product option

LUSAS Finite Element Analysis

Rail Track Analysis

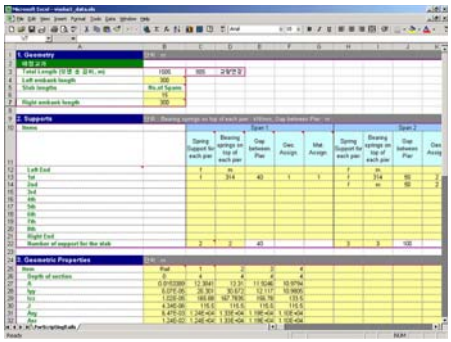
With a large percentage of track on modern high speed railways comprising continuously welded rails there is a requirement for accurate modelling of the interaction of the track with respect to any supporting bridge structures, and in particular, to calculate stresses and forces induced in the track by both thermal and train loading. The LUSAS Rail Track Analysis option permits track/bridge interaction analysis to the International Union of Railways Code UIC 774-3. It allows you to automatically build models from data defined in MS Excel spreadsheets, run an analysis, and quickly produce results in spreadsheet or LUSAS results file formats.

Model building

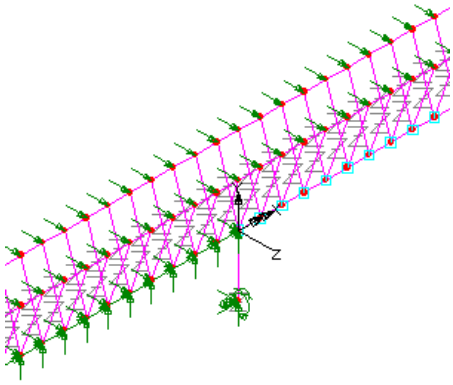
Track and bridge interaction models are built automatically in LUSAS in 3D from geometric, material property, and loading data defined in a MS Excel spreadsheet. Both thermal loading to the track and train loading due to acceleration and braking forces can defined. In accordance with the UIC774-3 code of practice, a user-specified element length is used to define the longitudinal embankment and bridge features. Rail clips, ballast movement, bearings and pier stiffnesses are all included in the analysis model. The model building dialogs allow for either one train crossing one or more structures, or for multiple trains crossing the same structure.

Analysis and results

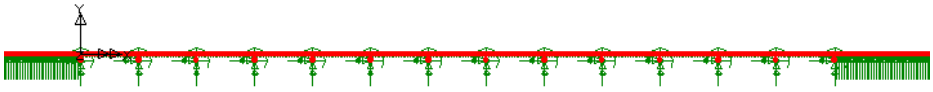
When running an analysis, deck temperature loading can be considered in isolation for subsequent analysis of multiple rail configurations, or a full analysis can be carried out considering the combined temperature in the deck and rail loading. Because the response of the ballast and/or clips is nonlinear a nonlinear analysis always needs to be carried out. Results can be produced in either Excel spreadsheet or standard LUSAS results file format. User-defined load combinations can be specified. Spreadsheet results include axial forces in the rails for deriving in-service stresses and forces and moments in the deck structure.



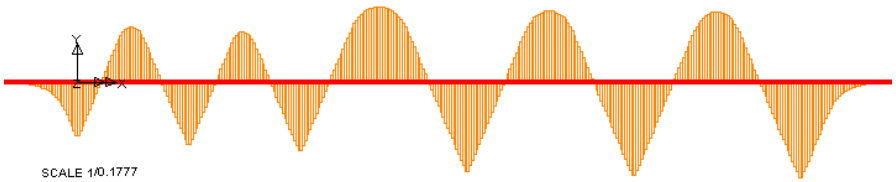
Spreadsheet data is used to generate model geometry automatically



Exploded view of part of the LUSAS model showing embankment support and beginning of first span



Part view of embankment and viaduct model as built by LUSAS



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MIN -0.7065E+06 AT ELT/GP 626/1
DIAGRAM SCALE = 1/0.4167E-01

Typical axial force results plot showing force in rails from thermal deck loading

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