Seattle Public Utilities

Draft Director's Rule

Title		Number	Rev. No.
Public Drainage System Requirements		DWW 210	0
Responsibility		**Supersedes**	**Pages**
Drainage and Wastewater Line of Business / Project Delivery and Engineering Branch		NA	TBD
General Manager/CEO Approval		**Approval Date**	**Effective Date**
			July 1, 2021

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I. PURPOSE

A. To support implementation of the Stormwater Code, the Director of Seattle Public Utilities (SPU) promulgates rules that provided specific technical requirements, criteria, guidelines, and additional information. This Director's Rule consists of rules for the purpose of implementing the Stormwater Code, specifically the following sections of the Seattle Municipal Code (SMC):

1) Minimum Requirements for Discharge Point (SMC 22.805.020.B) (also known as "Approved Point of Discharge")

2) Ensure Sufficient Capacity (SMC 22.805.020.H)

3) Extension of Public Drainage System – Projects Not Conducted in Public Right-of-Way (SMC 22.805.020.L)

B. (Typically applies to Single-family Residential and Parcel-based Projects)

1) Extension of Public Drainage System – Projects Conducted in Public Right-of-Way (SMC 22.805.020.M)

C. (Typically applies to Roadway Projects)

1) Public Drainage System Requirements (SMC 22.805.020.N)

D. For terms used in this Director's Rule, refer to SMC 22.801 (Stormwater Code - Definitions), SMC 21.16.030 (Side Sewer Code - Definitions), and Section VIII (Definitions) of this Director's Rule.

II. DISCRETION

A. In limited or exceptional circumstances, and when it is in the best interests of the utility, SPU's General Manager/Chief Executive Officer (Director) or authorized designee, may modify or waive the drainage requirements or public drainage improvements under this rule.

B. Director in this rule means the Director of SPU per SMC 22.801.050, unless otherwise noted.

III. APPROVED POINT OF DISCHARGE

Stormwater Code Language

22.805.020 Minimum Requirements for All Projects

B. Minimum Requirements for Discharge Point. The discharge point for drainage water from each site shall be selected using criteria that shall include, but not be limited to, preservation of natural drainage patterns and whether the capacity of the drainage system is adequate for the flow rate and volume. For those projects meeting the drainage flow control threshold, the proposed discharge point shall be identified in the drainage control plan required by this subtitle, for review and approval or disapproval by the Director.

Refer to proposed Stormwater Code during public review.

Final code language to be added to final rule

A. All projects shall convey stormwater flow to an approved point of discharge and include overflows for all stormwater best management practices (BMPs).

B. The approved point of discharge as determined by the Director, in order of priority, includes the following:

1) Receiving waters
2) Public storm drain pipes
3) Ditch and culvert system
4) Public combined sewer system
5) Infiltration on site

C. Stormwater and groundwater (including footing drains) shall not be conveyed to or enter a sanitary sewer (SMC 21.16.220) even if a system was “formerly combined” regardless of project size. Refer to SPU’s Water & Sewer Map for “Mainlines Permitted Use” in determining whether a system is classified as a sanitary sewer: https://gisrevprxy.seattle.gov/wab_ext/DSOResearch_Ext/

D. Extension of the piped public drainage system may be required even if a ditch and culvert system or a public combined sewer abuts a project. Refer to Section V (Extensions – Projects Not Conducted in Public Right-of-Way) and Section VI (Extensions – Projects Conducted in Public Right-of-Way for requirements.

Note: The public combined sewer is not a public drainage system by definition.

E. Seattle has a complicated system due to historical annexations, major sewer and drainage projects, and other complexities. Therefore, prior to proceeding with project design, confirm your project discharge location with the City of Seattle (City) through the City’s Preliminary Application Report (PAR) process to determine your project requirements. To determine Stormwater Code project requirements for projects that are not required to go through the PAR process, contact the Drainage Review Team at SideSewerInfo@Seattle.gov for projects conducted on private property or SPU_PlanReview@Seattle.gov for projects conducted in the right-of-way.

F. The types of conveyance systems to the approved point of discharge, in order of priority, include the following:

1) Direct pipe connections
2) Ditch and culvert system
3) Gutter or street flow line
4) Surface dispersal

IV. ENSURE SUFFICIENT CAPACITY

Stormwater Code Language

22.805.020

H. Ensure Sufficient Capacity. All large projects, all projects with an excavation depth of 12 feet or more below the existing grade, and all projects with an excavation depth of less than 12 feet located in an area expected to have shallow groundwater depths, shall ensure that sufficient capacity exists in the public drainage system and public combined sewer downstream of the site to convey peak flows, including any flows from dewatering activities. Capacity analysis shall extend to at least 1/4-mile from the discharge point of the project. Where sufficient capacity does not exist, capacity may be required to install a flow control facility or improve the drainage system or public combined sewer to accommodate flow from the site. Unless approved otherwise by the Director as necessary to meet the purposes of this subtitle:

a. Capacity analysis for discharges to the public drainage system shall be based on peak flows with a 4 percent annual probability (25-year recurrence interval); and

b. Capacity analysis for discharges to the public combined sewer shall be based on peak flows with a 20 percent annual probability (5-year recurrence interval).

Refer to proposed Stormwater Code during public review. Final code language to be added to final rule

This Section IV generally applies to projects that discharge to a ditch and culvert system. For projects that discharge to a piped public drainage system or a public combined sewer, refer to SMC 22.805.020.H (Ensure Sufficient Capacity) and SPU's Design Standards and Guidelines for requirements.

A. Ensure Sufficient Capacity Requirements

1) The minimum requirement to ensure sufficient capacity is in addition to other Stormwater Code minimum requirements.

2) The Director may waive the requirements to perform a downstream analysis if the system has been determined by the Director to have sufficient capacity or the project has otherwise provided flow control (e.g., providing Peak Flow Control for projects that discharge to the public combined sewer system).

3) For public drainage system or combined sewer improvements, the Director shall determine the type of improvements in accordance with the City's Standard Plans and Specifications, SPU's Design Standards and Guidelines, and as specified in rules promulgated by the Director.

4) For projects that discharge to a ditch and culvert system where there is insufficient capacity to accommodate flow from the site, provide the following:

a) For projects not conducted in the public right-of-way (e.g., Parcel-based, Single-family Residential), in any order, provide one of the following to accommodate flows from the site:

i) Meet Existing Condition Standard (SMC 22.805.080.B.4) on the project site.

ii) Meet Peak Control Standard (SMC 22.805.080.B.5) on the project site and mitigate identified downstream capacity issues (Sections D & E).

iii) Mitigate identified downstream capacity (Sections D & E) and erosion (Sections B & C) issues.

b) For projects conducted in the public right-of-way (e.g., **Sidewalk**, **Roadway**), in the following order of priority and based on feasibility, provide one of the following as determined by the Director to accommodate flows from the site:

i) Mitigate identified downstream capacity (Sections D & E) and erosion (Sections B & C) issues.

ii) Mitigate identified downstream capacity issues (Sections D & E). and meet the Peak Control Standard (SMC 22.805.080.B.5) on the project site.

iii) Meet the Existing Condition Standard (SMC 22.805.080.B.4) on the project site.

5) Upon review of the downstream erosion and capacity analyses described below (Section B and Section D), the Director may require a more detailed quantitative downstream analysis. The quantitative analysis shall require one of the following:

a) A quantitative analysis using non-surveyed field data and a uniform flow analysis.

b) A quantitative analysis using surveyed field data and a backwater analysis.

The analysis required will depend on the nature and significance of the identified downstream issues.

B. Erosion Analysis Requirements

1) Conduct a downstream erosion analysis for at least one-quarter mile downstream of each proposed project discharge point to identify existing or potential erosion problems that may occur as a result of the project. Unless requested by the Director, the downstream analysis will be a qualitative analysis based on available information and site observations conducted by a qualified professional. A downstream erosion analysis is typically required only for discharges to ditch and culvert systems and direct discharges to receiving water bodies. The downstream erosion analysis shall consist of the following tasks:

a) Define and map the study area. The study area shall extend one-quarter mile downstream of each proposed project discharge point.

b) Review published data and reports. At a minimum, the following resources of documented information relevant to the analysis shall be reviewed, at a minimum: basin plans, Federal Emergency Management Agency (FEMA) maps, drainage and design reports from nearby projects, drainage complaints, geographic information system (GIS) mapping data, and critical areas reports.

c) Perform a field inspection. Inspect the downstream flow path(s) from each proposed discharge point to identify existing and potential erosion issues. The field inspection of the study area for the downstream analysis shall investigate any issues noted during the resource review, verify the basin delineation and characterization, verify the existing stormwater conveyance information, and identify existing or potential scouring and incision, bank sloughing and erosion, and sedimentation and siltation.

d) Document the drainage system(s) and the existing and potential erosion issues (even if they do not meet the following definitions) in the Drainage Report. Potential erosion problems that require mitigation include:

i) Severe Ditch Erosion: A condition where the lining of an existing downstream ditch is insufficient to prevent erosion for the predicted post-development 25-year recurrence interval flow velocity or where any existing ditch erosion and/or incision is documented or observed.

ii) Severe Outfall Erosion: A condition where an existing downstream outfall or outfall structure is insufficient to prevent erosion for the predicted post-development 25-year recurrence interval flow velocity or where any outfall erosion or scour is documented or observed.

iii) Severe Creek Erosion: A condition where an existing downstream creek or stream has documented or observed erosion and/or incision.

C. Erosion Mitigation Requirements

1) Mitigate identified erosion problems. If no existing or potential erosion problems are identified based on the above criteria, no mitigation is required. For existing and potential erosion problems that are identified, the following mitigation shall be provided:

a) Severe Ditch Erosion: Line a ditch segment to accommodate the post-development 25-year recurrence interval velocity. Mitigation design shall not decrease existing conveyance capacity.

b) Severe Outfall Erosion: Provide energy dissipation outfall protection or an energy dissipation structure to accommodate the post-development 25-year recurrence interval velocity or provide an energy dissipater must be provided. Mitigation design shall not decrease existing conveyance capacity.

c) Severe Creek Erosion: Provide creek bank protection and/or restoration measures to accommodate the post-development 25-year recurrence interval velocity. Mitigation design shall not decrease existing conveyance capacity.

D. Capacity Analysis Requirements

1) Conduct a downstream capacity analysis for at least one quarter mile downstream of each proposed project discharge point. Unless requested by the Director, the downstream analysis will be a qualitative analysis based on available information and site observations conducted by a qualified professional. The downstream capacity analysis shall consist of the following tasks:

a) Define and map the study area. The study area shall extend one-quarter mile downstream of each proposed project discharge point.

b) Review published data and reports. At a minimum, the following resources of documented information relevant to the analysis shall be reviewed, at a minimum: basin plans, FEMA maps, drainage and design reports from nearby projects, drainage complaints, GIS mapping data, and critical areas reports.

c) Inspect the downstream flow path to identify existing and potential flooding issues. The field inspection of the study are for the downstream analysis shall investigate any issues noted as part of the resource review, verify the basin delineation and characterization, verify the existing stormwater conveyance information, and identify existing or potential overtopping and flooding.

d) Document the drainage system(s) and the existing and potential flooding issues (even if they do not meet the following definitions) in the Drainage Report. Existing and potential issues meeting the following definitions require mitigation:

i) Conveyance Nuisance Flooding: Observed or documented flooding of private property, roadway shoulder or lane, flow across driveways or flooding of outbuildings or the predicted 10-year recurrent overflow of a constructed conveyance system.

ii) Severe Building Flooding: Observed or documented building flooding or the predicted 25-year recurrence interval flood elevation will impact a finished floor of a habitable building or the electric/heating system of a habitable building. The recurrence interval shall be reduced to 5-year for any building deemed essential.

iii) Severe Roadway Flooding: Observed or documented roadway flooding that covers more than a roadway shoulder plus half the width of a travel lane or the predicted 10-year (arterial) or 25-year (residential) recurrent flood elevation will cover more than a roadway shoulder plus half the width of a travel lane.

E. Capacity Mitigation Requirements

1) Mitigate identified capacity issues. Measures must be implemented to prevent an increase in flows downstream of the mitigation, or the Ensure Sufficient Capacity analysis will need to continue for an additional one-quarter mile. Mitigation can be provided by one of the following:

a) Improving capacity in the downstream drainage system to ensure sufficient capacity to accommodate the post-development 10-year (for conveyance nuisance flooding) and/or 25-year (for severe building or roadway flooding) recurrence interval flow rate, OR

b) Constructing flood control measures to accommodate the post-development 10-year (for conveyance nuisance flooding) or 25-year recurrence (for severe building or roadway flooding) interval flow rate.

V. EXTENSIONS – PROJECTS NOT CONDUCTED IN THE PUBLIC RIGHT-OF-WAY

This section describes the minimum requirements for extension of the Public Drainage System related to projects not conducted in the public right-of-way. These requirements typically apply to Single-family Residential (SMC 22.801.200) and Parcel-based Projects (SMC 22.801.170).

For projects conducted in the public right-of-way, refer to Section VI of this rule.

Stormwater Code Language

L. Extension of the Public Drainage System. For projects not constructed in the public right-of-way, extension of the piped public drainage system across the full extent of the parcel boundary in the abutting public place shall be required for any of the following:

1. All projects where the Director has determined an extension is required considering, but not limited to, the following attributes of the project:

a. Poses a hazard to public health, safety or welfare;

b. Endangers any property;

c. Adversely affects the safety and operation of public right-of-way, utilities, or other property owned or maintained by the City;

d. Adversely affects the functions and values of an environmentally critical area or buffer;

e. Adversely affects an area with known erosion or flooding problems; or

f. Adversely affects receiving waters, any properties, or right-of-way.

2. All projects with 5,000 square feet or more of new plus replaced hard surface, unless:

a. The piped public drainage system is already accessible within an abutting public place to each existing, proposed, or adjusted parcel; or

b. The project is otherwise not required to extend by rules promulgated by the Director.

Refer to proposed Stormwater Code during public review.

Final code language to be added to final rule

PROJECT REQUIREMENTS

A. General Requirements

2) Extension of the **piped** public drainage system (also known as a Pipe Storm Drain (PSD)) is required unless otherwise noted.

3) Note: The public combined sewer is not a public drainage system by definition.

4) In combined sewer service areas where a public drainage system is determined to be inaccessible for extension, the extension of a public combined sewer may be allowed instead (refer to SMC 21.16.040).

5) A private easement across an adjacent parcel shall not preclude the requirement of extension of the public drainage system, system modification, and/or side sewer

installation perpendicular to an abutting public drainage system if otherwise required by this rule.

6) Any division, redivision, or lot boundary adjustment of land that has the effect of avoiding public drainage system installation or other appurtenance requirements shall not change the installation requirements under this rule that would apply before the division, redivision, or lot boundary adjustment.

7) If one or more parcels of a project are landlocked, a side sewer between the public drainage system and the structure served by the system may occupy a portion of one or more parcels of the project that are not served by that side sewer. Refer to 21.16.250 (Easements and Agreements) for easement requirements.

8) The cost of an extension is borne by the applicant. Some cost may be recovered by a Latecomer Agreement.

9) In some circumstances, including but not limited to state highways, divided roadways, the presence of railroad or streetcar tracks, or other obstructions in the right-of-way, installing a public drainage system to serve the near side of the road shall be required.

10) In special circumstances, the system may be best served by the installation of a pipe that is larger than required by this rule (i.e., 25-year storm event) or other system improvements. In such cases, SPU shall pay the difference in cost of materials for the required and the desired size.

11) If one or more parcels are landlocked, the Director may require that the applicant provide an easement to the benefit of the Utility and install a public drainage system on a private parcel.

12) Refer to SMC 22.805.020.N and Section VII of this rule for design requirements for the public drainage system.

13) Refer to Director's Rule ENG-430 (Utility System Improvement Dispute Process) for dispute procedures for system improvements.

F. Requirements for All Projects

1) Projects are required to extend the piped public drainage system if the Director determines that a project meets the criteria in SMC 22.805.020.L.1.

G. Requirements for "Small Projects"

1) Unless SMC 22.805.020.L.1 applies, projects with less than 5,000 square feet of new plus replaced hard surface are not required to extend the piped public drainage system if any of the following applies:

a) The approved point of discharge is directly into a receiving water.

b) Curb or alley discharge is allowed and used per Directors' Rule SDCI 6-2021 / SPU DWW-300, Section VII.I (Curb Discharge into the Public Place).

c) Onsite infiltration is allowed and used per Directors' Rule SDCI 10-2021 / SPU DWW-200, Volume .3, Section 4.3.2.1 (Requirements for Projects with No Off-site Point of Discharge).

H. Requirements for "Large Projects"

1) Unless SMC 22.805.020.L.1 applies, projects with 5,000 square feet or more new plus replaced hard surface are not required to extend the piped public drainage system, if any of the following applies:

a) The piped public drainage system is not accessible to be extended as determined by the Director.

b) The approved point of discharge is directly to a receiving water.

c) The project has less than 5,000 square feet of **new** hard surface and a public combined sewer or a ditch or culvert system is <u>accessible within the abutting public place to each existing, proposed, or adjusted parcel.</u>

d) The project is greater than 600 LF from a piped public drainage system and a public combined sewer or a ditch or culvert system is accessible within the abutting public place to each existing, proposed, or adjusted parcel.

e) One parcel has a parcel boundary that contains a piped public drainage system and a single service is required.

f) The project is a unit lot subdivision and the following conditions apply:

    i) The unit lot subdivision shares a boundary with more than one street; and

    ii) One boundary contains a piped public drainage system.

g) The Director makes the determination to waive or modify the requirements to extend the piped public drainage system. In making the determination the Director may consider, but is not limited to, the following conditions:

    i) The location of an environmentally critical area or buffer or disruption of existing drainage patterns makes extending, improving, or maintaining the public drainage system impractical.

    ii) An existing bridge, viaduct, or other structure such as a substantial retaining wall makes extending the public drainage system impractical.

    iii) Extension of the public drainage system cannot be built and operated under gravity flow conditions while meeting applicable engineering standards.

VI. EXTENSIONS – PROJECTS CONDUCTED IN THE PUBLIC RIGHT-OF-WAY

This section describes the minimum requirements for extension of the Public Drainage System related to projects conducted in the public right-of-way. These requirements typically apply to **Sidewalk Projects** (SMC 22.801.200) and **Roadway Projects** (SMC 22.801.190) that are conducted only within the public right-of-way.

For projects not conducted in the public right-of-way, typically Single-family residential or Parcel-based projects, refer to Section V of this rule.

Stormwater Code Language

M. Extension of the Public Drainage System. For projects constructed in the public right-of-way, extension of the piped public drainage system across the full extent of the site shall be required for any of the following:

1. All projects where the Director has determined an extension is required considering, but not limited to, the following attributes of the project:

a. Poses a hazard to public health, safety or welfare;

b. Endangers property;

c. Adversely affects the operation of City right-of-way, utilities, or other property owned or maintained by the City;

d. Adversely affects the functions and values of an environmentally critical area or buffer;

e. Adversely affects an area with known erosion or flooding problems; or

f. Adversely affects receiving waters, any properties, or right-of-way.

2. The project's total new plus replaced hard surface is 50 percent or more of the existing hard surfaces within the project limits. The project limits are defined by the length of the project and the width of the right-of-way. If a project encompasses more than one intersection, the project limits are further defined by one intersection to the other and blocks may vary in length, unless:

a. The piped public drainage system is already accessible within the site; or

b. The project is otherwise not required to extend by rules promulgated by the Director.

Refer to proposed Stormwater Code during public review.

Final code language to be added to final rule

A. General Requirements

1) Extension of the **piped** public drainage system (also known as a Pipe Storm Drain (PSD)) is required unless otherwise noted.

2) Note: The public combined sewer is not a public drainage system by definition.

3) In combined sewer service areas where a public drainage system is determined be inaccessible for extension, the extension of a public combined sewer may be allowed instead (refer to SMC 21.16.040).

4) The cost of an extension is borne by the applicant.

5) In some circumstances, including but not limited to state highways, divided roadways, the presence of railroad or streetcar tracks, or other obstructions in the right-of-way, installing a public drainage system to serve the near side of the road shall be required.

6) In special circumstances, the system may be best served by the installation of a pipe that is larger than required by this rule (i.e., 25-year storm event) or other system improvements. In such cases, SPU shall pay the difference in cost of materials for the required and the desired size.

7) Refer to SMC 22.805.020.N and Section VII of this rule for design requirements for the public drainage system.

B. Requirements for All Projects:

1) All projects conducted in the public right-of-way (e.g., sidewalk projects, roadway projects) are required to extend the piped public drainage system if the Director determines that a project meets the criteria in SMC 22.805.020.M.1.

C. Extension Not Required

1) Projects are not required to extend the piped public drainage system, under the following conditions:

a) The piped public drainage system is not accessible to be extended as determined by the Director.

b) The Director makes the determination to waive or modify the requirements to extend the piped public drainage system. The waiver or modification shall provide the minimum relief necessary from the requirement to extend the public drainage system. In making the determination the Director may consider, but is not limited to, the following conditions:

i) The location of an environmentally critical area or buffer or a disruption of the existing drainage patterns makes extending, improving, or maintaining the public drainage system impractical.

ii) An existing bridge, viaduct, or other structure such as a substantial retaining wall makes extending the public drainage system impractical.

iii) Extension of the public drainage system cannot be built and operated under gravity flow conditions while meeting applicable engineering standards.

VII. PUBLIC DRAINAGE SYSTEM REQUIREMENTS

Stormwater Code Language

Refer to proposed Stormwater Code during public review. Final code language to be added to final rule

This rule explains standard criteria for civil engineers to use in designing the following:

- Piped Storm Drain (PSD)
- Detention pipes
- Culverts
- Catch basin (CB) and inlet facilities
- Other public drainage systems

Because specific site conditions greatly affect the feasibility of many design elements outlined in this rule, SPU, at its discretion, may approve design variations other than those specified by these requirements. SPU and the Seattle Department of Transportation (SDOT) must approve all drainage improvements in the right-of-way.

A. Point of Discharge

1) Per SMC 22.805.020.B (Minimum Requirements for Discharge Point), selection of the point of discharge for any project shall consider whether the capacity of the drainage system is adequate for the flow rate and volume from the project site. If a project proposes to redirect flow from one public drainage system to another, the project shall analyze potential impacts on the downstream system or receiving water.

B. Grade Roadways and Alleys to Collect Drainage

1) Curb Returns

a) Grade curb returns at a minimum slope of 0.5% in the flow line so that no low point is located in a crosswalk or in front of a curb ramp per Standard Plan 260a.

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i) Avoid locating open grates inside curb ramp wings. This allows maintenance of the structure without closing the curb ramp. Open grates within the curb ramp landing are not allowed.

ii) Additionally, grade curb returns at a minimum slope of 0.5% in the flow line so that any drainage collection structure is not:

iii) From a curb ramp landing to any grate with a minimum clear distance of 1-foot. When unavoidable, a variance that is Americans with Disabilities Act (ADA) compliant will be considered.

iv) In a vehicle parking zone. This is to avoid the need for temporary on street parking restrictions when maintenance is required.

b) Avoid creating closed-contour low points and minimize new low points that trap stormwater.

2) Right-of-Way Behind the Curb

a) Grade right-of-way behind the curb to the street. The standard cross section is shown on Standard Plan 400.

b) When SPU agrees that the standard cross section is infeasible, especially at curb bulbs and bus bulbs, typical drainage design considerations or exceptions include the following:

i) Direct drainage away from building entrances.

ii) Direct any overflow towards the street.

iii) Evaluate alternative curb heights down to a minimum of 4 inches.

iv) Evaluate alternative slopes on the sidewalk down to a minimum of 0.5%.

v) Use the existing curb line along the sidewalk as a depression line to drain off water to the street.

vi) Grade so that overflow from rain gardens in the planting strip overtops the curb towards the street.

vii) Direct drainage to landscaping or infiltration facilities.

viii) Install curb cut outlets from bioretention features per Standard Plans 295c and 295d.

3) New Curb Bulbs

a) To the extent practical, grade new curb bulbs to allow drainage to flow to a standard location for a drainage collection structure.

b) When locating low points, consider access issues related to maintenance of drainage collection structures, such as worker exposure to traffic, and vehicles parked over the structure.

4) Concentrated Flow

a) Collect flow concentrated along a gutter or flow line in a drainage structure. Do not allow the flow to fan out after it has concentrated.

5) Inlet and CB Staking Points

a) Set elevations for inlets and CB grates at the curb face. Include the drainage transition zone as shown in Standard Plan 260a.

6) Alleys

a) Grade alley cross sections per Standard Plan 403, and grade longitudinal sections to drain to the perpendicular street. Public storm drain extensions to mid-alley low points will not be permitted, unless SPU agrees that there is no feasible alternative.

7) Raised Crosswalks

a) After SDOT determines that a raised crosswalk is desired for transportation purposes, SPU will review the drainage function and mitigation measures. Detailed grading analysis is required. Grade to limit ponding when drainage pickups are plugged. The overflow path must not be over the sidewalk or onto private property. Refer to Section C.6 Gutter flow calculations.

C. Locating CBs and Inlets

1) Collection points

a) Collect drainage in the following locations:

i) At all closed contour low points and minor low points along the roadway

ii) Upstream of all intersections

iii) Upstream of all crosswalks and curb ramps

iv) Before transitions on super-elevated roads

v) At the downstream end of developed alleys upstream of the sidewalk

b) Design variations, accepted at the discretion of SPU, include:

i) No required drainage pickup if the drainage area is 3,000 square feet or less leading to an intersection, crosswalk, or end of an alley.

ii) Additional drainage pickups to limit clogging due to tree leaves or other debris.

iii) Additional drainage pickups at abrupt grade changes.

c) Additional drainage pickups (CBs) are required at closed-contour low points.

2) Maximum curb length of a residential street contributing to a CB

a) Water from less than 1,000 total lineal feet of curb on a residential street may discharge into one CB. This includes the length of curb for inlets that discharge into a CB as well as the CB itself.

b) Although grading streets to minimize closed-contour low points along the roadway is preferred, some flat residential streets may require additional drainage pickups.

3) Pedestrian and bicycle routes

a) Locate and relocate solid cover CBs to avoid pedestrian and bicycle access routes. When possible, stay close to the curb to limit the need for lane closures during maintenance and avoid the vehicle wheel path to limit noise and cover wear.

4) Standard locations for drainage grates and exceptions

a) For standard locations of drainage grates, refer to Standard Plan 260a and 260b. Exceptions to the requirement of locating structures 1.5 feet from the point of curvature (PC) or point of tangency (PT) include the following:

i) A wider crosswalk or curb ramp location that would direct pedestrians to cross a grate

ii) Locating the drainage grate farther up gradient to avoid creating a low point farther up gradient

iii) Moving the drainage grate up-gradient to avoid utility conflicts

iv) Locating the drainage grate farther up-gradient due to site conditions requiring an abrupt grade change that flattens up-gradient of the intersection, especially at curb bulbs

5) Trees

a) Maintenance of drainage structures can be hazardous to tree health. To the extent feasible, locate structures outside the full-growth drip line of street trees. The minimum distance from the edge of the trunk to the edge of the structure is 5 feet per Standard Plan 030.

6) Gutter flow and allowable spread width calculations

a) To support safety and mobility of vehicles, pedestrians, and bicycles, the spread width of water on roadway edges shall be established as part of the design. Calculations of gutter flow and spread width, including sag inlet analyses, are required for projects that build new arterial streets or significantly change the areas contributing flow to existing collection inlets and for projects that build new sidewalk along roadways that previously had no curb and gutter conveyance systems.

b) Allowable spread width of gutter flow:

i) On arterial streets, the allowable spread width on a continuous grade is 5.5 feet for the pavement adjacent to the street edge or curb, for the 10-year rainfall intensity, 5-minute duration design storm. Scenarios where a lesser design spread width is proposed requires further assessment as follows:

- An assessment of the spread width should be made at locations where a lesser design spread width is proposed, including:
- Near bus stops
- Where there is no planting strip to provide separation of pedestrians from the roadway
- Upstream of closed contours where allowing bypass flow to enter the sag location will increase the risk of actual flooding
- If lane adjacent to the shoulder or curb is intended to be used for bike travel
- This allowable spread is required regardless of the use of the pavement adjacent to the street edge or curb (eg parking lane, bike lane, vehicle travel lane, etc).

ii) In the case of a closed contour, a roadway sag inlet analysis is required.

- Roadway sag inlet analysis shall be according to WSDOT's Hydraulic Manual.
- Roadway sag inlet analysis shall use the 50-year rainfall intensity, 5-minute duration design storm.
- If the closed contour is located in an intersection, the Engineer should consider safety at the intersection, the effects of icing and hydroplaning of vehicles at this location, and how quickly ponding from the rainfall event will flow off the roadway.

iii) The Engineer shall analyze the spread width of flow at existing and new inlet locations on a continuous run of curb until the curb ends or the curb enters an inlet or other collection structure.

- If the curb ends or no collection structure is located upstream of an intersection, the Engineer should evaluate:
- Impacts to private property

- Anticipated ponding in the ROW
- Impacts to traffic, pedestrian, and bicycle safety in an intersection
- If the next downstream collection point has capacity for flows.

iv) Where use of the allowable spread width is infeasible, the Engineer should evaluate the following drainage elements:

c) Longitudinal pavement slope (refer to Streets Illustrated for allowable range of slopes)

d) Cross or transverse pavement slope (refer to Streets Illustrated for allowable range of slopes)

e) The depth of flow at the edge of the travel lane (maximum of 0.12 feet)

On vehicle traffic lanes greater spread widths may be allowed where traffic volumes and speeds are low. An assessment of the relative risks and cost of various design spread widths may be helpful. SPU has an interest in minimizing new CB infrastructure when street function is not compromised. Exceptions to the allowable spread width must be approved by SPU and the City Traffic Engineer.

D. Type of CB or Inlet to Use Where

1) Preference for CBs

a) CBs provide more reliable drainage pickup and are preferred over inlets. Examples of when installation of an inlet is allowed instead of a CB include:

i) The existing condition is an inlet and CB system. Refer to Detail 1on the drawings at the end of Section VII.

ii) Utility interferences prevent the installation of a CB along the curb line. Refer to Detail 2 on the drawings at the end of Section VII.

2) Replacing existing inlets, CBs and connection pipe

a) Inlets along new curbs must conform with Standard Plan 250 or be replaced. Whenever an inlet is replaced, the connection pipe to the CB must be replaced with new pipe. If SPU determines that the existing CB or CB connection pipe is defective by SPU, it must also be replaced.

3) Standard CB installation

a) Standard CB installation within the street shall be in accordance with Standard Plan. 240D, which has a vaned grate and through curb opening.

b) Typical design variations and exceptions include the following:

i) Type 242B installation:

- To accommodate locating other shallow utilities behind the curb
- To avoid a top slab within the pavement

ii) Type 240A installation when inlets provide the open grated surface and the CB has a solid lid

iii) Type 240C or type 242A installations that do not have a through curb opening, when the structure is not at a curb or the curb height is less than 4 inches

4) Standard Inlet Installation

a) Install standard inlets within the street per Standard Plan 250B, which has a vaned grate and through curb opening. Use type 250A when the structure is not at a curb or the curb height is less than 4 inches.

5) At curb bulbs

a) For curb bulbs, refer to Detail 4 on the drawing at the end of Section VII. Locate a Standard Plan 240 CB no farther up-gradient than 1.5 feet from the PC or PT of the curb bulb.

b) Use a Standard Plan 250 inlet when the existing condition is an inlet and CB system and:

i) The location is not a closed contour low point or a minor low point.

ii) The inlet connection pipe can be placed at a minimum slope of 5% with an invert at the CB 2-inches minimum above the outlet pipe invert.

iii) Either an existing CB in good condition or a new type 240A CB is located in the roadway.

6) Closed Contour Low Points

a) At closed contour low points, two independently connected CBs are required in order to minimize the following:

i) Street flooding caused by plugging of the CB or inlet

ii) Drainage runoff overtopping the curb

iii) Private property damage

b) At most locations, the second CB is located on the opposite side of the street. Refer to Detail 3 on the drawings at the end of Section VII.

7) Alleys

a) In alleys, use a Standard Plan 241 catch basin.

8) Elevated Structures

a) For all elevated structures, consult with SPU about the requirements early in the design process. If drains are required on a bridge, install per Standard Plan 290 with a grate per Standard Plan 265. New bridge downspouts shall have a minimum pipe diameter of 6 inches and a minimum bend radius of 4 feet.

9) Non-Standard Installations Within Shallow Ditch and Culvert System

a) For non-standard installations within the shallow ditch and culvert system, consult with SPU about the requirements early in the design process. Design variations, allowed at the discretion of SPU, include the following:

i) Replacing all existing sand boxes within the project area with either a CB or a junction box, depending on the function

ii) Grading and defining depression lines to reduce the number of structures needed

iii) CB to CB connections along the culvert. This avoids offset CBs that require a junction box because a tee connection to the existing shallow culvert is infeasible

iv) Eliminating the trap when connecting CB to CB

v) Installing a Standard Plan 241 CB with a vane grate within the roadway

vi) Reducing or eliminating riser sections, if the street surface is flat enough to allow adjustment of the casting with a reduced riser

vii) Inverted frames to reduce the height of the casting

viii) Situation specific designs of shallow structures

10) Other Non-Standard Installations

a) Other non-standard installations and modified structures may be approved if SPU agrees that grading to eliminate the need is infeasible. Structures will be individually reviewed, using the following criteria:

i) The non-standard structure has the following attributes:

- Is accessible and maintainable
- Does not result in an increased risk of flooding
- Is ADA compliant

ii) Within the roadway, consider in the following order:

- Use of one or two smaller standard structures to increase storage volume (e.g., Standard Plan 241 with vaned grate).
- A modified shallower CB that has a standard grate, the maximum sump possible and a trap (detail required)

iii) Behind the curb installations will be evaluated in the following order:

- Depression line to an inlet connected to existing CB.
- Depression line to CB and connection to main.
- Trench grates will be approved only if there is no infrastructure available for CB connection.

E. Inlet and CB Connection Pipes

1) Sizing

a) Standard size for inlet connection and CB connection pipes standard size is 8-inch diameter. Design variations, allowed at the discretion of SPU, include the following:

i) When the CB is being connected to a 10-inch-diameter or smaller combined sewer, use a 6-inch-diameter pipe.

ii) Allowing a variance to reconnect to an existing 6-inch-diameter connection pipe in good condition, rather than replacing the pipe all the way to the mainline. Use a 6-inch-diameter pipe and a flexible gasketed coupling with stainless steel shielding. Connecting new 8-inch-diameter pipe to an existing 6-inch-diameter pipe is not allowed.

iii) Installing a 6-inch-diameter pipe when collecting sidewalk drainage only.

2) Inlet Connections

a) Inlet connections must be straight and conform with the following specifications:

i) Placed at a minimum slope of 5%

ii) A maximum length of 50 feet

iii) An invert at the CB that is at least 2 inches above the invert for the outlet pipe invert

b) Inlets must connect to a CB. Direct connection to a mainline must be made from a structure with a sump and outlet trap.

3) Outlet Location and Orientation

a) Refer to Standard Plans 240, 242, 250 and 261 for allowable location and orientation of outlets from structures. Pipe must be oriented to allow tool access utilizing the length of the casting opening, and traps must be below the casting, so they can be reached.

4) CB Connections

a) CB connections must be placed at a minimum slope of 2% and a maximum slope of 100% slope. Horizontal and vertical bends are expected, but shall not exceed 22½ degrees in a single fitting. A straight pipe section of at least 1 foot minimum is required between fittings.

5) Connection pipe material

a) Connections shall be ductile iron (DIP). Refer to standard construction notes “Drainage CB and Inlet Notes” (docx) and Standard Specifications for Municipal Construction . Design variations, allowed at the discretion of SPU, include the following:

i) Use of a non-metallic pipe when site conditions include corrosive soils or other corrosion source.

ii) Evaluating matching the existing pipe material when coupling to an existing pipe to remain.

6) Connecting to the mainline pipe

a) Connections to a new mainline pipe must be by manufactured tee unless one of the following attributes applies to the new mainline:

i) Diameter of a least 24 inches

ii) Reinforced concrete pipe (RCP)

b) For information on allowable connections and procedures for connections to existing mainline pipe, refer to Core Tap Procedures for Storm and Sewer Mains. Connections to maintenance holes are non-standard and will be evaluated by SPU on a case-by-case basis.

7) Shallow street culvert connections

a) When it is infeasible to install a tee on the existing culvert above the springline, connect to shallow street culverts with a junction box.

8) Ditch connections

a) Connections to a ditch must be tapered to match the ditch grading and may require armoring to prevent erosion.

9) Plan submittal requirements

a) Provide station and offset to staking point at face of curb for CBs and inlets per Standard Plan 260a.

b) Profiles are not required for inlet or CB connection pipes, except to show known conflicts or non-standard laying conditions, or connections to mainlines. The standards allow for some field adjustment.

c) Call out to provide polyethylene foam protection when clearances are less than 6 inches.

d) Call out measured lengths per Standard Plan 010.

F. Mainlines – Pipe Storm Drains (PSD)

1) Standard location

a) Locate storm drains in the standard location, 7 feet south or west of the right-of-way centerline, as shown in Standard Plan 030. Alternative alignments require approval by SPU and SDOT.

2) Sizing

a) Storm drains must be designed for full gravity peak flow with a 4% annual probability (25-year recurrence) for existing and anticipated loads. The hydraulic grade line (HGL) for that peak flow must stay a minimum of 4-feet below the rim of all drainage structures and a minimum of 3-feet below the lowest elevation served by gravity flow on adjacent private properties.

b) For more information on requirements for hydrologic analysis, including tidal and lake backwater constraints, refer to Appendix F to the Stormwater Manual Hydrologic Analysis and Design.

c) PSDs must be a minimum of 12 inches in diameter.

3) Pipe slope

a) Pipe slope shall generally follow the surface topography at a standard depth of cover of 6-feet. Desired minimum pipe slope is 1%. Typical exceptions include the following:

i) Downstream system is deeper or shallower than 6 feet.

ii) Surface topography is flat, and pipe slope is 0.5%.

iii) Connection cannot be made unless pipe slope is less than 0.5%

4) Minimum velocity

a) Required minimum velocity is 3 feet per second (fps). If velocity exceeds 20 fps, energy dissipation in the downstream maintenance hole (MH) is required to minimize hydraulic jumps.

5) Pipe material

a) Pipe material will be as approved by SPU, most typically ductile iron pipe. Refer to standard construction notes “SPU Mainline and Detention Pipe Notes" (docx) and Standard Specifications for Municipal Construction.

6) Plan submittal requirements

a) On pipeline profiles, calculate and show the invert elevations at MHs by projecting the pipe slopes to the center of the structure.

b) Call out measured lengths per Standard Plan 010.

c) Show the HGL on the profile, if the pipe is surcharged.

d) Provide notes documenting hydrologic and hydraulic design assumptions.

e) Provide a drainage report documenting all calculations.

G. Maintenance Holes

1) Where maintenance holes are required

a) Maintenance holes (MH) are required in the following locations:

i) Every 375-feet

ii) At intersecting streets for future extensions

iii) At pipe ends

iv) At pipe junctions

v) At grade breaks

vi) Where horizontal alignment changes

b) Design variations, allowed at the discretion of SPU, include the following:

i) Setting a MH on the smaller pipe within 30 feet of the connection when the connection is to a very large diameter PSD.

ii) Not requiring a MH if any of the following apply:

- At an end of pipe that is less than 100 feet in length, especially if a future extension is anticipated
- For a single vertical or single horizontal bend no greater than 22½ degrees between MHs.
- If the MH spacing requirement results in difficult access to the MH.

2) Match pipe crowns

a) Pipe crowns must match at MHs. For details on MHs, refer to Standard Plans 204 through 212. For standard installations, use Type A, unless the pipeline is too shallow.

3) Drop connections

a) Drop connections may be approved when SPU agrees that the slope or depth makes matching the pipe crowns infeasible. For inside drop connections, refer to Standard Plan 233b.

4) Sizing

a) For information on MH sizing, see maintenance hole selection (pdf).

H. Detention Pipe and Flow Control Structures

1) Detention pipe standards

a) Detention facilities shall conform to Standard Plan 270 Flow Control Structure with Detention Pipe.

2) Locating detention and flow control structures

a) Locate detention facilities to minimize traffic impacts during maintenance, including:

i) Locate off arterials, when feasible.

ii) Locate MHs to allow a single lane closure during inspection or maintenance of the structure.

b) Connect the flow control structure to a MH on the mainline. When possible, use and rechannel an existing MH.

3) Detention pipe material

a) Detention pipe material will be as approved by SPU, typically DIP or RCP. Polypropylene or steel reinforced polyethylene will be allowed if pavement restoration can be delayed for 30 days after installation to allow for flexible pipe testing. Refer to standard construction notes “SPU Mainline and Detention Pipe Notes" (docx) and Standard Specifications for Municipal Construction.

4) Plan submittal requirements

a) Detention pipe profile

b) Detail of the flow control structure

c) Notes with the detail documenting the major hydrologic and hydraulic design assumptions

d) Drainage report documenting all detention calculations

I. Culverts and Ditches

1) Within the informal ditch and culvert system, the City does not generally allow the filling of a ditch in the street right-of-way. Refer to Policy DWW-205 Ditch Replacement.

2) Any existing culvert pipe with less than 2 feet of cover under the hard surface of a project’s proposed roadway hard surface or concrete sidewalk (Standard Plan 420) must be replaced, unless the existing culvert pipe has the following attributes:

a) Consists of Ductile Iron Pipe (DIP)

b) Has sufficient capacity. See SMC 22.805.020.H (Ensure Sufficient Capacity) and Section IV of this rule for sufficient capacity determination.

3) Culverts on fish-bearing creeks or streams, even with intermittent flows, are not addressed in this rule.

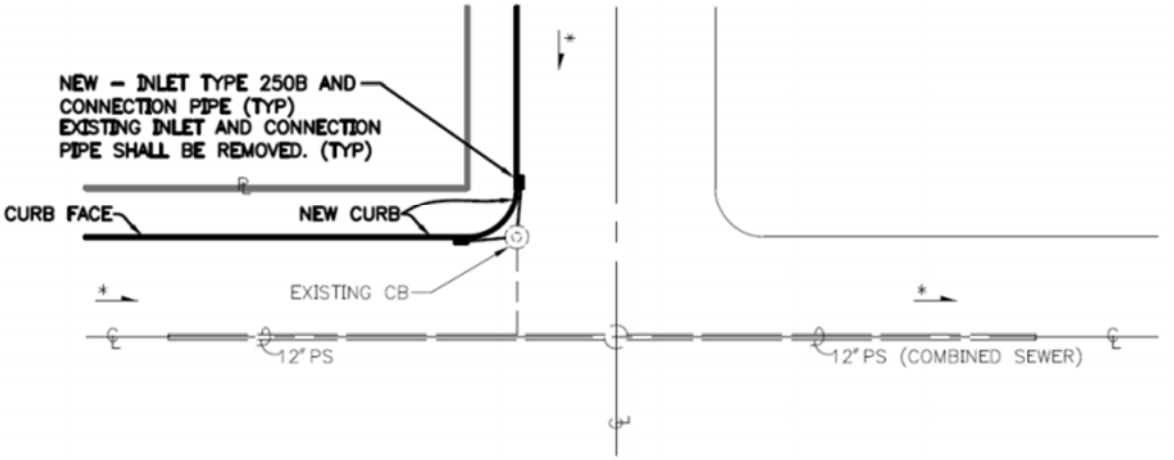
4) Sizing culverts

a) When replacing an existing roadside ditch with a culvert, size the new roadside culvert to maintain the capacity of the existing ditch. Culverts must have a minimum diameter of 12 inches, or if connecting to an existing culvert larger than 12 inches in diameter the diameter of the new culvert must match that of the existing larger culvert size.

b) When replacing an existing culvert, the new culvert must at a minimum match the existing culvert size.

5) Culvert pipe material

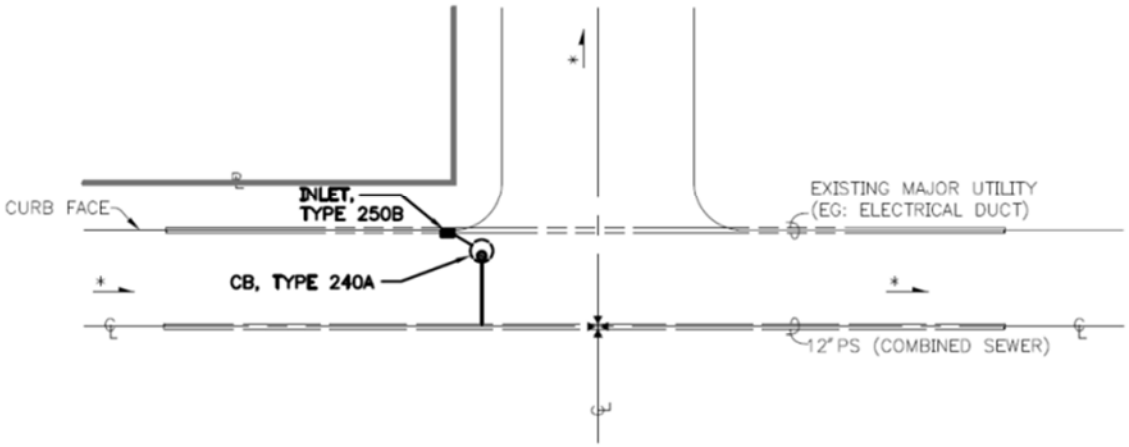
a) For culverts, use ductile iron pipe with Class D bedding. Alternative materials may be approved by SPU when pipe cover is greater than 2 feet.



DETAIL 1
INLET PLACEMENT ALONG NEW CURB
NTS

NOTES: EXISTING CATCH BASIN IS NOT REQUIRED TO BE REPLACED IF IN GOOD WORKING CONDITION.

• SLOPE (TYP)

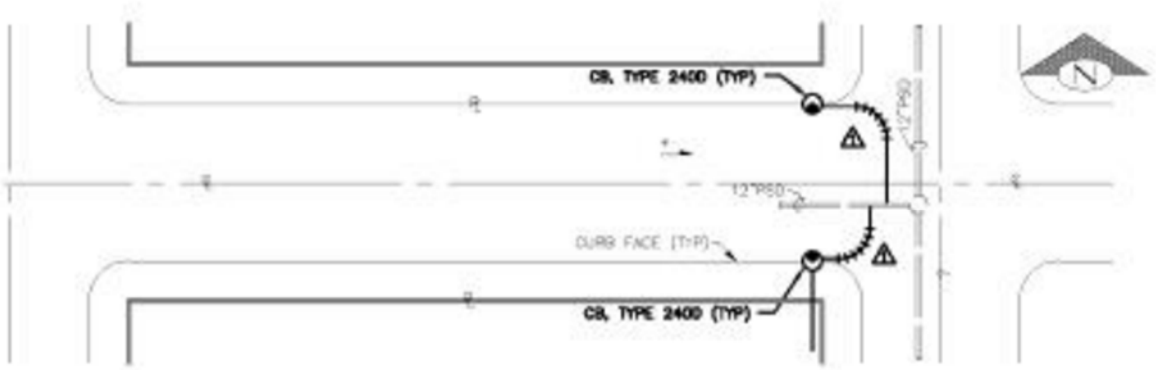


DETAIL 2
INLET PLACEMENT AT UTILITY CONFLICTS
NTS

NOTES: TO BE USED ONLY WHEN MAJOR EXISTING UTILITIES CONFLICT STANDARD CB PLACEMENT.

NOT APPROPRIATE AT CLOSED CONTOUR LOW POINTS WHERE PLUGGING OF THE INLET COULD RESULT IN DAMAGE.

• SLOPE (TYP)



DETAIL 3

CATCH BASIN LAYOUTS

NTS

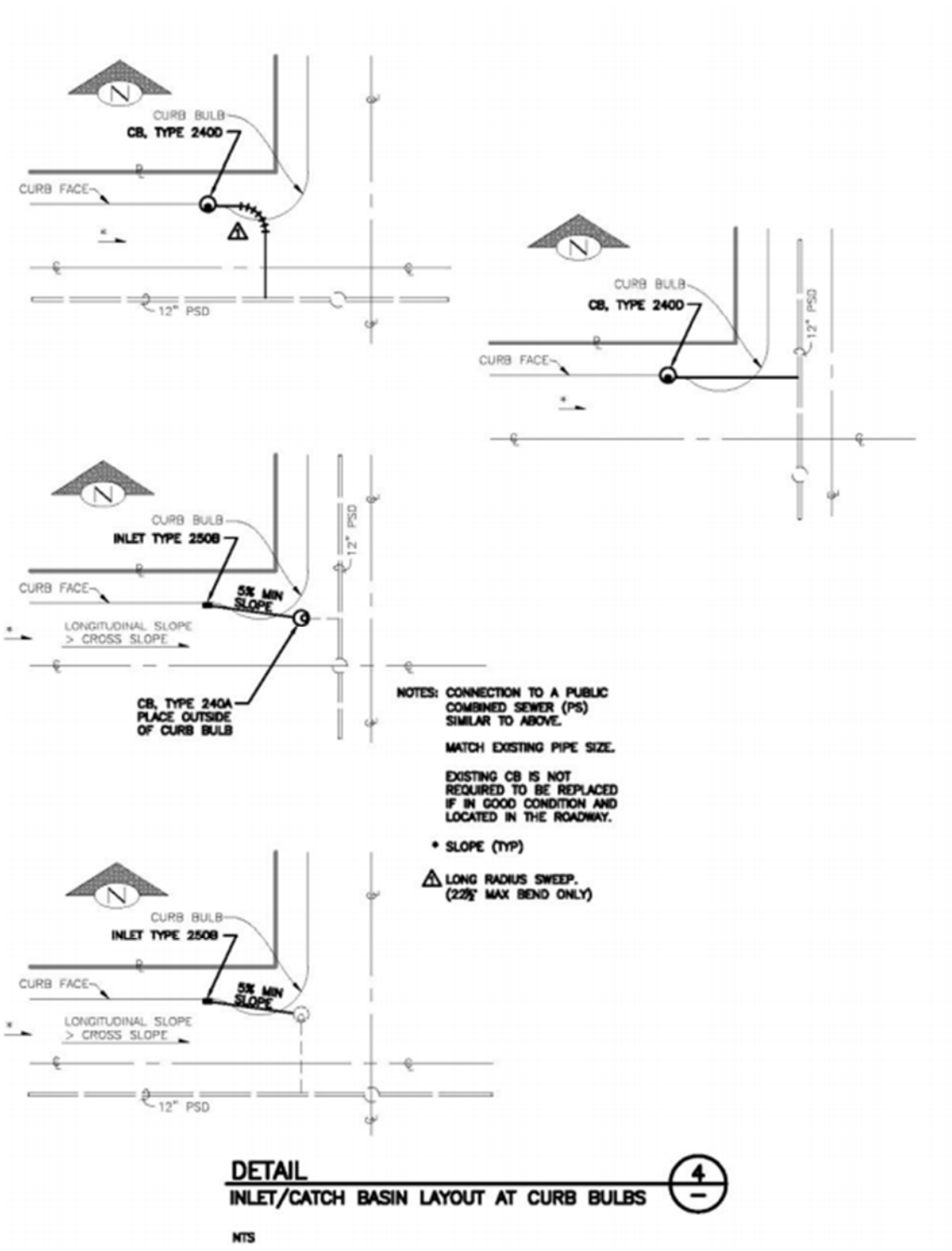
NOTES: MEETS 2 CATCH BASINS AT CLOSED CONTOUR LOW POINT REQUIREMENT ON CROWNED STREETS.

CONNECTION TO A PUBLIC COMBINED SEWER (PS) SIMILAR TO ABOVE.

* SLOPE (TYP)

⚠ LONG RADIUS SWEEP. (22½° MAX BEND ONLY)

1



DETAIL 4
INLET/CATCH BASIN LAYOUT AT CURB BULBS

NTS

1
2

VIII. DEFINITIONS

Landlocked. A parcel that does not abut any street right-of-way and is separated from the nearest street right-of-way by at least 10 feet of the parcel, which cannot serve as access to the parcel from the street right-of-way.

Latecomer Agreement. A contract between SPU and an applicant, pursuant to Revised Code of Washington (RCW), Chapter 35.91, and SMC 21.80, which allows an applicant to recover a portion of the costs of installing new utility system improvements from other benefiting parcels at the time they connect to the new system improvements.

Parcel. A tract or plot of land, including unit lot subdivisions under SMC Title 23, Land Use Code. For the purposes of this rule, individual lots are considered separate parcels.

Refer to SMC 22.801 for Stormwater Code Definitions and SMC 21.16.030 for Side Sewer Code Definitions

IX. AUTHORITY/REFERENCES

- SMC 3.32.020, SPU Administration – Adoption of Rules
- SMC 22.800, 22.808, Stormwater Code
- SMC 21.16, Side Sewer Code
- SPU Director's Rule DWW-200, Stormwater Manual
- SPU Director's Rule, DR-2011-004 Requirements for Design and Construction of Side Sewers
- City Standard Plans and Specifications
- City Streets Illustrated
- SPU Design Standards and Guidelines
- SPU Policy DWW-205, Ditch Replacement