calculate $\varepsilon_{eq}$. The final equivalent strain may be load path-dependent. The interaction between different loads shall be appropriately considered in the analysis method to determine the maximum equivalent strain that could occur.

4.2 STRAIN LIMITS

4.2.1 Strain Limits for Membrane Plus Bending Strain Due to Pressure and Other Sustained Loads

The equivalent elastic membrane plus bending strain $\varepsilon_{eq}^{SL}$ due to pressure and all sustained loads, calculated by elastic analysis and averaged across the pipe wall, shall be limited as follows:

$$\left(\varepsilon_{eq}^{SL}\right)_{ave} \leq \varepsilon_y$$  \hspace{1cm} (3)

where

$\varepsilon_y =$ the true strain value corresponding to the Code-specified yield stress at a temperature consistent with the loading under consideration per Section II, Part D, Table Y-1

This shall be applied to 4.2.2 and 4.2.3.

4.2.2 Strain Limits for Nonreversing Dynamic Loads or Nonreversing Dynamic Loads Combined With Reversing Dynamic Loads

The following requirements shall apply:

(a) The requirements of 4.2.3(b) and 4.2.3(c) shall be met for any reversing dynamic loads.

(b) All average equivalent strain $(\varepsilon_{eq})_{ave}$ across the pipe wall shall be limited as follows:

$$\left(\varepsilon_{eq}\right)_{ave} \leq 0.35n$$  \hspace{1cm} (4)

where

$n =$ strain hardening exponent per Mandatory Appendix XIII, Table XIII-3450-1 for the applicable material

TF = triaxiality factor, see 4.3

(c) The maximum equivalent strain $\varepsilon_{eq}^{max}$ of the pipe shall be limited as follows:

$$\varepsilon_{eq}^{max} \leq 0.45\varepsilon_f$$  \hspace{1cm} (5)

where

$\varepsilon_f =$ the true strain at fracture, defined in Nonmandatory Appendix EE

4.2.3 Strain Limits for Reversing Dynamic Loads Not Required to Be Combined With Nonreversing Dynamic Loads

The following requirements shall apply:

(a) The number of cycles of reversing dynamic load exclusive of earthquake shall be equal to or less than 20. Earthquake loads shall be considered as reversing dynamic loads, per NB/NC/ND-3622.2 and Appendix XIII, XIII-1300(aa).

(b) The equivalent elastic membrane plus bending strain $\varepsilon_{eq}^{DWT}$ of the piping due to deadweight shall be limited as follows:

$$\varepsilon_{eq}^{DWT} \leq \frac{1}{3}\varepsilon_y$$  \hspace{1cm} (6)

where

$\varepsilon_y =$ as defined in 4.2.1

(c) The maximum equivalent strain $\varepsilon_{eq}^{max}$ of the pipe shall be limited as follows:

$$\varepsilon_{eq}^{max} \leq \varepsilon_a$$  \hspace{1cm} (7)

where

$$\varepsilon_a = \frac{S_a(N)}{E}$$  \hspace{1cm} (8)

where

$a = 2.3$ for $S_a$ values from Figure I-9.1
$$= 1.5$ for $S_a$ values from Figure I-9.2

$E =$ Young’s modulus, can be obtained from Section III Appendices, Mandatory Appendix I, Figure I-9.1 or Figure I-9.2, as applicable

$N =$ number of cycles of dynamic load