\[ x_t = 0.5 \lambda (t + t_e + L_{41} + L_{43}) \quad \text{for set-in nozzles} \quad (4.5.163) \]

\[ x_t = 0.5 \lambda (t + t_e + L_{41}) \quad \text{For set-on nozzles with full penetration welds} \quad (4.5.164 \text{a}) \]

\[ x_t = 0.5 \lambda (t_e + L_{41}) \quad \text{for set-on nozzles} \quad (4.5.164) \]

\[ G_t = \exp \left[ -x_t \right] \quad (4.5.165) \]

**Step 3.** Determine the maximum local primary membrane stress in the nozzle at the intersection.

\[ Pr = \frac{2M_{p} \sin \theta}{r_{p} C_{2}} + \frac{PR_{n}}{r_{n}} \quad (4.5.166) \]

**Step 4.** The maximum local primary membrane stress at the nozzle intersection shall satisfy eq. \((4.5.167)\). The allowable stress, \(S_{\text{allow}}\), is given by eq. \((4.5.57)\).

\[ P_{r} \leq S_{\text{allow}} \quad (4.5.167) \]

4.5.12.2 If the nozzle is subject to external forces and moments from supplemental loads as defined in 4.1, then the local stresses at the nozzle-to-shell intersection shall be evaluated in accordance with 4.5.15.

4.5.13 **SPACING REQUIREMENTS FOR NOZZLES**

4.5.13.1 The limit of reinforcement, \(L_{R}\) (see Figures 4.5.1 and 4.5.2), for a nozzle shall not overlap with a gross structural discontinuity (see 4.2.5.1). The limit of reinforcement, \(L_{S}\) (see Figure 4.5.11), may be reduced from the maximum permitted by other rules to allow closer placement of nozzles so long as all opening reinforcement requirements are satisfied.

4.5.13.2 If the limits of reinforcement determined in accordance with 4.5.5 for nozzles in cylindrical or conical shells or 4.5.10 for nozzles in spherical or formed heads, do not overlap, no additional analysis is required. If the limits of reinforcement overlap, the following procedure shall be used or the design shall be evaluated in accordance with the design by analysis rules of Part 5.

4.5.13.3 The maximum local primary membrane stress and the nozzle maximum allowable working pressure shall be determined following 4.5.5 or 4.5.10, for each individual nozzle with the value of \(L_{R}\) determined as follows.

**(a)** For two openings with overlapping limits of reinforcement (see Figure 4.5.11):

\[ L_{R} = L_{S} \left( \frac{r_{nA}}{r_{nA} + r_{nB}} \right) \quad \text{for nozzle A} \quad (4.5.168) \]

\[ L_{R} = L_{S} \left( \frac{r_{nB}}{r_{nA} + r_{nB}} \right) \quad \text{for nozzle B} \quad (4.5.169) \]

**(b)** For three openings with overlapping limits of reinforcement (see Figure 4.5.12):

\[ L_{R} = \min \left[ L_{S1} \left( \frac{r_{nA}}{r_{nA} + r_{nB}} \right), L_{S2} \left( \frac{r_{nA}}{r_{nA} + r_{nC}} \right) \right] \quad \text{for nozzle A} \quad (4.5.170) \]

\[ L_{R} = \min \left[ L_{S1} \left( \frac{r_{nB}}{r_{nA} + r_{nB}} \right), L_{S3} \left( \frac{r_{nB}}{r_{nB} + r_{nC}} \right) \right] \quad \text{for nozzle B} \quad (4.5.171) \]

\[ L_{R} = \min \left[ L_{S2} \left( \frac{r_{nC}}{r_{nA} + r_{nC}} \right), L_{S3} \left( \frac{r_{nB}}{r_{nB} + r_{nC}} \right) \right] \quad \text{for nozzle C} \quad (4.5.172) \]

**(c)** For more than three openings with overlapping limits of reinforcement, repeat the above procedure for each pair of adjacent nozzles.
Case XXXX
Alternative Formula for Set-on Circular Nozzles on a Flat Head
Section VIII Division 2

- Inquiry:

When full penetration welds are used with Set-On nozzles per 4.5.12, may equation 4.5.164a shown below be used in lieu of equation 4.5.164 in the calculation of the dimensions scale factor of a flat head, $x_t$?

- Reply

It is the opinion of the Committee that equation 4.5.164a shown below can be used instead of equation 4.5.164 in Section VIII, Division 2 section 4.5.12 in the calculation for set-on nozzles with full penetration welds.

\[
x_t = 0.5\lambda_n (t + t_e + L_{41}) \quad \text{For set-on nozzles with full penetration welds} \quad (4.5.164a)
\]

\[
x_t = 0.5\lambda_n (t_e + L_{41}) \quad \text{For other set-on nozzles} \quad (4.5.164)
\]

All other provisions of section 4.5.12 must be complied with. This Case number shall be shown on the Manufacturer's Data Report.

Compliance with all other requirements of section 4.5.12 shall be required.