



LEAP® CONBOX®

FOR ANALYSIS AND DESIGN OF POST-TENSIONED AND CAST-IN-PLACE REINFORCED CONCRETE BOX GIRDER AND SLAB BRIDGES

LEAP CONBOX is specifically developed for the analysis and design of post-tensioned and cast-in-place reinforced concrete box girder and slab bridges constructed on falsework. The program incorporates AASHTO Standard and Load and Resistance Factor Design (LRFD) Bridge Design Specifications in one interface for simple and efficient transition to LRFD. LEAP CONBOX accommodates span hinges and a variety of column shapes.

Simplifies design

Easily enter project data with a streamlined, user-friendly interface. Users can specify bridge layout information including alignment, span lengths, and cross-sections; pier, hinge, and abutment locations; and superstructure-to-substructure connectivity. LEAP CONBOX simplifies workflows by importing bridge design structure (BDS) input files.

Supports multiple codes

Users can toggle between AASHTO Standard and LRFD specifications. The program computes post-tensioning losses according to AASHTO specification equations, lump-sum method, or time-dependent models. LEAP CONBOX calculates loads using AASHTO LRFD specifications. Extensive customization options enable users to model existing bridges for rating-to-current specifications for inventory and operating management.

Conforms to Caltrans Amendments

Users can design according to Caltrans amendments. These include Special Strength II Limit State related to P5-P15 trucks; Fatigue Limit State related to infinite fatigue life of concrete subjected to HL-93 fatigue truck; and revised resistance factor for tension-controlled, cast-in-place, and prestressed concrete sections subjected to flexure and axial load.

Delivers powerful design features

The program offers powerful design features that include superstructure cross-sections. Cross-section options 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. LEAP CONBOX inputs the fillets between the flange and web junction. Users can select from a variety of column shapes, specify linear or parabolic column variations, or

specify their own pier properties. The number of columns is unlimited. Piers can be drop-cap or integral-monolithic.

Automatically calculates mild steel reinforcement

LEAP CONBOX computes the required mild steel reinforcement at each checkpoint. Users can define the nature of the reinforcement, which LEAP CONBOX considers when calculating ultimate shear and moment capacities. Ultimate moment-strength calculations include effects caused by time-dependent concrete compressive strength, mild reinforcing, and post-tensioning steel.

Performs post-tensioning analysis

LEAP CONBOX allows for linear and parabolic tendon layout. Users can define friction and wobble coefficients and input the anchor set. Post-tensioning jacking force can be entered manually or calculated as a percentage of the ultimate stress. Additional losses caused by horizontal curvature and tendon elongations are computed.

Handles array of load specifications

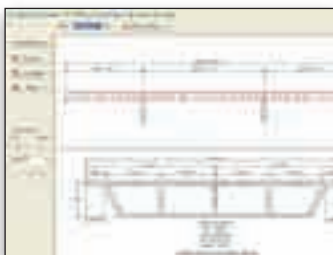
LEAP CONBOX users can specify uniform temperature loads, AASHTO temperature gradients, superimposed dead loads (FWS), and pedestrian loads. Additionally, LEAP CONBOX can compute the self-weight of the structure. Moving live loads consist of AASHTO type vehicles and Cooper E-80 train loads. Users can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

Analyzes structures and generates models

LEAP CONBOX features 3D geometry with 2D plane frame FEM analysis. Users can define checkpoints on top of program generated Points of Interest (POIs). LEAP CONBOX allows users to define piers, hinges and abutment locations. Pier support conditions at the bottom of the columns can also be defined. Users can specify alignment information that consists of a combination of tangent, horizontal curves and spirals. Also, by specifying coupling and stiffness



AASHTO Load and Resistance Factor Rating (LRFR) feature rapidly computes LFD and LRFD load rating.



Model tab defines tendon layout and properties, longitudinal and shear reinforcement layout.



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

SYSTEM REQUIREMENTS

Processor

Intel Pentium II 400 Mhz minimum; Intel Pentium III 800 Mhz recommended

Operating System

Microsoft Windows 2000, Microsoft Windows XP

Memory

256Mb minimum, 512 Mb recommended

Disk Space

75 Mb minimum, 100 Mb recommended

Input Device

Mouse

ABOUT BENTLEY

Bentley Systems, Incorporated is the global leader dedicated to providing comprehensive software solutions for sustaining infrastructure. Architects, engineers, constructors, and owner-operators are indispensable in improving our world and our quality of life; the company's mission is to improve the performance of their projects and of the assets they design, build, and operate. Bentley sustains the infrastructure professions by helping to leverage information technology, learning, best practices, and global collaboration – and by promoting careers devoted to this crucial work.

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coefficients, users can model semi-monolithic connections between the superstructure and substructure.

Offers advanced design capabilities

LEAP CONBOX delivers advanced design capabilities that compute ultimate moment calculations 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 that is necessary to satisfy AASHTO compressive stress checks. Shear and moment calculations are also generated automatically.

Automatically calculates loads

LEAP CONBOX includes side-by-side LRFD permit vehicle effects, which allows users to specify unlimited load

combinations and limit states. Analysis results include minimum and maximum effects for individual and envelope effects.

Generates reports

LEAP CONBOX provides text and graphical reports that are viewable on screen, printed, or exported to spreadsheets and DXF files. 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.

Integrates concrete bridge design

Invoking CONBOX from within the LEAP® Bridge console, allows access to integrated bridge geometry, substructure and superstructure analysis, design, and load-rating capabilities. Because LEAP Bridge is a parametric design solution, users can design an entire bridge within a single application. This ensures accuracy and simplifies the workflow.

LEAP CONBOX AT-A-GLANCE

Graphical User Interface

- User-friendly interface
- U.S. and metric (SI) Units
- Tabular and Dialog Input
- Graphical Feedback of Input Data
- User-Defined Libraries
- Read BDS Data Files
- Text and Graphical Report Formats
- Export of Graphics to DXF and DGN

Structural Analysis Engine

- Time-Dependent Analysis Engine
- 3D Analysis and Plane Frame Model
- Roller/Pin, Fix, and Spring Supports
- 3D Bridge Geometry Description
- Parametric and Relational Box Girder Cross Section
- Non-Linear 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
- Thermal Load Analysis
- Calculation of LFD and LRFD Live Load Distribution Factors
- Calculation of LFD and LRFD Impact Factors
- AASHTO LFD and LRFD Live Loading
- AASHTO LFD and LRFD Load Combinations

Design/Code Check

- AASHTO Standard and LRFD; Caltrans Amendments
- Design Summary and Specification Check
- Rebar Layout Design
- Shear Stirrup Layout Design
- Add a new bullet: Load Rating by LFR or LFRF

Libraries and Referencing

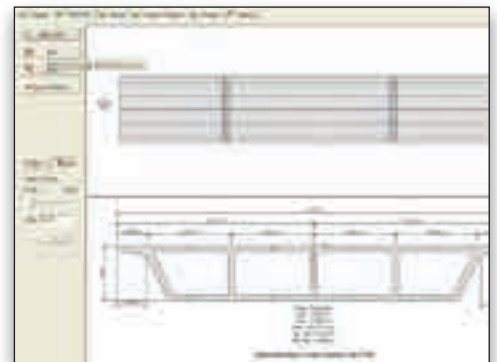
- Live Load Vehicle Library
- Rebar Library
- Tendon Library
- Substructure Definitions

Integration and Interaction with Bentley® and Other Products

- Bentley® Rebar and MicroStation® (DGN and DXF file formats)
- Bentley® GEOPAK® and LEAP® GEOMATH® (XML file format)
- Other LandXML Compliant Applications



Rebar Dialog automates layout of mild reinforcement.



Geometry tab defines structure layout, including roadway alignment, support layout, cross-section layout, and substructure definition.