

Sand Hill Lateral Review

The Sand Hill lateral is a 5.1 mile lateral from the Rancho Pipeline to the City of Austin Sand Hill generating plant. The lateral starts just west of the Garfield regulator and proceeds north to the generating station. The lateral is being constructed of new pipe to current 49 CFR Part 192 requirements. The pipe, construction practices and the hydrostatic test pressures have been reviewed.

Sand Hill Pipe Characteristics

Appendix C lists the pipe mills, diameter, wall thicknesses, grades and pipe properties of the pipe to be used in the Sand Hill Lateral. Presently in the US, the supply of 20 inch diameter pipe is very limited and therefore this pipe had to be purchased from two pipe mills to obtain sufficient pipe quantity. Table 1 presents the pipe sizes and properties.

Table 1. Sand Hill Pipe Data

Quantity, feet	Mill	Wall Thickness, inch	API Grade	Operating Stress, %SMYS	Min./Max. Test Stress , %SMYS (1509/162 2 psig)	Avg.CVN Plateau Energy, ft- lbs (2/3 t)	TW Flaw Length at operating stress, inch
3000	American Steel Pipe	0.312	X60 (PSL2)	36	94/101	158	~20
5500	STUPP	0.250	X65 (PSL2)	42	94/101	54.3	~11.5
14,000	STUPP	0.344	X65 (PSL2)	30	74/80	101	8.4
4500	STUPP	0.500	X60 (PSL2)	23	58/62	108	11.8

The pipe metallurgy and physical characteristics substantially exceed minimum requirements in all categories. All of this pipe is high fracture toughness and the critical through-wall flaw lengths (rupture to leak dividing lengths) at the maximum operating pressure range from 8.4 to 20 inches long in the axial direction and completely through the pipe wall thickness. These are very large flaws and integrity of this line is assured by the high toughnesses and low operating stress levels.

Class Location of Lateral

The Class location of the Sand Hill Lateral currently is Class 1 and 2 based on aerial surveys of the area. To provide for future development, Kinder-Morgan has decided to construct the pipeline to a Class 3 location which means that the maximum design stress for the pipe wall thickness is 50% SMYS. As can be seen in Table 1, the planned operating stress ranges from 23 to 42 % SMYS for this line and therefore is even more conservatively designed than allowed by the federal code 49 CFR Part 192.

Review of Construction Specifications

Noel Duckworth reviewed the 20" lateral construction specifications with Ron McClain, Alice Weekly, and "Chief" Saddler and the following is a brief synopsis of the key elements relating to installing the pipeline with the high standards that are expected within this environment:

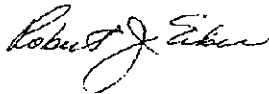
- The pipe is coated with 0.012"- 0.016" of fusion bonded epoxy coating, which is an excellent choice for this environment.
- The weld joints will be field coated with a 3M epoxy coating to assure compatibility with the FBE coating applied to the body of the pipe.
- There are 3 road bores and a 1200' directional drill under Onion creek that will be coated with Powercrete®, an epoxy based polymer concrete, which is the coating of choice for directional drilling and road boring.
- The ditch bottom will be padded with sand bags and other soft material either brought in to the location or crushed and sifted on site. This is standard procedure in the Industry to avoid coating damage during construction of the pipeline as well as from movement of the pipe within the ditch after commissioning.
- All pipe will be tested for holidays in the coating utilizing an electronic testing device (Jeep). There will be an inspector on site during all placement of pipe in the ditch and if he suspects that damage might have occurred to the coating, then he will require that the contractor re-inspect the pipe for holidays. This is an important integrity management process.
- There will be 100% X-Ray of all welding on the pipeline and all welds must maintain strict compliance with API 1104.
- All operations throughout the construction process will be inspected with third-party inspectors provided by Universal Ensco in Houston. This company is known to have good credibility in the field.
- There will be 6 inspectors on the project at all times and this number is certainly adequate to assure a quality product.
- In addition to the inspectors, there will be 2 survey crews documenting the precise placement of all welds and other elements of the pipeline.
- The final phase of construction will be hydrostatically testing to confirm the strength of the completed pipeline as well as to provide a leak test to assure no leakage. The pipeline will be hydro-tested to 93% of SMYS on the weakest joint in the system (structurally) and they have assumed that the weakest joint will be at the highest elevation. This assures a minimum 50% to 93% SMYS test on all joints. (Note, the wide range of SMYS percentages is because of the wide range of wall thicknesses and two strength grades X60 and X65.) Overall the test pressure to be applied to the lateral is 2.2 times the operating pressure, which is the same test margin that will be applied to the existing Rancho Pipeline. The test duration will be for 8 hours. There is very little elevation change in this short section and thus the whole 5.1 miles can be tested at once. It should be noted that the 1200 foot horizontal drill section will be pre-tested prior to installation so therefore, that section will be tested twice. This test complies with all Federal and State codes.
- We could not identify any elements of the pipe design, construction specifications or test practices that did not meet or exceed Federal and State Codes as well as the standards of care in the Industry.

Overall, this proposed lateral is somewhat unusual because of the limited availability of line pipe as it is significantly oversized and the construction specifications are of the highest quality. If any of this is not clear or if you require more details, please advise ASAP.

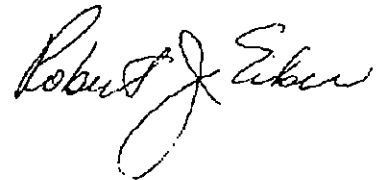
Thank You,

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H. Noel Duckworth

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Robert J. Eiber

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