Coating Temperature Limitations
October, 2014

Introduction

The purpose of this report is to provide a technical justification for setting temperature limits on the compressor station discharges in order to protect the integrity of the pipeline and its coating systems. The temperature limitations will be used in the Spectra Standard Operating Procedure (SOP) 2-2160. The current temperature limits are shown in Appendix A.

The performance of commonly used pipeline-coating materials over the temperature range from 120 F to 200 F is useful for the prediction of in-service limitations, integrity and time-to-failure of coatings. Results at higher temperature are directly relevant to pipelines operating at higher temperatures. In addition, elevated temperature has been an accelerating factor used to predict performance at longer times at ambient temperature.

While the general trends are known, the data for high temperature performance and the limits of acceptable performance are not well established. The important coating properties and appropriate test methods vary by coating type, e.g. cathodic disbondment tests for FBE, shielding for tapes and softening of extruded polyethylene system. In addition, there can be important interactions among the degradation modes of blistering, disbonding, and corrosion.

Higher operating temperatures are more aggressive to pipeline coatings which causes the rate of coating degradation to increase. Depending upon the type of coating material, there are temperature limits above which the coating in no longer suitable. Furthermore, the consequences of coating damage are more severe because the CP demands are higher and corrosion rates of steel are higher at elevated temperatures.

Unfortunately, the main basis for determining the temperature limits and subsequent performance of coatings is done by evaluating the cathodic disbondment behavior in laboratory tests which are run under controlled conditions. There is some direct evidence which is available within the company regarding coating failures related to high temperatures. Due to lack of records, the exact timing and the temperatures which were reached are not available. There have been no long term studies conducted by the industry to document the long term effects of high discharge temperatures on coatings. The annual increases in the remediation costs, specifically related to recoating and additional cathodic protection ground beds, is an indication that the pipeline coating is not holding up as it should on many segments. Many of these are related to temperature.

In general, the effects of temperature will vary depending upon coating type, e.g., FBE can become more permeable extruded coatings, tapes and coal tar enamels can soften and become more pliable and the effects on adhesion/disbonding are complex. With tapes, coal tars and extruded coatings, the effects of mechanical forces from soil stress increase in importance as temperature increases because components of the coating system can soften.

The current coating temperature limits in the Spectra SOP 2-2160 appear to have been set over 25 years ago. The documentation regarding the reason for setting these temperature limits has not been found. The current SOP has set temperature limits with limits based on a period of time at which it can operate within those temperature ranges. Although it is stated that it is not permissible to lower the temperature below the temperatures ranges provided in the SOP and then immediately bring the temperature back up to within the stated range, there is anecdotal information to suggest that this has been done. The purpose of the temperature ranges is to provide some operational flexibility in upset type of conditions, not to provide the temperature limits as a normal operating condition. The need to meet specific gas delivery requirements is not considered as an upset condition.

Coating System Descriptions

Asphalt Mastic (Somastic)

Mastic coatings normally involve one basic material – asphalt. Somastic pipe coating is a trade name for an asphalt-mastic mixture developed by H. C. Price. Co.

Mastic is applied to the pipe by continuous hot extrusion process as a uniform seamless coating with thickness such that complete waterproofing qualities are assured. The systems for pipe lines consist of a prime coat followed by a coating of a dense impervious essentially voidless mixture of asphalt, mineral aggregate, and mineral filler, which may include asbestos fiber.

Somastic's most common use is in areas with marshy ground, offshore and water crossings. Somastic can be applied in varying thicknesses from ½" to 1" thick. The weight of the coating is used to overcome negative buoyancy problems.

The operating temperatures will vary depending upon the type:
Grade I – 80 F
Grade II – 125 F
Grade III – 160 F
Grade IV – 210 F

Asphalt Enamel (Wrap)

These coatings may be referred to as "asphalt" or "asphalt enamel". These types of coatings are hot applied tars formulated from petroleum asphalts or derived from mining (which is the method of obtaining gilsonite, a naturally occurring asphalt. They contain inert fillers such as lime or slate dust for mechanical strength, impact and deformation resistance.

The average coating thickness is between 3/32" and 5/32". The coating is usually reinforced with embedded glass mesh and/or outer wrap with saturated glass mesh or asbestos felt to increase its resistance to handling and environmental conditions. The coating can be applied in

the ditch or in a mill and is applied over a primer. Bond strength of the coating is derived from proper primer application.

The maximum reported operating temperature is 161 F.

Coal Tar Enamel

This coating is applied hot over a primer. The average coating thickness is between 3/32" and 5/32". The coating may be applied with a glass mesh reinforcement and felt wrapped. The coating is formulated from coal tar pitches and inert fillers. The fillers increase the resistance of the coating to mechanical stress. Generally, all of the pipe coatings that are used within the Spectra system have a wrapping system along with the coal tar enamel.

Because coal tar pitches of higher softening point are brittle at normal temperatures, they are placticized. Plasticized coal tar enamels are made by plasticing a strong rigid material with a relatively soft coal tar base. High density coal is mixed with coal tar and the mixture is heated to about 600 F; the coal is swollen and ultimately dispersed as micelles in the coal tar.

A plasticized enamel having the proper softening point has the same high resistance to low stresses as an unplasticized enamel, but at high stress it has much less than proportional resistance to flow, that is, the enamel yields under handling blows rather than cracks.

Coal tar enamels generally fall into the following three general categories; Standard (unplasticized), semi-plasticized, and fully plasticized.

Standard Coal Tar Enamel

Standard coal tar enamel, "narrow range enamel", is the original coal tar enamel developed. It was an effective, economical coating under fairly severe field conditions. It is a hard enamel designed for service up to 122 F with a wrapping system. It is easy to apply and is well suited for over-the ditch application.

Semi-Plasticized Coal Tar Enamel

Semi-plasticized coal tar enamel (sometimes referred to as "moderate range enamel or "modified enamel") is produced by blending coal digested pitch with a straight run pitch to obtain the desired finished product characteristics. This product is designed to withstand operation temperatures up to 140 F (Note: Some literature references provide a maximum temperature of 130 F if used without a wrapping system). It is a good all purpose enamel and is easy to apply in the coating shop or over the ditch.

Fully Plasticized Coal Tar Enamel

Fully plasticized coal tar enamel (sometimes referred to as “wide range enamels”) is available in more than one grade. The low penetration enamel (4 to 10 dmm at 77 F) has a maximum service temperature up to about 160 F (Note: Some literature references have a temperature limit of 150 F if used without a wrapping system). It is resistant to shock and deformation and with broad temperature limits, it can be satisfactorily stored for extended periods. The high penetration enamel (10 to 20 dmm at 77 F) has the same service temperature range but is more flexible and better suited for applications to large diameter pipe.

There is also a “hot line” or “hot pipe”, high softening point enamel which is designed for higher temperature service. It is recommended for use in warm, swampy areas; salt flats, desert beds, or compressor station discharges where back fill and trenches are rough and for hot lines where in-service temperatures can be up to 180 F with a wrapping system.

Extruded Plastic Coating

Extruded plastic coatings are a two component pipe coating system of a thermoplastic adhesive and extruded continuous coating of high density polyethylene or polypropylene. The difference in the two coating systems is the range. The thermoplastic primer is 10 mil thick and the coating thickness can be from 20 to 60 mils. Typically, polyethylene coating is light yellow in color and polypropylene is orange in color.

Pritec Coating

Pritec is an extruded coating application that consists of extruding a film of butyl adhesive, which is spirally wound and fused to the heated pipe in two layers. With the butyl adhesive base still in a heated state, select polyethylene is extruded and spirally wound onto the pipe in layers to a specified thickness. This type of coating has high resistance to cathodic disbondment and was designed to have self-healing characteristics which allows the adhesive to ooze through damaged areas.

Liquid Epoxy

The liquid epoxy systems used by the Company are two part systems which may either be a “true” epoxy or an epoxy/urethane system.

For the epoxy/urethane system, the urethane polymer is pre-bonded to the epoxy resin rendering the coating “isocyanate free”. The synergistic effect of co-polymerizing epoxy and urethane produces a coating with the superior adhesion and permeability of epoxy along with the added toughness and abrasion resistance of urethane.

The liquid epoxy systems used by the Company are two part systems which are most often used as a girth weld coating or for coating/recoating of short lengths of pipe.

The temperature limits on the epoxies used by the Company, SPC 2888 or Protal 7200, are 176 F and 203 F respectively.

Fusion Bond Epoxy

An epoxy coating is formed by combining an epoxy resin with an appropriate curing agent and adding to this various fillers, pigments, flow control agents, etc. The possible combination of these materials is extensive and the resulting properties of the final product will vary.

Before the coating is applied, the pipe is shot blasted to white metal. The pipe is wire brushed to remove slivers and embedded shot. Prior to coating, the pipe is preheated uniformly. Resin powder is then uniformly applied to the pipe surface by electrostatic or cloud chamber deposition. The powder melts on the pipe, flow, gels and cures. It is typically applied to a thickness of about 14-16 mils.

Spectra Energy has used FBE coatings from both 3M Company (206N and 6233) and from DuPont (Nap-Gard 7-2500 and 7-2501).

The temperature limitation on the coating will vary depending upon the composition. The 3M 206N has a maximum temperature limit of 149 F (14 mils).

Other newer FBE coatings, such as 6233 have a temperature limit of 203 F at 14 mils and 230 F at 30 mils. The temperature limits are a function of coating thickness and environmental conditions.

The Nap-Gard products have a stated temperature limit up to 225 F, depending upon soil conditions.

Wax

Wax coatings can be put applied one of two ways. The wax tape system is applied by first preparing the surface with a wire brush to remove the rust and dirt. The primer is then applied over the surface. The wax tape is wrapped around the pipe surface, with an additional outer wrap often installed to provide additional protection. The maximum temperature for this system is 120 F.

The hot wax system is similar in that the surface preparation involves removing rust and dirt. The wax is heated to its pour point, where it is then poured onto the pipe surface and "granny ragged" so that the entire surface is covered. An outer wrap is then applied once the wax has cooled. The maximum temperature for this system is 125 F.

Conclusions

It is important to note that the coating temperature limits for all coatings will vary throughout the life of the coating system depending upon several factors:

- age of the coating

- soil conditions
- amount of moisture in the soil
- cathodic protection levels

Because of these variables a certain amount of conservatism is required when determine the appropriate compressor station discharge temperature limits.

Based on the current knowledge available about the coatings, the following revision is proposed or the various types of coating systems used throughout the Spectra system:

Table 1

	Proposed			**Current**		
Coating Type	**>2 Days, (F)**	**Max 2 Days (F)**	**Shutdown (F)**	**>7 days (F)**	**2-7 days (F)**	**<2 days (F)**
FBE (unknown)	149	NA	149	150	160	170
FBE, 3M 206N,	149	NA	149	150	160	170
FBE, 3m 6233. Nap-Gard 7-2500, Nap-Gard 7-2501	170	NA	170	150	160	170
Two Part Epoxy (SP 2888 or Denso 7200)	176	NA	176	NA	NA	NA
Asphalt Mastic (Grade III & IV)	154	155 to 159	160	160	170	180
Asphalt Enamel-Wrap	149	150 to 154	155	140	150	160
Standard Coal Tar Enamel	122	NA	122	120	130	140
Semi-Plasticized Coal Tar Enamel	129	130 to 134	135	130	140	150
Full Plasticized Coal Tar Enamel	144	145 to 149	150	150	160	170
Fully Plasticized coal Tar Enamel – high temp	164	165-169	170	160	170	180
Extruded Plastic	150	NA	150	NA	NA	NA
Wax Tape	120	NA	120	120	NA	130

Hot Wax	125	NA	125	NA	NA	NA

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NACE SP 0375 – Wax Coatings

Appendix A

Table 1 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (Texas Eastern)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Accident	49	CHPE	160	170	170
Accident	49A	CHPE	160	170	170
Accident	49B	CHPE	160	170	170
Accident	49C	CHPE	160	170	170
Armagh	12	CHPD	150	160	170
Armagh	19	CHUE	160	170	180
Armagh	27	P-MX	150	160	170
Athens	10	CSKD	120	130	140
Athens	15	CHPD	150	160	170
Athens	25	CHKE	160	170	180
Atlanta	1	CSBC	120	130	140
Bald Knob	1	CSBC	120	130	140
Barton (BART-MTPL)	10	CMBD	130	140	150
Barton (EGYP-BART)	10	CMBD	130	140	150
Barton (BART-MTPL)	15	CHPD	150	160	160
Barton (EGYP-BART)	15	CHPD	150	160	170
Barton (BART-MTPL	25	CHKE	160	170	180
Barton (EGYP-BART)	25	CHPE	160	170	180
Batesville	1	CSBC	120	130	140
Bechtelsville	12	CHPD	150	160	170
Bechtelsville	19	CHKE	150	160	170
Bechtelsville	27	P-MX	150	160	170
Bedford	1	P-MX	120	120	120
Bedford	2	P-MX	120	120	120
Berne	10	CSKD	120	130	140
Berne	15	CHPD	150	160	170
Berne	25	CHKE	160	170	180
Bernville	12	CMKD	130	140	150
Bernville	19	CHKE	160	170	180
Bernville	27	P-MX	150	160	170
Bernville	28	P-MX	150	160	170
Blessing	16	CHPD	150	160	170
Blessing	17	CMPD	130	140	150
Chambersburg	1	BARE	None	None	None
Chambersburg	2	P-MX	120	120	120
Charco	22	CMPD	130	140	150
Clinton	14	CHPD	150	160	170
Clinton	18	CHPD	150	160	170
Danville	10	CMPD	130	140	150
Danville	15	CHPD	150	160	170
Danville	25	CHRE	160	170	180

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Station Name (Texas Eastern)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Delmont	9	CSPD	120	130	140
Delmont	12	CHPD	150	160	170
Delmont	19	CHUE	160	170	180
Delmont	27	P-MX	150	160	170
Donaldson	1	CSBC	120	130	140
Eagle	1	CSBC	120	130	140
Eagle	2	P-MX	150	160	170
Eagle	1-H	M4HV	160	170	180
Egypt	1	CSBC	120	130	140
Egypt	10	CMBD	130	140	150
Egypt	15	CHPD	150	160	170
Egypt	25	CHPE	160	170	180
Entriken	12	CMPD	130	140	150
Entriken	19	CHUE	160	170	180
Entriken	27	P-MX	150	160	170
Five Points	1	P-MX	150	160	170
Five Points	2	CSBC	120	130	140
Five Points	3	CSPD	120	130	140
Franklin	20-A	A	140	150	160
Franklin	20-C	A	140	150	160
French Lick	1	CSBC	120	130	140
Gas City	69	P-MX	150	160	170
Gillis East	14	CHPD	150	160	170
Gillis West	14	CMRD	130	140	150
Gillis	18	P-MX	150	160	170
Gladeville (GLAD-TOMP)	10	CMBD	130	140	150
Gladeville (MTPL-GLAD)	10	CSRD	120	130	140
Gladeville (GLAD-TOMP)	15	CHPD	150	160	170
Gladeville (MTPL-GLAD)	15	CHPD	150	160	170
Gladeville (GLAD-TOMP)	25	CHAE	160	170	180
Gladeville (MTPL-GLAD)	25	CHRE	160	170	180
Glen Karn	69	P-MX	150	160	170
Grand Chenier	41	M3HV	160	170	180
Grantville	12	CHPD	150	160	170
Grantville	19	CHKE	160	170	180
Grantville	27	P-MX	150	160	170
Grantville	28	P-MX	150	160	170
Hanover	20-B	M3HV	160	170	180
Heidlersburg	2	P-MX	120	120	120
Holbrook	10	CSKD	120	130	140
Holbrook	15	CHPD	150	160	170
Holbrook	25	CHPE	160	170	180
Hope	1	CSBC	120	130	140
Huntsville	11	CMPD	130	140	150

Table 1 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (Texas Eastern)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Iowa Plant	41	M3HV	N/A	N/A	N/A
Joaquin	11	CMBD	130	140	150
Joaquin	13	CHPD	150	160	170
Koscuisko	10	CMBD	130	140	150
Koscuisko	15	CHPD	150	160	170
Koscuisko	25	CHPE	160	170	180
Lambertville	1	CSBC	120	130	140
Lambertville	2	CSBC	120	130	140
Lambertville	20	M3HV	160	170	180
Lambertville	38	P-MX	150	160	170
Larose	40	M3HV	160	170	180
Lebanon	1	CSBC	120	130	140
Lebanon	2	CSBC	120	130	140
Lebanon	3	CSPD	120	130	140
Leidy	24	CHPE	160	170	180
Leidy	37	CHPE	150	160	170
Lick Creek	1	CSBC	120	130	140
Lilly	12	CHPD	150	160	170
Lilly	19	CHPE	160	170	180
Lilly	27	P-MX	150	160	170
Linden	1	CSBC	120	130	140
Linden	2	CSBC	120	130	140
Linden	20	M3HV	160	170	180
Little Rock	1	CSBC	120	130	140
Longview	1	CSBC	120	130	140
Longview	13	CHPD	150	160	170
Marietta	1	P-MX	150	160	170
Marietta	2	CSBC	120	130	140
Monroe	26	CHPE	160	170	180
Mont Belvieu	16	AELD	140	150	160
Mt. Pleasant	10	CSRD	120	130	140
Mt. Pleasant	15	CHPD	150	160	170
Mt. Pleasant	25	CHRE	160	170	180
Norris City	1	CSWC	120	130	140
Oakford	9	CSPD	120	130	140
Opelousas(OPEL-STFR)	14	CHPD	150	160	170
Opelousas (GILL-OPEL)	14	CHPD	150	160	170
Opelousas (OPEL-STFR)	18	P-MX	150	160	170
Opelousas (GILL-OPEL)	18	P-MX	150	160	170
Oran	1	CSBC	120	130	140
Owingsville	10	CMKD	130	140	150
Owingsville	15	CHPD	150	160	170
Owingsville	25	CHAE	160	170	180
Perulack	12	CHPD	150	160	170

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Station Name (Texas Eastern)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Perulack	19	CHKE	160	170	180
Perulack	24	CHPE	160	170	180
Perulack	27	P-MX	150	160	170
Perulack	28	P-MX	150	160	170
Pollard (Fagus)	1	CSBC	120	130	140
Princeton	1	CSWC	120	130	140
Seymour	1	CSBC	120	130	140
Shermansdale	19	CHKE	160	170	180
Shermansdale	12	CMPD	130	140	150
Shermansdale	27	P-MX	150	160	170
Shermansdale	28	P-MX	150	160	170
Somerset	1	BARE	None	None	None
Somerset	2	BARE	None	None	None
Somerset	3	P-MX	150	160	170
Somerset	65	P-MX	150	160	170
St. Francisville	14	CHPD	150	160	170
St. Francisville	18	CHPE	160	170	180
Summerfield	1	BARE	None	None	None
Summerfield	2	BARE	None	**None**	None
Summerfield	3	CSPD	120	130	140
Summerfield	66	P-MX	150	160	170
Thomaston	21	CMPD	130	140	150
Tompkinsville	10	CMBD	130	140	150
Tompkinsville	15	CHPD	150	160	170
Tompkinsville	25	CHAE	160	170	180
Union Church (UCHC-CLIN)	14	CHPD	150	160	170
Union Church (STFR-UCHC)	14	CHPD	150	160	170
Union Church (UCHC-CLIN)	18	AHLE	160	170	180
Union Church (STFR-UCHC)	18	CHPE	160	170	180
Uniontown	1	P-MX	120	120	120
Uniontown	2	P-MX	120	120	120
Uniontown	9	CSPD	120	130	140
Uniontown	29	CHAE	160	170	180
Uniontown	39	P-MX	150	160	170
Uniontown	49	CHPE	160	170	180
Vidor East	14	CHPD	150	160	170
Vidor West	14	AELD	140	150	160
Vidor West	16	AELD	140	150	160
Walnut Ridge	1	CSBC	120	130	140
Waynesburg	1	P-MX	150	160	170
Wheelersburg (WHEE-ATHE)	10	CMBD	130	140	150
Wheelersburg (OWNS-WHEE)	10	CMBD	130	140	150

Table 1 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (Texas Eastern)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Wheelersburg (WHEE-ATHE)	15	CHPD	150	160	170
Wheelersburg (OWNS-WHEE)	15	CHPD	150	160	170
Wheelersburg (WHEE-ATHE)	25	CHRE	160	170	180
Wheelersburg (OWNS-WHEE)	25	CHRE	160	170	180
White Castle	40	CHKE	160	170	180
Wind Ridge	1	BARE	None	None	None
Wind Ridge	2	BARE	None	None	None
Yazoo City	26	CPKE	160	170	180

Table 2 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (AGT)	**Line No.**	**Coating Code (See Note)**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Burrillville	24” M/	W	120	N/A	130
Burrillville	30” L/L	C-P-	120	N/A	130
Chaplin	24” M/L	C-K-	120	N/A	130
Chaplin	30” L/L	C---	120	N/A	130
Cromwell	24” M/L	C-K-	120	N/A	130
Cromwell	30” L/L	C-P-	120	N/A	130
Hanover	26” M/L	C-K-	120	N/A	130
Hanover	30” L/L	C---	120	N/A	130
Oxford	30” L/L	C---	120	N/A	130
Oxford	24” ML	C---	120	N/A	130
Southeast	26” M/L	C-K-	120	N/A	130
Southeast	30” L/L	C---	120	N/A	130
Stony Point	26” M/L	C-K-	120	N/A	130
Stony Point	30” L/L	C-K-	120	N/A	130

Note: The Coating Code lists the temperature limiting coating on the discharge.

Table 3 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (ETNG)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Boyd's Creek	3300-1	CS-C	120	130	140
Bristol (BRIS-GLDE)	3300-2	P-MX	150	160	170
Bristol (FORD-BRIS)	3300-2	CS-C	120	130	140
Calhoun (CALH-MADI)	3200-1	CS-C	120	130	140
Calhoun (OOLT-CALH)	3200-1	CS-C	120	130	140
Clarkrange	3100-1	CS-C	120	130	140
Dixon Springs	3100-1	CS-C	120	130	140
Early Grove	3300-1	P-MX (SHRINK SLEEVES)	90	90	90
Estill Springs	3200-1	CS-C	120	130	140
Estill Springs	3200-2	P-MX	150	160	170
Flatwoods (FLAT-FORD)	3300-1	CS-C	120	130	140
Flatwoods (BOYD-FLAT)	3300-1	CS-C	120	130	140
Flatwoods	3305B-100	P-MX	150	160	170
Fordtown (FORD-BRIS)	3300-1	CS--	122	122	122
Fordtown (FLAT-FORD)	3300-1	CS-C	120	130	140
Fordtown (FORD-BRIS)	3300-2	P-MX	150	160	170
Fordtown (FLAT-FORD)	3300-2	P-MX	150	160	170
Fordtown	3307C-100	CS--	122	122	122
Fordtown	3307B-100	CS--	122	122	122

Table 3 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (ETNG)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Gainesboro	3100-1	CS-C	120	130	140
Gainesboro	3100-2	CS-C	120	130	140
Glade Springs (GLDE-RURA)	3300-2	P-MX	150	160	170
Glade Springs (BRIS-GLDE)	3300-2	P-MX	150	160	170
Lewisburg	3200-1	CS-C	120	130	140
Lewisburg	3200-2	P-MX	150	160	170
Lobelville	3200-1	CS--	120	130	140
Madisonville (MADI-MARY)	3200-1	CS-C	120	130	140
Madisonville (CALH-MADI)	3200-1	CS-C	120	130	140
Madisonville	3200-2	P-MX	150	160	170
Maryville	3200-1	CS-C	120	130	140
Monterey	3100-1	CS-C	120	130	140
Nora	3400-1	P-MX	150	160	170
Ooltewah	3200-1	P-MX	150	160	170
Ooltewah	3200-2	P-MX	150	160	170
Ooltewah	3500-1	P-MX	150	160	170
Ridgetop	3100-1	CS-C	120	130	140
Rural Retreat (RURA-EOLN)	3300-1	P-MX	150	160	170
Rural Retreat (GLAD-RURA)	3300-1	CS-C	120	130	140
Rural Retreat (RURA-EOLN)	3300-2	P-MX	150	160	170
Rural Retreat (GLAD-RURA)	3300-2	P-MX	150	160	170
Saltville	P-25	P-MX (SHRINK	90	90	90

Table 3 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (ETNG)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
		SLEEVES)			
Saltville	P-25L	P-MX	150	160	170
Tracy City	3200-1	CS-C	120	130	140
Tracy City	3200-2	P-MX	150	160	170
Wartburg	3100-1	CS-C	120	130	140

Table 4 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (M&N)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Baileyville	1	P-MX	150	160	170
Brewer	1	P-MX	150	160	170
Elliot	1	P-MX	150	160	170
Richmond	1	P-MX	150	160	170
Searsmont	1	P-MX	150	160	170
Westbrook	1	P-MX	150	160	170
Wood Chopping Ridge	1	P-MX	150	160	170

Table 5 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (Steckman Ridge)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Steckman Ridge	91	P-MX	150	160	170

Table 6 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name ()	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Moss Bluff	Compressor	P-MX	150	160	170

Table 6 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name ()	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
	station to wellheads				

Table 7 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (Egan Hub Partners)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Egan	Compressor station to wellheads	P-MX	150	160	170

Table 8 Recommended Maximum Gas Temperatures for Compressor Station Discharges					
Station Name (Bobcat Storage)	**Line No.**	**Coating Code**	**Temp. °F > 7 days (1)**	**Temp. °F 2-7 days (2)**	**Temp. °F <2 days (2)**
Bobcat	Compressor station to wellheads	P-MX	150	160	170

Notes:

(1) Temperatures listed in this column are the recommended maximum sustained temperatures during normal operations.

(2) Elevated temperatures are only allowed during upsets in normal operations. It is not acceptable to lower the temperature and then immediately return to the upset condition. Refer to the Coatings Committee for further guidance.

Table 9

Coating Codes					
	Type		**Grade**		**Manufacturer**
C	Coal Tar Enamel	S	Standard	P	Pittsburgh
A	Asphalt Enamel	M	Modified	B	Barretts
M	Asphalt Mastic	P	Plasticized	K	Koppers
T	Tape	H	Hot Line	R	Reilly
P	Thin Film Epoxy	E	E-120	L	Lion-Monsanto
W	Wax	A	E-120A	H	H.C. Price
		I)	Mastic	W	Wailes-Dove
		II)	Mastic	SR	Seamless Rubber
		III)	Mastic	PF	Plicoflex
		IV)	Mastic	A	Allied
		--	Not Designated	M	M.M.M.
				U	USS Chemical
				N	NAPKO

COATING CODE SHALL ALWAYS BE SHOWN IN THE FOLLOWING ORDER:

TYPE - GRADE - MFGR – CLASS

C - M - P – D

Coal Tar Enamel – Modified – Pittsburgh – Primer, Enamel No. 1, Fiberglass Wrap No. 1, Asbestos Felt Wrap

CLASS	**C**	**D**	**E**	**F**	**K**	**L**	**O**	**R**	**S**	**U**	**V**	**W**	**X**	**Y**
PRIMER	x	x	x	x	x	x	x	x	x	x	x	x		x
ENAMEL NO. 1	x	x	x	x	x	x	x	x	x	x				
FIBERGLASS WRAP NO. 1		x	x	x	x	x	x	x	x	x				
ENAMEL NO.2				x			x		x	x				
ASBESTOS FELT WRAP	x		x	x		x				x				
KRAFT WRAP		x			x		x							
ROCK SHELD					x	x	x							
CONCRETE COATING								x	x	x		x		
ASPHALT MASTIC											x	x		

THIN FILM													X	
TAPE														X