ATS Engineers are available to help provide a solution to your piping problem. Mail or FAX your piping configuration for a computer generated flexibility analysis, recommendations and a proposal.

[ ] THERMALLY INDUCED CHANGES OF PIPELINES:

Pipelines will always change in length as the temperature of the pipeline changes. This change must be accommodated by some method, either by natural flexibility of the pipeline or by use of an expansion device. The TP2 Expansion Joint is the ideal selection when long straight runs of pipe are involved.

Table 2 is used to determine the total change in length of the pipe run based upon the maximum and minimum temperatures of the system. The net change in length of the pipe run per 100 ft. of piping is the algebraic difference between the expansion constant at the highest temperature and the expansion constant at the lowest temperature. This difference is then multiplied by the total length of the pipe run divided by 100. NOTE: the minimum temperature may not be the installation temperature.

EXAMPLE: Determine the total change in length of a 250-ft. long pipe run that is designed for 250 psig saturated steam (406°F) and is being installed outside where the ambient temperature may reach -20°F.

$$3.29 - (-0.15) \times \frac{250}{100} = 8.6 \text{ in}$$

[ ] TRAVERSE SELECTION AND PRE-COMPRESSION:

Traverse is normally supplied in 4" increments, with 4", 8" and 12" nominal traverse considered standard. Once the total growth of the pipe run is determined, a safety factor of 10% should be added (See Table 2 footnotes), and a standard expansion joint traverse larger than the total growth should be selected. Assuming a single slip expansion joint is to be used for the example above, a 12" traverse expansion joint should be selected.

All ATS expansion joints for hot service are shipped with the slips pre-compressed 1", and are capable of moving the nominal traverse in compression and 1" in extension. For cold service, the slips are pre-compressed the nominal traverse, and are capable of moving the nominal traverse in extension and 1" in compression. Consult the factory whenever the installation temperature of the expansion joint is going to be abnormal, i.e., installing the expansion joint in a hot line, or installing the expansion joint on an exceptionally hot day in a normally cold location.

[ ] EXPANSION JOINT PACKING FRICTION FORCE:

The packing friction force of a slip type expansion joint is the force required to move the slip due to the injectable packing acting on the slip inside the stuffing box. ATS has determined from testing that for expansion joints properly packed for service up to 300 psig, this force is equal to approximately 1,000 lbs. per inch of expansion joint nominal diameter, i.e., a 6" expansion joint will require 6,000 lbs. of force to move the slip. Packing friction forces are tabulated in Table 3.
NOTE: When an expansion joint is to be packed for service above 300 psig, consult the factory for the appropriate packing friction force.

[ ] PRESSURE THRUST:

The pressure thrust associated with a packed slip type expansion joint can be calculated by multiplying the design pressure of the system by the thrust area of the expansion joint. The thrust areas for the ATS expansion joints are listed in Table 3. The pressure thrust is a very important component in the calculation of anchor loading and must be properly calculated and accounted for.

TABLE 2
THERMAL EXPANSION OF STEEL PIPE —INCHES PER 100FT.

Saturated Steam Vacuum in HG below 212°F., Pressure psig above 212°F.	Temperature Degrees Fahrenheit	Carbon & Carbon Molybdenum Steel
	—40	—0.29
	—20	—0.15
	0	0
	20	0.15
	32	0.23
	40	0.30
29.39	60	0.45
28.89	80	0.58
27.99	100	0.75
26.48	120	0.91
24.04	140	1.06
20.27	160	1.20
14.63	180	1.36
6.45	200	1.52
0	212	1.61
2.5	220	1.68
5.0	227	1.74
10.3	240	1.84
20.7	260	2.02
25.0	267	2.08
34.5	280	2.18
50.0	298	2.33
52.3	300	2.35
74.9	320	2.53
103.3	340	2.70
125.0	353	2.82
138.3	360	2.88
150.0	366	2.93
180.9	380	3.06
200.0	388	3.13
232.4	400	3.23
250.0	406	3.29
293.7	420	3.42
300.0	422	3.44
366.1	440	3.60
400.0	448	3.67
451.3	460	3.78
500.0	470	3.87
550.3	480	3.96
600.0	489	4.04
664.3	500	4.15
795.3	520	4.34
945.3	540	4.53
1115	560	4.73
1308	580	4.93
1525	600	5.13
1768	620	5.33
2041	640	5.53
2346	660	5.75
2705	680	5.95
3080	700	6.16
	720	6.36
	740	6.57
	760	6.79
	780	7.00
	800	7.23
	820	7.45
	840	7.66
	860	7.97
	880	8.10
	900	8.34

Add a minimum of 10% to calculated expansion for selection of the expansion joint nominal traverse for (1) discrepancies in minimum or installation temperatures, (2) jobsite necessity to relocate anchor points, and (3) temperature surges.