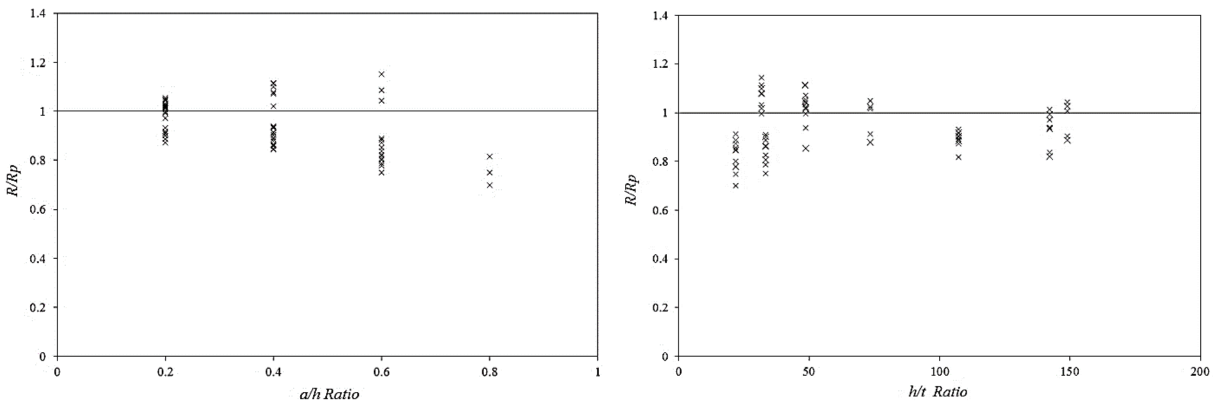

Fig. 7 Comparison of strength reduction factor for centred web opening where flange fastened to bearing plates

For example, for the centred circular web opening, the mean value of the web crippling reduction factor ratios are 1.00 and 1.00 for the cases of flanges unfastened and flanges fastened to the bearing plates, respectively. The corresponding values of COV are 0.10 and 0.13, respectively. Similarly, the reliability index values (β) are 2.62 and 2.51, respectively. For the offset circular web opening, the mean value of the web crippling reduction factor ratios are 1.00 and 1.00 for the cases of flanges unfastened and flanges fastened to the bearing plates, respectively. The corresponding values of COV are 0.02 and 0.01, respectively. Similarly, the reliability index values (β) are 2.84 and 2.85, respectively. Therefore, the proposed strength reduction factor equations are able to reliably predict the influence of the circular web openings on the web crippling strengths of cold-formed stainless steel lipped channels under end-two-flange (ETF) loading.

6. CONCLUSIONS

In this paper, the effect of web openings on the end-two-flange (ETF) loading condition of cold-formed stainless steel lipped channel-sections was investigated for duplex grade EN 1.4462. 730 non-linear elasto-plastic finite element analyses were conducted with different sizes of channel-section and openings. From the results of the finite element parametric study, four new web crippling strength reduction factor equations were proposed for the cases of both flange unfastened and flange fastened to the bearing plates. In order to evaluate the reliability of the proposed reduction factor equations, a reliability analysis was undertaken. It was demonstrated that the proposed strength reduction factors are generally conservative and agree well with the finite element results. It was shown that the proposed strength reduction factors provide a reliable design criteria when calibrated with a resistance factor of 0.85 (ϕ=0.85).

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