



ESDU 83044

Issued December 1983

Re-issued March 2014

Plasticity correction factors for plate buckling

Endorsed by
The Royal Aeronautical Society

AVA Documents
Document Sharing Hub

ESDU DATA ITEMS

Data Items provide validated information in engineering design and analysis for use by, or under the supervision of, professionally qualified engineers. The data are founded on an evaluation of all the relevant information, both published and unpublished, and are invariably supported by original work of ESDU staff engineers or consultants. The whole process is subject to independent review for which crucial support is provided by industrial companies, government research laboratories, universities and others from around the world through the participation of some of their leading experts on ESDU Technical Committees. This process ensures that the results of much valuable work (theoretical, experimental and operational), which may not be widely available or in a readily usable form, can be communicated concisely and accurately to the engineering community.

We are constantly striving to develop new work and review data already issued. Any comments arising out of your use of our data, or any suggestions for new topics or information that might lead to improvements, will help us to provide a better service.

THE PREPARATION OF THIS DATA ITEM

The work on this particular Data Item was monitored and guided by the Aerospace Structures Committee. This Committee first met in 1940 and now has the following membership:

Chairman

Dr T.W. Coombe — British Aerospace plc, Weybridge-Bristol Division

Vice-Chairman

Prof. J.G.ten Asbroek — Fokker-VFW N.V., Schiphol-Oost, The Netherlands

Members

Dr P. Bartholomew	— Royal Aircraft Establishment
Mr J.K. Bennett	— British Aerospace plc, Space and Communications Division
Mr H.L. Cox	— Independent
Mr G. Geraghty	— Westland Helicopters Ltd
Mr K.H. Griffin	— Cranfield Institute of Technology
Mr K.R. Obee	— British Aerospace plc, Hatfield-Lostock Division
Mr I.C. Taig	— British Aerospace plc, Warton Division
Mr K.van. Katwijk*	— European Space Agency, Noordwijk, The Netherlands.

* Corresponding Member

The construction and subsequent development of the Data Item was undertaken by

Mr R.L. Penning — Senior Engineer.

The person with overall responsibility for the work in this subject area is Mr M.E. Grayley, Head of Strength Analysis Group.

PLASTICITY CORRECTION FACTORS FOR PLATE BUCKLING

CONTENTS

	Page
1. NOTATION	1
2. NOTES	2
3. USE OF THE CURVES	2
4. DERIVATION	3
5. TABLES	4

ESDU Copyright material. For current status contact ESDU.

Copyright Engineering Sciences Data Unit

PLASTICITY CORRECTION FACTORS FOR PLATE BUCKLING

1. NOTATION

C	ratio of tensile yield stress to shear yield stress (note: for Tresca criterion $C = 2$, for von Mises criterion $C = 1.73$)		
E	modulus of elasticity	N/m ²	lbf/in ²
E_s	secant modulus	N/m ²	lbf/in ²
E_t	tangent modulus	N/m ²	lbf/in ²
f	stress	N/m ²	lbf/in ²
f_b	compressive stress at which buckling occurs	N/m ²	lbf/in ²
$(f_b)_e$	compressive stress at which elastic buckling would occur	N/m ²	lbf/in ²
f_n	stress at which $E_t = \frac{1}{2}E$	N/m ²	lbf/in ²
m	material characteristic (see Data ESDU 76016, Derivation 3)		
q_b	shear stress at which buckling occurs	N/m ²	lbf/in ²
$(q_b)_e$	shear stress at which elastic buckling would occur	N/m ²	lbf/in ²
η	plasticity reduction factor defined by $f_b = \eta(f_b)_e$ or $q_b = \eta(q_b)_e$		
ν	Poisson's ratio at stress level considered		
ν_e	fully elastic value of Poisson's ratio		
ν_p	fully plastic value of Poisson's ratio		
<i>Suffixes</i>			

1 6 Suffixes indicate particular plate forms in Table 5.1.

Both SI and British units are quoted but any coherent system of units may be used.

Issued December 1983
Re-issued March 2014