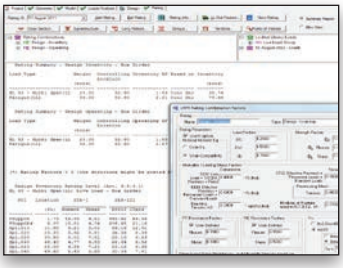
PRODUCT DATA SHEET

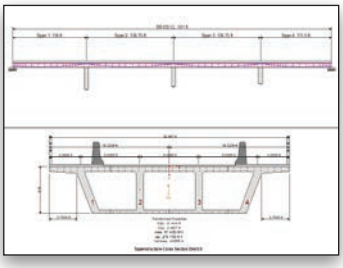
LEAP® CONBOX®

Analysis and Design of Post-Tensioned and Cast-in-Place Reinforced Concrete Bridges

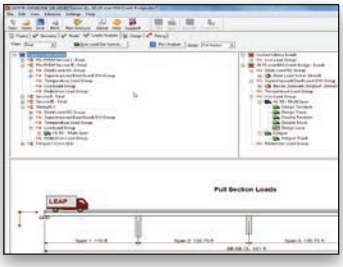
LEAP® CONBOX® is an analysis and design application for post-tensioned and cast-in-place reinforced concrete box girder, T-beam, and slab bridges constructed on falsework. The program accommodates an expanded array of column shapes and span hinges, in conformance with industry standards, codes, and specifications. Part of the LEAP Bridge Enterprise system, LEAP CONBOX runs fully integrated with LEAP® GEOMATH®, LEAP® CONSPAN®, and LEAP® RC-PIER®.



Rapidly compute load rating following AASHTO, CHBDC, and IRC codes.



Model superstructure using one easy layout and properties tab.



Drag and drop loads to define structure loads and load combinations for analysis.

Integrated BrIM Solution Accelerates Concrete Bridge Design

LEAP CONBOX is a module of the industry-leading concrete bridge design solution LEAP Bridge Enterprise. With this comprehensive system, bridge professionals are able to design the bridge in a whole-structure context, using a single, integrated application. Users enjoy synchronous access to bridge data and functionality – geometry, substructure, and superstructure analysis, design, and load rating.

Design-to-Spec Ensures Code Compliance

LEAP CONBOX supports an array of international bridge design codes to ensure compliance with mandated practices:

- American Association of State and Highway Transportation Officials (AASHTO) specifications:
  - » AASHTO Standard (LFD: Load Factor Design)
  - » AASHTO LRFD (Load Resistance Factor Design)
  - » AASHTO LFR (Load Factor Rating)
  - » AASHTO LRFR (Load & Resistance Factor Rating)
- Canadian Highway Bridge Design Code (CHBDC) specifications
- Indian Road Congress (IRC) bridge design specifications

Intelligent Interface Streamlines Design Process

Users can rapidly develop a box girder, T-beam, or slab bridge using LEAP CONBOX's streamlined interface. The application supports the full array of bridge layout information: alignments, span lengths, and cross-sections; pier, hinge, and abutment locations; and superstructure-to-substructure connectivity.

Advanced Design Capabilities Deliver Power

LEAP CONBOX offers powerful superstructure cross-section modeling. Cross-section features include transformed section properties, linear or parabolic variations along the length of the bridge (for web transitions and flange thickening), and vertical or sloped exterior webs. The program automatically creates the fillets between the flange and web junction. For substructures, users can select from a range of column shapes, specify linear or parabolic column variations, and even develop custom pier properties. The number of columns is unlimited. Piers can be drop-cap or integral-monolithic.

Automatic Calculations Improve Reinforcement Design

LEAP CONBOX's extensive modeling and analytical capabilities enable users to obtain Inventory and Operating ratings for bridges being designed, or model existing bridges to calculate bridge ratings.

Post-Tensioning Capabilities Enhance Analysis

LEAP CONBOX allows for linear and parabolic tendon layout. Users can define friction and wobble coefficients and input the anchor sets. Post-tensioning jacking force can be entered manually or calculated as a percentage of the ultimate stress. The program computes tendon elongation and additional losses caused by horizontal curvature.

Load Specification and Analysis Provide Comprehensive Results

LEAP CONBOX users can specify uniform temperature loads, temperature gradients, superimposed dead loads (FWS), and pedestrian loads. Additionally, LEAP CONBOX can compute the self-weight of the structure and the loads due to crash barriers and pedestrian railings. Moving live loads consist of AASHTO, CHBDC, or IRC type vehicles and Cooper E-80 train loads. Users can also define a custom vehicle load and concentrated or distributed custom loads.

3D Enhances Structural Analysis and Model Generation

LEAP CONBOX features 3D geometry with 2D plane frame FEM analysis. Users can define any desired checkpoints in addition to the automatically generated Points of Interest (POIs). Users can also define piers, hinges, abutment locations, and pier support conditions at the bottom of columns. Alignment information comprises tangent, horizontal curves, and spirals. LEAP CONBOX models semi-monolithic connections between the superstructure and substructure using coupling and stiffness coefficients.

System Requirements

Software
Microsoft .NET Framework 3.5 or higher

Processor
1 GHz 32-bit (x86) or higher

Operating System
Microsoft - Windows 7, Windows XP

Memory
Minimum of 512 MB, but more is recommended

Disk Space
200 MB

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Advanced Analysis Capabilities Deliver Quality Results

LEAP CONBOX computes ultimate moment based on the strain compatibility method. The capacity-demand ratio and safety factor are reported at each checkpoint for stresses, ultimate moment, and shear strength. The program checks top and bottom flange stresses, and calculates shear and moment reinforcement. LEAP CONBOX also calculates the level of post-tensioning force that is required to satisfy stress and the minimum concrete compressive strength. Shear and moment calculations are generated automatically.

Support for Codes Automates Multiple Methods

Users choose between AASHTO Standard or LRFD, CHBDC, or IRC codes and specifications. LEAP CONBOX also provides conformance with Caltrans Amendments. The application computes post-tensioning losses according to lump sum method, AASHTO specification equations, or IRC equations. Support for AASHTO and CHBDC specifications also includes time-dependent loss modeling.

Automatic Load Rating Calculations (AASHTO)

LEAP CONBOX's extensive modeling and analytical capabilities enable users to obtain Inventory and Operating ratings for the bridges they design, or model existing bridges to calculate bridge ratings.

Flexible Reporting Enhances Project Delivery

LEAP CONBOX provides text and graphical reports that are viewable onscreen, printed, or exported to spreadsheets and multiple file formats, including DGN and DXF. Users can select from a wide array of reports on all aspects of analysis and design results including loads, stress checks, design forces, prestress losses, detailed design calculations, and much more.

LEAP CONBOX At-A-Glance

Ease of Use
- Intelligent graphical user interface
- U.S. customary and metric (SI) units
- Tabular and dialog input
- Graphical feedback of data input
- Customizable libraries
- Text and graphical report formats
- Export graphics to DGN and DXF formats

Structural Analysis Engine
- Time-dependent analysis engine (AASHTO and CHBDC)
- 3D analysis and plane frame model
- Roller/pin, fix, and spring supports
- 3D bridge geometry description
- Parametric and relational box girder cross section
- Nonlinear parametric cross-section variation
- Optional transformed rebar properties for stiffness
- 3D substructure description (columns and pier caps)
- Column cross-section variation through height
- Parametric and relational post-tensioning layout
- PT tendon assignment by girder
- Horizontal curve

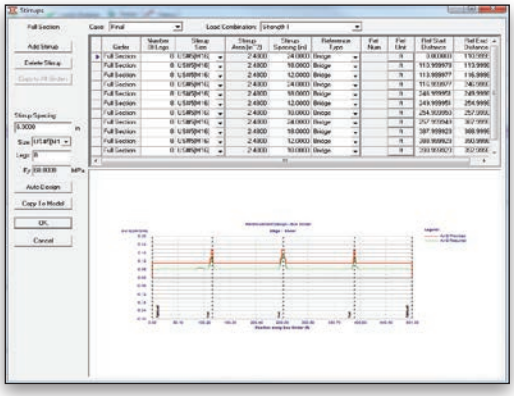
Structural Analysis Options
- Single-girder or whole-width analysis
- Prestress loss calculation by code equation
- Prestress loss calculation by time-dependent specs (LFD and LRFD; CHBDC)
- Thermal load analysis
- Calculation of live load distribution factors (LFD and LRFD; CHBDC)
- Calculation of impact factors
- Live loading and load combinations

Design and Code Checking
- AASHTO Standard
- AASHTO LRFD
- U.S. State: California
- CHBDC
- IRC
- AASHTO LFR and LRFR load-rating checks
- Rebar layout design
- Shear stirrup layout design

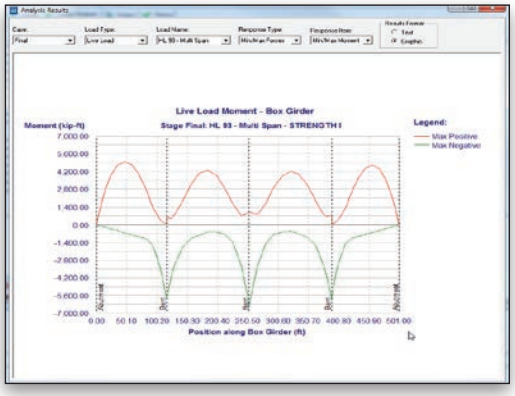
Libraries and Referencing
- Live load vehicles
- Rebar
- Tendons
- Substructure definitions

Support for Industry Formats
- DGN and DXF file formats
- XML and LandXML-compliant file formats

For more information, visit:
www.bentley.com/LEAP



Auto-design for shear.



Analysis results in graphical format bending moment diagram.

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Sustaining Infrastructure