Chapter 9. Storm Drainage & Other Concrete Facilities

9.1 Planning

9.1.1 Introduction

The purpose of this chapter is to present the design criteria and regulations governing storm drainage and floodplains in the City of Northglenn. All planning and design must provide control of storm drainage regarding quantity and quality to protect the health, safety, welfare, and property of the citizens and the City of Northglenn.

9.1.2 Stormwater Drainage

The stormwater drainage system provides protection from nuisance minor flooding and timely removal of storm runoff. The system includes several structures and features, including:

- storm sewer pipes, inlets and manholes,
- open ditches, channels and swales,
- detention and retention facilities of various types,
- levees and embankments,
- permanent erosion control measures,
- water quality control measures.

The following references apply to design of all storm drainage facilities in the City of Northglenn. The criteria in this chapter are intended to supplement these references, which are to be considered a part of these STANDARDS AND SPECIFICATIONS and shall apply for all policies and technical criteria not included or modified herein.

- The Mile High Flood District (MHFD)'s "Urban Storm Drainage Criteria Manual" (USDCM), Volumes 1 through 3 and any amendments issued by the MHFD.
- The City of Northglenn's Municipal Separate Storm Sewer System (MS4) Permit.
- The City of Northglenn Municipal Code Chapter 12 "SUBDIVISION REGULATIONS".
- The City of Northglenn Municipal Code Chapter 16 "PUBLIC PROPERTIES, UTILITIES AND SERVICES".

9.1.3 Floodplains

These floodplain requirements are intended to "promote and protect the public health, welfare, and safety so that citizens and property owners can remain under the National Flood Insurance Program." The major concerns in floodplain regulations are as follows:

- Prevention of excessive erosion, flood heights, or flow velocities.
- Protection of any use within or adjacent to a floodplain from damage.
- Control or alteration of natural floodplains and channels.

- Prevention of barriers which would divert flood waters and increase flood hazards in other areas. Floodplain regulations and requirements are detailed in the following documents, incorporated into these STANDARDS AND SPECIFICATIONS by reference:

- The City of Northglenn Municipal Code Chapter 11 (City of Northglenn Zoning Ordinance), Article 52 (Regulations to Minimize Flood Losses).
- The Code of Colorado Regulations 2 CCR 408-1 (Rules and Regulations for Regulatory Floodplains in Colorado).
- The Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM) Volume 1 (Management, Hydrology, and Hydraulics), Chapter 4 (Flood Risk Management).
- FEMA Regulations 59 and 60 Colorado code of regulations.

9.2 Design

9.2.1 Storm Design Criteria

All stormwater drainage, flood control and water quality calculations shall be completed for both a minor and a major storm event. The USDCM will be used to develop both the minor and major storms, with the following specific requirements:

- Minor storms shall be a 5-year return period. Roadside ditches and driveway culverts shall be designed using a 10-year return period.
- Major storms shall be a 100-year return period.
- Rainfall depths used for design storms shall be from the NOAA Atlas 14 Rainfall depths for Northglenn City Hall. This data is pre-loaded in the UDFCD design spreadsheets and can also be obtained from the NOAA Precipitation Frequency Data Server by inputting the Northglenn City Hall address (11701 Community Center Dr, Northglenn, CO 80233).
- Rational Method shall be used for runoff calculations for all drainage basins less than 90 acres. Runoff calculations for drainage basins greater than 90 acres must use the Colorado Unit Hydrograph Procedure (CUHP). Rational method may not be used for any basins larger than 90 acres.

9.2.2 Stormwater Drainage System

Use of Stormwater Drainage Facilities

The use of stormwater drainage facilities within the City of Northglenn shall be in accordance with the City of Northglenn Municipal Code, UDFCD guidelines, and all applicable state and federal laws.

Design Criteria

All subdivisions, re-subdivisions, planned unit development, private development and re-development, public improvements or any other proposed construction submitted for approval under the provisions of the Municipal Code shall include adequate storm drainage system analysis and appropriate drainage system plans in conformance with these STANDARDS AND SPECIFICATIONS. Special criteria shall be outlined at Pre-Application meetings and in the approved construction plans, as determined necessary by the City. Any deviation from these STANDARDS AND SPECIFICATIONS must be accepted in writing by the City, prior to acceptance of construction plans.

It is the intent of this "design criteria" section to provide enough detailed information to enable the Engineer for the Owner/Developer to correctly and efficiently design the overall stormwater drainage system for a particular development. If there is a question or a concern regarding the design of any portion of the stormwater drainage system that is not adequately answered within this chapter, the Owner/Developer or his representative shall contact the City to get all issues resolved prior to design.

System Layout

- All mains shall be installed in dedicated Rights of Way or public easements. Under no circumstances should stormwater drainage pipes be installed parallel to and directly below any concrete such as sidewalks, curbs or gutters.
- Stormwater drainage pipes shall be straight between manholes, both in horizontal and vertical alignment.
- Stormwater drainage pipes shall be laid a minimum of ten feet horizontally from any existing or proposed utility. See Section 9.2 of these STANDARDS AND SPECIFICATIONS for further horizontal and vertical clearance requirements and variances.

Inlet Capacity

Design of inlets shall provide enough inlet capacity to limit pavement spread at inlet locations to the maximum values shown in Table 9.1 and Table 9.2 below. Inlets at sag locations must meet the pavement spread requirements for minor storms with a 10-year return period.

Table 9.1: Minor Storm Allowable Pavement Spread

	Maximum Encroachment
Industrial and Local Residential	No curb overtopping, but flow may spread to crown of street (flow may spread to back of sidewalk).
Collectors	No curb overtopping and flow spread must leave at least one 10-foot lane free of water (5-feet on each side of the street crown or 10 feet on at least one side of median).
Arterials	No curb overtopping and flow spread must leave at least two 10-foot lanes free of water (10-feet each side of the street crown or median).

Table 9.2: Major Storm Allowable Pavement Spread

Classification	Maximum Encroachment
Industrial, Local Residential and Collectors	Building structures shall not be inundated at the ground line. The depth of water at street crown shall not exceed 6-inches.

Arterials	Building structures shall not be inundated at the ground line. To allow for emergency vehicles, the depth of water shall not exceed the street crown and 12-inches at the gutter flow line, whichever is more restrictive.

Surface Cross Flow

Cross street flow can occur in an urban drainage system under three conditions. One condition occurs when the runoff in a gutter spread across the street crown to the opposite gutter. The second is when cross-pans are used, typically at intersections. The third condition occurs when the flow in a Drainageway exceeds the capacity of a road culvert and subsequently overtops the crown of the street. Cross street flow is allowed only up to the limits shown below in Table 9.3. Cross pan gutters are not allowed in Collector or Arterial Streets.

Table 9.3: Limits of Cross Street Flow

Classification	Minor Storm Maximum Depth	Major Storm Maximum Depth
Industrial and Local Residential	6-inches of depth in cross pan; 4-inches or less cross flow depth at centerline with 6-inches of depth at gutter flow line.	12-inches of depth in cross pan; 10-inches or less cross flow depth at centerline with 12-inches of depth at gutter flow line.
Collectors	4-inches or less cross flow depth at centerline with 6-inches of depth at gutter flow line.	10-inches or less cross flow depth at centerline with 12-inches of depth at gutter flow line.
Arterials	Cross flow not allowed.	6-inches cross flow depth at centerline.

Pipe Capacity

All pipes shall be designed to accommodate the minor storm flows (5-year) with no surcharging of the pipes (hydraulic grade line below top of pipe). All storm drainage collection systems shall be designed such that the hydraulic grade line for major storm flows (100-year) maintains at least a 1-foot freeboard below the rim elevation of structures or the top of embankment on ditches and open channels.

Easements

Utility easements shall be attained in accordance with these STANDARDS AND SPECIFICATIONS.

Unlawful Discharges

It shall be unlawful for any person to discharge or cause to be discharged or spilled any substance other than naturally occurring stormwater runoff into the City's storm drainage system, other than those exceptions listed in the Municipal Code. This restriction applies to storm runoff from potential contamination sources such as outdoor fuel, fertilizer, chemical and other hazardous substance storage areas, garbage handling and dumpster pads, excessive fluid leaks from stored vehicles, and any other pollutant source that can be carried to the stormwater drainage system.

Unlawful Discharges

It shall be unlawful for any person to discharge or cause to be discharged or spilled any substance other than naturally occurring stormwater runoff into the City's storm drainage system, other than those exceptions listed in the Municipal Code. This restriction applies to storm runoff from potential contamination sources such as outdoor fuel, fertilizer, chemical and other hazardous substance storage areas, garbage handling and dumpster pads, excessive fluid leaks from stored vehicles, and any other pollutant source exposed to stormwater runoff that can be carried with runoff to the stormwater drainage system. This restriction also applies to unauthorized direct connections to any component of the stormwater drainage system such as roof drains and sump pumps.

The City does not permit Designers to directly connect roof drains and sump pumps to the storm drainage system. Designer is responsible for the dispersement of these flows within the historic flows permitted through these Standards and Specifications and Mile High Flood District.

9.2.3 Stormwater Detention & Water Quality

General

On-site detention and water quality treatment is required for all new development, expansion, and redevelopment. Required minimum detention volumes and maximum release rates shall be determined based on the criteria in the USDCM or as established by approved master plans.

Stormwater quantity management should strive to reduce or disconnect impervious areas as the first step in reducing runoff volumes prior to determining detention requirements per the USDCM, Volume 3, Chapter 1.

Detention may be provided by means of open space detention ponds, above ground or subsurface parking lot detention, rooftop detention incorporated with a “Green Roof” concept, and other emerging technologies and structures. Detention concepts should be discussed with City staff early in the planning stages, and all proposed detention concepts will be allowed on a case-by-case basis through the review and approval process of the drainage reports/letters. Designers are also required to add any required water quality capture volume (WQCV) to the flood detention volume. The WQCV itself shall be increased by 20% to account for sedimentation. Any proposed concept must have performance verified by third party testing such as the New Jersey Corporation for Advanced Technology (NJCAT), or equivalent testing, and must also meet Colorado Water Rights requirements of section 37-92-602(8), Colorado Revised Statutes (C.R.S.).

Detention ponds and water quality treatment measures should be designed as landscaped areas with multiple use provisions (recreation, aesthetic, wildlife needs, etc.). Within Urban Centers the detention ponds and water quality treatment measures should be designed to be architecturally compatible with the urban environment of the development. The landscape concepts, slope, and wall treatments should be identified on the landscape plan and site plan submitted to the City of Northglenn. All Designer are responsible to ensure that their design does not permit drainage other than rainfall to enter the storm drainage system. As an example, the Designer shall not put a dumpster near the storm drainage system inlets.

There are specific notification requirements that apply to all new or modified stormwater detention and infiltration facilities, including individual site facilities built by private parties as a development requirement. For any stormwater detention and infiltration facility constructed after August 5, 2015 and seeking protection from Water Rights claims under section 37-92-602(8), Colorado Revised Statutes (C.R.S.), the “entity that owns, operates, or has oversight for” shall, prior to operation of the facility, provide notice to all parties on the substitute water supply plan notification email list maintained by the State Engineer. This notice must include the following:

- The location

- The approximate surface area at design volume
- Data that demonstrate that the facility has been designed to comply with the release rates listed in section 37-92-602(8), Colorado Revised Statutes (C.R.S.).

Documentation of compliance must be provided in the Final Drainage Report document on forms provided by the City. City staff will then provide the required notification to the Colorado Stormwater Detention and Infiltration Facility Notification Portal.

Further information on this requirement can be obtained from the Colorado Department of Natural Resources, Division of Water Resources, Rainwater Collection & Storm drainage Management.

Design Requirements

- Design is in accordance with the USDCM, Volume 2.
- Emergency overflow and its flow path downstream shall be explicitly addressed in the design. The 100-year peak inflow shall be used as a minimum basis for designing emergency overflow structures.
- Detention facilities shall be designed to release or infiltrate at least 97% of all runoff from a rainfall event that is less than or equal to a 5-year storm within 72 hours after the end of the event.
- Detention facilities shall be designed to continuously release or infiltrate as quickly as practicable, but in all cases release or infiltrate at least 99% of the runoff within 120 hours after the end of events greater than a 5-year storm.
- Detention facilities shall be designed to operate passively and shall not subject the stormwater runoff to any active treatment process (e.g., coagulation, flocculation, disinfection, etc.).

Easements

All new developments and redevelopments must dedicate drainage access easements for their private detention ponds and Water Quality Control Measures (BMP's), including any "Green Roofs", and for maintenance access to drainage facilities. This easement is required to allow City personnel emergency access to the facilities and to allow for random inspections by city staff to determine compliance with maintenance requirements. A note must be added to the site plans or contextual site plans indicating who will be responsible for the maintenance of these facilities, i.e., the property owner, HOA or metro district. It is the underlying responsibility of the property owner to ensure the private detention and water quality Control Measures (BMP's) are maintained and they continue to serve the intended stormwater management function. For any public storm drainage systems or in special cases, the Engineering Division may require a utility easement that gives the City operation, maintenance and construction access.

Maintenance

Maintenance access must be provided to the top of the detention pond outlet structure and to Control Measure structures that may be located within the detention pond.

- Access routes shall be a minimum width of eight-feet with a two-foot recovery zone on each side of the access.
- Centerline radii less than 50-feet will require the access to be widened to accommodate the turning movement of maintenance vehicles, i.e., tandem axle dump trucks.
- In no case shall the centerline radii be less than 30-feet.

- The maximum grade shall be 10 percent.
- Where tributary areas are less than five acres in size the maximum longitudinal slope for maintenance access may be considered on a case by case basis for approval of up to 4:1 (horizontal: vertical).

Certifications

Refer to ***Chapter 4- Public Infrastructure Acceptance Procedures & Warranty Requirement***s for further requirements.

Construction Site Storm Drainage Management

Refer to ***Chapter 13– Right-of-Way Grading & Erosion Control*** for construction site storm drainage management requirements.

Post-Construction Water Quality Control Measures

The following Standards shall apply to all Post-Construction Control Measures per the most current version of the Phase II MS4 Permit.

- WQCV Standard
    1. Control Measures will provide treatment and/or infiltration of the WQCV.
    2. Control Measures will capture 100% of site runoff.
    3. The City of Northglenn, at its sole discretion, may exclude up to 20% of the proposed site, not to exceed 1 acre, if the City determines it is not practicable to capture runoff from some areas of the site. Applicant must adequately demonstrate, through design and the drainage report, the impracticability of capturing 100% of site runoff.
    4. The Control Measures design calculations will use a minimum drain time based on the specific pollutant removal mechanism and functionality of the measure.
- Pollutant Removal Standard
    1. Control Measures will be designed to treat minimum 80th percentile storm event.
    2. Control Measures will be designed to treat runoff to reduce event mean TSS to 30mg/L or less.
    3. Control Measures will capture 100% of site runoff.
    4. The City of Northglenn, at its sole discretion, may exclude up to 20% of the proposed site, not to exceed 1 acre, if the City determines it is not practicable to capture runoff from some areas of the site. Applicant must adequately demonstrate, through design and the drainage report, the impracticability of capturing 100% of site runoff.
- Runoff Reduction Standard
    1. Control Measures will provide Infiltration, evaporation, and/or evapotranspiration of 60% of WQCV runoff volume.

2. Control Measures can include "Green Infrastructure" as approved by the City of Northglenn. Requests to use “Green Infrastructure” measures must include performance data from field testing on measures installed and operating in “real world” conditions in addition to any lab testing data.

- Applicable Development Site Draining to a Regional WQCV Control Measure

1. Applications to use Regional Control Measures must show the Regional Control Measures are designed to accept the drainage from the entire Site under consideration.

2. Site may not discharge to a water of the state prior to discharge into a regional WQCV control measure.

3. Any Regional WQCV must meet the requirements of item #1 above.

- Applicable Development Site Draining to a Regional WQCV Facility

1. Applications to use Regional facilities must show that the Regional facilities are designed to accept the drainage from the entire Site under consideration.

2. Site may discharge to water of the state prior to discharging to regional facility provided:

    a. A minimum of 20% of the total impervious surface area of the applicable site first drains to a Control Measure with an area of at least 2% of the total impervious surface area of the applicable site,

    b. the Control Measure is adequately designed to treat 20% of the total impervious surface area of the applicable site,

    c. the Control Measure is designed in accordance with a design manual identified or accepted by the City of Northglenn, and

    d. the stream channel between the Site discharge point and the Regional WQCV Facility must be stabilized.

1. Regional facilities must meet following requirements:

    a. the Regional WQCV Facility must be implemented, functional, and maintained,

    b. the Regional WQCV Facility must be designed and maintained for 100% of the WQCV for its entire drainage area,

    c. the Regional WQCV Facility must have capacity to accommodate drainage from the Site,

    d. the Regional WQCV Facility must be designed and built to comply with all the assumptions for the development activities within the Regional WQCV Facility’s drainage area,

    e. the minimum drain time is based on the specific pollutant removal mechanism and functionality of the measures,

    f. the Site shall meet the City of Northglenn MS4 Permit for Control Measures,

g. the Regional facility must be subject to City authority consistent with the City of Northglenn MS4 Permit, and

h. the Regional facility must be designed and implemented with flood control or water quality as the primary use.

- Recreational ponds and reservoirs are not considered regional facilities.
- Water bodies listed by name in 5 CCR 1002-32 through 5 CCR 1002-38 are not considered Regional facilities.

- Constrained Redevelopment Sites Standard

1. Criteria for consideration as a Constrained Site:

a. The Site prior to redevelopment is greater than 75% impervious,

b. the applicant provides sufficient documentation to prove it is not practicable to meet Standards 1, 2 or 3 above, and

c. the Drainage Report must include evaluation of site's ability to install Control Measure without reducing the surface area of the Site covered by structures.

2. Standards – Site must meet 1 of the following:

a. Control Measure is designed to treat at least 50% of the WQCV for the Site

- Captured area is at least 50% of site total impervious area, and
- Minimum drain time based on specific pollutant removal mechanism and functionality of the Control Measure

b. Control Measures are designed to treat a minimum 80th percentile storm event

- Control Measures are designed to treat runoff to reduce the event mean TSS to 30mg/L or less,
- the Control Measures treat at least 50% of the total site including 50% of the total site impervious area, and
- the TSS removal meets or exceeds the requirements for the entire Site by providing increased removal for the smaller area.

c. Control Measures provide Infiltration, evaporation, and/or evapotranspiration of at least 30% of the entire site WQCV runoff volume.

9.3 Construction Specifications

9.3.1 Excavation & Trenching

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

9.3.2 Bedding

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

9.3.3 Pipeline Installation

General

The City shall be notified at least 48 hours in advance of any pipe installation. No stormwater drainage pipe shall be installed without prior City approval. No pipes shall be backfilled until they have been inspected by the City. Alignment and grade of the pipe and the location of fittings, manholes and inlets 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 sections, pre-cast manholes and inlet sections, shall be carefully lowered into the trench by means of a derrick, ropes or other suitable tools or equipment to prevent damage to stormwater drainage line material. Under no circumstances shall stormwater drainage line materials be dropped or dumped into the trench.

All pipe fittings 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 City. 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. A thin film of gasket lubricant shall be applied to the inside face of the gasket and the spigot end of the pipe. 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. All lifting holes shall be filled with cement mortar prior to backfilling. The pipe shall be secured in place by installation of bedding material and backfill, in accordance with ***Chapter 9 – Storm Drainage & Other Concrete Facilities*** and the detailed drawings in ***Appendix G.3.***

At times when installation is not in progress, the open ends of the pipe shall be closed with a 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.

9.3.4 Manhole Construction

General

Manholes, including cast-in-place or precast bases, inverts, barrel sections, tops and adjusting rings, shall conform to and be installed in accordance with Standard Drawings of these STANDARDS AND SPECIFICATIONS.

Inlets

Inlets shall be constructed with Class B concrete, placed on undisturbed ground and in conformance with the detail drawings in ***Appendix G.3***. The top portion of inlets shall be constructed concurrently with the adjacent curb and gutter to ensure proper alignment of grades.

Manhole/Inlet Grouting Treatment

The horizontal joints between precast manhole/Inlet sections shall be plastered and troweled smooth, inside and out, with cement mortar. The mortar shall be not less than five eighths inch (5/8") in thickness over the joint and shall extend at least four inches (4") on either side of the joint.

All pipes, including concrete, PVC and HDPE shall have a manhole water-stop gasket, to be furnished by the contractor, firmly attached to the pipe prior to grouting into the manhole. The opening in the manhole wall where a pipe enters or leaves shall be sealed and patched in a neat workmanlike manner, both inside and out with cement mortar. All lifting holes and other imperfections in the interior manhole/inlet wall shall be filled with cement mortar.

9.3.5 Connections to Existing Manholes

Stormwater drainage 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 stormwater drainage pipe. The existing concrete foundation bench shall be shaped 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. 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.

9.3.6 Tests

General

All stormwater drainage mains and appurtenances shall be cleaned and tested after backfilling operations have been completed. All required testing must be completed and approved prior to acceptance. Should the City find that the completed line or any portion thereof fails any of the specified tests; the City will not accept the new stormwater drainage line until such time as the stormwater drainage line meets the test specifications. Once the stormwater drainage line is completed and before a "Release for Service" Final Acceptance letter is issued, the contractor shall perform a television inspection on the completed line.

The contractor shall furnish all labor, materials, tools, and equipment necessary to clean the pipe and appurtenances prior to the television inspection. Any damages to the pipeline caused by cleaning shall be repaired or replaced by the contractor at his expense.

TV Inspection

Refer to ***Chapter 9 – Storm Drainage & Other Concrete Facilities*** for TV Inspection and Cleaning requirements and procedures for stormwater drainage lines.

9.3.7 Material Specifications

General

Only those pipeline materials described in this section are approved for stormwater drainage 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 stormwater drainages 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 approved 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/Contractor 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.

Defects

Pipe shall be free of defects in accordance with these STANDARDS AND SPECIFICATIONS.

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, may be required by the City prior to final acceptance of the work.

Polyvinyl Chloride Pipe (PVC) – Gravity

All gravity pipe materials and fittings shall meet the minimum requirements of ASTM D-3034, SDR-35, latest revision. 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. 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.

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.

Reinforced Concrete Pipe (RCP)

Developer/Owner shall have soils testing and a summary letter prepared by a geotechnical firm to determine the suitability of using RCP prior to including it in the design. Soil testing results and the letter shall be submitted with the design. All Reinforced Concrete Pipe used in the construction of a stormwater drainage system within the right-of-way in the City of Northglenn shall conform to the following specifications:

- Pipe – ASTM C76 – Reinforced Concrete Culvert, Storm Drainage and Sewer Pipe for Class II, III, IV, and V.
- Joints – ASTM C443 – Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets.
- O-Ring/Profile Rubber Gaskets – AASHTO M198

- All RCP shall be constructed with Type II modified cement. The absorption of the pipe shall meet minimum ASTM C-76.
- All concrete pipe fittings, wyes, tees, and bends shall be cast as an integral part of the pipe to which they are attached and shall be the same pipe classification.
- The following shall be clearly marked on the exterior surface of all pipe with waterproof paint:
    - ASTM Specification.
    - Class and Size.
    - Date of Manufacture.
    - Name or Trademark of Manufacturer

High Density Polyethylene Pipe (HDPE)

- High Density Polyethylene (HDPE) Corrugated and Smooth Lined Pipe & Fittings shall be manufactured in accordance with requirements of ASTM F 2306, latest edition. Type S: This pipe shall have a full circular cross section, with an outer corrugated pipe wall and a smooth inner wall.
- High Density Polyethylene (HDPE) Corrugated and Smooth Lined Pipe shall be manufactured from virgin PE compounds which conform with the requirements ASTM D 3350.
- Minimum Pipe Stiffness shall be in compliance with ASTM F 2306 and tested in accordance with ASTM D 2412.
- Installation shall be in accordance with ASTM D 2321.

Manholes

Manholes, reducing sections, ladder rungs, base slabs, joint material, mortar, and traffic lids shall conform with these STANDARDS AND SPECIFICATIONS.