Guidelines

For inspection of class 2 to 9 buildings

Building Codes Queensland
Department of Housing and Public Works

Queensland Government

Version 1 - Published 29.6.2012

Contents

Scope

The scope of these guidelines is limited to inspection of class 2 to 9 buildings as defined in the Building Code of Australia (BCA).

Purpose of these guidelines

The purpose of these guidelines is to provide building certifiers with guidance on how to meet their responsibilities for sufficient inspections under the *Building Act 1975* (BA) and the Building Regulation 2006 (BR).

Guidelines for the inspection of building work in class 2 to 9 buildings will not only help ensure safe community outcomes through higher levels of statutory compliance of buildings, but will also encourage accountability among building industry practitioners.

Legal status of these guidelines

These guidelines are made under section 258 of the BA which provides for guidelines to be made to help achieve compliance with the BA.

Section 133A of the BA requires a building certifier, in performing a function under the BA, to have regard to the guidelines made under section 258 of the BA.

Section 24(2) of the BR requires that building certifiers must set out the stages of work that require inspection in the conditions of the building development approval.

Evidence of regard to guidelines made under the BA may assist a building certifier in the event of a complaint about the performance of a building certification function.

Background

A building certifier is responsible for managing the building approval process with all relevant practitioners. This important role ensures that all the aspects of the building work comply with the building assessment provisions of the BA. Building certifiers are required to undertake sufficient inspections of buildings at stages at which the building development approval states the work must be inspected. In practice, this means that a building certifier is required to take a holistic view of a building rather than just consider a single aspect, such as structural adequacy.

The BR requires mandatory inspections for more simple buildings and structures, such as houses (class 1a buildings) and sheds and garages (class 10 buildings and structures). Guidelines are available for these classes of buildings to assist building certifiers to undertake inspections.

The BR does not currently provide a similar inspection schedule for class 2 to 9 buildings (which include multi storey residential buildings, office buildings, shops, public halls and commercial and industrial buildings).

A risk-based approach to inspection of class 2 to 9 buildings

These guidelines apply a risk-based approach to the inspection of class 2 to 9 buildings. The guidelines aim to provide practical and effective methods for building certifiers to meet their statutory duties and obligations. A risk matrix, with examples of suggested application to particular buildings, forms part of the guidelines and complements the risk-based approach to inspections.

The size, complexity, and nature of some class 2 to 9 buildings means it is not practical for a building certifier to inspect every element of the building for compliance with the building assessment provisions of the BA.

To ensure best industry practice, building certifiers must consider assuming responsibility for determining and implementing an inspection schedule (i.e. what should be inspected and when) for the various aspects of building work.

An inspection schedule that relies on prescriptive, itemised checklists may not sufficiently address the varying complexities that exist between class 2 to 9 buildings. This could lead to instances where low-risk buildings are over inspected (significantly adding to costs and delays) and high-risk buildings are under inspected (increasing the risk).

A best practice method of inspections of class 2 to 9 buildings should directly address the risk of the building. A risk-based approach allows building certifiers to take an overall view of the safety requirements of a building and establish an inspection schedule.

Getting started

Intended use and classification of the building

The use of a building will ultimately determine how it is to be classified under the BCA. Classifying a building involves a process of understanding risks according to its use. It is therefore critical to clearly understand the intended use of a building so the appropriate classification is applied. Correct classification will achieve the assessment and application of the relevant provisions of the BCA. This will provide a basis for establishing the most beneficial schedule of inspections to ensure proper compliance.

Most large commercial and public buildings will involve multiple uses and therefore different levels of risk will apply. Correct classification of these different parts of the proposed building is imperative so that the applicable building code provisions can be identified and an appropriate inspection schedule can be established. It may become clear that a building will have higher-risk uses (such as a hospital) while also accommodating lower-risk uses (such as car parking).

The delineation of these risks is the first step for a building certifier to consider when determining the inspection schedule and allocation of resources. This will assist in ensuring compliance with the BCA and approval documents.

The importance of detailed documentation

A building certifier should require that satisfactory levels of detailed documentation are provided so that the necessary building code compliance assessment can be properly carried out. The ability to refer to detailed documentation provides a vital reference tool and assists in ensuring that inspections of key building elements are conducted and not inadvertently overlooked.

The effectiveness of an inspection is enhanced by the clarity of information in the approval documents. With complex matters involving things such as fire safety systems, there may be a need to complement details on plans with relevant specifications. It may be that the plans provide a location of a particular component while its installation and function is better understood through supporting information.

A building certifier should require all necessary information to be readily available to assist in formulating an inspection schedule. An added advantage of readily available information is a reduction in unnecessary interruptions to the continuity of the process. For example, the location of smoke exhaust intakes can be easily identified on general plans. The construction and integration of the required ductwork may necessitate far more detailed specifications for such things as fire dampers, support mechanisms and system monitoring. Consideration of such matters in the assessment of an application is necessary so that the effectiveness and timing of on-site inspections is further enhanced.

Even though simple matters such as ceiling heights may only require indicative representation in documentation, they may have an impact on the timing of inspections and other associated elements.

The importance of detailed documentation should not be underestimated in the context of inspecting building work. The role of a building certifier was explored in the legal case of *Toomey v Scolaro's Concrete Constructions Pty Ltd [2001]* (Toomey's case). This case is discussed later in these guidelines and highlights a building certifier's responsibility in relation to examination of details in plans and documents for compliance with building legislation and standards. The case makes it clear that the responsible building certifier needs to carefully check the details of the plan against the applicable standards and codes. Any ambiguity in the plans should be resolved and errors corrected before proceeding with construction of the work.

Care needs to be taken to adequately identify where an alternative solution is proposed. Particular aspects of the proposal may warrant a specific inspection. This is especially important for unusual or unique proposals because the relevant practitioners may have limited experience in undertaking the work. For example, an alternative solution may have a number of important facets such as the expected airflow from smoke extraction fans. During construction, a contractor may decide to purchase a different model of fan which may affect the operation of the fire safety system during a fire. Only an inspection would identify this crucial change.

On-site and general compliance checking

On-site construction is a translation of the detail in plans and specifications to the physical fabric and elements of a building. The more detail available to a builder, the easier it is to provide a finished product that will comply with the approval documents and the applicable building codes. While this may be self-evident, it will only be effectively achieved if sufficient inspections are conducted to ensure compliance.

Building certifiers are responsible for ensuring specific compliance is achieved. Visual inspections, carried out by the building certifier or a competent person on their behalf, are the most effective way of confirming that the details of the documentation are reflected in the actual on-site construction. However, building certifiers are not responsible for the quality of workmanship within the construction process. This is the contractual obligation of the builder to the client.

It is essential at the early stage of construction that the building certifier ensures the building is located on the site, in accordance with the building development approval.

For example, before the building work substantially commences, the building certifier should require evidence confirming the building will comply with the building development approval conditions.

Toomey's case (referred to above) indicated that building certifiers must oversee building code compliance and instigate some reasonable and reliable checking process. As class 2 to 9 buildings contain a large range of safety features specified by various parts of the building code, this is an important practice to adopt.

A realistic level of random auditing by a building certifier (or a competent person inspecting on their behalf) should form part of a reasonable inspection schedule. For example, a building may require systems of smoke detection, sprinkler protection, fire collars, fire hydrants and various other fire safety systems. A reasonable level of auditing inspections may involve random checking of some matters of compliance for each system on a number of levels of the building. Examples of how such an audit might be achieved include but are not limited to:

- fire-rated penetrations
- sound-rated construction for duct work
- concealed space detection as part of a fire safety system.

When noncompliance is detected during an audit, the building certifier should consider increasing the frequency and detail of inspections. This will ensure overall compliance with the building development approval is achieved. Reinspection of those identified noncompliant elements of the construction may have to be undertaken. It would not be acceptable to leave all the compliance matters to be confirmed only by installer certificates.

Managing the process

Effective communication

There is a diverse range of people involved in the construction of a modern building. A building certifier needs to develop effective communication strategies with all of these people. Identifying risks, ensuring the availability of detailed plans, and developing inspection schedules will be of little value if they are not supplemented by effective, ongoing communication. This is particularly important where there have been design or other changes throughout the construction of the building that have not been made known to the building certifier.

A tragedy in South Australia highlighted the fact that each specialist area tends to communicate to its own very limited field of participants and not to the broader group of consultants, contractors and other professionals. The incident involved the collapse of a trussed roof on a bowling club and was the subject of a recent coronial inquiry. In this case, the Coroner made comments in relation to the way in which different participants in the building industry communicate or, rather, fail to communicate well. The Coroner commented that it was clear from the evidence in the inquest that the building industry is highly compartmentalised.

Simply conveying a piece of information to another party may not be sufficient if the party is not aware of the significance of the information. In complex buildings there may be a broad cross-section of consultants and other building professionals all responsible for various building systems and components. It is inevitable that these systems and components will in some way integrate with each other as part of the complete building. For example, a mechanical ventilation system operating as smoke extraction may pass through elements of construction (i.e. walls and floors). The construction of both of these elements is managed by different practitioners who must communicate effectively to ensure that each system complements the other so that compliance is achieved.

It is crucial that everybody involved in the building process has established clear lines of open communication to share information. A building certifier has responsibility to ensure the completed building complies with the approval and BCA. To help achieve this, a building certifier should, as far as practicable, encourage communication between relevant practitioners at the beginning of a project. For example, a building certifier, upon approval, could arrange to meet practitioners responsible for managing a building project to establish the extent of the construction program and key areas requiring inspection. At this point the building certifier could emphasise to the building contractor the importance of being notified of any changes to relevant practitioners involved in the project.

Managing changes to the construction of a building

The more complex the building project, the higher the likelihood will be of changes to design, specifications or other crucial elements throughout the construction phase. While this is considered normal for complex projects, it is an issue that can cause significant problems with overall compliance with the BCA.

As part of the communication strategy, building certifiers should request that they be advised of any proposed changes to the construction of a building. Even the smallest changes can impact on whether or not a building complies with the building code.

Building certifiers should consider the potential for consequential implications of any change and whether additional checking is required. A lack of communication may result in significant rescheduling of inspections which subsequently impacts on costs and project timeframes.

Departures from the approved plans, such as changing the waterproofing treatment to an external balcony from a thin membrane to a thick mortar bed, can impact on the final critical dimension of the balustrade height. If this is not made known to the building certifier when it occurs, and construction continues, it may result in significant, time-consuming and costly remedial work. Regular audits by the building certifier will minimise the likelihood of these changes remaining undetected.

Managing changes to practitioners involved in the building process

Similar to changes in the actual construction of a building, changes to the practitioners involved in a building project can cause issues relating to overall compliance. If a practitioner changes throughout the course of a building development, building certifiers need to consider several consequences that might arise with respect to this change.

For example, if a new practitioner is responsible for a component of the building's design, the building certifier must establish, and be satisfied with, the level of competence of the new practitioner. A building certifier must be aware of the impacts upon systems and building components that may flow as a result of the introduction of the new practitioner. The introduction of a new practitioner could result in a change to the design which will require reassessment and amended approval of the changed elements.

If a specific component, such as a fire safety system of the building, is under the control of a new practitioner (including one relating to a design and construct contract), a building certifier will need to assess the work to ensure continued compliance with the approval and BCA. If a new assessment is required it must be carried out promptly so as not to interfere with the construction program. It will also ensure that any impacts on other systems or building components are understood and also checked for continued compliance.

Risk matrix: a tool for establishing a sufficient inspection schedule for class 2 to 9 buildings

The use of a risk-based approach to developing and implementing a sufficient inspection schedule can be achieved through a risk matrix that assigns buildings a rating based on certain criteria. The risk rating assists the building certifier in determining an inspection schedule, including the type and frequency of inspections required.

How to use the risk matrix

The risk matrix contained in these guidelines identifies three risk categories: low, medium and high. To establish the risk level, a building is assessed against five risk factors. Each risk factor contains broad criteria against which to compare buildings so that a risk level can be established.

A risk level is established if all the criteria under a particular level are met. For example, a building will be considered to have a low-risk level if it meets and does not exceed any of the risk factor criteria for that level. If the criterion of one or more risk factors under the low-risk level is exceeded, the building's risk level would be increased to the next relevant level.

This matrix is a guide to establishing the level of risk. There may be development proposals that present unique risk factors that are not specifically addressed. In these cases the matrix should be considered in context, along with any additional unique factors, to arrive at a logical level of risk for a proposal.

Risk matrix

Risk factor	Risk level		
	Low risk	Medium risk	High risk
Building classification	Building is a class 2, 3, 4 (part of a building), 5, 6, 7 or 8 and has a rise in storeys of less than three storeys.	Building is class 2, 3, 4 (part of a building), 5, 6, 7 or 8 and has a rise in storeys of more than three storeys.	Building is class 9 or of any class determined to be of importance level 3 or 4 in accordance with the BCA.
Height/floor area	Not greater than three storeys above the ground. Fire compartments do not exceed the provisions of BCA Table C2.2.	More than three storeys above ground but no more than 25 metres in height.	Contains fire compartments exceeding the provisions of BCA Table C2.2. More than 25 metres in height.
Alternative solutions	No alternative solution – proposal meets deemed-to-satisfy provisions of BCA.	Incorporates alternative solution not involving fire safety systems.	Incorporates alternative solution involving fire safety systems.
Experience of the design and building team	Practitioners designing and constructing the building have been involved with more than three buildings of the same classification.	Practitioners designing and constructing the building have been involved with, and completed, fewer than three buildings of the same classification.	Practitioners designing and constructing the building have no previous experience relating to the proposed classification or building type.
Climatic conditions	Area is not impacted upon by known risks e.g. flood, bushfire, earthquake, cyclone, landslip.	Area has known risks e.g. flood, bushfire, earthquake, landslip, contaminated land. Building is not a class 9.	Area has known risks e.g. flood, bushfire, earthquake, landslip, contaminated land. Building is a class 9.

Risk factors

The risk matrix comprises factors that are most likely to pose an element of risk for those occupying a building. These risk factors range from the physical size of a building to its classification under the BCA. Also included are criteria relating to the experience of the design and building team. While this aspect is not directly aligned with the requirements of the BCA, it is an important issue to consider in the context of a building certifier's statutory functions.

The BCA is structured in a way that sets out standards of construction based on general risk to the occupants of a building. For example, the BCA provides that a single storey shop with a floor area of less than 500 m^2 can be constructed to a lower fire resistance level than a four storey shop with a floor area exceeding 2000 m^2.

This reflects the higher risks to occupants required to exit a multi-storey building in the event of an emergency. A multi-storey building under fire conditions must be capable of maintaining structural integrity so that people can evacuate safely.

The BCA also recognises that buildings of a public nature such as public halls, hospitals and aged care facilities pose greater risks to occupants than buildings used for bulk storage or manufacturing processes. Public buildings pose unique risks to occupants who may be incapable of evacuating a building without assistance.

The risk factors and their criteria are broadly aligned with those set out in the various parts of the BCA.

The following is an overview of each risk factor in the risk matrix and the general criterion for the different risk levels:

Building classification

The BCA classifies buildings according to their use which in turn reflects the level of risk to which occupants are exposed. Generally, the system of classification places buildings into three use categories:

- residential buildings (includes classes 2, 3 and 4)
- commercial buildings such as offices, shops, warehouses and factories (includes classes 5, 6, 7 and 8)
- buildings of a public nature such as halls, hospitals and aged care facilities (class 9 buildings).

The risk matrix has allocated a level of risk to the various use categories considering the rise in storeys and vulnerability of the occupants.

Essentially, it is considered that all building classes, with the exception of class 9, with a rise in storeys not exceeding three can be considered as low risk. The medium-risk level applies to all building classes except class 9 that have a rise in storeys of more than three. The high-risk level includes class 9 buildings and any class of building that has been determined to have an importance level of 3 or 4 in accordance with the BCA.

Height and floor area

Buildings are considered to pose less risk to occupants where the rise in storeys is no greater than three and the size of fire compartments does not exceed the maximum areas set out under the BCA. The required level of fire resistance and the type of fire safety systems required under the BCA mean occupants can generally evacuate quickly and safely to open space.

Buildings greater than three storeys are subject to more complex requirements relating to fire resistance and have more complex fire safety systems. These requirements are a reflection of the increased risks to occupants. This is particularly important in those buildings involving permanent residency, where people sleep on a regular basis or where residents have high levels of dependency.

Alternative solutions

As a performance-based document, the BCA provides a framework for building solutions that can be achieved by altering or departing from the prescriptive deemed-to-satisfy requirements. Departing from the deemed-to-satisfy requirements of the BCA often means that a building must comply with a complex, one-off, specific design. The design will generally involve the coordination of multiple systems or methods of construction within a building.

Commonly, alternative solutions address changes to the type and level of fire safety systems incorporated in a building. These solutions directly relate to occupant safety and will require a high level of scrutiny to ensure compliance. The use of alternative solutions involving fire safety systems will therefore place the building into the high-risk level so that an appropriate amount of attention is paid to the inspection frequency and type.

Some alternative solutions relate to non-fire related matters such as access for people with disabilities or health and amenity issues such as ceiling heights and room sizes. While these solutions are as equally important as those relating to fire safety, they are considered to attract less risk and should be scrutinised accordingly.

Experience of the design and building team

The experience of practitioners involved in designing and constructing a building is important in assessing risk. Architects, engineers and building practitioners who have worked on similar projects for a significant period of time or have continually worked on complex building projects are likely to have an understanding of shortfalls or areas of potential danger in the construction of class 2 to 9 buildings.

If the design or building practitioners have limited experience working on a large or complex building, they may lack requisite knowledge about important aspects and pitfalls associated with the particular class of building. The role of the building certifier in this circumstance becomes even more crucial in minimising risk.

Climatic conditions

Queensland has unique climatic conditions compared with other Australian states and territories. These impact on the way a building must be designed to ensure structural adequacy and occupant safety. For example, northern areas of Queensland are subject to cyclones and storm surge. A significant proportion of Queensland is subject to flooding and resultant consequences such as landslip. Some areas are also prone to bushfire attack and to some extent, earthquakes or seismic ground movement.

The effects of all these conditions must be considered and incorporated into both the design and construction of buildings to ensure structural adequacy and occupant safety. Climatic conditions pose increased risk for class 2 to 9 buildings where a number of occupants have mobility impairment (such as health or aged care facilities) as these may take longer to evacuate in the event of natural disaster.

Inspection schedule – low-risk level

A low-risk building will generally be of any class except class 9, and not exceed three storeys in height. The building would also be subject to compliance with the deemed-to-satisfy provisions of the BCA.

There may be large variations in the complexity of construction of buildings that fall into this risk level depending on the classification. For example, a class 7 warehouse will have relatively simple fire safety requirements in terms of construction type and egress and there may not be a need to construct fire-resisting walls or have complex fire safety requirements such as fire detection and alarm systems.

By comparison, a class 2 building with a rise in storeys of three, while still in the low-risk level, would contain more complexities than a simple warehouse. In this case, there would be a need to increase the number of inspections of critical areas to ensure compliance with the building development approval and the BCA.

A schedule of inspections in the key areas listed below should be established to complement the construction program. This will ensure sufficient inspections are carried out at the most appropriate time and while the area is accessible e.g. penetration through fire-rated elements of construction.

For buildings in the low-risk level, inspection schedules should be developed giving consideration to the following:

- preliminary building layout and site requirements
- fire safety requirements
- health and amenity.

Example 1 in this guideline provides a typical inspection schedule for a building considered to be low risk under the risk matrix.

Preliminary building layout and site requirements

The building certifier should be satisfied that the layout of the overall building on the site is in accordance with the building development approval.

Confirmation of this information at this early stage aims to reduce the risk of the building being located in a position that is not in accordance with approval documents. It will also reduce the risk of potential interference with service infrastructure, easements and other site-related requirements e.g. flood levels, building height restrictions, boundary clearances, and fire-source features etc.

Fire safety requirements

Fire safety requirements may differ across the various classes of buildings, potentially being more complex for buildings of a public nature or residential use when compared with general commercial buildings such as warehouses and factories.

Fire safety requirements can also be broken down to those methods that make up fire safety systems. These can include a combination of both passive and active systems such as the construction of fire-rated walls and ceilings, fire-stop collars separating floors, smoke hazard management, automatic or manual fire suppression systems and methods such as provision for safe evacuation from the building. These should be inspected at a time when they are accessible and able to be clearly viewed.

An inspection schedule must be established with consideration given to the complexity of fire safety systems, the number of storeys in the building and the construction program. For example, a three storey, class 2 building may contain multiple fire safety systems.

It may be appropriate that these fire safety systems are inspected as each level of the building reaches a stage in the construction program that precedes wall and ceiling finishes. It is beneficial to audit items such as walls, ceilings and service penetrations for appropriate fire resistance levels. It may be convenient to audit the construction of those same building elements that include acoustic construction.

Other fire safety systems such as fire detection and alarms can be inspected at a later stage in the construction program which coincides with testing and commissioning. This can be near the completion of the building work or at various stages towards the end depending on the type and complexity of the actual system.

The inspection of fire safety system requirements at appropriate times will reduce the risk of these systems being incorrectly installed. Identifying noncompliant fire safety requirements early in the construction process will permit corrective or remedial action to be taken without causing further delays or additional costs to the completed project.

Health and amenity

The components of a building that relate to health and amenity can include elements such as handrails and balustrades, natural and mechanical ventilation and lighting (for habitable rooms and areas). Some elements relating to health and amenity may be best inspected at a stage where the building work is nearing completion. Other elements will benefit the inspection schedule when inspected at an earlier stage.

Elements of construction including ceiling heights, doorway and passageway widths (for people with a disability), room sizes, floor surfaces and gradients should be inspected as early as possible in the construction phase. This will allow greater opportunity for remedial or corrective measures to be undertaken if full compliance is not being achieved.

Items such as finished handrail and balustrade heights, lighting and ventilation are more appropriately inspected towards the completion phase of building work. Conducting regular audits of these items throughout the construction of the building will significantly reduce the risks of non-compliant work being carried out or continuing. In the case of repetitive construction items such as handrails and balustrades, early inspections should be carried out to establish compliance. This will avoid the possibility of costly mistakes or errors being compounded, or discovered, towards the end of the project.

Example 1

A single storey, class 7 warehouse building is proposed for construction on industrial land. The floor area is 1000 m^2 and one wall of the building containing doors and windows is 1.5 metres from a side boundary. This side is to form part of the fire safety egress to the road at the front of the property. The building also contains a small mezzanine with stair access.

The external walls are to be constructed using concrete tilt panels attached to a portal frame. A sewer main runs across the property and part of the building requires the footing system to bridge this infrastructure.

The building will require a fire detection and alarm system and part of the rear fire exit must be contained within a fire-rated passageway.

With an understanding of the construction program provided by the builder, the building certifier has determined the following inspection schedule to be appropriate and form part of the conditions of approval for the building work.

	Inspection requirement	Timing
Preliminary building layout and site requirements	Confirm building footprint complies with approval documents and accommodates location of all service infrastructure.	At completion of building set out.
Fire safety	Location of openings in external wall adjacent property boundary.	After positioning of tilt panel.
	Connection of tilt panel to steel portal.	After positioning of tilt panel and prior to placement of roof sheeting.
	Construction of fire-resistant walls to exit passageway.	Upon completion of passageway construction and installation of fire safety door.
	Testing of fire detection and alarm system.	Completion of system installation.
Health and amenity	Damp and weatherproofing of all roofed areas and door and window fixtures.	Prior to final completion of building work.
	Sanitary and other facilities.	Prior to completion of building work.
	Other health and amenity elements including light, ventilation, access for people with disability and glazing.	Prior to completion of building work.

Note: The inspections set out in this example should not be considered as an exhaustive list. Each building must be considered on its own merits.

Inspection schedule – high-risk level

Buildings that fall in the high-risk level often include public buildings or buildings that are substantial in either floor area or rise in storeys, or are the subject of complex alternative solutions involving fire safety systems. It follows that these types of buildings should have a rigorous inspection schedule that not only reflects the identified risks but also reduces them to ensure occupant safety.

A sufficient inspection schedule will reduce a building certifier's liability and protect the interests of the builder responsible for the overall construction program. A building in this risk level will benefit from frequent audits of multiple areas throughout construction.

As with buildings in the lower risk levels, the following key areas should be sufficiently inspected to ensure compliance:

- preliminary building layout and site requirements
- fire safety requirements
- health and amenity.

Preliminary building layout and site requirements

For some buildings in the high-risk level, site requirements can be significantly more extensive and complicated than those of a lower risk. For example, a high-rise building is likely to include several basement levels that may be used for car parking or other purposes.

In these cases the building certifier should be satisfied that the layout of the overall building on the site is in accordance with the building development approval.

As with buildings of lower risk, confirmation of information relating to the location of a building on the site at an early stage in the construction program will reduce the risk of noncompliance with the building development approval. It will also reduce the risk of potential problems relating to water tables, ongoing drainage, service infrastructure and any structural complexities.

Fire safety requirements

Fire safety requirements for buildings in the high-risk level are likely to be the most complex, particularly if they involve an alternative solution. Most of these systems will be incorporated into each level of a high-rise building or across several fire and smoke compartments in buildings such as hospitals and aged care facilities.

As discussed earlier in these guidelines (under Inspection schedule – low-risk level) fire safety requirements can be broken down into those methods that make up fire safety systems. These can include a combination of both passive and active systems such as the construction of fire-rated walls and ceilings, fire-stop collars separating floors, smoke hazard management, automatic or manual fire suppression systems and methods such as provision for safe evacuation from the building.

An inspection schedule should be established that considers the complexity of all fire safety requirements. It would be convenient to audit the elements of these systems at a time when they are accessible and able to be clearly viewed.

In high-rise or multi-level buildings it is likely there will be significant amounts of service penetrations through fire-rated components of construction. As the construction program continues these penetrations will be progressively covered, making visual inspection difficult. To overcome this, an inspection schedule that complements the building program needs to be established. This may mean site visits occur at regular intervals to ensure each level, or a sufficient number of them, are appropriately inspected.

Health and amenity

The health and amenity components of a building in the high-risk level will generally reflect those found in lower-risk buildings. However, an inspection schedule to ensure all health and amenity issues are compliant may be more extensive.

In high-rise buildings it is important to structure a sufficient inspection schedule that ensures, at the earliest opportunity in the construction program, that those components that are to be replicated throughout the building are compliant. Construction elements involving safe access and egress, sound attenuation, waterproofing, lighting and ventilation should be inspected to complement the construction program.

Example 2

A 25 storey residential building is proposed for construction on a site immediately adjacent to a permanent body of water. The building contains three levels of basement car parking and the ground level will have a mix of commercial and retail uses.

The building is also the subject of an alternative solution which involves innovative fire safety systems. These fire safety systems rely on, and operate in conjunction with, passive construction components which include lightweight, fire-resistant walls and ceilings.

Each of the individual residential units contains its own private open balcony and has access to an adjoining unit through a door required to be fire resistant. The builder indicates the carpark levels and ground floor commercial and retail portions of the building are to be completed and occupied before the remainder of the residential tower is complete.

After consultation with the builder, the building certifier established the following inspection schedule.

	Inspection requirement	Timing
Preliminary building layout and site requirements	Confirm building footprint complies with approval documents and accommodates location of all service infrastructure.	On completion of set out.
Fire safety	Construction of all passive fire safety features.	Completion of construction of passive fire safety element at each level prior to application of finished linings.
	Installation of all active fire safety systems.	Completion of system installation prior to final commissioning.
Health and amenity	All items relating to health, safety and amenity under the building development approval.	Completion of relevant building work on each level and prior to occupation of any stage.

Note: The inspections set out in this example should not be considered as an exhaustive list. Each building must be considered on its own merits.

Case study 1:

Toomey v Scolaro's Concrete Constructions Pty Ltd (in liq) and Others (No. 2) [2001] VSC 2799

Mr Toomey was bumped by two friends skylarking on the first floor landing of a stairwell, causing him to fall backwards over the balustrade of the landing and fall. He sustained severe injuries which left him an incomplete quadriplegic. Mr Toomey claimed more than $3 million damages from several parties, including the building certifier.

The building certifier had relied on a building inspector to issue a compliance certificate certifying that, among other things, the height of the balustrade was compliant with the BCA. The balustrade actually measured 933 millimetres instead of the required one metre.

The certifier was found to be vicariously liable for the failings of the building inspector, who was negligent in the inspection. The certifier was not protected by any legislation allowing building certifiers to rely on compliance certificates, because in this case, the certificate provided by the inspector did not meet the statutory requirements:

A vicarious liability can be defined as the liability created by an action or non-action by a person, working on behalf of him when he is responsible for all the action or inaction of such person within the limits of their association. So when an employee or worker cause a loss to somebody in the normal course of his duty then the employer will be responsible for such loss.

The Court also found that reliance cannot be placed on a certificate where the certifier knew, or had reason to know, it was not the result of a thorough and competent inspection. In this case, the unusually low rate charged by the building inspector should have alerted the building certifier that the inspector may be likely to cut corners.

This case demonstrates that reliance on competent persons, and certificates issued by competent persons, can indicate that a building certifier has not acted with the requisite level of diligence. Improperly certified building work presents an unacceptable level of risk to the health, safety and amenity of people occupying buildings in Queensland.

This case highlights the important obligation on building certifiers to check plans for accurate and clear compliance with the BCA. There should also be a third party checking compliance throughout the construction phase. Building certifiers, in light of the outcomes of this case, may decide that some auditing of standard compliance metrics across the various safety provisions of the BCA and standards is necessary.

63 George Street Government Office Building

Case study 2:

Hyatt Regency Hotel Walkway Collapse – Kansas City, 1981

The Hyatt Regency Hotel walkway collapse is one of the deadliest structural collapses in U.S. history, surpassed only by the collapse of the World Trade Centre in 2001. The disaster killed 114 people and injured 216 others.

One of the defining features of the Hyatt Regency Hotel was its lobby, which featured a multi-level, interior, suspended walkway system. The fourth floor walkway was suspended directly over the second level walkway, with the third floor walkway set several metres off to the side.

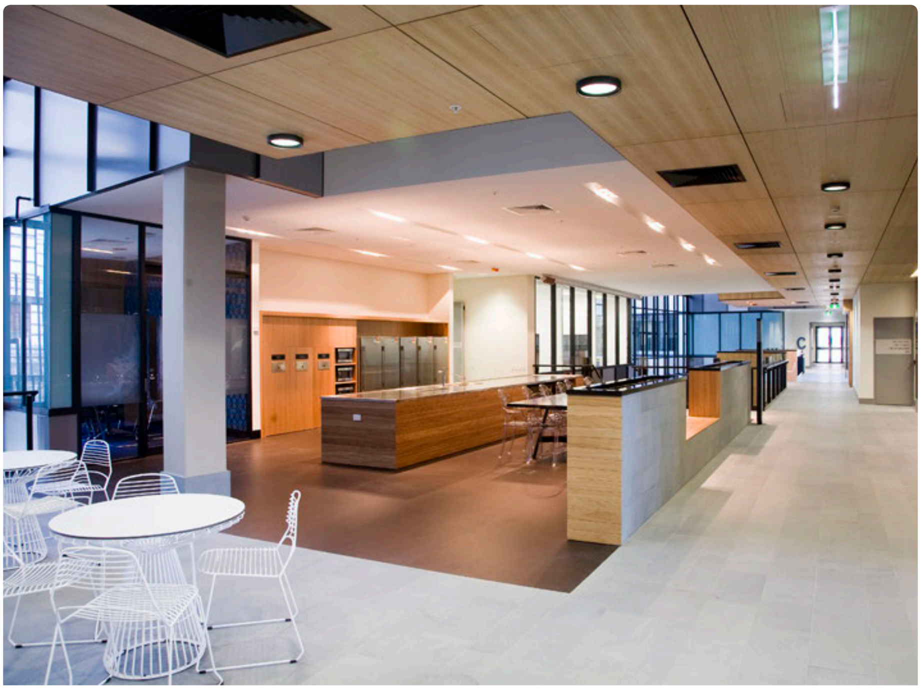
One year into construction of the Hyatt Regency Hotel, the design of the hanger rod connection supporting the walkway system was changed from a one-rod system to a two-rod system. This meant that the weight of two walkways was now held by the same structure designed to hold one. On the day of the disaster, the connection failed and the fourth floor walkway collapsed onto the second floor and both walkways then fell to the lobby floor below.

It was found that the mid-construction changes were not properly tested for safety or compliance with the building code. The drawings of the modified design prepared by the engineering firm were preliminary sketches only, but were interpreted by the fabricator as finalised drawings. The fabricator subsequently constructed the walkways as per the plans.

Both parties failed to perform basic calculations that would have revealed the design's intrinsic flaws – in particular, the doubling of the load on the fourth floor beams.

This case highlights the need for assessment and approval of changes to construction before they are incorporated into the building. It also highlights the importance of keeping the lines of communication open to ensure any changes are made known to all relevant practitioners and, importantly, the building certifier responsible for approvals.

This case exposed the lack of procedures by several parties to accommodate and document changes throughout construction of the building. The final approval of changes was seen as a crucial omission which reinforces the value of the building certifier's involvement in the building approval process and the inspection of building work.



Boggo Road Urban Village

Assessment flowchart

The following assessment flowchart will assist building certifiers to assess a building's risk level. The flowchart summarises the steps in establishing a sufficient inspection schedule.

Determine BCA building classification (including floor area and volume calculations)

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Establish the type of construction including the height and rise in storeys of the building

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Assess any relevant alternative solutions for compliance with BCA performance provisions

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Determine the risk level in accordance with the risk matrix

↓

Produce an inspection schedule based on risk level assessment including elements identified to be inspected

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Incorporate the inspection schedule requirements in the conditions of the development decision notice including a condition that would trigger assessment of, at a minimum, the need for additional plans and construction details if those are changed

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Communicate with the builder and relevant practitioners to verify inspection schedule requirements

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Carry out inspections in accordance with the schedule including audits of the building work to ensure compliance with the building development approval

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Upon satisfactory completion of the building work issue the certificate of classification in accordance with the BA

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