ABCB

National Construction Code

Structural software

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Enquiries about this publication can be sent to:

Australian Building Codes Board
GPO Box 2013
CANBERRA ACT 2601
Phone: 1300 134 631
Email: ncc@abcb.gov.au
Web: abcb.gov.au

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Preface

The Australian Building Codes Board (ABCB) is responsible for developing and maintaining the National Construction Code (NCC) which, in turn, is given legal status by State and Territory Building Acts and Regulations.

This Protocol is designed to assist with the approval process when a design submitted for approval is produced using structural software without engineering supervision.

This Protocol is intended to define the minimum requirements that software must have to be suitable for designing in compliance with the Structural Deemed-to-Satisfy (DTS) Provisions of the NCC. The software output can be considered as evidence of suitability under NCC in A5.2(2).

Process for revising the Protocol

The Protocol may be subject to revision from time to time as necessary. Revisions will occur in consultation with the State/Territory building control Administrations.

State & Territory Regulatory matters

It should be noted that some States or Territories may have additional requirements for structural software.

Contents

1 Scope

This Protocol describes the essential elements of structural software that can be used for designing in compliance with the NCC Deemed-to-Satisfy (DTS) Provisions as well as general requirements for software documentation, testing, quality assurance and user training.

The scope of this Protocol is limited to structural software that-

(a) uses criteria derived from the NCC Deemed-to-Satisfy Provisions, (including its referenced documents);
(b) relates to the structural framing system of a building or structure, such as roof trusses and the like;
(c) is capable of computing all member loads and load effects;
(d) is capable of applying relevant provisions, including any discretionary factors, of the appropriate Australian Standards or other relevant documents:
(e) is capable of selecting the appropriate components for use in a particular design;
(f) when used as a computer-based submission as part of a building approval or the like, is not signed off by a professional engineer.

2 Limitation

The application of this Protocol is limited to structural software for steel and timber trussed roof and floor systems and framed building systems for buildings within the following geometrical limits:

(a) The distance from ground level to the underside of eaves must not exceed 6.0 m.
(b) The distance from ground level to the highest point of the roof, neglecting chimneys must not exceed 8.5 m.
(c) The building width including roofed verandas, excluding eaves, must not exceed 16.0 m.
(d) The building length must not exceed five times the building width.
(e) The roof pitch must not exceed 35°.

The Protocol does not apply to design software for individual frame members such as electronic tables similar to those provided in Acceptable Construction Manuals (e.g. AS 1684).

3 Software Requirements

To comply with this Protocol, software must have the following characteristics:

(a) Software must be based on relevant Deemed-to-Satisfy Provisions of the NCC and/or its referenced documents.

(b) Software inputs and outputs must comply with Clauses 4 & 5 of this Protocol.

(c) Authorship, testing, quality assurance, documentation and training of users must comply with Clauses 6, 7 & 8 of this Protocol.

4 Software Inputs

4.1 Software inputs must have the following characteristics:

(a) Inputs to software must be limited to items that can be readily identified in the documentation to be submitted for approval.

(b) There must be no manual over-ride on what can be considered as 'engineering criteria' and any other over-ride must be clearly stated in the output.

(c) Self-checking input error warnings must be incorporated.

Notes: 'engineering criteria' include, for example, requirement for full internal pressure due to wind actions, limitations on spans etc.; 'other over-ride' include, for example, options to include different roofing materials and additional loads such as solar panels etc.

4.2 If specific input information must be provided by a professional engineer then this must be made apparent to the user and the information must be clearly shown in the outputs.

5 Software Outputs

Outputs, relevant to the assessment of structural safety and used to demonstrate compliance with NCC Deemed-to-Satisfy Provisions, must include the following information:

(a) Name and version number of the software.

(b) Declaration of compliance with NCC Deemed-to-Satisfy Provisions and location of the Compliance Document (see Clause 8).

(c) Name and edition of NCC and the relevant referenced documents that have been incorporated into the software.

(d) Specific recommended installation/transport procedures if these procedures are essential parts of the design assumptions.

(e) Input parameter settings (including those that are locked in the software) when these are allowed in the NCC or referenced documents. These include any discretionary factors referred to in the appropriate NCC referenced document or other relevant document.

(f) No outputs are to be made available if the inputs exceed the declared limitations of the software.

(g) Name of the person who has used the program to produce the design so that their suitability/competence to use the program can be checked by the Approval Authority. Where appropriate their training or approval number for the use of the software should also be included, along with the period of validity.

6 Testing and Quality Assurance

6.1 The software supplier must have in place a quality assurance (QA) program which is independently verified by an appropriate organisation.

6.2 The QA program must validate that the software will perform the following functions as appropriate:

(a) Execute sound structural analysis.
(b) Apply relevant provisions, including any discretionary factors, in the appropriate NCC referenced document or other relevant document.
(c) Properly select from the appropriate components for use in a particular situation.
(d) Produce all appropriate outputs including items listed in Clause 4 and 5.

6.3 The method(s) of software validation must be identified in the Compliance Document (see Clause 8), in particular how the performance of the four functions in 6.2 (a), (b), (c) and (d) were ascertained and the name of the person or organisation who has carried out the validation.

Notes: The software validation can be carried out using a number of methods such as, alternative methods of structural analysis, selecting a variety of typical building applications and selecting a variety of structural configurations.

6.4 The author responsible for the preparation of the software must be competent in the practice of structural engineering.

7 Training of Users

7.1 A training program for users, including training in the current version of the software, must be available in accordance with the needs of the software.

Notes: If the software undergoes changes that require changes to the training program then the trained personnel must be informed and the training program updated.

7.2 Suitable means of identifying trained personnel must be made available to Approval Authorities. Suitable means may include one of the following:

(a) a letter or certificate (which could be presented to approval authorities when requested), or
(b) a unique training number (which can be quoted in the design documentation submitted for approval), or
(c) a list of trained persons made available in print or on web sites.
(d) In addition to (a), (b) or (c), the means of identifying the trained personnel must also include the name of the relevant software and the version.

8 Compliance Document

8.1 Documentation of the evidence to verify that a software package is suitable for demonstrating compliance with the NCC Deemed-to-Satisfy Provisions (including the referenced documents) is called a Compliance Document.

8.2 The Compliance Document must be kept by the software provider and made available for examination if requested by the Approval Authority or other person.

8.3 The Compliance Document must be appraised by an independent assessor who is competent in the practice of structural engineering to ensure that:

(a) the design process used in the software is in compliance with the NCC Deemed-to-Satisfy Provisions; and
(b) the management of the software is in accordance with this Protocol.

8.4 The independent assessor shall:

(a) where necessary, request further clarifications to be included in the Compliance Document; and
(b) certify in writing that the Compliance Document has been prepared in accordance with this Protocol; and
(c) provide a summary of the Compliance Document including critical inclusions, exclusions, referenced documents etc. to accompany any appraisal report and certification; and
(d) indicate in the certification the period of its validity.

8.5 The content of the Compliance Document must include all of the following information (not necessarily in the order indicated):

(a) Name of Software (including version number).
(b) Scope and limitation of application of software (particularly applications that are NOT appropriate for use).
(c) User Qualifications - degree of training/competence required, availability of list of qualified operators.
(d) Name and contact details of the organisation responsible for the software.
(e) Declaration of compliance and location of the Compliance Document.

(f) Name and edition of the NCC and its referenced documents that have been incorporated into the software.

(g) References for general installation instructions and specific recommended installation/transport procedures which are not part of the 'general requirements' or 'standard industry practice'.

(h) Evidence of software validation that has been done to substantiate the veracity of the outputs.

(i) Evidence of software quality assurance measures.

(j) Availability of guide or training for users.

(k) History of revision/upgrading.

(l) Software Features: Sufficient information must be provided to allow the approval authorities to determine whether the design process used in the software complies with the Deemed-to-Satisfy Provisions of the NCC and its referenced documents. The documentation must include:

(A) Input features:

(i) Relevant referenced documents

(ii) Loads and load combinations used in design

(iii) Options for loading inputs

(iv) Structural details: geometry, member properties

(v) Options for structural detail inputs

(B) Analysis and Design features:

(i) Relevant referenced documents

(ii) Type of analysis used in software

(iii) Assumptions made in analysis

(iv) Options available for analysis

(v) Member design procedures (strength & serviceability)

(vi) Connection design procedures

(vii) Other design features (bracing, lateral restraints etc.)

(C) Output features:

(i) Software capability to provide analysis outputs (e.g. action effects on members etc.)

(ii) Software capability to provide design outputs (e.g. design calculation, details for members and connections etc.)

(D) Samples of input /output screens and outputs used in submission to Approval Authority.

(E) Worked examples of typical designs covered by the software.

9 Maintaining and Upgrading Software

9.1 Software must be maintained to ensure its compliance with the current NCC at the time of use.

9.2 Any revisions, updates or new versions must be identified by a unique number or other form of designation. The status of any revisions, updates or new versions, such as whether it has been approved by an appropriate authority, must also be clearly indicated.

APPENDICES

Appendix A Information for Approval Authority

A.1 General

Date:

Reference No:

Property Title:

Building Classification and use:

Scope of Software:

Address:

Name of Software used in analysis (including version number):

Name and contact details of the organisation responsible for the software:

Name(s) of the person from the organisation that has produced the submitted design and who has checked the design inputs and outputs:

Appendix B Suggested Checklists

B.1 Checklist for Software User

Table B.1 Checklist for software users

Item	Yes	No
1. Is the software appropriate for the application and has it been used within the documented limits of the software?		
2. Have input sources been checked?		
3. Do the inputs to the software match the design documentation?		
4. Are the assumptions made in the software reasonable and match the design documentation?		
5. Have critical components been checked?		
6. Has documentation of any additional checks deemed to be warranted been included?		
7. List any major assumptions and provide comments on them (e.g. internal walls as supports, special hold-down requirements, top chord restraints, overhang support, special loads etc.)		

B.2 Site Checklist for the Construction Supervisor

Table B.2 Site checklist for the construction supervisor

Item	Yes	No
1. Have site storage and lifting caused any damage to the components?		
2. Have approved plans and layouts been followed?		
3. Have lateral and diagonal bracing specifications (temporary and permanent) been followed?		
4. Have connection, fixing and hold-down specifications been followed?		
5. Have instructions from the manufacturers been supplied and followed?		