INTRODUCTION

The current EC3 specifications for high strength steel (HSS) design employs elastic, perfectly plastic material model and cross-section classification to determine cross-section resistances, which are known to over-predicts for stocky section. The Continuous Strength Method (CSM) has been developed to reflect the actual behaviour of structural sections for different metallic material by allowing rational exploitation of strain hardening. This study extended the application of CSM to HSS design and showed that the CSM offers improved accuracy and reduced scatter relative to the existing design methods.

CONTINUOUS STRENGTH METHOD

The CSM is a strain based design approach consists of a base curve, that defines the relationship between the cross-section slenderness \(\lambda_p\) and the cross-section deformation capacity \(f_csm/f_y\), and a material model, which allow stresses greater than the yield stress.

METHODOLOGY

Test data of HSS stub column and 4-point bending test were gathered and combined with stainless steels and other carbon steels for the development of design base curve.

The material response of HSS depends on the manufacturing process HSS (i.e. hot-finished, tempered and quenched (Q&T), normalised, cold-formed, thermo-mechanical rolled (TMCP)), two material models were proposed for corresponding material response.

MATERIAL RESPONSE

The table below summarises the typical material response of different types of HSS sections, based on 193 coupon tests.

<table>
<thead>
<tr>
<th>Material response</th>
<th>Material types</th>
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</thead>
<tbody>
<tr>
<td>Rounded stress-strain behaviour</td>
<td>Hot-finished or welded sections with Q&amp;T or TMCP HSS as base material</td>
</tr>
<tr>
<td>Stress-strain behaviour with yield plateau</td>
<td>Cold-formed section</td>
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<tr>
<td></td>
<td>Hot-finished or welded sections with normalised HSS as base material</td>
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</tbody>
</table>

RESULTS AND CONCLUSIONS

The predictions from the CSM \((N_{csm}, M_{csm})\) have been compared with the experimental results \((N_{test}, M_{test})\) on HSS I-section and Box-section stub columns and beams, and show that the CSM improved the mean resistance predictions and reduced scatter, as compared to the EN 1993-1-2 design rules.

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REFERENCES
