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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 617

CALCULATION OF RECTANGULAR SYMMETRICAL FILLET WELDS STATICALLY LOADED IN SUCH A WAY THAT THE TRANSVERSE SECTION IS NOT UNDER ANY NORMAL STRESS ($\sigma_{//} = 0$)

1st EDITION

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For each individual country the only valid standard is the national standard of that country.

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BRIEF HISTORY

The ISO Recommendation R 617, *Calculation of Rectangular Symmetrical Fillet Welds Statically Loaded in such a Way that the Transverse Section is not under any Normal Stress* ($\sigma_{//} = 0$), was drawn up by Technical Committee ISO/TC 44, *Welding*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question by the Technical Committee began in 1957 and led, in 1961, to the adoption of a Draft ISO Recommendation.

In October 1965, this Draft ISO Recommendation (No. 848) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies:

Australia	Israel	Spain
Austria	Italy	Switzerland
Belgium	Japan	U.A.R.
Brazil	Netherlands	United Kingdom
Chile	New Zealand	U.S.S.R.
Denmark	Portugal	Yugoslavia
France	Republic of South Africa	
Germany		
India	Romania	

Four Member Bodies opposed the approval of the Draft:

Canada
Ireland
Sweden
U.S.A.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in September 1967, to accept it as an ISO RECOMMENDATION.

ISO Recommendation R 617 September 1967

CALCULATION OF RECTANGULAR SYMMETRICAL FILLET WELDS STATICALLY LOADED IN SUCH A WAY THAT THE TRANSVERSE SECTION IS NOT UNDER ANY NORMAL STRESS ($\sigma_{//} = 0$)

1. The state of stress should be determined by the *average stress affecting the throat section*, the normal component of which is $\sigma_{\perp}$ and the shear component τ, which may be in any direction. τ is then defined by its components $\tau_{\perp}$ and $\tau_{//}$, which are respectively normal and parallel to the longitudinal axis of the weld.

2. In the case of mild steel and when the stress is perpendicular to the longitudinal axis of the weld, the great ellipse of Figure 1 should be accepted as the locus of the ends of the vectors representing the failing stress for the rupture of the weld (average stress calculated for the weld throat section).

3. In the case of mild steel and when the direction of the shear component varies in the plane of the throat section, it is provisionally admitted that the locus of the ends of the vectors representing the failing stresses (average stress calculated for the weld throat section) should be the ellipsoid of revolution generated by the great ellipse of Figure 1 rotating around its axis perpendicular to the throat section.

4. The ends of the vectors representing the maximum permissible stresses should be situated on an ellipse or an ellipsoid similar and coaxial to the ellipse or ellipsoid of failing stresses, defined in the preceding clauses.

5. The equations of the ellipse and ellipsoid of the maximum permissible stresses are respectively as follows:

$$\sigma_{\perp}^2 + (\lambda \times \tau_{\perp}^2) = (k \times R)^2$$

and

$$\sigma_{\perp}^2 + (\lambda (\tau_{\perp}^2) + \tau_{//}^2) = (k \times R)^2$$

where

λ is a coefficient depending on experience,

R is the maximum permissible stress in pure tension of the parent metal for the loading conditions under consideration,

k is a coefficient depending upon the quality of welding and, possibly, the size of the weld.

6. In order to justify the size of a weld, care should be taken to ensure that the end of the vector representing the working stress remains inside or is at most on the ellipse or ellipsoid of the maximum permissible stresses.

To do this, the following procedure may, for instance, be applied:

Determine first the conventional calculation components n, $t_\perp$ and $t_{//}$ obtained by applying the formulae of strength of materials to the throat section rotated into the plane of one side of the weld (see Fig. 2) *.

Determine also the components $\sigma_\perp$ and $\tau_\perp$ by projecting n and $t_\perp$ into planes perpendicular and parallel to the throat section (see Fig. 2); furthermore, $\tau_{//} = t_{//}$.

Then ensure that one of the following relations is satisfied:

$$\sigma_\perp{}^2 + (\lambda \times \tau_\perp{}^2) \leqslant (k \times R)^2,$$

or

$$\sigma_\perp{}^2 + \lambda\,(\tau_\perp{}^2 + \tau_{//}{}^2) \leqslant (k \times R)^2.$$

If it is desired to use directly n, $t_\perp$ and $t_{//}$, the relations become:

$$(1 + \lambda)\ (n^2 + t_\perp{}^2) - 2\ (\lambda - 1)\ (n \times t_\perp) \leqslant 2\,(k \times R)^2,$$

or

$$(1 + \lambda)\ (n^2 + t_\perp{}^2) - 2\ (\lambda - 1)\ (n \times t_\perp) + 2\,\lambda\,t_{//}{}^2 \leqslant 2\,(k \times R)^2.$$

* In most cases, this plane is the contact plane of the assembled parts.