

Chapter 7. SANITARY SEWER SYSTEM

7.1 Introduction

All sanitary sewer systems shall comply with the requirements of these STANDARDS AND SPECIFICATIONS and may include special criteria established by the Engineering Division for overall hydraulics of the sanitary sewer system. Special criteria shall be outlined at a Pre-Application (Developer)/Pre-Design (City Projects) meeting.

The use of sanitary sewers within the City of Northglenn shall be in accordance with applicable sections in **Chapter 7 – Sanitary Sewer Systems** of the Municipal Code.

7.2 Design Criteria - Planning

7.2.1 Scope

It is the intent of this "design criteria" section to provide sufficient detailed information to enable the Designer for the Owner/Developer to correctly and efficiently design the overall sanitary sewer system for a particular project. If there is a question or a concern regarding the design of any portion of the sanitary sewer system that is not adequately answered within this chapter, the Owner/Developer or their representative shall contact the Engineering Division to address all issues resolved prior to design.

CDPHE Oversight and Approval. Outfall sewers, pumping stations, interceptors and appurtenances are included under the definition of "domestic wastewater works" in the State Water Quality Control Act. Section 25-8-702 of the State Water Quality Control Act states: "No person shall commence the construction of any domestic wastewater treatment works or the enlargement of the capacity of an existing domestic wastewater treatment works, unless the site location and the design for the construction or expansion have been approved by the division (Colorado Department of Public Health and Environment, CDPHE)." Section 25-8-103 (5) of the State Water Quality Control Act states: "Domestic wastewater treatment works means a system or facility for treating, neutralizing, stabilizing, or disposing of domestic wastewater which system or facility has a designed capacity to receive more than two thousand gallons of domestic wastewater per day." Therefore, all plans falling under this criterion shall be submitted to the CDPHE for approval prior to construction of any domestic wastewater treatment works, including wastewater treatment plants, individual sewage disposal systems, lift (pumping) stations and certain interceptor sewers with a capacity of 2,000 gallons per day or greater, as well as certain facilities that produce reclaimed domestic wastewater.

General

The design process for sanitary sewer projects includes the submittal of a utility study (Refer to **Chapter 5 – Design Report Requirements**) and construction drawings for review and approval by the Engineering Division. Refer to CDPHE for sewage flow factor requirements. City sewage flow factor is 2.9 persons per dwelling unit at 151 gal/person/day.

The flows used to design the sanitary sewer system for a particular development or project vary depending on the type of project. There are three general categories of development/projects for which flow rates are given: residential development, commercial development and industrial development. Once the specific type of development is determined, the peak flows are calculated based on average demand, peak factor and infiltration/inflow amounts. The criteria for all sanitary sewer system for analyses is based on the current AWWA Standards.

7.2.2 Hydraulic Design/Downsizing of Sewer Lines

General

- **Design.** Sanitary sewer shall be designed to carry the discharge calculated in accordance with the Northglenn Collection System Modeling Report and to transport suspended material such that deposits in the sewer are precluded.

- **Minimum Pipe Size.** The minimum diameter for sanitary sewer mains shall be 8-inches. At peak flow in sanitary sewer main must not exceed 80% of pipe capacity or it shall be re-sized to carry the appropriate peak flow.
- **Oversizing.** Oversizing of mains may be required by the Engineering Division, and costs of such oversizing shall be borne by the City; however, if such oversizing is required to meet the needs of the Developer, the full cost thereof shall be borne by the Developer. The Public Works Engineering Division reserves the right to size mains to provide service for future needs.
- **Minimum Service Line Size.** The minimum diameter for sanitary sewer service lines shall be 4 inches.

Sanitary Sewer Mains

For minimum and maximum allowable slopes for sanitary sewer mains. Refer to CDPHE for sewer slope for pipes up to 21". All pipes over 21" will require separate design calculations in the Utility Report and Engineering Division review.

The sewer must be designed at a slope great enough to produce a flow velocity of two feet (2') per second at the peak design flow using the Manning equation and n = 0.015 but not less than the minimum slope given above. Maximum flow 8 feet per second.

Hydraulic design of pressure sanitary sewers shall be in accordance with these standard specifications.

Sanitary Sewer Service Lines

Table 7.1 shows the minimum and maximum allowable slopes for sanitary sewer service lines:

Table 7.1: Service Line Size and Slope

Diameter (Inches)	Minimum Slope (Foot/Foot)	Maximum Slope (Foot/Foot)
4	0.0208	0.0800
6	0.0104	0.0600

7.2.3 System Layout

Location

All mains shall be installed in dedicated Right of Ways or public easements. Under no circumstances should sanitary sewer mains be installed parallel to and directly below any concrete such as sidewalks, curbs or gutters. Lines shall normally be located five feet south or east of street centerline. Sanitary sewer mains shall be straight between manholes, both in horizontal and vertical alignment.

Minimum Cover

Sewer mains will ordinarily have a minimum of eight feet of cover to finished ground surface. Where this will provide less than nine feet of elevation difference between the finished lot grade at building line and the top of the sewer main, it will be indicated on the plans that the lot is served by a "shallow sewer" and appropriate elevation information will be given.

Termination

Sewer mains will be extended at least ten feet uphill from the lowest lot corner of the uppermost lot to be served adjacent to the sewer main. Sewer mains will terminate in a manhole.

Horizontal Clearance

Sanitary sewer mains shall be laid a minimum of ten feet horizontally from any existing or proposed utility.

Steel Casing

When the sanitary sewer main passes under a highway, railroad or drainage or irrigation ditch, there shall be a minimum of 3-1/2 feet of cover and steel casing shall be installed in accordance with **Standard Drawing W-17**. The steel casing shall extend the entire width of the Right of Way or easement of the crossing structure or as directed otherwise by the City Engineering Division. In certain circumstances, the City Engineering Division may require grouting or 'bricking' closed the end of the pipes.

For casings under irrigation ditches, the Designer shall contact the ditch company and coordinate with them on their design requirements.

Minimum Vertical Clearances

The minimum vertical clearance for utility crossings is two feet (2').

7.2.4 Easements

Utility easements shall be a minimum of twenty feet (20') for one utility, thirty feet (30') for two utilities and forty feet (40') for three utilities.

7.2.5 Future Connections

Manholes shall have pipes stubbed out which are sized to accommodate flows from the upstream basin whenever a future extension of the sanitary sewer main is anticipated. The main line stub-out shall be capped and sealed.

7.2.6 Services

Service Lines

Each structure shall be served by a separate service line. Each service line shall have a cleanout. The sewer cleanout shall be located between the curb and sidewalk when the sidewalk is detached or in the sidewalk if not.

Horizontal Separation

Sanitary sewer service lines shall be located a minimum of ten feet away from all water services (measured horizontally).

Perpendicular Access

All service lines shall be constructed perpendicular to the property line of the property they are going to serve and not less than five feet from the side property line.

Location of Service Line

Typical installations should locate the sanitary sewer service line five feet downstream of the centerline of the lot. An 'S' shall be stamped on all new curbs for the location of each new service being installed.

Manhole Connections

Six-inch (6") service lines and larger shall require connection to the main with a manhole. Any service line tying into a main line larger than eight inches (8") shall also be enclosed within a manhole. Pressure line must be connected to a manhole prior to entering the City's sanitary sewer line.

Stub Outs for Future Connections

The City shall not be responsible for locating sewer service lateral stub-outs for future connections.

7.2.7 Taps

All sanitary sewer service connections to the sanitary sewer main shall be made using "wye" fittings. The City Engineering Division requires "Concrete encasement of the Eye" refer to **Standard Drawing SS-6**.

7.2.8 Unlawful Connections

It shall be unlawful to discharge roof drainage, foundation drainage, sump pumps, surface drainage or any other non-acceptable waste streams to the sanitary sewer which would violate any of the provisions of the Municipal Code.

7.2.9 Appurtenance

Manholes

The maximum spacing between manholes shall be 400 feet. Manholes shall not be located in areas which are subject to flooding from surface runoff. Manholes shall be located in areas which allow direct access by maintenance vehicles when it is not feasible to locate the manhole in the public street. If manholes are located outside of the Right of Way, they must be in an easement as described in Section 7.2.4.

If the possibility of surface runoff cannot be avoided, an internal watertight insert shall be installed to prevent inflow. All manholes located outside dedicated street Right of Ways shall be designed and constructed with locking-type cover and the manhole ring shall be bolted to the manhole cone and steel marker posts and shall be at eighteen inches (18") above the adjacent grade.

At the termination of a force main, outside drop manholes or other locations at which hydrogen sulfide gases (H₂S) is deemed to be a problem, a chemical and or gas resistant manhole lining will be required. The City requires Sewpercoat Protector 401 lining or approved equal.

Underdrains

Where underdrains are to be constructed under sewer mains, separate clean-outs shall be provided next to each manhole in accordance with **Standard Drawing SS-11**. Further, all underdrain service lines originating from within lots shall meet these requirements including size, marking tape and sock.

Sizing. The Designer is responsible for the sizing as per recommendations in the Utility and Geotechnical reports (Refer to **Chapter 5- Design Report Requirements**).

7.3 Materials & Facilities Requirements

7.3.1 Excavation & Trenching

Excavation, trenching and backfilling shall be done in accordance with **Chapter 14- Trenching, Backfilling and Compacting - Utilities** of these STANDARDS AND SPECIFICATIONS.



7.3.2 Bedding

Bedding shall conform and be installed in accordance with **Chapter 14- Trenching, Backfilling and Compacting – Utilities** of these STANDARDS AND SPECIFICATIONS.

7.3.3 Pipeline Installation

General

The Engineering Division shall be notified at least 48 hours in advance of any pipe installation. No pipes shall be backfilled until they have been inspected by the Engineering Division. Alignment and grade of the pipe and the location of fittings and manholes shall be staked under the supervision of a professional surveyor registered in the State of Colorado.

Proper implements, tools and facilities shall be provided and used by the contractor for the safe and convenient execution of the work. All pipe fittings and manhole sections shall be carefully lowered into the trench by means of a derrick, ropes or other suitable tools or equipment to prevent damage to sanitary sewer line material. Under no circumstances shall sanitary sewer line materials be dropped or dumped into the trench.

All pipe fittings and pre-cast manhole sections shall be carefully examined for cracks and other defects immediately before installation. The groove in the bells of the pipe shall be full and continuous or the pipe will be rejected.

Defective pipe or fittings shall be removed from the job site within 24 hours of notification by the Engineering Division. All foreign matter or dirt shall be removed from the interior and ends of the pipe before they are lowered into position in the trench and prior to connection.

Every precaution shall be taken to prevent foreign material and trench water from entering the pipe and fittings.

During construction, the contractor shall provide and maintain adequate equipment to properly remove and dispose of all water entering the trench and any other part of the work.

Pipe

Pipe shall be laid from downstream to upstream with spigot ends pointing downstream. All pipe shall be placed true to line and grade and carefully centered and with a smooth invert at the joint. The joint shall be made in a workmanlike manner and shall be watertight. Immediately before joining two lengths of pipe, the inside of the bell and the outside of the spigot end and the gasket shall be thoroughly cleaned. Caution shall be exercised to ensure that the correct type of gasket is used. The Contractor shall follow the pipe manufacturer's instructions for gasket lubrications and other joint assembly instructions. The spigot end of the pipe shall be placed in the bell with care to prevent the joint from contacting the ground. The joint shall be completed by pushing the pipe home with a slow steady pressure, without jerky or jolting movements. Pipe furnished without a depth mark shall be marked before assembly to ensure insertion to the full depth of the joint. The pipe shall then be properly set and brought to correct line and grade. The pipe shall then be secured in place by installation of bedding material and backfill, in accordance with **Chapter 14 - Trenching, Backfilling and Compacting – Utilities** and the **Standard Drawing SS – 4**.

At times when installation is not in progress, the open ends of the pipe shall be closed with a watertight plug. Cutting of pipe for inserting closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or lining, leaving a smooth end at right angles to the axis of the pipe. Pipe ends shall be smooth and beveled with a file or other tools according to the pipe manufacturer's recommendations.

Extra care should be used in handling PVC pipe during cold weather due to the reduced flexibility and impact resistance as temperatures approach and drop below freezing. PVC pipe to be stored outside and exposed to sunlight for more than 30 days shall be covered with an opaque material such as canvas. Clear plastic sheets shall not be used to cover

the pipe. Air circulation shall be provided under the covering. Any over-exposed pipe, as determined by the City, will not be permitted for installation.

No pipe or appurtenant structure shall be installed upon a foundation in which frost has penetrated or at any time when the City deems there is a danger of ice formation or frost penetrations at the bottom of the excavation. No pipe or appurtenant structure shall be installed unless backfilling can be completed before the formation of ice and frost.

7.3.4 Manhole Requirements

Cast-in-Place Base

Table 7.2: Cast-in-Place Manhole Details

Bases	Manhole bases shall be constructed per ASTM C-478 and C-858 with Class B concrete, placed on undisturbed ground and in conformance with the Standard Drawing SS-1 in Appendix G.2 Concrete bases shall extend at least eight inches below the invert of the pipe and shall be benched to at least two inches over the top of the pipe. The manhole floor between the sewer pipe and the outer portions of the bench shall be flush with the top edges at the pipe spring line and shall slope upward at least two inches per foot. No pipe shall be designed or constructed through the manhole. Connections from the pipe to manhole shall be constructed with boot connectors. The base shall have a 0.1' drop across manhole base.
Change in Flow	Changes in direction of flow through the manhole shall be made with a smooth curved channel having as large a radius as possible. The change in size of channels shall be made gradually and evenly and shall be formed directly in the concrete.
Finish	The floor of the manhole outside of the channel shall be finished to a brushed surface.
Base Reinforcement	Reinforcement will be required in all manhole bases. Precast base and invert must be used in all cases except when approved by the City Engineering Division. Manhole deeper than 15 feet may require additional reinforcement. Reinforcement shall be designed and provided on construction plans for approval prior to construction.

Precast Base/Inverts

- **Pre-Cast Bases.** Precast bases will be allowed by the Engineering Division and shall be in conformance with this section. There is a 0.1' drop across the manhole base.
- **Subbase.** The ground surface below the precast concrete base shall be excavated six inches below the elevation of the bottom of the base and backfilled with three quarter inch gravel. The gravel shall be carefully leveled and smoothed to give uniform support to the precast base over its entire area. The precast base shall be set at the proper location to center the manhole over the sewer main.

Precast Barrel

- **Setting of Manhole Sections.** Precast manhole sections shall not be placed on the foundation until it has reached sufficient strength to provide support without damage.

- **Joint.** The joint between the manhole base and the barrel section shall be made with a flexible butyl resin joint sealing compound. Each succeeding precast section shall be joined in a similar manner and smoothly finished, inside and out.
- **Intermediate Platform Requirements.** In the event that the distance between the manhole invert and the ring and cover exceeds seventeen feet (17'), a precast concrete platform shall be installed. The platform shall conform with Section 7.5.5 and **Standard Drawing SS-3**.

Manhole Grouting Treatment

Table 7.3: Manhole Grouting

Horizontal Joints	The horizontal joints between precast manhole sections shall be plastered and troweled smooth, inside, and out, with cement mortar.
Mortar Thickness	The mortar shall be not less than five eighths inch in thickness over the joint and shall extend at least four inches on either side of the joint.
Water Stop Gasket	All smooth surface pipes, such as PVC shall have a manhole water-stop gasket, to be furnished by the contractor, firmly attached to the pipe prior to grouting into the manhole.

Adjustment Rings

- **Precast Adjustment Rings.** Precast concrete adjustment rings shall be used on top of the cone to support and adjust the manhole frame to the required final grade.
- **Maximum Depth of Rings.** The maximum depth of the adjustment rings shall be six inches and the maximum depth from top of cone to final grade shall be twelve inches. The top elevation of the manhole shall be adjusted to match final street grade.

Cleanouts

All sanitary sewer services are required to provide a Cleanout. See **Standard Drawing SS – 6 or SS - 11**.

Manholes Off-Pavement

- **Manholes Outside of Pavement.** If manholes are located in open fields, they shall be left at least eighteen inches above grade and a locking ring and cover shall be installed.
- **Location in Fields.** In cultivated areas, manholes shall be properly marked by a steel post painted green on the top six inches and located five feet from the centerline of the manhole cover.

7.3.5 Connections to Existing Manholes

Sewer pipe connections to existing manholes where there is no existing pipe stubbed out shall be made in such a manner that the finished work will conform as nearly as practicable to the requirements specified for new manhole construction. The Contractor shall break out as small an opening in the existing manhole as necessary to insert the new sewer pipe. The existing concrete foundation bench shall be chipped to the cross-section of the new pipe in order to form a smooth continuous invert similar to what would be formed in a new concrete base. Where practical, the downstream invert shall be plugged during construction to prevent storm and non-sewage flow from entering the

system. The Contractor shall pump out and clean the manhole before removing the plug. Cement mortar shall be used to smoothly finish the new invert and to seal the new line, both inside and outside, so the junction is watertight.

7.3.6 Underdrains

General

- **Need for Underdrain.** Where excessive ground water is encountered, the Engineering Division will require construction of a piped underdrain, to reduce infiltration. Underdrains shall be daylighted to the nearest suitable point as shown on the approved construction drawings.
- **Cut-Off Walls.** Cut-off walls may also be required to minimize the movement of the groundwater through utility trenches.
- **Engineered Design.** Underdrain main construction shall be done in accordance with engineered construction plans for the work prepared under the direction of a registered professional engineer and accepted by the Engineering Division.
- **Report Requirements.** Subsurface investigations to determine soil properties and provide underdrain design recommendations are prerequisite to the underdrain system. A written proposal on the underdrain system must be presented to the City of Northglenn as part of the Utility Report required in **Chapter 5- Design Report Requirements**. This report must be accepted and approved before the Public Improvements Agreement is approved.

System Layout

- **Location.** Underdrain shall be placed in its own trench approximately 1-1.5 feet below sanitary sewer main.
- **Cleanouts.** All underdrain cleanouts should be located in either a storm sewer vault or in its own valve box. Underdrain cleanouts will not be permitted in sanitary sewer manholes.

Materials

- **Requirements.** All underdrains shall be constructed in perforated and/or non-perforated ASTM D 3034 SDR-35 PVC pipe or ASTM D3034, with a tracer wire attached for locating purposes.
- **Size.** A minimum of 6-inch PVC pipe shall be used for all underdrain mains and services.
- **Filter Fabric.** Underdrains shall be lined in filter fabric prior to installation only if perforated.

Mapping

As-built mapping and address plats should be provided to the Engineering Division prior to date of acceptance. All maps must provide adequate details of the underdrain prior to being accepted by the Engineering Division. GPS coordinates shall be shown for all manholes, inlets, and outlet pipes as well as any special features.

Inspections

- **Engineering Division Inspection.** The Engineering Division shall inspect underdrain mains prior to backfill. If the Contractor covers the pipe prior to inspection, the Engineering Division will require the contractor to re-expose the pipe for the required inspection.
- **Location of Clean Outs.** Underdrain cleanouts must be located outside of sanitary sewer manholes. See **Standard Drawing SS - 8**.

- **Daylighting of Underdrain.** Underdrain daylightings shall be placed to avoid being covered by dirt. This daylighting location shall be designed and provided on the Final Construction Drawings.

Bedding

- **Depth of Bedding.** Granular bedding material shall be installed a minimum of 12 inches above the top of the pipe and 12 inches below the invert of the pipe. (Granular bedding material will be the equivalent of squeegee.)
- Squeegee Sand

Table 7.4: Squeegee Sand Grading

Sieve Size	Total Percent Passing by Weight
3/8- inch	100
No. 200	0 - 5

- **Backfill Depth Limits.** Backfill must be placed in lifts not exceeding 6 inches.

Backfill

All trenching, backfilling and compaction of underdrain shall be done in accordance with **Chapter 14 - Backfill, Trenching and Compacting - Utilities** of these STANDARDS AND SPECIFICATIONS.

7.3.7 Pressure Sewers

All requirements of **Chapter 8 - Water System** of these STANDARDS AND SPECIFICATIONS shall apply to the installation of pressure sanitary sewer lines. All pressure sanitary sewers shall be installed using PVC AWWA C-900 or AWWA C-905.

A green plastic identification strip, a minimum of a six-inch wide, continuously labeled "Caution Sewer Line Below" shall be installed directly above the pressure sewer, the full length of the sewer, and shall be buried midway between the top of the pipe and the finished ground surface elevation.

7.3.8 Sanitary Sewer Service Line Construction

Conformance

All sanitary sewer service lines which connect to the City of Northglenn sanitary sewer system shall comply with these STANDARDS AND SPECIFICATIONS.

Appurtenances

The contractor shall place wyes, stubs and risers where required by the approved construction plans.

Table 7.5: Sanitary Sewer Appurtenances

Risers	Riser connections shall be installed where the elevation of the top of the branch is more than twelve feet below the approved finished grade. Riser connections will ordinarily reach to a grade ten feet below the finished ground surface.
Water-tight Plugs	Water-tight plugs shall be installed in each branch pipe or stub. As-built measurements shall be made by the contractor or his representative to reference the wye or riser connection to the nearest manhole before backfill. Said measurements shall be carefully and accurately made and recorded and shall be shown on the Record Drawings applicable portions of ASTM D-2321 (latest revision) and to the pipe manufacturer's installation instructions.
Laying of Pipes	The grooves shall be cleaned free of all foreign materials prior to assembling the joint. The pipe shall be laid with the spigot end pointing in the direction of the flow.
Dry Trenches	Trenches shall be kept free of water during laying and jointing. Lines longer than fifty feet shall be laid with a laser, or other means approved by the Engineering Division.
Clean Outs	Clean-outs are required at a minimum interval of 100 feet or at all bends or changes in grade. The area around a clean-out shall be graded so water runs away from the clean-out. No clean-outs, other than those installed as part of the sewer main underdrain system, shall be installed in publicly owned Right of Ways or easements.
Service Stub-Ins	Service stub-ins shall be extended at least ten (10) feet into the property and be plugged with a compression stop.
Backfilling	Backfilling shall be in accordance with Chapter 14- Trenching, Backfilling and Compacting - Utilities of these STANDARDS AND SPECIFICATIONS.
Risers	Riser connections shall be installed where the elevation of the top of the branch is more than twelve feet below the approved finished grade. Riser connections will ordinarily reach to a grade ten feet below the finished ground surface.

Tapping Existing Sanitary Sewers

Where tees have not been installed in the sewer main, the main shall be tapped by machine drilling a hole sized to fit the saddle for the service line. The drilling machine and method of drilling and the saddle shall be approved by the Engineering Division. The saddle shall be sealed when attached to the main and held in place with metal straps or other approved methods. The saddle and sewer main shall be encased in concrete flowfill.

7.4 Tests

7.4.1 General

All sanitary sewer mains and appurtenances shall be cleaned and tested after backfill operations have been completed and compaction test results have been submitted to and approved by the Engineering Division. All required testing must be completed and reviewed prior to acceptance. Should the Engineering Division find that the completed line or any portion thereof fails any of the specified tests, the Engineering Division will not accept the new sewer line until such

time as the sewer line meets the test specifications. Once the sewer line is completed and before a "Release for Service" letter is issued, the contractor shall perform an air test and video inspection of the completed line. The use of alternate testing methods may be allowed or required in addition to those stated herein and as determined necessary by the Engineering Division. Alternate testing methods include water infiltration test, deflection test and additional video inspection.

The Contractor shall furnish all labor, materials, tools and equipment necessary to clean the pipe and appurtenances, make the tests and perform all work incidental thereto. Any damages to the pipeline caused by cleaning or testing operations shall be repaired or replaced by the contractor at his expense.

7.4.2 Air Tests

The contractor shall perform these tests with suitable equipment specifically designed for air testing sewers. The pipe or sections of concrete pipe to be tested, may be wetted before the air test. The line shall be plugged at each manhole with pneumatic balls. All service plugs shall be secured in place to prevent displacement during testing operations.

Low pressure air shall be introduced into the plugged lines until the internal air pressure reaches 4.0 psi plus 0.4 psi per foot of water table above the pipe invert, if any. At least two minutes shall be allowed for the air temperatures to stabilize before readings are taken and the timing started.

The portion being tested shall pass if it does not lose air at a rate to cause the pressure to drop from 3.5 to 3.0 psi (plus any adjustments for water table pressure as mentioned previously) in less time than listed in Table 7.6:

Table 7.6: Air Test Specs

Pipe Diameter (Inches)	Minimum Allowable Time for Pressure Drop from 3.5 to 3.0 psi (Minutes)
4	3.0
6	3.0
8	4.0
10	5.0
12	6.0
15	7.0
18	9.0
21	10.5
24	12.0



If the installation fails this test, the testing equipment may be used to determine the location of the pipe leak. All failing tests shall be paid by the Contractor/Developer.

7.4.3 Deflection Test

The maximum vertical deflection for PVC pipe shall not exceed manufacture’s recommendations. The Engineering Division may require the contractor to perform deflection tests of the pipe before acceptance. Optional devices for testing include calibrated television, photography, properly sized go-no-go mandrel, sewer ball or deflectometer. The method used shall be approved by the Engineering Division. To ensure accurate testing, the line shall be thoroughly cleaned prior to testing. Testing shall be done no sooner than 30 days after the pipe has been backfilled.

The contractor shall schedule the test with the City 48 hours prior to the test and the City shall be present during the test and shall verify the accuracy of the equipment used. The City may require the contractor to perform another deflection test prior to the end of the warranty period.

7.4.4 Pressure Test for Pressure Sewers

After the pipe has been laid, including fittings, thrust blocks, and backfill in accordance with the specifications, it shall be subjected to a hydrostatic pressure of not less than 150 P.S.I. for one hour. The allowable leakage shall not exceed the following formula:

$$L = \frac{SD \sqrt{P}}{148,000}$$

Where, L = Testing allowance (makeup water), in gallons per hour

S = Length of pipe tested, in feet

D = Nominal diameter of pipe, in inches

P = Average test pressure during the hydrostatic test, in pounds per square in gauge

Each valved section or the entire line if there are no valves, shall be slowly filled with water and the specified test pressure, measured at the highest point of elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connection, gauges and all necessary apparatus shall be furnished by the contractor. Gauges and measuring devices shall be approved by the City and the necessary taps made as required by the contractor. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made at the highest elevations of the test section and plugged with brass plugs once the pipeline has passed the test.

Any cracked or defective pipes, fittings, or valves discovered in the pressure test shall be removed and replaced by the contractor with sound material. The test shall be repeated until the pipeline passes the pressure test and is accepted by the City.

7.4.5 Manhole Leakage Test

Manholes shall be tested for leakage separately from the pipe when required. The sewer pipe in the manhole shall be sealed with watertight plugs. If the ground water table is below the invert, the manhole shall be filled with water to a depth five feet above the invert. The test level shall be clearly marked. The maximum leakage allowance shall be 0.00947 gallons per foot diameter per foot of depth per 24 hours. If the water level in the manhole drops during this 24-

hour period, the level shall be raised to the test level mark prior to the start of the test. All vent holes in the lid shall be plugged and the lid shall be installed prior to start of the test. The test shall last a minimum of 24 hours. Once the test begins, the manhole lid shall only be removed in the presence of the ENGINEER. Exfiltration will be determined by measuring the amount of water required to raise the water level back to the marked level at the end of the test period.

The manhole shall be considered to pass the water exfiltration test if the measured exfiltration is less than or equal to the allowable leakage specified in paragraph 1 above.

If a manhole fails the water exfiltration test, the manhole shall be repaired with a non-shrinkable grout or other material approved by the ENGINEER. The water exfiltration test shall then be repeated until a satisfactory test is obtained.

All observed leaks shall be corrected even if exfiltration is within the allowable limits. All temporary plugs shall be removed after each test.

If the ground water table is above the invert of the manhole, then the manhole shall be filled to a level at least three feet above the ground water table or to the top of the uppermost precast manhole section, whichever is less, but not less than five feet above the invert. After soaking for one hour, the manhole shall be filled to the original level. It shall then be tested for two hours. The allowable drop in the water level shall be one-quarter inch. No manhole shall be accepted that has any visible infiltration when empty. Any manhole whose test is unsatisfactory shall be repaired at the contractor's expense and retested until satisfactory results are obtained.

7.4.6 Video Inspection

The Contractor will perform video inspections unless otherwise specified by the City of all new sewer lines and all defects that have been repaired prior to acceptance. Upon completion of the video inspection, the Contractor shall provide a thumb drive or other form of an electronic file containing the inspection prior to the Owner releasing the retainage. In order to be considered for inspection, the improvements shall have been completed, accessible and cleaned sufficiently to allow for detailed inspection.

Cleaning Prior To Inspections

Sewer cleaning shall be by high-pressure jet cleaning to remove foreign materials from lines. The jet cleaning machine shall be capable of removing stones, grit, grease, sludge, and other debris from the sanitary lines by the flushing action of high-pressure water. Dumping of large volumes of water from hydrants or tankers is expressly prohibited.

The jet cleaning machine must be capable of providing a continuous flow of water at a minimum of 40 GPM and 2000 PSI. At a minimum, the cleaner shall use a 90% interior pipe diameter proofer skid at all times. Cleaning shall begin at the upper end of the system and proceed downstream to the outfall. The hose should be brought back at a proper yet steady speed for appropriate and satisfactory cleaning. If necessary, repeat the process to remove all debris. All debris shall be captured and prevented from entering the downstream portion of the existing collection system.

Sewers found to be improperly cleaned shall be cleaned and re-inspected at the contractor's expense.

7.5 Materials

7.5.1 General

Only those pipeline materials described in this section are approved for sanitary sewer installations. Any other material proposed as an equal shall be approved by the City prior to construction. All pipe materials to be incorporated in the construction of sanitary sewers shall conform to the requirements specified herein or as modified elsewhere in these STANDARDS AND SPECIFICATIONS. All materials furnished shall be new and undamaged. Everything necessary to complete all installations shall be furnished and installed whether shown on the accepted drawings or not and all

installations shall be completed and fully operational. Acceptance of materials or the waiving of inspection thereof shall in no way relieve the Developer of the responsibility for furnishing materials meeting the requirements of these STANDARDS AND SPECIFICATIONS.

All materials delivered to the job site shall be adequately housed and protected to ensure the preservation of their quality and fitness for the work.

7.5.2 Defects

The presence of any of the following defects in an individual pipe or in a shipment of pipe, may constitute sufficient cause for rejection of the pipe. Rejected materials shall be removed from the work site within 24 hours unless otherwise permitted by the City.

- Pipe length varying more than two inches from the specified length. Pipe shall not be ordered in random lengths.
- Pipe having a deviation from straight which exceeds the following:
 - $(\text{Length of Pipe in Feet}) / (32) = \text{Maximum Deviation in Inches}$
- Porous areas on either the inside or the outside surface of a concrete pipe having an area of more than five square inches and a depth of more than one-half inch.
- Pipe which has been patched or repaired without City approval.
- Exposure of the reinforcement.
- Pipe damaged during shipment or construction.
- Any deficiencies noted in applicable ASTM Specifications.

7.5.3 Certification

A manufacturer's certification that material was manufactured and tested in accordance with applicable ASTM designations, together with a report of all test results, will be required by the City at substantial completion of the work.

7.5.4 Pipe

Polyvinyl Chloride Pipe (PVC) – Gravity

All gravity pipe materials and fittings shall meet the minimum requirements of ASTM D-3034, latest revision or ASTM F-679. Pipe shall be subjected to drop-impact tests in accordance with ASTM D-2444. The pipe shall have bell and spigot joints with gasketed joint per ASTM D-3212. The spigot end shall be marked so the installer and the inspector can determine when the pipe is properly inserted into the bell. The maximum pipe length shall be 20 feet.

Table 7.7: Minimum Pipe Wall Thickness for Gravity PVC Pipe

Pipe Diameter (Inches)	Wall Thickness (Inches)
4	0.125
6	0.180
8	0.240
10	0.300
12	0.360
15	0.437
18	0.499

All fittings and accessories shall be as manufactured and furnished by the pipe supplier and have bell and/or spigot configurations compatible with that of the pipe.

Pipe stiffness for all pipe sizes shall be tested in accordance with ASTM D-2412. Joint tightness shall be tested in accordance with ASTM D-2855.

Polyvinyl Chloride Pipe (PVC) – Pressure

All pressure pipe materials and fittings shall meet the minimum requirements of AWWA C-900 (latest revision) or AWWA C-905 (latest revision). Pipe shall be subjected to sustained pressure tests in accordance with ASTM D-1598. The pipe, couplings and fittings shall meet the requirements of ASTM D-1784. Gaskets and lubricants must be compatible with the pipe as well as in combination. The spigot end shall be marked so the installer and the inspector can determine when the pipe is properly inserted into the bell. The maximum pipe length shall be twenty feet.

Table 7.8: Minimum Pipe Wall Thickness for Pressure PVC Pipe

Pipe Diameter (Inches)	Wall Thickness DR18 (Inches)	Wall Thickness DR14 (Inches)
4	0.267	0.343
6	0.383	0.493
8	0.503	0.646
10	0.617	0.793

12	0.733	0.943
16	0.967	-
18	1.083	-

All fittings and accessories shall be as manufactured and furnished by the pipe supplier and have bell and/or spigot configurations compatible with that of the pipe.

PVC pipe and all fittings shall conform to the manufacturer’s specifications.

7.5.5 Manholes

Table 7.9: General Manhole Design Requirements

Requirements	Manholes, reducing sections, ladder rungs and traffic lids shall be precast and conform to ASTM Standard Designation C-478.
Traffic Loading	All traffic lids shall be designed for AASHTO H-20 traffic loading.
Steps/Rungs	No rungs or steps are to be built into sanitary manholes.
Reducing Sections	Concrete reducing sections shall not be used. The top cone is not a reducing section.
Extension Collars	Concrete extension collars shall be used to bring the manhole ring and cover up to approved street or ground surface elevation.
Cast-Iron Locking Lid	All manholes not within the Right of Way shall have cast-iron locking lids.
Type of Concrete	Concrete used in the manufacturing or construction of manholes shall be a minimum of Class B concrete as per CDOT Standard Specifications in accordance with Chapter 15- Street Construction Standards of these STANDARDS AND SPECIFICATIONS.

Manhole Rings & Covers

All cast iron manhole rings and covers and other iron castings shall conform to the requirements of AASHTO M105/ASTM A48. Ductile Iron castings shall conform to the requirements of ASTM A536. All castings shall conform to Federal Specification, Commercial Item Description A-A-60005, for shape and dimension required. Castings shall be free from sand, blowholes, shrinkage, cracks, and other cold shuts and be well cleaned by shot blasting. Runners, risers, fins and other cast-on pieces shall be removed from the castings and ground smooth. Bearing surfaces between manhole rings and covers shall be cast or machined with such precision that uniform bearing shall be provided throughout the perimeter area of contact.



Manhole frame or ring dimensions shall be 24” diameter, 8” tall or as otherwise approved.

Fittings shall be hot dipped, factory applied, water base, asphalt paint to form a firm and tenacious coating. Aluminum covers may be used for meter vaults where approved and must have a recessed cut out for a transponder. Aluminum rings may not be used.

Acceptable product is East Jordan Iron Works #2405A, Product #240561 (sanitary vault only) or approved equal.

Manhole Base Slabs

- **Constructed.** Pre-cast manhole bases are preferred by the City. In special circumstances, poured bases will be permitted.
- **H-20 Loading.** The slab shall be designed to uniformly support AASHTO H-20 traffic loading and any earth loading.
- **Minimum Thickness.** The minimum slab thickness shall be eight inches below bottom of the pipe and 2-inches above the top of the pipe.
- **Reinforcement.** The minimum reinforcement required in all base slab shall conform to the **Standard Drawing SS - 1.**

Joint Material

Joint material used to set barrel sections shall be a flexible butyl resin joint sealing compound meeting Federal Specifications SS-S-00210(210-A) and AASHTO M 198-B.

Mortar

Mortar used within Manholes must follow the following:

Table 7.10: Mortar Guidelines

Mixture	Mortar used in repair of precast sections shall be composed of one-part Portland Cement and not more than three nor less than two parts of fine aggregate. Hydrated lime or masonry cement shall not be used.
Portland Cement	Portland cement shall meet the requirements of ASTM C-150, Type II. Fine aggregate shall consist of well-graded natural sand having clean, hard, durable, uncoated grains, free from organic matter, soft or flaky fragments or other deleterious substances.
Aggregate	The fine aggregate shall be thoroughly washed and shall be uniformly graded from coarse to fine with a minimum of 95 percent passing a No. 4 sieve and a maximum of seven percent passing a No. 100 sieve.

7.6 Industrial Pre-Treatment Devices

7.6.1 General

The section pertains to interceptor devices only. All pretreatment devices must be approved in writing through the City’s Industrial Pretreatment Program.

This section pertains to interceptor devices only. All pretreatment devices must be approved in writing through the City's Industrial Pretreatment Program. The requirements established in the municipal code shall apply to facilities subject to the Fats, Oils and Grease (FOG) Sector Control Program established by the City. These facilities shall install and maintain a grease interceptor as directed by the City Engineering Division.

Sanitary Sewer Pre-Treatment Sewer-Monitoring Facility

Any new building to be constructed in an industrially-zoned area with a floor space greater than five thousand square feet or with a water meter size greater than three-quarter inch or if otherwise required by the City Engineering Division shall install a sewer-monitoring facility in accordance with the Standard Drawings prior to final building inspection approval. The monitoring facility shall be situated outside of the building on the user's premises. If the industrial user's service line ties into an existing City manhole and such manhole allows for safe sampling and isolation of the industrial user's discharge, the City Engineering Office may allow said manhole to serve as the industrial user's monitoring facility. Building with multiple tenants will be required to have multiple sewer-monitoring facilities.

Hydromechanical vs Gravity (Preference – Hydromechanical)

The requirements contained in this document are applicable to all commercial food service establishments, including those that are undergoing:

- New construction
- Interior remodeling to accommodate expansion or operational modifications.
- Changes of ownership/occupancy
- Facilities which may be experiencing difficulty in achieving compliance with maintenance and/or wastewater discharge limitations

Existing facilities with a gravity grease interceptor currently in operation must operate and maintain a grease interceptor at the standards of the City. Inspection by the City will identify if a facility's grease interceptor is correctly sized and operating efficiently. Under circumstances that the City deems the gravity grease interceptor poses a risk to wastewater back-ups the City may require upgrades to a hydromechanical grease interceptor.

All new grease interceptors shall be hydromechanical grease interceptors unless written exception is provided by the City.

7.6.2 Grease Interceptors

For Non-Domestic Facilities

All non-domestic facilities that prepare, serve, or otherwise make any type of food or beverages available for consumption are required to install and maintain a grease interceptor. An individual grease interceptor shall be provided for each building, lot or unit that requires an interceptor. Domestic waste is prohibited from entering the grease interceptor; thus, no toilets, urinals, and similar fixtures shall be connected to a building's grease interceptor. All domestic waste must be directed into the building's sewer and waste system. In addition, food and food waste shall not directly enter the grease interceptor.

Sizing of Hydromechanical

Hydromechanical grease interceptors (HGI) shall conform to the following requirements. The FOG Sector Control Program – Hydromechanical Grease Interceptor Design Form must be completed and stamped by a licensed Professional Engineer, or otherwise approved by the City of Northglenn Public Works.



HGIs must be certified to ASME A112.14.3, CSA B481, or PDI G101. They may be installed indoors or outdoors and shall have the minimum flow rate in gallons per minute (gpm) based on the kitchen fixtures connected and the minimum grease storage capacity based on a minimum service frequency of 90 days. The minimum flow rate and the minimum grease storage capacity can be determined through a two-step process.

They must be installed in an easily accessible location with access to the Engineering Office during the hours of 7 am to 5 pm and maintain a 3-foot clearance zone around to provide adequate space for inspection, cleaning, and removal of intercepted grease. Access to pre-treatment facilities shall always remain unobstructed. The removal of large objects such as boxes, crates, cans, etc. or the need for a ladder to inspect a wastewater pre-treatment facility shall constitute a violation. Refer to specific manufacturer requirements for details on compaction requirements and bedding type and depth.

STEP 1: SIZE BY FLOW RATE

Calculate the minimum required flow rate for the following three types of common kitchen fixtures: drainage fixtures, faucet fixtures, and cleaning fixtures. (See **Appendix F** for FOG Sector Control Program’s Hydromechanical Grease Interceptor Design Form)

Drainage fixtures are filled and completely drained at the end of their use and includes the 3-compartment sink and cooking equipment like tilt skillets, braising pans, rotisserie ovens, and wok ranges. Flow is calculated using the Manning Formula which accounts for sink pipe drain size, pipe material and pipe slope to determine the maximum flow rate from fixture. Most drainage fixtures connect to a single drainpipe; if the fixture connected to a separate drainpipe, list as multiple fixtures.

$$Flow\ Rate\ (gpm) = 669 \times A \times R^{2/3} \times S^{1/3} \div n$$

$$\text{Where, } A = 0.7254 \times [Pipe\ Diameter\ (in.) \div 12]^2$$

$$R = 0.251 \times Pipe\ Diameter\ (in.)$$

$$S = Pipe\ Slope$$

$$n = roughness\ coefficient$$

Note: Manning’s roughness coefficient, n, depends on the pipe material and age of the drainage pipe. Additionally, an estimate can be made for the minimum slope based on pipe size if slope is unknown.

Table 7.11: Manning’s Roughness Coefficient

Roughness, n	PVC	Copper
Minimum (new)	0.008	0.010
Normal (used)	0.009	0.011
Maximum (old)	0.010	0.012

Table 7.12: Minimum Slope

Drainage Pipe Diameter	Minimum Slope
2 ½ inches or smaller	0.0208
3 to 6 inches	0.0104
8 inches or larger	0.0052

Also, it is assumed that 87.5% of the horizontal drainage pipe is wettable due to flow caused by gravity alone. (Contact City if sewage ejector pumps are used)

Faucet fixtures are not filled, but instead drain at their faucet’s flow rate and includes sinks for food preparation, pre-rinse, equipment cleaning and waste food disposal units. If floor drains are present, their combined flow equals the fixture(s) supplying the spray. Sinks with two faucets count as two fixtures. Ignore hand-wash-only fixtures for sizing.

The International Plumbing Code requires most faucets discharge a maximum 2.2 gpm at 60 psi and service/mop sinks should discharge a minimum 3 gpm at 8 psi.

Cleaning fixtures have specific peak discharge rates that exceed faucet flow but are less than the maximum rate the drainpipe permits and includes dishwashers, clothes washers used for cleaning of food services-associated linens, and automatic food cleaning systems. A facility must provide a list with the manufacturer and model of all fixtures that specifies the flow rate.

The total minimum flow rate is calculated by summing the calculated flow rate from drainage fixtures, the flow rate from faucets discharge, and the flow rate of cleaning fixtures provided by the manufacturer.

Thus, HGI Flow Rate = DFQ + FFQ + CFQ = Minimum flow rate.

Note: DFQ (Drainage Fixture Flow), FFQ (Faucet Fixture Flow) and CFQ (Cleaning Fixture Flow)

STEP 2: SIZING BY GREASE PRODUCTION

Once the minimum flow rate has been established in Step 1, calculate the minimum grease storage capacity for the HGI required for the desired pump-out frequency as follows:

$$Required\ Grease\ Capacity = Grease\ Factor \times Meals\ or\ Customers\ per\ day \times Days\ between\ pumpout$$

Where, the grease factor is determined using the Table 7.13.

Table 7.13: Grease Factor

			Without Fryer Without Flatware	Without Fryer with Flatware	With Fryer Without Flatware	With Fryer with Flatware
Type	Menu	Grease Factor ->	A	B	C	D
1	Bakery		0.035	0.0455	0.035	0.0455
2	Bar and Grille		0.005	0.0065	0.025	0.0325
3	Barbeque		0.035	0.0455	0.035	0.0455
4	Breakfast Bar - Hotel		0.005	0.0065	0.025	0.0325
5	Buffet		0.035	0.0455	0.058	0.0754
6	Burger and fries, fast food		0.035	0.0455	0.035	0.0455
7	Cafeteria		0.025	0.0325	0.035	0.0455
8	Caterer		0.005	0.0065	0.025	0.0325
9	Chinese		0.035	0.0455	0.058	0.0754
10	Coffee Shop		0.025	0.0325	0.035	0.0455
11	Convenience Store		0.005	0.0065	0.025	0.0325
12	Deep Fried Chicken/Seafood		0.035	0.0455	0.058	0.0754
13	Deli		0.005	0.0065	0.025	0.0325
14	Family Restaurant		0.035	0.0455	0.035	0.0455
15	Frozen Yogurt		0.005	0.0065	0.025	0.0325
16	Greek		0.025	0.0325	0.035	0.0455
17	Grocery Bakery		0.025	0.0325	0.035	0.0455



Type	Menu	Grease Factor ->	Without Fryer Without Flatware	Without Fryer with Flatware	With Fryer Without Flatware	With Fryer with Flatware
			A	B	C	D
18	Grocery Deli		0.025	0.0325	0.035	0.0455
19	Grocery Meat Department		0.025	0.0325	0.025	0.0325
20	Ice Cream		0.025	0.0325	0.035	0.0455
21	Indian		0.025	0.0325	0.035	0.0455
22	Italian		0.035	0.0455	0.035	0.0455
23	Mexican, Fast Food		0.035	0.0455	0.035	0.0455
24	Mexican, Full Fare		0.035	0.0455	0.058	0.0754
25	Pizza		0.025	0.0325	0.035	0.0455
26	Religious Institution		0.005	0.0065	0.025	0.0325
27	Sandwich Shop		0.005	0.0065	0.025	0.0325
28	Snack Bar		0.005	0.0065	0.025	0.0325
29	Steak and Seafood		0.035	0.0455	0.058	0.0754

Grease interceptors certified to meet the minimum requirement of ASME A112.14.3, CSA B481, and/or PDI G101, shall have the flow rates and minimum grease storage capacities as listed.

Table 7.14: Grease Storage

HGI Flow Rate	Minimum Grease Storage Capacity* (lbs.)
20	40
25	50
35	70

50	100
75	150
100	200

*Minimum grease capacity as required by ASME A112.14.3, CSA B481 and/or PDI G101

Sizing of Gravity Grease Interceptors

Gravity grease interceptors are to be sized based on the expected flow rate of three categories of kitchen fixtures (similar to HGI) in gallons per minute with criteria of hydraulic residence time of 30 minutes and a 25% FOG and solids storage factor. The design flow rate is one-third the maximum flow rate because of the bulk hydraulic compensation of short-term peak flow events.

$$Volume = [Maximum\ Flow\ R(gpm)] \times 30\ min \times 1.25\ Storage\ Factor \div 3$$

Where maximum flow rate is calculated by summing the calculated flow rate from drainage fixtures, the flow rate from faucets discharge, and the flow rate of cleaning fixtures provided by the manufacturer.

Thus, HGI Flow Rate = DFQ + FFQ + CFQ = Minimum flow rate. (For calculation details of DFQ, FFQ, and CFQ see section, Sizing of Hydromechanical)

7.6.3 Sand & Oil Interceptors

For Automotive Facilities

Non-domestic dischargers where work or service is performed includes automotive service, machine shops, parking garages, automotive care centers, auto body shops, car washes or any other facility that generate sand, petroleum oil, grease, or other petroleum products, grit, gravel, or other aggregate that may discharge into the wastewater collection system. Access to wastewater collection system is often via floor drains located inside shop areas that are not limited to non-polluting wastewater sources.

At repair garages, car washing facilities with engine or undercarriage cleaning ability, all oil-bearing, grease-bearing, and flammable waste shall be discharged to an hydromechanical grease interceptor before emptying in the building drainage system or other point of disposal.

Sizing

Where automobiles are serviced, greased, repaired, or washed or where gasoline is dispensed, an interceptor shall be installed having a minimum capacity of 45 gallons for the first one-hundred square feet of area to be drained, plus 7.5 gallons for each additional one-hundred square feet of area to be drained.

7.6.4 Best Management Practices

Best management practices (BMP) benefit facilities by preventing grease discharges and keeping interceptor maintenance cost low.

All food preparation facilities are required to follow kitchen BMP, including, but not limits to the following:

- Regularly train all employees on fats, oil, and grease control and management.

- Prevent grease from entering all fixture units.
- Excess food waste and grease must be scraped off plates prior to washing.
- Food waste must be disposed of in the garbage.
- Drain screens must be installed on all drainage fixture units.
- Cooking grease must be collected and recycled.

It is the responsibility of the waste generator to ensure compliance with the City's discharge limitation. Hazardous waste, such as acids, strong cleaners, pesticides, herbicides, paint, solvent, or gasoline should be disposed properly.

7.6.5 Operation & Maintenance

Periodic operation and maintenance inspection are performed by the City to ensure compliance. It shall be the responsibility of those engaged in the operation of the business activity to maintain the associated wastewater pre-treatment facilities in efficient functioning order.

Grease interceptors shall be pumped and cleaned of the accumulated matter as often as necessary to ensure maximum efficiency and to prevent non-compliance with applicable discharge. Must occur at a minimum of once per 90 days for Food Service Establishments and once per year for Automotive Facilities.

A hydromechanical grease interceptor is deemed to require service when settled solids and FOG exceed manufacturers' recommended depth. A gravity grease interceptor is deemed to require service when settled solids and FOG exceed 25% maximum depth.

The Engineering Division may require a business to maintain a specific grease interceptor pumping and cleaning interval based on observed problems or non-compliance related to grease production, accumulation, and wastewater discharges.

Grease interceptor pumping, cleaning, and hauling service companies must be hired to perform work for non-domestic grease producers in the City of Northglenn. If a facility produces more than 55 gallons of waste to dispose, an accredited and licensed grease transporter must be hired to remove the waste grease and dispose of it according to Colorado state law. The transport and disposal of waste grease is regulated under Colorado's solid waste regulation (6 CCR 1007-2, Section 18). The Division's website, www.colorado.gov/cdphe/wastegrease, has a list of registered waste grease transporter who can accept the waste.

Maintenance and pumping records must be kept onsite for a minimum of three years. The Engineering Division reserves the right to require a business to submit maintenance and pumping records to the Engineering Division within a week of the event.

Partial cleaning of grease interceptors is not allowed.

Enzymes, solvents, and emulsifiers are not permitted as these will only change the form of grease allowing it to be carried out of the grease interceptor with the wastewater and deposited in the collection system. Biological treatment systems must be pre-approved by the Engineering Division. These systems will not alleviate the necessity for inspection and proper maintenance.

7.6.6 Inspection & Construction

All permitting, construction, and inspection activities must be completed in accordance with the City Plumbing Code. Additionally, the following specifications must be incorporated into grease interceptor construction and inspection.

- In facilities where dishwashing machines are installed and water discharge temperature may exceed 150 °F, a tempering valve must be installed prior to the grease interceptor.
- All grease bearing waste streams, such as two-compartment sinks, three-compartment sinks, pot/pan sinks, dishwashers, mop sinks and floor drains should be routed through an appropriate grease interceptor.
- All hydromechanical grease interceptors shall be certified to ASME A112.14.3, CSA B481 or PDI G101. If the interceptor does not follow one of these standards, then an effluent sampling well must be implemented. Sampling wells will have an access cover and a drop from inlet to outlet pipe.

Design Form Documents/Worksheets

See *Appendix F*.

7.7 Lift Stations Specifications

7.7.1 General

Gravity Flow

The Engineering Division acknowledges the use of lift stations on their sanitary sewer system; however, there are limited occurrences where a portion of the Engineering Division cannot be served by gravity that the Engineering Division will consider the construction of a sewage lift station.

CDPHE Requirements

The lift station must satisfy all of the requirements of the Colorado Department of Public Health and the Environment (CDPHE), 208 agencies and in accordance with the Engineering Division requirements. The requirements set forth in this section are minimum requirements and additional requirements may be applied.

CDHPE Application

The Engineering Division will require that the Developer's Designer and/or Contractor prepare the "Application for Site Approval" for the submittal to the Colorado Department of Health and a set of Record drawings of the sewage lift station in accordance with these Standards and Specifications. The Owner/Designer will be responsible to acquire approval through the applicable agencies and must keep the Engineering Division involved in the process.

Operation & Maintenance Manuals

Upon completion of the lift station construction, the Contractor shall also provide the Engineering Division with four copies of an "Operation and Maintenance Manual" for the lift station. All lift stations must have all approvals from the Engineering Division and other agencies before construction will be permitted.

Duplex Station

New lift stations will be duplex station, where each of the two pumps will be capable of meeting 110% of the station design flow. Built out flow based on full development and zoning must be considered as design flow.

Hardware Specification

All hardware exposed metal surfaces to sewage or are outside must be 316 stainless steel.



Submersible Pumps

Submersible pumps shall pass a minimum 2 inches diameter solids. All new lift stations for all new dry/wet stations are not accepted.

Maximum Detention Time

Lift Stations maximum detention time in the wet well must not exceed 30 minutes. In some cases, larger pumps station may be required, which shall be constructed with three or more pumps.

Discharge

All lift stations shall discharge to a manhole prior to gravity flowing to a sewer main.

Approval of Lift Stations

All lift stations have unique sites and/or characteristics requiring review and approval on a case by case basis.