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**spBeam v5.50 - Upgraded August 2018**

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**New Features:**

1. Introduced new spReporter module with the following features, for generating, viewing, exporting and printing reports
  - (a) Program text results output in formatted tables, modernized headings and titles along with diagrams including a report cover page and table of contents
  - (b) Export and print options in a panel to customize reports
  - (c) Option to preview the report in pdf/word or text formats
  - (d) Option to select between small, medium or large font sizes for the report
  - (e) Options for printer selection and customization of printer properties
  - (f) Options for print settings including paper size, orientation, margins and range
  - (g) Option to export the customized report in .docx, .xlsx, .pdf, .csv or .txt formats
  - (h) Option to directly print the customized report in .docx, .pdf or .txt formats
  - (i) An Explorer panel to organize contents in a tree view for easy navigation between data tables
  - (j) Option to include/exclude parts of the output to customize the report
  - (k) Easy navigation options within the explorer tree view
  - (l) Option to collapse or expand the explorer tree view
  - (m) Explorer panel location options based on user preference
  - (n) Option to keep explorer configuration based on user preference
  - (o) Option to toggle explorer On/Off
  - (p) Large preview area to evaluate the generated report
  - (q) Standard navigation options in the report preview
  - (r) Toolbar for easy and quick access to commands and options
  - (s) Page viewing options for the report preview
  - (t) Zoom and pan options in preview area
  - (u) Select and copy data options from the report preview
  - (v) Standard navigation options in report preview via page numbers and buttons
  - (w) Settings dialog box to set or modify preferences
  
2. Introduced new spResults module with the following features, for viewing and exporting input and output data
  - (a) Program results output in formatted data tables
  - (b) Viewing area to display data tables including associated notes and titles
  - (c) Option to toggle On/Off display of table notes
  - (d) Manual adjustment of data table column widths
  - (e) Ascending or descending sort option for each column in data table
  - (f) Select and copy option from the data table
  - (g) Standard navigation options within data tables

- (h) Toolbar for easy and quick access to commands and options
- (i) Auto adjust table option to fit column widths in the viewing area
- (j) Capability to switch to default/maximum permissible column widths
- (k) Option to export data table being viewed in .txt .csv or .xlsx formats
- (l) Standard navigation among data tables using table numbers and buttons
- (m) Settings dialog box to set or modify preferences
- (n) An explorer panel to organize contents in tree view for easy navigation between data tables
- (o) Standard navigation options within the explorer tree view
- (p) Option to collapse or expand the explorer tree view
- (q) Explorer panel location options based on user preference
- (r) Option to keep explorer configuration based on user preference
- (s) Option to toggle explorer On/Off

### 3. Added independent font options for printed outputs

#### **Enhancements:**

1. Provided additional web based resources and online help options in the help menu and disabled all options related to context help.
2. Optimized the diagram in print preview to cover maximum available space in the paper for clarity in printing.

#### **Resolved Issues:**

1. Resolved the issue of double image generation in PDF files created from print preview.
2. Resolved the issue of message boxes showing wrong titles.

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**spBeam v5.00 - Upgraded December 2015**  
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#### **Code Features:**

1. Added support for ACI 318-14 design standard in Metric and English units.
2. Added support for CSA A23.3-14 design standard in Metric and English units.

#### **Enhancements:**

1. Improved reporting of short and long term deflections by providing extended summary in new Deflection Results section and by detailing long-term and strip deflections by segments along the span allowing more transparency into displacements resulting from dead, live, sustained live, and total.
2. Resolved various issues related to deflection calculations:
  - a. Added sustained load as a load level in deflection calculations
  - b. Accounted for location in calculations of maximum long-term deflections

- c. Accounted for moment sign when calculating moment of inertia for cracked sections
- d. Accounted for non-prismatic members when averaging effective moment of inertia
3. Improved reporting of reinforcement by providing development lengths tables in design results of top and bottom bars designed for flexure
4. Provided a check to warn when bar cut-off location is in tension zones and shear capacity does not satisfy ACI-318, 12.10.5.1
5. Added indication of location of critical section for flexure and display the corresponding moment value in Moment Capacity graph similar to Shear Capacity graph
6. Provided a comparison table for applied and design moments detailing the required reinforcement by segment along the span
7. Documented the status of section capacity compared to applied moment and the corresponding governing pattern and load combination for maximum positive and negative moments
8. Included a warning message and report if flexural demand exceeds the flexural capacity in investigation mode
9. Enhanced zoom in, zoom out, and pan options in active screens

**Resolved Issues:**

1. Resolved issue with program hanging and/or producing many steel layers in order to resist very large bending moments

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**spBeam v3.60 - Updated April 2013**  
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**Resolved Issues:**

1. In investigation mode where required shear capacity provided by stirrups,  $V_s$ , exceeds  $4\phi\sqrt{f'_c}b_wd$  and user-provided stirrup spacing exceeds the halved ACI code maximum, the shear capacity – instead of previously used  $4\phi\sqrt{f'_c}b_wd$  – is now reduced to  $0.5\phi V_c$  resulting in lower beam shear capacity
2. Shear and torsional capacity in segments between support face and critical section for shear at span ends is now investigated explicitly rather than assumed to be the same as at the critical section for shear. In cases where shear reinforcement is reduced or discontinued between support face and critical section for shear, this may lead to insufficient shear and torsional capacity reported by program in the vicinity of supports.
3. For lightweight concrete beams, the lambda factor is now included in  $V_c$  to calculate the shear force threshold that triggers the halved ACI code maximum stirrup spacing potentially resulting in smaller stirrup spacing requirements

4. In investigation mode, to ensure that flagging of exceeded shear capacity in text results report matches the graphical results, text output now includes more segments where shear capacity is checked against the shear force
5. Improved program ability to recognize and flag in results report special conditions, such as stirrup area below minimum condition and inadequate stirrup spacing condition, encountered in shear design and investigation
6. For a single span model, the effective moment of inertia was modified to include only the effect of the midspan section instead of previously used midspan and right end sections. In single and multi-span beams, fixed ends are now treated as continuous end conditions. Depending on beam geometry and loading, the changes introduced in calculating  $I_{e,avg}$  can potentially result in a lower  $I_{e,avg}$  and higher deflections.

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**spBeam v3.50a - Updated May 2012**  
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Maintenance release to update installation procedure for systems with 64-bit version of Windows 7

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**spBeam v3.50 - Upgraded December 2011**  
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**Code Features**

1. Added support for ACI 318-11 design standard in English and Metric units.

**Enhancements**

1. Revised default value of rupture modulus,  $f_r$ , to half of its value for deflection calculations of one-way slabs and beams in accordance with the 3rd Update of CSA A23.3-04
2. Implemented several improvements clarifying program output
3. Improved calculations of bar development length resulting in reduction of the development length for some cases

**Resolved Issues**

1. Corrected output section for column axial forces and moments to remove double reduction for patterned live loads

2. Resolved several issues related to program output, installation, and checking for updates

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**spBeam v3.18 - Updated February 2011**  
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**Resolved Issues:**

1. For supports with column capitals, adjusted locations of critical section for flexure design from column face to capital face for interior supports and to one half of capital projection for exterior supports.
2. Allowed reduction of torsional moment to  $0.67 \cdot T_{cr}$  from full value if compatibility torsion is selected simultaneously with combined M-V-T design per CSA A23.3-04 code.
3. For combined M-V-T design, enforced bar sizes reported in Top Reinforcement table match bar sizes reported in Top Bar Details in all cases.
4. For CSA code, corrected the application of the 50 mm limit to clear effective concrete cover to be measured from bar surface rather than from bar center in calculation of maximum reinforcement spacing derived from crack control requirement.
5. Applied correction to deflections and internal forces for models with triangular and trapezoidal loads.
6. Relaxed minimum shear reinforcement requirements for beams meeting certain geometrical criteria stipulated by ACI 318 and CSA A23.3-94 standards. For details, refer to section One-Way Shear Analysis of Longitudinal Beams and Slab in Chapter 2 of spSlab Manual.
7. In Results Report, corrected Input Echo section with respect to reporting the presence of a cantilever on the right hand side of the model. This correction has no impact on analysis and design results.
8. Upgraded program documentation to address changes in the program and other editorial issues.

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**spBeam v3.12 - Updated September 2010**  
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Maintenance update to correct factors used for minimum area of transverse reinforcement calculations in metric units per ACI 318M-08 and ACI 318M-05 found in versions 3.10/3.11 and improve context sensitive help for some elements of the graphical user interface.

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**spBeam v3.11 - Updated April 2010**  
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**Resolved Issues:**

1. Revised Manual and Help documentation to enhance description of various program features and to resolve several typographical and formatting issues.

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**spBeam v3.10 - Updated January 2010**  
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**Enhancements:**

1. Adjusted ACI 318-08 metric factors for concrete shear capacity and minimum shear reinforcement calculations.
2. Revised minimum shear requirements for special members per ACI 318-08.
3. Revised normal weight concrete limit in development length calculations per ACI 318-08.
4. Revised lambda factors for lightweight concrete.
5. Improved development length calculations for structural semi-low density concrete for CSA code.
6. Revised Manual and Help documentation to increase accessibility and enhance description of program features.

**Resolved Issues:**

1. Exceeding combined M-V-T capacity of bottom bars in certain design cases.
2. Column reaction equal to zero for systems that include lateral loads and moment redistribution.
3. Applying default load combinations when switching design codes and no load cases are defined.
4. Applying default load combinations when switching design codes and SELF and/or DEAD load cases are not defined.
5. Providing results for combined shear and torsion in investigation mode.

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**spBeam v3.00 – Upgraded April 2009**  
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**Code Features:**

1. Added support for ACI 318-08 design standard in English and Metric units.
2. Added further support for CSA A23.3-04 floor systems with beams.
3. Updated Lambda factor calculations for lightweight concrete for consistency with latest standards and other StructurePoint programs.
4. Updated calculations for the following issues:
  - a. Minimum slab thickness limits in joist construction
  - b. Minimum slab thickness for lightweight concrete construction
  - c. Minimum beam/one-way slab thickness

- d. Minimum shear strength and reinforcement to address size effect of special members in ACI and CSA standards
5. Introduced unified treatment of effect of slab bands and beams in the transverse direction.
6. Incorporated new formulas for development and splice length in both English and Metric units.
7. Enhanced checking of structural integrity reinforcement and detailing requirements intended to mitigate the potential progressive collapse.

**Enhancements:**

1. Provided easier and faster access to software manual directly from the Help menu.
2. Improved shear and torsion capacity charts, various dialog windows, bar spacing requirements and significant digits for redistribution coefficients and development length constants.
3. Renamed pcaBeam, also formerly known as ADOSS, as **spBeam** to better relate and support the registered trade name of the publisher, StructurePoint, formerly PCA's Engineering Software Group.

**Resolved Issues:**

1. Corrected display of calculated axial forces and moments for circular columns modeled over beams.
2. Eliminated the occurrence of SELF load case in the span table

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**pcaBeam v2.51 – Updated January 2009**  
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**Resolved Issues:**

1. Editorial corrections in Startup Defaults dialog box and text output

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**pcaBeam v2.50 – Upgraded December 2008**  
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**Code Features:**

1. Added support for CSA A23.3-04 design standard

**Enhancements:**

1. Added SNOW load by default in load cases and load combinations
2. Provided capability to add and remove self weight from both ultimate and service load combinations
3. Included self weight and live load patterns in text report

4. Included live load pattern selection and an option to display load units in graphical load view
5. Provided capability to copy a set of stirrups from left side of a beam to the right
6. Provided capability to modify location of first stirrup
7. Improved placement of stirrup segments
8. Improved calculation of additional width due to stirrup bend
9. Improved calculations of distance from extreme compression fiber to centroid of longitudinal tension reinforcement in Design and Investigation modes
10. Reported segmental reinforcement requirements
11. Allowed one flexure bar in joist beams
12. Flagged flexural reinforcement if provided steel area in design mode exceeds maximum allowable
13. Added a warning and a flag for deep beams to indicate that additional design and reinforcement detailing is required
14. Provided capability to start design from the maximum bar size rather than minimum
15. Included rib spacing validation for joist slabs
16. Clarified input parameters for ribs
17. Updated and enhanced manual

**Resolved Issues:**

1. Corrected overestimated stirrup material take-off
2. Increased accuracy of self weight calculations for metric unit system
3. Self-weight is now included in load combination results for column axial forces
4. Corrected minimum slab thickness for slabs with transverse beams on discontinued edge per CSA code
5. Corrected integrity reinforcement calculations per CSA standard by using specified rather than factored loads
6. Eliminated Memory Allocation Error happening during flexure investigation of a failed design
7. Resolved Memory Allocation Error shown for systems with transverse beams extending beyond end cantilevers
8. Corrected load patterning for shear forces
9. Eliminated Memory Allocation Error happening randomly for beams with moment redistribution
10. Corrected minimum reinforcement calculations for beams with flanges in tension per CSA A23.3-94 standard
11. Corrected bottom reinforcement selection issue resulting in one bar (instead of two) that extends to the support in some cases
12. Supplemented maximum spacing limit requirements for one-way slabs to include provision 7.6.5 per ACI 318
13. Removed inadvertent flagging of torsion results occurring occasionally in torsion section of design results
14. Corrected axial forces and moments report to include results for circular columns

15. Resolved issue with inadvertent very small positive bending moments occurring intermittently on cantilevers
16. Corrected issue with values of lambda factor for long-term displacements for some sections with compressive reinforcement
17. Corrected bar development length for flexure design per CSA standard
18. Corrected weight of bar #15 in CSA G30.18 bar set
19. Corrected location of critical section for positive bending moments not to approach span ends closer than face of supports
20. Adjusted location of critical section for one-way shear in slabs supported by transverse beams
21. Removed error checking for support width in one-way systems
22. Resolved issue in Torsion Capacity view for mixed systems with beams and one-way slabs
23. Eliminated overlapping of Frame and Engineer labels in printout

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**12-15-2006 pcaBeam v2.00**  
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**New Features:**

24. Supports ACI 318-05
25. Includes calculation of long-term deflections

**Enhancements:**

1. Check for Updates command is added
2. The installation file is digitally signed by pcaStructurePoint
3. If all network license tokens are in use a warning message is now displayed
4. Improved reactions report
5. Properties of cracked sections are now reported
6. Flexural capacity now increases gradually over the development length of reinforcing bars
7. Side cover can be modified
8. Distance between bar layers can be modified
9. Number of stirrup legs in the design mode can be controlled
10. Steel requirements for structural integrity are now implemented
11. 80 (previously 40) character long descriptions are now allowed in General Info
12. Consistent coordinate system for loads and displacements is now introduced with axis Z pointing downward

Note: This may require changing the sign of prescribed displacement if they were entered into the data file using pcaSlab/pcaBeam v1.5x

**Resolved Issues:**

1. Incomplete data resetting from previous solution
2. Overestimated reinforcement bar lengths
3. Incorrect bar spacing for top reinforcement

4. Effective width and one tenth of span length are not taken into account for bar spacing in one way systems
5. Incorrect value of concrete modulus of rupture for the CSA standard when imported from ADOSS files
6. Incorrect values of column and shear forces for point loads located very close to a support
7. Reversed signs of support loads
8. Shear capacity jump in case of the first stirrup having zero area
9. Freezing of the program in some situations e.g.
  - (a) displaying combined shear and torsion capacity diagram for some models
10. Top reinforcement selection for a simple beam with no negative moments
11. Incorrect moment capacity display in cases with no bars and no moments
12. Double support loads shown in load view
13. Incorrect reporting of solution options in the input echo
14. Problems with file association for slb files in Windows environment
15. Glitches in the Input Wizard
16. Calculation of flexural capacity  $f_y = 87$  ksi and above
17. Slight overestimation of flexural capacity for CSA
18. Neglecting effective width when calculating flexural capacity
19. Neglecting bottom continuous bars in material takeoff for some models
20. Using slab cover for flexural capacity of a beam
21. Reporting bars covering the whole span as short bars (long should be reported)
22. Calculating capacity as if only one layer was used when flexure design results in two layers of bars
23. Converting two layers of bars to one layer when switching from design to investigation mode
24. Not taking stirrup diameter into account when calculating bar spacing in beams
25. Issues related to calculations of effective moment of inertia for cracked members
26. Default max bar spacing for CSA increased to 500mm from 450mm
27. Excessive reinforcement for one-way slabs due incorrect calculation of minimum spacing per CSA crack control requirements

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**pcaBeam v1.51 - 01-12-2006**  
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**Enhancements:**

1. pcaBeam can now import PCA-Beam v1.0x data files. See “Notes on PCA-Beam v1.0x data file import” below.
2. Maximum bar spacing in beams and one-way slabs now takes into account crack control requirements.

**Resolved issues:**

1. Issue of missing longitudinal torsional reinforcement details for some specific design parameters has been resolved.

2. Setting moment redistribution factors larger than 0 for cantilevers by copying redistribution factors from internal supports or by adding and removing spans has been disabled.
3. If the CSA code is selected, then the automatically calculated value of the concrete rupture modulus now defaults to  $0.5 \cdot f_r$ . However, if the full value has to be used, as for one-way slabs, then the default value has to be manually overwritten by the user.
4. For CSA code the minimum area of flexural reinforcement in beams is now correctly calculated based on the depth of the member instead of the effective depth (as for ACI).
5. Load combination numbers are no longer switched for M-ve and M+ve in the text output under Segmental Moment and Shear – Envelopes.
6. Overflow error in torsion design for load cases with no live load has been eliminated.
7. A “#” character can now be safely used in the text input fields. However, it is still not allowed to start a text input with “###”.
8. In investigation of punching shear, pcsBeam now uses the provided steel diameter and cover rather than assuming these values from design parameters.
9. pcaBeam icon is now correctly displayed under Add/Remove Programs in the Control Panel of the Windows system

**Notes on PCA-Beam v1.0x data file import:**

1. PCA-Beam v1.0x supported ACI 318-89 and CSA A23.3-84 standards which are not supported in pcaBeam. By default pcaBeam will assume ACI 318-99 or CSA A23.3-94 standards respectively.
2. PCA-Beam v1.0x allowed cantilevers with zero dimensions. However, they are not allowed in pcaBeam, so a warning will be displayed when such cantilevers are imported. They will have to be then removed or their dimensions will have to be corrected before the analysis can be performed.
3. The center segment of a three-lapped top continuous bar entered in PCA-Beam v1.0x will be ignored if its size does not match any of the right or left segments. This is because pcaBeam does support lapped bars and it does support top discontinuous bars.
4. The first stirrup in the span will be moved 3in [75mm] away from the face of the column (below) regardless of the first stirrup location set in PCA-Beam v1.0x. This is due to fixed location of the first stirrup assumed in pcaBeam.
5. PCA-Beam v1.0x load cases including lateral loads consist of two patterns: Left-to-Right and Right-to-Left. In pcaBeam, these two patterns will be converted to two separate load cases: Lat-L and Lat-R.
6. Due to slightly different input validation rules in pcaBeam and PCA-Beam v1.0x, it may happen that a valid PCA-Beam file will not run in pcaBeam. Similarly, it is also possible that files that failed in PCA-Beam v1.0x will run in pcaBeam.

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**pcaBeam v1.50 - 07-07-2005**  
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License file for pcaBeam versions 1.0x will not work with this release. This release is considered an upgrade and requires obtaining a new license code.

pcaBeam is now a limited version of pcaSlab v1.50 program. It includes the following features:

1. Analysis, design and investigation of beams and one-way slab systems
  2. Torsion analysis and design of beams (equilibrium and compatibility)
  3. Moment redistribution
  4. Improved licensing including:
    - multiple entries (each on a separate line) are allowed in the lshost.txt to achieve license server redundancy
    - LAN keyword can be specified in the lshost.txt file to instruct the license manager to search for a license in the local area network (within the same subnet)
    - complete licensing information displayed in the About box
  5. User interface enhancements including:
    - font selection is available for the text and the graphical output
    - reinforcement labels can now be rotated to fit better in the graphical output
    - reinforcement lengths are now be displayed in the graphical output
    - load factors can now be automatically reset when the code selection changes
  6. Enhanced documentation including:
    - context sensitive Help
    - reformatted and updated manual
1. t of negative (upward) load magnitudes.