WATER AGENCIES' STANDARDS

Design Guidelines for Water and Sewer Facilities

SECTION 10.2
SEWER SURGE CONTROL/ANALYSIS GUIDELINES

10.2.1 PURPOSE

This section provides minimal guidelines for in-house staff and design consultants in preparing Surge Control/Analysis associated with the design of a sewage pump/lift station.

10.2.2 GENERAL

It is the responsibility of the user of these documents to make reference to and/or utilize industry standards not otherwise directly referenced within this document. The Engineer of Work may not deviate from the criteria presented in this section without prior written approval of the Agency's Engineer.

10.2.3 SURGE ANALYSIS METHODOLOGY

All pumping stations shall be independently evaluated by the Design Engineer for the potential for hydraulic transients. Computer programs for transient analysis shall be approved by the Agency on a case-by-case basis. Current state-of-the-art computer programs for transient analysis, such as LIQT developed by Stoner Associates, Inc., or Surge 5 developed by the University of Kentucky, Network-Surge developed by John List, Flow-3D developed by Flow Science or other programs approved by the Agency, shall be used for evaluation of all transient phenomena and proposed control measures. Each program is unique in terms of its capabilities and must be assessed in each situation to make sure the program can handle the complexities of the analysis involved.

10.2.4 SUBMITTAL OF CALCULATIONS

Prior to initiating detailed design of a pumping station, the hydraulic transient calculations prepared by the Design Engineer shall be submitted to the Agency along with a narrative description of any potential for hydraulic transients and the steps recommended by the Design Engineer for further action or mitigation of the hydraulic transients. Based on the contents of this submittal, the Agency may direct the Design Engineer to design the necessary means for mitigation of hydraulic transients.

10.2.5 TRANSIENT CONTROL MEASURES

Devices for transient control shall be considered in design, and installed as required to reduce pressure surges with pump starts and stops. Transient control measures to be considered singly or in combination for wastewater systems are limited to the following and listed in the order of preference:

10.2.6 PUMP STATION LOACTION

Relocate Pump Station (if possible) to avoid high points.

10.2.7 SHAFT-MOUNTED FLYWHEELS

To increase moment of inertia for systems subject to column separation.

10.2.8 FORCE MAIN ALIGNMENT

Revisions to eliminate potential column separation zones force mains shall be designed with a continuous uphill slope without highpoint. For additional guidelines regarding the design of Sewer Force Mains refer to Section 6.4.

10.2.9 VACUUM RELIEF VALVES AND PRESSURE RELEASE VALVES (COMBINATION TYPE)

Locate vacuum relief valves and pressure release valves at critical locations along the force main to prevent column separation and damaging vacuum conditions following pump shutoff. For additional guidelines regarding the design of Sewer Force Mains refer to Section 6.4.

10.2.10 SLOW-CLOSING, HYDRAULICALLY-OPERATED PUMP DISCHARGE VALVES

To control the rate of the head rise in the pressurized discharge pipelines the pump and valve manufacturers should be consulted for recommendation on appropriate valves to be utilized.

10.2.11 VACUUM RELIEF VALVES OR CHECK VALVES (VENTED FROM WETWELL)

Vacuum relief valves or check valves (vented from wetwell) shall be considered for entry of air into the line to prevent column separation following pump shutoff.

10.2.12 NON-APPROVED MEASURES

Surge tanks are specifically prohibited as water hammer control measures for wastewater pumping systems unless otherwise directed by the District Engineer.

10.2.13 REFERENCE

A. Should the reader have any suggestions or questions concerning the material in this section, contact one of the member agencies listed.

B. The publications listed below form a part of this section to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said publications unless otherwise called for. The following list of publications, as directly referenced within the body of this document, has been provided for the users convenience. It is the responsibility of the user of these documents to make reference to and/or utilize industry standards not otherwise directly referenced within this document.

1. Water Agencies' Standards (WAS):

a. Design Guidelines

1. Section 6.4, Pressure Systems (Force Mains)

END OF SECTION