Statement O-3

1 Assumptions, Bases, Formulas, and Methods Used

a. Assumptions

i. Flowing gas temperature: 60°F (519.67°R)

ii. Specific Gravity of gas: 0.60

iii. Barometric pressure: 14.73 psia

iv. BTU content of gas: 1,000 Btu per cubic foot

v. Pipeline roughness: 0.0007 inches

vi. Pipe efficiency: 0.92

vii. Compressibility factor: 1

viii. Pressure drops

A pressure control valve located at the Old Monroe provides the necessary pressure control to allow receipt or deliveries at MRT.

ix. Pressure Assumptions:

Pressure required at the pipeline terminus at Fort Leonard Wood is at least 300 psig. Pressure available for receipt from MRT is 290 psig or higher. Pressure required for delivery to MRT can be up to 500 psig.

b. Bases

i. The unit of volume is one cubic foot at a pressure of 14.73 psia and a temperature of 60°F (519.67°R).

ii. The specific gravity of dry air is 1.0

c. Formulas

i. Flow Calculations:

ii. Flow calculations are determined via the Panhandle-A flow equation:

1. $$Q = 44.32\left(\frac{T_b}{P_b}\right)^{1.0788}\left(\frac{P_1^2 - P_2^2}{G^{.853}T_f LZ}\right)^{.5392} D^{2.6182}E$$

iii. This equation is provided in the operations manual of the hydraulic modeling software used to determine flow calculations, and includes the following variables:

iv. Q = Volumetric flow rate, Mcfd

v. T_b = Base temperature, rankine

vi. P_b = Base pressure, psia

vii. P_1 = Pipe inlet pressure, psia

viii. P_2 = Pipe outlet pressure, psia

ix. G = Specific gravity, dimensionless

x. T_f = Average gas flowing temperature, rankine

xi. L = Pipe length, feet

xii. Z = Compressibility factor, dimensionless

xiii. D = Inside pipe diameter, inches

xiv. E = Pipe efficiency, percent/100

d. Design Pressure

i. The design pressure for steel pipeline is determined in accordance with the following formula (Barlow's):

i. $$P = \frac{2StFET}{D}$$

ii. P = Design pressure in pounds per square inch gauge

iii. S = Yield strength on pounds per square inch determined in accordance with 192.107

iv. D = Nominal outside diameter of the pipe in inches

v. t = Nominal wall thickness of the pipe in inches. If this is unknown, it is determined in accordance with 192.109. Additional wall thickness required for concurrent external loads in accordance with 192.103 may not be included in computing design pressure.

vi. F = Design factor determined in accordance with 192.113

vii. E = Longitudinal joint factor determined in accordance with 192.113

viii. T = Temperature factor determined in accordance with 192.115

e. Methods Used

i. All engineering design calculations are based on the use of the formulas and assumptions mentioned above and other standard arithmetic relations generally used and accepted by the industry.

2 Description of Pipe and Fittings

a. Pipe:

All pipe is prefabricated from plate or skelp by electric flash, continuous electric resistance or electric fusion welding process. Testing conformed to API-5L and API-5LX during the fabrication process.

b. Fittings:

All valves, flanges and other fittings conform to or exceed the requirements of the Code of Federal Regulations, Title 49, Part 192 entitled “Minimum Federal Safety Standards”, including all documents, specifications and standards incorporated by reference, dated August 12, 1970 as now and from time to time amended or supplemented.

3 Design Capacity

a. The design capacity for receipts from PEPL is 103,146 Dth/day.
b. The design capacity for receipts from MRT is 20,000 Dth/day.

4 Maximum Allowable Operating Pressure

a. The Curryville compressor discharge pressure is limited to 999 psig based upon a pressure test on the pipeline downstream from the station. The facilities installed within the Curryville compressor station have a design pressure of 1480 psig.