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22.0 MAINLINE VALVES

22.1 INTRODUCTION

This section contains design criteria applicable to the mainline valve assemblies for the gas pipeline project. Criteria are presented for the design of components and the locating of the mainline valve assemblies.

Design procedures address the functional features and details that will be included in the various components along with the considerations for site selection.

22.2 CODES AND CRITERIA

22.2.1 Codes

- Code of Federal Regulations, Title 18 – Conservation of Power and Water Resources
- Code of Federal Regulations, Title 49 – Transportation, Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards.
- American Petroleum Institute, "Specification for Pipeline Valves," API Specification 6D/ISO 14313, 22nd edition.
- American National Standards Institute, "Steel Pipe Flanges and Flanged Fittings," ANSI B16.5-03.
- American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels (for end closures).
- Manufacturers Standardization Society, Standard Practice, "Standard Marking System for Valves, Fittings, Flanges and Unions," MSS SP-25-1998.
- Federal Right-of-Way Grant for the Alaska Natural Gas Transportation System Alaska Segment, Serial No. F-24538 (December 1, 1980), as such may be updated and/or amended from time to time.
- Federal Energy Regulatory Commission conditional certificate of public convenience and necessity, issued on December 16, 1977, as such is finalized

22.2.2 Criteria

- Maximum design operating gas pressure and minimum design operating gas temperature in accordance with the project design basis.
- Minimum design ambient temperature of -50°Ffor aboveground piping and valve top works.
- Minimum design operating temperature of the blowdown system will be based on the operating pressure at time of blowdown and minimum design operating gas temperature.

- Design factor for mainline valve assembly will be 0.6 for Class 1 locations.
- Valves will be located at a spacing 20 miles or less or a waiver will be requested. Closer spacings will be used where required as in fault crossings.
- An adequate level of fracture toughness will be specified to provide fracture initiation resistance of the base materials and welds at the design temperatures. The final material selected will provide an adequate ductility at the design conditions to withstand fracture initiation based on accepted fracture mechanics analysis.

22.3 DESIGN PROCEDURES

22.3.1 Mainline Valves

- Block valves will be a 48-inch weld-end ball valves.
- The inside diameter of the block valve will be full-bored to match 48-inch OD steel pipe.
- Transition pieces will be provided to permit welding directly to 48-inch, specification level PSL 2, API Grade 5L X80 steel pipe.
- Stem extension heights will be adjusted to suit the final grade elevations and the operator selected.
- Valves and stem extensions will have protective coating for buried installation.
- Secondary sealing systems will be included in the valve design.
- Valve body vents and drains, suitable for removing liquids to ensure reliable operation, will be specified.

22.3.2 Mainline Valve Operators

- Mainline valves at remote sites will have local control capability only, but will be adaptable for adding automatic features at a later date. The use of automatic controller devices, that will automatically initiate valve closure upon sensing a condition that indicates a line break, will be evaluated. Mainline valves at compressor stations will have both local and remote control capabilities.
- Gas powered operators will be used for 48-inch mainline valves except at compressor stations where electric powered operators may be used.
- Pipeline gas pressure will be used as the primary power source.
- Provisions for connecting an alternate pressure source for valve operation without pipeline pressure will be included.
- Capability for manually operating the valves will be provided.

22.3.3 Blowdown and Bypass Description

- The design will allow for the blowdown, purging and loading of the pipeline.
- Piping materials will be suitable for blowdown temperatures.
- Piping configuration will be designed to withstand blowdown vibration, thrust and phase change in the gas stream.
- Piping configuration will be sized to permit depressurization of a 20-mile pipeline section in approximately 6 hours without throttling or using other equipment.
- Final blowdown duration will be evaluated for each mainline valve section taking into account actual physical conditions, seasonal variations, and potential for two-phase flow during blowdown.
- Piping configuration will be designed to permit throttling of blowdown gas to maintain a predetermined blowdown rate taking into account resulting blowdown temperatures and mainline pipe material limitations.
- Blowdown risers will be designed with a valve for positive shut-off in addition to valves provided for throttling.
- Piping configuration will be evaluated to provide the following design features:
  - Capability of connecting a portable gas compressor for depressurizing a valve section into an adjacent valve section during scheduled and maintenance operations.
  - Capability of connecting line efficiency testing equipment.
  - Capability of connecting portable silencers, if required, for noise abatement during line blowdown.
  - Capability of installing special ejector nozzles or special equipment if required for eliminating potential two-phase flow during line blowdown.

22.3.4 Blowdown Valves

- Welded connections will be used on the mainline side of positive shut-off valves.
- Plug valves or metal seated ball valves will be used for throttling.
- For ball valves, ball will be bored to equal the inside diameter of matching pipe.
- Valves will be manually operated.
- Materials will be suitable for blowdown temperatures.

22.3.5 Quick-Opening End Closures for Blowdown Stacks

- Closures will be in accordance with ASME Section VIII
- Materials will be suitable for blowdown temperatures.

22.3.6 Future Connections

Valve assemblies located at future compressor station sites will be provided with future connection capability that will facilitate tie-in of future piping without system shutdown.

22.3.7 Location

In determining the spacing for and siting of the mainline valves the following will be considered:

- Site topography
- Available access
- Proximity of existing facilities
- Geotechnical terrain evaluations (where practical, mainline valves will be sited in non-frost susceptible soils to preclude the requirement for mitigative design such as insulation)
- Terrain stability
- Environmental considerations

The valves will be installed within a locked, fenced area for security reasons and vehicle access will be provided.

22.4 FIGURES AND TABLES

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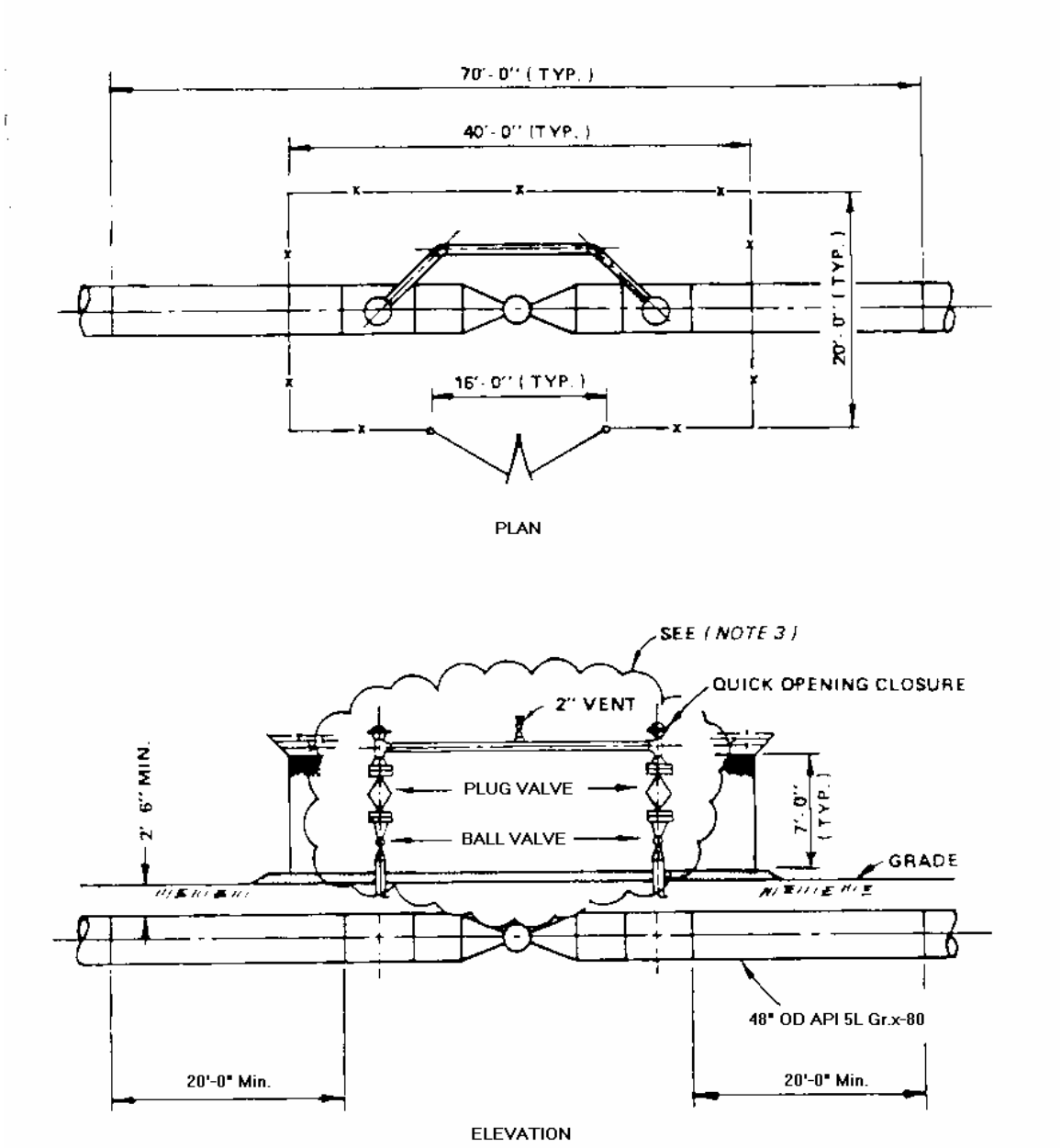

Figure 22-1 Typical Mainline Valve Assembly

Notes: 1. This drawing applies to mainline valve assemblies installed at remote locations.

2. Field welding will be in accordance with project welding procedures.

3. Blowdown piping configuration, final dimensions, and site-specific foundation requirements to be developed in final design.