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Importance Level 4 Special Study: Industry Vulnerabilities Snapshot 2023

Jordan Bartlett[1]

1. Proactive Design, Park Orchards VIC Australia

Abstract

This paper explores the present delivery of Importance Level 4 (IL4) Special Studies, which are specified in AS1170.4 and are intended to ensure that critical building infrastructure is designed and built to remain operational following a moderate earthquake. Special Studies, when commissioned, vary significantly from a whole-of-campus design-to-construction process through to building services installers providing a post-tender response to the main contractor. Many facilities anticipated to be IL4 are downgraded to Importance Level 2 or 3 structures, with some designed as Importance Level 1 (class 10) shed under NCC Volume 2. One state infrastructure department and the *AEES Commentary to AS1170.4:2007 (2nd Edition)* have both provided a detailed staged approach for industry, although: How effective has its uptake been? What factors is it competing with? Can the IL4 Special Study be integrated into other initiatives that already have inertia? Or Does Australia require a significant earthquake event and a subsequent Royal Commission to make more clear a mandated building requirement?

This paper will outline the current industry practices and dialogue around facility resilience, bring forward methodologies for gaining traction for an all-of-campus, 'all-hazards' approach to embedding Special Studies and the opportunity to review existing facilities for improved resilience.

Keywords: Special study, Importance Level 4, IL4, seismic design, resilience, vulnerability, serviceability, operational, business continuity plan, natural hazards, consequence, fragile systems, non-structural elements

1 Introduction

The *National Construction Code Volume 1 (NCC)* applies to Class 2 to 9 Buildings, and its *Part B1 Structural Provisions* requires the assigning of Building *Importance Levels.* Numbered 1 to 4, these are *determined in accordance with Table B1D3* (2022, previously Table B1.2a) with a *'generic description of building types'* (i.e. vague definitions) except for Importance Level 4 (IL4): *Buildings or structures that are essential to post-disaster recovery or associated with hazardous facilities*. An Importance Level 5 exists in Australia for buildings not covered by the *BCA (NCC Volume 1),* with relevant information contained in *AS/NZS 1170.0 Appendix F*.

The NCC Part B1 Structural Provisions also require a building or structure to resist the most critical action, including *earthquake actions,* in accordance with *AS 1170.4:2007*. This design load standard saw the introduction of a *Special Study* for IL4 '*structures to ensure they remain* *serviceable for immediate use following the design event associated with importance level structures'* (presently a *1-in-500-year event*, NCC 2022).

Since its introduction, *IL4 Special Studies* have been prepared for multiple projects around Australia with varying degrees of detailing and consideration. These documents have formed a basis for the seismic design criteria of the documentation for critical infrastructure projects. However, these are not public documents and generally receive no scrutiny for adequacy to the requirements of *AS1170.4* or other relative guidance documentation.

The *AEES Commentary to AS 1170.4-2007, 2nd Edition* (Clause C2.2.1) integrated McBean's (2021) paper *'AS1170.4 Special Study Requirements for Importance Level 4 Buildings and Facilities'* which detailed a proposed scope and methodology for IL4 Special Studies. It is recognised that prior to the release of the updated commentary, very little documentation had been published on this topic, resulting in highly varied outcomes.

2 Importance Level determination

2.1 Results may vary

The *determination* of an Importance Level for a facility can result in multiple outcomes and does so through significant subjectivity. Considered a 'highly logical process' by many engineers, the author has observed much variation to illustrate by example: a *remote rural-based state emergency service vehicle storage facility and operations centre* can be determined as –

a. Importance Level 4 - due to its post-disaster response or recovery obligations (under a state emergency management plan (SEMP) or similar), or;

b. Importance Level 3 – because:

    a. '*AS/NZS 1170.0:2002 Table 3.2*[1] (sic) does not include Rescue in the list of emergency service facilities for IL4' (a State Government Treasury Department, 2018), or;

    b. 'We have a network of *'emergency service* garages around the state, and we only need affected vehicles to get them out the doors, and the facility isn't needed'.

c. Importance Level 2 – 'We have so many other facilities spread around the state, therefore we can afford to lose a few buildings (therefore 'not essential'), and it's not a

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[1] **Important note:**

AS/NZS 1170.0 Table 3.2 should not be utilised for importance level determination in Australia as:

a. Section 3 relates to NZ only, as per the section title and multiple statements throughout the section to the fact that the Australian structures should be designed to the BCA (Building Code of Australia) or *AS/NZS 1170.0 Appendix F* (for non-BCA structures).

b. Table 3.2 has been superseded by the *New Zealand Building Code Clause A3*, which differs in many values and descriptors.

c. The Annual Probabilities of Exceedance in Section 3 & Appendix F for IL4 buildings are 2500 years and exceed the NCC values for Wind and Earthquake in Australia.

building 'designed to contain a large number of people as per IL3'. So, it's IL2 'not included in IL1, IL3 and IL4 (*NCC*, 2022), or;

d. Importance Level 1 – 'It's a Class 10 Shed: with only 3 vehicles stored within it' (apparently), and therefore able to be designed to NCC Volume 2. This situation is commonly reported to the author by Structural Engineers and is anticipated to originate from interpretations of the Australian Steel Institute shed design (ASI, 2012).

For clarification, these scenarios are common. With no adequate Importance Level determination process, agency stakeholders with responsibility for Disaster Risk Reduction (but very little construction knowledge) are dependent upon designers and constructors to 'provide the best facility for the given budget', creating subjectivity through an additional financial risk assessment over the building codes already established risk methodology.

2.2 Guidance for determination

The determination of an Importance Level is only enforceable based on the NCC Volume 1, although the *Guide to the BCA* (NCC Volume 1) does provide commentary.

Unfortunately, the NCC description for Importance Level 4 falls short of the common Disaster Management concept (4 phases) as these facilities are required during the post-disaster 'Response' phase, prior to 'Recovery', which unsettles IL4 facility definitions immediately.

The *NCC Volume 1 2022* was not published with a 'Guide to the BCA'. 2 years after the publication, an *Online guide* will be available in December 2023 (ABCB.gov.au, 17/09/2023). The *NCC 2019 Guide to Volume One* is considered the present source of Importance Level 'specific example'. It's worth noting the *Guide to the BCA 2016* Table B1.2a provides a much more precise visualisation due to its tabular form and does not appear to be text related to the previous heading, 'Windows forming part of a barrier' (as per 2019).

Points of interest in the Guide to the BCA 'specific examples' are:

a. Emergency service **vehicle garages** are included in *emergency service facilities*.

b. Hazardous conditions – capable of extending, or not, beyond property boundaries are differentiated between *IL4* & Importance Level 3 (*IL3*), respectively.

c. Utilities required as a backup for *IL4* facilities should be IL4.

d. *Medical Emergency or surgery facilities* – are anticipated to be redefined to *Emergency Medical and Surgery facilities*, as without an emergency function, medical surgery facilities are not essential to post-disaster function (*confirmed by ABCB to author, although yet to be published*)

Following the Importance Level examples in the *Guide to the BCA* is a sentence worthy of great attention: 'Importance Levels must be assigned on a case by case basis'. However, this is not expanded upon except for a highlighted 'Example' regarding two similar hospitals. This provides a great deal of subjectivity to be introduced through the sentence and use of the word 'may', meaning variance is permitted, allowed or optional (Standards Australia, 2023). Yes, a case-by-case basis must be utilised, but what does that look like?

The *Guide to the BCA* Part B1.2 provides a (untitled) table for 'the determination of Importance levels' based upon values for *Hazard To (sic) human life* and *Impact on the public*. The differentiation between the evaluations rests heavily upon the imagination of the user to estimate the Hazard and Impact and creates an opportunity for subjectivity. This Risk Matrix seems a highly sophisticated process for an Importance Level determination without any expanded guidance process and is not perceived to be utilised.

2.3 *Improving Importance Level Determination*

The author can assist projects, although in the absence of engagement, an '*NCC Importance Level Determination'* (Figure 1) process has been created for structures built to NCC Volume 1 (Class 2-9 structures), and an 'Importance Level 4 (IL4) Case-by-Case Basis' (Figure 2) process in alignment with the principles of this paper and McBean (2021).

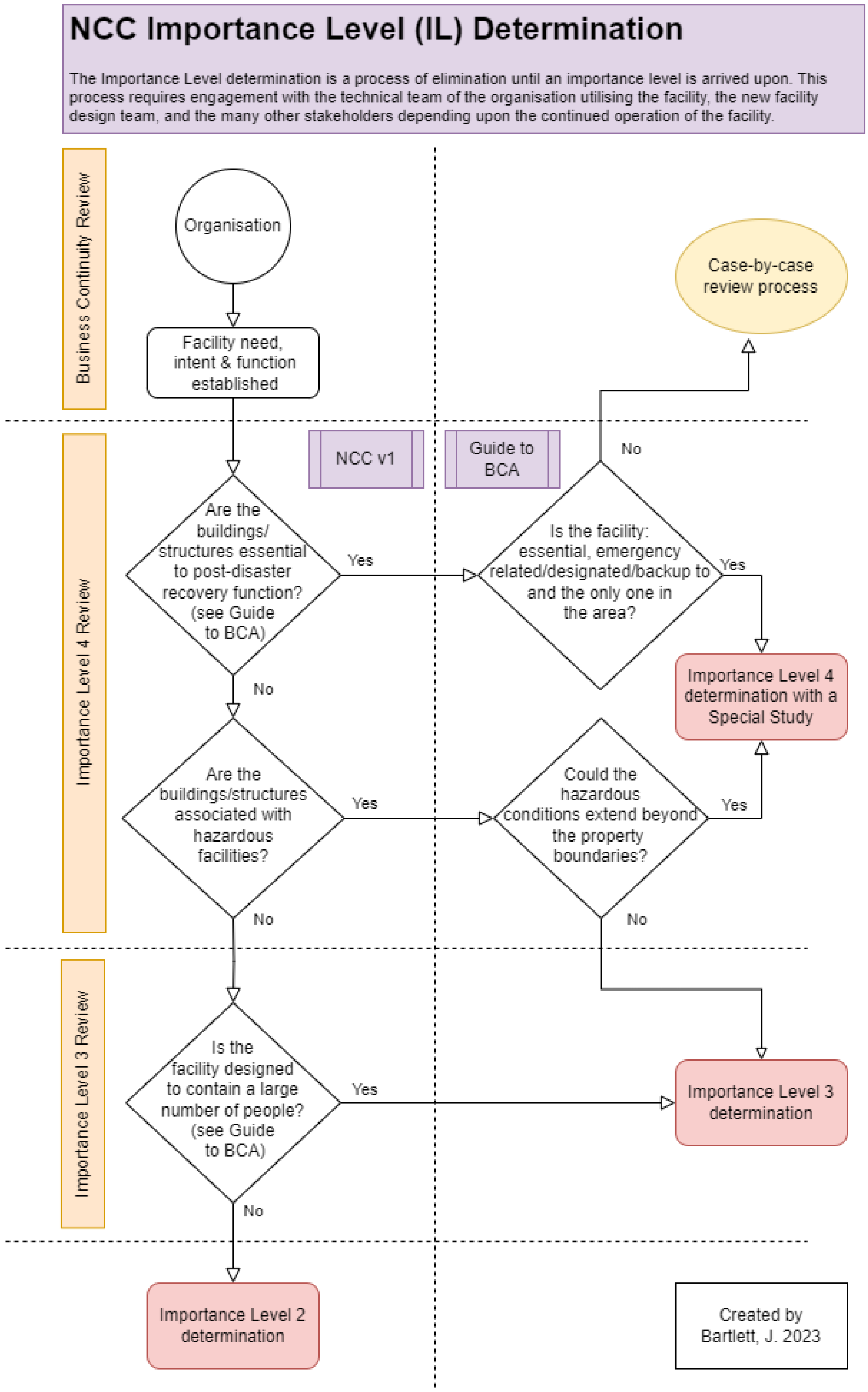

Figure 1 NCC Importance Level Determination' process

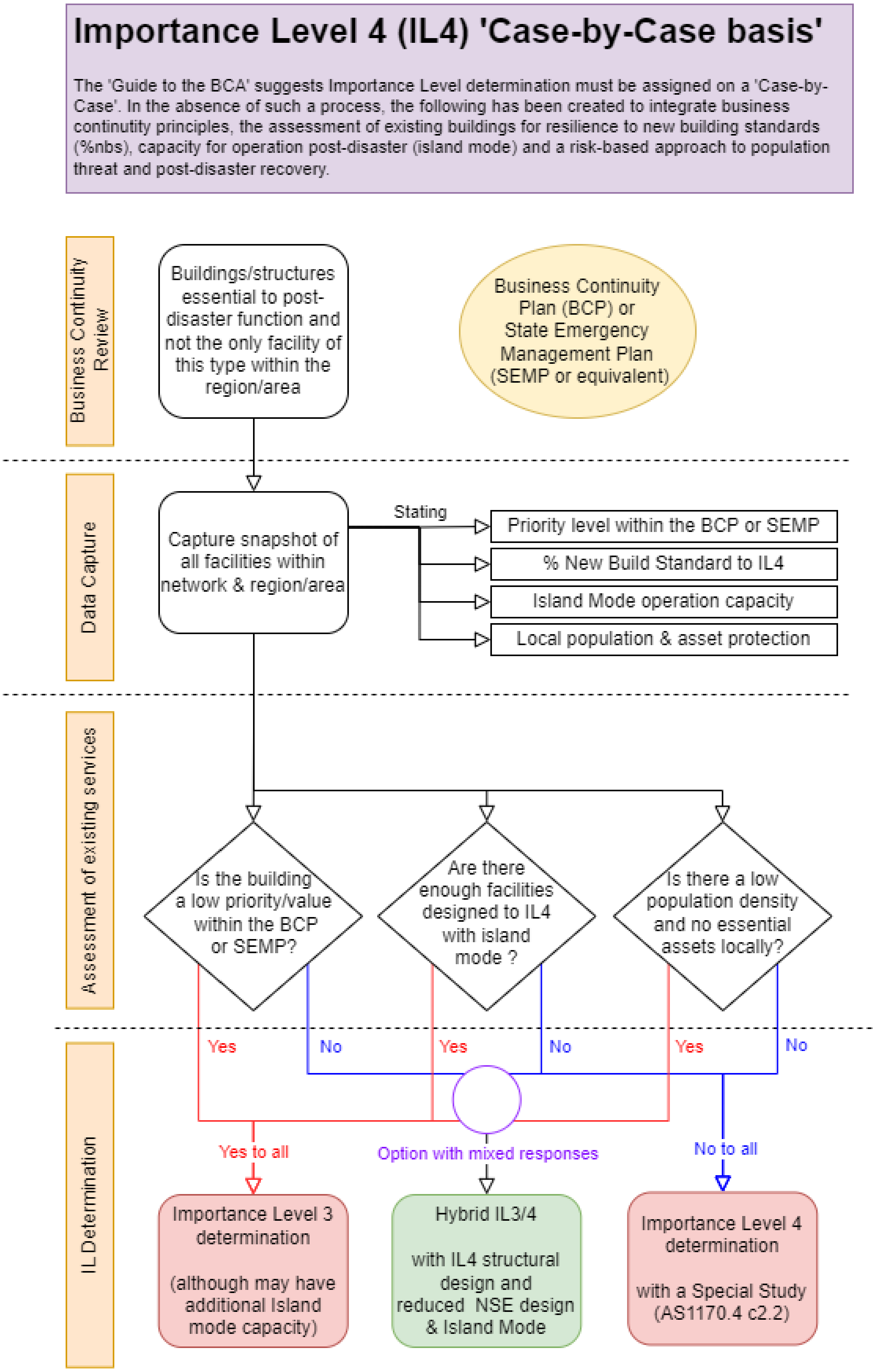

Figure 2 Importance Level 4 (IL4) Case-by-Case Basis

2.4 Reporting of Facility Resilience

The *Security of Critical Infrastructure Act 2018: Ge*neral guidance for Critical Infrastructure Assets (2023) states:

> *The Australian Government is committed to working with industry to protect the **essential services** all Australians rely on by uplifting the security and* resilience of our critical infrastructure*. Threats ranging from **natural hazards** (including weather events) to human induced threats (including interference, cyber attacks, espionage, chemical or oil spills, and trusted insiders) **all have the potential to significantly disrupt critical infrastructure**.*

Unfortunately, the responsibility for threat assessment is then left to the infrastructure agency, and it's anticipated 'Business as Usual' is accepted.

There is no evident method of reporting or form of governance (accountability) for Importance Level determination and resilient design (IL4 Special Study). This is not surprising as there is very little knowledge of the existence of Importance Levels outside of structural engineering (and seismic design requirements) and hardly any peer review or external oversight.

This topic may require more significant investigation in future, with an increased focus on community resilience and the ever-increasing pressures on the political and insurance landscape.

In short, multiple facilities or structures in Australia that should be IL4 are downgraded to IL3 or less and never get consideration for an IL4 Special Study to *'remain serviceable for immediate use'* following a 1-in-500-event (*IL2*).

2.5 Governance of IL Determination

It is assumed that a lack of guidance publication has led to little awareness of importance levels by individuals in Australia. Therefore, IL determinations are not often challenged by building approval authorities or facilitators. A basic search for disputes within Australia did not return any cases.

Due to the higher seismic hazard and associated hazard awareness and mitigation through Importance Levels, the search did return 5 cases in New Zealand where legal challenges had been lodged and determinations made by the Crown. In the interests of knowledge sharing, the cases have been added as Appendix A.

2.6 Other Hazard Events Considerations

Importance Levels also apply in Australia to the structural design for snow and wind considerations. A brief history of Importance Levels is illustrated in Figure 3 Importance Level (IL) - evolution story.

2.6.1 Wind

AS/NZS 1170.2: Structural Design Actions Part 2: Wind actions Table 3.1 (A) Note 3 includes a statement: 'for buildings in townships in cyclonic regions, users should consider the overall risk to a community when selecting importance levels'. This standard makes no other mention of importance levels and has no references to post-disaster function. It is wondered by the author if the 'overall risk' line is considered a 'full and fair warning' to ensure due diligence for post-disaster function. Occasionally, facilities are designed for post-disaster functions similar to the IL4 Special Study. However, it appears it is only in areas recently heavily impacted by cyclone events as a retrospective action.

2.6.2 Flood

Importance Levels have their origins in the International Building Code Table 1604.5 Risk categories (ICC, 2023). This table similarly applies to wind, snow and earthquake but applies to Flood Risk to structures. The consideration for Flood Risk in Australia is quite limited within the NCC and only appears to consider Class 1, 2, 3, 4 and 9 buildings, and quite topical presently.

2.6.3 Bushfire

Under NCC G5V1, an *Importance Level* is assigned for buildings in bushfire-prone areas and Importance Level 4 is assigned to post-disaster and hazardous materials facilities but also incorporates ‘stay in place’ strategies for accommodation for the aged, children or people with disabilities, detention centres, etc. Therefore, the same term, *Importance Level*, has been adopted by the NCC, although with a multitude of variations of the determination and very little guidance as to what is required, which seems quite concerning.

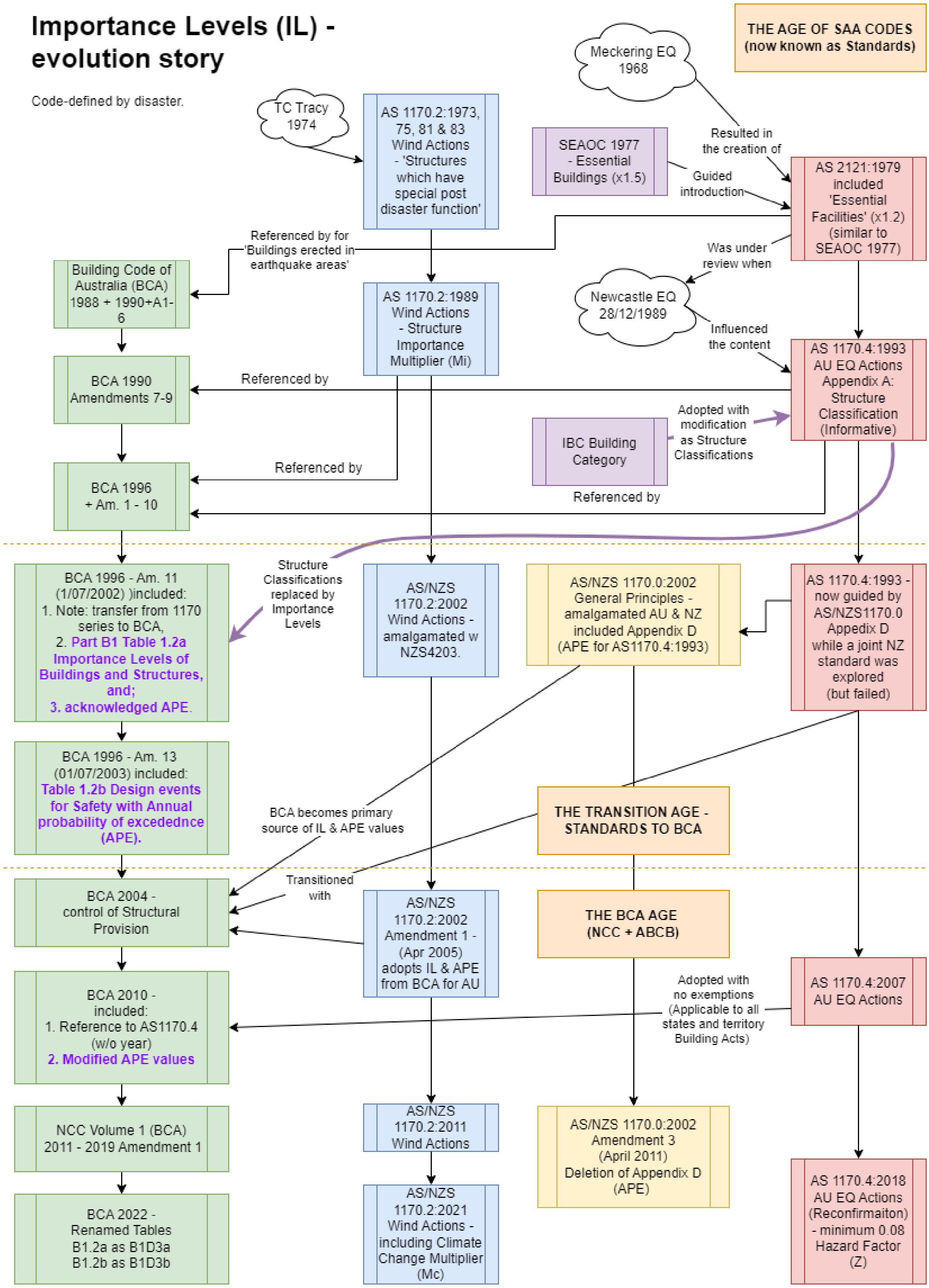

Figure 3 Importance Level (IL) - evolution story

3 IL4 Facility, but no Special Study

The author has produced many *IL4 Special Studies* for minor projects in 3 years but observed only five project-related reports (by others) in 10 years. The author has worked on (20) other major IL4 projects that did not have an *IL4 Special Study*. These IL4 projects include multi-billion-dollar state hospitals with Emergency Departments (Acute Services), state emergency service facilities, defence-related projects, etc. Some of these IL4 projects were also unaware of the *NCC-mandated* requirements of *AS1170.4 Section 8*. One project may be asking for 'seismic ceilings' although unaware of the requirements for other non-structural elements to be designed in accordance with Section 8.

Most IL4 projects without an *IL4 Special Study* did receive some degree of seismic design of elements. However, there was no holistic design to bring together the post-disaster function of the facility, subjectivity was allowed for component importance, ductility and other factors, and there was no construction monitoring specific to seismic compliance.

In short, the requirement for an *IL4 Special Study* is generally unknown to the project delivery team or unwanted. Some questions could be:

- Who should be asking for an *IL4 Special Study*?
- Why doesn't the financier, client or certifier know about *IL4 Special Study*?
- Why would anyone offer *IL4 Special Study* up? Especially if you have already won the tender.

The late arrival of such a requirement could trigger a project variation. Many an agency queried by this author has shuddered at the idea of scope creep. Unfortunately, non-expert consultants offer opinions, with one consultant advising an emergency services agency that 'a project cost could increase by a factor of +1.5' (2.5 times the original estimate from $800M to $2B) if an *IL4 Special Study* was created and implemented into the build.

The flip side of this argument is: What happens if an IL4 building is not built *to remain serviceable for immediate use* post-disaster?

Critical facilities that are intended to be available when our communities most depend on them are highly likely to have lost some or all of their functionality in an earthquake if they are not developed with a comprehensive Special Study.

In Australia, major natural hazard events defined as a disaster have been followed up by a Royal Commission. Generally, these events are found to have been a series of systemic failures and effectively human-made disasters with the term 'Unprecedented' 'wheeled-out' as an excuse. However, it is noted that the NCC and AS 1170.4 have already documented these needs: a failure to deliver an IL4 facility without a Special Study is a systemic failure and a vulnerability for the Australian people.

4 IL4 Special Study

4.1 Creation

McBean (2021) covered the requirements of an Il4 Special Study in great detail, and this author recommends a complete reading of that paper prior to reading the following section. McBean introduced in the *Concluding Remarks* the need for a 'single individual who should have responsibility for the continuous oversight of the special study': although no specific qualification was identified in the document, the subsequent conference presentation indicated a Structural Engineer would best service the role. It is here that this author suggests the appointment of a Risk Engineer or a similarly trained person with holistic systems knowledge, knowledge of business continuity planning, and a healthy curiosity (without expert knowledge).

The following are this author's learned experiences from involvement in separate phases of multiple projects with Special Studies.

4.2 Business Continuity & Existing IL4 facilities

Business continuity is the discipline that sits at the heart of building and improving the resilience of organizations. (the BCI, 2018)

Business Continuity Planning done well requires an organisation to review the facilities they have, develop a contingency plan for the short-term (capture duplicate resources), and establish medium to long-term needs with upgrades and building replacement. Unfortunately, business continuity in Australia does not consider earthquakes in the *BCI Good Practices Guide* with only one reference: 'consideration for 'adequate separation from duplicate resources'.

The assessment of the existing buildings could benefit from structural assessments similar to the NZ New Build Standard % (NBS%), with particular attention to the resilience of the non-structural systems. The Australian Standard *AS3826:1998 Strengthening of existing buildings for earthquake* was not mandated by any Building Code of Australia and was withdrawn 06-06-2019 (SAI Global, 2023). AS3826 has recently been made available for purchase and download, although it has not been updated since its introduction and is not anticipated to reflect present-day building requirements.

The South Australian Government document *MBS-001* provides a process for the consideration of acquisition or upgrading of an existing site. Within this specification is a Seismic Rapid Assessment, considerations for all importance levels, and guidance for upgrade requirements.

If a new facility is required, then considering the site for the location of an IL4 facility would benefit from an IL4 Special Study, but also with consideration for all hazards that could threaten the facility (an All-hazards approach).

4.3 New build design-phase

The addition of a Special Study requirement upon a design team results in a great deal of uncertainty in light of little guidance. The Structural Engineer is likely to guide the team based upon their own experience (and assumptions), although it is noted:

a. Earthquake Engineering is not explicitly taught in many Australian universities.

b. Seismic design of NSEs is not taught in any Australian university, and no specific short courses have been observed to this day;

c. No guidance (besides the publication of McBean in November 2021) existed for the basis of an IL4 Special Study;

d. Structural Engineers seem ready to try anything and appear unlikely to receive peer review outside of their firm.

The addition of a Special Study practitioner changes the dynamic of a design team, creates a rapid learning environment, challenges the status quo, and results in robust discussion early in a project rather than late challenges and delays. The outcomes are measurable resilience deliverables post-construction.

It is highly advisable not to go to tender without a complete IL4 Special Study or the inclusion of a seismic design specialist across an entire project.

4.4 Post-tender

If a Special Study has not been produced pre-tender, then there are likely to be multiple project (cost) variations submitted for any specified performance requirements that develop post-tender.

It has been observed that the architectural and building services teams (of main contractors) request seismic designs from their suppliers to illustrate their equipment will meet seismic requirements. Little scrutiny is employed due to a lack of specific specialist knowledge.

Sub-contractors have also been observed to provide IL4 Special Studies to the main contractor based on any assistance they can attain from seismic restraint material suppliers. In short, we have suppliers (incentivised) keen to sell the material who are providing 'Value Engineering' design advice to people with little specific knowledge outside of installing and purchasing. There is no expert review before documentation is added to an electronic system and a box ticked.

The reality is that the seismic design of non-structural elements in Australia is predominantly the responsibility of individual subcontractors during the construction phase of a project. This is done through the design specifications for each trade, which contain requirements to comply with AS1170.4, with varying degrees of further clarification. This is not anticipated to change without the following:

a. Greater industry knowledge of seismic design requirements and IL4 Special Studies
b. Facility owners are demanding greater resilience from their facilities
c. Insurers are taking an interest in facility resilience
d. A moderate earthquake with loss of facilities.

5 Post-installation Review

In Australia, we presently do not have any trigger for post-installation verification of seismic design or review against the IL4 Special Study. Some South Australian projects have received specific scrutiny, although it is not common practice. The author has engaged in multiple post-project evaluations with project walk-throughs and occasional post-construction validation, although to date, this process has not evolved as standard practice.

The post-installation walk-throughs have resulted in multiple identifications of non-compliant installations, non-conforming products, ill-considered processes, and vulnerable post-disaster systems. Most elements identified in walk-throughs stem from:

a. A lack of construction monitoring by a person with seismic design knowledge;
b. Misunderstandings of *AS 1170.4 Section 8*;
c. Misunderstandings of or ignoring the Special Study requirements;
d. Special Study risk controls that apply to the building management post-occupation, and;
e. Post-construction installed elements (additional facility needs) are getting no consideration for the earthquake resilience demanded during construction.

Post-construction validations identified a large number of general construction defects, a lack of seismic design consideration, a multitude of seismic design shortfalls, and multiple systems failing to meet the design intent of the original IL4 Special study. The seismic design shortfalls were:

a. Clashes of services with other services and the ceilings – inadequate vertical or horizontal clearances for displacement.

b. Loose, near vertical, or inadequate capacity wire restraints.

c. Inadequate anchoring – missing, non-seismic rated, edge clearance, angle, etc.

d. Product substitution – non-shake table tested, walls without drift allowance.

e. Requirements not stated in the IL4 Special Study or AS1170.4 but required within another NCC-mandated standard (such as AS2304 s4.6 under AS2118.1), then this requirement is missed as the Special Study is considered full due diligence.

f. Seismic restraint installations not considering vibration mount performance and introducing new pathways for vibration.

g. Fuel storage and other tanks containing liquid designs.

h. Unrestrained furniture, especially new windows in multi-storey buildings.

i. A general failure to consider gravity support of elements.

j. A general failure to allow for displacement of elements.

The impact (outcomes) of these shortfalls during any earthquake event up to moderate could be:

a. Excessive damage to essential elements.

b. Risk of failure of equipment, gravity supports, etc.

c. The creation of a hazardous environment.

d. Injury to occupants and loss of egress.

e. Loss of ingress for post-disaster duties and;

f. loss of facility operation when the community needs it most.

6 Observed seismic treatments

Figure 4 illustrates the many seismic design treatments that are commonly utilised in Australia.

The author has witnessed numerous attempts at achieving seismic resilience for non-structural elements. Some of these elements, which IL4 Special Studies cover, are assigned a single or double treatment that the design team considers to be sufficient. These treatments are documented as such but with lengthy disclaimers at the end of each section.

It is worth noting that some single treatments were required in combination with *‘Restraint to Structure’*. However, some were not, and it’s here that holistic non-structural expertise would have improved earthquake resilience.

For clarification: The author believes that elements benefit significantly from a minimum of three (3) pre-event (mitigation) treatments to establish adequate Seismic Design consideration.

Figure 4 does not take into account the post-occupancy emergency preparedness processes an organisation may take.

Figure 4 Hierarchy of Seismic Treatments of Non-structural Elements (Observed).

An explanation of each element:

Shake-table Testing – appears to be the pinnacle of seismic treatment for resilience and is highly sought after by designers specifying IL4 facilities. Cyclic testing with 3 degrees of freedom with accelerations of up to 3g has been observed in industry with references to AC156 Seismic Certification. Displacement testing is beneficial if the system is tested 'as installed' with all holistic design considerations included, such as integration of passive fire treatments, cross walls, doors & windows, etc.

Seismic design of Element – specific design of all elements of a system to remain operational has been applied to ceilings, non-structural walls, tanks containing liquid, etc.

Restraint to structure – appropriate where the element is capable of maintaining its structure, and this action is transferred directly into the structure or adequately designed substrate.

Duplication (redundancy) - 2 or more pathways or equipment. However, it is noted that duplication alone is inadequate, such as the following (terrible) examples:

a. Hot water boilers – 6x boilers where minimum 1x required: all unrestrained and interconnected: lose one, you lose them all.
b. Twin tanks containing liquid – identical design and restrained to concrete plinth, but no design of tank for liquid actions and structural deformation.
c. Two power transmissions into a building, although sometimes from the same grid feed.
d. Two sets of UPS – identically installed in the same room.

Utilise spare parts – the pre-purchase and storage of spare parts recommended by equipment suppliers or a maintenance/service provider, and availability of skilled labour when required.

Equipment repair – a reactive action post-event

Rent additional equipment – assumption of availability, priority for supply, capacity to supply, capacity to integrate into existing infrastructure, etc.

Utilise People & Consumables – people can replace systems:

a. Fire detection – waking surveillance of facility
b. Fire Suppression – fire appliances on-site for asset protection
c. Potable water – water truck, bottled water, etc.
d. Lighting – torches, lanterns, candles, etc.
e. Communications – handheld radios across varying frequencies (GRN, VHF, UHF, etc.)

Alternative Location – abandon the facility for contingency locations in alignment with the organisational business continuity plan or establish makeshift quarters where available.

7 Conclusions

Facilities that should be Importance Level 4 are being delivered around Australia far below the mandated requirements of the National Construction Code. Without a moderate earthquake in Australia to illustrate IL4 building failure, then industry and society will be none-the-wiser. Resultantly, IL Special Studies are not commonly triggered as a requirement, even when they are often an unknown requirement.

The selection of Importance Levels presently receives little oversight and appears to be entirely subjective. A Structural Engineer is generally relied upon to determine an outcome, no guidance documentation is available to other stakeholders in the process, and no form of oversight occurs. If the certifier is to hold the legal risk, then more significant guidance is required as society is at risk during the event.

Special Studies are an opportunity to disrupt Premature Commitment (design bias) and provide avenues to provide specific facility performance outcomes for resilience to earthquakes and other hazards.

Current construction practices are resulting in facilities being built that will likely suffer loss of function under a design event.

8 Recommendations

The author recommends in the short-term:

a. The creation of a Guidance Framework for Importance Level determination (expanding upon Figure 1 & Figure 2).

b. The creation of an Expanded Framework (beyond McBean (2021)) for IL4 Special Study performance determination.

c. Improve industry awareness of the requirement for an IL4 Special Study (possibly through ABCB, EA, AEES & iStructe)

d. Integration of an IL4 Special Study practitioner at the Concept Stage of a project or as soon as possible.

e. Importance Levels assigned, and IL4 Special Studies for all Critical Infrastructure be:

    a. Reported to the Department of Home Affairs Cyber and Infrastructure Security Centre for scrutiny by a Facility Resilience Panel with construction knowledge.

    b. Reviewed by the National Emergency Management Agency

c. Any variation from Importance Level 4 (accompanied by a Special Study) to be supported by evidence of suitability.

The author recommends in the medium term:

a. A resilience assessment of all existing infrastructure by agencies with post-disaster function obligations as per Figure 2 Importance Level 4 (IL4) Case-by-Case Basis,

b. *IL4 Special Studies* form part of the requirements for submitting Building Approval for IL4 facilities.

c. The Australian Wind Engineering Society produce a guide to designing Importance Level 4 Facilities to remain serviceable post-wind event to avoid facility failure, possibly in conjunction with the Australian Earthquake Engineering Society.

d. The preparation of a guide to design for post-disaster function of facilities deemed Importance Level 4 under the NCC Ancillary provisions G5V1 Buildings in Bushfire Prone Areas (as per Part B1, although including multiple IL3 facilities).

The author believes in time with multiple major disasters, excessive mortality and a change in public sentiment that, maybe there will be an appetite for:

***IL4 Special Studies* will become an *NCC Volume 1* requirement to address the combined natural hazard risks (where applicable) of earthquake, snow, wind, flood and bushfire.**

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