ASME B-31.8 Code.

General Stress Relieving Requirements:-

825 STRESS RELIEVING

825.1 Carbon Steels

Welds in carbon steels having a carbon content in excess of 0.32% (ladle analysis) or a carbon equivalent (C + ¼ Mn) in excess of 0.65% (ladle analysis) shall be stress relieved as prescribed in the ASME BPV Code, Section VIII. Stress relieving may also be advisable for welds in steel having lower carbon content or carbon equivalent when adverse conditions cool the weld too rapidly.

825.2 Wall Thickness

Welds in all carbon steels shall be stress relieved when the nominal wall thickness exceeds 1¼ in. (32 mm).

B823.2 Requirements for Qualification of Procedures and Welders on Sour Gas Piping Systems

B823.2.1 Qualifying Standard. All procedure and performance qualifications shall be based on destructive mechanical test requirements.

B823.2.4 Hardness Control. The hardness of all weld zones including weld metal and heat-affected zones on welding qualification test specimens shall meet the hardness requirements for the alloys welded as specified in NACE MR0175/ISO 15156. For most common pipe alloys, the maximum allowable hardness isHRC22. It is the user's responsibility to ensure the welding qualification specimen is metallurgically representative of full-scale pipeline welds.

NOTE: Both macrohardness and microhardness surveys of properly prepared qualification specimens are frequently used to determine the presence of thin HAZ hard zones. A commonly accepted maximum macrohardness limit near the inside surface is 250 HV10

B825 STRESS RELIEVING

B825.1 Carbon Steels

The chemistry of the steel and welding procedure shall be controlled to limit the hardness of the weldment as required by para. **B823.2.4**. **When the effectiveness of such controls is questionable, consideration shall be given to stress relieving welds in sour gas service**. In general, temper bead welding, peening procedures, or low-temperature postweld heat treatment does not provide the equivalent protection from service cracking as does a full thermal stress relief.

Aramco Requirements:-

7.5 Welding Procedure Qualification Hardness Testing
7.5.1 **Hardness testing of the welding procedure qualification is required for sour service applications and for girth welds of all offshore pipelines. The maximum allowable hardness for sour service is VHN 250**. For offshore pipelines in non-sour service, the maximum allowable hardness is VHN 300. The procedure is exempt from hardness testing if it is to be used on external structural attachments only, and the pipe wall at the attachment point is at least 25 mm thick.

12 Postweld Heat Treatment

12.1 The requirement for postweld heat treatment (PWHT) shall be determined by **ASME B31.4** or **ASME B31.8,** as appropriate. **If PWHT is to be applied**, then the general requirements of ASME SEC VIII shall apply. A written procedure describing the general PWHT requirements shall be submitted for review and approval. The PWHT procedure shall include descriptions of the equipment, method of heating, location and type of heating elements, temperature measurement, and thermocouple locations. The review and approval process shall be the same as described for welding procedures

12.6 **For applications where PWHT is required by the service conditions or where hardness limits are specified**:
a) Any reductions in the PWHT temperature or alternative temperatures below the normal holding temperatures listed in ASME SEC VIII are not permitted.
b) The minimum PWHT soak time shall be 1 hour.
c) If hardness limits are specified, the soak time for production welds shall not be less than 80% of the PQR soak time.

13 Production Weld Hardness Testing

13.1 Hardness testing according to ASTM A833 of production welds is only **required if specified by CSD** or **if PWHT is applied due to service requirement**. If specified, the maximum hardness for P-No. 1 material is 225 BHN for non-sour service and **200 BHN for sour service**.