Case Studies in Structural Engineering 6 (2016) 63–75

Contents lists available at ScienceDirect

Case Studies in Structural Engineering

journal homepage: www.elsevier.com/locate/csse

Current UK trends in the use of simple and/or semi-rigid steel connections

M. Kidd*, R. Judge, S.W. Jones

Blast and Impact Research Centre, School of Engineering, University of Liverpool, Liverpool, UK

ARTICLE INFO

Article history:
Received 22 March 2016
Accepted 10 May 2016
Available online 16 June 2016

Keywords:
Steel
Connections
Simple
Survey
Fabrication
Industry

ABSTRACT

This paper presents the findings of an internet based survey conducted on members of the UK steel construction industry. The survey was in the form of an online questionnaire that was open from April to October of 2015. The purpose of the survey was to aid the development of a programme of full scale dynamic testing on UK standard simple and/or semi rigid steel connections. The information that was obtained is of use to both the wider academic community and the steel industry itself. Findings of the survey indicate how often tubular box sections are used on projects, the most popular methods of connecting open sections to box sections, preferred choice of fasteners in blind connections, preferred methods of connecting open section beams to open section columns, how often stainless steel bolts are currently being used on construction projects and finally some additional comments on the design of simple and/or semi-rigid connections are presented that were provided by survey respondents.

1. Introduction

Simple and/or semi-rigid steel connections are commonly used to connect structural members together in the construction of steel framed buildings within the UK. The terms 'simple' and 'semi-rigid' refer to the connection being designed to resist shear and axial forces only (i.e. assumption of pin-joint behaviour and no bending moments). The term semi-rigid is used to cover scenarios where the size of connecting and/or connection elements may be such that the connection is classified as semi-rigid in accordance with BS EN 1993-1-8 [1], but is still designed without consideration of any bending moments that might be present due to the lever-arms in the bolt rows or as a result of the partial fixity attracted by an increased joint stiffness.

From April to October of 2015, an online based questionnaire survey was carried out on the steel construction industry to try to establish common practices and trends in the design, specification and fabrication of such connections. The motivation behind the survey was to inform the development of a dynamic testing programme for industry standard simple connections typically found in the UK based design guidance, commonly termed 'The Green Book' [2]. This testing programme is being developed to study the behaviour of such connections in blast and/or impact scenarios and forms part of a PhD study into the resilience of simple and/or semi-rigid connections under highly transient loading conditions. The information obtained from the survey may also be of use to both the academic and industry based communities.

* Corresponding author.
E-mail address: mkidd@liverpool.ac.uk (M. Kidd).

http://dx.doi.org/10.1016/j.csse.2016.05.004

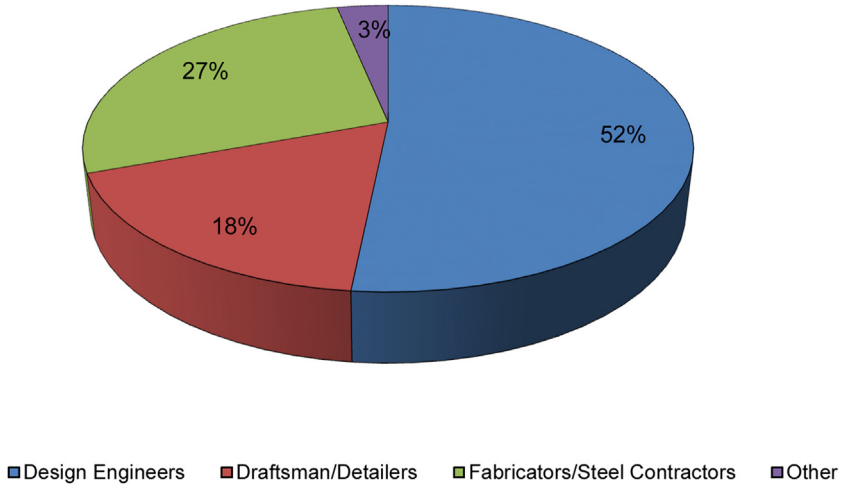

Fig. 1. Demographic of industry survey respondents.

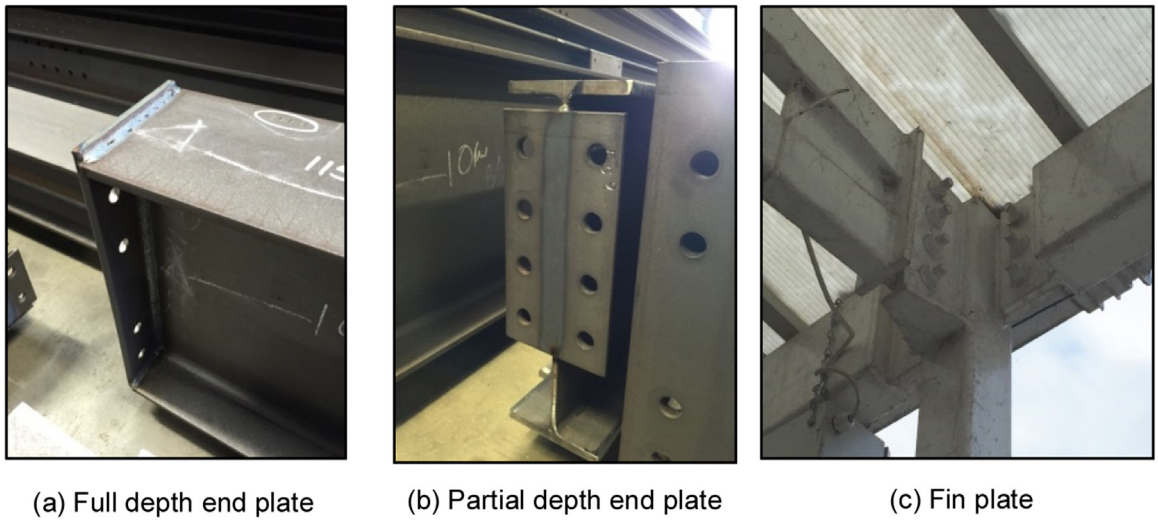

Fig. 2. Most common three connections forms typically found in the UK.

All *relevant* members of the UK Steel Construction Institute (SCI) and the British Constructional Steel Association (BCSA) were contacted (via email) about the survey. This amounted to 227 companies and from this 62 individual responses were obtained. Each company had the purpose of the survey explained to them and were provided with a hyperlink to the URL of the online survey page, assurance of anonymity was also given. No respondent was able to view any findings of the survey at any stage in the process to avoid any potential influence on question response. Feedback on the findings could be requested by the respondent providing an email address at the end of the survey, respondents that did this are to be sent a more detailed findings report post publication of this paper.

It was important to categorise the results of the survey by occupation of the respondents to capture different occupational points of view. This was achieved by making the first question of the survey about what role or position that the respondent held within the steel construction industry. The occupational demographic of the respondents was as shown in Fig. 1.

The 3% 'other' category comprised one quantity surveyor and one technical manager of a cold rolled manufacturer; this was deemed too low to be representative and therefore was neglected. It should be noted that the findings of this survey should not be taken as given fact but rather as a quantification of mass opinion. They (the findings) may be used as a guide to academics and industry practitioners on what some of the common trends are and the reasons such trends exist from a practical and economical view point.

The three most common standardised simple beam to column connection details that are used in the UK are shown in Fig. 2. These are the connection details that are discussed throughout the paper.