



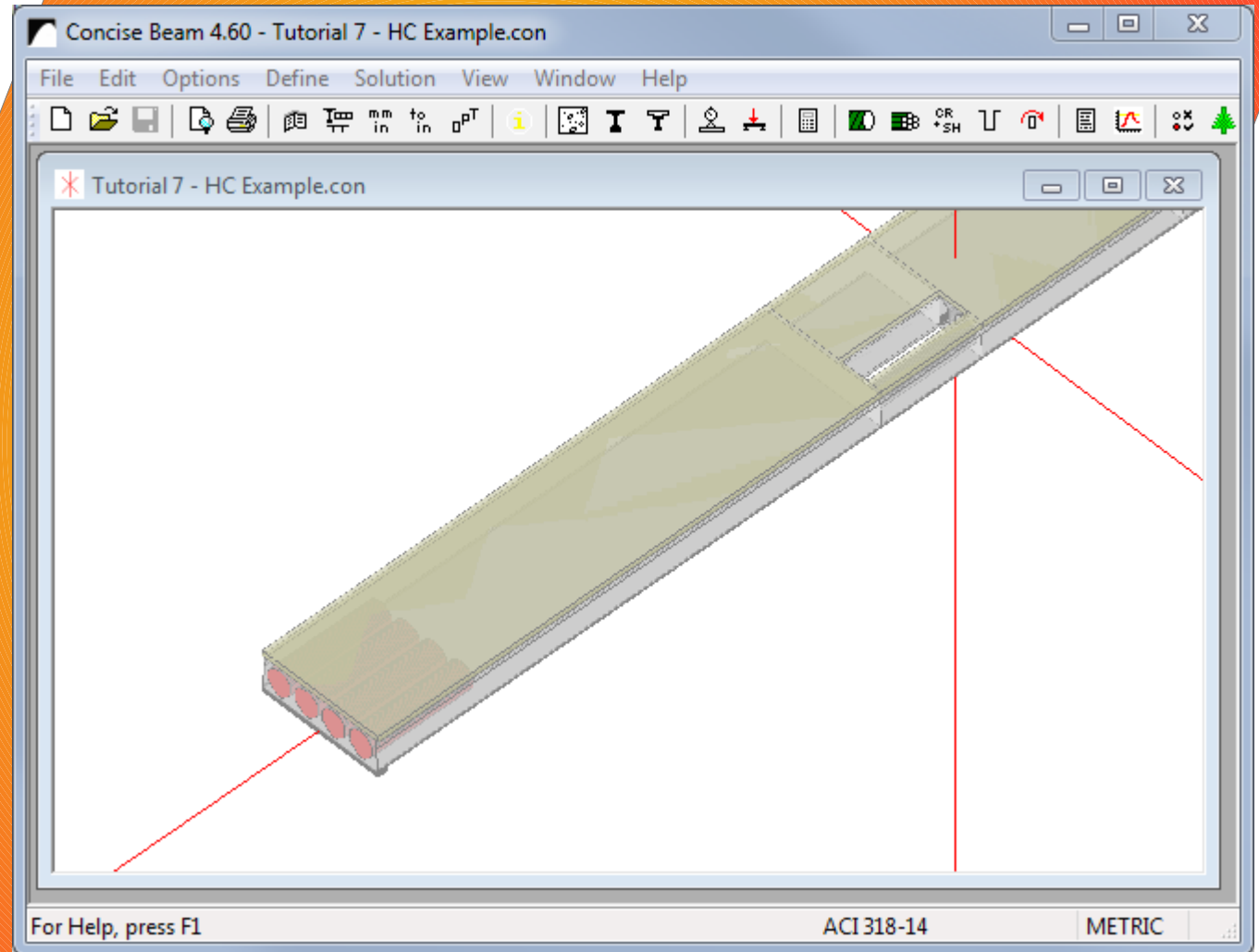
# Concise Beam

# Concise Beam

## Precast/Prestressed Beam Design

A state-of-the-art, easy-to-use Windows based program for the analysis and design check of precast concrete beams, prestressed or not, to American, Canadian, Australian, and New Zealand design standards.

Main  
Window





# Beam Layouts

- Simply supported precast beams
- Cantilever at either end
- Composite topping/slab with optional haunch
- Shored construction optional
- Hollow-core fill
- Automatic generation of openings

# Beam Definition

Beam Definition

Segment Details

Select Section from Library

View or Edit Section Properties

Name: HCS32-320

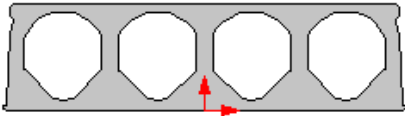
Section Type: Hollow-Core

Segment Length: 12.6 m

Lateral Offset (+/-): 0 mm

Vertical Offset: 0 mm

Define Openings



Beam Segment List

Add Modify Delete Move Up Move Down

	Section Name	Length	Offset Z	Offset Y	Openings?
1	HCS32-320	12.6 m	0 mm	0 mm	Yes

Total Beam Length: 12.6 m

Supports

	Left End	Right End
Support Center from Left End of Beam at Transfer	0	12.6 m
Support Center from Left End of Beam in Service	0.05	12.55 m
Bearing Length in Service (centered on support)	100	100 mm

Beam Handling Parameters

Go To Next ...

Define CIP Pour Torsion Parameters Define Loading

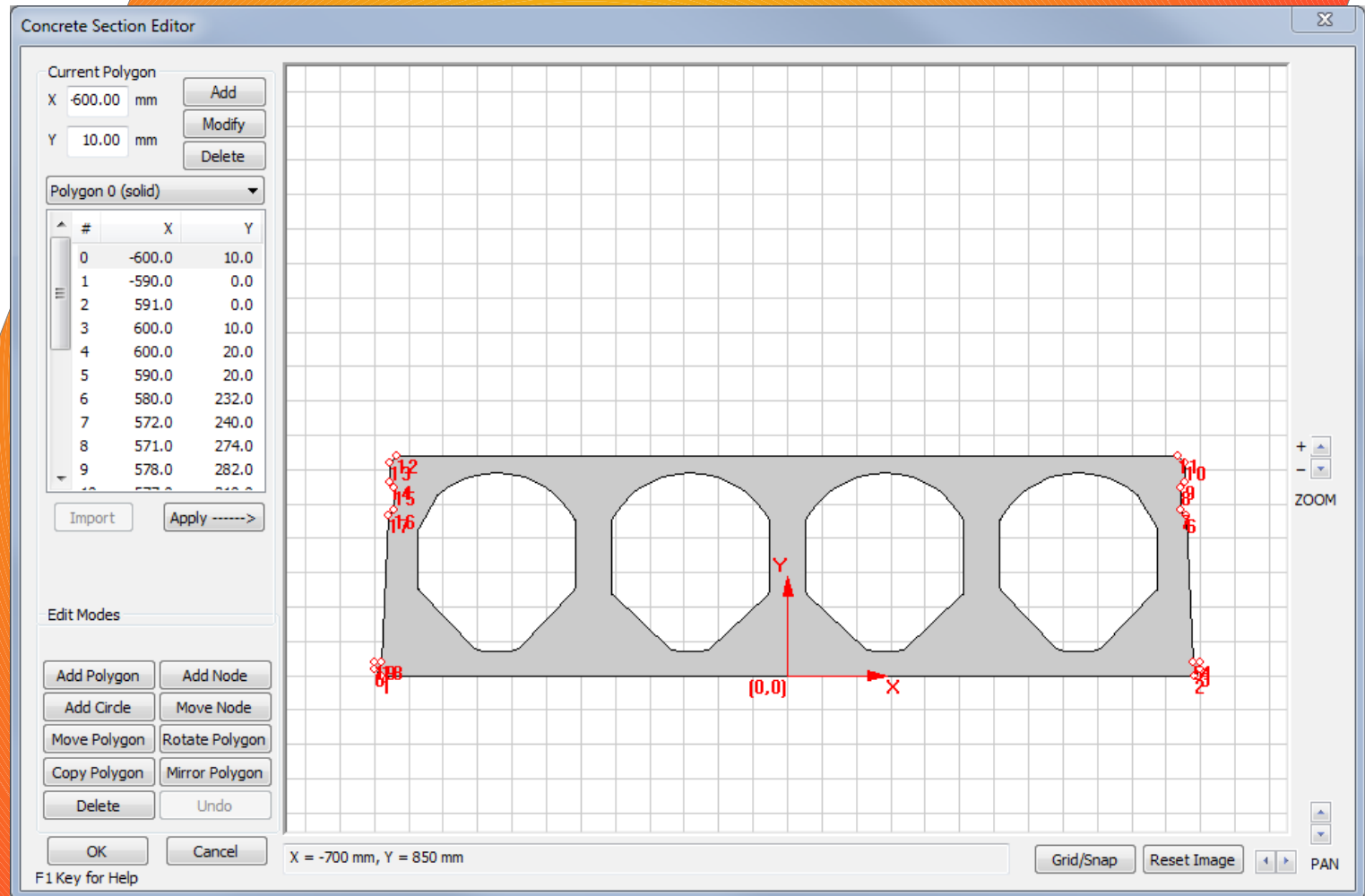
F1 Key for Help OK Cancel to US Units

# Concise Beam

# Beam Cross-Sections

- Model any user defined cross-section
- Select from a library of standard sections
- Use the section editor to create your own section, or modify a standard section
- Vary the section prismatically over the length of the beam

# Section Editor





# Reinforcement Options

- Reinforced, partial or fully-prestressed, precast beams
- Mix of rebar, wire, and strand
- Deflected and debonded strands
- Fully developed or hooked rebar and strand ends available
- Epoxy coated reinforcing bar available



## Rebar

Reinforcing Steel

Reinforcing Steel Group Details

Number of Bars/Wires

2

☐ Welded Wire Reinforcement?
 

☐ Epoxy Coated

Spacing of Bars/Wires \*

300 mm

Spacing of Cross Bars/Wires \*

300 mm

Vertical Offset \*\*

44 mm

from Bottom of Precast Beam [BB]

Offset from Left

0 m

Straight Embed. [SE]

Offset from Right

0 m

Straight Embed. [SE]

\*\* Bars measured from the top of the CIP pour are embedded in the CIP pour. Otherwise bars are embedded in the precast beam. Offset to center of bar group.

Reinforcing Bar/Wire Type

Select from Library

Name

15M

dia.

16 mm

fy

400 MPa

Deformed Bar

A

200 mm^2

E

200000 MPa

Save as the Default Reinforcing

Restore to the Default Reinforcing

☐ Low Ductility (AS/NZ Type L Steel)

Add

Modify

Delete

Move Up

Move Down

Section	Grade (fy)	Num.	Spacing	Lat. Spc	Offset	from	L. Offset	R. Offset
<input checked="" type="checkbox"/> 15M	400 MPa	2	300 mm		44 mm	BB	0 m	SE 0 m SE

Go To Next ...

Define Prestressing

Shear Reinforcing

View Reports

View Graphs

F1 Key for Help

OK

Cancel

to US Units

## Concise Beam

# Prestressing

**Prestressing**

Strand Group Details

Number of Strands:  ☐ Epoxy Coated

Stress Ratio at Lock-off:  (fpj / fpu)

Strand Height at Left End:  mm

Strand End Type and Offset from End of Beam

Left:   m

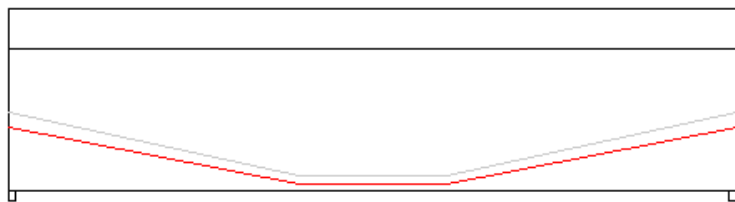
Right:   m

Strand Type

Select from Library Name:  dia.  mm fpu  MPa

Low-Relaxation Strand   mm<sup>2</sup> E  MPa

Section	Grade (fpu)	Num.	L. Offset	R. Offset	Lock-Off	Method
<input checked="" type="checkbox"/> 12.7 (1/2")	1860 MPa	7	0 m	B 0 m	B 0.7 fpu	Code
<input checked="" type="checkbox"/> 12.7 (1/2")	1860 MPa	5	0 m	B 0 m	B 0.7 fpu	Code



Go To Next ...

# Concise Beam

# Section, Material and Loading Libraries

- Libraries of standard beam cross-sections
- Libraries of standard materials
  - reinforcing steel sizes and material
  - prestressing strand sizes and material
- Libraries of Moving Loads
- Create your own libraries

# Section Library

Edit Concrete Section Library - CPCI\_4 rev.1.precastLib

Folder  
Name: Double Tee

Section  
Name: DT 3000x 700

A \* 341824 mm<sup>2</sup> V/S \* 40 mm  
I \* 15649000448 mm<sup>4</sup> bw \* 293 mm  
yb \* 492 mm Section Type: Double Tee

\* these values will be generated by the Section Editor and can be over-written. The shear width bw is only an approximation and needs to be checked to ensure that it is appropriate.

Height of Loading 700 mm Top of Web 650 mm


Folder List

- Box Beam
- Double Tee
- Flat Slab
- Hollow Core
- I-Girder
- Inverted Tee
- L-Shaped
- Rectangle
- Single Tee

Section List

- DT 2400x 300
- DT 2400x 500
- DT 2400x 700
- DT 2400x 900
- DT 3000x 300
- DT 3000x 500
- DT 3000x 700
- DT 3000x 900
- DT 3660x 350
- DT 3660x 400 PT
- DT 3660x 550
- DT 3660x 600 PT
- DT 3660x 750
- DT 3660x 800 PT

F1 Key for Help





# Applied Loads

- Automatic beam and topping self-weight
- Static Point loads, moments or torques
- Uniform, or linearly varying, distributed loads or torques
- Moving Loads including Highway Live Loads

# Flexible Load Groups

## Concise Beam

Applied Loads

Create a New Load Group

Load Group Details

Load Group Label: Asphalt

First Stage Load Group is Applied: Composite

Load Group Type: DL, Wearing Surface

Last Stage Load Group is Applied: Final

Load Type in Selected Code: D3

Load Group Duration: Sustained

☐ Loads in Group are Reversible

Load Distribution: 0 : No Load Distribution

Create or Edit Distributions

Loaded Beam: 0: Static Load applied to this beam

Add Modify Delete

Label	Type	First Stage	Last Stage	Duration	Distribution
<input checked="" type="checkbox"/> Barriers	DL, Cast-in-Place...	Composite	Final	Sustained	No Load Di...
<input checked="" type="checkbox"/> Asphalt	DL, Wearing Surf...	Composite	Final	Sustained	No Load Di...
<input checked="" type="checkbox"/> Moving Load	LL, Moving Loads...	Final	Final	Transitory	CSA S6-14...

Go To Next ...

Define Rebar Define Prestressing Load Combinations

F1 Key for Help OK

# Static Applied Loads

## Concise Beam

Loads in Current Load Group

Static Loads in Selected Group | Moving Load Definition in Selected Group

Load Form: **Area Load**

Load Label: **udl**


Beam Length: **30.6** m

\* downward gravity loads are positive

☒ Use Maximum Composite Beam Width

	Left	Right	
Intensity *	4.44	4.44	kN/m <sup>2</sup>
Left Offset	0	30.6	m
Eccentricity	0	0	m
Loaded Width	2.1	2.1	m

udl [4.4/4.4]



Loads in Group

Add Modify Delete Move Up Move Down

Load Label	Load Description
<input checked="" type="checkbox"/> udl	Area: 4.44 kN/m <sup>2</sup> full length

☒ Automatically Modify Current Load Group with Loads in Group Changes

Cancel to US Units

# Moving Loads

Loads in Current Load Group

Static Loads in Selected Group | Moving Load Definition in Selected Group

Select Moving Load from Library | Edit Moving Load Libraries

Moving Load Name: S6-14: CL-625-ONT Design

Truck Load

Axle Weights in Truck

Axle #	Offset *	Weight
1	0 m	50 kN
2	3.6 m	140 kN
3	4.8 m	140 kN
4	11.4 m	175 kN
5	18 m	120 kN

Add | Modify | Delete

Selected Axle  
Offset: 0 m  
Weight: 50 kN

☒ Only Include Axles that Maximize the Load Effect

Dynamic Load Allowance Factor (impact):  
 Single Axle: 1.4 | Short Truck \*: 1.3 | Full Truck and Trailer: 1.25

\* First three axles alone, or any other two axles alone (i.e. a truck without a trailer)

Lane Load [uniformly loaded lane (UDL) + truck]

UDL Intensity: 9 kN/m | % Truck in Lane: 80

[50.0]

Cancel | to US Units

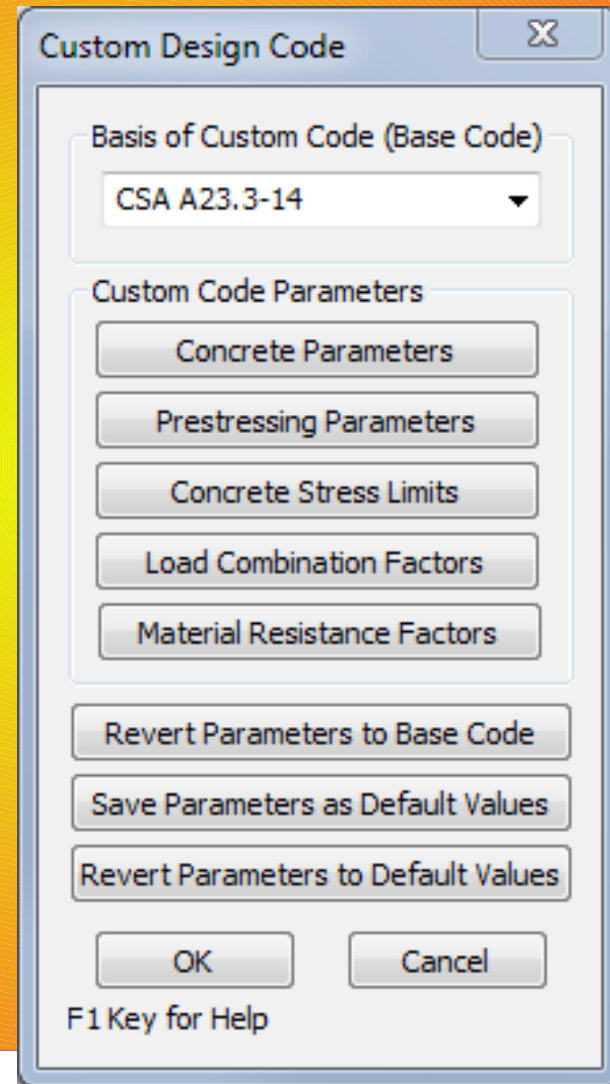
# Concise Beam



# Design Codes

- American standard ACI 318-99 through ACI 318-14
- Canadian standard CSA A23.3-94 through CSA A23.3-14, CSA S6-06S-10 and CSA S6-14
- Australian standard AS 3600-2001 and 2009
- New Zealand standard NZS 3101:2006
- Customize select code parameters

# Customized Code Parameters



# Units of Measure

- Work in metric or U.S. Customary (Imperial) units
- Switch back and forth at any time
- Select specific unit of measure (m, cm, mm, in, ft, etc.)
- Save your selection for future use



# Flexible Units of Measure

Units of Measure

System of Units

☒ Metric (SI)

☐ US Customary (Imperial)

Input Data

Length: m

Sectional Dimensions: mm

Force: kN

Concrete: MPa

Steel Strength: MPa

Output Results

Deflection: mm

Force / Shear: kN

Moment / Torsion: kNm

Stress: MPa

Steel Area per Length: mm<sup>2</sup>/m

Save Unit Settings as the Default

Restore the Default Unit Settings

OK Cancel

F1 Key for Help



# Advanced Engineering Capability

- Uses detailed methods whenever appropriate
- Provides select alternative methods
- Cracked section analysis
- Strain compatibility analysis including slippage of reinforcement
- Lateral stability check during lifting and transport
- Shear check of hollow-core with filled cores

# Loss and Design Parameters

**Design Parameters**

**Prestress Loss Calculation Method**

- ☐ ACI 209 Detailed Method (CPCI)
- ☐ PCI Simplified Method (Zia)
- ☐ AS3600 Method
- ☒ S6 Simplified Method

**Predefined Losses**

☐ Use Predefined Losses

Initial Losses  %

Total Losses  %

**Curing Method**

- ☒ Moist Cured
- ☐ Heat Cured (i.e. Steam)

**Concrete Parameters**

Slump  mm

Cement  kg/m<sup>3</sup>

Air  %

Fine/Total Aggregate

Aggregate Size  mm

Basic Shrinkage Strain  x10<sup>-6</sup>

**Service Environment**

Relative Humidity  %

Ambient Temp.  deg. C

Exposure

**Construction Schedule**

Precast Concrete is Placed at day 0.

Transfer/Stripping  days

Initial Lift  days

Transport/Erection Lift  days

Cast-in-Place Pour  days

Composite Action  days

Completion  days

Go To Next ...

F1 Key for Help

# Analysis and Design Features

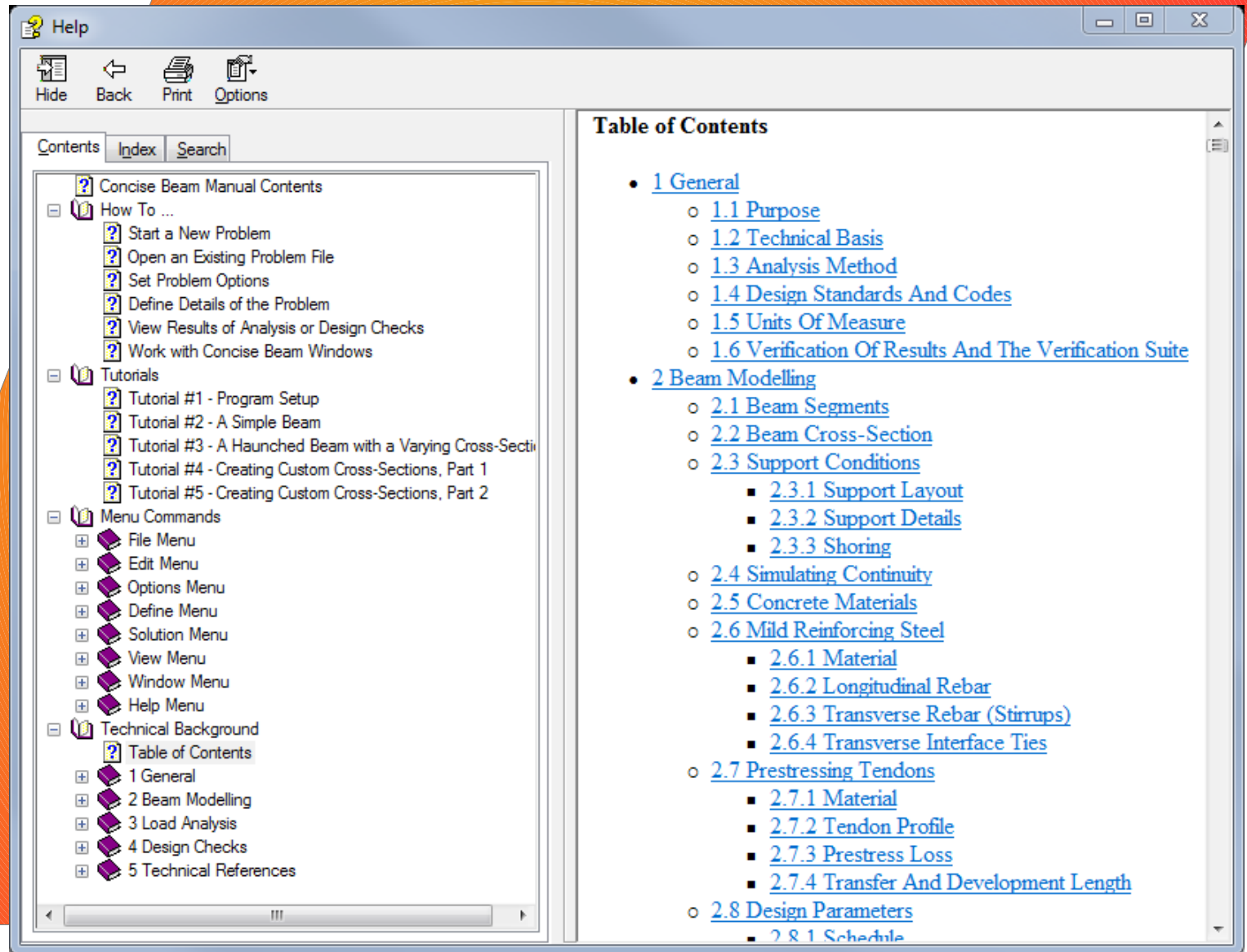
- Serviceability and Ultimate State Analyses
- Automatic design code checks
- Shear and torsion steel design
- Interface shear design for deck/topping
- Follows recognized methods as used in the PCI Design Handbook, CPCI Metric Design Manual, and the NPCAA Precast Concrete Handbook

## Ease of Use

- Standard Microsoft Windows desktop interface
- Easy-to-read on-screen user's manual and context-sensitive help
- Design tutorial and examples
- Full technical support
- Regular program upgrades



# On-Line Help



# Text Output

- Summary text report of input and output
- Detailed text reports of analysis and design check results for:
  - Flexure, shear, and torsion analysis
  - Prestress loss and force
  - Concrete stresses and cracking estimate
  - Deflection and camber estimates
  - Flexural, shear, and torsion design checks
  - Stirrup, interface tie and hollow-core fill design checks

## Summary Text Report

Summary Report

SUMMARY REPORT

Design Code Used: CSA S6-14

NON-DEFAULT OPTION SETTINGS

\*\* OFF \*\* G2: Use PCI Standard Design Practice, TR-7-05 (ACI codes only)

\*\* ON \*\* L1: Vary User Defined Losses Along Beam

\*\* ON \*\* S4: Use the Ultimate Section Capacity for Horizontal Shear (Moment Region Check)

\*\* OFF \*\* D3: Have Concise Beam calculate the long-term deflection multipliers for prestressed Beams

CONCRETE MATERIAL PROPERTIES

Precast Beam

Concrete Density

Compressive Strength

Modulus of Elasticity

Strength at Transfer

Modulus of Elast. at Transfer

Strength at Lifting

Modulus of Elast. at Lifting

Wt = 2400 kg/m<sup>3</sup>

f'c = 50.0 MPa

Ec = 29966 MPa

f'c = 30.0 MPa

Ec = 24870 MPa

f'c = 35.0 MPa

Ec = 26273 MPa

Cast-in-Place Pour

Concrete Density

Compressive Strength

Modulus of Elasticity

Wt = 2400 kg/m<sup>3</sup>

f'c = 35.0 MPa

Ec = 26273 MPa

Cement Content = 410 kg/m<sup>3</sup>

Air Content = 5.00 %

Slump = 50.0 mm

Aggregate Mix = 0.40 (fine to total aggregate ratio)

Aggregate Size = 20.0 mm

Basic Shrinkage Strain = 780.000E-6

Construction Schedule

Age at Transfer = 0.75 days

Age at Erection = 40 days

Age at Cast-in-Place Pour = 50 days

Age Cast-in-Place is Composite = 53 days

Age Construction is Complete = 143 days

Curing Method = Moist

Relative Humidity in Service = 70 %

Ambient Temperature in Service = 20 deg C

PRECAST BEAM LAYOUT

No	Segment/Length			Folder Name	Section Identification			Offset	
	From m	To m	Length m		Section Name	Section Type	Z mm	Y mm	
1	0.000	30.600	30.600	I-Girder	CPCI 1600	Flanged Beam	0.0	0.0	

Span Length at Transfer = 30.600 m, Centre of Supports, Left @ 0.000 m, Right @ 30.600 m

Span Length in Service = 30.000 m, Centre of Supports, Left @ 0.300 m, Right @ 30.300 m

## Detailed Text Reports

Concise Beam 4.60 - Tutorial 9 - Bridge Interior Girder.con

File Edit Options Define Solution View Window Help

**PRESTRESS LOSS - STRESSES**  
(-ve = loss of tension)

Design Code Used: CSA S6-14

Method Used: S6 Detailed Loss Method

All Strands (average stress loss)

x m	Relaxation before Transfer MPa	Elastic Shortening	Elastic Short. Diff	Shrinkage	Creep	Relaxation after Transfer	Total Loss
0.000	0.00						
0.000	0.00						
0.300	-4.16						
0.900	-8.27						
3.000	-8.27						
5.700	-8.27						
8.700	-8.27						
11.700	-8.27						
14.700	-8.27						
15.300	-8.27						
15.900	-8.27						
17.700	-8.27						
18.900	-8.27						
21.900	-8.27						
24.900	-8.27						
27.600	-8.27						
29.700	-8.27						

**Flexural Design Check**

FLEXURAL DESIGN CHECK

Design Code Used: CSA S6-14

A rectangular stress block will be used at sections at full concrete strain using the following  
 $\beta$  used: for precast beam = 0.845 , for cast-in-place pour = 0.882  
 $\alpha$  used: for precast beam = 0.775  $\alpha$  used: for cast-in-place pour = 0.797  
 Otherwise the concrete compressive stress-strain model used: PCA Parabola-Rectangle Curve

Material Resistance Factors Used: precast concrete = 0.75  
 cast-in-place concrete = 0.75  
 reinforcing steel = 0.90  
 prestressing steel = 0.95

Modulus of Rupture of Precast Concrete,  $f_r = 2.83$  MPa (tension)

x m	Factored Moment Mf kNm	Provided Resistance Mr kNm	Cracking Moment Mcr kNm	Minimum Required Resistance kNm	Depth in Compression c mm	Compression Depth Ratio c / d	Notes Warning
0.000	0.0	4.3	898.5	0.0	1.1	0.000	
0.000	0.0	4.3	898.5	0.0	1.1	0.000	
0.300	-66.9	-625.2	540.2	-89.2	376.3	0.261	
0.900	699.1	5261.0	5124.0	932.1	93.5	0.057	
3.000	2908.9	8336.8	5131.1	3878.6	143.4	0.088	
5.700	5258.0	8554.3	5200.5	6240.5	143.4	0.086	
8.700	7147.6	8795.6	5344.2	6413.0	143.4	0.083	
11.700	8287.0	9036.9	5538.8	6646.6	143.4	0.081	

For Help, press F1

CSA S6-14

METRIC

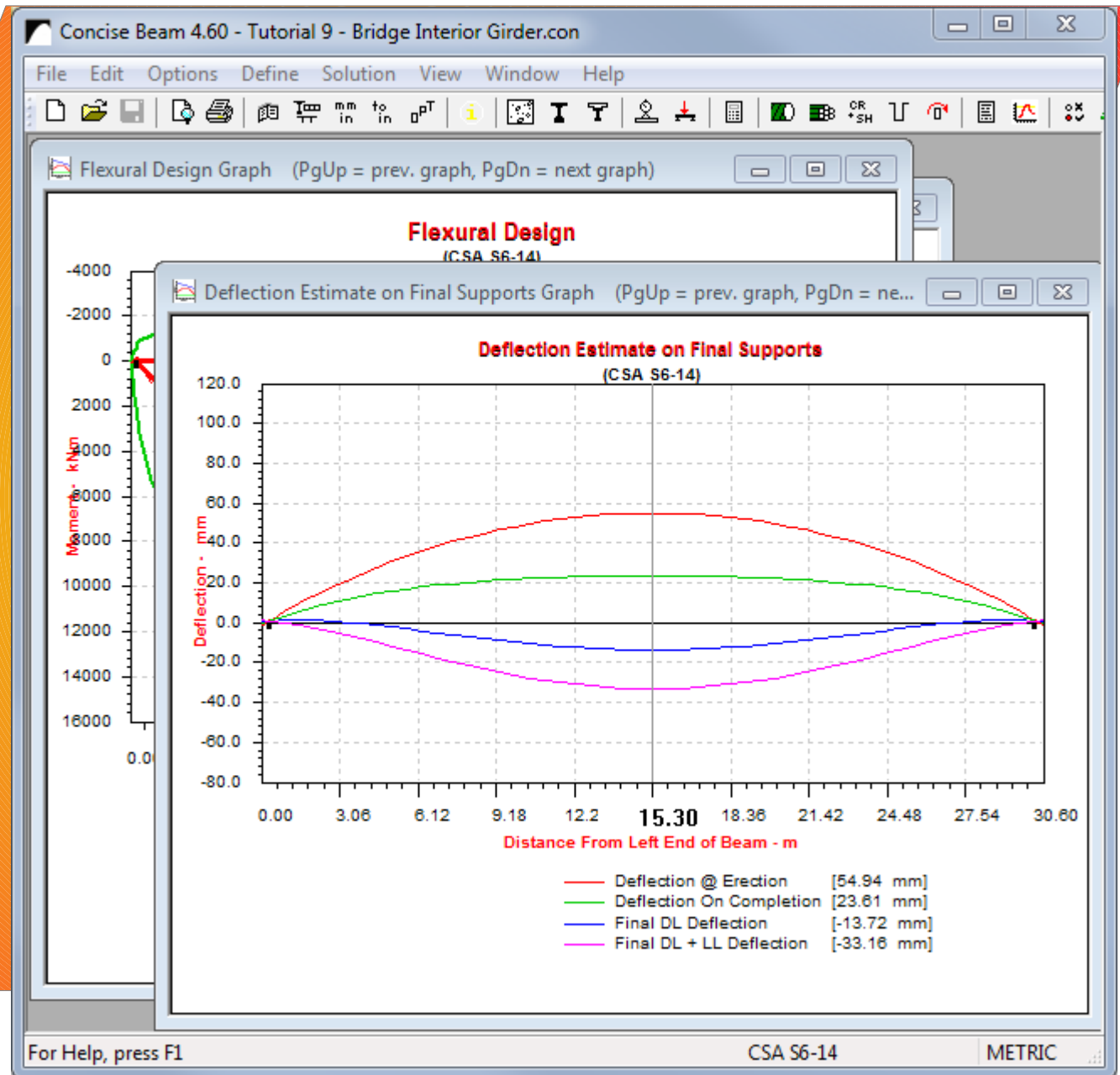
Tutorial 9 - Bridge Interior Girder.con



# Graph Output

- Graphs of analysis and design check results for:
  - Flexure, shear, and torsion analysis
  - Prestress forces
  - Concrete stresses
  - Deflection and camber estimates
  - Flexural and shear design checks
  - Stirrup, hollow-core fill and interface tie design checks

# Graphs



# Computer Requirements

- Simply, any computer capable of running Microsoft Windows XP or later, including Windows 10
- Supports any Windows installed printer or PDF printer
- Internet access and e-mail address for program distribution, updates, announcements, and technical support

# How to Obtain Concise Beam

- Visit Black Mint Software's web site at [www.BlackMint.com](http://www.BlackMint.com) to download a free 30 day, fully-functional, evaluation copy of the program
- Current pricing, ordering, and payment options are available on the web site
- Black Mint Software can also be reached through the web site to answer any of your questions



Visit Us at  
[www.BlackMint.com](http://www.BlackMint.com)

Contact Us at  
[ConciseBeam@BlackMint.com](mailto:ConciseBeam@BlackMint.com)

# Concise Beam

The screenshot shows the Concise Beam V4 website and a preview of the software interface. The website has a navigation bar with links: Home, Download, Pricing/Ordering, Support, and About Us. The main content area is titled "Concise Beam Version 4" and contains a description of the software's capabilities. A "News" section on the right lists updates from June 9, 2016, to February 13, 2016. The software interface shows a 3D model of a precast concrete beam, a "Shear Design Graph" with a red line for "Applied Shear V<sub>u</sub>" and a green line for "Design Shear Capacity φV<sub>n</sub>", and a table of material properties.

**Concise Beam V4**

**Home Download Pricing/Ordering Support About Us**

**Concise Beam Version 4**

Concise Beam is an easy to use program for the design of precast concrete beams. Concise Beam will perform a load analysis and design checks in accordance with the latest edition of ACI 318, CSA A23.3 & S6, AS3600, or NZ3101.1. Key code parameters can be customized to simulate other design codes. The beam can be conventionally reinforced, partially or fully pretensioned. It can model any cross-sectional shape and will allow the cross-section to vary prismatically (step-wise) over the length of the beam. A graphical editor allows the user to describe any cross-section, including voids.

**News**

**June 9, 2016 - Concise Beam version 4.60 beta 3 released for beta testing**

Concise Beam version 4.60 is now available for user beta testing on the Download page. Please give it a try give us your feedback.

**April 12, 2016 - Concise Beam version 4.60 released for beta testing**

Concise Beam version 4.60 is now available for user beta testing on the Download page. Please give it a try give us your feedback.

**February 13, 2016 - Concise Beam version 4.59x is now available for download**

**YOUR COMMERCIAL LICENSE MUST BE CURRENT UP TO THE END OF FEBRUARY 2016 AT THE EARLIEST TO BE ABLE TO USE THIS RELEASE.** Users evaluating this new release will be able to use this version for the remainder of their 30 day evaluation period. If your license has expired please contact us about how to bring your license up to date in order to use this latest release and to receive technical support. You do not need to install any previous versions of Concise Beam before installing this latest release.

Version 4.59x is an interim release which includes the following changes;

- Corrected calculation of V/M where M = 0 for prestressed beams under ACI 318.
- Corrected the label of the Principal Stress option and how it's saved to file.
- Adjusted the reading of version 2 files by resetting the deflection multipliers to default

**Concise Beam currently works in two-dimensions using beam theory**