Australian Institute of Architects

Building Energy Efficiency in New Commercial Buildings in the Northern Territory

Submission to the Department of Infrastructure, Planning and Logistics

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PURPOSE

- This submission is made by the Australian Institute of Architects Northern Territory Chapter (the Institute) to provide comments on the Volume 1 Section J of the National Construction Code (NCC)in the Northern Territory.
- At the time of this submission, the NT Chapter President is Jenny Culgan.
- This submission has been written by Joanna Rees, with significant contributions from Dr. T J Williamson, and contributions from Andy Marlow (NSW) and Graham Hunt (NSW).

INFORMATION

The Australian Institute of Architects (Institute) is the peak body for the architectural profession in Australia. It is an independent, national member organisation with around 11,000 members across Australia and overseas. More than 3,000 of these are based in NSW.

The Institute exists to advance the interests of members, their professional standards and contemporary practice, and expand and advocate the value of architects and architecture to the sustainable growth of our communities, economy and culture.

The Institute actively works to maintain and improve the quality of our built environment by promoting better, responsible and environmental design.

TABLE OF CONTENTS

1. INTRODUCTION

The Australian Institute of Architects (the Institute) is the peak body for the architectural profession in Australia, representing around 11,000 members. The Institute works to improve our built environment by promoting quality, responsible, sustainable design. Architecture influences all aspects of the built environment and brings together the arts, environmental awareness, sciences and technology. By combining creative design with technical knowledge, architects create the physical environment in which people live, which in turn, influences quality of life. Through its members, the Institute plays a major role in shaping Australia's future.

As a distinct profession, architects can and do offer services that directly impact on public health and safety issues and quality issues affecting buildings. The Institute's Code of Conduct expects architects to 'improve standards of health and safety for the protection and welfare of all members of the community.' This is an important distinction, beyond the basics of safety, and it is not just to serve interests of the client, the developer or the financial institution, but everyone.

The Institute welcomes the opportunity to make a submission to the Department of Infrastructure, Planning and Logistics. The comments below relate to the following:

> *The National Construction Code (NCC) Volume One Section J establishes performance requirements for commercial building energy efficiency. The NCC Section J has not been adopted in the Northern Territory and so commercial buildings and the common areas of apartment buildings do not need to meet these energy efficiency performance requirements. The Northern Territory Government is asking industry its views on what the impacts would be if the NCC Section J were to be adopted in the Northern Territory for new commercial buildings including the common areas of apartment buildings.*
>
> *Components of NCC Section J include: Energy Efficiency; Building Fabric; Building Sealing; Air-conditioning and ventilation systems; Artificial lighting and power; Heated water supply and swimming pool and spa pool plant; Facilities for energy monitoring.*
>
> *The assessment of the energy efficiency of buildings should not adversely affect the performance of other aspects of a building. No decision has been made by the Northern Territory Government about adopting Section J at this stage - this is a scoping consultation so that Government can gain a better understanding from industry.*
>
> *The Government needs to consider each component of NCC Section J and would like your views on any of the following:*
>
> - *Industry readiness to adopt;*
> - *Implications and impacts to industry;*
> - *Benefits to industry and the consumer;*
> - *Costs to industry and the consumer;*
> - *Risks of not adopting Section J;*
> - *If there are prohibitive reasons to not adopt NCC Section J;*
> - *Processes that would need to be put into place to adopt Section J..*

2. SUMMARY OF POSITION

The NCC Vol 1 section J states that "*A building, including its services, must have, to the degree necessary, features that facilitate the efficient use of energy appropriate to …*"

However, in the NT, for a Class 2 building and a Class 4 part of a building, Section J is replaced with Section J of BCA 2009. In addition, Section J does not apply to Class 3 and 5 - 9 buildings.

In NCC, Vol I Section J energy efficiency of buildings may be demonstrated through performance modelling or satisfying deemed-to-satisfy provisions.

The *Decision Regulation Impact Statement Energy Efficiency of Commercial Buildings* showed there was overall a positive benefit/cost ratio if Section J was a mandatory requirement in the NT. [i]

The construction industry in the Territory is able to adopt the NCC Section J provisions, given that only a small amount of change to existing practices is required. However, there is a reluctance to do so.[ii] Because there is reluctance, does not meant that industry can't, won't or shouldn't adopt the NCC Section J. To quote Dr Sorada Tapsuwan, "*Legislation is the key to pushing populations and market forces to better outcomes"*.[iii]

Recommendations

The Institute recommends that:

1. The Northern Territory government support the Council of Australian Governments (COAG) Energy Council's National Energy Productivity Plan and Trajectory for Low Energy Buildings (Commercial buildings).
2. NCC Section J be adopted as a whole in the NT.

3. INDUSTRY READINESS TO ADOPT COMMERCIAL BUILDING ENERGY EFFICIENCY

The architectural community, working with other design professionals within the NT construction industry are ready to adopt Section J.

Most architects practicing in the NT have the knowledge to be **able** to successfully adopt section J requirements if they so choose. The main change required relates to implementing more complex versions of existing practices. We note that there are a small number of members who are sceptical that adopting section J will have lower energy use outcomes.

We all want better **quality** buildings that consume less energy. Better quality outcomes include- improved fabric performance, greater human comfort, low cost to run, improved functionality of space, improved form and aesthetics. [iv]

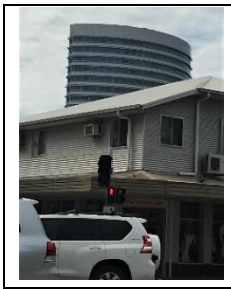
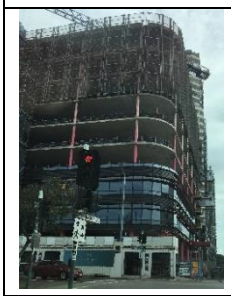
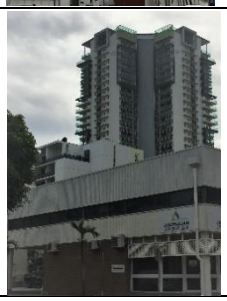
4. IMPLICATIONS AND IMPACTS TO INDUSTRY

The following outlines the impacts, positive and negative, to adopting the commercial building energy efficiency provisions.

a) There will be **reduced cost** to occupants, while achieving greater comfort:

- The current stock of commercial buildings in Darwin is reported to be the worst in the world, consuming vast amounts of energy to cool poorly shaded large commercial buildings with energy consuming air conditioning.[v] These existing poor-quality commercial buildings in Darwin often have owners as one group and tenants paying rent as another. The strong voice[vi] of commercial building owners has helped to convince the Northern Territory Government to resist greater upfront construction costs. This directly benefits building owners, resulting in tenants (ironically often government departments), that pay more for high **running costs.**

- The single most important proactive step the Government could action, is the requirement for all commercial buildings to have wall and window **fixed shading** that reduces afternoon sun from over-heating building fabric and spaces, whether Section J is adopted or not. The outcome would have effective wall and window shading that reduces afternoon sun from over-heating building fabric and spaces.

	2018 completed office tower with inappropriate fixed shading		2010 completed hotel, accommodation and office building with appropriate fixed shading
	2020 in construction currently office tower with inappropriate fixed shading		2010 completed hotel and accommodation building with appropriate fixed shading

b) There may be increased cost to:

- Construct buildings with better climatically performing fabric:
    - The cost of improved building fabric is a lesser concern than more expensive mechanical and electrical components and systems;[vii]
    - The cost to install and maintain fully integrated automated building systems, which are estimated to cost an additional 5%. To a $16-$20M commercial project, that is an additional upfront $1M;
    - It will take considerable time to recover larger upfront cost;
    - Mapping a real **pay-back time** against upfront cost would give all stakeholders informed cost benefit options.
- Deliver architectural construction documentation:
    - more complex construction takes more time therefore greater cost to design and document.
- Longer time frames to deliver architectural construction documentation due to:
    - more complex work to do by experts;[viii]
    - which then needs to be understood by all stakeholders; and
    - assessed by certifiers approving the works; and
    - construction authorities approving the certifiers.
- Longer time frames to construct more complex buildings:

c) Delaying the introduction of energy efficiency measures also involves a **cost.** ASBEC recommends smaller incremental increases rather than a large jump.

In our view, the longer we wait, the greater the increase in costs, rather than slow increases, as the other states and territories have been increasing building energy efficiency measures through section J over the last 10 years.[ix]

Interestingly, the NCC is heading towards zero carbon buildings via solar panel energy collection on each building. If the NT waits beyond 2022 to join the rest of the country in constructing energy efficient buildings, those NCC section J components may have already arrived, loading the higher upfront cost with solar technology on developers and reducing the occupant running costs, however poorly the building fabric contends with climate conditions inside and out.

5. BENEFITS TO INDUSTRY AND THE CONSUMER

The Institute believes that the following benefits will accrue:

- Building that are better- more resilient, more connected to the external world and comfortable.
- Better building design and control that reduces building energy loads (eg air-conditioning) will have a significant societal benefit in moderating electricity infrastructure costs and improving energy security.
- Cheaper to run buildings.
- Buildings that use **less energy (**a double win), reducing the need to upgrade electricity supply.
- Happier occupants/ tenants, because they are working in or visiting buildings that are using less energy.
- Improved thermal comfort leads to improved productivity but also improved health outcomes with reduced risk of heat stress, etc especially in schools and hospitals.[x]

A low-cost pathway for the NT to work towards a better, more efficient built environment is to adopt Section J.[xi]

It can be shown that adopting Section J provisions in the NT will produce reduced energy consumption by large amounts in schools and hotels as the outcome.[xii] With greater **transparency** there will be clearer benefits and more incentives for industry and consumers to have faith in better quality-built outcomes.

6. COSTS TO INDUSTRY AND THE CONSUMER

Costs associated with adopting Section J include:

- High upfront costs associated with fully automated building controls for: [xiii]
    - Lighting;
    - air conditioning;
    - mechanical ventilation;
    - and all energy consuming equipment.
- Adding additional upfront costs, with uncertain benefits is a big problem for already tight budgets on every commercial building project, to produce modest quality buildings.

7. RISKS AND COSTS OF NOT ADOPTING SECTION J

The costs associated with not adopting Section J include creating more terrible building stock, adding to the existing mediocre collection in Darwin[xiv] and the NT, that is:

- uncomfortably cold inside in some places
- too hot in others
- not connected to the outdoors
- expensive to run
- generally poor quality which results in ugly to look at and unpleasant to occupy space
- going to incur future costs of retrofitting the soon-to-be built buildings that are very poor performers

The **risks** of **not** adopting Section J are:

- More unhappy occupants of more hot commercial buildings
- Stable costs and stable timeframe to produce commercial construction drawings and commercial buildings, at least from less stringent energy regulations
- Increased commercial building stock of low quality
- More hot commercial buildings
- More expensive to run - high energy consumption for commercial tenants
- Increased energy consumption
- Increased climate change
- Ongoing large greenhouse gas emissions to maintain inefficient buildings at comfort levels in a tropical climate. This is in direct contract with the obligation NT government has under COAG to try and reduce such emissions[xv]
- More hot days and hotter temperatures
- Greater complexity and cost to introduce a different system and additional layer of NT based, unique, construction regulations to implement energy efficiency by alternative means.[xvi14]

There is a high cost of **doubt**.

There is doubt about better built environment outcomes from adopting Section J. However, if there was enough transparency to describe what outcomes will be achieved in terms of quality of space, some aspects of doubt would be removed.

We strongly advise improving the knowledge within the whole industry of the implications of Section J compliance in terms of real outcomes, eg improved quality of spaces, lower operating costs, etc.

There is widespread concern that signing up to comply with Section J provisions in the wet dry tropics will mean bunker like buildings with tiny windows, that will not open and a thermostat setting to 18 degrees. These concerns display a degree of ignorance. [xvii] For instance:

- Achieving comfort is included the language of the 2019 section J. Adaptive comfort controls incorporated in ASHARE Standard 55 can be employed under Section J requirements.

- Some commercial spaces benefit from fixed glass and others, like restaurants can benefit from windows and large glazed doors that are able to open or closed depending on weather.
- All buildings in the tropics benefit from connecting people with views to the outdoor environment. Too few and too small windows is of concern to all human building occupants and users.
- Equipment benefits from bunker like environments;

If the modelling papers that are the underpinning of policy recommendations to Section J include the real space parameters of thermostat settings and building envelope, concerns of this nature could be alleviated.

8. PROHIBITIVE REASONS NOT TO ADOPT SECTION J

The Institute does not believe that there are prohibitive reasons to not adopt Section J. We believe that demanding greater transparency would help a smooth transition and take-up of change by trades, professionals, the public and bureaucracy.

9. PROCESS TO ADOPT SECTION J

The processes that would need to be put into place to adopt Section J includes:

- Training for ministers and senior construction authority staff to support adopting section J for commercial buildings.
- Professional development single session for building professionals and trades that require skills upgrade, funded by attendees.

The following is a set of steps for the NT to achieve energy efficient commercial buildings[xviii]

1. Set a long-term vision for energy efficient buildings.
2. Accelerate the transition to high performance buildings with planning incentives:
    - Accelerate the shift to high performance buildings with targeted financial incentives;
    - Introduce and support the harmonisation of energy efficiency obligation schemes.
3. Support a Zero Carbon Ready building code:
    - Improve enforcement, monitoring and enforcement of the National Construction Code;
    - Support tenants with minimum energy efficiency standards for rental properties;
    - Undertake a review to investigate energy performance improvements.
4. Unlock the potential of distributed energy through energy market reform:
    - Ensure energy users are paid for the services they deliver to the grid;
    - Invest in the best mix of demand-side and supply side measures;
    - Expand the mandate of the Energy Security Board to drive energy productivity across the economy.
5. Lead through government owned and leased buildings:

- Support green loans and innovative finance products to drive high performing commercial buildings and retrofits;
- Incentivise deep retrofits for existing commercial tenancies;
- Shift the mid-tier office building market to better performance;
- Provide support for distinct market segments through sectoral leadership strategies.

6. Adopt a suite of robust rating tools for different building types:
    - Empower commercial tenancy owners, buyers and renters with a single national rating scheme for commercial energy performance (neighbours rating scheme);
    - Support mandatory performance disclosure for commercial buildings at the point of sale or lease
7. Transform markets for materials and products:
    - Support Australian leadership in high performing building products;
    - Support a nationally coordinated strategy to achieve net zero embodied carbon;
    - Grow the availability of cost-effective low emissions building materials

REFERENCES & LINKS:

ASBEC CWA *Built to Perform in Northern Australia* Nov 2018

ASBEC CWA *Built to Perform – An Industry Led Pathway To A Zero Carbon Ready Building Code,* July 2018 ASBEC and ClimateWorks media release.

CIE *Decision Regulation Impact Statement Energy Efficiency of Commercial Buildings*, Prepared for Australian Building Codes Board, 2018, Online link: https://www.abcb.gov.au/Resources/Publications/Consultation/Energy-efficiency-of-commercial-buildings

COAG, *National Energy Efficiency Building Project* (NEEBP), Nov 2018

COAG, *Trajectory for low energy buildings*, Dec 2018

CSIRO Darwin Living Lab online link: https://research.csiro.au/darwinlivinglab/

Energy Action, *Achieving Low Energy Commercial Buildings in Australia*, Nov 2018,

Energy Action, *Building Code Energy Performance Trajectory Technical Report – Northern Australia* Nov 2018

Energy Action, *Building Code Energy Performance Trajectory – Final Technical Report,* Oct 2018

Flanagan,R. *Australia Is Committing Climate Suicide*, New York Times, Jan 2020, online link: https://www.nytimes.com/2020/01/03/opinion/australia-fires-climate-change.html?fbclid=IwAR1e_ZMrdQEN1v8tV- 95PkDeIgKPGB4_EK-Q5mxzYRs5baFtQUR9t6eSXoc

Property Council and Green Building Council Australia, *Every Building Counts*, online link, https://www.everybuildingcounts.com.au

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ENDNOTES

[i] CIE (2018) *Decision Regulation Impact Statement* Energy Efficiency of Commercial Buildings, Prepared for Australian Building Codes Board, 2018, Refer especially summary and page 99 for NT summary where schools and hotels are the greatest commercial building types to reduce energy consumption through section J implementation. Climate zone 1 has the greatest possible energy savings of all climate zones for possible energy reductions.

[ii] Based on common discussions within industry forums in recent months, where discussions focus on a) high upfront costs with few perceived benefits, b) climatically irrelevant basis, as common negatives.

[iii] To quote Dr Sorada Tapsuwan, CSIRO Land and Water ACT, in the CSIRO Darwin Living Lab Symposium, December 2019.

[iv] Better quality outcomes include- improved fabric performance, greater human comfort, low cost to run, improved functionality of space, improved form and aesthetics. A comprehensive study lists these outcomes and measures the reduced energy consumption see especially Table 4.1.1 *Built to perform in Northern Australia ASBEC Nov 2018* and Table 1, in the ASBEC paper *Building Code Energy Performance Trajectory Technical Report – Northern Australia*

[v] Prof. Mat Santamouris, Darwin Living lab Symposium, December 2019. Prof. Matts has heat mapped 50 cities around the world, including Darwin. He heat-mapped Darwin in 2018, under the cooling Darwin project by the NT Chief Ministers department, resulting in the Cavenaugh St cooling work constructed 2019.

[vi] Development companies are listed as having made many large donations to both sides of politics in recent years. Building owners who are often developers are renown for loudly complaining and campaigning to ministers and senior department figures to suit their positions, see website www.ntec.nt.gov.au/financial-disclosure.

[vii] Consider the list of options under table 4, AE report *Achieving Low Energy Commercial Buildings in Australia*. 2018

[viii] The experts are largely specialist engineering consultants to assist in modelling facades on complex buildings that incorporate elegant and workable shading solutions. These are few and far between in the NT. At this point in time only a few local firms offer this service and those technical experts from the firms reside in SA and Victoria. If there is a consistent need for these services, there will be NT residing experts and competitive options. This work goes above and beyond the skills and capabilities of residential energy assessors at this point in time, though we would expect that to change with adoption, so that there would be options to use locally based energy assessor consultants using NatHERS or Greenstar competing against established engineering firms who have their own specialist software.

[ix] Cairns has been compliant with section J from the outset of NCC requirements, where there is a similar though slightly cooler and wetter climate

[x] A study for the Northern Territory government shows the tremendous impact of urban overheating on mortality, morbidity and energy, and the potential to improve our cities, undertaken by the project's team leader, Professor Mat Santamouris.

He said "We found that mortality increased by 5% for every 1C increase in daily maximum temperature. Mitigation of overheating across the city of Darwin could save about 10 lives per year, per 100,000 residents." Reported by UNSW 03 Sep 2018 Diane Nazaroff, https://newsroom.unsw.edu.au/news/art-architecture-design/cooling-darwin-unsw-plan-fight-climate-change

[xi] It is an established national construction regulation framework. Community benefits include: Reduction in energy consumption; Reduction in power bills; Reduction in stress on the existing energy infrastructure; Reduction in greenhouse gas emissions.

[xii] CIE (2018) *Decision Regulation Impact Statement* Energy Efficiency of Commercial Buildings, Prepared for Australian Building Codes Board, 2018, Refer especially summary and page 99 for NT summary where schools and hotels are the greatest commercial building types to reduce energy consumption through section J implementation. Climate zone 1 has the greatest possible energy savings of all climate zones for possible energy reductions.

[xiii] These high-end systems have been priced as 5% of the total project cost which is significant for a large new development and realistically could be better spent on trees and cooling the external environment. Consider a $16M new school facility with $800,000 cost to implement fully integrated artificially intelligence-controlled systems. Alternatively, money could be spent on regular switches and $800,000 worth of site appropriate, native, large shade trees with long lasting irrigation.

[xiv] At the CSIRO Living Lab Symposium held in Darwin 16-17 December 2019, Professor Mat Santamouris of UNSW said that 90% of energy consumed by the terrible existing commercial building stock in Darwin could be fixed with simple measures such as fixed shading. He said the performance of our commercial building stock is the worst in the world of the 50 counties that he is familiar with. We need help. To compound that argument slightly, the NT will be the worst performing jurisdiction in the worst performing country in the developed world; according to Richard Flanagan "Australia ranks 57/57 - last- of all nations on improving outcomes for emissions reduction", 3 January 2020, New York Times

[xv] NT agreement under COAG, refer page 5 Property Council report *Every Building Counts – Executive Summary*

[xvi] Adopting the NCC energy efficiency guidelines for commercial buildings is a low-cost pathway for the NT to work towards a better, more efficient built environment. Community benefits include: Reduction in energy consumption; Reduction in power bills; Reduction in stress on the existing energy infrastructure; Reduction in greenhouse gas emissions

[xvii] Thermostat settings in modern plant equipment are adjustable, unlike old air conditioning technology. Singapore regulators have elected to required office buildings to set their thermostats at 28 degrees C to improve outcomes for reduced energy consumption and comfort. Office workers do not need to wear additional layers of clothing to be comfortable inside as they once – according to Zee Kin Yeong at the Darwin Living Lab Symposium - and as Darwin workers in cold indoor office buildings do currently, Zee Kin Yeong is Assistant CE, Infocomm Media Development Authority of Singapore

[xviii] Taken from ASBEC publications "Every Building Counts": A PRACTICAL PLAN FOR EMISSIONS REDUCTION. Buildings account for over 50% of electricity use in Australia and almost a quarter of its emissions. Smart, targeted policies developed in partnership with industry can drive the step change we need to deliver a low carbon, built environment. The plans outline practical policies across residential, commercial and public buildings that should be implemented by federal, state and territory and local governments to drive emissions reduction in line with Australia's Paris Agreement commitments. From link https://www.everybuildingcounts.com.au/ Key Recommendations For State & Territory Governments"