

### Expansion Loop Requirements.

Generally, if the total expansion in any direction on the pipeway is less than 10", the loop could be avoided by locating an anchor in the middle of the run.

The total expansion between loop anchors should not exceed 12".

The expansion at the change of direction (i.e. points "A" and "B" in the example, paragraph 1.4) should not exceed 5". Consult the Supervising Stress engineer for any exceptions.

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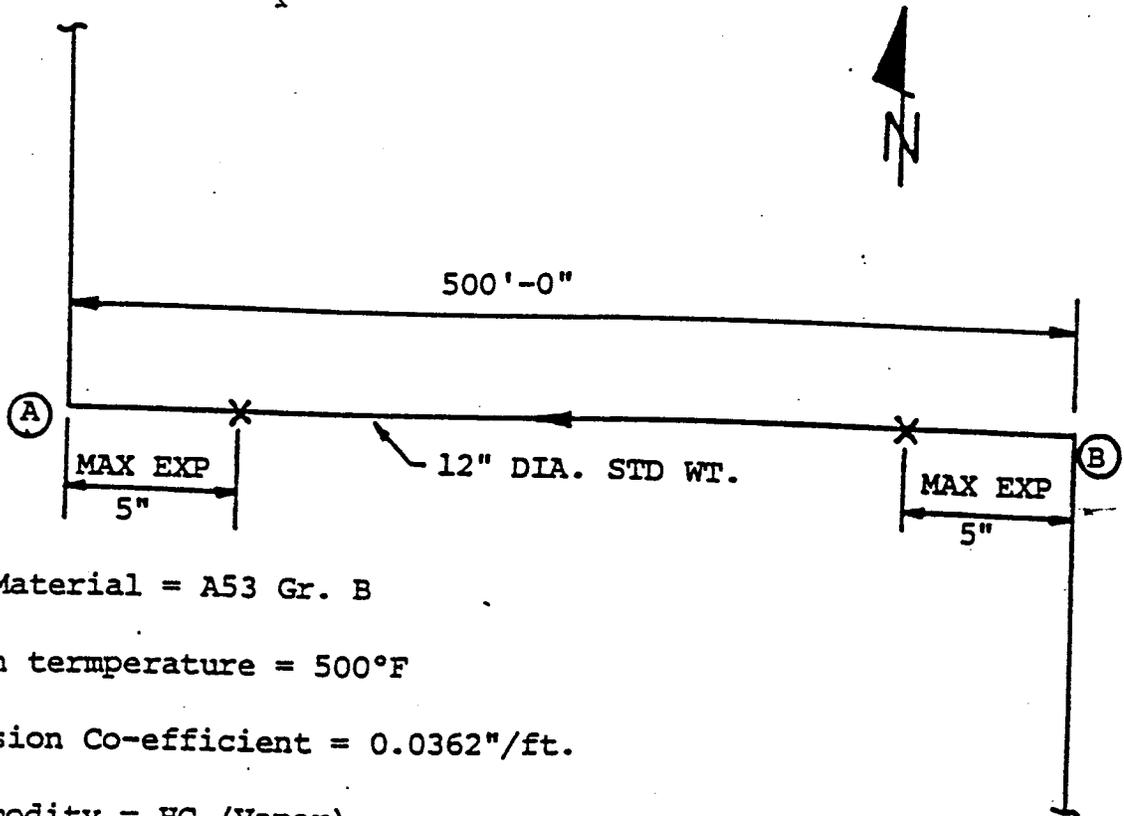
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Location of loops and guides.

Example:



Pipe Material = A53 Gr. B

Design temperature = 500°F

Expansion Co-efficient = 0.0362"/ft.

Commodity = HC (Vapor)

Insulation = none

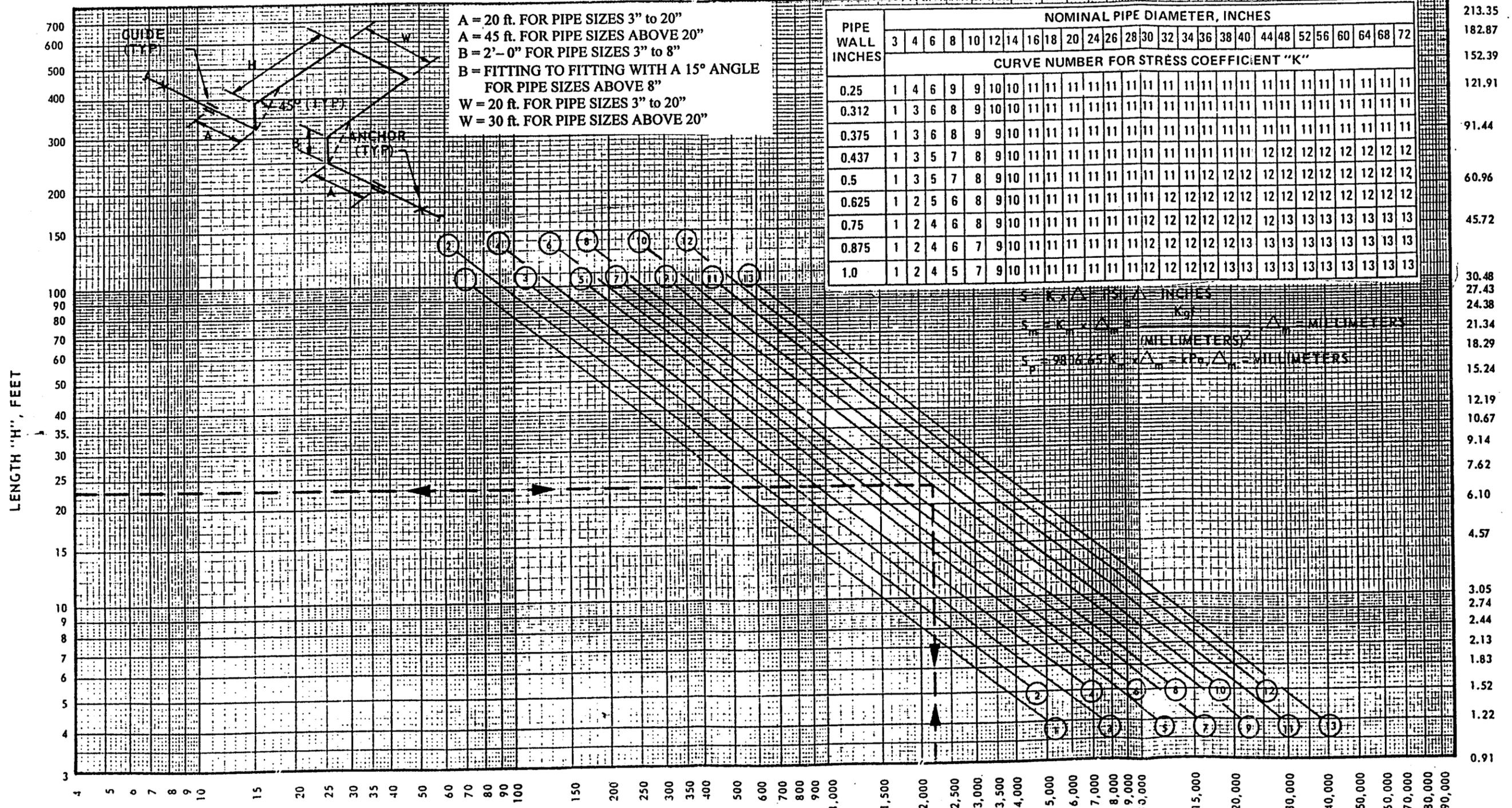
Co-efficient of friction = 0.3 (steel on steel)

Total expansion in the East-West direction.  
(500'-0") x (0.0362) = 18.1"

Location of loop anchors. Anchors should be located in such a way that the expansion going into the loop should not exceed 12" and the total unbalanced forces at the anchors should be within the limiting criteria (paragraph 1.2). Locate anchors at 125'-0" from points "A" and "B".

METRIC STRESS COEFFICIENT "K<sub>B</sub>"

- 0.00011
- 0.00014
- 0.00016
- 0.00019
- 0.00022
- 0.00024
- 0.00027
- 0.00041
- 0.00055
- 0.00069
- 0.00083
- 0.00096
- 0.0011
- 0.00138
- 0.00166
- 0.00193
- 0.00221
- 0.00249
- 0.00276
- 0.00415
- 0.00553
- 0.00692
- 0.00830
- 0.00968
- 0.01107
- 0.01384
- 0.01660
- 0.01937
- 0.02214
- 0.02491
- 0.02768
- 0.04152
- 0.05536
- 0.06920
- 0.08304
- 0.09688
- 0.11072
- 0.13840
- 0.16608
- 0.19376
- 0.22144
- 0.24912
- 0.27680
- 0.41520
- 0.55361
- 0.83041
- 1.10722
- 1.38402
- 1.66083
- 1.93764
- 2.21444
- 2.49125



A = 20 ft. FOR PIPE SIZES 3" to 20"  
 A = 45 ft. FOR PIPE SIZES ABOVE 20"  
 B = 2'-0" FOR PIPE SIZES 3" to 8"  
 B = FITTING TO FITTING WITH A 15° ANGLE FOR PIPE SIZES ABOVE 8"  
 W = 20 ft. FOR PIPE SIZES 3" to 20"  
 W = 30 ft. FOR PIPE SIZES ABOVE 20"

PIPE WALL INCHES	NOMINAL PIPE DIAMETER, INCHES																											
	3	4	6	8	10	12	14	16	18	20	24	26	28	30	32	34	36	38	40	44	48	52	56	60	64	68	72	
	CURVE NUMBER FOR STRESS COEFFICIENT "K"																											
0.25	1	4	6	9	9	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	
0.312	1	3	6	8	9	10	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	
0.375	1	3	6	8	9	9	10	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	
0.437	1	3	5	7	8	9	10	11	11	11	11	11	11	11	11	11	11	11	11	12	12	12	12	12	12	12	12	
0.5	1	3	5	7	8	9	10	11	11	11	11	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	
0.625	1	2	5	6	8	9	10	11	11	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	
0.75	1	2	4	6	8	9	10	11	11	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	13	13	13	
0.875	1	2	4	6	7	9	10	11	11	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	13	13	13	
1.0	1	2	4	5	7	9	10	11	11	11	11	11	11	11	12	12	12	12	13	13	13	13	13	13	13	13	13	

$S = K \times \Delta$  (PSI,  $\Delta$  - INCHES)  
 $S = K \times \Delta$  (MPa,  $\Delta$  - MILLIMETERS)  
 $S = 98066.5 K \times \Delta$  (KPa,  $\Delta$  - MILLIMETERS)

STRESS COEFFICIENT "K"

LENGTH "H", FEET

LENGTH "H", METERS