PROGRAMMING BASED STRUCTURAL STEEL DESIGN

S16

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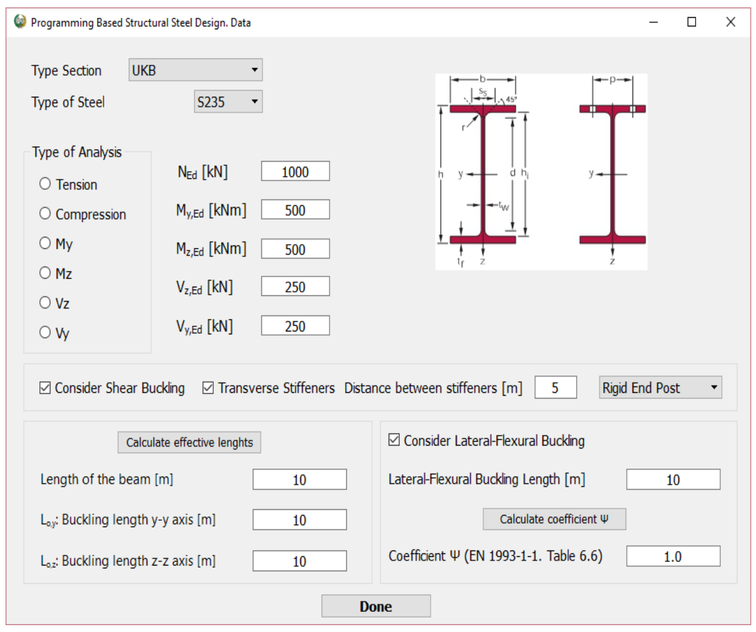
INTRODUCTION

In building design, verification of structural members in accordance with the Eurocode is a comprehensive task. For that reason, in this research project a program has been developed enabling structural engineers to automatically undertake the design and check of structural members such as steel beams, steel columns, composite beams and connections with reasonable effort. This will mitigate the necessity to carry out the extensive and laborious task of performing numerous hand calculations.

SECTION DESIGNER

Section Designer calculates the optimum cross-section –cross-section with less mass per metre– able to withstand the design load previously introduced. Diverse types of analysis can be performed depending on the load the cross-section is subject to: tension, compression, bending moment or shear force.



ULTIMATE CAPACITY

Ultimate capacity of steel members is calculated following the procedure provided by the code. Tension, compression, bending moment and shear force resistance is displayed using the following window:

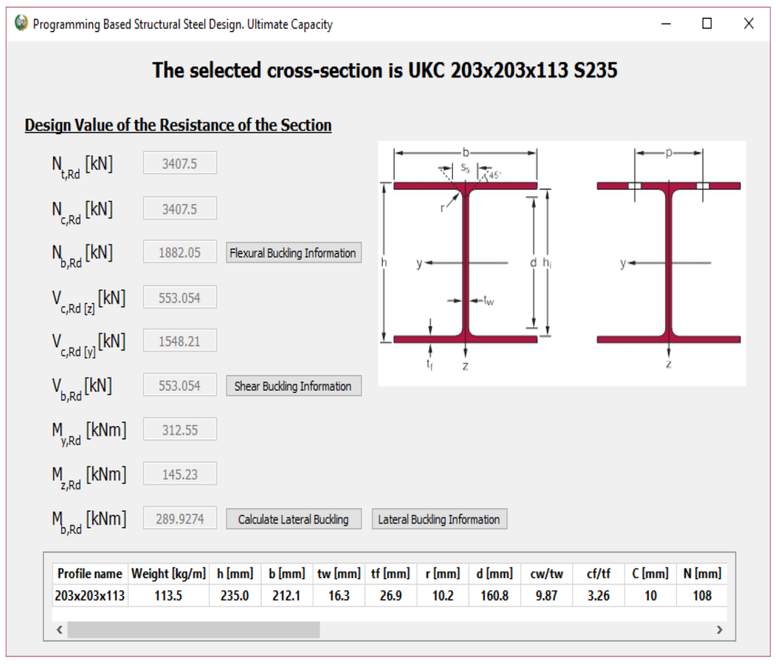
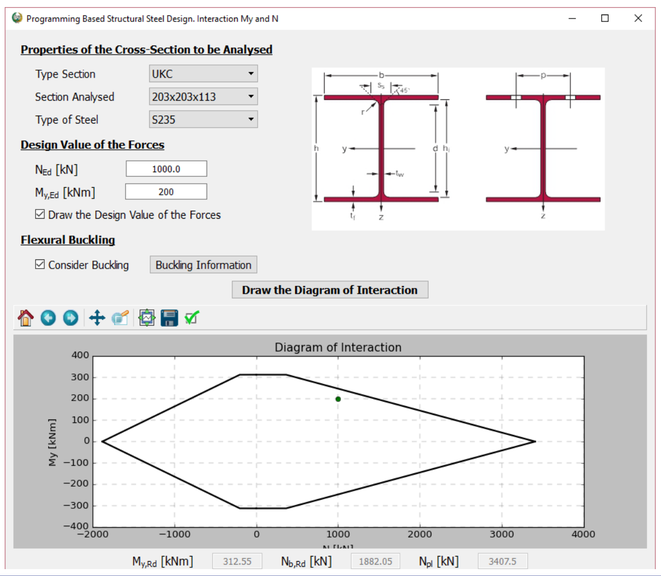


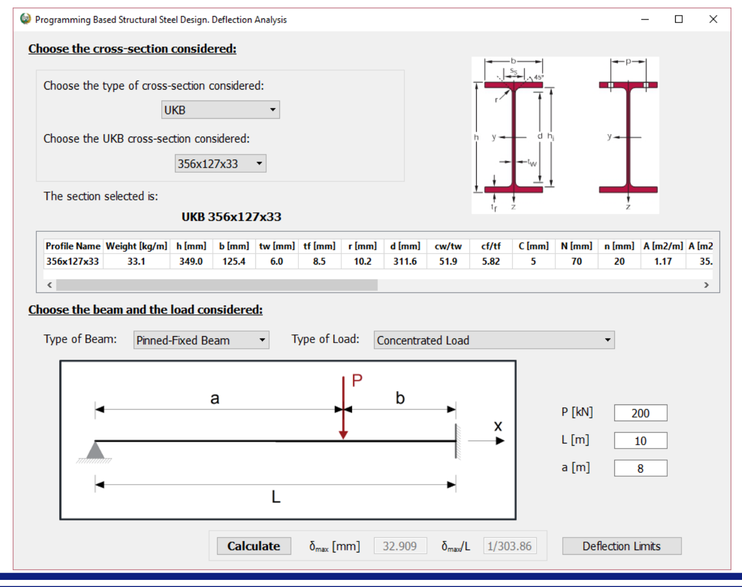
DIAGRAM OF INTERACTION

When a force is acting along with other types of forces, the individual resistance to that force is reduced. Thus, it is important to evaluate how interaction between different forces affects the cross-section resistance. Diagram of interaction between moment and axial load is shown below:



DEFLECTION ANALYSIS

The maximum deflection value under different load cases and with different boundary conditions is derived and checked against the limits provided by the Eurocode.



COMPOSITE BEAMS

Bending moment resistance with both full and partial shear connection is determined according to Eurocode 4 (EN 1994-1-1., 2004).

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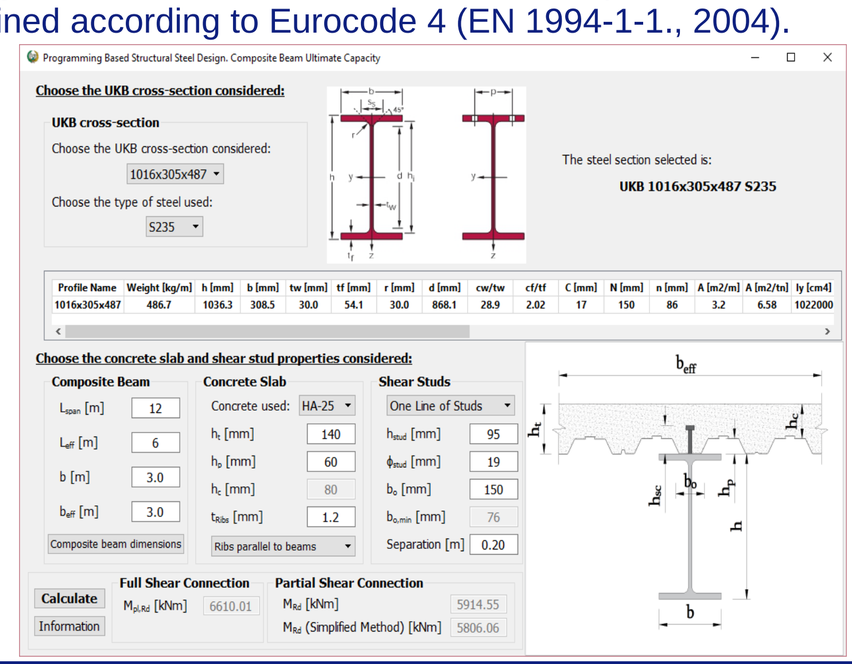

SEISMIC ACTION

Eurocode 8 (EN 1998-1., 2004) defines different elastic ground acceleration response spectra to represent the earthquake motion at a given point on the surface. This program allows to assess and represent the seismic action acting on a structure according to it.

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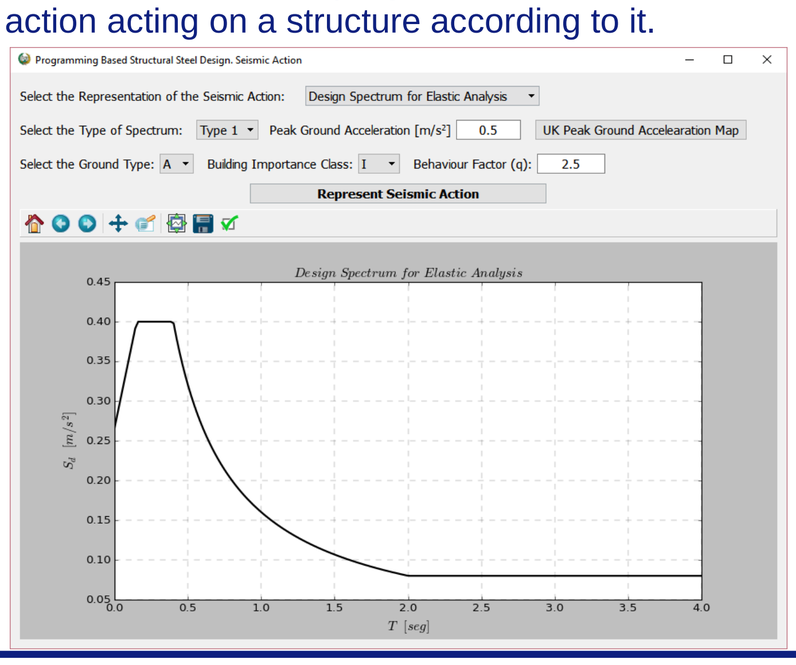
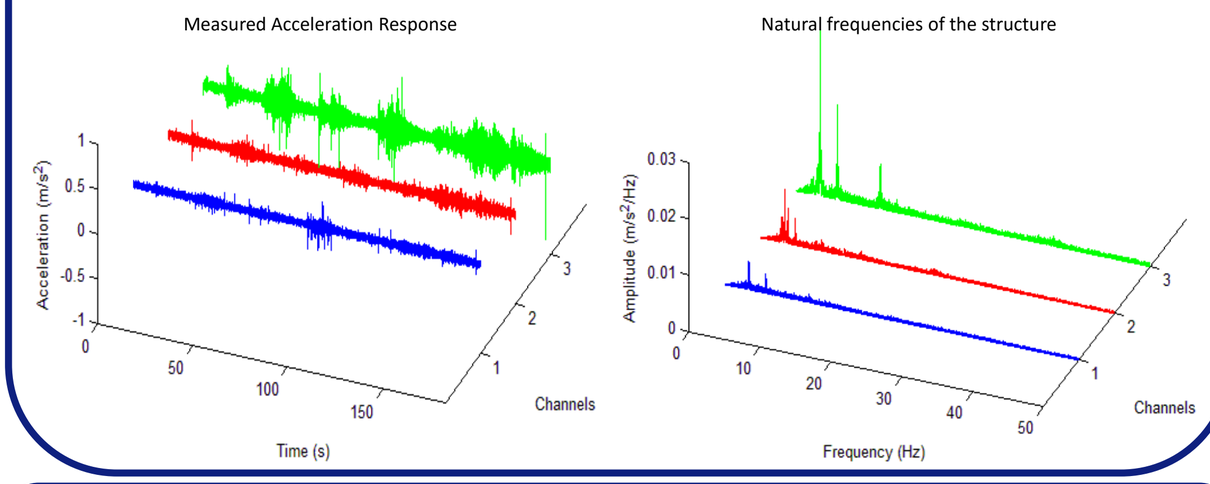


NATURAL FREQUENCIES

The natural frequencies of a structure are calculated applying the Fourier transformation to an accelerogram previously measured.



ACKNOWLEDGEMENTS

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REFERENCES

EN 1993-1-1. (2005) Eurocode 3. EN 1994-1-1. (2004) Eurocode 4. EN 1998-1. (2004) Eurocode 8.