Basis of Design

This section applies to the storm water conveyance system.

Background

- The University storm water conveyance system was originally constructed when the City of Seattle was a combined sewer/storm system. Approximately 25% of the Seattle Campus Refer to University record drawing 805RU-02 for the complete layout of the storm water conveyance system.
- Refer to University drawings 875RU-1 through 875RU-17 for a composite map of the existing utilities. The above drawings are updated regularly, but are schematic and may not be accurate or complete.

Design Criteria

- Design and install storm sewers and appurtenances in accordance with WSDOT/APWA Standard Specifications and the City of Seattle Directors Rules.
- Provide engineering calculations used to size all conveyance piping.
- Bury mains with at least 24 inches of cover from finish grade to top of pipe. Use Seattle aggregate No. 17 for pipe bedding. Refer to the section on earthwork for backfill requirements.
- Minimum pipe size is 6-inches.
- Maximum Manhole spacing is 300 feet.
- Design storm drains to convey a 25 year, 24-hour storm event. Pipe can surcharge at this flow as long as 50 year storm event does not overtop rim elevation based on backwater calculations. Provide backwater calculations to Engineering Services.
- Provide narrative describing impacts of 100 year storm event on downstream areas.
- Do not propose to pump storm water without prior consent from Engineering Services.
- Provide a manhole, full-sized clean-out, or catch basin at changes in pipe direction or diameter.
- Install clean-outs at all proposed connections to buildings. Use 54-inch diameter (minimum) manholes unless approved by Engineering Services.
- Refer to Utility Corridor Arrangement drawing (see Roadways section) for piping placement under roadways.
- Backfill around storm structures with CDF.
- Use thru curb inlets at low spots in roadway profiles.
- Do not downsize pipe diameters. Match crown elevations in structures as much as feasible.
- Use 0.5% as the minimum pipe slope.
- Storm structures in landscape areas and hill sides not collecting water, should have solid lids with rim elevations 6-inches higher than the final uphill grade.
- Drains and cleanouts in grass areas shall be built low so that mowers will not strike them.

Design Evaluation

The following information is required to evaluate the design:
• **Programming Phase**: Statement of design intent.

• **Schematic Phase**: Drawings showing existing utilities and a narrative describing material and system. Provide minimum finished floor elevations and general grades to insure positive drainage from site and building. Specify datum for elevations. Show any proposed low spots or special drainage areas such as loading dock drains or other low surface drains.

**Design Development Phase**: Along with information provided in schematic phase, provide pipe routing, pipe sizes, inverts of connection points to downstream systems and approximate rim elevations. Provide structure numbering. Provide narrative of downstream conveyance system 500 ft from site. Provide preliminary profiles. Identify any significant utility crossings that may affect the drain system design.

1) For detention facilities provide total storage volume and maximum water surface, for water quality facilities provide type of facility and cross section. Also provide preliminary details of any special structures.

2) Signify maintenance access locations to detention and/or water quality facilities.

• **Construction Document Phase**: Complete plans, complete profiles, and finished specifications, including the following (along with information from DD phase):

  1) Pipe lengths and slopes, pipe type, routing, points of connection, all inverts, trench and bedding details, special manhole and catch basin plans and sections (if not standard), clean-out details, and building penetration details. Provide all rim / grate elevation and lid types. Show connections points to building.

  2) Plan(s) showing all existing underground tunnels and utilities (power, communications, gas, water, storm drain, sanitary sewer, and street lighting). Identify clearances at utility crossings on profiles.

  3) Provide all rim elevations, structure size and lid type (solid, grate, etc.)

**Construction Submittals**

• Provide standard industry submittal requirements.

**Products, Materials and Equipment**

• All products, materials, and equipment shall conform to WSDOT/APWA Standards.

• Piping: SDR 35 PVC pipe per ASTM D3034 for sizes 12 inches in diameter and below, and reinforced concrete pipe per ASTM 67 for sizes above 12 inches in diameter. Exception: Use ductile iron pipe, or ductile iron sleeve, where high surface loads exist, under roadways, and where minimum cover cannot be achieved.

• Pipe connections: Use fittings made of the same material as the connecting pipe. Use an appropriate adapter when changing materials (e.g. when penetrating a concrete manhole with a PVC pipe).

• Exterior below grade pipe penetrations: Link-Seals, or approved substitution

**Installation, Fabrication and Construction**

• Install and clean storm drains in accordance with WSDOT/APWA Standard Specifications.
Refer to the following University drawings:
1) Area Way Drain, Bldg., Ramps, Balcony, and Landing
2) Roadway & Utility Corridor Arrangement (see Roadways section)

Refer to following City of Seattle (COS) Standard Plans:
1) Catch Basin (COS 240a); install inlet pipe invert at least 6 inches above outlet pipe invert.
2) Catch Basin (COS 242); install inlet pipe invert at least 6 inches above outlet pipe invert.
3) Catch Basin and Inlet Installation (COS 260b)
4) Catch Basin and Inlet Installation (COS 260a)
5) Typical Catch Basin Connection (COS 261)
6) Inlet (COS 252)
7) Inlet (COS 250)
8) Inlet Frame (COS 262)
9) Inlet Frame (COS 263)
10) Inlet Frame & Grate (COS 264)
11) Manhole (COS 201a)
12) Drop Connection (COS 233)
13) 8" Clean-out (COS 280)
14) Typical Trench Section (COS 284)
15) Pipe Bedding (COS 285)

END OF DESIGN GUIDE SECTION
MIN GRATE SIZE
140 SQ INCH

SEDIMENT BUCKET

BOTTOM OUTLET
WARD MODEL W-1740-T
SMITH MODEL 2450
JOSAN MODEL 35420

SIDE OUTLET
WADE MODEL W-1740-SO
JOSAN MODEL 36830
SMITH 2455

FLOOR DRAINS W/ SEDIMENT BUCKET

GRATE COLLAR W/ SECURED GRATE
R = 3/4"
SLOPE 2%

CAST IRON BODY
WADE MODEL W-1790

NOTES:
1. GRATE COLLAR WIDTH 8 3/8"
2. BODY WIDTH 11 3/8"

FLOOR DRAINS W/ TRAP

SIDE WALL DRAIN

Area Way Drain at Buildings, Ramp, Balconies & Landings

SD−C−37
NOTE:
AFTER INSTALLATION ALL SHUCKLE BOLTS, NUTS & BRACKETS TO BE COATED W/ TWO COATS OF ASPHALT ROYSTON ROSKOTE #612XM OR APPROVED EQUAL.

EXIST. MANHOLE, 54" Ø MIN.

7/8" SS BOLT W/ EXPANSION SHIELD

7/8" SS BOLT W/ EXPANSION SHIELD

HEAVY DUTY BRACKET, GRINNEL FIG. 199 NO. 2, OR EQUAL

ADJUSTABLE CLEVIS GRINNEL FIG. 590, OR EQUAL

MJ PLUG W/ GASKET BOTH CUT IN HALF

DI OR CI TEE MJ x MJ x FL

PVC FLANGE

SCH 40 PVC

EXIST. SHELF

EXIST. CHANNEL

SCH 40 PVC 45° BEND

REMOVE EXIST. SHELF & CONSTRUCT CHANNEL WITH NEW PVC BELOW TOP OF CHANNEL

54" or Larger Drop Manhole Interior