

APPENDIX C
FLEXIBLE PIPE
UTILIZATION IN MSD SYSTEM

For many years pipe materials installed into MSD's gravity sewer system were rigid pipe products comprised predominantly of two types. These were vitrified clay pipe (VCP), which was installed for small and intermediate size sewers, and reinforced concrete pipe (RCP) which was typically laid for larger diameter sewers. While each of these traditional products has some limitations, in general they have proven to be very durable and strong and they have served well in the MSD system.

In the early 1980's, solid wall polyvinyl chloride pipe (PVC) was introduced into MSD's sanitary system. PVC pipe has now replaced clay pipe as the preferred product for small to intermediate size sanitary sewers. Since PVC pipe diameters were limited to 18 inches and below, and these pipe materials exhibit relatively high stiffness values, MSD's standard crushed stone encasement (based on the industry standard ASTM D2321) has proven to be adequate for the necessary structural support.

In recent years, manufacturers have developed a number of new flexible pipe products with increasing diameters and some with lower stiffness values. These have included corrugated polyethylene (PE) pipe, high-density polyethylene (HDPE) profile-wall pipe, corrugated PVC pipe, PVC profile wall pipe, and steel spiral rib pipe. Many of these products have been reviewed and approved for use, because MSD recognizes that in certain situations the benefits of lighter weights and fewer joints may be greater than the structural disadvantages associated with flexible pipe.

However, MSD also recognizes that the use of flexible pipe products may not be appropriate in every situation. Accordingly, MSD's Director of Engineering has issued Guidelines for Use of Flexible Pipe for Drainage Facilities. These guidelines were developed after evaluating flexible pipe materials and seeking input from local engineers, developers and contractors. A copy of the guidelines, which have been in effect since February, 1991, is attached.

MSD considers the use of flexible pipe in drainage applications more critical than in sanitary facilities for several reasons. First, drainage facilities often include pipes installed at shallow depths. This makes the pipe more susceptible to damage caused by construction equipment, traffic loads, utility cuts, etc. Second, the flexible pipes products that are approved for sanitary applications tend to exhibit high stiffness values compared with flexible pipe products approved for drainage applications. Last, drainage pipes are typically of larger diameter. This means that larger loads must be supported by the pipe/soil structure. Consequently, more care must be exercised during installation to ensure that the crushed stone is properly worked into the haunching and initial backfill zones to provide the required lateral support.

It is for these reasons that rigid pipes are the preferred product in MSD's drainage system. MSD's policy requires that the Engineer justify the use of flexible pipe on drainage projects. The following is an application form and checklist which should be completed when an Engineer decides to use flexible pipe in the MSD drainage system.

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**APPLICATION FOR USE OF
FLEXIBLE PIPE IN DRAINAGE FACILITIES WITHIN
MSD DRAINAGE SERVICE AREA**

General Data

Date: _____

Project Name: _____

Owner/Developer: _____

Engineer: _____

MSD Reviewer: _____

Decision: _____ Accepted _____ Rejected

 _____ Revise and Resubmit

Flexible Pipe Data

Type of Pipe Proposed: _____

Manufacturer/Trade Name: _____

Diameter: _____ in. Min./Max. Cover: _____ ft./ _____ ft.

Justification Data

It is the responsibility of the Engineer submitting plans for approval to request and justify the use of flexible pipe materials. As a minimum, the Engineer must address the following items. Attach written responses to this application and reference MSD's Design Manual whenever applicable. Include responses as notes on plans when response requires Contractor's attention.

- Item 1. Outline procedures to protect flexible pipe from excessive construction loadings (both equipment and backfill material). If conditions are outside of those used in the Min./Max. Burial Depths Chart for Flexible Pipe, (for example, if backfill weights or construction loads are greater) provide design calculations in accordance with 1) AASHTO Design Procedures Section 12 or Section 18 (as appropriate) and 2) the Modified Iowa Equations to demonstrate a maximum deflection of 5 percent. Design calculations must also show maximum allowable loads, maximum construction loads and maximum in-service loads.

- Item 2. Provide information which demonstrates the proposed flexible pipe has adequate hydraulic capacity (If “n” value is higher than a previously approved product).
- Item 3. Provide geotechnical data to support design assumptions concerning soil stiffness in haunching and initial backfill zones. Refer to MSD’s trench Details for trench widths and crushed stone encasement dimensions, and reference the required trench width and encasement information on plans.
- Item 4. Does the groundwater condition or provisions where long runs of concrete encasement indicate that the pipe will be subjected floatation? If yes, discuss measures to prevent occurrence and reference on plans.
- Item 5. Discuss the potential for post-installation damage by subsequent construction of other utilities, service connections, fence posts, structure excavation, etc. Flexible pipe shall not be allowed within road right of ways and other locations where potential for damage exists.
- Item 6. If steep slopes exist, discuss methods to be employed that will prevent creep or downslope slippage.
- Item 7. Discuss the need to provide end treatments to protect inlet/outlet end of flexible pipes from damage.
- Item 8. Flexible pipe generally requires more inspection to ensure proper bedding, haunching, backfilling, etc. Outline a plan for the owner/developer to provide the construction inspection of flexible pipe, if MSD inspection forces are not available for full-time inspection during pipe installation. The plan should include the inspector’s qualifications and procedures that will be followed to provide complete inspection of installation procedures. Note that supervision must be provided by a registered professional engineer.

MSD Review Comments: _____

