ACES-PSC

Prestress Concrete Design Module

ACES-PSC performs the design of pre-tensioned concrete Super-T and related beams in accordance with the simplified design approach given in the Australian Standards Bridge Design Code (AS5100.5). The module can either be accessed directly from within the main ACES program or run in stand-alone mode. Either single or multiple sections can be designed. It can also be readily customized to handle other section shapes and design codes.

FEATURES

General:

- Default design to AS5100.5 (simplified method)
- Access from ACES model or stand-alone mode
- Design of a single section or the entire girder
- Design forces can be imported from EXCEL
- Fully customisable equations, dialogs & reports

Section types:

- Selectable from database
- Includes standard AS5100 Super-T's & I girders
- User-defined sections allowed
- Auto re-calculation of composite properties

Steel layout:

- Variable strand layout along girder length
- Variable passive reinforcement along length
- Layout schemes can be saved & retrieved

Design includes:

- Simplified or strain compatibility analysis
- Partial pre-stressing
- Cracked section analysis
- Estimate of jacking force
- Differential shrinkage
- Steam relaxation
- Elastic deformation
- Shrinkage losses
- Creep losses
- Loss summary
- Temperature stresses (user input)
- Stresses at transfer
- Serviceability stress check

Ultimate Shear Check:

- Ultimate capacity
- Cracking moment
- Flexure cracking details
- Centroidal web cracking
- Cracking at the web/flange interface
- Design of shear reinforcement

Ultimate moment check:

- Ultimate capacity
- Forces in strand and passive reinforcement

Ultimate Torsion Check:

- Check for web crushing
- Design of torsional reinforcement.
- Additional longitudinal reinforcement
- Display of reinforcement tables

Deformations:

- Axial shortening
- Deflection
- Hog at transfer
- Final girder hog
- Final stresses

Graphical display:

- Strand & reinforcement layouts
- Transfer & final stresses
- Ultimate moment capacity
- Ultimate shear capacity
- Access to full calculation log

Clear and well annotated dialog boxes and reports

ACES6.606: Run date - 28/8/2008

Heading: TEST PROBLEM
Job Name: Open top Super-T Type 4: 2400 mm top flange
Designer: GS
Comments: Test comment to check module
Units: mm, microstrain, kN, kN.m, MPa

DESIGN CODE: AS5100.5

PRESTRESS LOSSES

Initial jacking force (Pj)	=	9360 kN
Ultimate jacking force factor (Jf)	=	0.780

Loss due to Steam Relaxation

The steam relaxation factor (k5) is the larger of 0.0 or:

The maximum of: 1 + (Jf-0.7)*0.5/0.1	=	1.400 (Fig 6.3.4
and: (Jf-0.4)/0.3	=	1.267
Steam relaxation factor (k5)	=	1.400
Loss due to relaxation (Lsrl = 0.1*k5/1.5)	=	0.093

Strand segment data (UNITS: kN, mm, MPa)

Segment 1 | Segment 2 | Segment 3 | New segment

5.00 Length of strand segment (Lss)

Click <Set> to make the strand layout the same as segment: 1 Set

Row	Ybar (mm)	Total bars	No. bars debonded	No. bars included	Ybar* No. of bars included
1	60	10	5	5	300
2	160	10	5	5	800
3	250	8	0	8	2000
4	550	6	0	6	3300
5	1000	4	0	4	4000
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
	Totals	38	10	28	1.0400E+04

Ybar = Distance of bar centreline from bottom of girder — Recalculate

0.0 Strand diameter (Ds)
0.0 Area of a single PS strand (Aps)
827 Location of girder centroid (Yb)
371 Eccentricity of stressing steel (Ycgs)
455.6 Eccentricity (CG girder-strand group) (e)

Layout display options

☑ Show strand ☐ Show R/F ☑ Show sections ☑ Show nodes

Colours

To refresh values on the main form click <Recalculate> on exit

OK | Re-draw layout | View calcs

ulation log

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RESTRESS LOSSES TAB - Elastic Deformation Losses

Ap = Nbbars * Aps

                                  Nbbars: 44.0000000
                                    Aps: 143.300003

                                     Ap= 6305.20020

fcgs = -Pjr*1000*(1/Ag+e*e/Ig) + Msw*1E6*e/Ig

                                    Ag: 572000.000
                                     e: 494.454529
                                    Ig: 1.68300003E+11
                                     e: 494.454529
                          (1/Ag+e*e/Ig)= 3.20092727E-06
                                     e: 494.454529
                                    Ig: 1.68300003E+11
                                   Pjr: 7779.20020
                                   Msw: 1441.00000

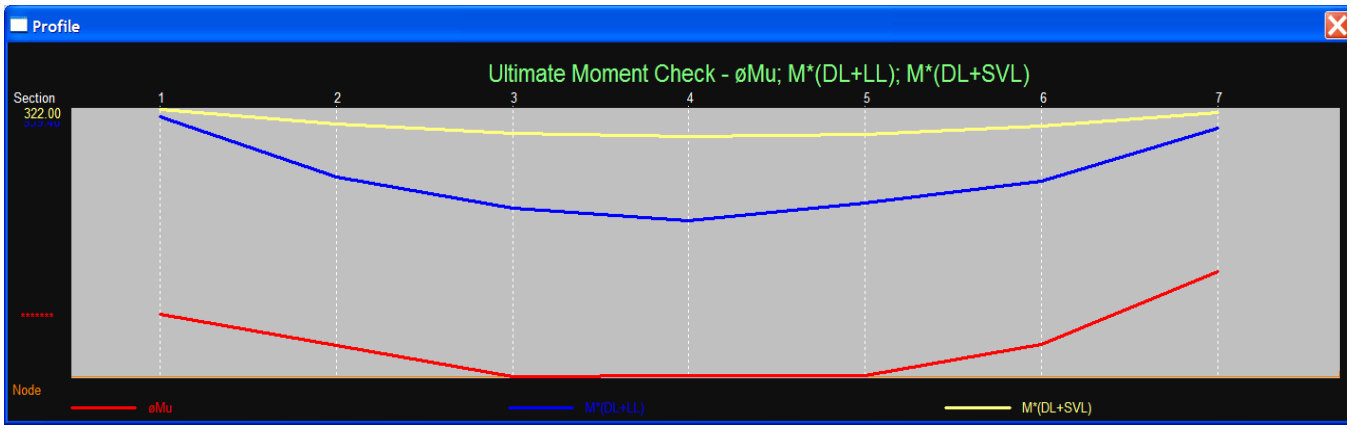
                                  fcgs= -20.6670895

Pelastic = fcgs*Ep*Ap/(Egmt*1000)

                                  Egmt: 32000.0000
                            (Egmt*1000)= 32000000.0
                                    Ap: 6305.20020
                                  fcgs: -20.6670895
                                    Ep: 195000.000

                             Pelastic= -794.077393
```

Calculation logs display every equation in the design process and the value of every parameter used in the design. The module mimics the way in which a spreadsheet works. Change a value anywhere in the form, click the 'Recalculate' button and the spreadsheet and associated reports are auto-matically updated.



Customisable interaction diagrams for serviceability, ultimate moment and ultimate shear checks.

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