

**LARSA 4D**

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LARSA 4D

LARSA 4D software is an advanced nonlinear structural analysis and design package for three-dimensional structures involving “fourth-dimensional” time effects. With an established ten-year record on projects worldwide, LARSA 4D is the latest in a long line of structural analysis and design software developed by LARSA, Inc. over the last two decades. In coupling structural analysis and design with the latest computing technology, LARSA 4D has become one of the most reliable software of its kind, providing the most trusted answers for segmental, cable-stay, suspension, stressed-ribbon, curved, skewed and other bridge forms, as well as other structures requiring geometric or material nonlinearity or a staged analysis.

Innovation in analysis

LARSA 4D provides the latest in structural engineering technology and has lead the field in staged construction and nonlinear analysis, influence-based live loading, and other complex design needs.

Staged construction analysis forms the core of LARSA 4D, modeling the changes to a structure over time, including time-dependent material effects such as creep, shrinkage, relaxation and nonlinear behavior. Developed for the rigorous needs of segmental construction and cable-supported structures, LARSA 4D goes beyond basic construction activities. Load class tracking of forces is possible for all activities, including support and element removal along with constraint changes. “Analysis Scenarios” option within staged construction allows live load, eigenvalue, time-history, or pushover analysis to be performed at an intermediate state of construction.

Updated for 2012, LARSA’s Steel Plate Girder Module is an AASHTO LRFD design code tool built to take the difficulty out of modeling for the analysis and design of bridges with very complex geometry. The Steel Plate Girder Module will create models with a variety of special conditions, such as bridges with girder lines that are not parallel, with girders terminating at different stations, and bridges with decks that widen or narrow. With a wizard-like interface within the LARSA 4D environment, the module generates a complete staged analysis bridge model ready to be analyzed by LARSA 4D’s nonlinear staged analysis engine and code checked for the current AASHTO LRFD code.

Other innovative tools for bridge analysis and design have been invented for LARSA 4D. Live Load results are based on LARSA 4D’s influence surface analysis, providing the ability to load the roadway with standard AASHTO trucks, permit trucks, or any other user defined custom load pattern. Covering the complete deck with one or more rows of traffic, the influence surface in LARSA 4D will



I-280 Veterans' Glass City Skyway, Toledo, Ohio. FIGG Engineering Group. Main span 200m.

place as many lanes as will fit on the surface simultaneously maximizing the effect according to any multiple presence factors specified. LARSA’s bridge path coordinate systems define the bridge alignment so that geometry can be specified in terms of station, transverse location and elevation, rather than x, y and z.

Finally, form finding tools are available to automatically compute cable initial or jacking forces and camber in order to arrive at the designed bridge geometry - even in a complete staged construction analysis of a cable-stay or suspension bridge.

Innovation in Support

Innovation comes in a variety of forms when structural analysis is coupled with the latest computing technology. But let us not forget that there is more to innovation in engineering software than the speed of its solver and the numerical accuracy of its elements. Innovation applies to a company’s support services, and LARSA has several unique ways that it services its clients: Macro integration with Excel has caught on with engineers that have some programming background. LARSA’s support team helps clients program macros that automate repetitive tasks like model generation and results extraction. The newest support feature is called “Features on Demand” where LARSA 4D can extend itself with new tools created on the spot by LARSA’s support team, bypassing the normal software release cycle. LARSA LIVE is a new deployment technology that allows clients to use new versions of the software without needing to uninstall their current version. This is particularly useful when an ongoing project requires staying at a particular version but the capabilities in the newer version would be beneficial.

These support tools compliment the other ways LARSA’s support team regularly provides assistance to its clients, such as with desktop-sharing, webinars for training over the web, and on-site training.

Engineers feel comfortable with LARSA 4D because LARSA developers and support personnel work closely with its clients to develop the tools they need to make their work more efficient and effective. LARSA worked with FIGG Engineering to develop time-dependent material effects including creep, shrinkage, and relaxation for the Staged Construction Analysis and cooperation with HDR has been part of the development of AASHTO LRFD tools for bridge code check. That may be why LARSA’s software has become a company standard at FIGG, HDR, International Bridge Technologies, Parsons Brinckerhoff, Parsons Transportation Group, T.Y. Lin International, and many other leading firms around the world. 