DESIGN STANDARDS FOR: STORM SEWER SYSTEMS

NOTE TO THE CONSULTANTS:

The attached Design Standards represent the minimum acceptable practices for the design and construction of Storm Sewer Systems on Seattle Parks and Recreation (SPR) properties. The consultant shall not add, delete, or alter these Standards unless approved by SPR prior to its inclusion in the contract documents. These are standard practices only and not specifications. The Consultant shall expand these practices into the design and technical specifications, using the appropriate SPR Standard Details (listed below) and Section 33 34 00 of the SPR Standard Specifications. The Consultant also has the added responsibility to not only comply with these practices, but to also use sound professional judgment in exceeding them as may be dictated or warranted by the following:

A. Special conditions for each project and site
B. Environmental considerations and constraints
C. The integrity of the proposed design
D. The health, safety, and welfare of the general public, etc.

All Details that are part of these Standards shall be used as shown (without any alterations) and shall be included in the Contract Documents and can be copied and included into the Specifications if desired or as directed by the Engineer.

The Consultant shall show to the Engineer that relevant (to the particular project) Design Standards have been included into the Contract Documents.

1. GENERAL

A. All drainage control plans shall be prepared by a registered Civil Engineer per current City of Seattle Drainage Control Ordinance.

B. All construction shall be in accordance with the SPR Standard Specifications and Standard Details (as listed below) and the City of Seattle (COS) Standard Plans and Specifications for Road, Bridge, and Municipal Construction (most recent edition).

C. All Storm Sewers shall be installed by a side sewer contractor registered with the City of Seattle Department of Planning & Development (DPD).

D. For all Storm Sewers, all applicable permits shall be required by SPR and processed through the DPD.

E. Park site plans shall be updated by the Consultant so as to accurately reflect the final "As Built" condition of completed sewer projects, with dimensions, prior to acceptance of said plans by SPR.

F. SPR Standard Details and COS Standard Plans for Municipal Public Works Construction, (most recent edition) shall be used). Use Standard Details from 33 44 16 thru 33 49 33.19 or the COS Standard Specifications for Road, Bridge, and Municipal Construction at (www2.cityofseattle.net/util/engineering/), if the SPR details do not cover the needed subject or the work is being done outside Park properties in the Street Rights of Way.

G. All structures and pipes shall be cleaned and free of all foreign materials prior to final acceptance of the project by SPR.

H. No perforated lines shall be connected to any existing tight line sewer.

I. Cross section of all storm sewer structures and profiles showing existing grades, any proposed grade changes, existing underground utilities, and proposed sewer lines shall be required when submitting design development phase drawings for review, and be part of all final drawings and documents.

2. LOCATION: Locate pipe a minimum of 30 inches from the existing or proposed building face to centerline of sewer.

3. COVERAGE: The storm water sewer shall be laid with a minimum of 18 inches of cover.

4. PIPE SPECIFICATIONS:

A. In general, Storm Sewer and Sub-surface Drainage systems on SPR properties shall be a minimum of 6-inch diameter with a minimum of 1.5 percent grade.

B. In general, all pipes shall be PVC, ASTM-3034.

C. Exception - If less than 18 inches of cover under paved areas, use PVC Schedule 40, Class 900 PVC, with smooth bore, glued joints.

D. All pipes shall have rubber gasket type joints.

E. Exception for perforated pipe - Perforated Pipes used for sub-surface drainage systems shall be equal to or better than ASTM D-2729 PVC, for areas that are not expected to have vehicle traffic over them (such as a play area) or ASTM-3034 for areas that will have vehicle traffic (such as an athletic field). Also, 4-inch diameter pipe may be used for sub-surface drainage system laterals that are not intended to be maintained (cleaned out), as approved by the Park Engineer thru the design review process.

F. A.D.S. pipe will not be acceptable for use in SPR properties, except as approved, in advance, by the Park Engineer.

G. Concrete Pipe - All pipes 12" diameter and greater shall be reinforced concrete pipes. (Detention systems shall be excluded from this requirement.)

5. EXCAVATIONS AND PREPARATION OF TRENCH: All excavations over 4 feet deep shall be in conformance with WISHA shoring regulations and COS Standard Specifications (most recent edition).

6. DE-WATERING:

   A. The control of ground water shall be such that softening of the bottom of excavations or formations of "quick" conditions or "boils during excavation shall be prevented. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils.

   B. During excavation and installation of pipelines, and placement of trench backfill, excavations shall be kept free of water. The Contractor shall control surface run-off so as to prevent entry or collection of water in excavations. The static water level shall be drawn down a minimum of 1 foot below the bottom of the excavation so as to maintain the undisturbed state of the foundation soils and allow the placement of any fill or backfill to the required density. The de-watering system shall be installed and operated so that the ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

   C. Before de-watering is started, the Contractor shall submit to the Engineer a statement of the method, installation and details of the de-watering system he proposes to use. Open and cased sumps shall not be used as primary de-watering for excavations deeper than 3 feet below the static water table.

   D. The Contractor shall comply with State of Washington Department of Ecology (DOE) requirements for dewatering using Decant Tank or meet or exceed the discharge criteria for turbidity.

7. PIPE BEDDING: Type 22 bedding shall be required for pipe bedding per the following sections:

   A. Bedding shall comply with COS Standard Specifications (most recent edition).

   B. For bedding of PVC pipe, see COS Standard Specifications (most recent edition).

   C. Exception - For ASTM D-2729 PVC pipe, 1-1/12 inch washed rock shall be required with Marafi filter fabric cloth.

   D. Refer to City of COS Standard Specifications (most recent edition), or SPR Standard Specifications Section 32 11 23 - Mineral Aggregates for aggregate sizing.

8. SURVEY LINE AND GRADE:

   A. This section shall comply with COS Standard Specifications (most recent edition).

B. Grade shall be accomplished by utilizing equipment with slope and depth control, such as a "Laser Plane Control System," or other methods as approved by the Engineer so as to insure accuracy in the laying of the pipe.

9. PIPE LAYING:

A. Pipe laying shall comply with Seattle Standard Specifications (most recent edition).

B. All storm sewer lines to be designed and installed with a minimum of bends.

C. No 90° bends or tees shall be allowed in any storm sewer with the exception of lateral subsurface perforated drains.

D. When laying pipe around a 90° corner, a wye and 45° bend in combination shall be used no closer than 2' on center and the wye left as a clean out (c/o). Stub up from the clean out to the finish grade.

10. CLEAN OUTS: All Clean Outs (C/O) shall be stubbed to any finish grade with a cast in place concrete collar and the appropriate cover per COS Standard Plan No. 280.

11. CLEAN OUT COVER ASSEMBLY: All Clean Out Covers shall be cast-iron, sleeve-type, body and cover, sized as appropriate for the terminal pipe run, as identified in the Contract Drawings. Cover shall include a stainless steel hex-keyed lock and be cast with the letters “CO” clearly visible. Concrete collar shall be constructed per the requirements of SPR Standard Specification 32 13 13 - Concrete Paving.

11. CATCH BASINS, FRAMES, COVERS, ADAPTERS, AND TRAPS:

A. All catch basins shall be one of the following:

1. Type 15, Type 240 or Type 241.

Note: If a Drinking Fountain catch basin is to be used in combination as an area drain, then the SPR Standard Detail No. 32 21 53 - Drinking Fountain shall apply.

B. Frame and Cover: Use pedestrian proof frame and grate as shown on SPR Standard Detail No. 33 49 16.39. Set the frame flush with the finished grade.

C. Maintenance Hole Adapter: Maintenance Hole adapters (sand collar) shall be used when grouting PVC lines into any catch basin as shown on SPR Standard Detail No. 33 49 13.39.

D. Traps: All catch basin outlet traps shall be per COS Standard Plan No. 267a

12. MAINTENANCE HOLES. FRAMES, COVERS AND ADAPTERS:

A. Maintenance Holes:

1. All storm water sewers shall have a maintenance hole for access, set on angle point or in line.

2. Maintenance Holes shall be precast maintenance holes with rubber gaskets (or saddle maintenance holes where precast cannot be used). Maintenance holes should be no further apart than 400 lineal feet.

3. Maintenance Hole Installation:

   a. Place the base section on the prepared bedding so as to be fully and uniformly supported in true alignment, making sure that all entering pipes can be inserted on proper grade and alignment.

   b. All lift holes and all joints between precast elements shall be thoroughly wetted and then be completely filled with mortar, smoothed and pointed both inside and out, to ensure water tightness with brushed finish.

   c. Precast sections shall be placed and aligned to provide vertical sides and vertical alignment of the ladder runs.

   d. The Contractor shall construct structures of the type specified on the project drawings so as to provide adjustment space for setting frames and covers to a finished grade. Frame and cover shall be installed and adjusted in accordance with COS Standard Specifications (most recent edition).

4. Drop Maintenance Holes: Where a grade change exists, drop connections will be required where difference in incoming and outgoing invert elevations exceed 48 inches (see SPR Standard Detail No. 33 49 13.29.

B. Maintenance Hole Channels: All Maintenance Holes shall have full and complete channels. Maintenance hole channels shall be made to conform accurately to the sewer grade and shall be brought together smoothly with well-rounded junctions, satisfactory to the Engineer. Channel sides shall be carried up vertically to the crown elevation of the various pipes, and the concrete shelf between channels shall be smoothly finished and warped evenly with slopes to drain.

C. Frame and Cover: All maintenance holes will have the round frame and round cover with cam lock as shown on COS Standard Plan No. 230 and the cover shall be lettered "SEWER."

D. Maintenance Hole Adapter: Maintenance Hole adapters (sand collar) shall be used when grouting PVC lines into any catch basin as shown on SPR Standard Detail No. 33 49 13.39.

13. JOINTING OF DISSIMILAR PIPE: The appropriate adjustable rubber coupling shall be used when connecting dissimilar pipe, see COS Standard Specifications (most recent edition).

A. Jointing of rigid dissimilar pipe shall require Romac, Dressler, Caulder, PVC Repair Coupling, or approved equal.

B. Jointing of flexible pipe shall be accomplished with a sleeve.

14. JACKING, AUGERING OR TUNNELING: Comply with COS Standard Specifications (most recent edition).

15. BACKFILLING: No sewer shall be back-filled until inspected by SPR (please contact Parks Construction Manager at **(206-684-7034**) and DPD's Inspectors. Final acceptance shall be conditional upon approval by SPR's Facilities Maintenance Plumbing Shop Sewer Crew staff **(206-684-7070**) and in conjunction with SPR's and DPD's Inspectors. A signed copy of the witnessing inspector (DPD) shall be supplied to SPR stating the results of the test. Back-filling shall be in accordance with COS Standard Specifications (most recent edition).

16. COMPACTION: Mechanical compaction shall be required to a density of 95 percent in both paved and unpaved areas. Comply with COS Standard Specifications (most recent edition).

17. CLEANING AND TESTING: Cleaning and testing shall comply with COS Standard Specifications (most recent edition).

18. FLOW CONTROL SYSTEMS: Flow control systems shall comply with COS Standard Specifications (most recent edition).

END OF SECTION