International Standard 7641/1

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Road vehicles — Caravans and light trailers — Calculation of the mechanical strength of the drawbar — Part 1 : Steel drawbars

Véhicules routiers — Caravanes et remorques légères — Calcul de résistance des timons — Partie 1 : Cas des timons en acier

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 7641/1 was developed by Technical Committee ISO/TC 22, *Road vehicles*, and was circulated to the member bodies in September 1982.

It has been approved by the member bodies of the following countries :

Australia	Germany, F.R.	Romania
Austria	Hungary	South Africa, Rep. of
Belgium	Iran	Spain
Brazil	Italy	Sweden
Bulgaria	Japan	Switzerland
China	Korea, Dem. P. Rep. of	United Kingdom
Czechoslovakia	Netherlands	USA
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France	Poland	

No member body expressed disapproval of the document.

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Road vehicles — Caravans and light trailers — Calculation of the mechanical strength of the drawbar — Part 1 : Steel drawbars

1 Scope

This part of ISO 7641 gives a simplified procedure for the calculation of the mechanical strength of drawbars for caravans and light trailers[1] where the vertical static load on the coupling head does not exceed the limits specified in ISO/TR 4114.

2 Field of application

Calculations shown in this part of ISO 7641 apply only to steel drawbars, of welded and other than welded construction.

For welded drawbars, only those types of steel which contain not more than 0,22 % carbon and the weldability of which is guaranteed by the manufacturer shall be used.

The welding procedure requirements given by the manufacturer shall be met (preheating, for example).

Drawbars made from other materials will be dealt with in ISO 7641/2.

3 References

ISO 1176, *Road vehicles — Weights — Vocabulary.*

ISO/TR 4114, *Road vehicles — Caravans and light trailers — Static load on ball couplings.*

ISO 7237, *Road vehicles — Masses and dimensions of caravans — Terms and definitions.*

1) Categories 01 and 02 as in ECE/UNO classification.

4 Symbols and definitions

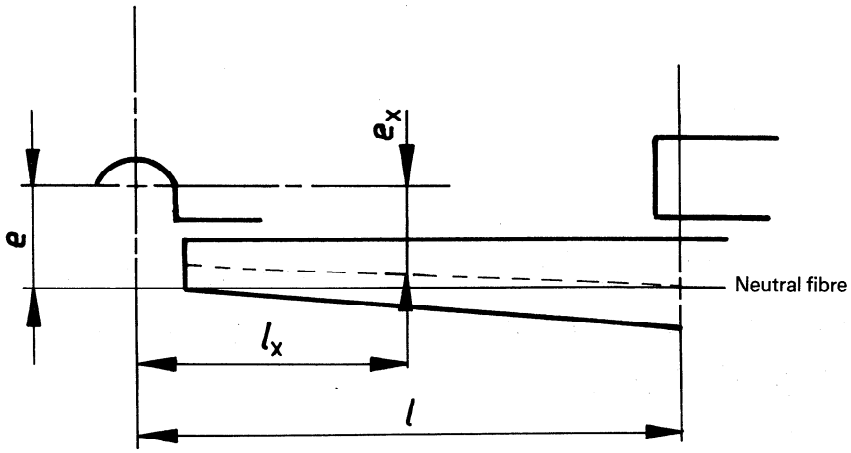

Figure 1 — Drawbar sketch

l is the distance, in metres, from the vertical axis of the coupling device to the first fixing point on the trailer frame;

l_x is the distance, in metres, from the vertical axis of the coupling device to the drawbar section corresponding to the maximum strain rate;

e is the distance, in metres, from the horizontal axis of the coupling device to the drawbar neutral fibre at the first fixing point on the trailer frame;

e_x is the distance, in metres, from the horizontal axis of the coupling device to the drawbar neutral fibre at the cross section corresponding to the maximum strain rate;

P is the maximum manufacturer's total mass, in kilogrammes (see ISO 7237);

D is the value, in newtons, determined by calculation for the longitudinal forces occurring between tractor vehicle and trailer :

$$D = g \times \frac{22\,000 \times P}{22\,000 + P}$$

k is the coefficient for a drawbar longer than 2,5 m to be determined as follows :

$$k = 1{,}25 - 0{,}1\,l \text{ with } k_{min} = 0{,}6$$

5 Resistance calculation

The calculation shall be carried out over the whole length l of the drawbar taking into account distances l_x and e_x in order to determine maximum strain rate. The strain rate shall be checked at the position where the maximum bending moment occurs when $l = l_x$ and $e = e_x$.

5.1 Calculation of the maximum bending moment, expressed in newton metres, for the drawbar with $e/l < 0{,}15$ and $e_x/l_x < 0{,}15$

Only flexure is taken into account for the calculation.

5.1.1 Drawbars of length 2,5 m or less :

— for braked trailers :

$$M_f = 0{,}36\,P\,g\,l_x$$

— for unbraked trailers :

$$M_f = 0{,}24\,P\,g\,l_x$$

5.1.2 Drawbars of length greater than 2,5 m :

— for braked trailers :

$$M_f = 0{,}36\,P\,g\,k\,l_x$$

— for unbraked trailers :

$$M_f = 0{,}24\,P\,g\,k\,l_x$$

5.2 Calculation of the maximum bending moment, expressed in newton metres, for drawbars with $e/l > 0{,}15$ and $e_x/l_x > 0{,}15$

Only flexure is taken into account for the calculation.

Three bending moments, M_f, M_{fD} and M_{fR} shall be calculated; the largest value of the three shall be used for the calculation of the maximum admissible stress (M_{fmax}).

5.2.1 Drawbars of length 2,5 m or less :

— for braked trailers :

$M_f = 0{,}36\ P\ g\ l_x$

$M_{fD} = 0{,}8\ D\ e_x$

$M_{fR} = 0{,}75\ (M_f + M_{fD})$

— for unbraked trailers :

$M_f = 0{,}24\ P\ g\ l_x$

$M_{fD} = 1{,}0\ D\ e_x$

$M_{fR} = 0{,}75\ (M_f + M_{fD})$

5.2.2 Drawbars of length greater than 2,5 m :

— for braked trailers :

$M_f = 0{,}36\ P\ g\ k\ l_x$

$M_{fD} = 0{,}8\ D\ e_x$

$M_{fR} = 0{,}75\ (M_f + M_{fD})$

— for unbraked trailers :

$M_f = 0{,}24\ P\ g\ k\ l_x$

$M_{fD} = 1{,}0\ D\ e_x$

$M_{fR} = 0{,}75\ (M_f + M_{fD})$

5.3 Permissible stress

Stress rates σ calculated for the whole length of the drawbar shall not exceed the allowed stress σ_c :

$$\sigma = \frac{M_f}{\frac{I}{V}}$$

where

$\frac{I}{V}$ is the section modulus of drawbar cross-section corresponding to the maximum bending moment.

5.3.1 Drawbars fabricated by means other than welding :

$0{,}6\ \sigma_{B\ min} \geqslant \sigma_c \leqslant 0{,}8\ \sigma_s$

where

σ_c is the permissible stress, in newtons per square millimetre;

σ_B is the ultimate tensile stress, in newtons per square millimetre;

σ_s is the yield stress, in newtons per square millimetre.

5.3.2 Welded drawbars :

$0{,}45\ \sigma_{B\ min} \geqslant \sigma_c \leqslant 0{,}65\ \sigma_s$

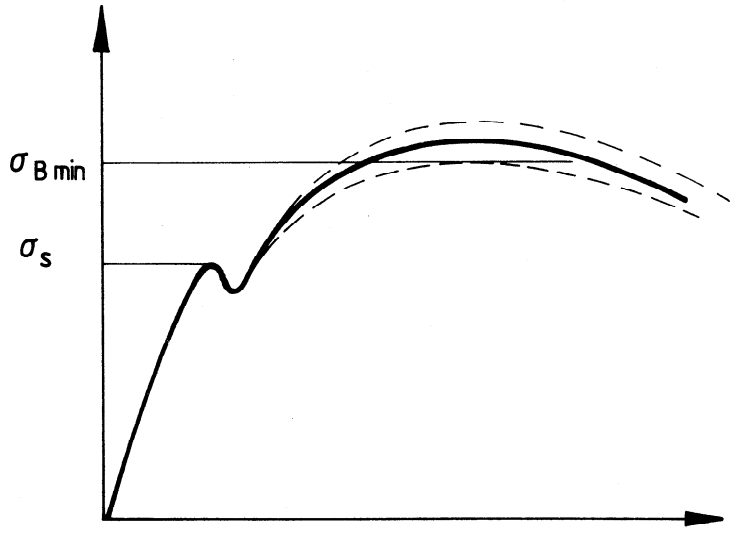

Figure 2 — Permissible stress

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