MANDATORY APPENDIX I
COMPRRESSIVE STRESS, $S_c$

I-1  GENERAL

Compressive stress, $S_c$, may be obtained from either Method 1 or Method 2.

I-2  METHOD 1: EXTERNAL PRESSURE CHART (EPC)

$S_c$ is obtained from external pressure charts in Manda
tory Appendix II and listed in Table I-1. The charts are en
tered with a given value of $A$ and a value of $S_c$ is obtained for a given temperature and time curve.

I-3  METHOD 2: EQUATIONS FOR CONSTRUCTING EPC

(a) External pressure curves for the materials listed in (b) are obtained from isochronous stress-strain curves. The procedure consists of obtaining first an average isochronous stress-strain curve for a given material at a giv
ten temperature and time. Then the average isochronous stress-strain curve is minimized and used to obtain an external pressure curve as outlined below.

(b) The following are materials with available equations defining their average isochronous stress-strain curves.

(1) Carbon steel
(2) C-0.5Mo steel
(3) 1.25Cr-0.5Mo annealed steel
(4) 1.25Cr-0.5Mo normalized and tempered steel
(5) 2.25Cr-1Mo annealed steel
(6) 2.25Cr-1Mo normalized and tempered steel
(7) 2.25Cr-1Mo quenched and tempered steel
(8) 2.25Cr-Mo-V
(9) 5Cr-1Mo steel
(10) 9Cr-1Mo steel
(11) 9Cr-1Mo-V steel
(12) 12Cr steel
(13) Type 304 and 304H stainless steel
(14) Type 316 and 316H stainless steel
(15) Type 321 stainless steel
(16) Type 321H stainless steel
(17) Type 347 stainless steel
(18) Type 347H stainless steel
(19) Type 347LN stainless steel
(20) Nickel alloy 800
(21) Nickel alloy 800H
(22) Nickel alloy 800HT

(c) The average isochronous curve for a given material at a given temperature and time at various stress levels is obtained from the following equations.

(1) The total strain is the sum of the elastic strain, $\varepsilon_e$, plastic strain, $\varepsilon_p$, and creep strain, $\varepsilon_c$.

$$\varepsilon_t = \varepsilon_e + \varepsilon_p + \varepsilon_c \tag{I-1}$$

(2) The elastic strain is defined as follows:

$$\varepsilon_e = \frac{\sigma}{E_y} \tag{I-2}$$

(3) The plastic strain is expressed as follows:

$$\varepsilon_p = \gamma_1 + \gamma_2 \tag{I-3}$$

where

$$\gamma_1 = 0.5(\sigma/\alpha_0)^{1/\alpha_2} \left[ \tan \left( \frac{1}{2} \left( \frac{\sigma}{\alpha_0} \right) \right) \right] \tag{I-4}$$

$$\gamma_2 = 0.5(\sigma/\alpha_0)^{1/\alpha_7} \left[ \tan \left( \frac{1}{2} \left( \frac{\sigma}{\alpha_5} \right) \right) \right] \tag{I-5}$$

(4) The creep strain is defined as follows:

$$\varepsilon_c = - \left( 1/\Omega \right) \ln \left( 1 - \varepsilon_{coT} \right) \tag{I-6}$$

where

$$\log_{10}(\varepsilon_{co}) = - \left[ A_0 + \Delta \frac{\Delta_2}{T_e + \tau_e} + A_1 + A_2 S_1 + A_3 S_2 + A_6 S_3 \right] \tag{I-7}$$

$$\log_{10}(Q) = B_0 + \Delta \frac{\Delta_2}{T_e + \tau_e} + A_1 + A_2 S_1 + A_3 S_2 + A_6 S_3 \tag{I-8}$$