

Government of Western Australia Department of Mines, Industry Regulation and Safety





Guidance Fire safety Performance Solutions

This guide has been produced to inform building surveyors, fire engineers, designers and others involved in developing and approving Performance Solutions relating to fire safety, of the practice that is expected by the Building Commissioner when developing fire safety Performance Solutions in Western Australia.

It also provides a benchmark when auditing registered building service practitioners and contractors. The information is current at the time of publication; however it may be subject to change.

Introduction

The *Building Act 2011* (the Building Act) and Building Regulations 2012 (the Building Regulations) in Western Australia adopts the Building Code of Australia (BCA) which is Volumes One and Two of the National Construction Code (NCC) as the applicable building standard. The NCC is published and maintained by the Australian Building Codes Board (ABCB) on behalf of the Australian Government and each State and Territory government.

The BCA is a uniform set of technical provisions for the design and construction of buildings and other structures throughout Australia. To comply with the BCA a building solution must meet the Governing Requirements and the Performance Requirements of the code. The Governing Requirements of the BCA, set out the governing rules as to how the BCA must be used and the process that must be followed.

Building solutions will comply with the BCA if it can be demonstrated that the relevant Performance Requirements have been met.

Compliance with the Performance Requirements can only be satisfied by a:

- (a) Performance Solution;
- (b) Deemed-to-Satisfy Solution; or
- (c) combination of (a) and (b).

While the Deemed-to-Satisfy Provisions (DTS) often provide a ready-made building solution with certainty of compliance, they may not always be cost effective or appropriate for every circumstance. The Performance Solution option allows flexibility and innovation in design.

Performance Solutions are commonly used for the fire safety provisions of the BCA and involve fire engineering.

About this guide

While this guide specifically relates to developing and approving fire safety Performance Solutions, the principles may apply to other types of Performance Solutions - with the necessary modifications.

Developing a fire safety Performance Solution is often complex and requires stakeholder input. This adds time to the overall project schedule, so it is important to consider Performance Solutions early in the design and not as a last minute fix to poor design or construction. Furthermore a Performance Solution isn't a mechanism for accepting non-compliance with building standards but a pathway for demonstrating compliance with the Performance Requirements of the BCA.

The table at Appendix A gives a general overview of the stages and responsibilities when considering fire safety Performance Solutions.

While not every aspect of a fire engineered Performance Solution is dealt with in this guide, the following key areas are covered:

- 1. Performance Solutions.
- 2. Fire Safety Verification Method
- 3. Qualifications of fire engineers and building surveyors.
- 4. Performance based design brief (PBDB)
- 5. Stakeholder engagement
- 6. Fire engineering report (FER)
- 7. Interface with relevant building services.
- 8. Department of Fire and Emergency Services (DFES) interaction.
- 9. Peer review.
- 10. Certification independence.
- 11. Certificate of design compliance.
- 12. Owner's responsibility.
- 13. Site completion.

Note: This is the third version of (Guidance on fire safety Performance Solutions) the publication.

Version 1 was originally published in November 2015 and version 2 was updated and republished in 2018 to reflect the change in NCC 2016 terminology from Alternative Solution to Performance Solution.

Version 3 reflects the introduction of the Performance Solution process in NCC 2019 Amendment 1, the Fire Safety Verification Method and the new Australian Fire Engineering Guidelines 2021 published by the Australian Building Codes Board.

In addition to participation from Department of Mines Industry Regulation and Safety (DMIRS), we would like to thank and acknowledge the members of the working group who have contributed to this version:

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1. Performance Solutions

Performance Solution is defined in the BCA as a method of complying with the Performance Requirements other than by a Deemed-to-Satisfy Solution. The pathway and appropriate steps for developing a Performance Solution are explained by the Governing Requirements.

To comply with the NCC a Performance Solution must demonstrate that it is compliant with either the relevant Performance Requirements or, be at least equivalent to the Deemed-to-Satisfy Provisions. They are to be developed in accordance with the Governing Requirements, including the use of appropriate Assessment Methods and the identification of all relevant Performance Requirements.

There are four steps to develop a Performance Solution:

- 1. Prepare a Performance Based Design Brief (PBDB)
- 2. Carry out analysis
- 3. Evaluate results
- 4. Prepare a final report

The final report must include:

- 1. All relevant Performance Requirements and DTS Provisions
- 2. All Assessment Methods used
- 3. Details of preparing the PBDB, the analysis carried out and the evaluation of results
- 4. Confirmation that the Performance Requirement(s) has been met
- 5. Details of conditions or limitation, if any regarding the Performance Solution

It is important that the person developing the Performance Solution understands the BCA requirements and intent. This knowledge and understanding is generally obtained from relevant skills, qualifications and experience. The onus is on the professional(s) carrying out the Performance Solution to provide sufficient documentation, evidence and validation to the building surveyor that the solution complies with the relevant performance requirements. Accordingly, it is important to involve the building surveyor early in the design stage as they can provide valuable guidance and interpretation on the BCA for the specific project.

Where the Performance Solution involves a specialist design the use of a suitably qualified and experienced person, such as a fire engineer in the case of fire safety, is necessary.

Nevertheless the building surveyor is responsible for approving Performance Solutions i.e. compliance with the Performance Requirements of the BCA when signing the certificate of design compliance.

The Australian Building Codes Board (ABCB) has published a handbook regarding the Performance Solution process and other resources, which may assist practitioners in meeting the Governing Requirements that apply to developing a Performance Solution.



Publications produced by the ABCB are freely available online at <u>www.abcb.gov.au</u>

2. Fire Safety Verification Method

The Fire Safety Verification Method (FSVM) is a Verification Method that provides a process for engineering the design of fire safety Performance Solutions. The FSVM is not mandatory and other Assessment Methods within the BCA may be more appropriate for a particular building.

The FSVM sets out twelve design scenarios that must be considered to demonstrate that the fire safety aspects of a Performance Solution comply with the relevant fire safety Performance Requirements provided in NCC Volume One and also requires that the fire safety aspects of the Performance Solution be at least equivalent to the Deemed-to-Satisfy Provisions.

The FSVM must only to be used by a professional engineer or other appropriately qualified person recognised by the building surveyor as having qualifications and/or experience in the discipline of fire safety engineering. Users should amongst other things be:

- proficient in the use of fire engineering modelling methods; and
- familiar with fire testing and validation of computational data.

Further information and examples regarding the use and suitability of the FSVM is provided in the Fire Safety Verification Method Handbook published by the ABCB.

Where a Performance Solution pathway is adopted to demonstrate compliance with the fire safety Performance Requirements of the BCA, the FSVM offers one, but not the only, solution. Performance Solutions conforming with the Governing Requirements, other than the FSVM, may also be developed to demonstrate compliance.

3. Qualifications of fire engineers and building surveyors

Western Australia does not currently have a requirement for registered fire engineers. However it is expected that fire safety Performance Solution designs are carried out by fire engineers with sufficient skills, qualifications and experience for the specific project. This is similar to structural engineering being carried out by a suitably qualified and experienced structural engineer.

Fire engineering may include qualifications such as an undergraduate degree in Fire Safety Engineering, a post graduate qualification in fire engineering and may also include registration with a relevant association such as the National Engineering Register, or being a registered fire engineer for the purposes of Building Code compliance in another State.

The building surveyor signing the certificate of design compliance is responsible for approving any Performance Solution and needs to be satisfied that the person carrying out the Performance Solution has the appropriate competency for the proposed building type and complexity. It is recommended that where necessary, further information on the fire engineer's qualifications and experience is requested to determine whether or not their competency and credentials are suited to the proposed project.

Complex Performance Solutions may require an engineer who has advanced qualifications and appropriate experience relevant to the type of Performance Solution proposed and/or involve the input of other specialists such as mechanical, electrical, structural and hydraulic engineers for example.

It is also expected that the building surveyor responsible for the project has the relevant competency appropriate to the complexity of the building solution. It should be noted that registration as a Level 1 or Level 2 building surveyor alone does not necessarily mean a building surveyor has the relevant qualifications, knowledge or experience to evaluate and assess the building surveying components of a Performance Solution. Where a fire safety Performance Solution involves complex fire engineering the building surveyor should have additional qualifications and sufficient experience in fire safety or be consulting with another building surveyor that has the necessary qualification and experience.

Building surveyors should be scrutinising fire engineering designs, in particular the performance-based design brief and final report. They must understand what has been proposed and/or designed before signing a certificate of design compliance. It is not acceptable for a building surveyor to rely on a fire engineer to develop a performance-based design brief and final report in isolation.

4. Performance-based design brief

The development of a performance-based design brief (PBDB) is fundamental and forms the basis of the process to develop any performance solution.

Fire safety Performance Solutions must be developed in accordance with the BCA. This includes the four step Performance Solution process as detailed in the Governing Requirements. Step 1 of the process requires the development of a PBDB, defined as:

"the process and the associated report that defines the scope of work for the performancebased analysis, the technical basis for analysis, and the criteria for acceptance of any relevant Performance Solution as agreed by stakeholders."

The ABCB Performance Solution Process Handbook provides further guidance on developing a PBDB. In addition, the Australian Fire Engineering Guidelines 2021 (AFEG), also published by the ABCB, provides guidance on the appropriate process and report required by a PBDB specific to a fire safety Performance Solution.

Unlike other engineering disciplines, such as structural engineering, where the scope of the work and the structural analysis is fully covered by Deemed-to-Satisfy standards, fire engineering requires the scope and inputs to the engineering analysis to be defined and agreed upfront. The development of the PBDB is therefore an essential part of the fire engineering process.

Fire can be very unpredictable and it may not be feasible to evaluate every possible scenario. The PBDB provides the process by which the building surveyor and fire engineer, together with other relevant stakeholders, identify the most significant hazards and most likely scenarios in order to establish, quantify and set the design parameters. The way a PBDB is documented has to be determined on a case by case basis. AFEG notes that "... for a simple departure from a DTS Provision, the PBDB might be a short document (written, printed or electronic, which could include email communication). However, for large and/ or complex projects, the PBDB could be a comprehensive report."

The Performance Solution Process Handbook notes :

"The final element of the brief is the endorsement of stakeholders verifying that each understands the brief and accepts its content. Typically a brief should include:

- a summary of the proposal
- a description and explanation of the proposed solution
- nominated applicable Performance Requirements
- agreed acceptance criteria
- required scope of supporting evidence
- format and content of the final report
- acknowledgment of participants."

The ABCB FSVM handbook notes that, "While full consensus on all aspects of the PBDB is the preferred outcome, it is acknowledged that in some instances this may not be possible. If full consensus cannot be achieved, dissenting views should be appropriately recorded and carried throughout the process and considered by the [building surveyor] when determining compliance and as part of the approvals process. Under these circumstances the [building surveyor and fire engineer's] primary responsibility is addressing life safety and being able to clearly demonstrate that compliance with the BCA and other relevant safety regulations and objectives has been achieved."

5. Stakeholder engagement

The relevant stakeholders required for the design of the Performance Solution will vary for every project. The Building Commissioner expects building surveyors and fire engineers to be following the guidelines in the AFEG which includes the following stakeholders:

- Client or client's representative (such as a project manager)
- Fire engineer
- Building surveyor
- Architect or designer
- Department of Fire and Emergency Services

More complex projects may require stakeholder input from various specialist consultants such as hydraulic; mechanical; structural or electrical engineers. It may also include tenants; building operations management; insurance company representative and the permit authority. The PBDB must be developed collaboratively by the relevant stakeholders.

6. Fire engineering report

As outlined in AFEG the fire engineering process typically goes through five stages:



Typical fire engineering process (AFEG)

After the PBDB is finalised, the fire engineer carries out analysis, modelling or testing, then collates and evaluates the results to ascertain if the agreed acceptance criteria in the PBDB have been met. This process may need to be repeated until results satisfy the agreed acceptance criteria and demonstrate compliance with the relevant Performance Requirements of the BCA to form part of the fire engineering report (FER). Where it is proposed to amend an FER it will be necessary to revisit the steps of the Performance Solution process and amend the PBDB, re-conduct analysis and revaluate results before amending the FER. Undertaking these steps will require consulting with the relevant stakeholders.

For the purposes of the Performance Solution process required by the Governing Requirements of the BCA, the FER may be the final report for fire safety Performance Solutions.

Carrying out these five stages is of little use unless it is reported in a transparent manner that is responsible, accurate and aimed at helping the decision maker (i.e. the building surveyor), is useful to the builder for construction, and the owner and permit authority for any future compliance purposes.

AFEG notes that "the FER should be a selfexplanatory document" which "provides not only the justification for the fire safety system used, but also detailed requirements to ensure that the design documentation includes the necessary construction, commissioning, operation and maintenance requirements".

AFEG provides the following headings for a possible format for the FER:

- Executive Summary
- Collating/evaluating results (with annotated drawings)
 Conclusions
- IntroductionPBDB

Analysis

- References
 - Appendices

7. Interface with relevant building services

Some fire safety Performance Solutions may affect the design of other services or building elements. For example, an enhanced smoke management system may be proposed that relies on the operation of the smoke exhaust system at a specific rate on activation of particular detectors (not all smoke detectors). In this case, the mechanical engineer will need to design the exhaust system to achieve the rate specified; and the electrical/fire services consultant will need to ensure that the smoke exhaust system operates as required on activation of the particular smoke detector/s in accordance with requirements of the fire engineering report.

The building surveyor must work with the fire engineer to ensure that the designs provided by the various consultants are in accordance with the FER. The building surveyor must be satisfied that the correct interface activities have occurred prior to signing and issuing the certificate of design compliance. This includes the correct information being relayed in the technical plans and specifications of the relevant engineering/consultant documentation. These aspects will also need to be checked at construction completion and may require further inspection, testing and certification at other stages during construction.

8. Department of Fire and Emergency Services interaction

DFES does not have an approval role for building standards under building legislation. However, DFES provides valuable advice on ensuring the Fire and Emergency Services (FES) Commissioner's operational requirements are met in the interests of fire fighters and the public. DFES is an integral stakeholder in developing the PBDB and FER and should be consulted from the early stages particularly when developing the PBDB.

The Built Environment Branch of DFES can be contacted for further information on DFES interaction in the fire engineering process.

The Building Regulations 2012 (the Building Regulations) requires the building surveyor to provide to the FES Commissioner plans and specifications, in sufficient detail to allow assessment of compliance with the FES Commissioner's operational requirements, at least 15 business days before signing a certificate of design compliance in respect of certain Class 2 to Class 9 buildings. This requirement is separate to DFES involvement as a stakeholder in developing a fire safety Performance Solution in accordance with the BCA and AFEG.

It is the building surveyor who has the authority to certify compliance with the Performance Requirements of the BCA and the building surveyor can decide not to take the advice of the FES Commissioner particularly where the advice does not relate to compliance with the BCA. However, the building surveyor may wish to liaise with the owner and DFES over the FES Commissioner's advice on operational requirements to mitigate any risk of facing enforcement action under the separate legislation administered by DFES.

There is a further requirement for the building surveyor to notify the FES Commissioner of any advice provided by the FES Commissioner that will not be included in the building design, and the reasons for not taking the advice provided, within 10 days of receiving the advice. While a building surveyor may confer with an expert on the matters raised by DFES, ultimately the building surveyor makes the decision to accept or reject the advice. It must be clear in the response to the FES Commissioner that the reasons for not taking the advice have been carefully considered and are those asserted and determined by the building surveyor and not another person.

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DFES have forms on their website for the purpose of submitting plans and specifications to the FES Commissioner www.dfes.wa.gov.au

9. Peer review

A peer review may be considered where a significant level of risk associated with the Performance Solution may be conceived, the solution involves several complex and possibly compounding building solutions, or where justification is required on Expert Judgement. In general the building surveyor, design team or stakeholder consensus may dictate if a peer review is required. However, given that the building surveyor is taking responsibility for approving the fire safety Performance Solution, the building surveyor needs to decide if the circumstances warrant a peer review.

Separate to any peer review, the building surveyor should confirm that the fire engineering design has undergone an appropriate quality assurance process. This may include that reports and calculations have been checked and approved by a competent person other than the author.

A peer review should be a constructive process to assist in the approval of fire safety Performance Solutions and not be a critique of fault finding and negative judgement. The person carrying out any peer review must have at least equivalent competencies and experience to the person carrying out the fire engineering.

10. Certification independence

Section 4 of the Building Act refers to an independent building surveyor. An independent building surveyor cannot be the owner or builder or be an employee of the owner or builder.

In addition to this, building surveyors need to also be aware of the WA Building Surveyors' Code of Conduct (the Code of Conduct) which sets out minimum expectations of registered building surveyors undertaking building surveying work in Western Australia (WA). The Code of Conduct includes an expectation that a building surveyor will not:

"perform a statutory function in relation to building work they have assisted to design, or develop a Performance Solution for", with the explanatory information noting that:

"Building surveyors must not accept roles where they are required to certify their own work as this is inconsistent with the independent nature expected of statutory functions."

This expectation does not prevent a building surveyor from "being involved during the design process" and they may:

"discuss the concept of performance solutions, and which performance requirements are relevant to a specific DTS deviation and provide input into a performance-based design brief (PBDB) as an Appropriate Authority stakeholder...". — Refer to the Code of Conduct for further information.

A building surveyor, when signing such certificates, should be cognisant of his or her level of competence and expertise and must not under any circumstances sign a compliance certificate if there is any uncertainty on the compliance with the applicable building standards. Under the Building Services (Registration) Act 2011, a registered building surveyor can face disciplinary action if found to be negligent or incompetent in connection with carrying out a building service.

Determining compliance with Performance Solutions can be particularly complex and in most cases will require extensive input from persons with expertise beyond that of a competent building surveyor. The usual skills and training provided as part of building surveying qualifications does not provide sufficient detail in the competencies required to carry out engineering analysis and reporting.

11. Certificate of design compliance

Regulation 18A(c) of the Building Regulations states that a certificate of design compliance for a class 2-9 building must include:

"a statement about each Performance Solution to a building standard that applies to the building work and details of the assessment methods used to establish compliance with the building standard"

This provision is satisfied if the certificate of design compliance references an FER prepared in accordance with the BCA.

Where a Performance Solution is in place in an existing building, and new works are proposed, any effect on the existing Performance Solution must be considered and noted on the certificate of design compliance for the new building works. The impact of proposed works to a building with existing Performance Solutions may not be readily apparent and therefore may require consultation with the fire engineer.

For all buildings, including Class 1 and Class 10 buildings, the application for a building permit must include details of each Performance Solution.

A certificate of design compliance must be in an approved form and must contain a statement, by the building surveyor signing the certificate, that if the building is completed in accordance with the plans and specifications that are specified in the certificate, the building will comply with each applicable standard (namely the BCA). Accordingly the plans and specifications should be sufficient in detail to clearly show how the building will be constructed to comply with the BCA including any Performance Solutions.

12. Owner's responsibility

Fire safety Performance Solutions will continue to have an impact beyond the completion of the building project, at which stage there is often a wholesale transfer of responsibility for the ongoing implementation of the Performance Solution to the building owner. AFEG identifies that people involved in developing and approving fire safety Performance Solutions are to ensure that requirements relating to the "management, use, maintenance, audits, alteration/extension of and change of use of the building" are communicated in a "self-explanatory" manner to all stakeholders being agreed upon during the PBDB and detailed in the FER. An owner's acknowledgement letter regarding any Management in Use provisions in the fire engineering report should be required prior to the signing or issuing of the certificate of design compliance.

Fire safety Performance Solutions can result in complex interactions between different systems and increasingly sophisticated protection systems. These interactions may be confusing to manage over the life of the building. Fire engineers developing fire safety Performance Solutions must consider management and maintenance practicalities in the design.

A Performance Solution may be attractive in providing cost savings at the design stage but may be more costly and less economical in the long term if the maintenance requirements are overly complicated or onerous. The Performance Solution should consider future impact on owners and tenants.

While there is no reporting mechanism for the maintenance of safety systems, Regulation 48A of the Building Regulations contains requirements for the owner of a Class 2 to Class 9 building to ensure safety measures perform to a standard not less than they were originally required to achieve. The owner should have operational manuals and appropriate documentation in order to meet their obligation for maintenance.

13. Site completion

On completion, a builder is required to submit a notice of completion to the permit authority along with test certificates for the mandatory tests listed in Schedule 3 of the Building Regulations relating to fire safety performance requirements. The permit authority must set out in the building permit each of these inspections and tests, including those that may form part of the FER.

The process of applying for an occupancy permit is separate to the builder's notice of completion. The determination of compliance and issuing of any certification by the building surveyor must be independent to the builder. The building surveyor should carry out the necessary inspections; witness any relevant tests; and collate relevant construction documentation in order to be satisfied that the building work has been completed in accordance with all the relevant plans and specifications, including the fire engineering report, before signing the certificate of construction compliance. The fire engineer may also be required to carry out site inspections; witness tests/commissioning; and collate relevant certification from sub-contractors to confirm that works have been completed in accordance with the approved FER. It is up to the building surveyor to insist on such inspections by the fire engineer if they are necessary for the building surveyor to be able to sign and issue the certificate of construction compliance.

Regulation 35 of the Building Regulations contains the requirement to clearly display the occupancy permit at or near the principal entrance of the building or related part of the building.

A condition on the occupancy permit will assist building occupants on any Management in Use requirements associated with the fire safety Performance Solution for the building. This may include reference to the FER and possibly a summary of the Performance Solutions.

The permit authority may determine any relevant conditions to place on an occupancy permit with assistance from the building surveyor to correctly document conditions relating to Performance Solutions.

Other alternative measures may be considered to ensure relevant information about Performance Solutions continues to be conveyed to building owners during the life of the building.

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APPENDIX A

The table below below gives a general overview of the stages and responsibilities when considering fire safety Performance Solutions.

DESIGN		
 Building surveyor: Identifies areas of non-compliance to Deemed-to-Satisfy Provisions of the Building Code of Australia (BCA). Before any fire engineering starts identifies and agrees on performance design philosophies in principle. Ensures that any Performance Solution is developed in accordance with the Governing Requirements of the BCA. Agrees to the performance-based design brief (PBDB) to enable fire engineering report (FER). Reviews and provides comment on fire engineering proposals in context with the BCA performance requirements. 	Fire engineer: Develops PBDB with stakeholder input, undertakes analysis, evaluates results against assessment criteria, and documents the process in the (FER)	Design team (e.g. architect, services consultants, fire engineer and building surveyor): Relevant liaison occurs with the Built Environment Branch of the Department of Fire and Emergency Services (DFES) and other stakeholders on the PBDB and fire engineering throughout the design process.
DESIGN APPROVAL		
Building surveyor: Completes a certificate of design compliance (CDC) when satisfied the fire safety Performance Solution, along with overall building design, comply with the Performance Requirements of the BCA. Note: For all Class 2 to Class 9 buildings involving Performance Solutions relating to fire safety, the building surveyor must provide plans and specifications to the FES Commissioner at least 15 business days before signing the CDC. Any advice from the FES Commissioner and any reasons for not incorporating that advice must be noted on the CDC.	Fire engineer: Provides final FER confirming the acceptance criteria in the PBDB have been met.	Design team: Ensure final documentation is consistent with fire engineering report for providing to the building surveyor for the certificate of design compliance. May assist the building surveyor in providing any further comment on FES Commissioner advice.
CONSTRUCTION		
Building surveyor: May carry out inspections to ensure compliance with plans and specifications including that the fire engineered solutions specified in the relevant CDC are being achieved during the construction stage.	Fire engineer: May inspect site during construction and provide advice on the FER during construction.	Builder: Ensure construction is being carried out in accordance with the plans and specifications, including fire engineered solutions specified in the relevant CDC.
COMPLETION		
Building surveyor: Must be satisfied the building has been completed in accordance with the plans and specifications including FER specified in the relevant CDC prior to signing a certificate of construction compliance for the building owner or occupier to obtain an occupancy permit when one is required.	Fire engineer: Inspects and gathers relevant information to confirm requirements of FER have been met.	Builder: Must submit a notice of completion with relevant test certificates. Owner: Has responsibility to maintain the building's safety measures including any requirements in the FER.