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## **NCC 2015 – Public comment draft**

AIRAH Submission - Access for  
maintenance as a function of design  
and construction





## Prepared by

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## About AIRAH

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AIRAH is the recognised voice of the Australian air conditioning, refrigeration and heating industry. We aim to minimise the environmental footprint of our vital sector through communication, education and encouraging best practice.

## AIRAH – Strategic Aims

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### **Claim the sustainability space**

Through its conferences, publications, manuals and training, AIRAH will educate and motivate the HVAC&R industry and related fields about achieving sustainability. Our aim is to be the HVAC&R organisation whose values are aligned with sustainability in a practical sense

### **Close the skills gaps**

At a time of rapid change of new technology and standards, and a shifting regulatory landscape, AIRAH will provide relevant professional development for HVAC&R industry personnel, and work alongside government and providers to ensure the voids in formal training are filled.

### **Inform regulation and policy decisions**

As the key industry organisation representing HVAC&R in Australia, it is essential AIRAH collaborate with government at both the state and federal levels. The collective skills and specialist knowledge of the Institute can better inform decisions that affect society and the HVAC&R industry.

### **Build and engage membership**

AIRAH will become the institute of choice for HVAC&R professionals in Australia. This means ensuring that formal connection with AIRAH provides benefits – actual and intangible – that are valuable, worthwhile and attractive to our members throughout their professional lives.

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# AIRAH Submission - *Maintenance in design and construction*

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# AIRAH Submission - *Maintenance in design and construction*

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## Introduction

AIRAH is a member of the Building Codes Committee (BCC). At the last BCC meeting (2014 - 1) ABCB proposed the deletion of Performance Requirement JP2 and its associated Deemed-to-Satisfy Provisions.

AIRAH objected to the proposal however, it was passed by the BCC and is reflected in the public comment draft for the changes promulgated for NCC 2015. AIRAH have developed this submission on the topic to provide further background and information on the maintenance in design and construction issue and provide the BCC with the AIRAH (and wider industry) view of the issue.

AIRAH strongly believe that requirements to provide access for the future maintenance of building services systems are an important element of current building regulations. These requirements should not be removed from the NCC on the pretext that this is a building operational issue that should be addressed by individual state regulators/administrations. Access for maintenance is a design and construction issue not a building operational issue. Without access for maintenance, the performance promises of mechanical systems are a fiction.

Some of the key points of this submission include:

1. In 2005 ABCB/BCC believed the requirement to mandate access for maintenance was justified.
2. ABCB have not provided a cost-benefit analysis relating to the proposed deletion of these requirements.
3. ABCB have based their proposal on the action of "market" forces. There is ample evidence from buildings built before 2005 that these supposed market forces do not produce maintainable services.
4. Expert opinion and experience within the building services industry is that deletion of this provision has the potential to:
  - i) increase the energy consumption of building systems,
  - ii) reduce life safety and amenity within buildings,
  - iii) reduce the economic life of building services, and
  - iv) reduce the economic value of the building asset.
5. AIRAH propose that the current requirements (JP2 and associated DtS requirements) be retained within the NCC Vol. 1.
6. The ABCB/BCC should work to quantify access requirements or develop a non-regulatory guide on the topic with key stakeholders.

## The maintenance-in-design issue

NCC BCA V1 Performance Requirement JP2, states *“a building, including its services, must have, to the degree necessary, features that facilitate the maintenance of systems and components appropriate to the function and use of the building”*. This Performance requirement was introduced into Volume One of the BCA in the 2005 edition and has remained, unamended, since that time.

To the best of our knowledge there have been no particular issues highlighted for this requirement from building certifiers, nor any proposal for change received regarding it.

Because of the deletion of the administrative inspection and maintenance provisions from the NCC in 2014, the ABCB has raised concerns about the appropriateness of JP2 and its associated Deemed-to-Satisfy Provisions, and have recommended the deletion of this requirement. The argument that the present text/requirement can't be easily verified is not an adequate reason for deleting it. Given that the ABCB is in the process of trying to improve performance requirements versus DtS the argument put forward for deleting these requirements seems contradictory.

The ABCB recommendation is based on an assumption that the building construction 'market' will adequately address the access for maintenance issue. This is a false assumption since, in most cases, those who design and build new buildings do not maintain them. Therefore no market forces exist to drive the provision of adequate maintenance facilities and access, particularly when such provisions may have other negative effects on a building project such as increased capital costs or reduced lettable area. The second possibility promulgated is that harmonised Work Health and Safety (WHS) laws address the access for maintenance issue through safety in design legislation. AIRAH's experience is that safety in design legislation is not well understood or well applied by the building design and construction industry – including architects, designers and contractors. In addition WH&S regulations are generally enforced reactively (after a safety incident) rather than proactively during the design phase. Retrofitting access solutions can be very expensive.

AIRAH strongly disagrees with the ABCB proposal to delete JP2. The outcome of this recommendation is that there will be no requirement, anywhere within building regulations, that a building and its services (which are provided largely for the health and safety of the occupants) must be capable of being maintained. A fundamental objective of the NCC is that features of the building have sufficient durability so that they can continue to perform their function for their economic life. For example, the NCC contains provisions for corrosion protection of brick ties and lintels. Achieving a similar durability for services, through the provision of access for maintenance, is consistent with this objective.

## What JP2 means

The current performance requirement JP2 clearly states that the design and construction of a building must allow for the future maintenance of the services contained within it. Future maintenance (by others) must be facilitated by the designers and building constructors.

This reflects recognition by Government that the incorporation of maintenance considerations into the design and installation phase of a building is essential on the grounds of health, safety, and energy.

JP2 is in place to ensure that services and systems can continue to perform to an acceptable standard. There is no requirement that maintenance actually be provided because this is a matter for individual state and territory administrations. The requirement is that the performance of maintenance is possible, practicable, and can be achieved in a safe manner.

## A conflict in views

### Market success or market failure

In its proposal to delete JP2 the ABCB postulates that because the provision of access for maintenance for some life safety systems (e.g. smoke control systems and emergency lighting) has not traditionally been required in the NCC, this is somehow proof that design for maintenance aspects of buildings and systems can be adequately addressed by the market.

AIRAH notes that the design standards for life safety systems mandated by the NCC do address 'provisions for future maintenance and inspection', these requirements are embedded into the technical standards referenced by the BCA in its DtS requirements. So it is entirely appropriate and consistent that the design standards for energy using systems, which are currently represented by the DtS requirements of Section J, should also address the minimum provisions of access, space and facilities for future maintenance. Since no appropriate standards or codes are available for reference by the NCC to cover this, the NCC must fill the gap until such standards or codes are published.

The ABCB suggests that access for maintenance (for systems) can be adequately controlled using non-regulatory means (i.e. left to market).

AIRAH strongly contests this suggestion. The 'market', as it is evidenced by existing buildings, is rife with examples of unmaintainable services. HVAC&R maintenance companies are constantly encountering existing systems in existing buildings that cannot be maintained adequately or safely, due to inadequate space or access provisions.

### A conflict in government policy

At a time when, due to societal desire to reduce energy consumption, the building and HVAC&R industry is being asked to reduce energy use, the regulations governing building design and construction are proposing to remove any requirement to provide access for the maintenance of these systems.

These two positions are contradictory and appear to be working at cross-purposes to each other.

The provision of maintenance for HVAC&R services has already been identified as a market failure by the Australian Government and COAG. A best practice guide on the maintenance and operation of HVAC systems for energy efficiency has been developed as part of the National Strategy on Energy Efficiency (NSEE). This "*Guide to Best Practice Maintenance & Operation of HVAC Systems for Energy Efficiency*" ([access here](#)) was developed as a non-regulatory solution for energy efficiency maintenance. This Guide has not been shown to have incentivised any change or improvement in the market since its publication, i.e. the 'market' has shown no inclination to adopt its provisions and no major property developers or government have mandated it in service contracts. The removal of

JP2 from the NCC will only make the application of maintenance for energy efficiency that much more difficult and that much more unlikely.

On the one hand COAG and NSEE are attempting to justify and incentivise maintenance for energy efficiency within building services systems and on the other hand COAG and ABCB are disincentivising maintenance by removing any requirement to provide access, space and facilities for it. This conflict in government action would not occur if JP2 were retained in its current form.

### **Maintenance access and NCC objectives**

To achieve the outcomes desired by the community for; efficient use of energy, fire safety, and occupational health and safety, the NCC BCA Vol. 1 requires the construction of buildings to include measures which achieve specified performance parameters in these areas.

Many of these measures are based on mechanical services which are subject to degradation due to usage and/or environmental induced corrosion. Such measures cannot continue to achieve the required performance outcomes without routine service or maintenance.

Most mechanical services in occupied parts of buildings are deliberately concealed for aesthetic or occupational safety reasons. Maintenance or routine service cannot be achieved without access to these systems. Lack of maintenance or routine service invariably leads to loss of performance, and hence failure to comply with the objectives implied above.

In the new Handbook on maintenance produced by the ABCB in June 2014 “Maintenance of Safety Measures, Equipment and Energy Efficiency Installations” it is recognised that the provision of access for maintenance is an important design and construction element. The Handbook states that “*good design and configuration should facilitate access for maintenance consistent with the frequency and type of maintenance required to be undertaken*”. The Handbook does not however contain any advice on what access should be provided or to what services.

### **Maintenance imperatives**

Building services are generally active in that they rely on active components such as automatic controls, motors, and moving assemblies to work. These are often complex systems that require regular maintenance inspections and interventions to keep them operable. Even if maintenance is not provided to a service, access will still be needed to replace the equipment when it inevitably fails due to lack of maintenance. To exclude any requirement to provide access for maintenance from a design and construction code for a ‘device’ (i.e. building) that has serious technical requirements for maintenance and operation to ensure; it’s safe operation, it’s effective performance (i.e. safety and well being of occupants) and its efficiency (life cycle use/impact of energy, water, asset components, consumables) is just wrong.

### **Maintenance for life safety**

Many of the services installed into buildings are essential safety systems required by the NCC. These systems are typically detailed in technical consensus based Australian Standards. These system standards do not typically include requirements for the provision of maintenance but many do

contain design and construction requirements for maintenance access, space and the provision of facilities.

Notwithstanding these standards that are in place, the provision of access for maintenance is often delivered haphazardly and inconsistently, even for essential safety systems.

### **Maintenance for energy efficiency**

Many building services are the high energy using HVAC and refrigeration systems embedded into every building. If these systems cannot be maintained then the energy efficiency is compromised and the resulting environment impacts increased.

The current JP2 supports and is consistent with the Australian Governments stated desire for an increase in maintenance delivery for energy efficiency.

### **Maintenance for indoor air quality**

Many buildings are provided with mechanical ventilation systems to provide for adequate air quality as required by the NCC. These systems require access for maintenance and for the provision of HVAC Hygiene. Building IAQ and IEQ are strongly related to occupant comfort and productivity. Poor IAQ produced by a lack of maintenance due to inadequate access to filters, ducts and coils can significantly affect the productivity of the occupants.

### **Access for maintenance**

Space for building services is a constant point of tension on most construction projects. Without a requirement within building regulations that space must be provided within a building to allow the services to be maintained, the space will simply not be provided. This is the market failure. Evidence from pre-2005 buildings shows that the market does not force the provision of maintenance access, hence the original inclusion of the JP2 requirement within the NCC.

In the HVAC&R industry it is not uncommon for services to be installed on top of roofs, deep in basements and hung off facades. Confined spaces are common and technical service providers need to work with a range of hazards including those associated with electricity, refrigerant and onsite construction activities. The provision of space for services within buildings is an ongoing point of conflict between building designers, developers and service providers. Many building services systems are related to health and safety (fire dampers, air filters, cooling towers, smoke control fans) and must be maintained to comply with state regulations. If these systems cannot be maintained, the health and safety of building occupants is compromised.

### **PRIME and maintenance**

AIRAH has played a lead role in the development of a whole of industry pathway to a low emissions future called PRIME ([access here](#)). PRIME is the HVAC&R industry's blueprint for a successful transition to a low-emissions future through Professionalism, Regulation, Information, Measurement, and Emission abatement.



The PRIME initiative has revealed significant deficiencies within the delivery of maintenance for energy efficiency. One of the barriers to the effective and efficient provision of maintenance services and building tuning for energy efficiency identified by PRIME is the often poor access provisions within existing buildings. One of the market failures identified for this issue is the lack of technical standards or codes of practice documenting access for maintenance provisions.

## Rational provisions for maintenance

Features that facilitate the maintenance of systems and components can be essentially reduced to:

- Safe access to places that have plant which requires maintenance (which may be covered by state based WHS/OHS regulations in some applications).
- Enough space to perform maintenance procedures safely and correctly.
- Power supply for maintenance activities.
- Drainage for maintenance activities.
- Light and ventilation for service personnel.

The ABCB state that the NCC currently provides no methods of confirming compliance with the DtS provisions. While this is true there are many areas where NCC Vol 1 does not detail DtS provisions but provides performance criteria. To specify the fine detail of the provisions for maintenance would be a complex and time consuming task made difficult by the level of variability and technical detail involved in building services systems. However it should be possible to require that there must be sufficient space, light etc for the function without specifying every technical detail.

The solution to this is not to delete the requirement but rather to provide a method of confirming compliance. AS/NZS 3000 for example uses the term 'readily accessible' frequently and defines it as *"Capable of being reached quickly and without climbing over or removing obstructions, mounting upon a chair, or using a movable ladder, and in any case not more than 2.0 m above the ground, floor or platform."* Similar definitions could be defined for building services.

AIRAH proposes that a rational and measured approach should be adopted which is already reflected by the current performance and DtS requirements. A simple and understandable DtS requirement is *"Adequate safe access must be provided to all plant, equipment and components of services that rely on maintenance, to continue to perform at the level required at the time of installation, to achieve their function"*.

The building certifier can then rely on the expert assessment of the building professionals involved with the project to determine compliance.

The performance of maintenance is a separate and more complex issue, but the designers' responsibilities will be met when these simple provisions are allowed for within the design. Where provisions are not made within design and construction to address these features the building and its systems cannot be maintained, causing potential health safety and environmental impacts as well as degrading and devaluing the building asset.

The industry knows that if maintenance cannot be performed it will not be performed, and it is a responsibility of designers and constructors, and the regulations that they work with, to ensure that

maintenance can be carried out safely and appropriately for the life of the building. An unmaintainable building is not a desirable asset, the risks are large, the costs long-term and unavoidable.

## Benefits and costs of retaining JP2

The benefits of maintaining JP2 in its current form are that the services of new buildings can be physically maintained into the future, and it is possible to do so safely. There are no additional costs to industry or government because the access requirement is current.

The benefits and costs of deleting JP2 are unknown; they have not been identified by the ABCB. Retrofitting access arrangements to facilitate HVAC&R plant maintenance post-construction is very expensive.

## Costs of deleting JP2

It is important to understand that the deletion of JP2 may have commercial and productivity implications for buildings and it will be the property industry and its tenants that bears the costs. There are many instances where building owners discover (after the defects liability period) that their new building doesn't have safe access for maintenance or has access arrangements that materially add to the cost of maintenance. This can be because of general difficulty in access, the need to use specialist access equipment, or because the 'as-constructed' access arrangements result in something that should be a single person task is actually (on this site) a two person task. This adds cost to the property owner directly for physical improvements and or as increased charges reflecting the maintenance productivity issues. These costs ultimately end up with tenants and can result in less than safe workplaces for our industry.

On the face of it the proposal to remove JP2 meets a Regulatory Impact Statement (RIS) commercial impact 'means test' and therefore the proposal should be tested with an RIS.

## Proposed solutions

Going forward AIRAH proposes that:

- The proposal to delete JP2 is not agreed for NCC 2015 and the performance requirement JP2 and its associated Deemed-to-Satisfy Provisions are retained in their current form.
- Further consideration of the potential impacts and a full cost-benefit analysis of this proposal need to adequately documented by the ABCB and considered by BCC.
- ABCB should work with industry to develop an agreed proposal for the inclusion of design for maintenance provisions and promulgate these to all relevant stakeholders. AIRAH is willing to support this work.
- ABCB work with industry to develop quantifiable standards, codes or guides to detail DTS solutions. AIRAH is willing to collaborate with ABCB and relevant groups to enable this.
- ABCB work with industry and WHS authorities to develop an agreed non-regulatory guideline detailing minimum access requirements for common building services systems.

- An industry working group should be constituted to determine whether JP2 should be extended to all services within a building and whether maintenance should be considered in the design of all building components.
- Consider extending this work to include issues such as the skills of the construction personnel, level of supervision, durability etc. That is consider including within the NCC requirements that the design of all building components be compatible the limitations imposed by the available construction skills, supervision, durability, corrosion protection ,weather resistance requirements as well as access for maintenance requirements.

## Summary

Measures required by the NCC BCA Vol 1, using mechanical services, to achieve desired outcomes of energy efficiency, occupational health and fire safety will not continue to provide these outcomes unless they are maintained. These objectives of the BCA are defeated if the market is allowed to construct buildings where access for maintenance is inadequate and maintenance or routine service is prevented.

The omission of access provisions may be rectified post construction, but the cost of providing adequate access post-construction is invariably much greater than provision of sufficient access at the time of original construction.

## Consultation

In developing this submission AIRAH have consulted widely with industry organisations and practitioners. The following organisations have indicated that they support this submission, its objectives and proposed solutions:

- Australian Mechanical Contractors Association
- Engineers Australia
- NATSPEC
- Standards Australia

## Appendix A

The following wise words on maintenance in design are reproduced from AIRAH Application Manual DA19 on *HVAC&R Maintenance*, a consensus non-regulatory document developed by industry stakeholders, and reproduced here for your information.

### A1 Design considerations

The following extract from DA 19 applies to design considerations.

#### 3.2 *Design considerations*

*All HVAC&R systems should be designed to be as simple, reliable and sustainable as possible while being fit for purpose and providing the required function. This is particularly true of control systems associated with HVAC&R systems.*

*System designers are best placed to develop the design/maintenance philosophy for a building or system. The maintenance philosophy should be developed based on the maintenance objectives of the owner and the final design should take full account of the maintenance policy, refer section 4.*

*The maintainability of plant and systems is an important determinant in how energy and water efficient the systems will be over their whole life cycle. Something that is difficult to maintain and tune will be much less likely to operate efficiently and as intended than something that is easier to maintain. Designers should carefully consider the complexity of the systems they conceive with respect to maintenance and operating requirements and the maintenance provider's ability to deliver these services.*

*Maintainability also relates to issues of equipment selection and ongoing maintenance cost and convenience. Consideration should be given to the standardization of common components in a new installation, same make/type of pumps, valves, and the like to reduce the number and type of spare parts that are required to be held or accessed. The ability to readily and cost effectively access spare parts also needs to be considered during equipment selection to help ensure that the life cycle costs of the systems are minimized.*

*Similarly consideration should be given to the use of specialist or non-specialist plant and local or exotic plant origins. The availability of local maintenance knowledge, equipment (spares), training and support can improve both system maintainability and sustainability. The use of an established technology rather than a new technology in a design may be more appropriate in some cases due to the unavailability of future maintenance skills and resources.*

*Designers can reduce or minimise future maintenance by using high quality components (reduced mean time between failure), by using components or systems requiring no maintenance (passive systems) or by using duplicate services (run/standby pumps).*

*Designers should consider the commissionability of the system. Commissionability relates to the extent to which the design and installation of HVAC&R systems facilitates system balancing and tuning to required performance.*

*Designers should consider “building in” systems for monitoring and feedback of plant operation into their designs. Built in monitors can be linked to building management systems and can be associated with future condition monitoring maintenance strategies.*

*The ability of system designers to make cost effective changes to the design with regard to system maintainability, commissionability or sustainability is most significant in the early stages of design. As the project progresses through detailed design, installation, handover and operation the costs of any required changes to the system rise dramatically.*

## **A2 Access considerations**

The following extract from DA 19 applies to access issues.

### **3.4 Accessibility**

*Good access is essential to allow plant to be maintained easily and safely. Access for maintenance has always been a requirement of AS/NZS 3666.1. In addition, access for maintenance is a legal requirement for energy efficiency plant required by the BCA.*

*Because of the range of equipment in the marketplace, and the different sizes and shapes of equipment serving the same purpose, it is difficult to quantify in general terms the amount of access that would be needed by HVAC&R plant. For example, a shell and tube heat exchange will have different spatial requirements for access to a plate heat exchanger. Manufacturers can provide the necessary guidance.*

*The requirement for safe access is a legal requirement and the first responsibility for ensuring safe access rests with the initial designer.*

*Access provisions should include:*

- Provide access to plant rooms and to any other equipment rooms*
- Provide fixed platforms, walkways, stairways and ladders where required to AS 1657.*
- Provide sufficient space around plant for the removal of parts and the safe productive performance of service.*
- Provide sufficient access for the replacement/upgrade of plant.*
- Provide inspection covers to allow observation of all items of plant.*
- Access panels or doors should be large enough and located to allow ease of entry for service person and removal or replacement of parts.*
- Access doors should open against the air pressure.*

End of submission