

✓ 9-13-06

VARIANCE REQUEST

Iowa Department of Natural Resources

1. Date: June 23, 2000
2. Review Engineer: Bill Graham
3. Date Received: May 30, 2000
4. Facility Name: Fontanelle WWTF
5. County Number: 1, Adair County
6. Program Area: CP (wastewater)
7. Facility Type : C05
8. Subject Area : 393, pipe-reaming, materials and joints
9. Rule Reference: 567-64.2(9)a
10. Design Stds Ref: 12.4b, Materials and Joints, Flexible Pipe
11. Consulting Engr: Howard R. Green Co., Creston
12. Variance Rule: 567-64.2(9)c

13. **Decision:** *Approved*
Date: *7/25/00*

14. **Appeal:**
Date:

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15. Description of Variance Request:

The City of Fontanelle is requesting a variance from Design Standard 12.4b, Materials and Joints for Flexible Pipes which does not include the use of polyethylene pipe. The city proposes to replace existing sewers utilizing a trenchless construction method called pipe-reaming that uses polyethylene pipe and heat fusion joints. Pipe-reaming sewer replacement produces different requirements for materials, joints, and pipe thickness due to installation stresses and long term effects from groundwater pressure and surface live loads than open cut construction. This is because the pipe is pulled through the borehole during installation creating significant tensile stresses and because it assumed that there is no side-support for the pipe inside the boring. In open cut construction most of the pipe resistance to deflection results from the support the side of the pipe receives from the embedment materials and surrounding soil. In most cases horizontal borings are larger than the pipe diameter to facilitate insertion of the pipe and so the pipe is subjected to loads without side support. The proper Dimensional Ratio (DR) must be selected based on estimated installation tensile forces and expected pressure and live loads for the life of the sewer.

16. Consulting Engineer's Justifications

Polyethylene pipe has seen limited use in Iowa in conventional open cut sewer construction and as a lining for rehabilitation of existing sewers. There are ASTM standards for polyethylene pipe material, polyethylene fusion joints, and horizontal boring installation of polyethylene pipe and these have been included in the project specifications. A pipe vendor's method for determining required pipe SDR based on the ASTM standard for horizontal directional drilling was used to calculate the pipe strength required for the conditions expected. The relevant ASTM standards used in the specifications are:

- ASTM F 714-97 Standard Specification for Polyethylene Plastic Pipe Based on Outside Diameter
- ASTM D 1248-98 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
- ASTM D 3350-99 Standard Specification for Polyethylene Plastics Pipe and Fitting Materials

- ASTM D 2837-98a Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
- ASTM D 2657-97 Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
- ASTM F 1962-99 Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings

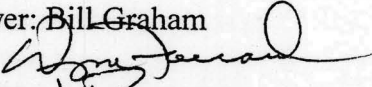
The calculations for determining required pipe SDR use the method described in *Technical Note: Horizontal Directional Drilling (Guided Boring) with Plexco Pipe (rev. 2/99)* from Chevron Chemical Company.

17. Department's Justifications:

Recommend approval of the variance to use polyethylene pipe for the pipe-reaming sewer replacement method. Polyethylene pipe is frequently used in water supply mains that are installed using directional boring. Inclusion of the pertinent ASTM standards in the engineer's specifications assure that the different aspects of using polyethylene pipe have been examined by a committee of authorities on the subject. The pipe-reaming specifications require use of these standards. The engineer has submitted calculations that determine the necessary SDR rating for the project's polyethylene pipe based on the relevant ASTM standard for horizontal directional drilling. The specifications also require that there be no more than a 5% deflection of the installed pipe 30 days after installation which corresponds to the Iowa Design Standards for pipe installed using open cut construction.

18. Precedents Used:

No variances have been previously requested for the use of polyethylene pipe with the pipe reaming process nor have there been any for the use of pipe reaming. The City of Marshalltown has used polyethylene pipe as a liner for existing pipe and also with conventional open cut sewer construction.

19.	Staff Reviewer: Bill Graham	Date: 7-13-00
20.	Supervisor: 	Date: 7/13/00
21.	Authorized by: J. T. Glessner	Date: 7/20/00