, there shall be installed in the line a device known as a “Detector Check Valve” with a metered by-pass. The metered by-pass shall be of sufficient size to carry normal usage without activating the detector check valve. The detector check valve shall be as manufactured by the Kennedy Valve Company or approved equal. A full flow meter may be used as approved by the Director of Public Works or his/her designee. ~~See City of Fairfield Drawing for Water Division Construction Standards.~~ **See City of Fairfield Water Division standard drawing for detector check.**

- 403.07 Post Indicator Valve.** Connections to Public water systems shall be controlled by post indicator valves of an approved type, and located not less than forty (40) feet from the protected building. The post indicator valves shall be placed where they will be readily accessible in case of fire, and liable to injury. Post indicator valves shall be set so that the top of the post will be thirty- six (36) inches above the final grade. Post indicator valve shall properly protected against mechanical damage. Post indicator valves shall conform to NFPA 24. ~~See City of Fairfield Drawing for Water Division Construction Standards.~~ **See City of Fairfield Water Division standard drawing for post indicator valve.**
- 403.08 Valve Pits.** Valve pits shall be of adequate size, and readily accessible for inspection, operation, testing, maintenance, and removal of equipment contained therein. They shall be constructed and arranged to properly protect the installed equipment from movement of earth, freezing, and accumulation of water. The pit shall be poured in place, or pre-cast reinforced concrete. Valve pits shall conform to NFPA 24.
- 403.09 Operating Test.** Each hydrant and control valves shall be fully opened and closed under system water pressure, and dry barrel hydrants checked for proper drainage. Where fire pumps are available, this shall be done with the pumps running. **See AWWA Manual 17, Installation, Maintenance, and Field Testing of Fire Hydrants.**

Water Service Connections

- 404.00 Cross Connections.** There shall be no connection between the water distribution system and any pipes, pumps, hydrants or tanks where there is a chance that contaminated water or other material may be discharged or drawn into the public water system. **See AWWA manual 14, Backflow Prevention and Cross Connection Control and Section 405 of this manual.**
- 404.01 Dead Ends.** All dead ends on new mains shall be terminated with a valve and fire hydrant to facilitate flushing and the future extension thereof **as per Section 403.02.** ~~At the discretion of the Public Utility Director or his/her designee, As-Built or GPS location verification may be required.~~
- 404.02 Water Services.** The Contractor shall provide each lot with an individual water service. The Contractor shall install the corporation stop, service line, **meter setting and meter pit**~~or~~ curb stop and curb box in a suitable manner from the city water main to the curb box **or meter pit.** The elevation of the curb box shall be established so that it is no less than four (4) feet below the finished grade. The elevation of the curb box shall be no more than five and one half (5 ½) feet of maximum depth. The service shall be set at the middle of the lot. The location of curb boxes for properties on cul-de-sac roadways shall be determined by the Director of Utilities **and/or his/her designee.** Looping through water services, or multiple metering systems to permit water to pass between public water mains is not permitted. All underground water service pipe systems shall be thoroughly

flushed before a connection to any fire suppression system. The location of each curb stop shall be clearly marked with a “W” imprinted in the concrete curb, near the top before the concrete hardens. All installation work for the water service shall be performed prior to the construction of new sidewalk and the street roadway. ~~See City of Fairfield Standard Construction Drawing.~~ **See City of Fairfield Water Division standard drawing for water service installation.**

404.03 Copper Service. All water service lines ¾”, 1”, 1 ½ “, and 2” shall be flexible Type “K” copper pipe. The minimum water service size shall be a three fourths (¾”) inch diameter size. The service shall be installed from the water main into each lot. Fittings for copper service branches shall be high quality copper brass with AWWA C800 Dimensions **and meeting AWWA Standards.**

404.04 Corporation Stop. (Water Tap) Corporation stops for use with saddles shall be bronze alloy with IPS inlet thread of AWWA tapered thread, and outlet thread compatible with connecting pipe, without special adapters. Corporation stops for direct tapping shall be bronze alloy with AWWA tapered inlet thread, and with outlet thread compatible with connection pipe, without special adapters. All corporation stops one (1”, 1 ½”, or 2”) in size, shall be Ford FB-1000 ball type **or equal.** The corporation stop shall be installed at either the two (2) o’clock or ten (10) o’clock position on the pipe. ~~The developer shall install the corporation stop while it is under pressure; i.e. a pressure tap.~~

404.05 Curb Stop. Service stops shall be bronze with coupling threads conforming to AWWA C800. The stop must be designed that water pressure from the inlet side of the body shall provide additional sealing action. The stop must open counter-clockwise. All curb stops (1”, 1 ½ “, or 2”) shall be Ford B44-444 ball valve type **or equal.** Service boxes shall be of a “Buffalo” type cast iron Covers shall have the word “WATER” cast in raised letters and shall be securely fastened by a bronze or brass bolt. The Contractor shall insure that the curb stop is free of mud and debris, and be operational at all times. Curb stop boxes shall installed and maintained vertically so that the access to the stop-key is unobstructed. The curb stop and box shall be installed between the curb and the sidewalk for each lot. Each curb box shall be marked with a wooden stake painted blue, and inserted eighteen (18) inches into the ground next to the curb box. The blue stake shall be thirty six (36) inches above the ground level. The location of each curb stop shall be clearly marked with a “W” imprinted in the concrete curb, near the top before the concrete hardens. ~~See City of Fairfield Standard Drawing for Water Division Construction Standards.~~ **See City of Fairfield Water Division standard drawing for utility service designation.**

Meter Sets

404.06 Classification of Meter Sets. Meter sets are classified by location into two categories: Indoor meter sets and outdoor meter sets. Indoor meter sets shall only be used when outdoor meter sets cannot be used. Meter sets are further classified by the use as follows: Domestic water meters and sprinkling meters.

404.07 General Requirements for Meter Sets.

- (a) All meters shall be set in an approved non-hazardous place and accessibility shall be maintained at all times.
- (b) The size of the meter shall be the same size as the water service, except a smaller sized meter may be installed based upon pressure available, the length of the service line and/or where it can be shown the water demand is less than the rated capacity of the meter.
- (c) Meters shall be installed on water service lines as soon as practical after installation of the line but in every case after the final inspection required by the building code having jurisdiction. All meters shall be installed between the sidewalk and curb except as otherwise provided in the following sections.

404.08 Indoor Meter Sets. All indoor meter sets shall be installed by a private contractor and shall conform to the following requirements and must be approved by the Public Utilities Department before installation can begin.

- (a) Meters shall not be set higher than four (4) feet to center of connection above the floor.
- (b) Meters shall not be concealed and obstructed by cabinets, benches or other built-in fixtures.
- (c) Indoor meters sets shall be made as near as possible to the point where the service line enters the building.

Remote meter touchpads or radio read equipment shall be installed by authorized employees of the Public Utilities Department only. The Public Utilities Department shall not be responsible for defacement or damage to property caused by necessary holes, fastenings or other work required for proper installation.

The Public Utilities Department will maintain remote reading devices under the same provisions as meters.

A charge for repairs to any remote reading device or connections thereto, necessitated by damage or neglect by the consumer or owner shall be made in addition to any other charge provided.

Clear access to the meter set shall be maintained at all times.

- (g) Meter set shall be made in such a locality that reading and changing of meter shall in no way interfere with the customer's normal course of business.
- (h) Water meters shall be installed in a horizontal position as close as possible to the main stop. Where an approved basement is not or will not be available and the

building or structure to be served is of a type of construction defined as approved, the water meter shall be placed within the building or structure in an accessible location in the utility room and if no utility room is available, the meter shall be placed in an accessible location in the kitchen or other location as approved by the Public Utilities Department. The water meter shall always be located to provide protection from mechanical injury.

(i) Meter Space. Accessible meter space shall be installed for all water services. Meters shall be so installed so as to be level. All meters shall be located as near as practicable to the point of entrance and in a position giving ample protection against freezing and other external damage. Water meters shall not be installed in sheds, garages, storage buildings, etc. that are not of standard construction or not properly heated.

404.09 Outdoor Meter Sets. All outdoor meter sets shall be installed by a private contractor and shall conform to the following requirements:

(a) Meter sets shall be placed between the curb and sidewalk, when possible, at such location as to prevent an accumulation of water within the tile.

(b) Meter sets shall require curb stops on public property in front of the property to be serviced.

(c) Meters shall be set in a tile or pit and in the arrangement as show in the Standard Drawing Section of this manual.

See City of Fairfield Water Division standard drawing for water meter pit.

(d) Outdoor meters must be in a location accessible to Public Utilities Department vehicles

(e) Meter pits and meters shall be owned and maintained by the Public Utilities Department.

404.10 Meters. It is the contractor's responsibility to properly size the water service and metering system. Meters shall be sized to handle peak flows at 90% of rated capacity. Water meters shall be approved by the Public Utilities Director for the appropriate type of service. The applicant shall provide expected flow ranges for low, average and peak flows, and type of metering system. Water meters shall be purchased from the City of Fairfield Public Utilities Department. Meters shall be installed in a clean pipeline, free from foreign materials. The meter shall be installed horizontally, with the register facing upward; with the direction of flow as indicated by the arrow cast in the meter case; protected from freezing, damage, and tampering.

Meters remain under the sole control and ownership of the Public Utilities Department and shall not be removed or tampered with by unauthorized persons. Unserviceable or defective meters will be replaced by the Public Utilities Department. Maintenance of the meter is the responsibility of the Public Utilities

Department; however, if a customer wishes his meter tested for accuracy, the City will comply after the payment of a fee by the customer for the service in accordance with the schedule in section 921.05 of the City of Fairfield Codified Ordinance book, Inspection of Meters.

404.11 Servicing of Meters. The maintenance of meters shall occur during normal working hours of the Public Utilities Department. In the event that this procedure inconveniences a customer, he may request that his meter be changed after normal working hours; however, he will be required to bear the cost of this service.

404.12 Charges for Change of Meters Whenever it is requested by the customer to change an existing meter for one of a different size, the authorization for such action shall be given in writing to the Public Utilities Department. The costs for changing meters shall be borne by the customer making the request. The customer will be required to pay the difference in the increased meter size as per the effective schedule of fees. No refund fees will be given for a reduction in meter size.

404.13 Protection of Meters. The property owner will be held responsible for the meter in his custody and shall pay all costs of damage from any cause over which he has control such as freezing or hot water and vandalism. If the meter is stolen or lost, the replacement cost shall be paid by the owner. Unauthorized entry into a meter pit will result in a penalty being assessed against the owner for testing of the meter to assure its proper operation.

404.14 Meters Required. All water service branches shall be metered.

404.15 Number of Meters. The supply of water from the service connection may be measured by one or more meters. When more than one meter is used, they shall be set in an area not under the control of any tenant and accessible to the Public Utilities Department at all times. The minimum charge for each meter shall be based on the size of each meter, except that in all cases, the meter or meters must satisfy the minimum requirements for service branches and meters, as provided for by these regulations and each separate service shall be subject to the same rules and regulations as a service where one branch serves a single meter. Normally, a separate service line is required for each metered service; however, at the owner's option, one service line may be installed to serve more than one metered service provided: Service lines are divided near the property line and individual curb stop valves are installed, and proper sizing is made of the service lines, and property served cannot logically be divided for sale.

Only one meter is required for each building or development complex. However, at the owner's option, a meter may be installed for each dwelling unit.

Proper provision shall be made to permit the City to discontinue service either by:
(i) Installation of separate curb stop valves in public right-of-way or easements and separate lines from the curb stop to the meter,
or

(ii) One valve and one line to the meter room and installation of lockout valves on the individual meters; and the right to enter upon private property by the Public Utilities Department to the location of the meters and lockouts. Denial of the right of entrance will result in the turn-off of water at the water main.

It is expected that the situation detailed in (ii) above will be for multiple living units where one service is run into the meter room and each individual service is taken from a manifold. For multiple units served from one service line, a master meter is/may be required.

Meter readings shall be used to calculate charges, but the Public Utilities Department shall be authorized to use other means when it is apparent that a meter has not been operating properly, if it has been removed or cannot otherwise be read.

Meters set inside a building in a manifold shall be set in accordance with Public Utilities Department Standards.

All water meters placed in manifold shall have the inlet valve equipped with padlock wings.

Meters may not be placed in manifold unless the total of such meters satisfies the minimum requirements determined by the size of the service branch being utilized.

All rules which apply to the billing and collecting for individual service shall apply to every meter in manifold.

A meter set in manifold shall be considered an active account until the inlet valve is locked in the off position and the account is placed in hold status.

~~404.06 **Water Meter Pits.** Water Metering Pits shall only be used when metering devices cannot be installed inside a structure. It is the contractor's responsibility to properly size the water service and metering system. Meters shall be sized to handle peak flows at 90% of rated capacity. Water meters shall be approved by the Public Utilities Director for the appropriate type of service. The applicant shall provide expected flow ranges for low, average and peak flows, and type of metering system. Water meter pits requiring concrete construction shall be constructed per the City of Fairfield Standard Drawing. Lids shall be double duty and fit tightly. All fittings inside of a pit with a three (3) inch or larger service, shall be flanged.~~

~~404.07 **Water Meters.** Water meters shall be purchased from the City of Fairfield Water Utility Department. Meters shall be installed in a clean pipeline, free from foreign materials. The meter shall be installed horizontally, with the register facing upward; with the direction of flow as indicated by the arrow cast in the meter case; protected from freezing, damage, and tampering. An underground meter~~

~~shall be set at minimum of four (4) feet bellow grade. The meter setting yoke shall permit the meter to be readily installed without disturbing piping. There shall be a coupling between the water meter and the downstream valve. Water metering devices on branch service lines, which provide fire protection, shall comply with the AWWA standards, and be UL approved for the measuring device as applied to that service. All leak detection meters on detector checks, shall be a meter purchased from the City of Fairfield. Meters shall certified as to suitable for contact with drinking water by an accredited organization in accordance with ANSI/NSF Standard 61, Drinking Water System Components Health Effects.~~

~~**404.08 Remote Reading.** All meters shall be equipped and installed with a remote reading system, to enable obtaining register readings without directly accessing the meters location. The system shall be suitable for indoor and outdoor use, and shall be factory sealed to prevent tampering.~~

Separation of Water Mains and Sewers

405.00 Separation of Water Mains and Sewers. *In all cases, the most recent revision of Recommended Standards for Water Works and Recommended Standards for Wastewater Facilities shall be followed.* The following factors should be considered in providing adequate separation between water mains and sewers:

- Materials and joint placement for water and sewer pipe.
- Soil conditions.
- Service and branch connections into the water main and sewer pipe.
- Compensating variations in horizontal and vertical separation between water main and sewer pipe.
- Space for repair and alterations between water mains and sewer pipe.
- Off-setting of pipes around manholes and other obstructions.
- No water pipe shall pass through or come into contact with any part of a sewer, or sewer manhole.

405.01 Parallel Installation of Water and Sewer Lines. Under normal conditions, water mains shall be laid at least ten (10) feet horizontally from any sanitary sewer, storm sewer, or sewer manhole. The distance shall be measured from edge of pipe to edge of pipe. When conditions prevent a horizontal separation of ten (10) feet, a water main may be laid closer to a storm or sanitary sewer provided that the bottom of the water main is at least eighteen (18) inches above the top of the sewers. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials with joints that equivalent to water main standard of construction. In addition, they shall be pressure tested to assure water tightness prior to backfilling.

405.02 Crossing of Water and Sewer Lines. Under normal conditions, water mains shall not cross lateral sewers, or sanitary sewers. Water mains shall be laid to provide a vertical separation of at least eighteen (18) inches between the bottom of the water main and the top of the sewer. When conditions prevent a vertical

separation of eighteen (18) inches, sewers shall be constructed of materials with joints that equivalent to water main standards of construction, and shall be pressure tested to assure water tightness before backfilling.

All water mains passing under a sewer shall have the following additional protection:

- A vertical separation of at least eighteen (18) inches between the bottom of the sewer and top of the water main.
- Adequate structural support for sewers to prevent excessive deflection of joints and seepage.
- The length of the water pipe centered at the point of crossing, so water main joints shall be equidistant from the sewer, and as far away as possible from the sewer.
- No water pipe shall pass through, or come in contact with any part of the sewer manhole.

Protection and Interruption

406.00 Protection of Existing Underground Utilities. The accuracy of location of existing underground utilities as shown on plans is not guaranteed. It shall be the duty of the Contractor to locate these utilities in advance of excavation, and to protect same from damage after uncovering. The Contractor shall contact the owners of the utilities for assistance in locating these service lines. **If necessary, the Contractor shall call the Ohio Utilities Protection Service (8-1-1 or 1-800-362-2764) at least 48 hours in advance of digging.** Any expense incurred by reason of damaged or broken lines shall be the responsibility of the Contractor.

406.01 Service interruptions. It is the responsibility of the Contractor to notify the ~~City Water~~ **Public Utilities** Department in advance, when it becomes necessary for the purpose of making connections, or to shut off, or to turn on the water in existing mains. **Such work shall be performed during normal City business hours not excluding City observed holidays. These holidays can be found on the City of Fairfield's website.** The Contractor shall notify the City Water **Division** ~~Department~~ as to when, and for how long the water service will be interrupted. No valve or other control on the existing system, shall be operated for any purpose by the Contractor. The City of Fairfield will operate all valves, hydrants, blow-offs, and curb-stops.

Excavation

407.00 Trenching and Excavation. No trenching or laying of pipe, or fittings shall be done until grade stakes have been set. The Contractor shall use digging equipment that produces an even ~~bedding and trench~~ foundation. **The trench shall conform to the *Typical Trench Detail* found in the *Standard Drawing* section of this handbook.** ~~on which the pipe and fittings shall be installed. The bottom of the~~

~~trench shall be level and free from lumps, holes excessive loose dirt and large stones. If in rock, the bottom of the trench base shall be undercut six (6) inches, and then back filled with sand. The bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of pipe. Support of pipe shall be given at every point along it's entire length, except to excavate for bell holes and joints. Allowing the pipe to be bridged by the bell is unacceptable. The trench shall be excavated to the depth required to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground at every point between bell holes. All water lines shall a minimum cover of forty-eight (48) inches. The open trench ahead of pipe-laying shall be kept to a minimum, and shall not be in excess of twenty- five (25) feet at the end of the working day, or at the ceasing of work.~~

Open cut trenches shall be sheeted and braced as required by governing state laws, and municipal ordinances, and as may be necessary to protect life, property, the work, or as ordered by the project engineer, or inspector. To protect persons from injury, and to avoid property damage, adequate barricades, construction signs, torches, red lanterns, and guards shall be placed and maintained during the progress of the construction work until it is safe.

The width of the trench shall be ample to permit the pipe to be laid and joined properly, and the back to be placed and compacted as specified. Trenches shall be of such extra width, when required, to permit the convenient placing of timber supports, sheeting, bracing and handling of specials.

Whenever wet or unstable soil is incapable of properly supporting the pipe in the trench bottom; such soil shall be removed to the depth and length as determined by the engineer or project inspector. The trench shall be back filled to grade with a controlled, or non-shrinkable type of back fill as determined by the City of Fairfield.

All grading in the vicinity of a trench excavation shall be controlled to prevent surface water from flowing into the trench. Any water accumulating in the trench shall be removed by pumping or other approved method. Material excavated from the trench shall be stacked in an orderly manner at a safe, sufficient distance away from the trench edge. ~~Materials unsuitable for backfilling shall be wasted by the project inspector.~~ **The project inspector will have the contractor remove materials unsuitable for backfilling.** The Contractor will keep the City informed a reasonable time in advance of the location and time that the Contractor intends to work. Any unauthorized excavation below grade shall be back filled at the Contractors expense with good, well- ~~tamped~~ **compacted** material.

All trenching, grade and cover work shall conform to the lines and grades given by the engineer. Work shall be done according to the drawings and specifications; subject to such modifications as the City of Fairfield may determine necessary during the project period. ~~See City of Fairfield Drawing for Water Division Construction Standards.~~ **See City of Fairfield Water Division standard drawing for typical trench detail.**

- 407.01 Allowable Removal of Pavement.** No trenching or tunneling shall be permitted in a public roadway, or right of way, unless authorized by permit and review by the Public Works Department. The Contractor shall use such methods; either drilling, chipping, or sawing to assure the breaking of pavement along straight lines. The face of the remaining pavement shall be approximately vertical. If the Contractor removes or damages pavement or surfaces beyond the limits specified, such pavement and surfaces shall be repaired or replaced at the Contractors expense. The Public Works Department must be notified and an inspector present for any pavement restoration to be acceptable.
- 407.02 Tunneling.** Tunneling, or boring when necessary, shall be done under the supervision of the engineer or project inspector. No tunneling shall be permitted in a public roadway or right of way, unless authorized by permit and review by the Public Works Department. **See City of Fairfield standard drawing for Water Division Construction Standards.**
- 407.03 Protection of the Public.** During the period that any work is being performed within the public right of way, or that an open trench or pit exists within the limits of said right of way, the Contractor shall furnish and utilize such signs, lights, barricades, and safety devices in order to properly guide and protect the public. The Contractor shall conduct his work to not interfere with public travel. Whenever it is necessary to cross or interfere with railroads, intersecting streets, driveways, public or private, crosswalks, or approaches to any buildings, the Contractor shall provide and maintain a safe bridge or crossing for public travel. The Contractor shall promptly remove any temporary structures when requested by the city. The Contractor shall post, where directed by the engineer, suitable signs indicating that the street is closed, and necessary detour signs for the proper maintenance of traffic **compliant with the most recent version of the Ohio Manual and Uniform Traffic Control Devices.**

Installation

- 408.00 Installation.** Pipe and fittings shall be handled in such a manor as to insure delivery to the work in a sound, undamaged condition. All pipe shall be inspected for defects before installation. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to water main materials, protective coatings, and linings. Under no circumstances shall the water main materials be dropped, or dumped into the trench.

All pipe or fittings shall be carefully examined for cracks, and other defects while suspended above the trench immediately before installation into final position. Defective pipe or fittings shall be laid aside for inspection by the engineer, or inspector who will prescribe corrective repairs or rejection.

The pipe and fittings shall be thoroughly cleaned by swabbing before being lowered into the trench, and shall be kept clean until the joints are completed. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. All open ends are to be closed to with caps or plugs at all times, unless pipe is actually being laid. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by watertight plug or other means approved by the engineer, or inspector. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

Deflections from a straight line or grade, as required by vertical or horizontal curves, shall not exceed manufacturers recommendations and approval by the engineer or project inspector. Valve boxes shall have the interiors cleaned of all foreign matter before installation.

Mechanical joints shall be installed under the provisions of the recommendations of the joint manufacturer. Fittings at bends or dead-ends shall be firmly blocked against the vertical face of the trench to prevent fittings from being blown off the lines when under full pressure. Thrust blocking shall conform to City of Fairfield specifications. Where pipe ends are left for future connections, they shall be valved, plugged, or capped as shown on the plans. Where connections are made, between any new work and existing mains, the connections shall be made by using the fittings as required by the City of Fairfield.

- 408.01 Thrust Blocking. When required on existing mains, a** All bends over five (5) degrees, shall be securely blocked against movement with concrete blocking placed against undisturbed earth in accordance with AWWA C600. All concrete shall be Class "C" type. ~~All deflections over five (5) degrees closer than the standard length of pipe (approximately 18 feet) shall be thrust blocked. Water mains at all pipe intersections and changes of direction shall be thrust blocked. See City of Fairfield Drawing for Water Division for Construction Standards. See City of Fairfield Water Division standard drawing for thrust block detail.~~

Concrete thrust blocking shall be placed at least two days in advance of testing mains. All caps or plugs used in mains to undergo hydrostatic testing, shall be properly installed and thrust blocked in advance. All securing and blocking of caps shall be inspected by the City Water Department, or project inspector.

- 408.02 Restraining Joint Systems.** New water main installation must be restrained by restraining joint systems, or locking gaskets provided that sufficient length is available. Restraining joint systems are acceptable when designed in accordance with "Thrust Restraint Design for Ductile Iron Pipe" and shall meet ASTM A536-80. ~~See City of Fairfield Drawing for Water Division Construction Standards. See City of Fairfield Water Division standard drawing for restraining joint detail.~~

- 408.03 Pipe Cutting.** Cutting the pipe shall be kept to a minimum, and shall be done in a neat and workmanlike manner without damage to the pipe. Cutting shall be done by means of an approved mechanical cutter. Wheel type cutters shall be used when practical.
- 408.04 Connection to City Mains.** Newly installed piping shall not be connected to existing City mains until acceptance of pressure and leakage tests **or in special circumstances as approved by the Public Utilities Director and/or his/her designee.** Test plugs, corporations, connecting sleeves, and temporary piping to a water source, shall be furnished by the Contractor.

Backfilling

- 409.00 Backfilling of Trenches.** ~~Materials for tamped backfill and the method of placement shall be specified per AWWA C600 Type 3 pipe bedding. The trenches shall then be carefully backfilled up to twelve (12) inches above the top of the pipe with sand and earth, in layers of not more than six (6) inches thick and carefully tamped to form a solid bedding for the pipe.~~

~~The balance of the excavated material shall be consolidated in the following manner. Tamped backfill will be required for the full depth of the trench above the pipe bedding in layers not to exceed twelve (12) inches in depth. As backfilling proceeds, the entire mass shall be vibrated with a mechanical vibrator.~~
Refer to Standard Drawing Section, Trench Detail.

The Contractor shall remove and properly dispose of all surplus materials from the work site. In addition, the Contractor shall restore berm, and unpaved driveways to original condition. The Contractor shall reinstall any fencing, main boxes, signs, poles, etc. that were removed for the installation of the water mains. The removal and disposal of surplus materials shall be done at the Contractors expense.

The Contractor shall use sod, or seeding to restore any grass areas damaged, or destroyed by the installation of the water mains. The use of sod or seeding shall be determined, and mutually agreed upon by the Contractor and the Public Utilities Director. Reasonable protection and care, including any necessary watering of sod or seed, shall be maintained by the Contractor ~~for a period of thirty (30) days following their placement.~~ **until a satisfactory stand of grass has been established.**

Backfilling shall not be done in freezing weather, except by permission of the Public Utilities Department, or the project inspector. Backfilling shall not be made with frozen material. No fill shall be made where the material already in the trench is frozen.

- 409.01 Backfilling Under Pavement.** Flowable controlled density fill shall be per ODOT 613 under roadway and curb. Granular backfill item 304 may be used

under private driveways. ~~See standard construction drawing #97004.~~ **See Public Works Standard Construction Drawing.**

409.02 Nonshrinkable Backfill. The non-shrinkable backfill shall be ~~a mixture of sand, gravel, Portland cement, and water which flows easily around the utility being covered, and develops a 28-day compressive strength from 30 to 200psi. No nonshrinkable backfill mix designs shall be used without the approval of the project inspector. Fly ash may be approved in the mix, if test data are submitted to indicate the above characteristics are met.~~ **per ODOT Standard 613.**

The mix design shall meet the following requirements:

- ~~Portland Cement~~ 60 lbs.
- ~~47-B Sand Gravel~~ 3,300 lbs.
- ~~Water~~ 40 gal.

See City of Fairfield standard drawing for Water Division Construction Standards.

Testing, Disinfecting, and Flushing Mains.

410.00 Disinfection of Water Mains. The Contractor shall pay for the costs of testing, disinfecting, and flushing of the water mains. The disinfections of the water main shall be performed before hydrostatic testing. The Contractor shall furnish all labor, pumps, pipe connections, additional line plugs, adapters, caps, and other necessary apparatus and materials. All work shall conform to the “AWWA Standard for Disinfecting Water Mains”; AWWA²ANSI C-651. A solution of hypo chlorite using HTH or equal shall be introduced into the section of the line by using a chlorine dosage, attached chlorine tablets of at least twenty-five (25) ppm in the main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that dosage of twenty-five (25) ppm has been obtained throughout the pipe. The chlorinated water shall be allowed to remain in the pipe for a minimum of twenty-four (24) hours, after which a residual of ten (10) ~~ppg~~ **ppm** shall be obtained. The disinfections shall be repeated until ten (10) ~~ppg~~ **ppm** can be obtained after twenty-four (24) hours. The main shall be thoroughly flushed until the residual chlorine content is not greater than 2.0 ~~ppg~~ **ppm**.

410.01 Flushing. The Contractor shall provide a means of disposing of the water and ~~sterilizer~~ **disinfectant** to prevent damage to the environment during flushing operations. If there is any question that the chlorinated discharge will cause damage to the environment, then the Contractor shall supply a reducing agent (Sodium Thiosulfate) to the water to be wasted.

410.02 Disinfection. The main shall then be tested to Ohio EPA Standards for (MRDL), Maximum Residual Disinfection Levels for rule 3745-81-10, and 3745-81-70; OEPA Drinking Water Rules and Regulations.

410.03 Bacteriological Test. After final flushing, and before the water main is placed in service, samples shall be collected from the line, and shall be tested for bacteriological quality in accordance with the "Standard Methods For The Examination of Water and Wastewater" as prepared and published by the American Public Health Association, the American Water Works Association, and the Water Pollution Control Federation. The bacteriological test and sample collection shall be performed by the city. The cost for all testing shall be paid by the Contractor.

If the bacteriological test is positive, the Contractor must re-disinfect the line until the bacteriological test is negative. Upon successful passing of the bacteriological test, the water main shall be flushed to establish and maintain a chlorine residual no greater than two (2) mg/l for six (6) hours. Two (2) consecutive negative bacteriological tests will be required, and performed by the city. The cost for all testing shall be paid by the Contractor.

Pressure and Leakage Test

411.00 Pressure Testing. All water lines shall be given a hydrostatic test to two hundred (200) psi, under which leakage shall not exceed ten (10) gallons per twenty-four (24) hours per inch of diameter per mile of pipe. Loss of water pressure during the Pressure and Leakage test shall not exceed ten (10) psi in a twenty-four (24) hour period, nor two (2) psi in a four (4) hour period. Where practicable, pipe lines shall be tested between line valves or plugs at a maximum of fifteen hundred (1500) feet. Water line sections shall not be pressure tested until all service taps, branches, hydrants, etc. have been installed. The Duration of the test shall not be less than four (4) hours, nor more than twenty-four (24) hours.

The Contractor shall furnish all labor, pumps, pipe connections, additional line plugs, adapters, caps, and all other necessary apparatus. The Pressure and Leakage Test shall be in accordance with the AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances by ~~ANSI~~AWWA C-600.

411.01 Air Removal Before Test. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged by the Contractor.

411.02 Procedure. The pipe shall be slowly filled with water, and the specified test pressure shall be applied by means of a pump connected to the pipe. During the pressure test, any exposed pipe, fittings, valves, fire hydrants, and joints shall be examined carefully. Any damaged or defective pipe, fittings, valves, fire hydrants, or joints that are discovered shall be replaced or repaired

with sound material. The test shall be repeated until the City of Fairfield is satisfied.

A recording pressure gauge shall be used for the measurement. The pressure gauge is furnished either by the Contractor, or by the City of Fairfield at the discretion of the Public Utilities Director.

- 411.03 Leakage Testing.** A leakage test shall be conducted after the pressure test has been satisfactorily complete. Leakage testing shall be performed at the same pressure as specified for the pressure test. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valve section thereof, to maintain pressure within two pounds per square inch (2) of the specified test pressure after the pipe has been filled with water and the air has been expelled.

Acceptance shall be determined on allowable leakage. If any test of laid pipe discloses leakage greater than specified, the Contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

- 411.04 Isolation Valve.** The main isolation valve shall not be operated for flushing or rechlorination until a downstream hydrant is opened. During such operations, the main isolation valve shall only be operated by Utility Department personnel.

- 411.05 Completion.** After completion of the disinfections and testing procedures, the main shall be flushed by the Contractor under City supervision until the chlorine concentration is reduced to a level not exceeding ~~1 mg/l~~ **2 ppm**. The main shall be connected to the City's water distribution system by the Contractor under City supervision. *See section 410.01 Flushing.*

- 412.00 As Built.** ~~At the completion of construction, the developer shall supply the City with one (1) set of Mylar plans to indicate any and all deviations from the original plans. These plans must be clearly marked "AS BUILT" on every sheet with all water services, fire hydrants and main valve locations verified by a post-construction survey made at the Contractor's expense. Within thirty days after completion of construction work on any part of the water system, the contractor shall provide a complete set of certified, reproducible "As Built" drawings to the Public Utilities Director or his/her designee, for all water mains constructed, including those constructed in subdivisions. These plans must be clearly marked "As-Built" on every sheet with all water services, fire hydrants and main valve locations verified by a post construction survey made at the Contractor's expense.~~

~~"As Built" plans shall be provided on reproducible sheets measuring twenty-four (24) inches by thirty six (36) inches and sealed and signed by the engineer to certify that the "As Builts" are per field conditions and along with an AutoCAD (.dwg or .dxf) on CD or DVD.~~

Backflow Prevention and Cross-Connection Control

413.00 If, in the judgment of the Public Utilities Director and/or his/her designee, an approved backflow prevention device is necessary for the safety of the Water Works System, notice will be given to the water customer to install and maintain such an approved device. The water consumer, at his own expense, shall install such an approved device at a location and in a manner approved by the Director and shall have inspections and tests made of such approved devices as required by the Ohio Administrative Code Chapter 3745-95.

413.01 Where Protection is Required. An approved backflow prevention device shall be installed on each service line to a consumer's water system serving premises, where in the judgment of the supplier of water or the director, a health, pollutional or system hazard to the public water system exists. An approved backflow prevention device shall be installed on each service line to a consumer's water system serving premises where the following conditions exist:

(a) Premises having an auxiliary water system, unless such auxiliary system is accepted as an additional source by the supplier of water and the source is approved by the director;

(b) Premises on which any substance is handled in such a fashion as to create an actual or potential hazard to a public water system. This shall include premises having sources or systems containing process fluids or waters originating from a public water system which are no longer under the control of the supplier of water;

(c) Premises having internal cross-connections that, in the judgment of the supplier of water, are not correctable or intricate plumbing arrangements which make it impracticable to determine whether or not cross-connections exist;

(d) Premises where, because of security requirements or other prohibitions or restrictions, it is impossible or impracticable to make a complete cross-connection survey;

(e) Premises having a repeated history of cross-connections being established or re-established.

413.02 Type of Backflow Protection Required. An approved backflow prevention device of the type designated shall be installed on each domestic water service connection to the following types of facilities unless the Director determines that no real or potential health, pollutional or system hazard to the public water system exists. This list is presented as a guideline and should not be construed as being complete.

Abbreviations used are as follows:

A.G. - Air Gap Separation

R.P. - Reduced Pressure Principle Backflow Preventer

D.C. - Double Check Valve Backflow Preventer

<u>Type of Facility</u>	<u>Minimum type of Protection</u>
Breweries, Distilleries, Bottling Plants	D.C.
Car Wash with Recycling System and/or Wax Eductor	R.P.
Chemical Plants	R.P.
Dairies	D.C.
Dentist Offices	R.P.
Fertilizer Plants	R.P.
Film Laboratories or Processing Plants	R.P.
Food or Beverage Processing Plants	D.C.
Hospitals, Clinics, Medical Buildings	R.P.
Laboratories	R.P.
Laundries & Dry Cleaning Plants	D.C.
Machine Tool Plants (Health or System Hazard)	R.P.
Machine Tool Plants (Pollutional Hazard)	D.C.
Metal Processing Plants (Health or System Hazard)	R.P.
Metal Processing Plants (Pollutional Hazard)	D.C.
Metal Plating Plants	R.P.
Morgues or Mortuaries	R.P.
Nursing Homes	R.P.
Packing Houses or Rendering Plants	R.P.
Paper Products Plants	R.P.
Petroleum Processing Plants	R.P.
Petroleum Storage Yards (Health or System Hazard)	R.P.
Petroleum Storage Yards (Pollutional Hazard)	D.C.
Radiator Repair Shop Acid Tanks	R.P.
Pharmaceutical or Cosmetic Plants	R.P.
Piers, Docks or Waterfront Facilities	R.P.
Power Plants	R.P.
Radioactive Material Plants	R.P.
Restaurants, with Soap Eductors and/or Industrial Type Disposal	R.P.
Sand and Gravel Plants	D.C.
Schools with Laboratories Having Acid Wastes	R.P.
Sprinkling or Irrigation Systems	R.P.
Swimming Pools with Piped Fill Line	A.G.
Sewage Treatment Plants	R.P.
Sewage Pumping Stations (Health or System Hazard)	R.P.
Storm Water Pumping Stations	R.P.
Veterinary Establishments	R.P.

In addition to and including those types of facilities listed above, an approved backflow prevention device of the type designated shall be installed on each domestic water service connection to any premises containing the following real or potential hazards.

<u>Others Specified by the Director</u>	<u>Minimum type of Protection</u>
Premises having an auxiliary water system not connected to a public water system	R.P.
Premises having a water storage tank, reservoir, pond or similar appurtenance	R.P.
Premises having a steam boiler, cooling system or hot water heating system where chemical water conditioners are used	R.P.
Premises having submerged inlets to equipment	R.P.
Premises having self-draining yard hydrants, fountains, hose boxes or similar devices presenting a health or system hazard (i.e., chemical storage plants tank farms, bulk storage yards)	R.P.
Premises having self-draining yard hydrants, fountains, hose boxes or similar devices presenting a polluttional hazard (i.e., parks, play fields, cemeteries)	D.C.
Others specified by the Director	

(4) An approved backflow prevention device shall be installed at any point of connection between a public water system or a potable consumer's water system and an auxiliary water system, unless such auxiliary system is accepted as an additional source by the supplier of water and the source is approved by the Director.

(E) Type of Protection Required.

(1) The type of protection required under paragraphs (1), (2) and (3) 5of the above Section D shall depend on the degree of hazard which exists as follows:

(a) An approved air gap separation shall be installed where a public water system may be contaminated with substances that could cause a severe health hazard.

(b) An approved air gap separation or an approved reduced pressure principle backflow prevention device shall be installed where a public water system may be contaminated with any substance that could cause a system or health hazard.

(c) An approved air gap separation or an approved reduced pressure principle backflow prevention device or an approved double check valve assembly shall be installed where a public water system may be polluted with any substance that could cause a polluttional hazard.

(2) The type of protection required under paragraph 4 of above Section D shall be an approved air gap separation or an approved interchangeable connection.

(3) Where an auxiliary water system is used as a secondary source of water for a fire protection system, the provisions of paragraph (2) of this rule for an approved air gap separation or an approved interchangeable connection may be waived by

the Director provided:

(a) At premises where the auxiliary water system may be contaminated with substances that could cause a system or health hazard, a public water system or potable consumer's water system shall be protected against backflow by installation of an approved reduced pressure principle backflow prevention device;

(b) At all other premises, a public water system or a potable consumer's water system shall be protected against backflow by installation or (of) either an approved reduced pressure principle backflow prevention device or an approved double check valve assembly;

(c) A public water system or a potable consumer's water system shall be the primary source of water for the fire protection system;

(d) The fire protection system shall be normally filled with water from a public water system or a potable consumer's water system;

(e) The water in the fire protection system shall be used for fire protection only, with no other use of water from the fire protection system downstream from the approved backflow prevention device.

(f) Backflow Prevention Devices.

(1) Any backflow prevention device required by the above Sections (d) and (e) shall be of a model or construction approved by the supplier of water and the Director.

(2) Any backflow prevention device required by the above Sections (d) and (e) shall be installed at a location and in a manner approved by the supplier of water and shall be installed by and at the expense of the water consumer. In addition, any backflow prevention device required by paragraphs (2) and (3) of above Section (e) shall be installed at a location and in a manner approved by the Director as required by Section 6109.13 of the Revised Code.

(3) It shall be the duty of the consumer, on any premises on which backflow prevention devices required by Sections (d) and (e) are installed, to have thorough inspections and operational tests made of the devices at such intervals and in such manner as may be reasonably required by the supplier of water or the Director. These inspections and tests shall be at the expense of the water consumer and shall be performed by the supplier of water or a person approved by the supplier as qualified to inspect and test backflow prevention devices. It shall be the duty of the supplier of water to see that these tests and inspections are made. These devices shall be repaired, overhauled or replaced at the expense of the consumer whenever they are found to be defective. Records of such inspections, tests, repairs and overhaul shall be kept by the consumer and made available to the supplier of water.

(4) Existing backflow prevention devices approved by the supplier of water or the Director prior to the effective date of this rule and which are properly maintained shall, except for inspection, testing, and maintenance requirements, be excluded from the requirements of paragraphs (1) and (2) of this rule if the supplier of water and the Director are assured that the devices will satisfactorily protect the public water system.

413.03 Booster Pumps.

(A) No person shall install or maintain a water service connection to any one, two or three family dwelling where a booster pump has been installed, unless an air gap separation is provided to ensure that the booster pump cannot exert suction on the service line.

(B) For booster pumps not intended to be used for fire suppression, no person shall install or maintain a water service connection to any premises not included in paragraph (A) of this rule where a booster pump has been installed on the service line to or within such premises, unless such booster pump is equipped with a low pressure cut-off designed to shut-off the booster pump when the pressure in the service line on the suction side of the pump drops to twenty pounds per square inch gauge or less.

(C) For booster pumps used for fire suppression installed after the effective date of this rule, no person shall install or maintain a water service connection to any premises not included in paragraph (A) of this rule where a booster pump has been installed on the service line to or within such premises, unless the pump is equipped with a minimum pressure sustaining valve on the booster pump discharge, which throttles the discharge of the pump when necessary so that suction pressure will not be reduced below twenty pounds per square inch gauge while the pump is operating.

(D) For booster pumps used for fire suppression installed prior to the effective date of this rule, no person shall maintain a water service connection to any premises not included in paragraph (A) of this rule where a booster pump has been installed on the service line to or within such premises, unless the pump is equipped with either a low pressure cut-off designed to shut-off the booster pump when the pressure in the service line on the suction side of the pump drops to twenty pounds per square inch gauge or less, or a minimum pressure sustaining valve on the booster pump discharge, which throttles the discharge of the pump when necessary so that suction pressure will not be reduced below ten pounds per square inch gauge while the pump is operating.

(E) It shall be the duty of the water consumer to maintain the low pressure cut-off device or minimum pressure sustaining valve in proper working order and to certify to the supplier of water, at least once every twelve months, that the device is operable and maintained in continuous operation.

413.03 Violations.

(1) The supplier of water shall deny or discontinue, after reasonable notice to the occupants thereof, the water service to any premises wherein any backflow prevention device required by this chapter is not installed, tested and maintained in a manner acceptable to the supplier of water, or if it is found that the backflow prevention device has been removed or bypassed or if an unprotected cross-connection exists on the premises or if a low pressure cut-off required by the above Section (G) is not installed and maintained in working order or if the supplier of water or the Director or the authorized representative of either, is denied entry to determine compliance with this section.

(2) Water service to such premises shall not be restored until the consumer has corrected or eliminated such conditions or defects in conformance with this chapter and to the satisfaction of the supplier of water.

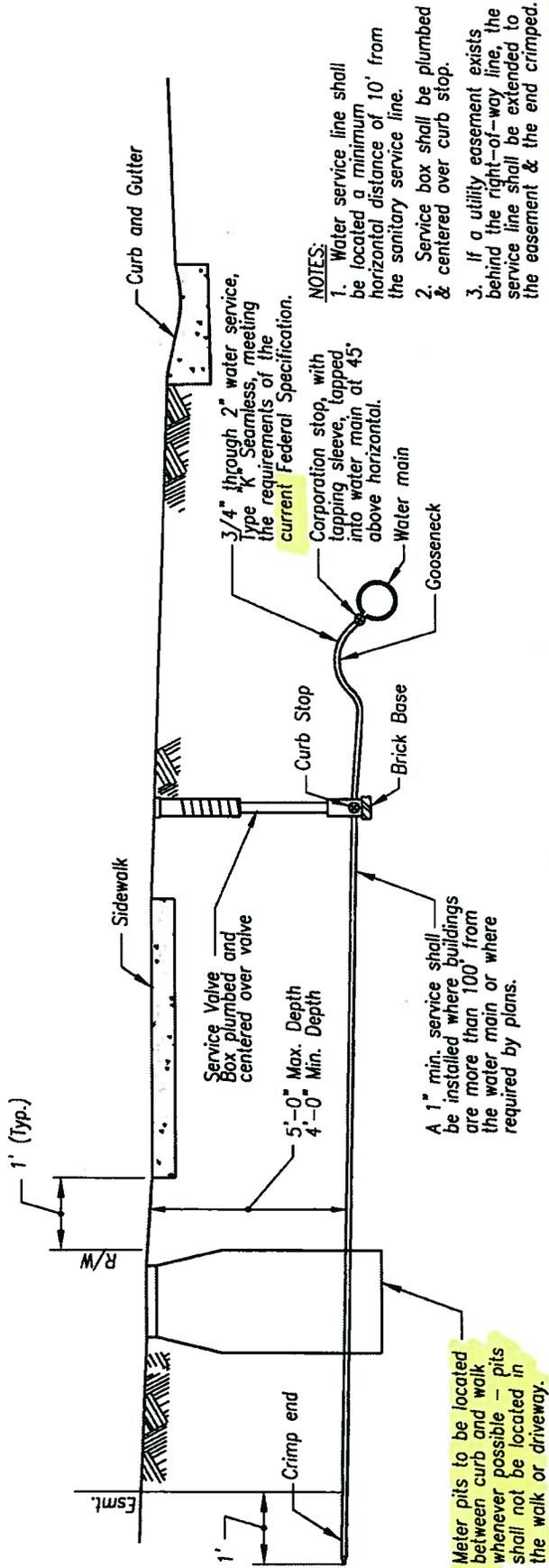
WATER DIVISION CONSTRUCTION STANDARDS*

*Refer to Section 400 for Complete Specification Details

City of Fairfield Construction Standards Fairfield, Ohio



DATE: 1/23/2013 SCALE: NONE FILE: WDETAILS.DWG



WATER SERVICE INSTALLATION DETAIL NTS

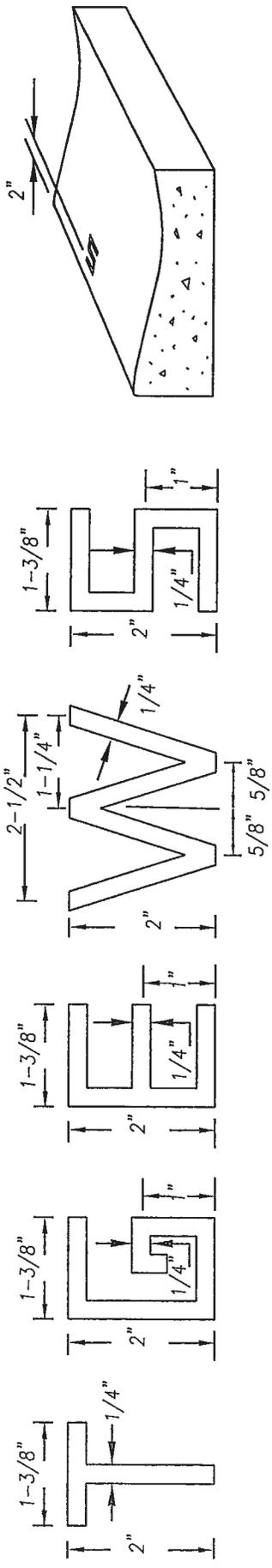
**WATER DIVISION
CONSTRUCTION STANDARDS***

*Refer to Section 400 for Complete Specification Details

**City of Fairfield
Construction Standards
Fairfield, Ohio**



DATE: 1/23/2013 SCALE: NONE FILE: WDETAILS.DWG



Letters to be impressed into the fresh concrete a depth of 1/2" directly above point where services cross the curb.

UTILITY SERVICE LOCATION DESIGNATION

WATER DIVISION CONSTRUCTION STANDARDS*

*Refer to Section 400 for Complete Specification Details

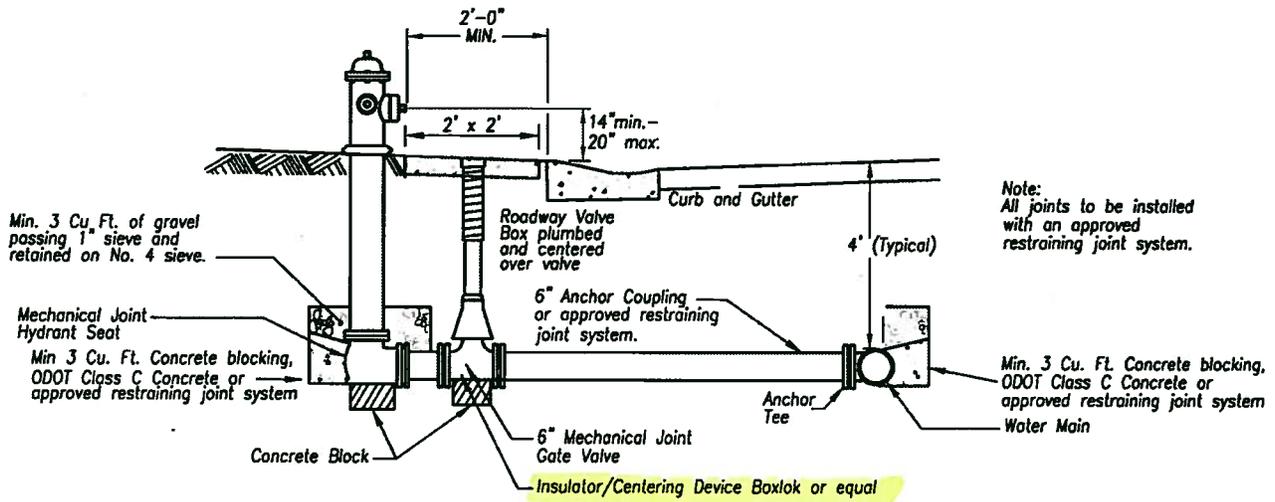
City of Fairfield
Construction Standards
Fairfield, Ohio



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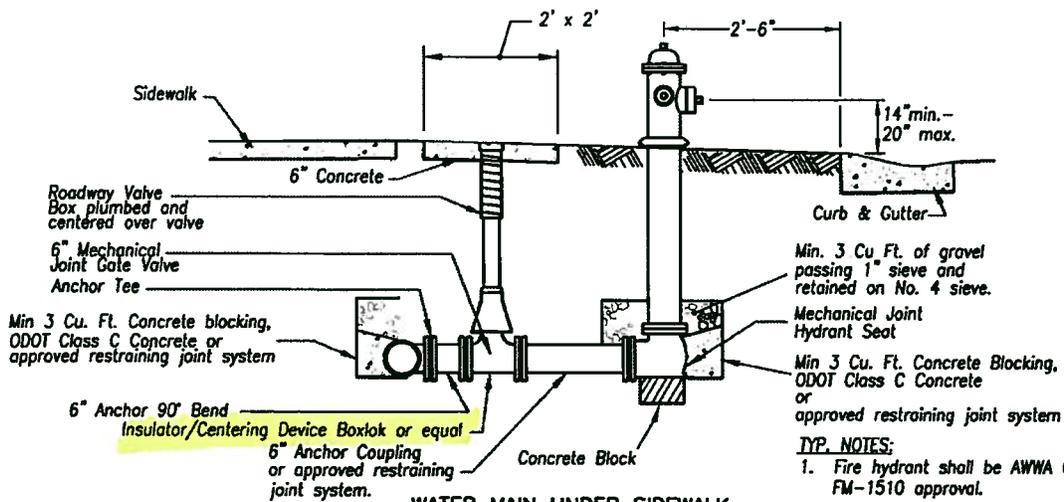
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Note:
All joints to be installed with an approved restraining joint system.

WATER MAIN UNDER STREET PAVEMENT



WATER MAIN UNDER SIDEWALK

TYP. NOTES:

1. Fire hydrant shall be AWWA C502 and FM-1510 approval.
2. Fire hydrant shall be placed on the North or east side of the street.
3. Polyethylene wrap all ductile iron joints and fittings.

FIRE HYDRANT INSTALLATION DETAIL

NTS

WATER DIVISION CONSTRUCTION STANDARDS*

*Refer to Section 400 for Complete Specification Details

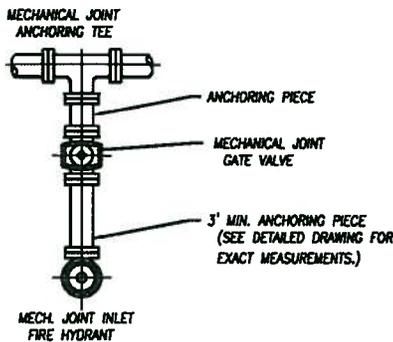
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Construction Standards
Fairfield, Ohio



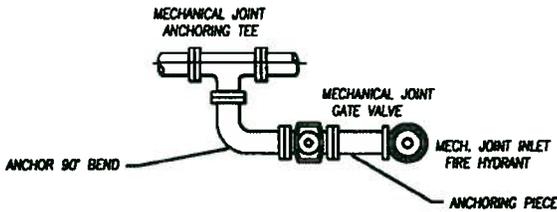
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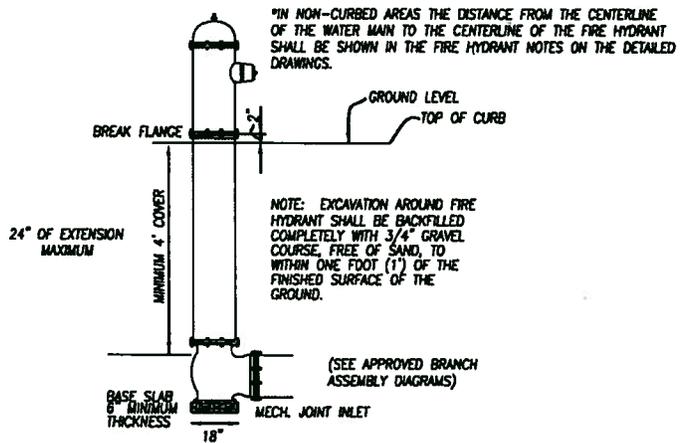
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TYPE "A" HYDRANT
NTS



TYPE "B" HYDRANT
NTS



FIRE HYDRANT PROFILE VIEW
NTS

**TABLE NO. 1
FIRE HYDRANT DETAILS**

DIA. - MAIN VALVE OPENING	5-1/4 INCHES W/ BRONZE SEAT
DIA. - PUMPER CONNECTION	5 INCHES STORZ INTEGRAL
DIA. - HOSE CONNECTION	2 1/2 INCHES
HAMILTON-FAIRFIELD THREAD TYPE	3.187 X 7
SHAPE - CAPS & OPERATING NUT	PENTAGON W/ WEATHERSHIELD AND ONE PIECE BRONZE OPERATING NUT
DIMENSIONS - OPERATING NUT	1 1/2 INCHES
DIRECTION OF CLOSING	RIGHT (CLOCKWISE)
COLOR TO BE PAINTED (PUBLIC)	OSHA SAFETY YELLOW
COLOR TO BE PAINTED (PRIVATE)	OSHA SAFETY RED
SPECIFIC MODEL OR MODELS REQUIRED	MUELLER A423, AMERICAN DARLING B-84-B, OR APPROVED EQUAL

* ALL MAIN LINE PIPE AND FITTINGS SHALL CONSIST OF CLASS 55 DUCTILE IRON PIPE AND FITTINGS C151 AND C153 WITH POLYETHYLENE WRAP FOR HYDRANT BRANCH, BARREL AND FITTINGS.

WATER DIVISION CONSTRUCTION STANDARDS*

*Refer to Section 400 for Complete Specification Details

City of Fairfield
Construction Standards
Fairfield, Ohio



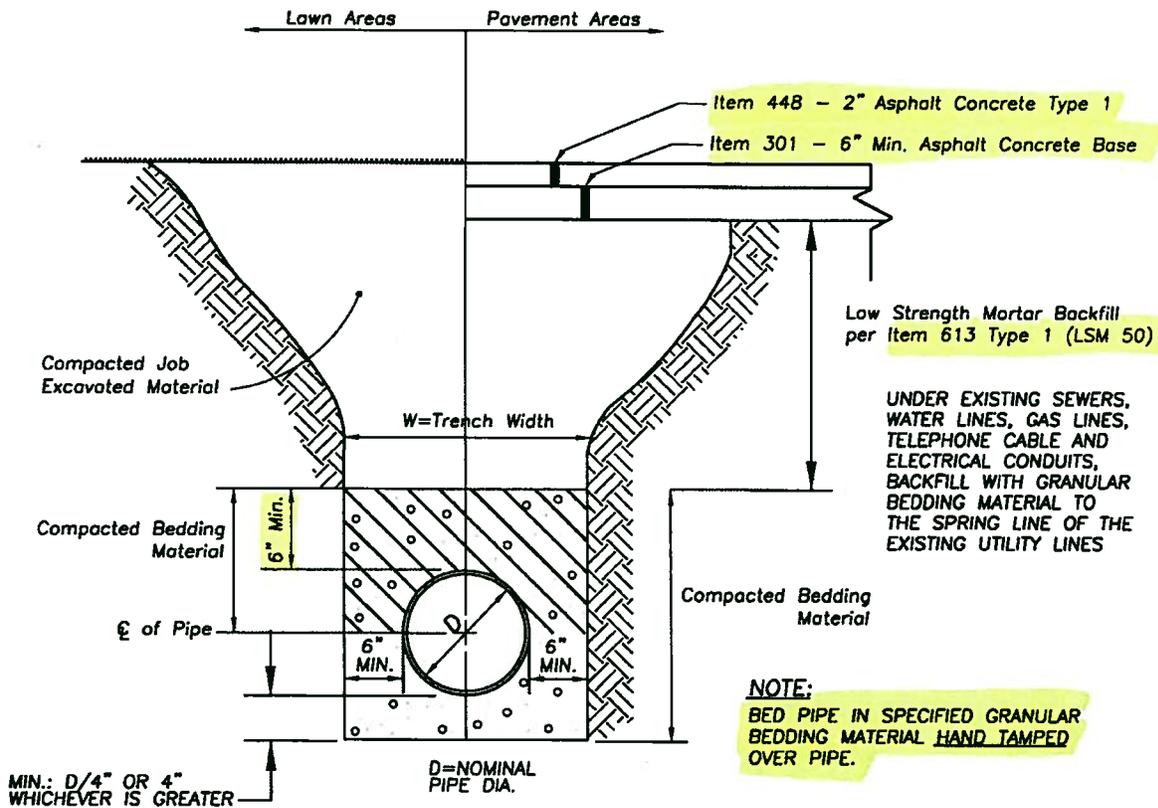
DATE: 1/23/2013

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New Standard - Replace
old trench detail

Water main shall be installed in a separate trench from the sanitary sewer and will be a minimum of 10' measured horizontally, from outside diameter to outside diameter. If this cannot be achieved, it may be permitted to place the water in a separate trench or on an undisturbed earth shelf located on one side of the sewer and at an elevation so that the bottom of the water main is at least 18" above the top of the sewer.



TYPICAL TRENCH DETAIL

NTS

NOTES:

Bedding consisting of 8's, 9's or washed 57's will be used in all water main construction.

Other bedding not listed here are considered non-standard and must be approved in writing prior to use.

For new construction; Trench to be backfilled with granular backfill to street subgrade within roadway limits. Granular backfill to be compacted to 90% of maximum density in 8" maximum lifts.

Trench to be backfilled with low strength mortar backfill to street subgrade within existing street limits.

WATER DIVISION CONSTRUCTION STANDARDS*

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**City of Fairfield
Construction Standards
Fairfield, Ohio**



DATE: 1/23/2013

SCALE: NONE

FILE: WDETAILS.DWG

REQUIRED CASING PIPE SIZES AND WALL THICKNESSES FOR RAILROAD CROSSINGS *			
NOMINAL DIAMETER (INCHES)	ACTUAL O.D. (INCHES)	WHEN COATED OR CATHODICALLY PROTECTED (INCHES)	WHEN NOT COATED OR CATHODICALLY PROTECTED (INCHES)
8"	8 3/8"	.250	.250
10"	10 3/4"	.250	.250
12"	12 3/4"	.250	.250
14"	14"	.250	.250
16"	16"	.250	.281
18"	18"	.250	.312
20" & 22"	20" & 22"	.281	.344
24"	24"	.312	.375

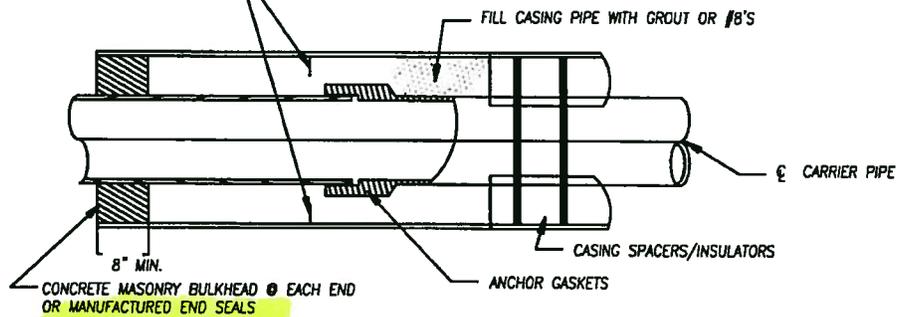
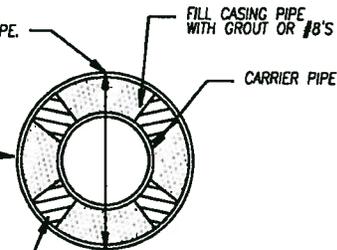
NOTE:

- BASED ON E80 LOADINGS WITH A MINIMUM COVER AT 4'-6".
- STEEL CASING PIPE SHALL HAVE A STEEL YIELD STRENGTH OF 35,000 PSI, MEET ASTM A139 GRADE B REQUIREMENTS
- NO HYDROTEST REQUIRED
- CHART BASED ON RECOMMENDATIONS FROM AMERICAN RAILWAY ENGINEERING ASSOCIATION

THE I.D. OF THE STEEL CASING PIPE SHALL BE AT LEAST 6 INCHES LARGER THAN THE LARGEST OUTSIDE DIAMETER OF ANY JOINT APPENDAGE (INCLUDING RESTRAINED MECHANICAL JOINTS FOR DUCTILE IRON PIPE).

UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS, WALL THICKNESS SHALL COMPLY WITH THE CHART SHOWN ON THIS PAGE.

TO BE AN EQUAL DISTANCE OR AT LEAST 3" OFF THE BOTTOM OF CASING PIPE.



CASING PIPE DETAIL

*REQUIRE RESTRAINED JOINTS - FIELD LOK OR EQUAL

WATER DIVISION CONSTRUCTION STANDARDS*

*Refer to Section 400 for Complete Specification Details

**City of Fairfield
Construction Standards
Fairfield, Ohio**



DATE: 1/23/2013 SCALE: NONE FILE: WDETAILS.DWG

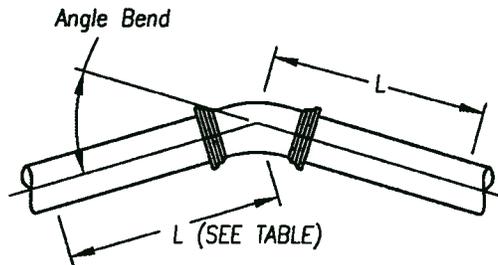


Table For Required Restraint Lengths Based on:
 100 psf Soil Unit Weight 0.25 Soil Friction Coefficient
 150 psi Water Pressure 1.25 Factor of Safety

		Diameter of Watermain						
		6"	8"	10"	12"	14"	16"	LARGER THAN 16"
Angle Bend	11-1/4°	*	*	*	*	*	2'	BY DESIGN
	22-1/2°	2'	3'	4'	5'	6'	7'	
	45°	8'	11'	14'	19'	23'	26'	
	TEE, 90°	26'	37'	47'	66'	77'	90'	

* Restraint Required at Fitting Only

Restraining joint systems are acceptable when designed in accordance with "Thrust Restraint Design for Ductile Iron Pipe", published by the Ductile Iron Pipe Research Association (DIPRA). Restraining glands, manufactured of ductile iron conforming to ASTM A536-84 specifications, or locking gaskets such as Field Lok, or equal, shall be used.

RESTRAINED JOINT LENGTHS

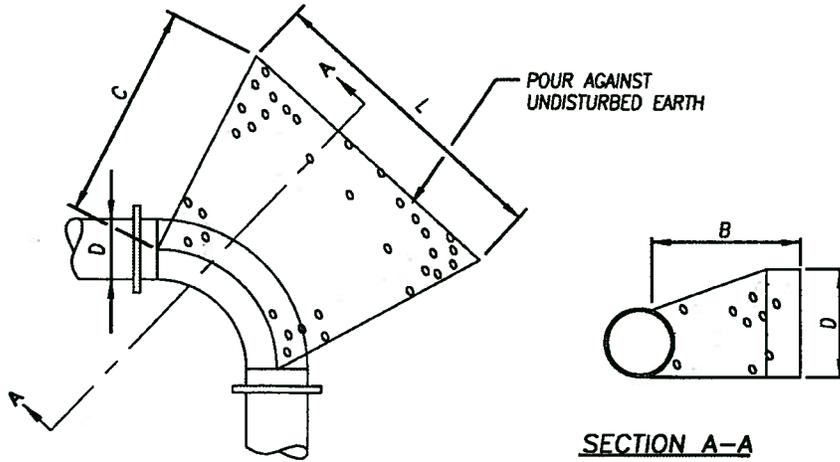
WATER DIVISION CONSTRUCTION STANDARDS*

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**City of Fairfield
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Fairfield, Ohio**



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PLAN VIEW

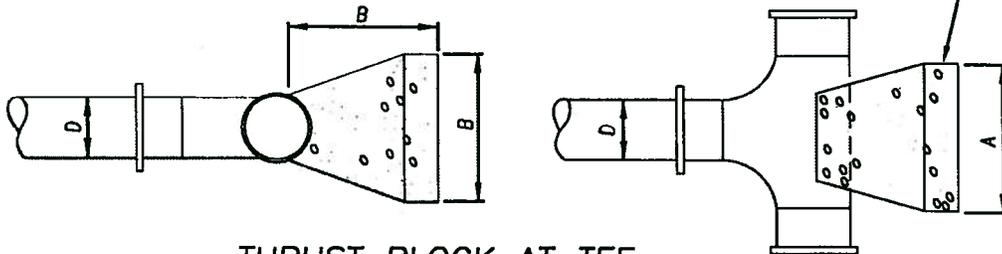
SECTION A-A

MIN. AREA OF ELBOW BLOCKS (SQ. FT.)

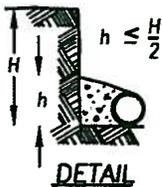
DIA. D	HORIZONTAL BEND				TEE OR DEAD END
	11 1/4"	22 1/2"	45°	90°	
4"	1	1	1	2	2
6"	1	2	3	4	3
8"	1	2	4	7	5
10"	2	3	6	11	8
12"	2	4	8	15	11
16"	4	7	14	26	18

Areas tabulated are for single fittings and bearing pressure of 2000 lb/sf. When more than one fitting is used, the bearing area should be increased proportionately.

THRUST BLOCK AT BENDS
NO SCALE



THRUST BLOCK AT TEE
NO SCALE



DETAIL

1. Bearing depth shall be determined from bearing area required. Bearing length will be 1.0' Minimum.
 2. The surface of the bearing area shall be smooth undisturbed earth.
 3. ODOT Class C Concrete shall be used for all blocking.
 4. Height of blocking to be less than or equal to 1/2 of the depth of the trench.
- Concrete anchor blocking will be permitted for work on existing mains. New watermain installation must be restrained by restraining joint systems or locking gaskets such as FieldLok, or equal, provided that sufficient length for mechanical restraint is available.

WATER DIVISION CONSTRUCTION STANDARDS*

*Refer to Section 400 for Complete Specification Details

**City of Fairfield
Construction Standards
Fairfield, Ohio**



DATE: 1/23/2013 SCALE: NONE FILE: WDETAILS.DWG

REQUIRED CASING PIPE SIZES AND WALL THICKNESSES FOR RAILROAD CROSSINGS *			
NOMINAL DIAMETER (INCHES)	ACTUAL O.D. (INCHES)	WHEN COATED OR CATHODICALLY PROTECTED (INCHES)	WHEN NOT COATED OR CATHODICALLY PROTECTED (INCHES)
8"	8 3/8"	.250	.250
10"	10 3/4"	.250	.250
12"	12 3/4"	.250	.250
14"	14"	.250	.250
16"	16"	.250	.281
18"	18"	.250	.312
20" & 22"	20" & 22"	.281	.344
24"	24"	.312	.375

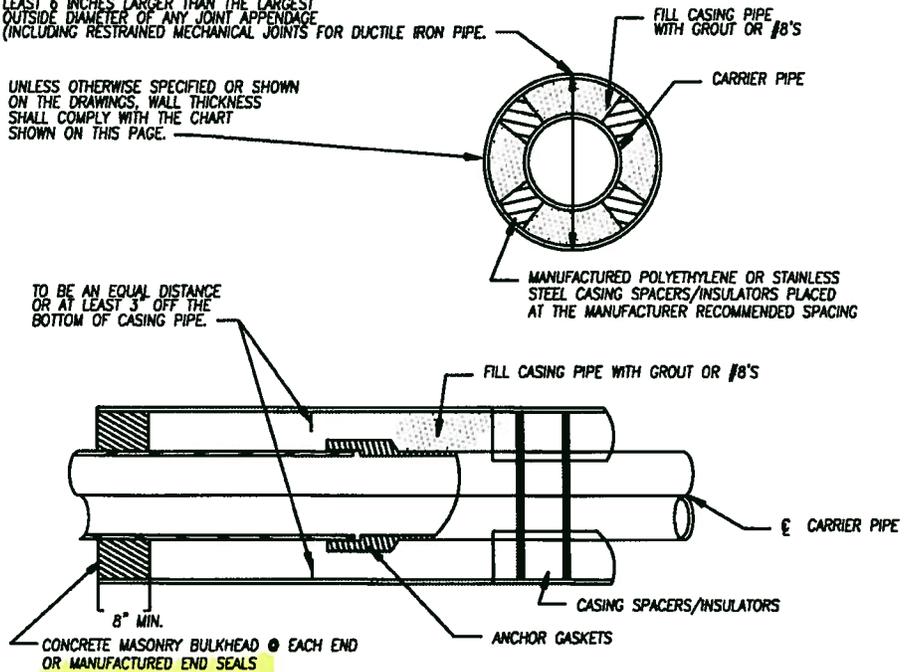
NOTE:

- * BASED ON E80 LOADINGS WITH A MINIMUM COVER AT 4'-6".
- STEEL CASING PIPE SHALL HAVE A STEEL YIELD STRENGTH OF 35,000 PSI, MEET ASTM A139 GRADE B REQUIREMENTS
- NO HYDROTEST REQUIRED
- CHART BASED ON RECOMMENDATIONS FROM AMERICAN RAILWAY ENGINEERING ASSOCIATION

THE I.D. OF THE STEEL CASING PIPE SHALL BE AT LEAST 6 INCHES LARGER THAN THE LARGEST OUTSIDE DIAMETER OF ANY JOINT APPENDAGE (INCLUDING RESTRAINED MECHANICAL JOINTS FOR DUCTILE IRON PIPE).

UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS, WALL THICKNESS SHALL COMPLY WITH THE CHART SHOWN ON THIS PAGE.

TO BE AN EQUAL DISTANCE OR AT LEAST 3" OFF THE BOTTOM OF CASING PIPE.



CASING PIPE DETAIL

*REQUIRE RESTRAINED JOINTS - FIELD LOK OR EQUAL

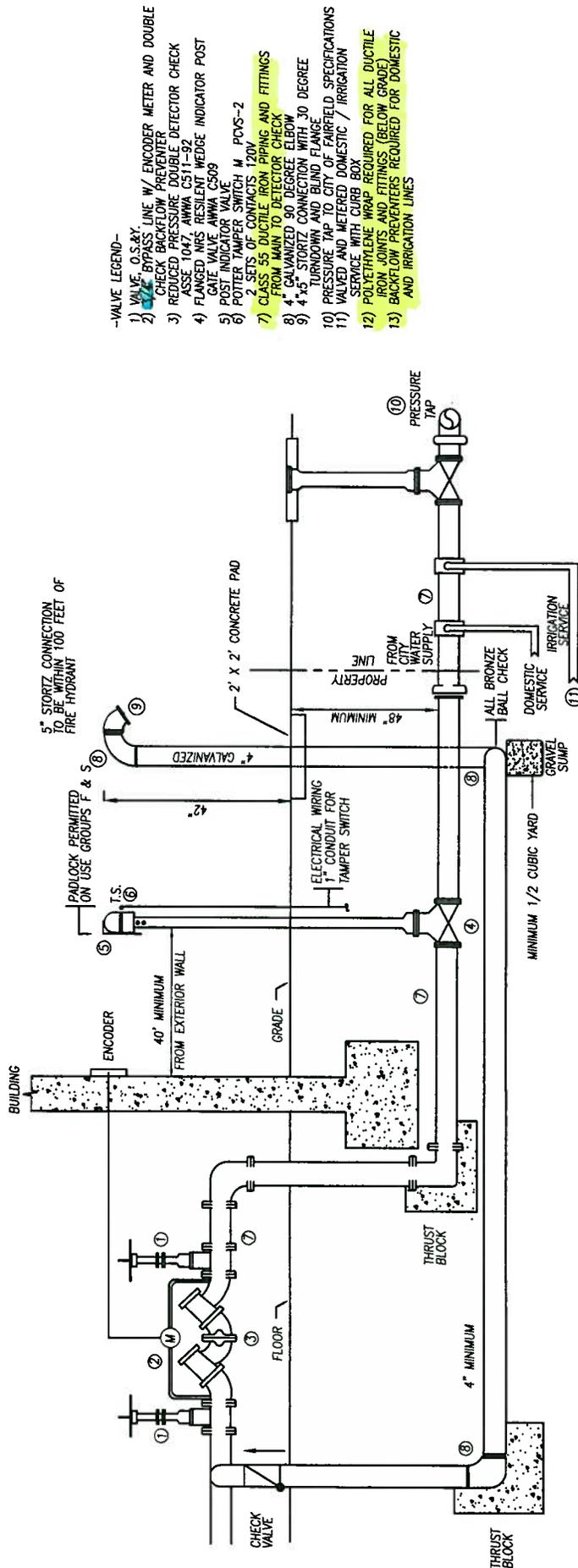
WATER DIVISION CONSTRUCTION STANDARDS*

*Refer to Section 400 for Complete Specification Details



City of Fairfield Construction Standards Fairfield, Ohio

DATE: 5/17/2013 SCALE: NONE FILE: WDETAILS.DWG



**FIRE LINE DOUBLE DETECTOR
CHECK INSTALLATION INSIDE BUILDING**

- VALVE LEGEND-**
- 1) VALVE, O.S.&Y.
 - 2) BYPASS LINE W/ ENCODER METER AND DOUBLE CHECK BACKFLOW PREVENTER
 - 3) REDUCED PRESSURE DOUBLE DETECTOR CHECK ASSE 1047, AWWA C511-92
 - 4) FLANGED NPS RESILIENT WEDGE INDICATOR POST GATE VALVE AWWA C509
 - 5) POST INDICATOR VALVE
 - 6) POTTER TAMPER SWITCH M - PCVS-2
 - 7) CLASS 55 DUCTILE IRON PIPING AND FITTINGS FROM MAIN TO DETECTOR CHECK
 - 8) 4" GALVANIZED 90 DEGREE ELBOW
 - 9) 4" X 3" STORTZ CONNECTION WITH 30 DEGREE TAP
 - 10) PRESSURE TAP TO CITY OF FAIRFIELD SPECIFICATIONS
 - 11) VALVED AND METERED DOMESTIC / IRRIGATION SERVICE WITH CURB BOX
 - 12) POLYETHYLENE WRAP REQUIRED FOR ALL DUCTILE IRON JOINTS AND FITTINGS (BELOW GRADE)
 - 13) BACKFLOW PREVENTERS REQUIRED FOR DOMESTIC AND IRRIGATION LINES



City of Fairfield
Construction Standards
Fairfield, Ohio

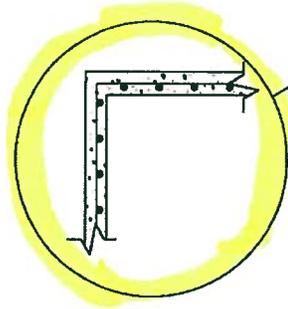
DATE: 5/17/2013 SCALE: NONE FILE: WDETAILS.DWG

**WATER DIVISION
CONSTRUCTION STANDARDS***

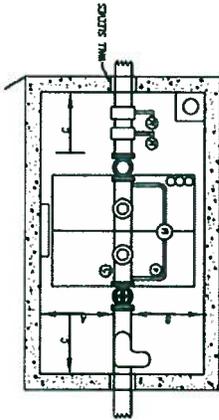
*Refer to Section 400 for Complete Specification Details

MINIMUM CLEARANCES FOR DETECTOR CHECK INSTALLATION:			
SIZE	A	B	C
4" x 1"	4-1/2"	4-1/4"	2"
6" x 1"	6-1/2"	6-1/4"	3"
8" x 1"	8-1/2"	8-1/4"	4"
10" x 1"	10-1/2"	10-1/4"	5"
12" x 1"	12-1/2"	12-1/4"	6"

CLEARANCES FOR FIRE PIT METER:			
SIZE	A	B	C
2"	37"	28"	21"
3"	38"	29"	22"
4"	39"	30"	23"
5"	40"	31"	24"
6"	41"	32"	25"



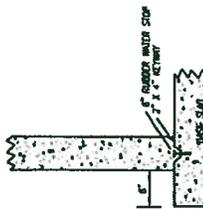
6" COVER TALL GUARD POSTS FINISHED WITH CON. SAFETY YELLOW



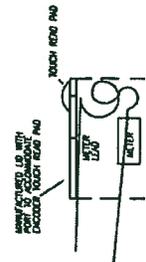
PROJECT FIT TO BE APPROVED BY DIRECTOR OF PUBLIC UTILITIES

VALVE LEGEND--

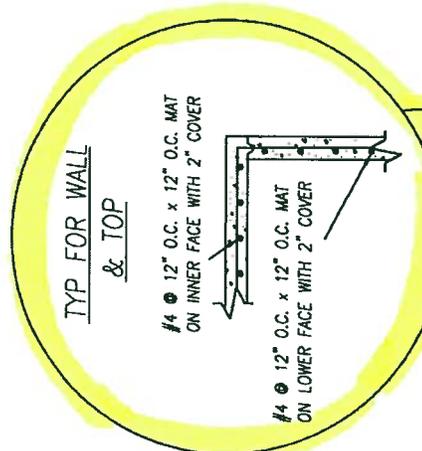
- 1) 4"x4" STUBOUT CONNECTION WITH 30 DEGREE TAPERED END AND 1/2" DIA. END
- 2) 4" GALVANIZED 90 DEGREE ELBOW
- 3) POST INDICATOR
- 4) 3/4" BRASS LINE WITH ENCODER METER AND DOUBLE CHECK BACKFLOW PREVENTER
- 5) DOUBLE CHECK BACKFLOW PREVENTER ASSEMBLY, ASSE 1048
- 6) VALVE (D.S.R.)
- 7) FLANGED RESILIENT WEDGE INDICATOR POST GATE
- 8) INDICATOR POST
- 9) VALVE, W/VA, C509
- 10) PRESSURE TAP TO CITY OF FAIRFIELD SPECIFICATIONS
- 11) VALVED AND METEDED DOMESTIC / IRRIGATION SERVICES
- 12) CLASS 35 DUCTILE IRON PIPE AND FITTINGS, W/VA
- 13) CLASS 35 DUCTILE IRON DOMESTIC AND IRRIGATION BACKFLOW PREVENTERS ARE ALSO REQUIRED



WATER STOP DETAIL



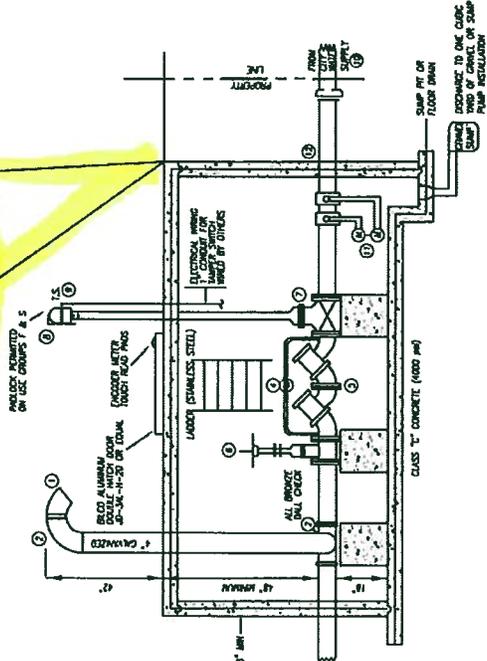
ENCODER METER



TYP FOR WALL & TOP

#4 @ 12" O.C. x 12" O.C. MAT ON INNER FACE WITH 2" COVER

#4 @ 12" O.C. x 12" O.C. MAT ON LOWER FACE WITH 2" COVER



FIRE LINE WITH DOUBLE CHECK DETECTOR METER PIT INSTALLATION

SECTION 5
WASTEWATER

SECTION 500

WASTEWATER

INTRODUCTION

This section is subject to periodic revision to meet changing requirements for materials, and environmental regulations, etc. At the beginning of a project, users should verify that they have the latest edition.

Section 500 is intended to convey the general design and construction requirements for a typical project. It also lists specific City of Fairfield Wastewater Department requirements relating to plan review, inspection, testing and acceptance of facilities. It is not intended as a substitute for site-specific engineering. Individual project conditions may require variances from the provisions in this document in which case the variances should be noted in the plans and other data submitted by the project design professional for the City of Fairfield's approval.

The standard details in Section 500 are complimentary to the general construction materials and specifications. If the developer or designer notes any discrepancies or desires an interpretation of a specification, they shall submit their question to the City of Fairfield in writing for a decision.

“Wastewater or sewage” means the spent water of a community, and may be a combination of the liquid and water-carried wastes from residences, commercial buildings, Industrial plants, and institutions, together with any ground water, surface water, and storm water that may be present.

Any single family, or multi-family dwelling, commercial or industrial establishment shall be connected to a public sewer if the sanitary lines are available for connection. Sewage shall be considered available if the property can be connected by gravity flow within a hundred (100) feet of a main sanitary line in any public right-of-way or easement. The connection shall be at the cost of the property owner.

In all buildings in which any building drain is too low to permit gravity flow to the sewer main, sanitary sewage carried by such drain shall be lifted by artificial means as approved by the Public Utilities Director, and discharged into the sewer service.

Sewer availability will be determined by the City of Fairfield, or representative of the municipal authority in the area of the proposed development. The City of Fairfield will review the preliminary plans to determine if the wastewater treatment facilities, lift stations, and sanitary lines in the area of the proposed development have sufficient capacity to serve the proposed development.

Septic tanks, leech fields and mound systems are under the authority and review of the Butler County Board of Health. Butler County sanitary sewers are under the authority and review of the Butler County Environmental Services Division.

If the Director of Public Utilities, or his/her designee, requires that a subdivision sewer or sewers must be larger than the size required to handle the sewage flow from the subdivision, due to expansion of the sewer system beyond the subdivision in the future, the City shall pay the developer the difference in cost for the larger piping materials. Additional installation cost for the larger piping is the responsibility of the developer.

The latest published edition of the following documents shall be the accepted standard for materials and/or procedures for the construction, modification, alteration, or expansion of the City of Fairfield's public wastewater system.

1. *City of Fairfield Design, Construction and Material Specification Handbook.*
2. *City of Fairfield Codified Ordinances. Sewers Chapter 925.*
3. *Ohio EPA Laws and Regulations (OEPA).*
4. *Ohio EPA Backflow Prevention and Cross Connection Control.*
5. *Recommended Standards for Sewage Works, "The Great Lakes Upper Mississippi River Board" (G.L.U.M.R.B.) also known as "The Ten State Standards".*
6. *The Clean Water Act. (CWA).*
7. *40 Code of Federal Regulations Part 403. General Pretreatment Regulations.*
8. *National Pollutant Discharge Elimination System (NPDES).*
9. *Ohio Revised Code (ORC) 6111.032- Ohio Pretreatment Program.*
10. *Solid Waste Disposal Act (SWDA).*

If a conflict shall exist between reference sources, the more restrictive requirement shall prevail. The Public Utilities Director shall provide interpretation, as requested.

An approval by the City of Fairfield does not imply, nor assure approval by the Ohio EPA.

Plans are approved as subject to the conditions of compliance with all applicable laws, rules, regulations and standards. The proposed project may be constructed only in accordance with the approved plans. There may be no deviation from the approved plans without the written approval from the City. Approval of the plans does not constitute an assurance that the proposed project will operate in compliance with all Ohio laws and regulations.

As required by the Public Utilities Director, plans shall be submitted to the Ohio EPA for approval. The Developer shall pay the cost of submitting the plans to the Ohio EPA, and for the review by the Ohio EPA. Construction shall not begin until the Ohio EPA approves such plans, or unless the Public Utilities Director issues a conditional release.

ABBREVIATIONS

The following abbreviations used in this manual shall have the designated meanings:

- **AASHTO** - *American Association of State Highway Transportation Officials*
- **ABS** - *Acrylonitrile-Butadiene-Styrene*
- **ANSI** - *American National Standards Institute*
- **ASTM** - *American Standard Test Methods*
- **BCDES** - *Butler County Dept. of Environmental Services*
- **BOD** - *Biochemical Oxygen Demand*
- **CCTV** - *Closed Circuit Television*
- **CRF** - *Code of Federal Regulations*
- **COD** - *Chemical Oxygen Demand*
- **CWA** - *Clean Water Act*
- **DI** - *Ductile Iron*
- **FOG** - *Fats, Oils, Grease*
- **GI** - *Grease Interceptor*
- **GLUMRB** - *Great Lakes Upper Mississippi River Board*
- **Gpd** - *Gallons per Day*
- **Mg/l** - *Milligrams per Liter*
- **NACE** - *National Association of Corrosion Engineers*
- **NSF** - *National Sanitary Foundation*
- **NPDES** - *National Pollutant Discharge Elimination System*
- **ODOT** - *Ohio Department of Transportation*
- **OEPA** - *Ohio Environmental Protection Agency*
- **ORC** - *Ohio Revised Code*
- **PDI** - *Plumbing and Drainage Institute*
- **POTW** - *Publicly Owned Treatment Works*
- **PVC** - *Polyvinyl-Chloride*
- **RCRA** - *Resource Conservation and Recovery Act*
- **SAE** - *Society of Automotive Engineers*
- **SDR** - *Standard Dimension Ratio*
- **SIC** - *Standard Industrial Classification*
- **SSPWC** - *Standard Specification Public Works Construction*
- **SWDA** - *Solid Waste Disposal Act*
- **TDH** - *Total Dynamic Head*
- **TOMP** - *Toxic Organics Management Plan*
- **TSS** - *Total Suspended Solids*
- **UPC** - *Uniform Plumbing Code*
- **USEPA** - *U.S. Environmental Protection Agency*

Prohibited Discharges

501.00 Prohibited Discharges. No person shall discharge or cause to be discharged any storm water, surface water, ground, roof runoff, subsurface drainage, cooling water or unpolluted industrial process water into any sanitary sewer of the City of Fairfield, or permit or allow to be discharged or conveyed to a public sewer any wastewater containing pollutants of such character or quantity that will:

- Not be susceptible to treatment or interfere with the process or efficiency of the treatment system.
- Constitute a hazard to human or animal life, or to the stream or water course receiving the treatment plant effluent.
- Violate pretreatment standards.
- Causes the treatment plant to violate its NPDES permit, or applicable receiving water standards.

No person shall discharge or cause to be discharged without prior written approval of the Director of Public Utilities, or his/her designee, any hazardous waste into the sanitary sewer of the City of Fairfield. A hazardous waste shall be defined by OAC 3745-51-21 to 3745-51-24 inclusive, or is a waste listed in OAC 3745-51-31, 3745-51-32, 3745-51-33(E), or 3745-51-33(F).

Approval

502.00 Wastewater Approval. Plan approval by the City of Fairfield does not imply, nor assure approval from the Ohio EPA. Approval of the plans does not constitute an assurance that the proposed project will operate in compliance with all Ohio laws and regulations.

503.00 Plans are approved subject to the conditions of compliance with applicable laws, rules, regulations and standards. The proposed project may be constructed only in accordance with the approved plans. There may be no deviation from the approved plans without the written approval by the Director of Public Utilities, or his/her designee. Plans should contain a note stating “All work within the right of way within City limits will require a permit from Public Works. Permits can be found at <http://fairfield-city.org/publicworks/rightofway.cfm>.

504.00 As required by the Director of Public Utilities or his/her designee, plans shall be submitted to the Ohio EPA for approval. The cost of submitting plans to the Ohio EPA, and review by the Ohio EPA shall be paid by the developer. Construction shall not begin until such plans are approved by the Ohio EPA, or unless the Director of Public Utilities, or his/her designee, issues a conditional release.

505.00 All sewers connecting to the City of Fairfield’s public sewer system shall comply with all City of Fairfield standards, as well as Federal, State, and City ordinances. *The Public Utilities Director and other authorized employees of the City bearing proper credentials and identification shall be permitted to enter into or upon all properties for the purpose of inspection, observation, measurement, sampling and testing, in accordance with the provisions of this section.* No tie-in shall be made except in the presence of the City of Fairfield Inspector.

Inspection of Construction – See Section 102.00.

506.00 Construction Requirements and Materials Specifications.
Determination of the Amount of Sewage and Average Flows.

The average flow of sanitary sewage shall be computed on the basis of 100 gallons per capita. The estimated flows listed are to be used only for the design of sewers and lift stations, and should not be used in the design of treatment plants.

WASTEWATER SOURCE	ESTIMATED SEWAGE FLOW
	(gallons - per -day)

Airports

Per Employee	20
Per Passenger	5

Apartments

One bedroom	250
Two bedroom	300
Three bedroom	350

Assembly Halls

Per seat	2
----------	---

Bowling Alleys (no food service)

Per Lane	75
----------	----

Camps

With individual bath units-per person	50
With central bath house per person	35

Churches

Small- per sanctuary seat	3-5
Large with kitchen-per sanctuary seat	5-7

<u>Dance Halls</u>		
Per person at maximum capacity		2
<u>Factories</u>		
No showers per employee		25
With showers per employee		35
<u>Family Dwelling</u>		
Per person		100
<u>Food Service Operations</u>		
Restaurant per seat		35
Banquet rooms-per seat		5
Tavern (very limited food service) per seat		35
<u>Hospitals</u>		
No resident personnel per bed		300
<u>Institutions</u>		
Residents per bed		100
<u>Laundries</u>		
Coin operated-per machine (standard size)		400
<u>Motels</u>		
Per Unit		100
<u>Nursing and Rest Homes</u>		
Per patient		150
Per resident employees		100
<u>Office Buildings (exclusive of cafeteria)</u>		
Per employee per shift		20
<u>Playgrounds and Daytime Parks</u>		
With toilet facility-per person		5
With showers, bathhouse toilets-per person		10
<u>Schools</u>		
Elementary (not including showers or cafeteria-per pupil)		10
High and Junior High (not including showers or cafeteria per pupil)		15
Add for cafeteria – per pupil		5
Add for showers – per pupil		5

<u>Service Gas Station</u>	1000
<u>Shopping Centers (without food service or laundries)</u> Per area of floor space	0.2/sq.ft
<u>Swimming Pool (average with hot shower)</u> Per swimmer	3-5
<u>Theaters</u> Movie – per seat	5
<u>Trailer Parks (mobile home parks)</u> Per trailer space	300
<u>Travel Trailer and Recreational Vehicle (parks and camps)</u> Per trailer or tent space	125
<u>Vacation Cottages</u> Per person	50

506.01 Peak Flows. Sanitary sewers shall be designed on a peak flow basis using a peak factor of four (4) times the total calculated average daily wastewater flow for collector sewers, and a peak factor of 2.5 for sub-mains and trunk sewers. Pumps and force mains should be designed to carry the peak flow of all the sewers that discharge into the lift station. The peak flow for areas which do not have a 24-hour run-off period shall be calculated as follows:

$$\text{Peak Factor} \times \frac{(\text{Calculated Wastewater Flow(gallons)} \times 24 \text{ hours})}{\text{Run-off period (in hours)}} = \text{gpd.}$$

Peak Factor = 4.0 for collector sewer mains.

Peak Factor = 2.5 for trunk main sewers.

ENTITY

RUN-OFF PERIOD

Municipality	24 hours
Factories	Length of shift
Subdivisions (over 250 homes)	24 hours
Subdivisions (under 250 homes)	16 hours
Hospitals	12-24 hours
Camps	16 hours
Schools	8 hours
Restaurants	4 hours
Boarding Schools	16 hours
Mobile Home Parks	12 hours

Apartments	12 hours
Motels	4 hours

Use of other run-off periods must be documented.

DESIGN OF SEWERS

507.00 Approval of Sewers. In general, the City of Fairfield will approve plans for new systems, extensions to new areas, or replacement sanitary sewers only when designed upon the separate basis, in which rain water from roofs, streets, and other areas, and groundwater from foundation drains are excluded.

507.01 Design Capacity and Design Flow. In general, sewer capacities should be designed for the estimated ultimate tributary population, except in considering parts of the systems that can be given to the maximum anticipated capacity of institutions, industrial parks etc. Where future relief sewers are planned, economic analysis of alternatives should accompany initial permit applications.

507.02 Minimum Size. All public sanitary sewers conveying raw sewage shall be a minimum of eight (8) inches in diameter. Sanitary sewer laterals shall be a minimum of six (6) inches of diameter, and run to within five (5) feet of the building, and tied directly into the building sanitary sewer.

507.03 Depth. In general, sewers should be sufficiently deep to receive wastewater from basements, and to prevent freezing. Insulation shall be provided for sewers that cannot be placed at a depth sufficient to prevent freezing. A minimum depth for sewer laterals shall be thirty-six (36) inches from the crown of the lateral to afford protection from frost. Sewer installation requiring less cover shall require the approval of the Director of Public Utilities, or his/her designee.

507.04 Buoyancy. Buoyancy of sewers shall be considered and shall be prevented with appropriate construction, and the flotation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.

507.05 Location. Public sewer mains shall be installed in public right-of-way, or upon approval, in a public utility easement. The width of a permanent sewer maintenance easement shall be governed by the following depth chart:

<u>Depth</u>	<u>Width of Maintenance Easement</u>
10-15 feet	20 feet
16-20 feet	30 feet
21-30 feet	2.0 x depth of sewer, plus 10 feet

**Greater than 30 feet of depth shall require the approval of the Director of Public Utilities.*

This sewer maintenance easement shall be no less than twenty (20) feet wide, and shall be totally within the public right-of-way, or public utility easement. The easement shall be evenly divided on both sides of the sewer line.

507.06 Flow Velocities. All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second, bases on Manning’s formula using an “n” value of 0.013. When velocities greater than twelve (12) feet per second are expected, provisions should be made to protect against displacement by erosion and impact.

507.07 Minimum Allowable Slope. The following are recommended minimum slopes, which should be provided for sewers eighteen (18) inches or less. However, slopes greater than these may be desirable for construction, to control sewer gases, or to maintain self-cleansing velocities at all rates of flow within the design limits.

The minimum allowable slope shall be that which results in a velocity of at least two (2) feet per second when the sewer pipe flows at ¼ of full depth. Sewers of eighteen (18) inches or less shall be laid with uniform slope and straight alignment between manholes. The line and grade alignment shall be checked with laser instruments whenever possible.

Sewer size	Min. Slope 2.0 FPS Velocity (ft./100ft.) n-0.013	Approx. Capacity Minimum Slope (GPD)	Approx. Capacity Minimum Slope (CFS)	
8 inch	0.50	520,000	0.80	
10 inch	0.28	750,000	1.16	
12 inch	0.22	1,100,000	1.70	
15 inch	0.15	1,680,000	2.60	
18 inch	0.12	2,330,000	3.60	

507.08 Minimum Flow Depths. Slopes, which are slightly less than the recommended minimum slopes, may be permitted only by the review of the City of Fairfield,

Director of Public Utilities, or his/her designee. Such decreased slopes may be considered where the depth of flow will be 0.3 of the diameter, or greater for design average flow.

507.09 Minimum Solids Deposition. The pipe diameter and slope shall be selected to obtain the greater practical velocities to minimize settling problems. Oversize sewers will not be approved to justify using flatter slopes. If the proposed slope is less than the minimum slope of the smallest pipe, which can accommodate the design peak hourly flow; the actual depths and velocities (minimum, average and maximum) shall be calculated by the design engineer, and shall be included in the plans.

507.10 Slope Between Manholes. Sewers shall be laid with uniform slope between manholes. The minimum design slope for an eight (8) inch sewer main shall be 0.50%.

507.11 Steep Slope Protection. Sewers of a 15% slope or greater shall be anchored with concrete anchors spaced as follows:

1. Grades from 15% to 35% shall be anchored on 36 feet center to center.
2. Grades from 36% to 50% shall be anchored on 24 feet center to center.
3. Grades from 51% and over shall be anchored on 16 feet center to center.

507.12 Alignment. In general, sewers 24 inches or less shall be laid with straight alignment between manholes. Straight alignment shall be checked by either using a laser beam, or by lamping. A laser beam system shall conform to OSHA requirements, and have an early warning system. See section 515.00 Laser System.

Curvilinear alignment of sewers larger than 24 inches may be considered on a case by case basis provided compression joints are specified and ASTM or specific pipe manufacturers' maximum allowable pipe joint deflection limits are not exceeded. Curvilinear sewers shall be limited to simple curves, which start and end at manholes. When curvilinear sewers are proposed, the recommended minimum slopes must be increased accordingly to provide a minimum velocity of 2.0 feet per second when flowing.

507.13 Changes in Pipe Size. The invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method to accomplish this is to place the 0.8 depth point of both sewers at the same elevation. When larger sewer discharges into a smaller one, the invert of the smaller sewer should not be raised to maintain the same energy gradient.

Sewer extensions should be designed for projected flows even when the diameter of the receiving sewer is less than the diameter of the proposed extension at a manhole constructed with consideration of an appropriate flow channel to minimize turbulence when there is a change on sewer size.

507.14 Connections. Roof drains, and foundation drains, as well as all other clean water connections to the sanitary sewer system are prohibited. The following shall appear on sanitary sewer plans submitted for review: *“No Buildings Shall Be Connected To A Lateral Until The Building Is Under Roof.”*

507.15 Protection Water Supplies. There shall be no physical connection between a public or private potable water system and a sewer, or its appurtenance that would permit the passage of any sewage into the potable water supply.

507.16 Parallel Installation. Sanitary sewers and manholes shall be laid a minimum of ten (10) feet horizontally from any existing or proposed water main. When local conditions prevent a separation of ten (10) feet, a sewer line may be laid closer than ten (10) feet to water main if it is laid in a separate trench. The sewer shall be laid lower than the water line, with a minimum of eighteen (18) inches below the invert of the water main. When it is impossible to obtain proper separation, the sewer shall be mechanical joint material, or seamless high density pipe (HDP) and both services shall be pressure tested to assure water tightness.

507.17 Crossings. Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least eighteen (18) inches below the bottom of the water main. When the elevation of the sewer cannot be buried to meet the above requirement, the water main shall be relocated to provide this separation, or reconstructed with mechanical -joint pipe ductile iron pipe that will withstand a 150 psi pressure test for a distance of ten feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

LATERALS

508.00 Lateral Size. No gravity lateral sewer conveying wastewater shall be less than six (6) inches. Laterals for low-pressure force main systems shall be sized according to the hydraulic design criteria.

508.01 Lateral Slope. The slope of the six (6) inch pipe shall be not less than one quarter (1/4) inch (2 %) per lineal foot, while maintaining a minimum vertical separation of thirty six (36) inches. **A minimum vertical separation of thirty-six (36”) inches shall be required as measured from the crown of the public sanitary main and the lowest floor elevation served by gravity sewers.** In any structure in which the plumbing is too low to permit gravity flow to the utility system, or private sewer, the sewage shall be lifted by artificial means and discharged into the utility system. When only the lower floor of a structure is too low for gravity flow, the remaining floors must flow by gravity. ~~See standard drawing for sanitary laterals.~~ **See City of Fairfield Sanitary Sewer standard drawing for sanitary laterals.**

508.02 Location. No sewer lateral shall be laid parallel to within five (5) feet of any bearing wall, which might thereby be structurally weakened. A two-inch (2") high "S" shall be stamped on the curb face at all sewer lateral locations. ~~See standard construction drawings water and sewer location designation.~~ **See City of Fairfield Sanitary Sewer standard drawing for sewer location designation.**

508.03 Depth. The minimum sewer lateral cover depth shall be thirty-six (36) inches from the crown of the lateral to afford protection from frost. The sewer lateral shall be installed on the low point of the property being served and shall be sufficiently deep to receive wastewater from basements. **A minimum vertical separation of thirty-six inches (36) shall be required as measured from the crown of the public sanitary main and the lowest floor elevation served by gravity sewers.**

508.04 Alignment. The sewer lateral shall be laid at a positive uniform grade and in straight alignment. Changes in direction shall be made only with properly made curved pipe-fittings with no deflections greater than forty-five (45°) degrees permitted. The maximum connection angle shall be no greater than sixty (60°) degrees into the public main.

508.05 Tap Connections. The connection of a building lateral to an existing sanitary sewer shall be air and water tight in an acceptable manner. The standard connection shall utilize the standard pipe-fitting or manufacturer's recommended adapter designed to join the type of pipes together. The connection from the four (4) inch pipe to the six (6) inch lateral shall be made by use of a commercial fitting only and within five (5) feet of the building. Cement grout shall not be permitted. **Building connections are not to be completed until the structure is under roof in order to prevent unnecessary inflow and infiltration.** Connections to gutters, sump pumps, or pool drains will not be allowed.

The **tap for truss pipe** shall be accomplished by installing a manufactured "Wye" fitting to prohibit any degradation of the interior truss lining void structure. ~~No boring of the tap shall be permitted.~~ **Boring of the tap may, at the discretion of the Public Utilities Director, be completed.** For Truss pipe tapping connections, a "Fernco" type coupling with wide stainless shear bands shall be used in addition to slip-lock clamps to add integrity and stiffness to the pipe at each connection.

A manufactured **tap saddle** of a high durometer PVC shall be used on sanitary pipe materials other than truss pipe. The tap saddle apron shall be installed by a solvent weld system, in addition to stainless steel slip-lock clamps around the saddle on the sanitary main pipe.

All connections within the sanitary sewer system shall be inspected and approved by the City of Fairfield before being covered. No sewer pipe laid under ground shall be covered or the trenches filled until after the sewer has been inspected for workmanship and proper material. If the City of Fairfield refuses to approve the work, the plumber or owner must proceed immediately to correct the work.

508.06 Clean Outs. Clean outs to grade shall use a four (4) inch minimum diameter riser tapped with a four (4) inch metallic cleanout plug. The metallic clean out cap/plug shall be locatable with a metal detector. The cap/plug shall not have a protruding operating nut, but rather a recessed operating nut. Clean outs are required at every one hundred (100) feet ~~or fraction thereof along all straight lines of pipe intervals of straight pipe~~ and at the discretion of the Public Utilities Director or his/her designee, at changes of direction of forty-five (45) degrees or more. Clean out installation should be avoided in traffic areas, however if such installation is required, materials shall be capable of bearing traffic weight. Clean outs constructed of plastic material in traffic areas shall be un-acceptable. ~~See standard drawing for typical sanitary clean-out.~~ **See City of Fairfield Sanitary Sewer standard drawing for typical sanitary clean out.**

508.07 Bedding. All sanitary sewer laterals shall be embedded in ~~pea gravel, or comply with ODOT 603.04 Class B bedding. #8's, #9's or #57's~~ gravel. The granular bedding shall extend to twelve (12) inches above the top of the lateral. The over-dig area can utilize one inch (1") gravel to aid placement of the bedding. Bedding shall have bell holes for joint shape and locations.

508.08 Backfill. Flowable controlled density fill shall be per ODOT 613 under roadway and curb. Granular backfill item 304 may be used under private driveways. ~~See standard construction drawing # 97004.~~ **See City of Fairfield Sanitary Sewer standard drawing for trench details.**

508.09 Sewer Stubs. All sewer lateral stubs shall be capped with a watertight plug. Plug location shall be marked with a 2x4 stake, 12 feet long, with one end buried at depth of the plug invert and extending at least three (3) feet vertically out of ground. The portion of the stake above the ground shall be **painted green** and marked with the word "SEWER" and indicates the depth from the pipe invert to the ground surface. Any new street curb, or curb replacement over the sanitary lateral shall be stamped with an "S" symbol to identify the approximate location of the sewer. ~~See standard drawing for curb stamp location and dimensions.~~ **See City of Fairfield Sanitary Sewer standard drawing for curb stamp locations and dimensions.**

508.10 Cured-In-Place-Pipe (CIPP) Service Lateral Lining. The intent of this CIPP lateral lining specification is to provide reconstruction of service laterals without excavating the entire existing pipeline. The existing pipe reconstruction will be accomplished using a scrim reinforced liner tube measured to exact length and inside diameter utilizing a thermosetting resin that meets required physical and

chemical resistance properties. The scrim reinforced liner will be impregnated with resin then loaded into an approved air pressure launching system. The liner will be aligned to the open end of the existing lateral pipe. Once the liner is aligned, the launching system will invert the resin-impregnated liner with air pressure. **The inversion process is completed once the liner has fully inverted to the sewer main collection pipe, stopping at the connection.** The liner will be open to allow the calibration tube to invert beyond the liner end at the sewer main connection. A calibration tube is then inverted into the liner holding the liner in place during the curing process. At no time will the calibration tube lose air pressure and be re-pressurized during the inversion process. The calibration tube will be sealed at the sewer main, holding air pressure to secure the liner against the existing host pipe until the liner is fully cured. After the resin-impregnated liner is fully cured, the calibration tube is removed. The sewer lateral collection pipe will be immediately televised for the inspector's approval. A copy of the televised inspection must be recorded on DVD or MPEG format for future reference.

The liner tube will consist of scrim reinforcement and needled felt. The liner tube will be fabricated together using a butt stitched seam sealing process with a heat welded sealing tape to ensure airtight seal. The liner tube will be capable of carrying resin and withstanding installation pressures and curing temperatures. The liner tube will be lined on one side with a translucent impermeable chemically resistant polyvinylchloride (PVC) water proof coating. This coating will be on the inner lateral collection lined pipe after curing is completed. The coating will provide a smooth and seamless inner wall.

The resin will be a two-part, 100% solids epoxy containing no styrene. The epoxy resin shall be formulated to have a gel (pot) life of approximately 30 minutes with a set cure time of three hours. The epoxy shall ambient cure by internal exothermic chemical reaction.

The scrim reinforced / seam stitched / heat welded seam tape / felt liner tube and resin will upon installation meet and/or exceed minimum testing standards as required by ASTM, IAPMO and ANSI/NSF International. All materials must have 3rd party testing provided by independent laboratory. The materials must be ANSI/NSF Standard-14 and IAPMO Certified for small diameter pipe lining in Sewer Pipes and Vents. The scrim reinforced / seam stitched / heat welded seam tape / felt liner tube and resin must have NSF Standard 14 denoted on the tube.

The Inversion Process must conform with ASTM F 1216.

1. The Contractor must have a valid City of Fairfield Sewer Tapper License. The Contractor must be a certified CIPP installer with proof of certification.
2. The Contractor will supply plans to the Director of Public Utilities or designee five days prior to construction. The Contractor will arrange for work to be inspected by the City Inspector prior to construction.

3. The owner shall be notified 24 hours in advance of project start time. No building utilities, such as toilets, sinks, dishwasher, laundry washer, bath tubs or sump pumps will be used during the installation and curing process. Generally no by-pass pumping is needed.
4. Lateral Sewer Collection Pipe must be cleaned thoroughly prior to installation of liner. All sand, rocks, gravel, grease, mud, sludge, and other debris must be removed from the invert to permit proper installation. Roots will need to be removed to the extent necessary to effectively line the entire pipe to the main.
5. The existing Service Lateral will be inspected using a mini-television color camera system capable of viewing the interior condition of the host pipe. The TV inspection must be performed within 5 hours prior to installation of liner tube and be provided to the homeowner.
6. The resin-impregnated liner tube will be kept clean and loaded directly into the air pressured launching system. The launching system will be aligned to the existing host pipe for proper installation.
7. The resin will not be contaminated and/or diluted prior to installation.
8. The liner tube will be inverted using air pressure, inverting the liner inside-out until the liner tube reaches the sewer main collection pipeline. The liner tube will be open and not sealed off. The liner tube will be designed to fit tightly against the host pipe annular space and gaps. A calibration tube will be inverted inside the liner tube to ensure the liner is tight against the host pipe until fully cured. The Resin-impregnated liner tube will cure within 4 hours without external heat sources.
9. Once the curing process is finished, the calibration tube is removed and the lateral sewer collection pipe is immediately inspected for final acceptance. The new lined pipe will be free of any foreign objects providing a smooth, seamless and continuous lined pipe from entry point to main sewer connection pipe.
10. Any liner tube protruding from the lateral sewer collection pipe into the main sewer pipeline will be removed by remote robotic cutting equipment.
11. If the liner/repair contacts or affects the city sewer main in any manner, the contractor is solely responsible and must repair the main to meet city standards.
12. A final TV Inspection of the lined lateral will be recorded and provided to the owner for final approval. A TV inspection of the main sewer connection pipe will be recorded and provided to the Director of Public Utilities or designee for final approval.

Required Cured-In-Place Lateral Lining Standards

Flexural Strength	ASTM D-790	4,500 PSI (min.)
Flexural Modulus	ASTM D-790	250,000 PSI (min.)
Tensile Strength	ASTM D-638	3,000 PSI (min.)
Compressive Strength	ASTM D-695	4,000 PSI (min.)
Tensile Elongation	ASTM D-638	5 PSI (min.)
Chemical Resistance	ASTM D-543	>20% loss

Leakage Test*	NSF Standard 14	0/gal/in/day
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*Leakage test performed by ANSI/NSF International

Manufacturer must have United States based manufacturing headquarters. The manufacturer must have at least five years of manufacturing / supplying CIPP Air Inversion Liner Tube and Materials. The manufacturing plant has a Quality Assurance / Quality Control program in place and overseen by NSF International and IAPMO R&T Laboratories.

SEWER MAIN PIPE MATERIALS

509.00 Force Main and Gravity Sewers. All materials for sewer pipe shall be new and furnished by the Contractor. The Manufacturer and Contractor shall use equipment and methods adequate to protect pipe, joint elements, and coatings from damage during hauling, storage and handling. When there is reasonable doubt as to the structural strength or water tightness of damaged sections, those sections shall be rejected and replaced at the Contractor's expense. Any proposed deviations from these listed, or specified materials must first be approved by the City of Fairfield, Director of Public Utilities, or his/her designee. The force mains and sewers shall be constructed to the alignment and inverts shown on the construction plans, and of the size and type shown or specified.

~~The City of Fairfield prefers a "Truss Pipe" design for normal sewer main installations involving pipe sizes from eight (8) inches to (15) inches in diameter. The double wall system of a Truss pipe offers a high pipe stiffness and beam strength to minimize deflection and ground water infiltration at the pipe joints.~~

A manufacturer's certificate that the ABS or PVC material was manufactured and tested in accordance with the appropriate ASTM specification shall be furnished to the City of Fairfield prior to the installation of pipe.

ABS and PVC pipe shall not be used in industrial areas where the effluent is detrimental to the integrity of the pipe. The Director of Public Utilities, or his/her designee, may request analytical data on the proposed industrial discharge. Any cost for the analysis will be encumbered by the contractor. The Director of Public Utilities, or his/her designee, shall make a determination on what type of pipe should be used based upon industrial sampling.

No sewer shall exceed twenty-five (25) feet in depth without the approval of the City of Fairfield, Director of Public Utilities, or his/her designee.

All materials not specifically referenced shall comply with applicable sections ASTM, AWWA, APWA, GLUMRB, or ODOT standard specifications.

509.01 ABS Pipe. ABS composite pipe shall conform to ASTM D 2680 or current standard for pipe sizes of eight (8) inches to fifteen (15) inches in diameter. All pipe spigots shall have a “home” mark to facilitate joint closure.

509.02 PVC Pipe. PVC pipe shall conform to ASTM D 3034-08 or current standard. PVC gravity sewer pipe may be installed according to manufacturer’s recommendations except for the conditions noted on the following table:

<u>PVC Gravity Pipe</u>	<u>Depth (feet)</u>
SDR 35	3-14 feet
SDR 26	15-19 feet
SDR 21	20-25 feet

509.03 Ductile Iron Sewer Pipe. All ductile iron shall conform to ANSI/AWWA C150 and ~~ANSI/AWWA C151 /A21.50-08~~ or current standard. In no case shall the pipe be less than Class ~~53~~ 55 (Ductile Iron Wall Thickness). The lining and coating for ductile iron pipe and fittings shall be cement mortar epoxy epoxy coated with Protecto 401 or equal, ~~lined with bituminous seal coat~~ conforming to ANSI/AWWA/C104 A/21 or current standard.

~~The joints for ductile iron pipe shall be mechanical and shall conform to ANSI/AWWA/C111 A/21 or current standard.~~ All pipe joints shall conform to AWWA C111/A21.11. Gasket material shall be standard styrene butadiene copolymer (SBR) per this standard. Bolts shall be high-strength, and corrosion resistant alloy conforming to AWWA C111. All ductile iron pipe shall bear the manufacturer’s name or trademark, the year produced, and the letter’s “DI” or word “Ductile”. The Ductile Iron lining coating system shall be impervious to sewer gases and waste. A Polyethylene Encasement conforming to AWWA C105 shall be utilized when ductile iron pipe is installed.

509.04 Deflection of Pipe. The deflection of pipe diameter shall not exceed (5%). Installed pipe shall be tested 30 days or more after trench has been back-filled to the finished grade. Test is to be scheduled and performed by the Developer or Contractor, under supervision by the City of Fairfield.

509.05 Joints. ABS or PVC pipe joints can be solvent-welded and conform to ASTM 2680, ASTM D2680-01 or current standard or elastomeric gasket joints which shall conform to ASTM D 3212-07 or current standard. Ductile iron joints shall be mechanical, and conform to ANSI/AWWA/C111 A/21 or current standard. Joints recommended for circular sewers where infiltration or exfiltration is a factor in design shall use flexible watertight joints using compression type rubber gaskets for sealing the joint, and shall conform to ASTM C443 or current standard. Sewer joints shall be premium joints, and shall be designed to minimize

infiltration and to prevent entrance of roots. In all jointing operations, the trench shall be dry before making pipe joints. All surfaces to be joined and all parts of the joint shall be clean and dry.

509.06 Concrete Encasement. In areas requiring concrete encasement, Ductile Iron Class 53 55 with poly wrap (refer to 509.03) shall be used unless waived by the Director of Public Utilities, or his/her designee. Concrete encasement is required where sanitary sewers cross under streams, drainage swales, points of heavy loading, or at other locations as directed by the City of Fairfield. Concrete encasement shall completely surround the pipe and shall have a minimum thickness at any point of one fourth (1/4) of the outside diameter of the pipe, or a minimum of six (6) inches, which ever is greater. In addition, four (4) reinforcing bars of a size selected by the inspector shall be evenly spaced around the pipe, and have a length equal to that of the encasement. The concrete encasement shall be designed to provide the necessary addition strength. **See City of Fairfield Sanitary Sewer standard drawings for case piping detail.**

509.07 Casing spacers and insulators . Field adjustable casing spacers shall be ISO-9001 Certified and used to center, or adjust the position and elevation of the gravity sewer pipe to on-grade requirements within the casing. An appropriate End-seal shall be used on the encasement as recommended by the manufacturer.

Manholes

510.00 Manholes. Manholes shall be installed in accordance with the City of Fairfield Sanitary Sewer Standard Construction Drawings. ~~Manholes and~~ shall not be spaced further apart than four hundred (400) feet. Manholes shall conform to ASTM C478-12a ~~or current standard~~ for precast reinforced concrete manhole sections. ~~In traffic load bearing conditions, Mmanholes shall conform to AASHTO M199 or current standard for traffic load bearing conditions.~~ ~~Pre-cast reinforced concrete manholes shall be constructed with use of Xypex C-1000, or approved equal, at the discretion of the Public Utilities Director.~~ In addition, all pre-cast reinforced concrete manholes shall include the sidewall rings and base. The cone shall be of the eccentric type. ~~The joint between manhole sections shall be o-ring, or equal as approved by the Director of Public Utilities.~~ Manhole joints shall be sealed with flexible watertight rubber gaskets conforming to ASTM C900, C443 or current standard. Prior to backfilling, rubber external seal wraps or approved equal shall be applied to each manhole section joint in accordance with ASTM C877 (Type III – Chemically-Bonded Adhesive Butyl Bands) or current standard. At points of pipe inlet, the pre-cast base manhole shall contain a wedge lock, or flexible o-ring joint conforming to ASTM C-923-08 or current standard. “Resilient Connections” to insure the prevention of shearing the pipe due to differential settling. Grouted joints between sections and cast-in-place bases are not acceptable.

Pipe material changes between manholes may be permitted provided there is not a substantial difference in inside diameters, ~~a smooth uniform flow line is maintained,~~ and a watertight rubber sleeve or mechanical coupler conforming to ASTM C-425-04 **or current standard**, (*Flexible Compression Joints*) is used to make the transition. All metal hardware shall be stainless steel. The transition sleeves shall be manufactured by Fernco, or approved equal.

510.01 Manhole castings shall be made of cast iron, and conform to AASHTO M199 **or current standard** or Low Density Traffic H-20 Loading to support traffic, **or current standard**. The manhole frame/lid shall be Neenah R 1767 or approved equal and have "SEWER" factory cast into the lid. Vented lids shall have a maximum of four (4), 1-inch ventilation holes and be utilized in all unpaved areas. Water-tight manhole covers are to be used wherever the manhole covers may be flooded by street run-off, or predicted high water conditions. Water-tight covers shall be Neenah R 1916-F or approved equal. Vented Manhole covers shall be permitted only if the manhole, and sanitary system has high-pressure fluctuations and requires pipe venting. Steps inside the manhole shall be either cast iron, polypropylene encapsulated steel, or aluminum spaced a **minimum maximum** of twelve (12) **and a maximum of sixteen (16)** inches apart. The standard base shall be precast by the manufacturer.

510.02 Manhole Installation. Manholes shall be installed plumb. Whenever possible, the height of the manhole sections shall be selected in order to allow the manhole casting to be set directly in the top cone at the required elevation, rather than **use using pre-cast grade rings, brick to raise the casting.** In areas where the manholes are located in streets, the casting and cover shall be installed at the same grade as the street ~~by use of a solid ring or other approved method,~~ **with use of pre-cast grade rings.** Pre-cast grade rings may be utilized to adjust grade levels at a **minimum of two (2) inches, and a maximum of sixteen (16) inches.** No more than three pre-cast grade rings may be utilized for grade adjustment.

The minimum diameter of the manhole shall be forty-eight (48) inches and shall conform to the requirements of ASTM C478-12a **or current standard**. A minimum access opening of twenty-two (22) inches shall be provided. Manholes shall be installed at the end of each sewer line, or service lateral having a length greater than 150 feet at all changes in grade, size, alignment, and at all pipe intersections. Manholes shall also be installed at a spacing distance not greater than 400 feet for main sewers. The locating of a manhole in a sidewalk shall be avoided whenever possible. Private sewer systems must be separated from the City sewer systems by a manhole located at the right-of-way line.

Manholes installed in flood plains shall extend two (2) feet above the 100-year flood elevation, and shall have an internal rubber seal installed to seal the frame-chimney joint area. Seals must be provided with the initial sleeve and extensions on the installation of manholes with multiple adjusting rings. The full chimney section, between the frame and cone section shall be open. Expansion bands are

required at such intervals to ensure a complete rubber seal. A sleeve or boot shall have a vertical height of eight (8) inches, and be capable of expanding two (2) inches, or alternate as approved by the Director of Public Utilities, or his/her designee.

All resilient connectors, boots and sleeves between the reinforced concrete manhole structure its pipes and laterals shall conform to ASTM C-923-08 **or current standard.**

510.03 Drop inlets shall be avoided whenever possible. However, where they are required, a drop pipe shall be provided for a sewer entering a manhole at an elevation of twenty- four (24) inches or more above the manhole invert. Drop manholes shall be constructed with an outside drop connection. Inside drops shall only be used when tying into any existing sewer main, and will need approval by the Director of Public Utilities, or his/her designee. Where the difference in elevation between the incoming sewer and the manhole invert is less than twenty-four (24) inches, the invert should be filleted to prevent solids deposition.
See City of Fairfield Sanitary Sewer standard drawings for manholes and typical drop connection.

510.04 Flow Channel. The flow channel shall be straight through the manhole, and shall be made to conform in shape, slope and smoothness to that of the sewers. Flow direction changes in excess of 90 degrees will not be permitted. The channel walls should be formed or shaped to the full height of the crown of the outlet sewer in such a manner to not obstruct maintenance, inspection or flow in the sewers. A bench shall be provided on each side of the flow channel when pipe size is less than manhole diameter. No lateral sewer or drop manhole pipe shall discharge onto the surface of the bench. The bench shall slope one (1) inch per foot.

511.00 Control and Inspection Manholes. All industrial dischargers shall provide for an on-site monitoring manhole. All discharge from the property must pass through one control manhole before entering the City of Fairfield sewer system. Control manholes are manholes through which all flow from a single user passes. Inspection manholes are manholes with additional monitoring features to allow for routine sampling of a user's wastewater discharge.

The City of Fairfield requires that a control manhole be installed for any new, or changed industrial unit. The Director may require the user to install monitoring and/or flow measuring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the user at its own expense. The Director or his designated agent(s) shall have the right to enter the premises of any user to determine whether the user is complying with the requirements of the wastewater discharge permit, or order issued hereunder.

Users shall allow the Director ready access to all parts of the premises for purposes of inspection, sampling, records examination and copying, and the performance of any additional duties. Information and data on a user obtained from reports, surveys, wastewater discharge permit applications, and monitoring programs from the Director's inspection and sampling activities shall be available to the public without restriction, unless the user specifically requests, and is able to demonstrate to the satisfaction of the Director, that the release of such information would divulge information, processes, or methods of production entitled to protection as trade secrets under applicable State law.

511.01 Manhole Inspection. Sanitary Sewer manholes will be inspected in the field for visual damage and water tightness. All manholes shall be ~~air~~ vacuum tested by the contractor prior to acceptance using testing procedures ~~described in ASTM C-1244-05 or ASTM C 828 or current standard, as necessary.~~ 515.02. The vacuum test method shall demonstrate the integrity of the installed materials. This preliminary test shall be performed prior to backfill. ~~See section 515.01 for testing requirements for acceptance.~~

512.00 Protection of Underground Utilities. The accuracy of location of existing underground utilities as shown on plans is not guaranteed. It shall be the duty of the Contractor to locate these utilities in advance of excavation, and to protect same from damage after uncovering. The Contractor shall contact the owners of the utilities for assistance in locating these service lines. If necessary, the Contractor shall call the Ohio Utilities Protection Service (1-800-362-2764 or 8-1-1) at least 48 hours in advance of digging. Any expense incurred by reason of damaged or broken lines shall be the responsibility of the Contractor.

Separation of Water Mains and Sewers. See section 405.00 water utilities

513.00 Trenching and Excavation. No trenching or laying of pipe, or fittings shall be done until grade stakes have been set. The Contractor shall use digging equipment that produces an even bedding and foundation on which the pipe and fittings shall be installed. The bottom of the trench shall be level and free from lumps, holes, excessive loose dirt and large stones. If in rock, the bottom of the trench base shall be undercut six (6) inches, and then back filled with ~~pea~~ #8's, #9's or #57's gravel. The bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of pipe. Support of pipe shall be given at every point along its entire length, except to excavate for bell holes and joints. Allowing the pipe to be bridged by the bell or joint end is unacceptable. The trench shall be excavated to the depth required to provide a uniform and continuous bearing support for the pipe on solid and undisturbed ground at every point between joint ends.

All sanitary sewers shall have minimum cover of thirty- six (36) inches. The open trench ahead of pipe-laying shall be kept to a minimum, and shall not be in excess of twenty-five (25) feet at the end of the working day, or the ceasing of work.

Open cut trenches and excavations shall be sheeted and braced as required by ~~governing state laws~~, OSHA Standards and municipal ordinances, and as may be necessary to protect life, property, the project, or as ordered by the project engineer or inspector. To protect the persons from injury, and to avoid property damage, adequate barricades, construction signs, torches, red lanterns, and guards shall be placed and maintained as required during the progress of the construction until it is safe.

All grading in the vicinity of a trench excavation shall be controlled to prevent surface water from flowing into the trench. Any water accumulating in the trench shall be removed by pumping or other approved method. Material excavated from the trench shall be stacked in an orderly manner and a safe distance way from the trench edge. The project inspector ~~shall waste~~ will have the contractor remove materials unsuitable for backfilling.

The Contractor will keep the City informed a reasonable time in advance of the location and time that the Contractor intends to work. Any unauthorized excavation below the grade shall be backfilled at the Contractors expense with controlled fill.

All trenching, grade and cover work shall conform to the lines and grades given by the engineer. Work shall be done according to the drawings and specifications; subject to such modifications as the City of Fairfield may determine necessary during the project period.

Allowable Removal of Pavement. See Section 407.01

Tunneling. See Section 407.02

Protection of the Public. See Section 407.03

514.00 Pipe Installation. Proper facilities shall be provided for stringing and lowering sections of pipe into the trench. The pipe shall be installed in accordance to the active standard ASTM D2321-05 for underground installation of buried thermoplastic pipe for sewers and other gravity-flow applications.

Existing sanitary sewer lines and flow shall remain in operation at all times. Any rerouting or blockage of sewer lines during construction by the Contractor shall require prior approval by the Director of Public Utilities, or his/her designee.

Pipe laying shall begin at existing sewer locations and shall proceed upgrade with the bell or groove end of the pipe placed upstream. The interior of the pipe shall be kept free form dirt, excess mortar and other foreign material as the laying progresses. Pipe shall not be laid when the condition of the trench or the weather is unsuitable, or when water or mud may interfere with proper joining. All open

ends of pipe and fittings shall be adequately and securely closed whenever the work is discontinued. Any pipe, which shows undue settlement or is damaged shall be taken up and replaced at the Contractor's expense.

Concrete Encasement. See section 509.06

515.00 Laser System. The Contractor shall furnish and use, for grade and alignment control, a laser beam system, which complies with OSHA requirements. The laser system is to be provided by the Contractor, and shall have a minimum accuracy of 0.01 foot per one hundred feet (100') on line; and a minimum visible range of one thousand (1000') feet.

The battery for the laser device should be located far enough from the manhole or sewer pipe to ensure that it will not act as an ignition source for explosive hazards originating in the excavation or in existing sewer lines. When laser alignment is impractical, such as short pipe runs, the Contractor shall have an Engineer on the ground to set grade of each pipe joint by means of an engineers level.

515.01 Testing Requirements. The contractor ~~at his option may air~~ **will vacuum** test the ~~manhole and air test the~~ sanitary system before backfilling to ~~aid the contractor in checking-check~~ for any defects. ~~The testing for acceptance and compliance shall be performed after backfilling has been completed. Testing for acceptance and compliance will be performed at this time.~~ If the line does not meet or exceed the test requirements, the Contractor shall make repairs to the line as necessary, and shall retest the sanitary system. The ~~air vacuum~~ test is usually conducted between two consecutive manholes. All manholes shall be tested separately.

Air Testing Requirements. See section 519.

515.02 Vacuum Testing of Manholes. This specification shall govern the vacuum testing of sanitary sewer manholes and structures and shall be used as a method of determining acceptability by the Director of Public Utilities, or his/her designee,, in accepting maintenance of a sanitary sewer manhole or structure on behalf of the public. Vacuum testing shall be according to ASTM C1244-11, or current standard, except as specified otherwise herein. Other forms of testing of some manholes may be required, as deemed necessary by the Director of Public Utilities.

At least twenty-five percent (25%) of the total sanitary sewer manholes and other structures on each project shall be vacuum tested as specified herein. Manholes to be tested shall be selected by the Inspector at the time of testing. No advance notice will be provided to the Contractor as to which manholes will be tested. If more than ten percent (10%) of the manholes tested fail the initial test, an additional twenty-five percent (25%) of the total manholes shall be tested. This process shall continue until a series of manhole (25% of the total) successfully tests with no more than 10% initial failures or until all manholes have been tested.

The plans may require vacuum testing for specific manholes in areas especially susceptible to infiltration. The manholes selected for testing by the Inspector shall be in addition to the manholes indicated on the plans (i.e. the manholes indicated on the plans will not count toward the required 25%).

Manholes shall be tested after installation with all connections in place.

1. Lift holes, if any, shall be plugged with an approved, non-shrinkable grout prior to testing.
2. Drop connections shall be installed prior to testing.
3. The vacuum test shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings.
4. Manhole vacuum testing shall be performed prior to backfilling.
5. If a coating or lining is to be applied to the interior of the manhole the vacuum test must not be performed until the coating or lining has been cured according to the manufacture's recommendations.
6. If existing manholes are to be vacuum tested (e.g. in the case of a sewer rehabilitation project), the Inspector and Contractor must deem the manhole structurally sound prior to vacuum testing.

Procedure for testing shall be as follows:

1. Temporarily plug all pipes entering the manhole. Each plug must be installed at a location beyond the manhole/pipe gasket (i.e. outside the manhole wall), and shall be braced to prevent the plug or pipe from being drawn into the manhole.
2. The test head shall be placed inside the rim of the cast iron frame at the top of the manhole and inflated, in accordance with the manufacture's recommendations.
3. A vacuum of at least ten inches of mercury (10" Hg) shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and shut off the pump or disconnect the vacuum line from the pump.
4. The pressure gauge shall be liquid filled, having a 3.5 inch diameter face with a reading from zero to thirty inches of mercury.
5. The manhole shall be considered to pass the vacuum test if the vacuum reading does not drop more than 1" Hg (i.e. from 10" to 9" Hg) during the following minimum test times.

MH Depth(feet)	4' Diameter MH	5' Diameter MH	6' Diameter MH
15 Feet or less	50 sec.	1 min. 5 sec.	1 min. 20 sec.
15.01 to 30 Feet	1 min. 20 sec.	1 min. 45 sec.	2 min. 10 sec.

6. If any manhole fails the vacuum test, the manhole shall be repaired with a non-shrinkable grout or other material or method approved by the Director of Public Utilities, or his/her designee. The manhole surfaces shall be properly prepared prior to any repairs. Once the repair material

has cured according to the manufacture's recommendations the vacuum test shall be repeated. This process shall continue until a satisfactory test is obtained.

7. All temporary plugs and braces shall be removed after each test.

~~See section 511.01 for manhole testing.~~

See section 519.00 Testing Requirements for Gravity Sewers and Pipes.

See Section 519.01 Testing Requirements for Low Pressure Force Mains.

An Occupancy Permit shall not be issued until the sanitary sewers are tested and accepted by the City of Fairfield. See section 520.00 for building permits and occupancy.

516.00 Fat, Oil, and Grease (FOG), waste food, and sand interceptors. FOG, waste food and sand interceptors shall be installed when in the opinion of the City of Fairfield they are necessary for the proper handling of liquid wastes containing Fats, Oils and Grease, ground food waste, sand, soils, or other harmful ingredients in excessive amounts, which impact the wastewater collection system. All interceptors shall be of a type and capacity as approved by the City of Fairfield, or the Butler County Department of ~~Environmental Services (BCDES)~~ **Water and Sewer (BCWS)** as the governing jurisdiction requires. In general, the interceptor shall be designed to meet the Plumbing and Drainage Institute (PDI) standards.

New construction and renovation of Food Service Establishments shall be required to install adequately sized grease interceptors necessary to maintain FOG compliance. All car washes, truck washes, garages, service stations, laundries, airport facilities, and other sources of sand, soil and oil shall have effective sand, soil and oil interceptors installed.

Oil and grease interceptors shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight, and be equipped with easily removed covers, which when bolted in place shall be gas tight and waterproof. The interceptor shall be installed at a location where it can be easily accessed for inspection, cleaning, and removal of accumulated grease and installed as close as possible to the source of the FOG laden hot water. Access manholes, with a minimum diameter of twenty-four (24") inches shall be provided over each grease interceptor chamber. The access manhole shall extend to finished grade and be designed and maintained to prevent water inflow or infiltration. Grease interceptor sizing shall be a minimum of five hundred (500) gallons, and meet the PDI design guidelines.

Where installed, all oil, grease and sand interceptors shall be maintained by the owner at his expense while providing continuous operation at all times. The owner shall maintain a yearly maintenance logbook subject to the review by the Director of Public Utilities, or their agent(s). The owner shall provide for the proper removal and disposal of the captured material. Grease interceptors shall be fully pumped out and cleaned at a frequency such that the combined FOG and

solids accumulation does not exceed the twenty-five (25%) percent of the total design hydraulic depth of the grease interceptor.

All food service establishments shall pump out and fully clean the grease interceptor not less than every 90 days. Permits for the hauling and disposal of this material must be secured from the Butler County Health Department.

516.01 FOG Capacity Sizing Procedure for Restaurants based on the UPC Code.

This procedure is not based on any determining flow rates. Specify the standard

<i>Interceptor size (liquid capacity)=Number of meals per peak hour¹ x Waste flow rate² x Retention time³ x Storage factor⁴</i>	
1. Meals Served at Peak Hour	
2. Waste Flow Rate	
a. With dishwashing machine	6-gallon flow
b. Without dishwashing machine	5-gallon flow
c. Single-service kitchen	2-gallon flow
d. Food-waste disposer	1-gallon flow
3. Retention Times	
a. Commercial kitchen waste- Dishwasher	2.5 hours
b. Single-service kitchen- Single serving	1.5 hours
4. Storage Factors	
a. Fully equipped commercial kitchen	
8-hour operation:	1
16-hour operation:	2
24-hour operation:	3
b. Single- service kitchen: 1.5	

size with a capacity greater than or equal to the calculated size.

516.02 FOG Capacity Sizing Procedure for Establishments based on Maximum Flow Rate.

This method is based on the probability that no more than two fixtures discharge at the exact same time. Use the table below to determine the flow rates.

Note: Floor drains in the kitchen areas where FOG may spill on the floor shall be routed to the grease interceptor but shall not be connected in the design calculations for maximum flow, because grease concentrations are likely to be a lot lower than from fixtures.

$S=GL \times 225$	S= Interceptor size in gallons	GL= Flow rate of fixtures in dishwasher
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1. Determine the largest fixture and the dishwasher size discharging into the interceptor. Do not use floor drains in this equation.
2. Add the dishwasher and the single largest flow rates together. If there is no dishwasher, add the two largest fixture flow rates together. This is the maximum probable flow rate into the interceptor.

3. Multiply the flow rate by 225 to calculate the minimum grease retention in gallons. This figure of 225 has a proven history of success.
4. Specify the standard size with a capacity greater than, or equal to the calculated size.

Drainage Fixture Size in Inches equivalent	=	Peak gallons per minute
1- 1.5		2.25
2		3.0
2.5		3.5
3		4.5
4		6.0

Note: the drainage fixture flow rate is from the UPC and the dishwasher flow rates are from the EPA.

Dishwasher	
Up to 30-gallon water capacity	1.5
Up to 50-gallon capacity	2.5
Up to 100-gallon capacity	4.0

517.00 Closed Circuit Television (CCTV). All new sanitary sewer extensions shall be CCTV camera inspected by the City of Fairfield Wastewater Division prior to acceptance. The sanitary laterals shall also require additional CCTV camera inspection as a condition of acceptance. All construction must be completed and approved by the inspector prior to the CCTV inspection. The sewer lines and manholes shall be cleaned before the inspection process. A camera inspection will be performed after the Air test of the sanitary system(s). Additional CCTV inspections shall be performed when warranted.

The contractor shall bear all costs for correction of deficiencies found during the CCTV inspection, including the cost for additional CCTV camera inspection(s) to verify the correction of deficiencies.

No performance bond shall be released until a CCTV inspection has been performed, and the sanitary work has been approved for quality assurance by the City of Fairfield. The City of Fairfield may also CCTV inspect the sewer lines prior the expiration of any warranty, or again before final acceptance of a subdivision or other project as necessary.

If an unsatisfactory condition is found, that condition shall be presumed to have been caused by defective workmanship, or materials. The Contractor shall be directed to correct the work in a manner as approved by the City of Fairfield Wastewater Division.

518.00 Grinder Pumps and Low Pressure Force Main Systems. In developments where first-floor gravity service can be provided, but basements cannot be served by gravity, individual grinder pumps will be permitted to provide basement sewer service. In this event, gravity sewers shall be installed throughout the development such that each building can be provided with first-floor-only gravity sewer service.

The lowest level serviced by a gravity sewer shall be a minimum of three (3) feet above the top of the receiving sewer at the point of connection. If the minimum separation cannot be achieved, then an on-site individual sanitary grinder pump system is required. No public or shared force mains will be permitted where first-floor gravity service can be provided.

The installation of grinder pump systems creates an ongoing operation and maintenance expense for the property owners and transfers the burden of extending off-site trunk sewers to the City of Fairfield and its sewer customers (existing and future).

It is the goal of the City of Fairfield Public Utilities Department to provide for the conveyance of wastewater by natural gravity flow wherever, and whenever possible.

518.01 Complete System Design Requirements for Low Pressure Mains. Plans shall be consistent with a complete system design submittal which shall be approved by the pump manufacturer and submitted to the City of Fairfield's Department of Public Utilities for approval for each set of plans.

518.02 The Complete system design shall include:

1. Numbers of properties served by each force main and force main branch.
2. Type of occupancy and anticipated flow rate for each property.
3. Development sequence and timetable.
4. Design flows (average, daily peak, instantaneous peak etc.).
5. Grinder pump system manufacturer and model number(s). Include catalog cut sheets, pump curve(s), and a description of system features.
6. Small scale sketch of entire pump system, including pump locations and elevations; location and direction of flow for each individual force main/service lateral, and each common force main or branch; location and elevation of discharge point(s); locations and elevations of any high points in the system. Each branch or zone shall be identified on the sketch with a unique branch number. Branches/zones shall be divided as described below.
7. Table indicating the following information for each branch-zone to include:
 - a). Branch number.
 - b). Number of pumps connected directly to the branch.
 - c). Accumulated total number of pumps connected directly or indirectly.
 - d). Maximum daily flow in branch.
 - e). Pipe size.

- f). Maximum daily velocity in branch.
- g). Length of branch.
- h). Friction loss in branch per Hazen Williams with C 120.
- i). Accumulated friction loss.
- j). Maximum force main elevation (between branch and discharge).
- k). Maximum pump elevation (connected directly to branch).
- l). Maximum elevation difference.
- m). Maximum total dynamic head (for pump connected directly to branch).

518.03 Maximum Daily Design. The force main design maximum daily velocity (i.e. minimum velocity anticipated to occur at least once each day) shall not be less than 1.90 feet per second (fps) and not greater than 4.0 fps. This requirement shall apply to each force main branch or zone. Zones shall be divided based on the number of grinder pumps connected as shown in the following table. A new zone shall also be defined on each side of any common force main junction. The following table shall be used to determine the maximum number of grinder pumps operating simultaneously daily in each zone.

Maximum Number of Grinder Pumps Operating Simultaneously Daily

Number of Grinder Pumps Connected (Each range represents a separate zone.)	Maximum Number of Grinder Pumps Operating Simultaneously Daily
1	1
2-3	2
4-9	3
10-18	4
19-30	5
31-50	6
51-80	7

518.04 Basic Design and Construction requirements for low pressure systems. All grinder pump systems shall be designed and constructed in accordance, but limited to, the following:

1. The maximum number of contiguous (or nearly contiguous) homes allowed with private grinder pumps shall be eighty (80) homes. Public wastewater lift stations will be considered for larger developments.
2. All properties to be served by a particular common force main shall be included in the same section of the development and developed at the same time. Any future section requiring a common force main shall have a separate force main independent of any other common force main. Each individual grinder pump installation connected to a common force main shall be consistent with the overall system design approved by the manufacturer and Public Utilities Director.
3. No public force main branches shorter than three hundred feet (300') will be permitted. Homes or other buildings on short cul-de-sac streets or panhandle/ flag lots shall be served via parallel individual service laterals.

4. Where grinder pumps are required, each building or property that is (or could potentially be) owned by a different owner shall have a separate wet well tank, grinder pump, and force main/service lateral.
5. No individual/private force main discharging directly to a gravity sewer will be permitted longer than will allow for a complete turnover of the sewage in the force main at least four times per day at 150 gallons/day per residential home.
6. **Single-family pipe requirements:** All individual force mains and service laterals shall be 1-1/4" or 1-1/2" nominal diameter SDR 21 PVC, Schedule 40 PVC (200 psi) or other approved material. Diameter (1-1/4" or 1-1/2") shall be determined during the design of each project/installation and shall be approved by the Public Utilities Director. Joints shall be rated for at least 200 psi.
7. **Commercial and Multi-family Residential pipe requirements:** All individual force mains and service laterals shall be sized according to the estimated average flows anticipated from each building or parcel, with a minimum size of 1-1/4" nominal diameter. Pipe diameter shall be approved by the Public Utilities Director. Piping smaller than 3" nominal shall be SDR 21 PVC, Schedule 40 PVC (200) psi or other approved material. Piping 3" nominal diameter and larger shall be Ductile Iron Class 53. Joints shall be rated for at least 200 psi.
8. Detectable magnetic marking tape shall be installed in the ditch line one-foot (1') below the final surface grade for non-metallic pipe installed within the public right-of-way and easements.
9. Private force mains that connect to a public gravity sewer shall connect via a "Wye" fitting. No private force main connections to public manholes will be allowed.
10. Private Service laterals that connect to a common/public force main shall connect at a manufactured fitting. No direct taps or tapping saddles will be permitted on public force mains. No new service connections to existing force mains will be permitted-only those connections included in the original design. A brass curb stop and cast-iron stop box shall be installed inside the public right-of-way or easement on each service lateral and shall be located approximately five feet (5') from the public force main. Curb stops shall be least two inches (2") lower than the connection of the service lateral to the public force main. All curb stops shall be made of brass, and all curb-stop-boxes shall be made of cast iron. The top of each curb stop box shall be set in a concrete slab 18"x18"x6" thick (or 18" circular x6" thick) with the top of the slab and box flush with the top of the ground.
11. Each individual/private force main or service lateral shall have at least one check valve located at the pump, and an additional redundant check valve located at the curb-stop. Check valves and all other portions of the private force main or service lateral shall meet the pump manufacturers requirements and recommendations.
12. All public force mains shall be at least 2" nominal diameter. Force mains 3" nominal diameter and larger shall be Ductile Iron Class 53. Force mains

smaller than 3" nominal diameter shall be SDR 21 PVC (200)psi with gasketed joints. Other materials may be allowed for force mains smaller than 3" if they are demonstrated to be more reliable and suitable for this application and are approved by the City of Fairfield. Detectable magnetic marking tape shall be installed in the ditch line for non-metallic public force mains both one foot (1') below the final surface grade and one foot (1') above the force main.

13. Private force mains shall be installed with a minimum of four feet (4') ground cover. Common/public force mains shall be installed with a minimum of six feet (6') and a maximum of twelve feet (12') ground cover. A minimum of ten feet (10') horizontal clearance (for parallel installations) and eighteen inches (18") vertical clearance (at crossings) shall be maintained between all force mains/services laterals and water mains/services.
14. Whenever possible, common/public force mains should be installed with a continuous positive grade to the discharge into the gravity sewer. Approved air/vacuum release valves shall be installed anywhere where this is not possible and where localized high points exist or long runs (greater than 2500 feet) with no clearly defined high point occur. Air/vacuum release valves shall be installed on upward-turned tees. Taps or tapping saddles are not allowed. The Engineer and plumber should also evaluate the need for air release valve(s) at high points on private force mains and service laterals.
15. Flushing installations shall be installed at the end of each common force main (farthest from the discharge point), at each junction of two common force main branches, and at intermediate points such that the maximum distance between flushing installations (or discharge point) is one thousand feet (1000'). The Engineer and plumber should also evaluate the need for flushing attachments on private force mains and laterals.
16. Public force mains shall discharge into a gravity sewer through a separate manhole with no up-stream gravity sewer connections. The force main shall be extended along the bottom of the manhole and approximately ten feet (10') into the gravity sewer at the sewer's invert. A flow channel and bench shall be formed in the manhole to allow any water or sewage to drain into the gravity sewer, but still allow access into the sewer for maintenance. No laterals may be connected into the gravity sewer within twelve feet (12') of this manhole.
17. A hydrostatic pressure test at 150 psig for at least 2 hours shall be performed in accordance with the Hydrostatic Testing Requirements of AWWA C600 on all force mains and service laterals. If the pressure drops more than 5 psi in two hours, or the leakage is greater than allowable as determined by the formula in AWWA C600, the test shall be considered failed. Common force mains shall be tested after all air release valves, flushing installations, and other appurtenances have been installed, including all service laterals installed to the curb stop. Private force mains and service laterals (on the pump side of the curb stop) shall be tested after the entire system is

completely installed (except for the connection to the gravity sewer, when applicable).

18. The following requirements apply to installations connected to common force mains: All pumps shall be progressive cavity non-clogging, non-jamming grinder pumps capable of pumping 15 g.p.m. at 0 feet TDH, 9 g.p.m. at 138 feet TDH, and capable of operating at negative TDH without overloading the motor. The maximum design Total Dynamic Head (TDH) for any pump shall be 138 feet (60 psig) with the maximum number of grinder pumps operating simultaneously daily (see article five). Grinder pump motor shall have built-in automatic reset overload protection. Grinder pumps shall be designated for the specific purpose of grinding and domestic wastewater. Grinder pumps shall be suitable for operation under varying conditions in a system with multiple other grinder pumps. An anti-siphon valve and check valve shall be integral with the grinder pump. Level sensing control for grinder systems shall be non-fouling type with no moving parts in contact with the sewage. Each grinder pump system shall have a high-level audible and visual warning alarm to warn the building's occupants of a high wet well level. A battery backup system is recommended. Future replacement pumps must be the same type and meet the same operating conditions as the original pump.
19. Detectable marking tape shall meet the following requirements:
 - Minimum thickness of 5 mil, with a solid aluminum foil core. Construction is 2 mil clear film, reverse print laminated to aluminum foil to 2 mil clear film, making the film permanently printed.
 - Minimum width of 3 inches (3").
 - Color coded green to signify Sewer or associated line.
 - Tensile strength of 35 lbs./in. (15,000 psi).
 - Elongation of 80%.
 - Adhesives with value of Morton 548 or higher.
 - Bottom layer with the value of virgin PE.
 - Top layer with the value of virgin PET.
 - Printability value of 45 dynes.
20. Where future gravity service is reasonably possible (as determined by the Director of Public Utilities, or his/her designee) and there is unsewered upstream property, a dry gravity sewer shall be installed from the most reasonable point at the downstream property line of the proposed development (for connection to the future trunk sewer) to the upstream boundary/boundaries of the development. This dry sewer shall be installed prior to acceptance of the grinder pump system by the City of Fairfield.
21. Whenever there is potential for installation of a future gravity sewer to serve the involved properties, each building utilizing a grinder pump system shall have a gravity sewer drain through the building's foundation to facilitate connection to the future sewer, whether the grinder pump is located inside or outside the foundation.

22. Where future gravity sewer service is reasonably possible, adequate platted right-of-way and/or easements shall be provided for future local gravity sewers. Each building's gravity sewer drain shall leave the foundation at a location that will facilitate connection to the future gravity sewer.

518.05 Operation and Maintenance. All individual grinder pump facilities and force mains serving only one home or property shall be privately owned and maintained by the property owner. All common force mains serving multiple properties will be publicly owned and maintained by the City of Fairfield.

The City of Fairfield will maintain the service lateral from the public force main to (and including) the curb-stop. The property owner will be responsible for the private service lateral or force or force main from the curb-stop the pump. The property owner shall maintain all check valves on the private service lateral and/or force main.

The property owner shall be responsible for operation, maintenance, and future replacement of the private grinder pump system. At least annual maintenance of each grinder pump system shall be performed by a licensed plumber/contractor, which is certified and approved by the equipment manufacturer. Documentation of all maintenance shall be provided to the City of Fairfield's Public Utility Department. Failure to adequately maintain the private pump system or provide the required documentation will cause for disconnection of sewer service by the City of Fairfield.

518.06 Construction Plan Requirements. The following language shall be included on all construction drawings for developments that include any lots to be served by private grinder pump systems. Such plats shall clearly indicate which lots require grinder pumps, and appropriate utility easements.

1. Where grinder pumps are required, each building or property that is (or could potentially be) owned by a different owner shall have a separate wet well tank, grinder pump, and force main/service lateral.
2. Each individual grinder pump installation connected to a common force main shall be consistent with the overall system design approved by the pump manufacturer and the City of Fairfield's Director of Public Utilities Department, or his/her designee.
3. Each building utilizing a grinder pump system shall have a gravity sewer drain through the building's foundation at a location that will facilitate connection to a future gravity sewer, unless future gravity sewer service is not possible.
4. All individual grinder pumps facilities and force mains serving only one home or building shall be privately owned and maintained by the property owner. All common force mains serving multiple properties will be publicly owned and maintained by the City of Fairfield.

5. All individual force mains and service laterals shall be 1-1/4" or 1-1/2" nominal diameter SDR 21 PVC, Schedule 40 PVC (200 psi) or other approved material.
6. Detectable magnetic marking tape shall be installed in the ditch line one foot (1') below the final surface grade for non-magnetic pipe installed the public right-of-way and easements.
7. Private force mains that connect to a public gravity sewer shall connect via a "Wye" fitting. No private force main connections to public manholes will be allowed.
8. Private Service laterals that connect to a common/public force main shall connect at the original laterals installed with the public force mains. No new service connections to existing force mains will be permitted-only those connections included in the original system design. All curb-stops shall be made of brass, and all curb-stop-boxes shall be made of cast iron. The curb-stop and curb-stop-box shall remain when the connection is made, and the elevation of the curb-stop shall not be changed. The top of each curb-stop-box shall be set in a concrete slab 18" x 18" x 6" thick (or circular x 6" thick) with the top of the slab and box flush with the top of the ground. The City of Fairfield will maintain the service lateral from the common force main to (and including) the curb-stop. The property will be responsible for the private service lateral from the curb-stop to the pump.
9. Each individual/private force main or service lateral shall have one check valve located at the pump, and an additional redundant check valve located at the curb-stop. The property owner shall maintain all check valves. Check valves and all other portions of the private force main or service lateral shall meet the pump manufacturer's requirements and recommendations.
10. No individual/private force main discharging directly to a gravity sewer will be permitted longer than will allow for the complete turnover of the sewage in the force main at least four times per day per day at 150 gallons/day per residential home.
11. The property owner shall be responsible for operation, maintenance, and future replacement of the private grinder pump system.
12. The annual maintenance of each grinder pump system shall be performed by a licensed and bonded plumber/contractor, which is certified and approved by the equipment manufacturer. Documentation of all maintenance of all pumping shall be provided by request to the City of Fairfield Director of Public Utilities, or his/her designee. Failure to adequately maintain the on-site pump system, or provide the required documentation will cause for disconnection of sewer by the Public Utilities Department.
13. The Engineer and plumber should evaluate the need for air release valve(s) and/or flushing attachments on private force mains and service laterals.
14. A hydrostatic pressure test of each private force main/service lateral shall be performed in accordance with the City of Fairfield requirements.
15. The following requirements apply to installations connected to a common force main:

- a) All pumps shall be progressive cavity non-clogging, non-jamming grinder pumps capable of pumping 15 g.p.m. at 0 feet TDH, 9 g.p.m. at 138 feet TDH, and capable of operating at negative TDH without overloading the motor.
- b) The grinder pump motor shall be designated for the specific purpose of grinding and pumping domestic wastewater. Grinder pumps shall be suitable for operation under varying conditions in a system with multiple other grinder pumps.
- c) An anti-siphon valve and check valve shall be integral with the grinder pump.
- d) Level sensing control for the grinder pump systems shall be of a non-fouling type with no moving parts in contact with sewage.
- e) Each grinder pump system shall have a high-level audible and visual warning alarm to warn the building's occupants of a high wet well level. A battery back-up system(s) is strongly recommended.
- f) Grinder pump systems shall be GP2000 series as manufactured by Environment One Corporation or approved equal. Future replacement pumps must be the same type, and meet the same operating conditions as the original pump. **See City of Fairfield Sanitary Sewer standard drawing for typical low flow grinder pump installation.**

518.07 Deed Restrictions. The following language shall appear on the recorded deed and record plat for each property to be served by a private grinder pump system. The language shall be included on any subsequent deeds, certificates of transfer etc. until such time as the grinder pump system is eliminated and replaced by a different means of providing sanitary sewer to the property.

- 1. The individual force main(s) serving the building(s) on this property, both check valves and all other appurtenances that are a part of the force main, or are connected to it, are private and shall be owned and maintained by the property owner. The curb-stop, curb-stop-box, and force main between the curb-stop and public force main shall be owned and maintained by the City of Fairfield.
- 2. The property owner shall be responsible for operation, maintenance, and future replacement of the grinder pump system. At least annual maintenance of each grinder pump system shall be performed by a licensed and bonded plumber/contractor, which is certified and approved by the equipment manufacturer. Documentation of all maintenance shall be provided to the City of Fairfield's Public Utility Department, 5350 Pleasant Avenue, Fairfield, Ohio 45014. Failure to adequately maintain the on-site pump system, or provide the required documentation will cause for disconnection of sewer service by the Public Utilities Department.
- 3. For installations connected to a common force main:
 - a) All pumps shall be progressive cavity non-clogging, non-jamming grinder pumps capable of pumping 15 g.p.m. at 0 feet Total Dynamic Head (TDH), 9 g.p.m. at 138 TDH and capable of operating at negative

TDH without overloading the motor. Grinder pump motor shall have built-in, automatic reset overload protection. Grinder pumps shall be designated for the specific purpose of grinding and pumping domestic wastewater. Grinder pumps shall be suitable for operation under varying conditions in a system with multiple other grinder pumps. An anti-siphon valve and check valve shall be integral with the grinder pumps. Level sensing control for grinder pump systems shall be non-fouling type with no moving parts in contact with sewage. Each grinder pump system shall have a high-level audible and visual warning alarm to warn the building's occupants of a high wet well level. A battery back-up system is recommended. Future replacement pumps must be the same type and meet the same operating conditions as the original pump.

- b) These conditions are to run with the land, and shall be binding upon the Owner(s) as well as the heirs, successors, administrators, and assigns of the Owner(s), until such time as the grinder pump system is eliminated and replaced by a different approved means of providing sanitary service to the property.
- c) Invalidation of any condition herein by a judgment or court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

519.00 Testing Requirements of Gravity Sewers and Manholes. ~~The intent of these specifications is to insure a sanitary system with a minimum amount of infiltration. To that end, all sewer pipes and manholes shall be inspected for leakage.~~

~~— Sewer pipe joints shall be tight and all visible leakage shall be repaired in a manner approved by the City of Fairfield.~~

~~— Sanitary sewer lines shall be tested after backfill using a low pressure air test in accordance with ASTM C828-76T. All sewer lines and manholes shall also be tested for final acceptance using either the infiltration or exfiltration method as directed by, and in the presence of the City of Fairfield's Construction Inspector. The leakage outward or inward (exfiltration and infiltration) shall not exceed 100 gallons per inch of pipe diameter per mile per day (24 hours) for any section of the system. An exfiltration or infiltration test shall be performed with the minimum positive head of two (2') feet. All sanitary sewer mains and manholes shall be air tested by the Contractor. The test procedure may be used as a presumptive test which enables the installer to determine the acceptability of the line prior to backfill and subsequent construction activities.~~

All completed piping shall be tested as specified herein by low-pressure air test, exfiltration, or infiltration test prior to backfilling to test for leaks. The maximum leakage allowance for all sanitary sewers shall be 50 gallons per inch diameter per mile of pipe per 24 hours. If the level of the current prevailing groundwater is two feet or more above the top of the sewer pipe, an infiltration test will be required.

At the request of the Inspector, a low pressure air test or exfiltration test will be performed instead of or in addition to an infiltration test if the ground water level is uncertain. Labor, equipment and supplies required for all tests shall be furnished by the Contractor. The Contractor shall flush and clean the sewer line to the satisfaction of the Inspector prior to testing. The Inspector shall witness and approve all leakage tests. In the event the Contractor performs any test without witness by the Inspector, the Contractor will be required to test the section again at no cost to the City. The Contractor and Inspector shall sign all test reports. Note that only four sections (approximately 1,200 – 1,600 feet) of sewer will be permitted to remain untested at any time.

Low Pressure Air Test:

Prior to backfilling, the air test shall be conducted between two consecutive manholes. Low pressure air tests shall be in accordance with ASTM C 924-02, or current standard, for concrete pipe or F 1417-11a, or current standard, for plastic pipe, except as specified by the Director of Public Utilities, or his/her designee, herein. All pipe outlet must be plugged in the section being tested with suitable test plugs. One of the plugs used at a manhole must be tapped and equipped for an air inlet connection for filling the line from the air compressor.

Air shall be supplied slowly to test section until the internal pressure reaches approximately 4 pounds per square inch (psi). At least 2 minutes shall be allowed for the air pressure to stabilize. When the pressure has stabilized and is at or above 3.5 psi, the air supply shall be disconnected and timing shall begin. Timing shall continue until the pressure has dropped 1.0 psi. If the time elapsed before the pressure drops 1.0 psi is greater than the specified minimum holding time, the section shall be considered to have passed the test. If the time is less than the specified minimum holding time, the section shall be considered to have failed and must be repaired or replaced.

Minimum Holding Time shall be calculated from the following equation:

$$\text{Holding Time (minutes)} = 0.00037 \times D^2 \times L / Q$$

where D = Pipe Diameter (inches)

L = Length of Pipe Tested (feet)

Q = Allowable Air Loss (ft³/min) from Table: Minimum Holding Time for Low Pressure Air Test

An air pressure correction is necessary when the current prevailing groundwater is above the invert of the sewer line being tested. Under this condition, the air test pressure shall be increased 0.433 psi for each foot the groundwater level is above the invert of the pipe. All gauge pressures shall be increased by this amount. If the current prevailing groundwater is more than 24 inches above the invert of the

pipe, the infiltration or exfiltration test should be used as required above. Thus, internal air pressures should never exceed 5.0 psi.

Minimum Holding Time for Low Pressure Air Test

Nominal Pipe Size, (Inches)	Time per 100 feet
6	42 seconds
8	1 minute – 12 seconds
10	1 minute – 30 seconds
12	1 minute – 48seconds
15	2 minutes – 6 seconds
18	2 minutes – 24 seconds
21	3 Minutes
24	3 minutes – 36 seconds
27	4 minutes – 12 seconds
30	4 minutes – 48 seconds
33	5 minutes – 24 seconds
36	6 minutes

Allowable Air Loss for Low Pressure Air Test

Nominal Pipe Size (Inches)	Air Loss (Q), ft³/min
6 and 8	2
10	2.5
15	3
15	4
18	5
21	5.5
24	6
27	6.5
30	7
33	7.5
36	8
42	9
48	10
54	11
60	12
66	13
72	14

Infiltration Test:

The Contractor may elect to use an infiltration test when the level of the current prevailing groundwater is two (2) feet or more above the top of the sewer pipe, including all service laterals, at the highest point of the section being tested. The inlet end(s) of the upstream manhole shall be securely sealed. The downstream sewer shall be completed and open to allow the sewer to drain. The Inspector shall approve the length of sewer to be tested at one time. The Inspector may require that each manhole span be tested separately. The amount of infiltration

shall be measured by means of a weir located in the downstream manhole. The test head shall be maintained for a period of at least 24 hours before the weir measurement is made. Infiltration shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours. This infiltration test may not be performed until the sewer line and manholes are completed and all known leaks are repaired. The Contractor will be required to correct all conditions that permit visible infiltration and may be required to relay sections with such conditions that cannot be corrected, even though infiltration is within allowable limits.

Exfiltration Test:

When the exfiltration test is selected, the inlet ends of the upstream and downstream manholes shall be sealed with watertight plugs or bulkheads, and the sewer along with the upstream manhole shall be filled with water until the elevation of the water in the upstream manhole is: 1) two feet higher than the top of the sewer pipe, including all service laterals, at the highest point of the section being tested, or 2) two feet above the level of the current prevailing groundwater, whichever is the higher elevation. The test level shall be clearly marked in the upstream manhole. The entire length of section to be tested shall be filled and maintained full of water for a period of at least 24 hours prior to the start of the test. If the water level in the upper manhole drops during this 24 hour period, the level shall be raised to the test level mark prior to start of the test. Exfiltration will be determined by measuring the amount of water required to maintain the marked water level for a period of 1 hour from the start of the test. The allowable leakage of 50 gallons per inch diameter per mile of pipe per 24 hours based on a maximum difference in elevation of 8 feet between the water level in the upstream manhole and the invert of the pipe being tested in the lower manhole or the current prevailing groundwater level, whichever is higher. If this difference in elevation exceeds 8 feet, the allowable leakage shall be increased 5 percent for each 1 foot in excess of 8 feet. All observed leaks shall be corrected even if exfiltration is within the allowable limits.

519.01 Testing Requirements of Low-Pressure Force Mains. A hydrostatic pressure test at 150 psig for at least two (2) hours shall be performed where joints are exposed and not less than eight (8) hours where joints are covered. All tests will be conducted in accordance with the Hydrostatic Testing Requirements of AWWA C600, or current standard, on all force mains and service laterals. Pressure shall be measured at low point on section of pipelines. The contractor shall furnish all gauges, meters, pumps and other equipment required and shall maintain said equipment for accurate testing.

If the pressure drops more than five (5) psi of leakage is greater than allowable is determined by the formula in AWWA C600, or current standard, the test shall be considered failed. Common force mains shall be tested after all air release valves, flushing installations, and other appurtenances have been installed and with all service laterals installed at least to the curb stop. Private force mains and service

laterals (on the pump side of the curb-stop) shall be tested after the entire system is completely installed (except for the connection to the gravity sewer, when applicable).

520.00 Building Permits and Occupancy. Building permits in a new development (both major and minor Subdivisions) shall not be issued until the sewers serving the structure have been tested and approved. This prevents the unauthorized connection of a structure to a sewer thus preventing a test. A model home for sales display only, and not for immediate occupancy, may be built prior to construction of the sanitary sewers. The house shall not receive an occupancy permit issued until the sanitary sewers are tested and accepted by the City of Fairfield.

521.00 As-Builts. ~~At the completion of construction, the developer shall supply the City of Fairfield with one (1) set of Mylar plans (or other reproducible format) to indicate any and all deviations from the original plans.~~ Within thirty days after completion of construction work on any part of the wastewater system, the contractor shall provide a complete set of certified, reproducible “As Built” drawings to the Public Utilities Director or his/her designee, for all sewers constructed, including those constructed in subdivisions. These plans must be clearly marked “As-Built” on every sheet with all sewer service lateral locations, manholes, inverts, and the distances verified by a post-construction survey made at the developer’s expense.

“As Built” plans shall be provided on reproducible sheets measuring twenty-four (24) inches by thirty-six (36) inches and sealed and signed by the engineer to certify that the “As Builts” are per field conditions and along with an AutoCAD (.dwg or .dxf) on CD or DVD.

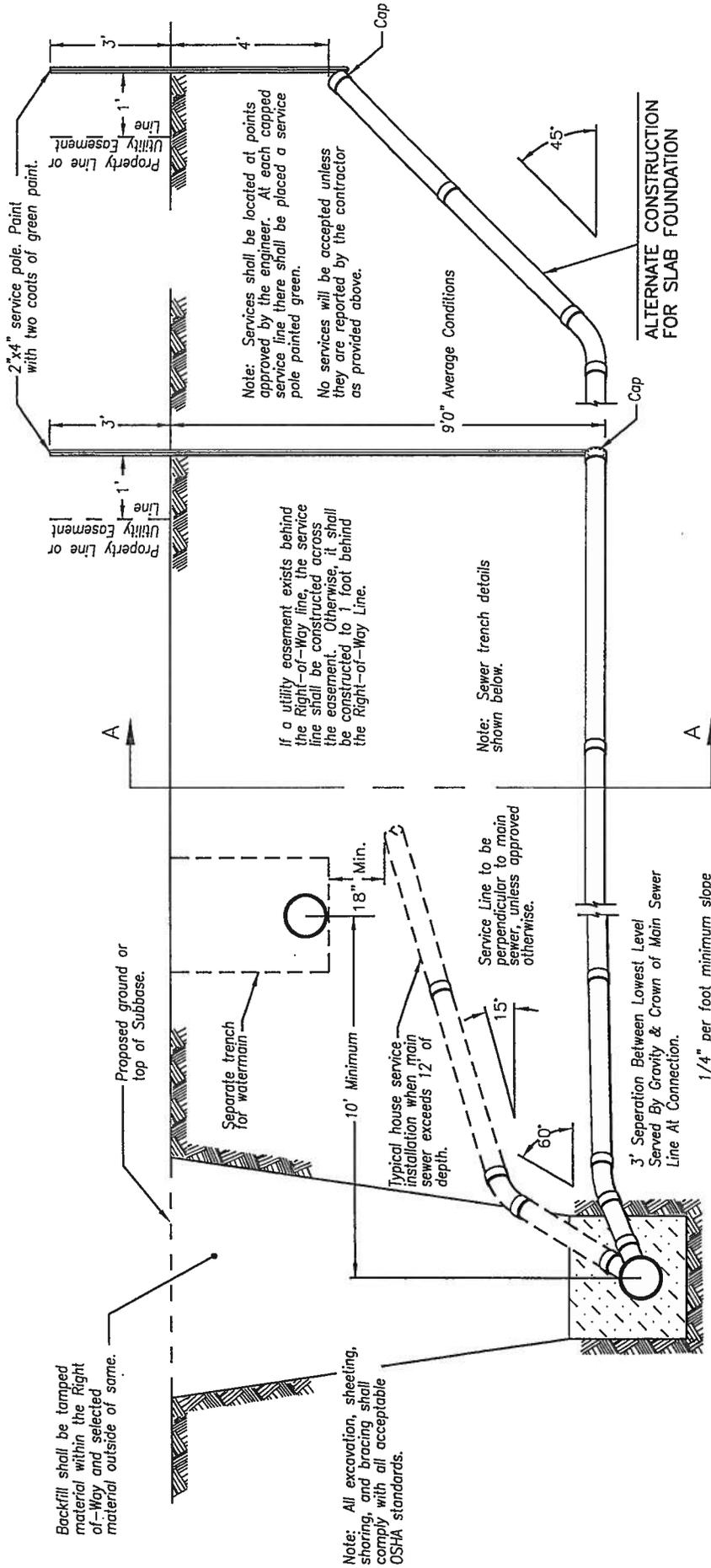
SANITARY SEWER CONSTRUCTION STANDARDS*

*Refer to Section 500 for Complete Specification Details

City of Fairfield Construction Standards Fairfield, Ohio



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SERVICE LINE DETAILS*

*Minimum lateral depth of cover will be 36". Written permission will be required for coverage less than 36".

SANITARY SEWER CONSTRUCTION STANDARDS*

*Refer to Section 500 for Complete Specification Details

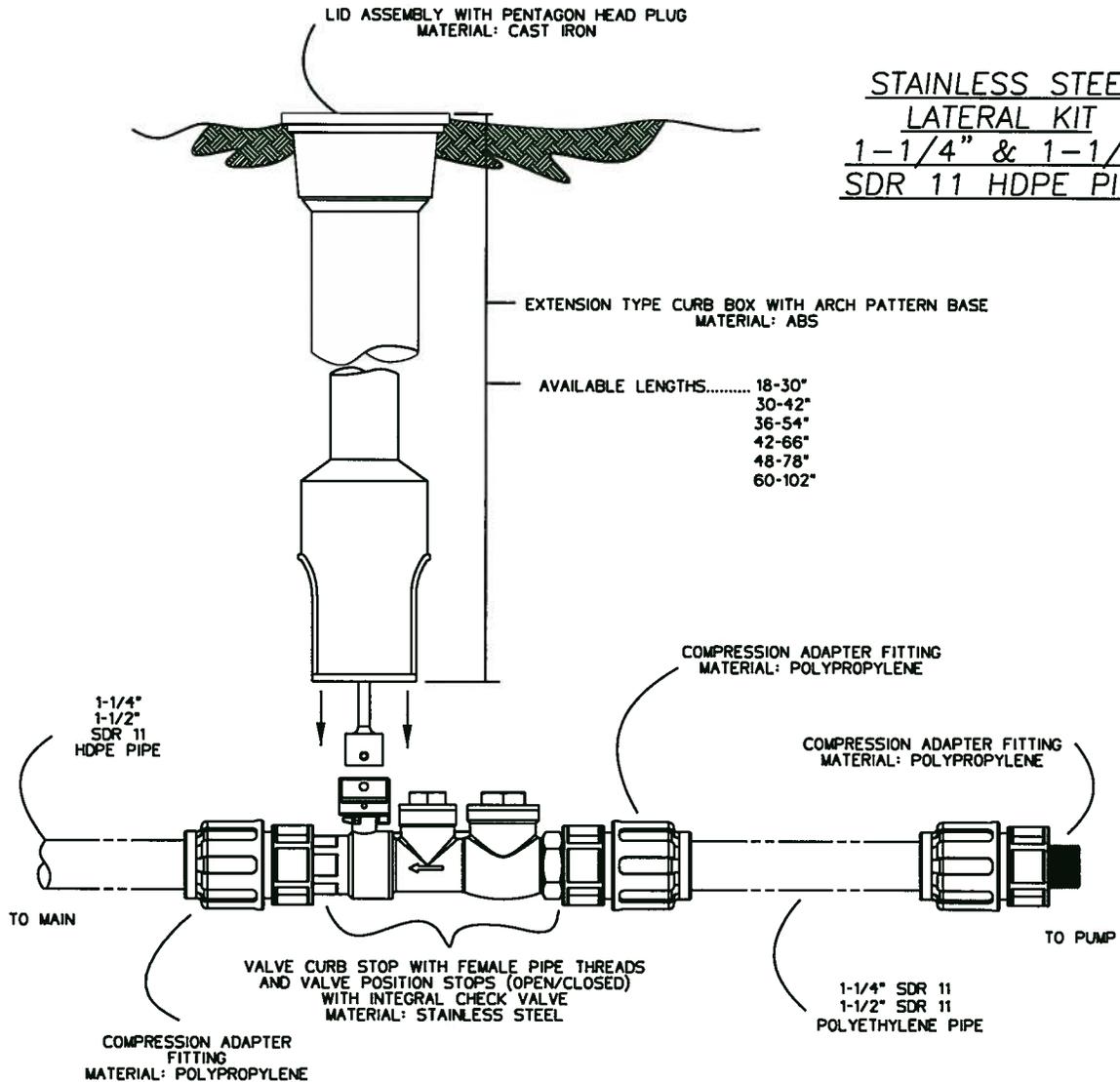
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New Drawing

STAINLESS STEEL
LATERAL KIT
1-1/4" & 1-1/2"
SDR 11 HDPE PIPE



NOTES:

1. SS CURB STOP/CHECK VALVE AND FITTINGS ARE PROVIDED SEPARATELY
2. TO ASSEMBLE, APPLY A DOUBLE LAYER OF TEFLON TAPE, A LAYER OF PIPE DOPE TO THE THREADS ON THE PLASTIC FITTINGS AND INSTALL PER THE MANUFACTURER'S INSTRUCTIONS
3. ASSEMBLY IS TO BE PRESSURE TESTED
4. ASSEMBLY IS TO BE USED WITH SDR11 HDPE PIPE
5. TO ORDER SS LATERAL KIT

SANITARY SEWER CONSTRUCTION STANDARDS*

*Refer to Section 500 for Complete Specification Details

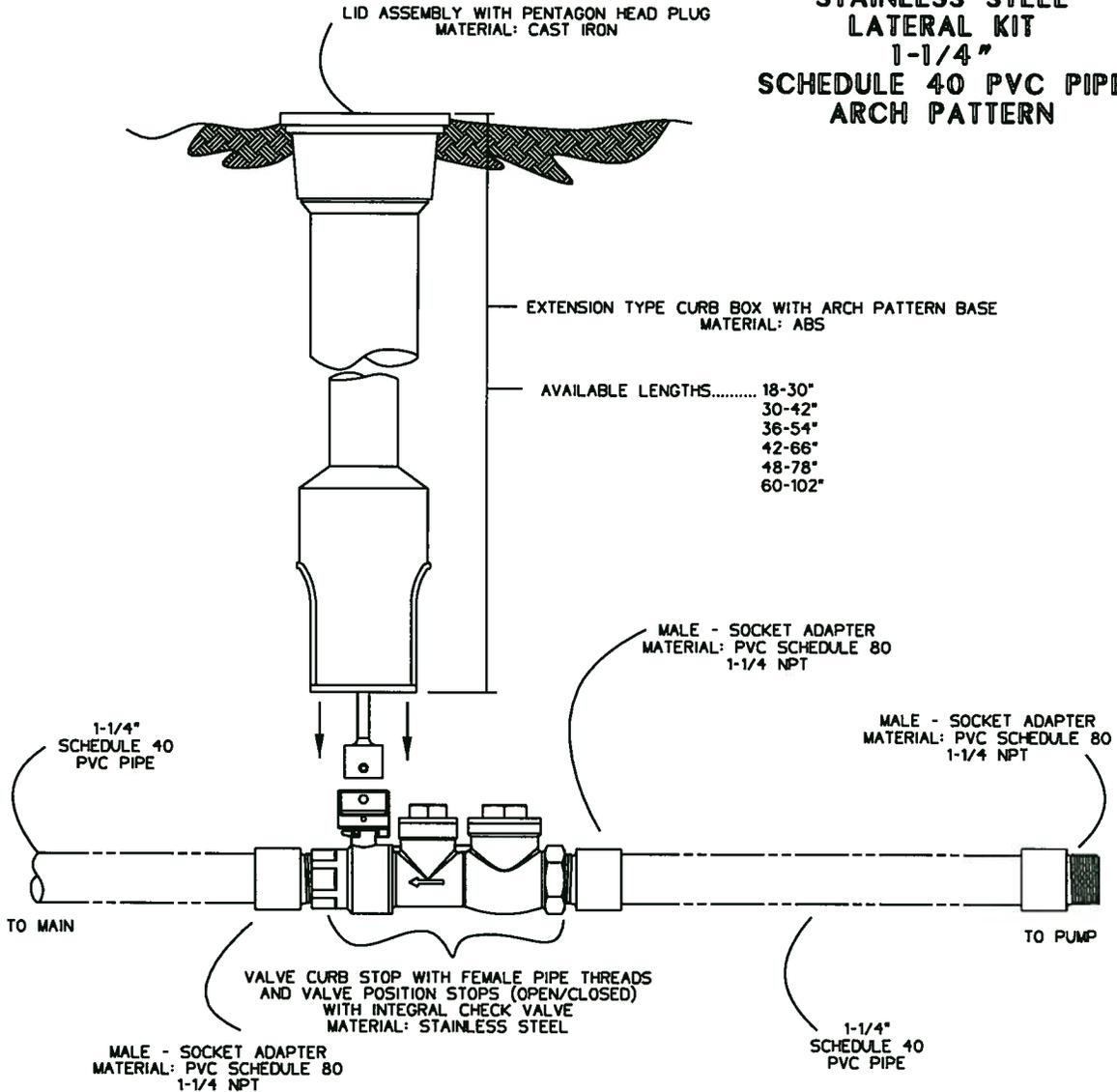
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New Drawing

STAINLESS STEEL LATERAL KIT 1-1/4" SCHEDULE 40 PVC PIPE ARCH PATTERN



NOTES:

1. SS CURB STOP/CHECK VALVE AND FITTINGS ARE PROVIDED SEPARATELY
2. TO ASSEMBLE, APPLY A DOUBLE LAYER OF TEFLON TAPE, AND A LAYER OF PIPE DOPE TO THE THREADS ON THE PLASTIC FITTINGS AND INSTALL PER THE MANUFACTURER'S INSTRUCTIONS
3. ASSEMBLY IS TO BE PRESSURE TESTED
4. ASSEMBLY IS TO BE USED WITH SDR11 HDPE PIPE
5. TO ORDER SS LATERAL KIT

SANITARY SEWER CONSTRUCTION STANDARDS*

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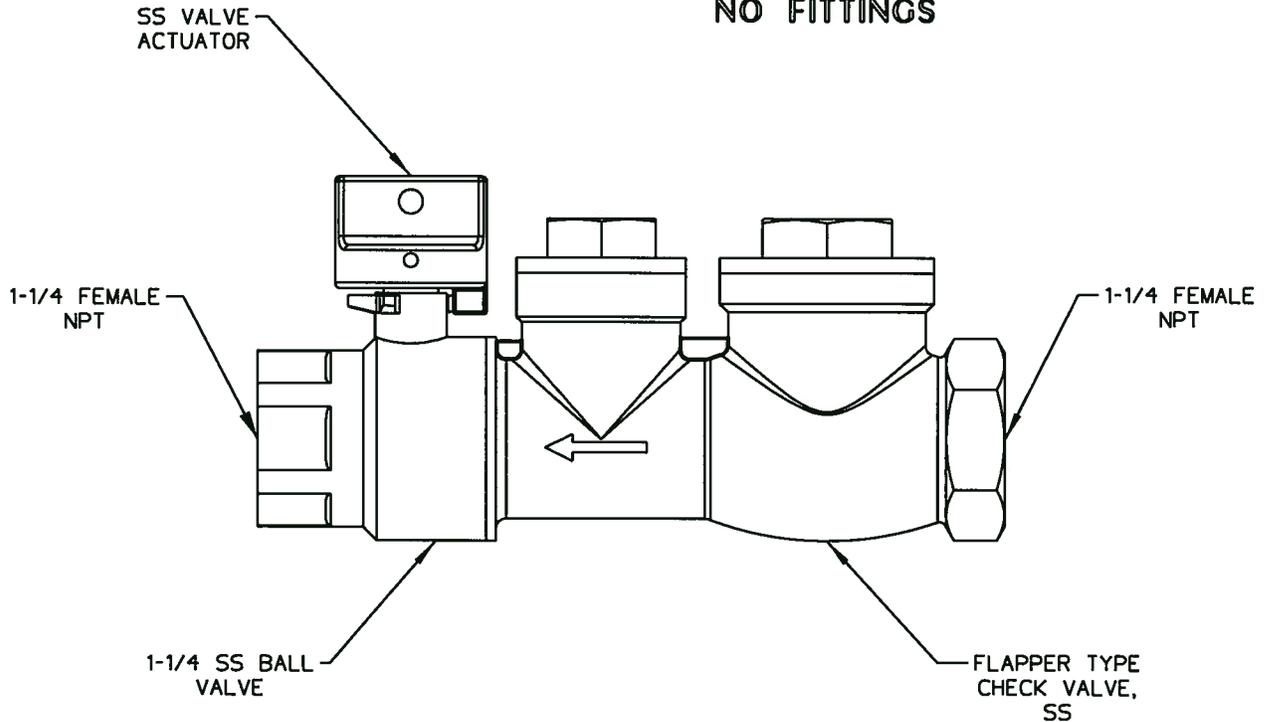
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New Drawing

STAINLESS STEEL LATERAL ASSEMBLY NO FITTINGS



PART IS A BALL VALVE CURB STOP WITH FEMALE PIPE THREADS,
VALVE POSITION STOPS (OPEN/CLOSED), AND INTEGRAL CHECK VALVE
MATERIAL: STAINLESS STEEL

PRESSURE RATING: 235 PSI

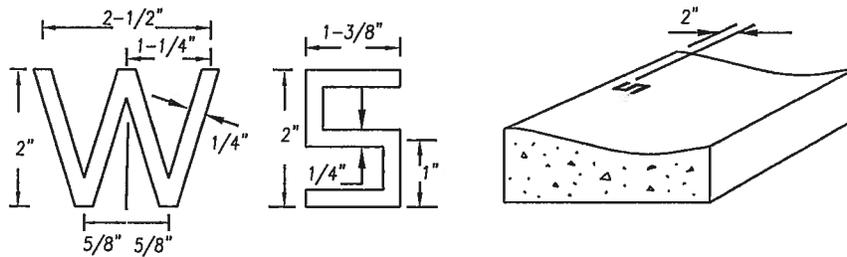
SANITARY SEWER CONSTRUCTION STANDARDS*

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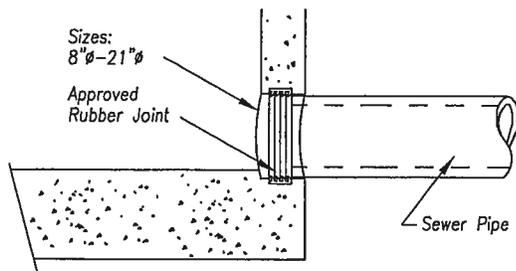
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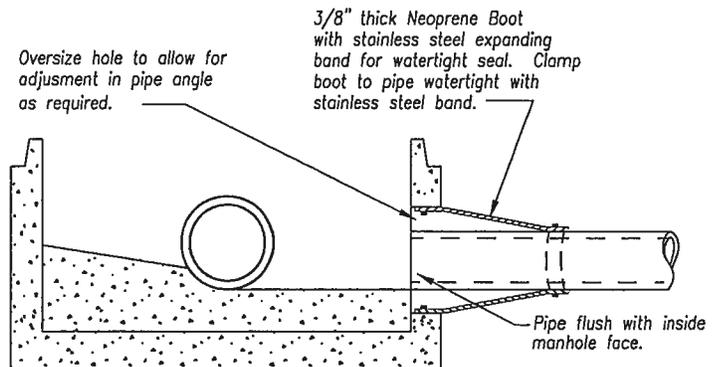
Letters to be impressed into the fresh concrete a depth of 1/2" directly above point where services cross the curb.

WATER & SEWER LOCATION DESIGNATION

NOTE: All joints at pipe openings in the manhole will be thoroughly caulked with cement mortar to prevent infiltration into the manhole.



PIPE CONNECTION DETAIL
ALTERNATE #1



PIPE CONNECTION DETAIL
ALTERNATE #2

SANITARY SEWER CONSTRUCTION STANDARDS*

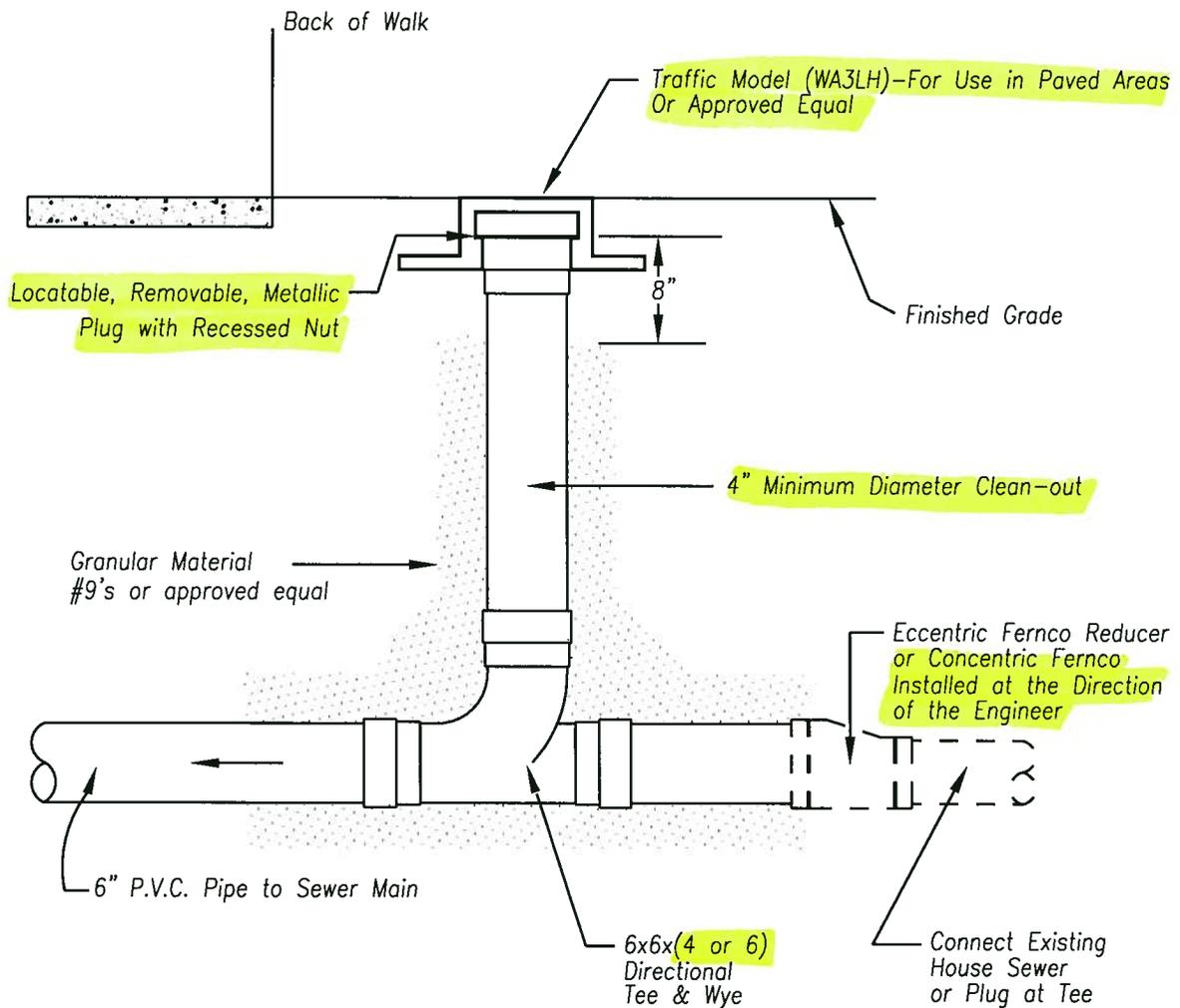
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Note: Clean-Out Cover and/or cap to be locatable with a metal detector.



TYPICAL SANITARY LATERAL CLEAN-OUT

SANITARY SEWER CONSTRUCTION STANDARDS*

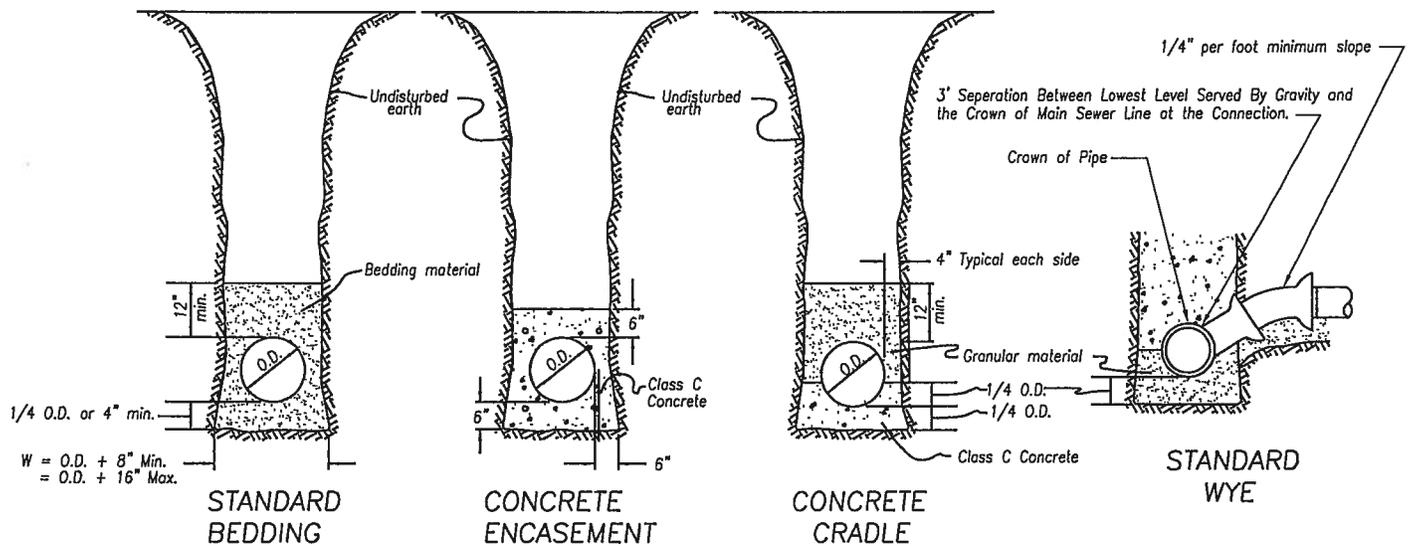
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STANDARD SANITARY TRENCH DETAILS



NOTES:

Bedding consisting of 8's, 9's or 57's will be used in all sewer construction. Other bedding not listed here are considered non-standard and must be approved in writing prior to use.

All building drains and building sewers must be embedded and compacted in sand, pea gravel or grits to four (4) inches above the top of the crown of the pipe.

For new construction; Trench to be backfilled with granular backfill to street subgrade within roadway limits. Granular backfill to be compacted to 90% of maximum density in 8" maximum lifts.

Trench to be backfilled with low strength mortar backfill to street subgrade within existing street limits.

SANITARY SEWER CONSTRUCTION STANDARDS*

*Refer to Section 500 for Complete Specification Details

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SCALE: NONE

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REQUIRED CASING PIPE SIZES AND WALL THICKNESSES FOR RAILROAD CROSSINGS *

NOMINAL DIAMETER (INCHES)	ACTUAL O.D. (INCHES)	WHEN COATED OR CATHODICALLY PROTECTED (INCHES)	WHEN NOT COATED OR CATHODICALLY PROTECTED (INCHES)
8"	8 3/8"	.250	.250
10"	10 3/4"	.250	.250
12"	12 3/4"	.250	.250
14"	14"	.250	.250
16"	16"	.250	.281
18"	18"	.250	.312
20" & 22"	20" & 22"	.281	.344
24"	24"	.312	.375
26"	26"	.344	.406
28"	28"	.375	.438
30"	30"	.406	.469
32"	32"	.438	.500
34" & 36"	34" & 36"	.469	.531
38"	38"	.500	.562
40"	40"	.531	.594
42"	42"	.562	.625
44" & 46"	44" & 46"	.594	.656
48"	48"	.625	.688
50"	50"	.656	.719
52"	52"	.688	.750
54"	54"	.719	.781
56" & 58"	56" & 58"	.750	.812
60"	60"	.781	.844
62"	62"	.812	.875
64"	64"	.844	.906
66" & 68"	66" & 68"	.875	.938
70"	70"	.906	.969
72"	72"	.938	1.000

NOTE:

- BASED ON EBO LOADINGS WITH A MINIMUM COVER AT 4'-6".

STEEL CASING PIPE SHALL HAVE A STEEL YIELD STRENGTH OF 35,000 PSI, MEET ASTM A139 GRADE B REQUIREMENTS

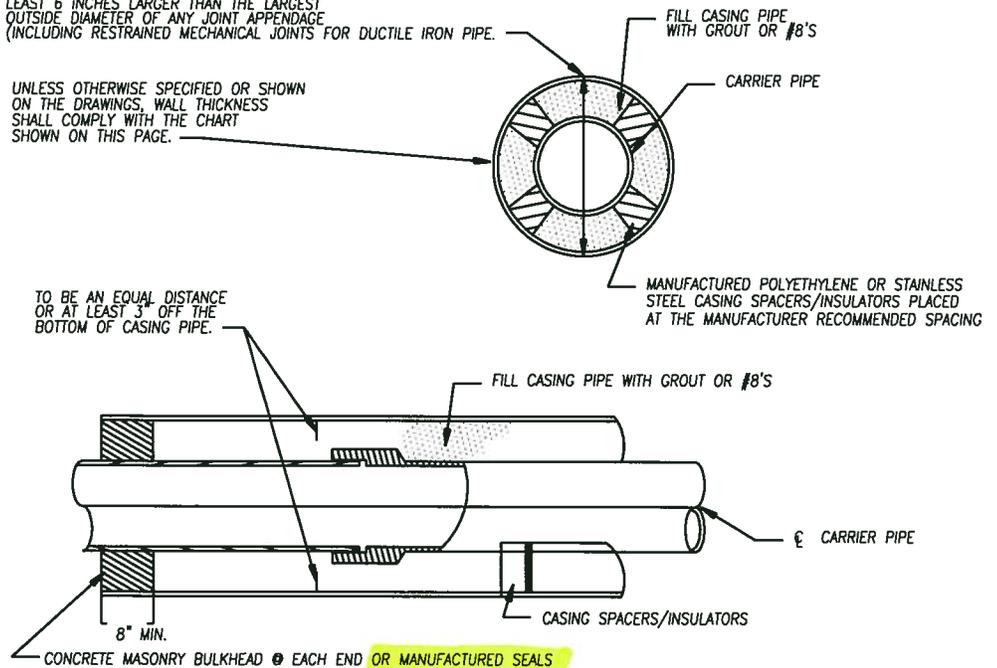
NO HYDROTEST REQUIRED

CHART BASED ON RECOMMENDATIONS FROM AMERICAN RAILWAY ENGINEERING ASSOCIATION

THE I.D. OF THE STEEL CASING PIPE SHALL BE AT LEAST 6 INCHES LARGER THAN THE LARGEST OUTSIDE DIAMETER OF ANY JOINT APPENDAGE (INCLUDING RESTRAINED MECHANICAL JOINTS FOR DUCTILE IRON PIPE).

UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS, WALL THICKNESS SHALL COMPLY WITH THE CHART SHOWN ON THIS PAGE.

TO BE AN EQUAL DISTANCE OR AT LEAST 3" OFF THE BOTTOM OF CASING PIPE.



CASING PIPE DETAIL

- RESTRAINED JOINTS REQUIRED FOR FORCEMAIN (FIELDLOK OR APPROVED EQUAL)

SANITARY SEWER CONSTRUCTION STANDARDS*

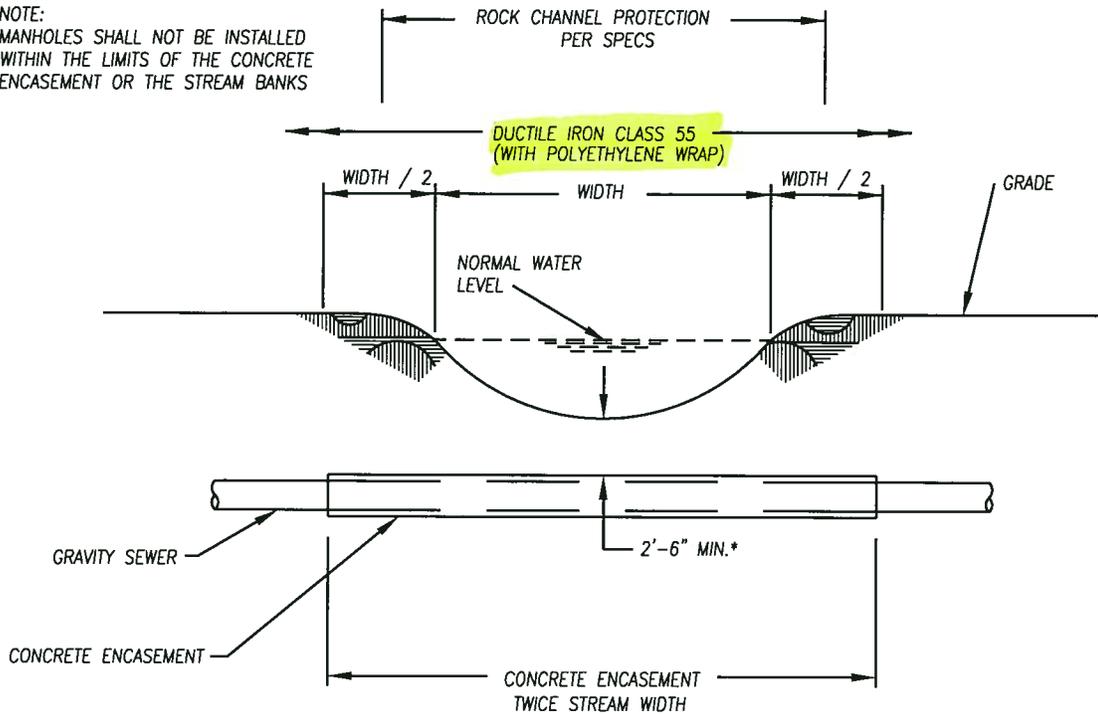
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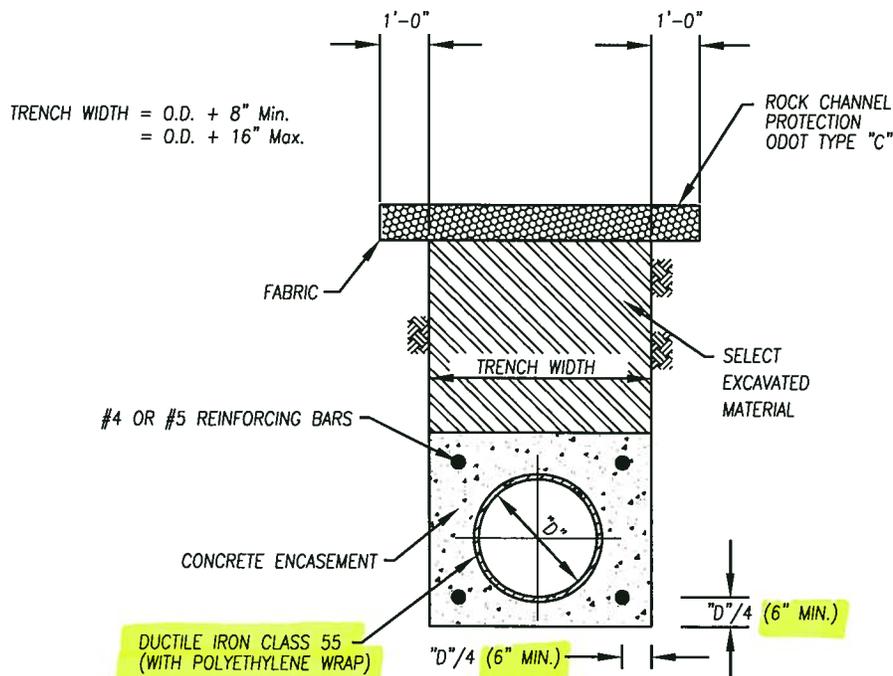


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NOTE:
MANHOLES SHALL NOT BE INSTALLED
WITHIN THE LIMITS OF THE CONCRETE
ENCASEMENT OR THE STREAM BANKS



* Minimum depth of cover for concrete encasement will be reviewed on a case by case basis. Greater depth of cover may be required for higher velocity streams. Final determination on depth of cover required is to be made by the Director of Public Utilities.



**TYPICAL CREEK CROSSING
FOR GRAVITY SEWERS**

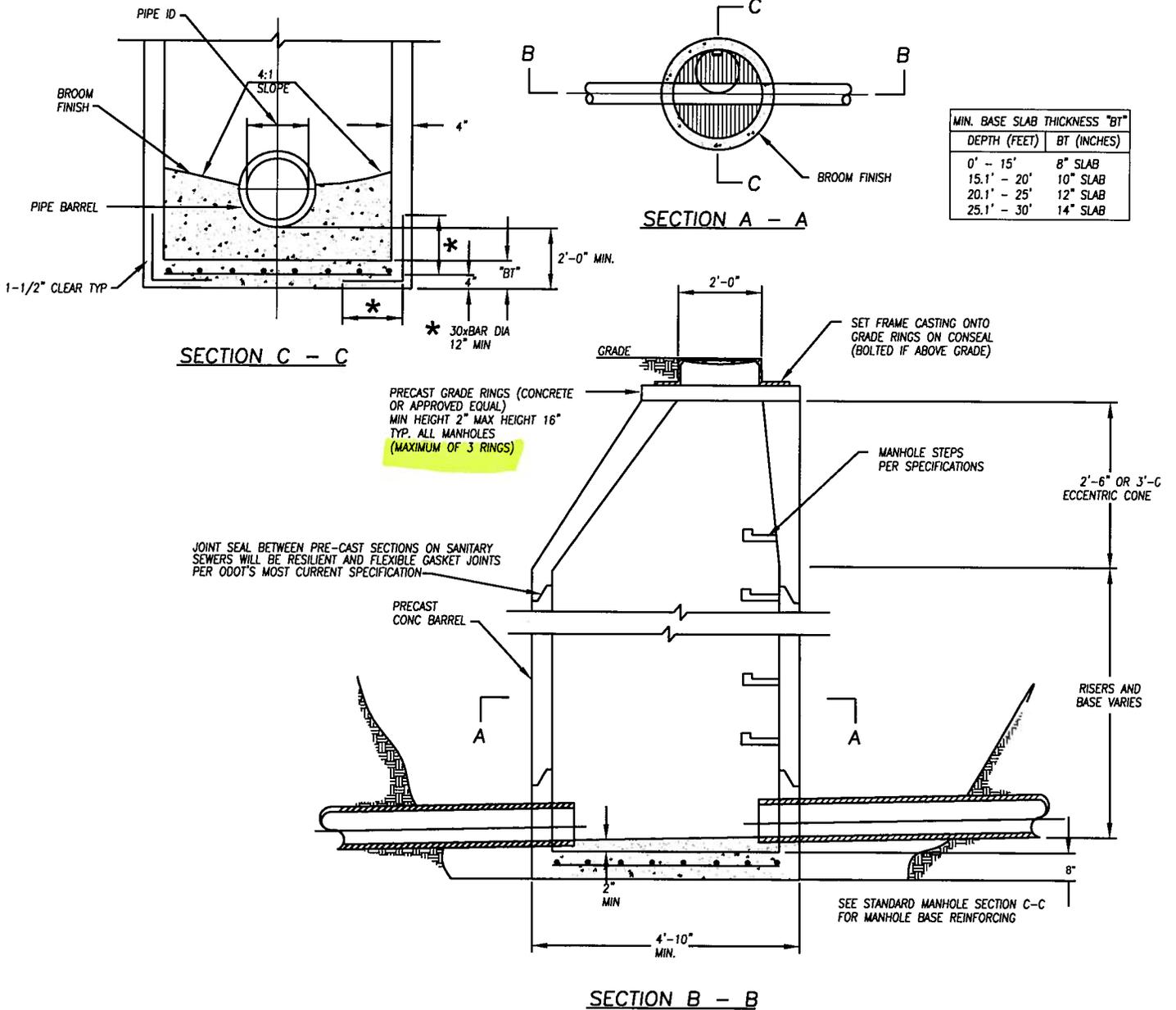
SANITARY SEWER CONSTRUCTION STANDARDS*

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STANDARD CONTROL MANHOLE

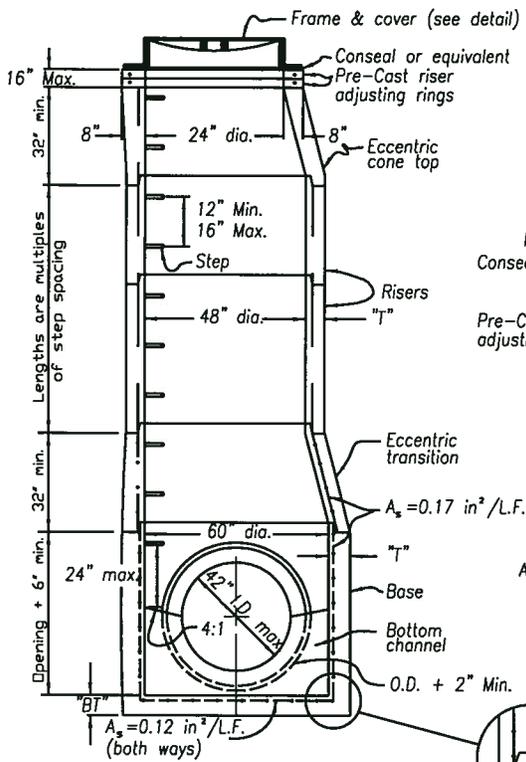
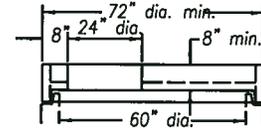
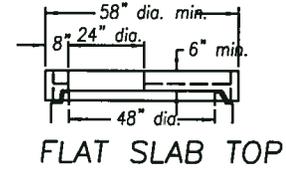
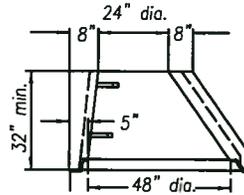
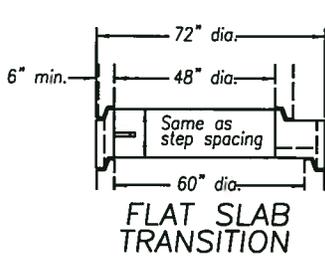
SANITARY SEWER CONSTRUCTION STANDARDS*

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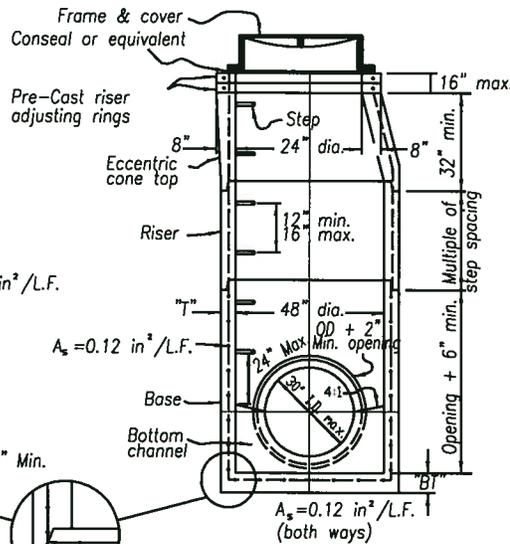
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60" PRECAST BASE
FOR 42" AND SMALLER PIPE



48" PRECAST BASE
FOR 30" AND SMALLER PIPE



NOTES:

1. Manhole walls and top cone shall be pre-cast concrete. Pre-cast manhole sections and joints between sections to conform to current applicable ASTM standards.
2. Pre-cast bases are required. Cast in place bases are allowed only on existing sewer mains when approved by the City's Public Utilities Director.
3. Joint seal between pre-cast sections on sanitary sewers will be resilient and flexible gasket joints per ODOT's most current specification.
4. Manhole steps will be per ODOT Standard Drawing MH-1.1, dated 7-20-12.

MIN. BASE SLAB THICKNESS "BT"	
DEPTH (FEET)	BT (INCHES)
0' - 10'	6" SLAB
10.1' - 15'	8" SLAB
15.1' - 20'	10" SLAB
20.1' - 25'	12" SLAB
25.1' - 30'	14" SLAB

WALL THICKNESS "T"	
MH DIA. (FEET)	T (INCHES)
4'	5"
5'	6"
6'	7"

SANITARY SEWER CONSTRUCTION STANDARDS*

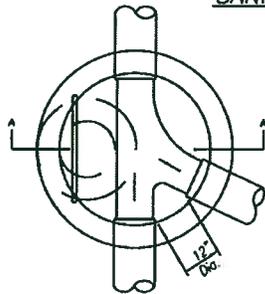
*Refer to Section 500 for Complete Specification Details

City of Fairfield
Construction Standards
Fairfield, Ohio

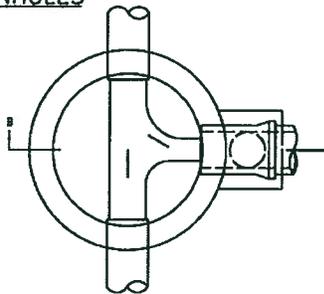


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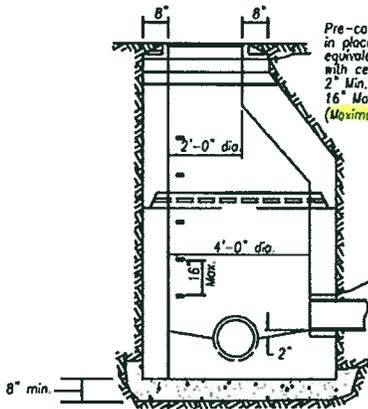
SANITARY MANHOLES



PLAN-STANDARD TYPE A

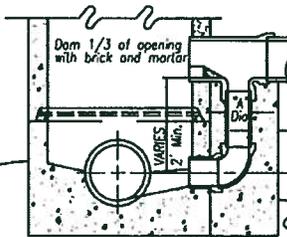


PLAN-STANDARD TYPE B
DROP MANHOLE



SECTION A-A

Pre-cast concrete risers sealed in place with CONSEAL or approved equivalent, & plaster inside surface with cement grout (as needed).
2" Min. Height
16" Max. Height
(Maximum of 3 rings)



SECTION B-B

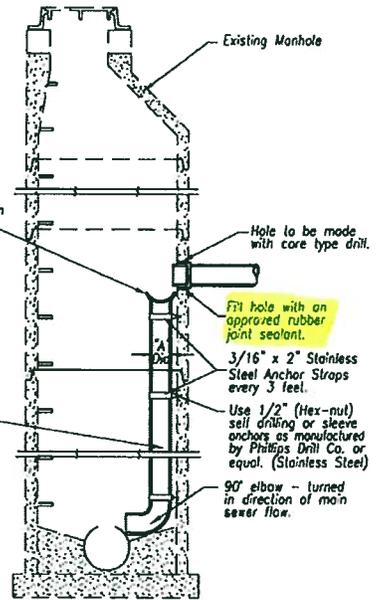
Incoming Pipe Dia.	"A" Dia.
6"	8"
8" to 18"	8"
21" to 30"	12"

Precast Concrete Base

Dam 1/3 of opening with brick and mortar

8" ϕ of drop pipe to be the same elevation as ϕ of effluent sewer.

Class C concrete



SEWER DROP INSIDE MANHOLE*

* The inside drop assembly must be approved in writing prior to use by the City's Public Utilities Director.

SECTION VIEWS OF REINFORCED PRECAST MANHOLES

SANITARY SEWER CONSTRUCTION STANDARDS*

*Refer to Section 500 for Complete Specification Details

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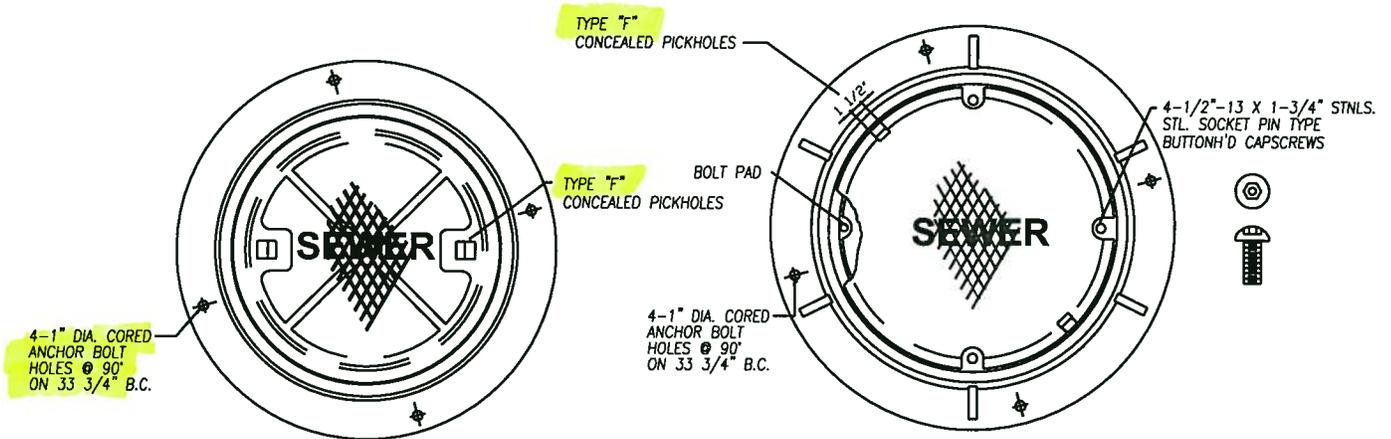


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SELF-SEALING

NEENAH R-1767 FRAME & 1767-5027 LID
OR APPROVED EQUAL

NEENAH R-1916-F FRAME & LID
OR APPROVED EQUAL

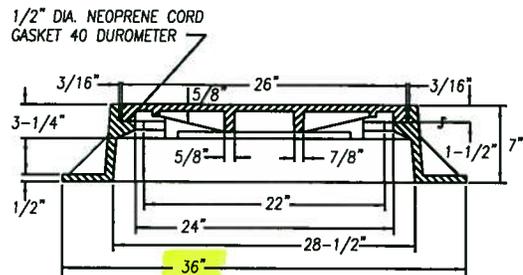
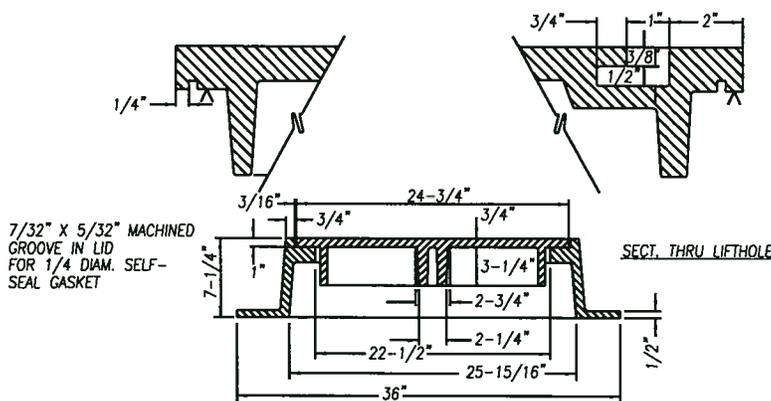


NOTES:

In unpaved areas, use Neenah R-1767 Series, Manhole Frames, (4) 1" hole vented lids, or equivalent

In streets, use Neenah R-1767 Series, Manhole Frames, 1767-5027 self-sealing lids, or equivalent.

Other locations use Neenah R-1916-F Series, Waterproof Manhole Frames, with stainless steel tamperproof bolts, or equivalent.



SANITARY SEWER CONSTRUCTION STANDARDS*

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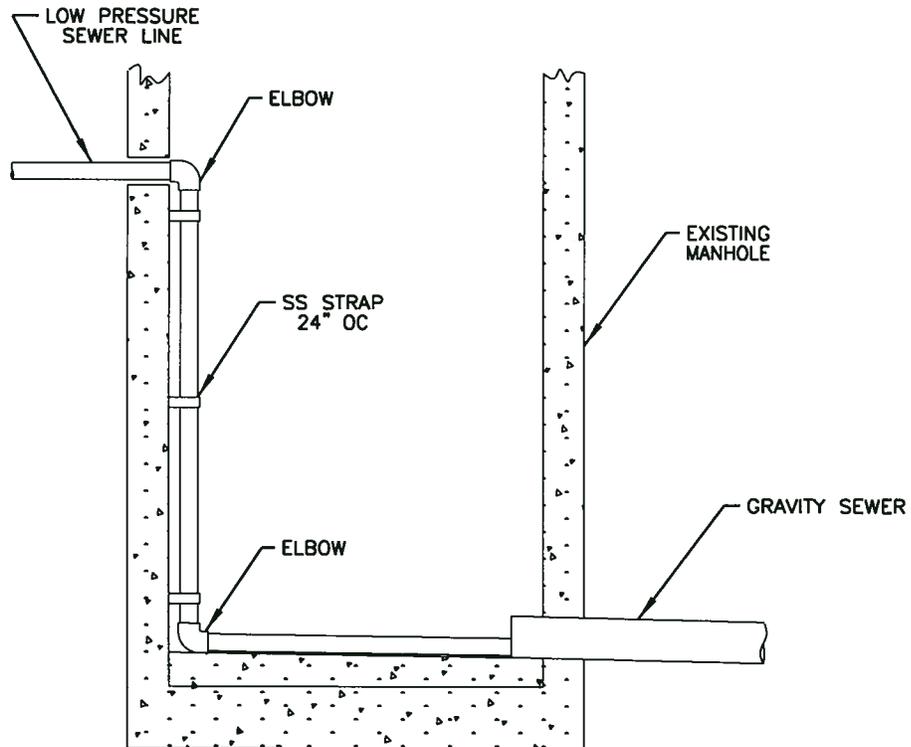
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New Drawing

TYPICAL DROP CONNECTION IN EXISTING MANHOLE



New Drawing



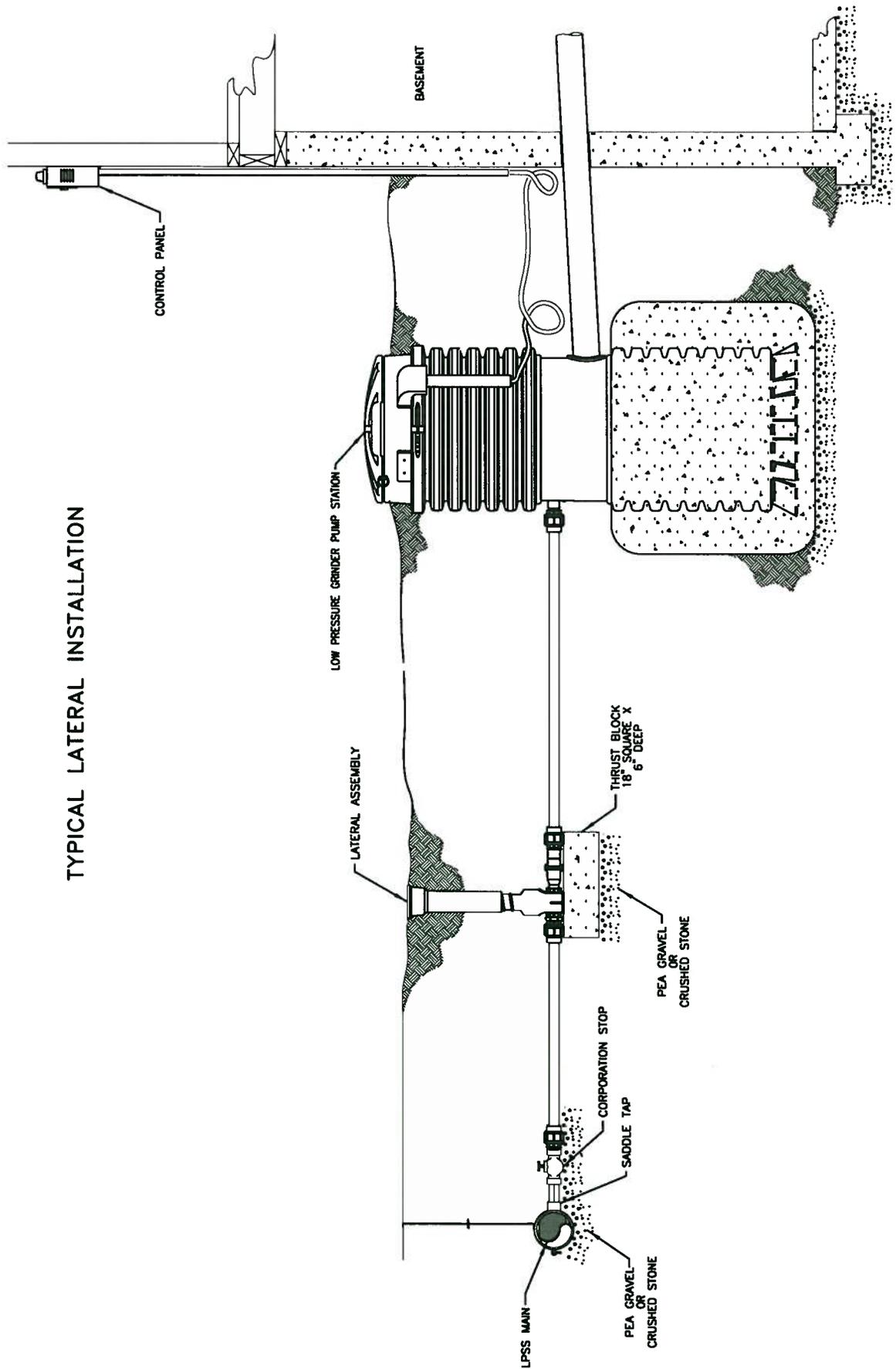
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SANITARY SEWER CONSTRUCTION STANDARDS*

*Refer to Section 500 for Complete Specification Details

TYPICAL LATERAL INSTALLATION



BASEMENT

CONTROL PANEL

LOW PRESSURE GRINDER PUMP STATION

LATERAL ASSEMBLY

THRUST BLOCK
18" SQUARE X
6" DEEP

PEA GRAVEL
OR
CRUSHED STONE

CORPORATION STOP

SADDLE TAP

PEA GRAVEL
OR
CRUSHED STONE

LPSS MAIN

SANITARY SEWER CONSTRUCTION STANDARDS*

*Refer to Section 500 for Complete Specification Details

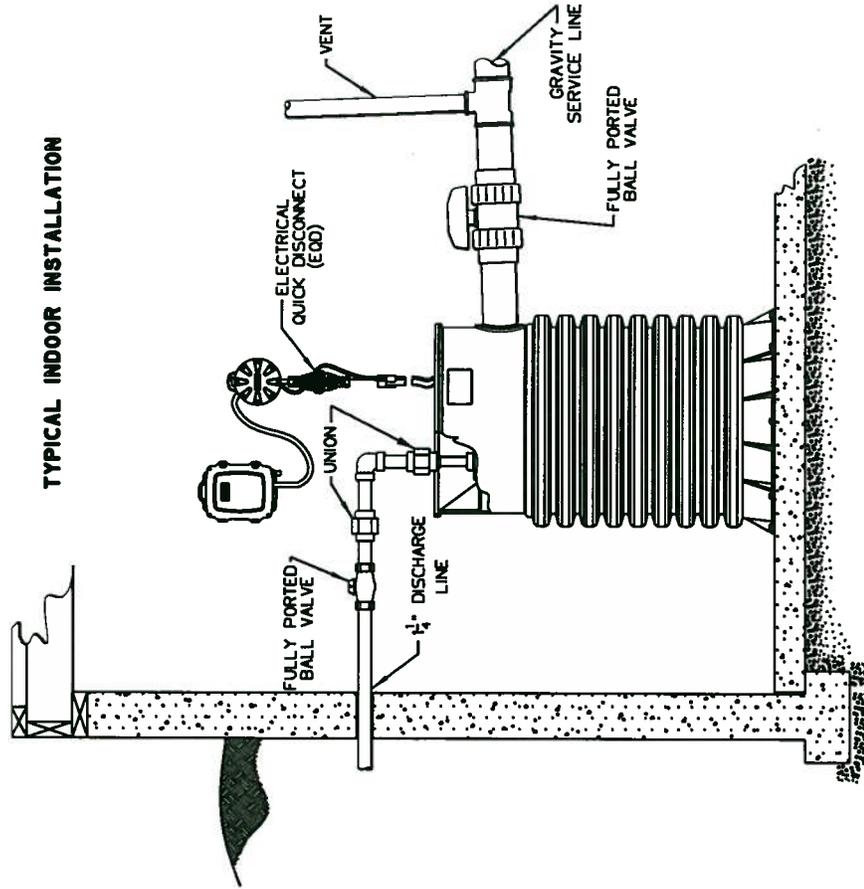
City of Fairfield Construction Standards Fairfield, Ohio



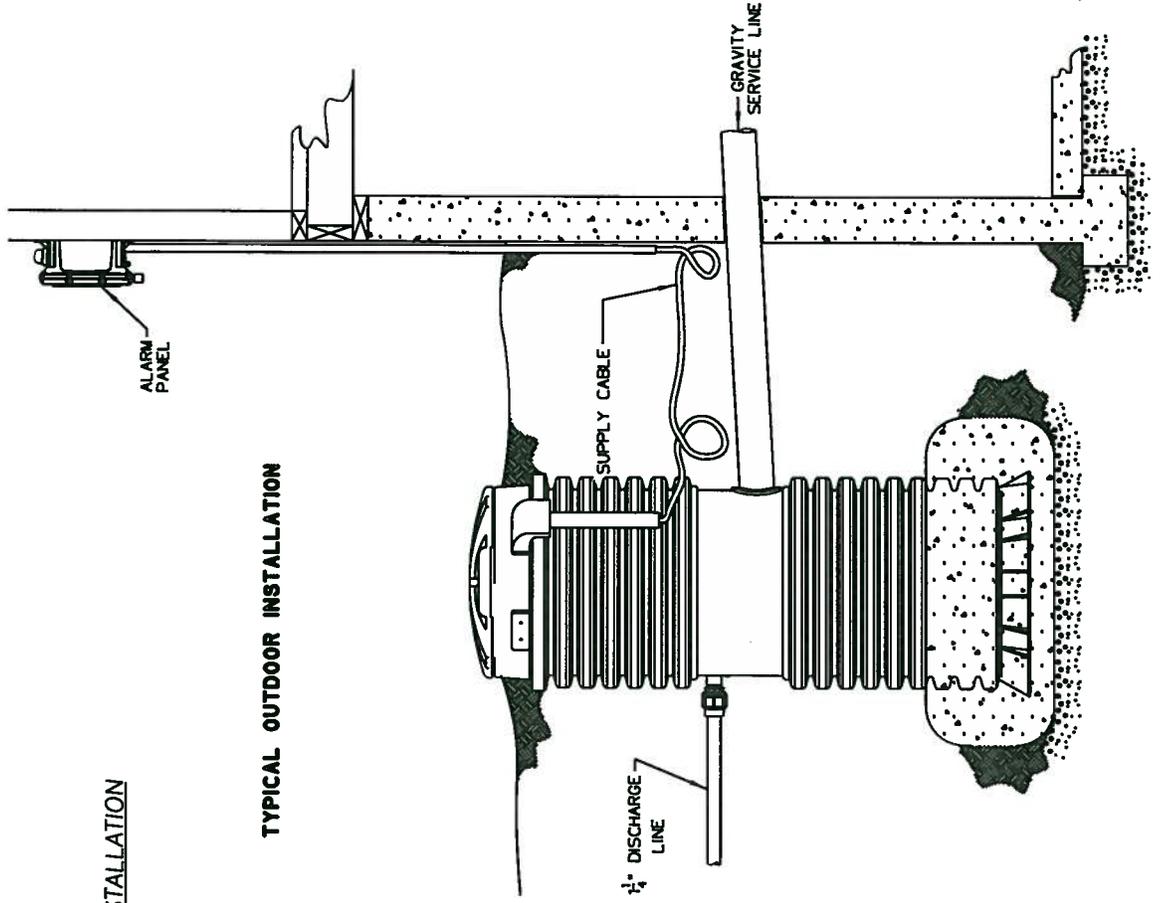
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New Drawing

GRINDER PUMP STATION INSTALLATION



TYPICAL INDOOR INSTALLATION



TYPICAL OUTDOOR INSTALLATION

SANITARY SEWER CONSTRUCTION STANDARDS*

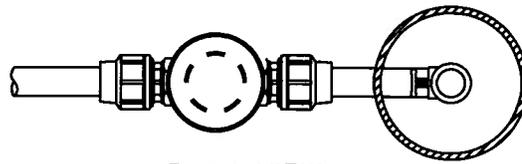
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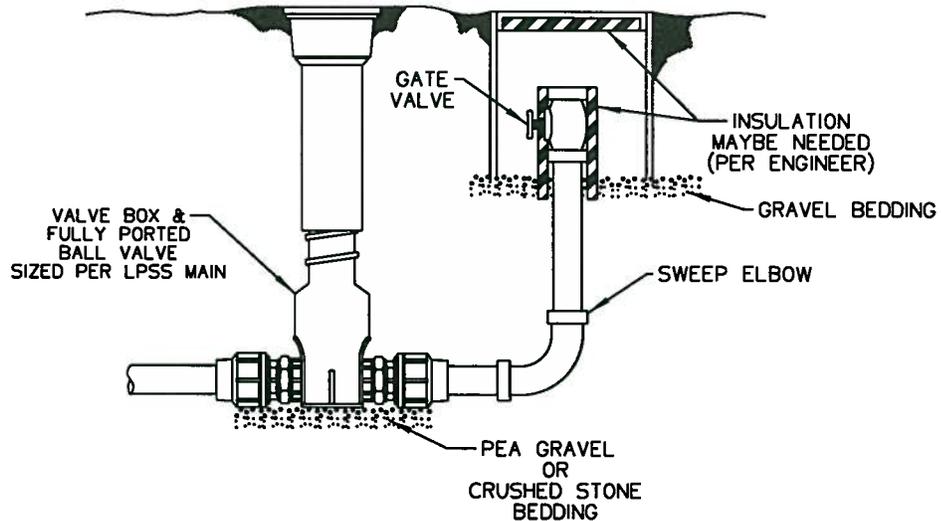


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New Drawing



PLAN VIEW



TYPICAL TERMINAL FLUSHING CONNECTION

SANITARY SEWER CONSTRUCTION STANDARDS*

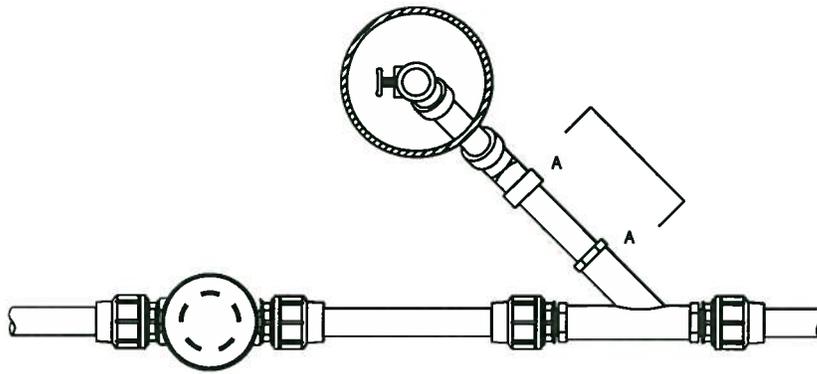
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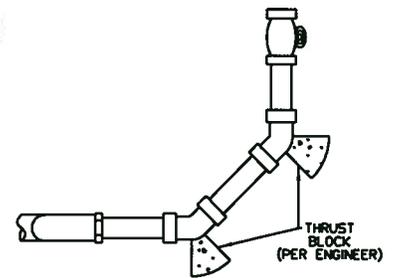


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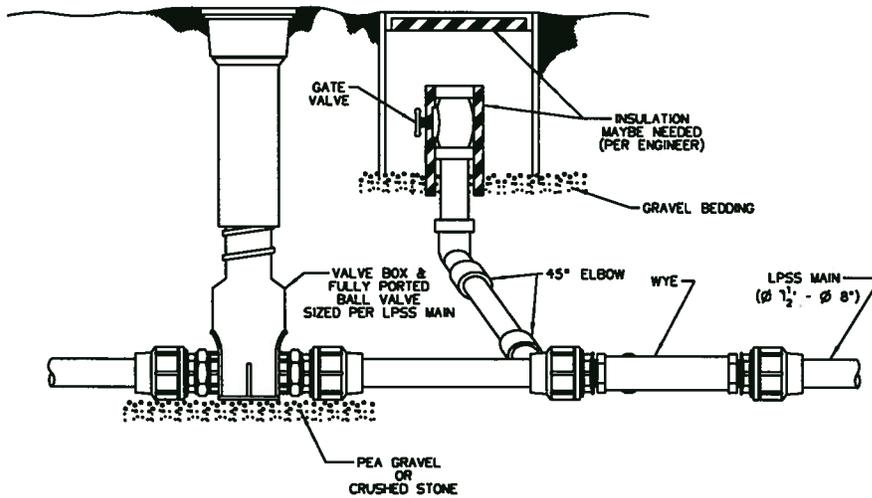
New Drawing



PLAN VIEW



VIEW "A"
3/4 = 1



TYPICAL FLUSHING CONNECTION ON LPSS MAIN

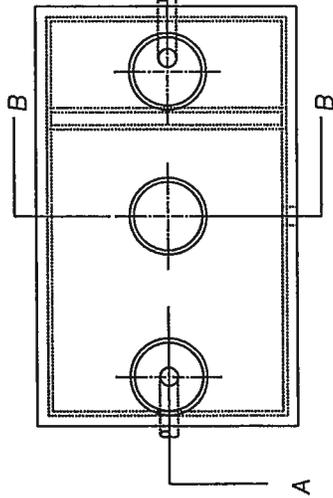
SANITARY SEWER CONSTRUCTION STANDARDS*

*Refer to Section 500 for Complete Specification Details

City of Fairfield Construction Standards Fairfield, Ohio

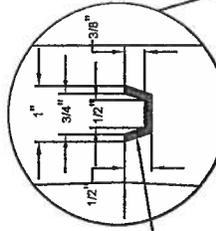


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PLAN VIEW

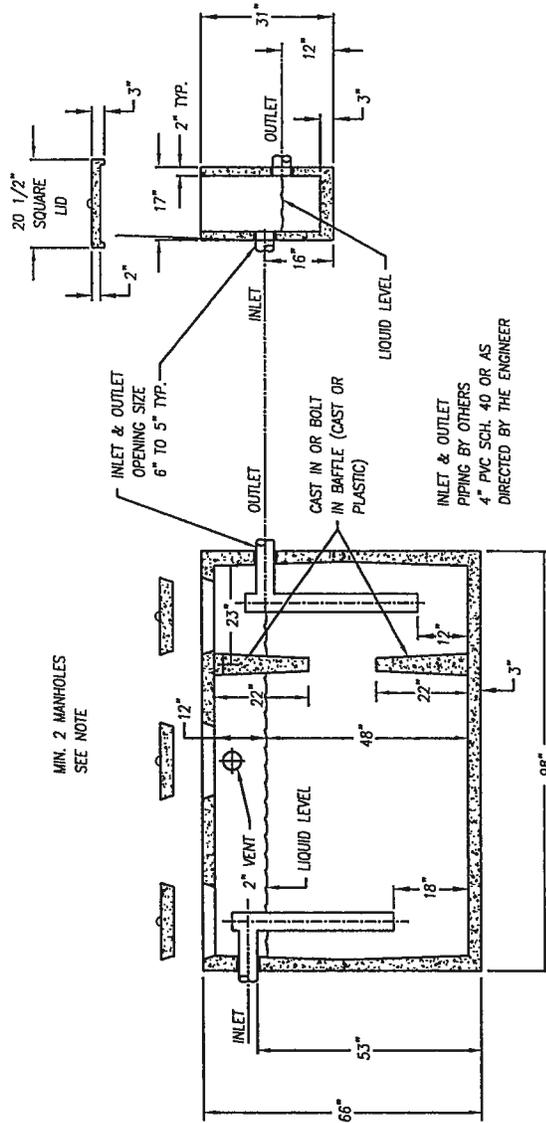
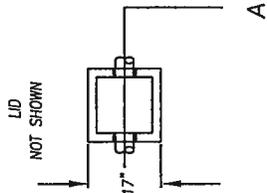
NOTE:
ACCESS MANHOLES WITH A MINIMUM DIAMETER OF 24" SHALL BE PROVIDED OVER EACH GREASE INTERCEPTOR CHAMBER. THE ACCESS MANHOLE SHALL EXTEND AT LEAST TO FINISHED GRADE AND BE DESIGNED AND MAINTAINED TO PREVENT WATER INFLOW OR INFILTRATION. THE MANHOLES SHALL HAVE READILY REMOVABLE COVERS TO FACILITATE INSPECTION, GREASE REMOVAL, AND WASTEWATER SAMPLING ACTIVITIES.



JOINT DETAIL

ASTM D-85 OR CONSEAL
WORKABILITY TEMP
30 TO 300 DEGREES F.

INSPECTION BOX
(OPTIONAL)



SECTION A-A

READILY REMOVABLE COVERS TO FACILITATE INSPECTION,

MIN. 2 MANHOLES
SEE NOTE

INLET & OUTLET
OPENING SIZE
6" TO 5" TYP.

CAST IN OR BOLT
IN BAFFLE (CAST OR
PLASTIC)

INLET & OUTLET
PIPING BY OTHERS
4" PVC SCH. 40 OR AS
DIRECTED BY THE ENGINEER

SECTION B-B

TWO PIECE SEPTIC TANK MODIFIED
FOR GREASE INTERCEPTOR 1000 GALLON CAPACITY