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Fatigue strength of transverse fillet welded joints and attachments in steels under bending loading

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THE PREPARATION OF THIS DATA ITEM

The work on this particular Data Item was monitored and guided by the Stress Analysis and Strength of Components Committee. This Committee first met in 1964 and now has the following membership:

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

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

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FATIGUE STRENGTH OF TRANSVERSE FILLET WELDED JOINTS AND ATTACHMENTS IN STEELS UNDER BENDING LOADING

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FATIGUE STRENGTH OF TRANSVERSE FILLET WELDED JOINTS AND ATTACHMENTS IN STEELS UNDER BENDING LOADING

1. NOTATION

b	depth of penetration at weld root (see Sketches 3.1a to 3.1e)	m	in
N	endurance (number of load cycles)		
P	load applied to joint (see Sketch 2.1)	N	lbf
R	stress ratio = S_{min}/S_{max}		
S_a	nominal alternating extreme fibre stress (half range) in loaded plate	N/m ²	lbf/in ²
S_m	mean extreme fibre stress in loaded plate	N/m ²	lbf/in ²
S_{max}	nominal maximum extreme fibre stress in loaded plate	N/m ²	lbf/in ²
S_{min}	nominal minimum extreme fibre stress in loaded plate	N/m ²	lbf/in ²
s	weld leg length on loaded plate (see Sketches 3.1a to 3.1e)	m	in
t	nominal thickness of plate (see Sketches 3.1a to 3.1e)	m	in

Both SI and British units are quoted.

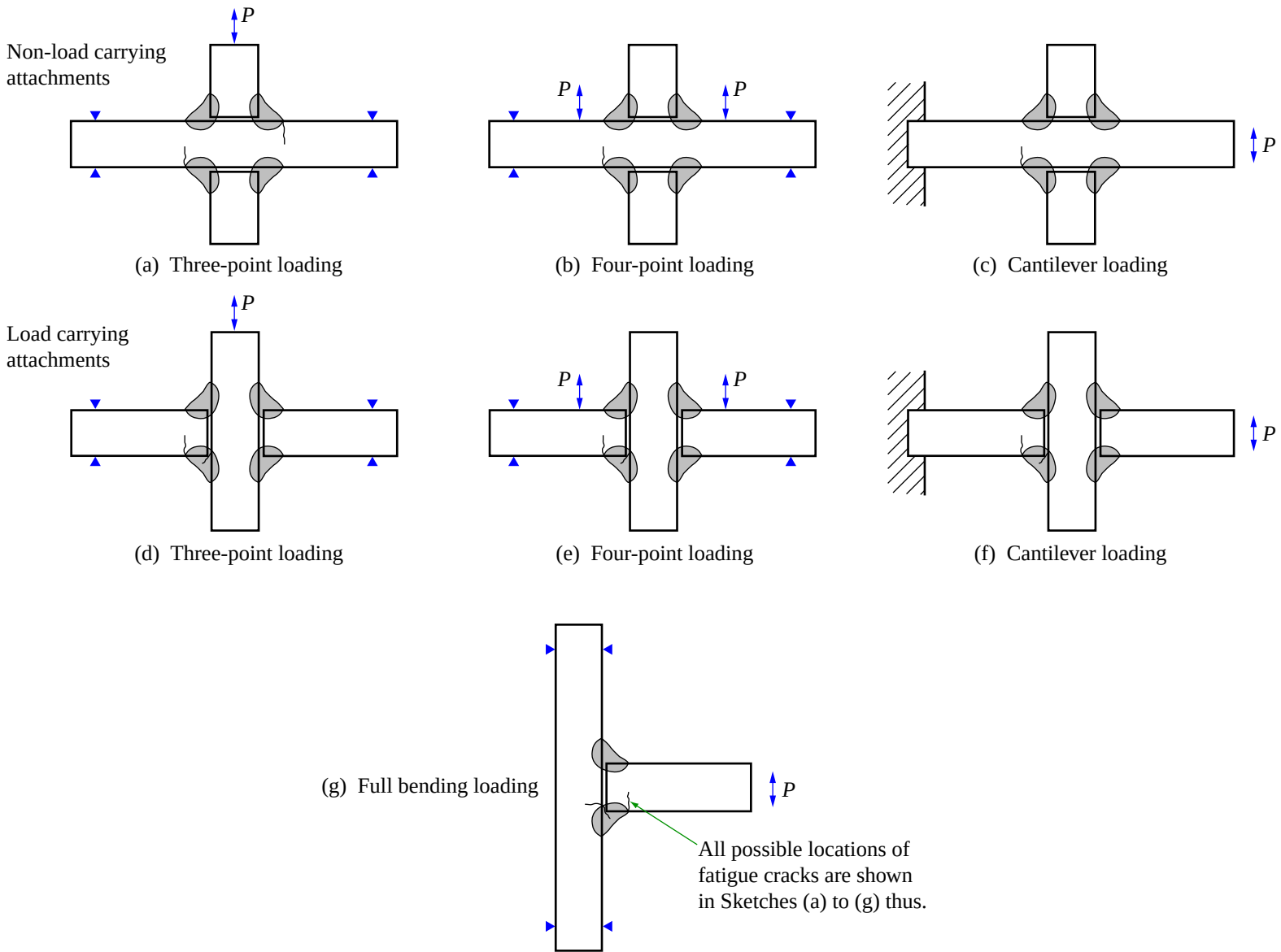
2. PRESENTATION OF DATA

This Item provides data on the as-welded and ground fatigue strength of transverse fillet welded joints and attachments in flat steel plate subjected to bending. The data are based upon the nominal extreme fibre stress range in the plane of the weld toe in the loaded plate, that is the plate(s) that experiences the bending moment.

The Item gives data for joints failing from the weld toe by initiation of fatigue cracks at small defects in the transition region between plate and weld materials and the subsequent propagation of these cracks through the loaded plate transverse to the direction of stress. The data are for both non-load-carrying and load-carrying joints, that is joints failing through the continuous plate or the attachment respectively. For joints in which failure commenced from locations other than the weld toe, for example non-load-carrying welds failing from the crack-like defect caused by unfused land through the weld throat, the nominal extreme fibre stress range at the weld toe was also used in presenting the data, irrespective of where the failure commenced.

This Item provides data on joints and attachments of the types shown schematically in Sketch 2.1. The sketch shows both the attachments and continuous plates as being of the same thickness and this was the case for the majority of joints tested. The remainder of the data was for cases in which the attachment was thinner than the continuous plate. Attachments in some non-load-carrying joints were on one side of the continuous plate only and in a few cases more than one attachment was welded to one side of the continuous plate.

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Sketch 2.1 Illustrating the types of joint covered by this Item