

# 1. INTRODUCTION

## 1.1 Scope

Although concentrically loaded connections are simpler to design and generally more efficient, there are many cases where eccentrically loaded connections are not easily avoided. This Module presents design aids for determining the resistance of eccentrically loaded fillet weld groups in welded joints. The capacity of connected parts and other modes of behaviour are beyond the scope of this publication.

While Design Module No. 2 (DM2) includes connection configurations encountered in common applications, the CISC does not discourage the use of other connection types and configurations that are proven adequate for their intended purposes.

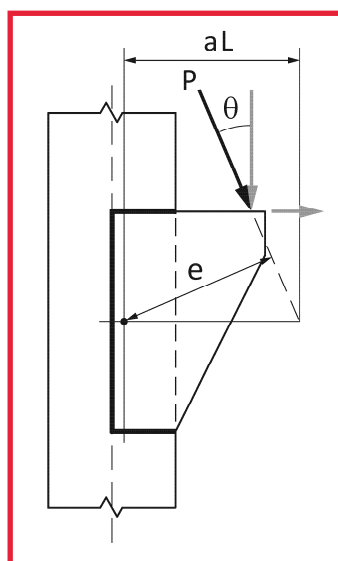
## 1.2 Types of Eccentrically Loaded Weld Groups

Point loads may be applied eccentrically in the plane of the weld group or out-of-plane. For weld groups loaded in-plane, the load eccentricity is represented by the distance,  $e$ , with respect to the group centroid, as shown on the left-hand side of the figure below. The relation between the eccentricity,  $e$ , the horizontal distance,  $aL$ , where  $L$  is the length of the vertical fillet weld(s), and the load angle,  $\theta$ , is described in Section 2.

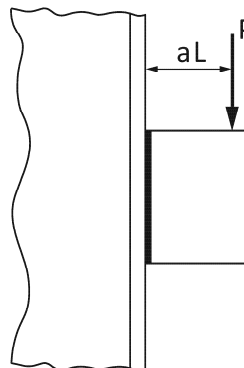
If the load is applied out-of-plane, as shown on the right-hand side, the load eccentricity is the perpendicular distance between the plane of the weld group and the line of action of applied force. For this type of connection, only vertical loads are considered, as described in Section 4.

## 1.3 Weld Electrodes and Plate Material

The design aids are based on a matching electrode,  $X_u = 490$  MPa. For connections loaded out-of-plane, the mechanical properties of the plate are  $F_y = 300$  MPa and  $F_u = 440$  MPa. Hence, the design aids may be conservatively applied to several other steel grades, such as CSA G40.21-350W and ASTM A992/A992M, A572/A572M [345].



In-Plane Loading



Out-of-Plane Loading

### Eccentrically Loaded Weld Groups