Australian Institute of Architects

Royal Commission into National Natural Disaster Arrangements

Submission to the Australian Government

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PURPOSE

- This submission is made by the Australian Institute of Architects (the Institute) to provide information on the response by the Institute and members to the 2019-20 bushfire season and to provide evidence about resilience, adaptation and mitigation in response and recovery from disasters.
- At the time of this submission the National President of the Institute is Professor Helen Lochhead.
- The Chief Executive Officer is Julia Cambage.

INFORMATION

The Australian Institute of Architects (Institute) is the peak body for the architectural profession in Australia. It is an independent, national member organisation representing over 12,500 members across Australia and overseas.

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.

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EXECUTIVE SUMMARY

The Australian Institute of Architects works to ensure high quality outcomes in our built environment helping to shape resilient, liveable and high-functioning cities, regional towns and rural communities.

We welcome the opportunity to provide evidence to the Royal Commission into National Natural Disaster Arrangements, established in response to the extreme bushfire season of 2019-20 which resulted in loss of life, property and wildlife and widespread environmental destruction.

Our submission will highlight the critical role of built environment professionals in improving the resilience and adaptation of Australian society to changing climatic conditions. At the same time, we will seek to provide evidence and recommendations that will actively mitigate the impact of natural disasters.

The Institute accepts the science on climate change and the need for a proactive response. Globally, building and construction accounts for nearly 40 precent of energy-related carbon dioxide emissions while also having a significant impact on our natural habitats and biodiversity.

Climate change is the key factor contributing to the disruption of human societies through extreme weather events and natural disasters, and as the most recent bushfire season has reminded us, Australia is not immune to this new reality. It is clear that these impacts will escalate in the future and urgent action is required to both reduce greenhouse gas emissions to limit the severity of climate change and to proactively plan for a more hostile climate.

The physical destruction accompanying disasters, including the 2019-20 bushfires, typically creates an urgency to rebuild damaged communities and help survivors get their lives back on track. There are many inspiring examples of how architects, planners and other built environment professionals have contributed to rebuilding.

Post-disaster recovery and reconstruction presents an opportunity to reduce vulnerability to future disasters and to build community resilience in physical, social, environmental and economic terms. The Institute is supporting and enabling built environment professionals to not only contribute to rebuilding what has been lost, but to build back better.

In the medium to longer term, where and the way we live and organise our communities, and how and where we build our houses will play an important part in how we prepare and respond to natural disasters in the future.

Action to change the way we approach the design and management of the built environment is required now and we must seek to continually improve the efficiency of buildings through design and use and move progressively toward a built environment that positively contributes to natural systems and actively works to mitigate the impact of natural disasters.

To this end we support the following recommendations to the Royal Commission:

1. The Australian Government must ensure we meet our international Paris Agreement obligations to reduce greenhouse gas emissions by 26 - 28 per cent from 2005 levels by 2030.
2. A national crisis response framework led by the Australian Government requires detailed consideration with clear roles, expectations and funding at all levels of government.
3. A new national disaster monitoring facility should be established to fill data gaps related to past natural disaster events in Australia and provide modelling on future scenarios to underpin evidenced based policy and regulation development, alongside climate change resilience, adaptation and mitigation initiatives.
4. Australian Government sponsored rebuilding projects following natural disasters and designed as stimulus in response to the Covid-19 pandemic should be mandated to comply with net zero emissions which can be achieved through the appropriate choice of complying building materials and construction processes.
5. Built environment professionals must be supported to design more sustainable buildings that address the impacts of more extreme climate and weather events, are responsive to local conditions and produce locally based solutions.
6. The National Construction Code should be amended to ensure that overall energy efficiency is balanced alongside the need for heat resistant design, limiting indoor heat stress for occupants during heatwaves.
7. The concept of a “building control zone” in the Northern Territory must be removed and all construction must be compliant with the National Construction Code.
8. A detailed and considered review of options to upgrade both infrastructure and housing in remote communities in response to the effects of climate change must be undertaken.
9. Australian Government building projects following natural disasters or designed as stimulus in response to the Covid-19 pandemic, should be used to upgrade both infrastructure and housing in remote communities as a priority.
10. Australian Government initiatives following natural disasters or designed as stimulus in response to the Covid-19 pandemic, should support people to upgrade the energy efficiency of their homes to prepare for, and create additional resilience to, the impacts of climate change in our built environment.
11. When rebuilding after disasters we must ensure we “build back better”. It is possible to design much better, more fire resistant, more resilient, sustainable and climate responsive houses than what was there before. We must ensure this occurs.
12. Rebuilding in bushfire affected zones is appropriate when designs are well located and compliant with Australian Standards and use best practice planning principles.

13. Remote locations with a single access approach, surrounded by bush and without any support infrastructure or any potential for a fire break, should be considered unsuitable for reconstruction and seen as inherently vulnerable.
14. Effective solutions to the creation of disaster resilient communities will require a wide range of people, including built environment professionals, working together. Where a settlement has been affected, for example by bushfire, communities can and should be part of the future planning and decision-making process to ensure investment and reconstruction benefits the broader community.
15. Australian Standard *AS3959-2018: Construction of buildings in bushfire-prone areas* is guided by 2009 Forest Fire Danger Index (FDI) data. The Standard should be updated in line with modelling that includes data from 2019/20 fire events to allow bushfire risk to be appropriately quantified and mitigation actions appropriately identified.
16. Post fire analysis is extremely important, and we should seek to understand if the cost of building destruction in bushfires is greater than the costs of putting in place more stringent building requirements and regulation. Where required, regulation should be altered in response to relevant findings.
17. The use of *Australian Standard AS 1530.8.2: Methods for fire tests on building materials, components and structures* by each regulator in each state and territory should be reviewed and processes streamlined.
18. Where possible, products deemed acceptable as an "Alternative Solution" in one jurisdiction should be able to be used in like situations in another jurisdiction without further product testing or expert reports.
19. A detailed and considered review of options to upgrade existing housing stock in bushfire prone areas must be undertaken. If necessary, government incentives and regulatory assistance should be provided to support homeowners to upgrade property to enhanced safety levels.
20. Australian Government sponsored rebuilding projects following natural disasters should include opportunities for homeowners who have not lost their homes to access support to upgrade their properties to enhanced safety levels.
21. Economic stimulus in response to the Covid-19 pandemic to support the building and construction sector should consider government incentives and regulatory assistance to homeowners to upgrade property to enhanced safety levels, in response to both bushfire threat and other natural disasters.
22. Evidence collected from the 2019-20 Bushfire season must be used to revise Australian Standard *AS 5414-2012: Bushfire water spray systems*. This should include a reassessment of the regulatory and practical benefits of installing water spray systems on both new and existing dwellings in both residential and commercial settings and seek to remove the regulatory limitation stating that water spray systems are only suitable for use in situations up to Bushfire Attack Level BAL-19.

23. A detailed and considered review of options to bring a wider array of accredited bushfire bunkers to the market should be undertaken.
24. The Building Ministers Forum and Australian Building Codes Board should consider the merits of approved bunkers within bushfire prone areas for both private and public use including using community buildings as ‘safer-place’ refuges.

1. INTRODUCTION

The Australian Institute of Architects (the Institute) is the peak body for the architectural profession in Australia, representing over 12,500 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.

The Institute mobilised early to provide as much support to the architectural profession, and in turn the community, as possible during the 2019-20 bushfires which ravaged Australian communities over the Christmas and New Year period.

Across Australia communities were also mobilising to provide assistance in every possible way to family, to friends and to complete strangers. The stories of compassion and generosity witnessed directly or seen in the media show the Australian spirit is strong, providing a source of hope and support for many who faced an extremely dark and difficult time. The Institute would like to thank those dedicated volunteers and emergency services who worked tirelessly to battle the fires and give support to those in need.

The Institute welcomes the opportunity to make a submission to the Royal Commission into National Natural Disaster Arrangements (Royal Commission). The comments below relate both to the response by the Institute and its members to the events of the 2019-20 bushfire season, and to broader conversations around the changing global climate and increased risks to Australia's ability to prevent, mitigate and respond to bushfires and other natural disasters.

Architects and other built environment professionals are well placed to contribute to responsible development and strategies that address the consequences of longer, hotter, drier seasons and severe weather events over the coming months and years.

The Institute is already developing new skills and capacity in the architectural profession to ensure we build back better. In the medium to longer term, where and how we build our homes and organise our communities, will also play an important part in how well we prepare and respond to bushfire and other natural disaster threats in the future.

How we ensure the adaptation of our existing infrastructure and housing stock is also of key importance to the Institute as is the development of a stimulus response to the economic impacts of the Covid-19 pandemic, that strives for more sustainable, zero carbon development outcomes in all new building projects.

2. NATURAL DISASTERS IN AUSTRALIA AND OUR CHANGING CLIMATE

2.1 Natural disasters

The 2019–20 Australian bushfire season, started with a series of uncontrolled fires in June 2019, peaking during December 2019 –January 2020 with the fires burning more than 46 million acres of land including at least 80 percent of the Blue Mountains World

Heritage area in New South Wales and 53 percent of the Gondwana world heritage rainforests in Queensland.[i]

Destroying over 5,900 buildings including 2,779 homes and killing at least 34 people[ii] the cost of dealing with the bushfires, before the outbreak of the Covid-19 pandemic, was expected to exceed the A$4.4 billion of the 2009 Black Saturday Fires[iii] as tourism sector revenues fell more than A$1 billion.[iv]

More than a billion native animals including 800,000 in New South Wales have been estimated to have been killed[v], along with a large number of livestock including at least 100,000 sheep on Kangaroo Island alone[vi]. Hundreds of thousands of fish also died in the Macleay River in northern NSW because of the ash and sludge from the fires. [vii]

During the peak of the fires, air quality dropped to hazardous levels[viii] and by 7 January 2020, the smoke had moved approximately 11,000 kilometres across the South Pacific Ocean to Chile and Argentina.[ix] NASA has estimated that 306 million tonnes (337 million short tons) of CO2 were emitted during the bushfires, which is over half of Australia's annual carbon emissions[x].

Natural disasters, bushfires, floods and droughts all occur on the Australian continent and one disaster or another can leave whole communities devastated every year. Tropical cyclones are able to destroy acres of crops in minutes, drought destroys the landscape and kills livestock and native animals slowly and cruelly, and floods and fire sweep through the land ruining everything in their path. Lives are lost, significant pain and trauma occurs, and the economic effects are equally devastating.

With Australia vulnerable to a wide range of natural disasters including heatwaves, bushfires, droughts, floods, severe storms and tropical cyclones, earthquakes, tsunamis, landslides and now pandemics it is clear that a national disaster response capability is essential. We must learn from previous events, adapt, respond and move forward together in order to meet these future challenges head on.

2.2 The changing climate

The Institute accepts the science on climate change and the need for a proactive response. Globally, building and construction accounts for nearly 40 precent of energy-related carbon dioxide emissions while also having a significant impact on our natural habitats and biodiversity.

Climate change is the key factor contributing to the disruption of human societies through extreme weather events and natural disasters, and as the most recent bushfire season has reminded us, Australia is not immune to this new reality. It is also clear that these impacts will escalate in the future.

The Australian Government must ensure we meet our international Paris Agreement obligations to reduce national greenhouse gas emissions by 26 - 28 per cent from 2005 levels by 2030. The Paris Agreement also expects countries to increase their current targets so it can meet its goal of keeping global warming well below two degrees.

ARCHITECTS DECLARE A CLIMATE AND BIODIVERSITY EMERGENCY

In 2019 the Australian Institute of Architects endorsed "Architects Declare Australia" a group of 889 (and growing) leading Australian architects and architectural firms who have joined their international peers to declare a climate and biodiversity emergency:

www.architectsdeclare.com.au

"The twin crises of climate breakdown and biodiversity loss are the most serious issue of our time. Globally, buildings and construction play a major part, accounting for nearly 40% of energy-related carbon dioxide (CO2) emissions whilst also having a significant impact on our natural habitats.

For everyone working in the construction industry, meeting the needs of our society without breaching the earth's ecological boundaries will demand a paradigm shift in our behaviour. Together with our clients, we will need to commission and design buildings, cities and infrastructures as indivisible components of a larger, constantly regenerating and self-sustaining system.

The research and technology exist for us to begin that transformation now, but what has been lacking is collective will. Recognising this, we are committing to strengthen our working practices to create architecture and urbanism that has a more positive impact on the world around us. We will seek to:

- Raise awareness of the climate and biodiversity emergencies and the urgent need for action amongst our clients and supply chains.
- Advocate for faster change in our industry towards regenerative design practices and a higher Governmental funding priority to support this.
- Establish climate and biodiversity mitigation principles as the key measure of our industry's success: demonstrated through awards, prizes and listings.
- Share knowledge and research to that end on an open source basis.
- Evaluate all new projects against the aspiration to contribute positively to mitigating climate breakdown and encourage our clients to adopt this approach.
- Upgrade existing buildings for extended use as a more carbon efficient alternative to demolition and new build whenever there is a viable choice.
- Include life cycle costing, whole life carbon modelling and post occupancy evaluation as part of our basic scope of work, to reduce both embodied and operational resource use.
- Adopt more regenerative design principles in our studios, with the aim of designing architecture and urbanism that goes beyond the standard of net zero carbon in use.
- Collaborate with engineers, contractors and clients to further reduce construction waste.
- Accelerate the shift to low embodied carbon materials in all our work.
- Minimise wasteful use of resources in architecture and urban planning, both in quantum and in detail.

In Australia, we as architects are aware that Aboriginal and Torres Strait Islander peoples have long espoused the cultural, social, economic and environmental benefits embedded in the holistic relationship of Caring for Country.

The Founding signatories of Architects Declare are:

ARM Architecture, Alec Tzannes, Bates Smart, Breathe Architecture, Brit Andresen, BVN, Circa Morris-Nunn, Clare Design, Design 5, dwp | design worldwide partnership, FJMT, TheFulcrum.Agency, Glenn Murcutt, Greenaway Architects, Gregory Burgess Architects, Hassell, Iredale Pedersen Hook, Jackson Clements Burrows (JCB), John Wardle Architects, Ken Maher, Kerstin Thompson Architects, Koning Eizenberg Architecture, Inc., Liminal Studio, Partners Hill, Peter Stutchbury, Rick Leplastrier, Six Degrees, Taylor and Hinds Architects, TKD Architects, Troppo, and Woods Bagot.

The Department of Environment and Energy projections released in December 2019 show Australia is currently not on track to meet the current target.[xi] This is confirmed by modelling in the annual United Nations Environment Programme *Emissions Gap Report 2019*.[xii]

The Paris Agreement aims to limit temperature increases between 1.5°C and 2°C. The world is already far off the pace needed to meet these emissions reduction targets, and must ultimately get to net-zero to prevent the worst climate change impacts. Urgent action is required to both reduce greenhouse gas emissions to limit the severity of climate change and to proactively plan for a more hostile climate. The architectural profession is both leading to drive the reduction of greenhouse gas emissions while working to ensure our built environment is able to adapt and respond to new climate norms.

The recent "Australian Architects Declare a Climate and Biodiversity Emergency" includes a commitment from architectural firms to raise awareness of the climate and biodiversity emergencies and the urgent need for action. The signatories have agreed to advocate for faster change in the built environment industry towards regenerative design practices and the establishment of climate and biodiversity mitigation principles as a key measure of success.

Recommendations

1. The Australian Government must ensure we meet our international Paris Agreement obligations to reduce greenhouse gas emissions by 26 - 28 per cent from 2005 levels by 2030.

3. ROLE OF AUSTRALIAN GOVERNMENTS

3.1 National coordination

More people are living in high-risk bushfire areas, emergency services are stretched, and the climate is rapidly changing making future crises inevitable. With bushfire only one of the natural disasters that Australia must prepare for, the need for a national crisis response framework, led by the Australian Government with clear roles, expectations, and funding at all levels of government requires detailed consideration.

State and territory governments are primarily in the front line of emergency management. However, catastrophic disasters like the 2019-20 bushfire season show that incidents of this scale quickly exceed the ability of local, state and territory governments to cope and a nationwide response with national scale resource provision is essential.

The resources of our emergency services, their staff and volunteers can only go so far. Regularly the emergency services of one area or state are deployed to other areas to respond to emergencies. While existing emergency management plans allow for assistance across state borders and between all levels of government, there is no national emergency legislation defining the Australian Government's role or assigning responsibility for responding.

With resource-sharing between states requiring better coordination and reduced duplication, investment in programs that enable emergency services to work better together, coordinated at the national level, embedded in a national crisis response framework would be a positive step.

An overarching national framework could also support non-government organisations, business and communities who are already making valuable contributions to play a more central role and foster a whole-of-community response to natural disasters. For example, a well-resourced national framework could provide greater training and investment to build the capacity of local networks of community groups to manage community preparedness including creating community safe places and helping locals before and during emergencies through the development and implementation of Regional Disaster Response Plans.

There should be whole-of-government support for the establishment of Aboriginal and Torres Strait Islander adaptation and resilience groups to prepare for disaster response, drawing on existing social and economic capital. This could include the continuation and expansion of the Indigenous Land and Sea Ranger program, community enterprise groups, housing and outstation agencies alongside enhanced partnerships with industry and government.

As for other communities, Regional Disaster Response Plans must be developed which provide safe emergency shelters, enable the restoration capacity of regional infrastructure, and implement preventative disaster methods including fire management and infrastructure monitoring. With future increased temperatures and extreme weather events, many rural and remote regions will increasingly depend on the remaining-on-country resident Aboriginal and Torres Strait Islander communities as the basis for a decentralised system that supports a local response to natural disasters as well as promoting initiatives to reduce risk and target disaster mitigation.

Looking beyond crisis management, any national framework should also be robust enough to develop an efficient and effective disaster and land management program across Australia, alongside any other risk reduction and targeted disaster mitigation activities that would benefit from national coordination.

A federal bureau of disaster and land management could effectively support national policy development and coordinate investment, including monitoring and reporting on forest and land conditions. State agencies, local authorities, private landowners along with Aboriginal and Torres Strait Islander communities could continue to provide land management that meets local needs but that is aligned with national targets and supports a national coordinated approach to disaster management in Australia.

Recommendations

2. A national crisis response framework led by the Australian Government requires detailed consideration with clear roles, expectations and funding at all levels of government.

3.2 Reducing risk

The Productivity Commission and Australian Prudential Regulation Authority (APRA) have been calling for a focus on risk reduction and targeted disaster mitigation funding. This could include priority investments in flood mitigation, strengthening buildings against cyclones in northern Australia and appropriate land use planning to ensure that future developments are not exposed to unacceptable risks. This would also play a role in helping to address insurance affordability.

Locating new or expanding existing settlements and infrastructure areas exposed to unreasonable risk from natural disasters is irresponsible. The increasing intensity of hazards associated with climate change makes strategic planning to minimise risk even more relevant.

It also makes sense to focus on prevention and preparedness to strengthen infrastructure and the development of policies and programs to reduce risk and help safeguard the poorest and most vulnerable in our communities against disaster impacts.

This approach also makes economic sense, stimulating the economy when delivering disaster risk management, community and built environment resilience projects. These comments apply equally to initiatives designed in response to natural disaster events as well as the Covid-19 pandemic.

3.3 National data and monitoring capability

Australia currently has no national bushfire database making it impossible to track trends in bushfire activity, cost and impacts. Individual states and territories have developed their own approaches, and these are not integrated enough to provide a national picture. This is also applicable to other disasters for example heatwaves, cyclones and floods.

There is a need for a new national disaster monitoring facility empowered to fill in missing data gaps and inform evidenced based policy and regulation development alongside climate change resilience, adaptation and mitigation initiatives. It will also be essential to track our response to the 2019-20 Bushfire season and to make sure we have learnt from the past.

From here we must balance the desire to rebuild communities affected by disasters as quickly as possible alongside the need for careful evidence-based planning that appropriately takes into account the changing face of natural disasters and the growing risks linked to climate change.

Recommendations

3. A new national disaster monitoring facility should be established to fill data gaps related to past natural disaster events in Australia and provide modelling on future scenarios to underpin evidenced based policy and regulation development, alongside climate change resilience, adaptation and mitigation initiatives.

4. ADAPTING THE BUILT ENVIRONMENT TO OUR CHANGING CLIMATE

4.1 Designing for climate impacts[xiii]

Adapting building designs in response to climate change is about managing the unavoidable. While there remains debate around what level of adaptation is needed, here is no doubt that we need design to effectively consider the increased risk and intensity of extreme events including natural disasters. This is supported by a growing body of research examining potential climate change effects on buildings and the methods for adaptive strategies for building design.

An architect who designs for a changing climate recognises that the nature of weather events is unlikely to remain the same throughout a building's lifetime and considers the increased risk and intensity of extreme events such as bushfires, tropical cyclones, floods, hailstones and droughts, which are likely to present a significant risk to individual homes but also collectively result in considerable economic costs to the nation.

While neither mitigation nor adaptation measures on their own can prevent significant climate change impacts, taken together they can significantly reduce risk for individual homes and communities. Together they are mutually re-enforcing and shouldn't be considered in isolation.

For example, mitigation can be considered as a "climate friendly" dwelling that over its lifetime has been designed to have low greenhouse gas emissions. Adaptation can be considered as a "climate safe" dwelling that by design leads to low vulnerability to potential climate change effects such as flooding or bushfire. Mitigation effects are important in terms of slowing the rate of climate change, however given we are already experiencing environmental effects from climate change, adaptation is now also an essential response.

A major challenge is to predict the extent of the vulnerability of our buildings, towns and cities to climate change and natural disasters, which varies regionally throughout Australia. Australia has a dispersed geographic nature and climatic variability, resulting in a wide range of climate change influences impacting on existing housing, towns, regions, cities and infrastructure.

This means that mitigation and adaptation responses need to be an integral part of sustainable design principles. At the same time, they need to be flexible enough to address localised risks, for example a design approach that can successfully balance different risk profiles such as the potential for flooding against the potential risk of bushfire.

Key "predictable" climate change induced hazards which designers will now need to consider at a local level and for each project include, but are not limited to, increasing temperatures and fire risk, coastal storm surges and inundation, flooding, tropical cyclones, intensified downpours and hail events.

The physical destruction accompanying disasters, including the 2019-20 bushfires, typically creates an urgency to rebuild damaged communities and help survivors get their

lives back on track. There are many inspiring examples of how architects, planners and other built environment professionals have contributed to rebuilding.

In many cases their efforts have facilitated the re-establishment of eroded communities and created a sense that the worst is over, and things are getting better. Post-disaster recovery and reconstruction also presents an opportunity to reduce vulnerability to future disasters and to build community resilience in physical, social, environmental and economic terms.

Critically important is that all rebuilding projects following natural disasters must look to ensure that the standard of our built environment is enhanced with new projects delivering net zero emissions while being responsive to our new climate reality. This can be achieved through the appropriate choice of complying building materials, design and construction processes.

Recommendations

4. Australian Government sponsored rebuilding projects following natural disasters and designed as stimulus in response to the Covid-19 pandemic should be mandated to comply with net zero emissions which can be achieved through the appropriate choice of complying building materials and construction processes.
5. Built environment professionals must be supported to design more sustainable buildings that address the impacts of more extreme climate and weather events, are responsive to local conditions and produce locally based solutions.

4.2 Heat stress resistant residential design in Australia

In Australia, heatwaves are a significant natural hazard and a major driver of peak electricity demand, blackouts and high electricity prices. They also substantially decrease productivity and economic activity.

Ensuring that we are able to keep the Australian built environment cool while reducing the need for air conditioning is a key challenge exacerbated by the growing effects of climate change. The Institute Acumen Practice note, *Heat stress resistant residential design in Australia*[xiv] forms the basis of the following discussion.

Air-conditioning use to cool down the interior environment, with waste heat being projected outside of buildings is intensifying urban heat island effects (UHIE). Climate change is also increasing the severity and regularity of heatwaves and exacerbating the UHIE effect. We are also seeing “energy poverty” where people who have access to heating and air-conditioning cannot afford to run their appliances to ensure a healthy indoor temperature year-round.

While it is generally assumed that buildings can protect us from excess heat, recent evidence indicates that a significant proportion of the population is exposed to indoor heat stress and during heatwaves, indoor conditions can be even worse than the outdoor environment. It is essential that built environment professionals understand the impact of design and construction practices on the performance of residential buildings during heatwaves.

At the moment, an energy efficient building may have a low annual thermal energy load when considering the total sum of its heating and cooling requirements, however this does not mean that the building will successfully perform in both winter and summer. In some cases, recently constructed energy efficient buildings can overheat more than older less efficient buildings due to the high level of airtightness and insulation without sufficient ventilation and shading.

Successful heat stress resistant design creates an indoor thermal environment that is comfortable and safe even during heatwaves and heat stress resistant design can be most easily delivered by the inclusion of passive design features that do not require energy, such as natural or mechanical ventilation. Homes built since the introduction of a minimum six-star Nationwide House Energy Rating Scheme (NatHERS) rating can still underperform during heatwaves as the National Construction Code (NCC) only encourages overall energy efficiency and this does not necessarily deliver heat stress resistance. As a result, a high star rated newly built home can have decreased heat stress resistance and increased reliance on air conditioning during heatwaves compared to a traditional, double brick home.

Although three new thresholds for separate heating and cooling loads have been included in recent updates to the National Construction Code in 2019 these are still lenient, and well below the standards of international high-performing building standards such as Passivhaus. While appropriate regulation is not in place in Australia to deliver heat resistant design in new construction, architects can make a substantial difference to future residential building stock by implementing heat stress resistant strategies now.

Recommendations

6. The National Construction Code should be amended to ensure that overall energy efficiency is balanced alongside the need for heat resistant design, limiting indoor heat stress for occupants during heatwaves.

4.2 Vulnerability in remote and regional communities

Another critical issue is the impact of heat stress on Aboriginal and Torres Strait communities driven by inadequate existing housing and exacerbated by failures in planning regulation, particularly in the Northern Territory.

In the Northern Territory houses built outside the “building control zone” do not need to comply with the National Construction Code. This exemption covers approximately 90 percent of the Northern Territory and includes large areas of freehold land, most Aboriginal and Torres Strait Islander communities, pastoral properties, some mining towns, mining sites, and resorts in remote locations.

The Institute believes it is critical that the idea of a “building zone” be removed and all construction in the Northern Territory should comply with the building code. Without the application of the National Construction Code and associated planning regulations poor design outcomes and shortcuts will mean that people cannot continue to live in housing during extreme weather.

In addition, along the north coast which is prone to cyclones the houses are not built to the wind code and with regular and increasing cyclones, liveability and survivability will be compromised.

The condition of both infrastructure and housing in remote communities is also extremely poor adding to the considerable vulnerability of people living in remote and regional communities to cope with natural disasters. A detailed "gap" assessment of infrastructure and housing across remote and regional communities must be undertaken and action to rapidly upgrade substandard housing, community facilities and infrastructure to current Australian Standards and the National Construction Code must be done as a priority.

Good design and construction delivered in line with national standards can deliver houses that are energy-efficient and support communities to be more resilient. Houses that don't cool down overnight result in people sleeping outside or cramming everybody into the coolest room of the house leading to the spread of diseases. It is also common for people to sleep in shifts leading to young people roaming the streets at night and sleeping during the day when they should be at school. Some measures, such as making sure houses are built with the right orientation, use passive cooling, louvres, sunscreens, wide awnings, verandas and insulation as well as a white reflective roof, are design decisions that cost almost nothing.

Over the longer term we will need to plan for the impact of climate change for example an influx of internally displaced people, forced to move from remote communities that find themselves without water, or that have experienced rising temperatures and extreme heat events that has made the available housing unliveable.

Community resilience must therefore also be modelled, and plans put in place to deliver a base level of self-sufficiency. This would mean that there could be confidence that all community wide essential services would have a minimum period of independent operation calculated on all-weather access to a regional supply centre. Where known weather events seasonally disrupt access the minimum independent operation of a community must align with that period of time. Essential infrastructure in this environment would be considered communications, power, water, sewer systems, fuel, food and medical supplies.

As outlined in Section 3.1, there needs to be whole-of-government support for the establishment of Aboriginal and Torres Strait Islander adaptation and resilience groups to prepare for disaster response. Regional Disaster Response Plans must be developed which provide safe emergency shelters, enable the restoration capacity of regional infrastructure, and implement preventative disaster methods including fire management and infrastructure monitoring.

Recommendations

7. The concept of a "building control zone" in the Northern Territory must be removed and all construction must be compliant with the National Construction Code.

8. A detailed and considered review of options to upgrade both infrastructure and housing in remote communities in response to the effects of climate change must be undertaken.
9. Australian Government building projects following natural disasters or designed as stimulus in response to the Covid-19 pandemic, should be used to upgrade both infrastructure and housing in remote communities as a priority.

4.3 Improving the energy efficiency of our existing built environment

While new homes in Australia have an average energy efficiency rating of 6.1 stars. Australia's existing homes have an average rating of only 1.7 stars, which means that they are cold in winter and too hot in summer.

The Australian Sustainable Built Environment Council (ASBEC) and ClimateWorks Australia research shows that simple measures would cause a dramatic increase in energy efficiency. Any upfront costs would be more than offset by the energy bill savings, reduced spend on heating, cooling and ventilation equipment, and electricity network savings."[xv]

Retrofitting could include improving air tightness, fitting double glazed windows, increasing insulation, installing adjustable outdoor shading or larger eaves, increasing the efficiency of air conditioning, lighting and domestic hot water systems and installing ceiling fans.

Retrofitting in the commercial building sector to achieve better energy efficiency would cut businesses' energy bills; strengthen the electricity grid and reduce the risk of power shortages; dramatically reducing Australia's greenhouse gas emissions. ASBEC and ClimateWorks Australia estimate that upgrading the energy efficiency of Australia's commercial buildings would deliver $12 billion in energy savings between 2016 and 2030.[xvi]

Upgrading the environmental performance energy efficiency in public and community housing would also have long term benefits and would assist in reducing the power bills of more vulnerable tenants, delivering improvements in building comfort and community health.

Recommendations

10. Australian Government initiatives following natural disasters or designed as stimulus in response to the Covid-19 pandemic, should support people to upgrade the energy efficiency of their homes to prepare for, and create additional resilience to, the impacts of climate change in our built environment.

5. BUILDING BACK BETTER: LESSONS FOR THE 2019-20 BUSHFIRE RECOVERY

The Institute response to the 2019-20 Bushfires is outlined at Section 6 and the expertise held by Institute members will be critical to informing how we build back better and learn as much as possible from this experience.

The Institute Acumen Practice note, *Development in Australian bushfire prone areas* forms the basis of this discussion into the impact of climate change on bushfire conditions in Australia and the required changes to the regulatory framework for planning and construction within bushfire prone areas.[xvii]

Bushfire has long been a part of the Australian landscape, but climate change is now driving an increase in fire emergencies and the need for a greater regulatory response. There are new levels of bushfire frequency, severity and unpredictability across much of Australia – and indeed globally. The previous bushfire season pattern is no more, with record heat and drying creating extreme fire weather patterns. The risk is also spreading from the rural and urban-bushland interface, across more of the landscape and into towns and cities.

Research has shown that climate change is bringing on extreme weather events with lengthened fire seasons since around 1970 and the extent, frequency and intensity of future bushfire events is on the rise. The average temperature has risen across the continent by almost 1 degree since 1900, while rainfall in many areas has dramatically fallen from long-term averages and nine of the ten hottest years on record have occurred since 2005.

The areas affected by bushfire have broadened, the fire season has extended and the opportunity for hazard reduction between fire seasons is much reduced. The Forest Fire Danger Index (FDI), which estimates the fire danger on a given day, has rapidly increased from 1973 across Australia, accelerating since the late 1990s.

Climate change predictions indicate that mega-bushfires may become the new norm in many areas, overwhelming many communities' and agencies' ability to mitigate, evacuate or respond effectively. The intensity of these mega-bushfires and the resulting loss of life have resulted in an essential change in bushfire response strategy, from focusing on minimising building and infrastructure loss, to the preservation of human life.

The way that we prepare for, deal with and recover from bushfires will need to adapt to this new reality. Professor Helen Lochhead, the National President of the Institute and Dean of the Faculty of Built Environment at the University of New South Wales Sydney, commented widely in the Australia media during the 2019-20 bushfire season on the need for sensible, thoughtful design to ensure appropriate reconstruction, for the longer term.[xviii]

Key issues highlighted by Professor Lochhead included that it is possible to rebuild in bushfire affected zones so long as the designs are well located and compliant with Australian Standards and use best practice planning principles. In the majority of cases, when rebuilding it is possible to design much better, more resilient, sustainable and climate responsive houses, than what was there before. This is true following any disaster.

For this reason, rebuilding should proceed only after the site is assessed and confirmed as being suitable for reconstruction, and time is taken to ensure that the best possible design solution can be reached.

It is clear that the rebuilding process must "build, back, better" and ensure that the considerations outlined above around adapting our built environment to our changing climate are given appropriate consideration from the early planning stages.

Remote locations with a single access approach, surrounded by bush and without any support infrastructure or any potential for a fire break, should be considered unsuitable for reconstruction and seen as inherently vulnerable.

Effective solutions to the creation of bushfire resilient communities will require people working together, and where a settlement has been affected, communities can and should be part of the future planning and decision-making process, so investment and reconstruction benefit the broader community. For example, it may be possible to build back safer community infrastructure and put in fire breaks in public spaces to protect housing against fire travel in the future.

Key considerations for rebuilding, which architectural design can support, include ensuring adequate clearing around houses, self-cleaning gutters, fire resistant decking on verandahs, enclosed undersides of buildings to prevent embers getting trapped underneath the floor, and adequate stored water, whether tanks, pools, ponds or dams in more isolated areas to fight fires if they do occur. The use of fire-resistant materials such as masonry, brickwork or rammed earth, and concrete should also be considered, with combustible materials deliberately limited.

Observing that these design considerations are more sustainable and cost effective over the longer term, resilient buildings are not beyond the reach of the average person. Rather they are designed sensibly, sustainably and acknowledge the climate and environment in which we live.

Recommendations

11. When rebuilding after disasters we must ensure we "build back better". It is possible to design much better, more fire resistant, more resilient, sustainable and climate responsive houses than what was there before. We must ensure this occurs.
12. Rebuilding in bushfire affected zones is appropriate when designs are well located and compliant with Australian Standards and use best practice planning principles.
13. Remote locations with a single access approach, surrounded by bush and without any support infrastructure or any potential for a fire break, should be considered unsuitable for reconstruction and seen as inherently vulnerable.
14. Effective solutions to the creation of disaster resilient communities will require a wide range of people, including built environment professionals, working together. Where a settlement has been affected, for example by bushfire, communities can and should be part of the future planning and decision-making process to ensure investment and reconstruction benefits the broader community.

5.1 Australian Standards

Appropriate building codes and national standards are about weighing costs and benefits. Only analysing the reasons buildings were destroyed following a fire event will tell us if more needs to be done.

What is true is that not all buildings are created equal when it comes to fire resilience, with older ones being more vulnerable than newer compliant construction. A direct result of building regulations improving over time.

The devastating Victorian 2009 Black Saturday bushfires and subsequent Royal Commission resulted in regulatory changes across Australia with the existing main Australian Standard *AS3959-2018: Construction of buildings in bushfire-prone areas* upgraded and revised and additional standards developed. The four most relevant are currently:

- Australian Standard *AS3959-2018: Construction of buildings in bushfire-prone areas*
- Australian Standard *AS5414-2014: Bushfire water spray systems*
- Australian Building Codes Board 2014: *Private Bushfire Shelters Performance Standard*
- National Association of Steel Framed Housing (NASH) Standard 2014: *Steel Framed Construction in Bushfire Areas*

Building regulation is coordinated by state and territories, however all Australian governments have recognised the value of nationally consistent building codes through the National Construction Code (NCC) which sets minimum standards for the design and construction of new buildings on bushfire prone land. Most states and territories have also introduced changes to their planning regimes to try and ensure greater bushfire protection, relevant to localised conditions.

The National Construction Code is “performance based” and it does not specify how a building must be built, but instead how a building must perform. This should mean that innovative designs, materials and construction methods can be readily adopted and approved however the coordination between local planning requirements, the National Construction Code and Australian Standards can lead to less than optimal outcomes.

Residential buildings on bushfire prone land, must be designed and constructed to “reduce the risk” of ignition from a bushfire, taking into account the risk from bushfire flames, embers, radiant heat and the intensity of the bushfire attack. This risk is determined by an individual site assessment taking into account conditions such as vegetation type and density and slope of land.

The National Construction Code does not attempt to minimise the number of buildings damaged or destroyed in extreme fire events as the regulation is attempting to balance competing interests through a cost-benefit analysis that considers the risk and potential costs of homes being destroyed in bushfires versus the more certain costs involved in requiring all homes to be built to more exacting building codes.

One key factor that should be considered is the age of the buildings destroyed in the recent bushfire season. Most homes would have a 50-year life and in that time, they could be subject to multiple fire fronts over this period. Many of the homes destroyed in the 2019-2020 fires were older homes built prior to current regulations. Over a 50-year life span the investment in higher standards that embed appropriate bushfire resilience is essential.

5.2 Measuring and applying risk: bushfire attack levels

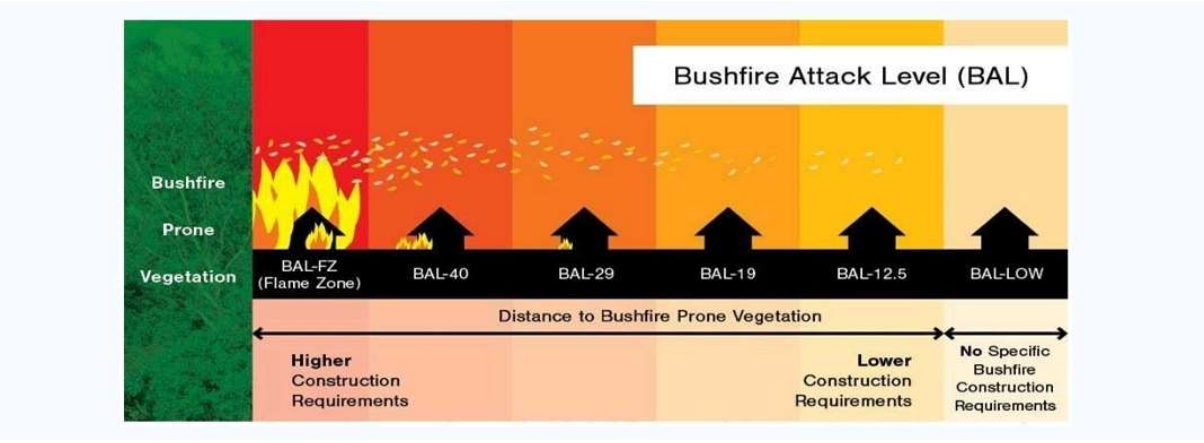
Over time the Forest Fire Danger Index (FDI) has been incorporated into a wide range of regulations and guidelines at the national, state, territory and local government level.

Although every state and territory address bushfire management in a slightly different way, only one national standard applies - *Australian Standard AS3959-2018: Construction of buildings in bushfire-prone areas* - and it is this standard that is referenced throughout the National Construction Code.

In *AS3959-2018* FDI data and ratings have been translated into six "Bushfire Attack Levels" (BAL), which outline the necessary fire-resistant construction, materials and components for each level of risk.

The BAL for a specific project should then be determined by a trained and accredited bushfire assessor using the assessment steps in *AS3959-2018* with construction requirements from this standard along with any state, territory or local government variations appropriately applied.

Figure: Bushfire Attack Level (BAL)



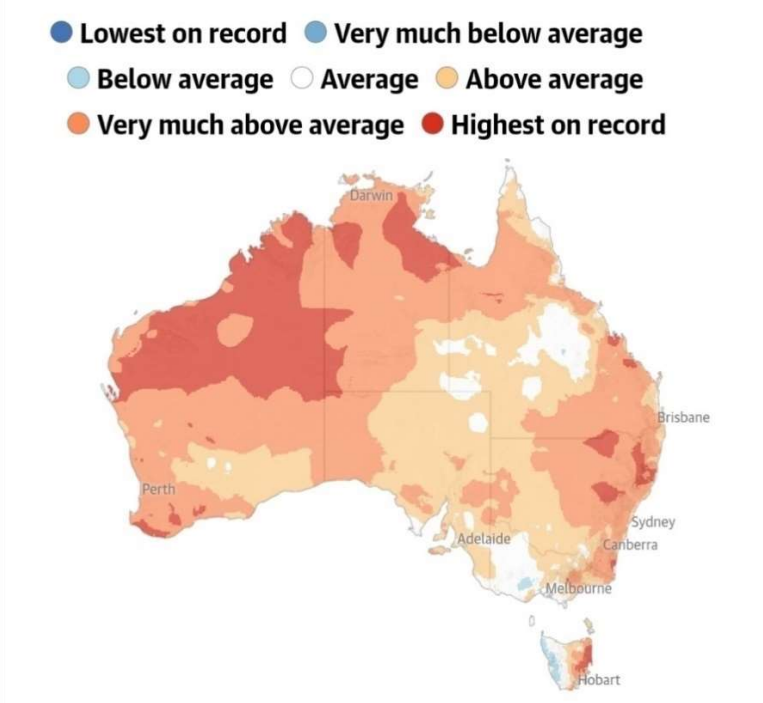
Source: reproduced from Australian Institute of Architects Acumen Practice note, *Development in Australian bushfire prone areas,* Nigel Bell

Originating in 2009, *AS3959-2018* has been reviewed and revised a number of times with many elements growing in regulatory complexity including site assessment requirements, vegetation classifications, shielding, enhanced requirements for fire tests, enhanced glazed components, what constitutes approved and or excluded materials and the requirements for fire testing.

The most recent broad revision of *AS3959-2018* occurred in 2018, with the changes applicable for all bushfire-affected construction from 1 May 2019. However, of particular concern to the Institute is that *AS3959-2018* is conservatively based on 2009 FDI levels, rather than responding to the much higher levels now being experienced in 2019/2020 as represented in the following figure:

Figure: Winter bushfire weather conditions, 2019

(Cumulative forest fire danger index (FDI) for winter 2019 -June to August–compared to all winters since 1950. The cumulative FDI is the sum of daily vales over the specified period)



Source: Bureau of Meteorology, reproduced Guardian Australia, *Australia bushfires factcheck: are this year's fires unprecedented?,* Adam Morton, Nick Evershed and Graham Readfearn, November 2019

Recommendations

15. Australian Standard *AS3959-2018: Construction of buildings in bushfire-prone areas* is guided by 2009 Forest Fire Danger Index (FDI) data. The Standard should be updated in line with modelling that includes data from 2019/20 fire events to allow bushfire risk to be appropriately quantified and mitigation actions appropriately identified.
16. Post fire analysis is extremely important, and we should seek to understand if the cost of building destruction in bushfires is greater than the costs of putting in place more stringent building requirements and regulation. Where required, regulation should be altered in response to relevant findings.

5.3 Responding to risk: material choice

For development in BAL—FZ (Flame Zone), subject to intense embers, heat, flame and more, all materials and components must be fully fire-tested if the building is sited less than ten metres from the edge of classified vegetation (*Australian Standard AS 1530.8.2: Methods for fire tests on building materials, components and structures*)

Members of the Institute have indicated that some jurisdiction's product testing to AS 1530.4 with acceptable Fire Resistance Levels (FRLs) were not deemed comparable or acceptable without submission of a National Construction Code Alternative Solution Expert Report.

Deemed-to-Satisfy Provisions of the National Construction Code do not allow some building elements to be constructed from combustible materials or they nominate the material that can be used, such as concrete or masonry.

Alternative Solutions may be developed by an accredited/registered Fire Safety Engineer in specific applications, however as the National Construction Code is called into legal effect by each state and territories' legislation, this approval process varies.

Due to the time associated with review by approval authorities and the inherent risk associated with obtaining approval of Alternative Solutions, time for the completion of the approvals process needs to be taken into account in the project timelines. As a consequence, material choice is restricted, new materials are difficult to utilise, additional costs, particularly for glazed components occur and the associated approval delays create considerable uncertainly and delays that also increase costs.

Recommendations

17. The use of *Australian Standard AS 1530.8.2: Methods for fire tests on building materials, components and structures* by each regulator in each state and territory should be reviewed and processes streamlined.
18. Where possible, products deemed acceptable as an "Alternative Solution" in one jurisdiction should be able to be used in like situations in another jurisdiction without further product testing or expert reports.

5.4 Upgrading existing housing stock

Prohibitive costs

The Institute would like to highlight research by *SGS Economics & Planning* that suggests Australia-wide, some 2.2 million people live in high or extreme bushfire risk areas.[xi] This suggests a fundamental legacy issue of up to one million existing houses in bushfire prone areas currently with little or no bushfire protection. This must be addressed.

Feedback from our membership has indicated particular problems in trying to apply Australian Standard *AS 3959-2018: Construction of buildings in bushfire-prone areas* when upgrading existing properties – as this standard presupposes new construction. When dealing with existing buildings within bushfire prone areas the vast majority of existing construction cannot meet the exacting *AS3959* requirements physically and/or at any cost. AAMI insurance have suggested that additional building costs to meet construction requirements in line with Bushfire Attack Level BAL-40 and Flame Zone BAL-FZ may be $100,000's. [xiii]

This issue is particularly evident in NSW where the *Environmental Planning and Assessment Regulation 2000* (the EP&A Regulation) requires a complete house bushfire

upgrade if adding 50 percent or more to building plan area/volume. Due to the extent of 'non-conforming' materials and products, upgrading may not be possible.

The undesirable consequence may be demolition and complete rebuilding for a marginally safer home, compliant to *AS3959-2018*, abandonment of any upgrading at all; or on-selling to a new and un-suspecting buyer. Anecdotally, this also results in "informal" bushfire upgrades that are undertaken in such a way as to avoid any approach to approval authorities. In summary, alterations and/or additions have become especially problematic in terms of meeting bushfire regulations. This is an area that requires a detailed regulatory review.

Recommendations

19. A detailed and considered review of options to upgrade existing housing stock in bushfire prone areas must be undertaken. If necessary, government incentives and regulatory assistance should be provided to support homeowners to upgrade property to enhanced safety levels.
20. Australian Government sponsored rebuilding projects following natural disasters should include opportunities for homeowners who have not lost their homes to access support to upgrade their properties to enhanced safety levels.
21. Economic stimulus in response to the Covid-19 pandemic to support the building and construction sector should consider government incentives and regulatory assistance to homeowners to upgrade property to enhanced safety levels, in response to both bushfire threat and other natural disasters.

Water spray systems

In part, the answer to issues related to upgrading existing housing stock in line with bushfire regulations could lie in the wider application and acceptance of an upgraded edition of the Australian Standard *AS 5414-2012: Bushfire water spray systems*. This would also have wider application when dealing with bushfire prone properties more generally.

Sprinkler systems have been utilised for a nearly a century to reduce fire risk in commercial buildings – including external protection of glazing near boundaries or adjacent buildings. Anecdotal evidence from the recent bushfires suggested that twelve Nerrigundah residents in New South Wales were saved at the Rural Fire Service "tin shed" by a roof-top water spray system.[xiv]

The problem is that the current version of *AS 5414-2014* is highly limited in utility as it states that water spray systems are only suitable up to Bushfire Attack Level BAL-19. The Institute believes that there is widespread potential for enhanced bushfire safety to be delivered through water spray systems and to much higher BAL levels, bringing many 'non-conforming' buildings in line at a fraction of the cost and difficulties seen when attempting to deliver upgrades that meet *AS3959-2018: Construction of Buildings in Bushfire-prone areas*.

We would like to highlight the recent PhD research evidence from Dr Alan Green at the Sustainable Building Research Centre, University of Wollongong (2019). Dr Green has been leading work focused on the analysis of external water spray systems designed to protect buildings from bushfires. Experiments have been undertaken to reveal the detailed behaviour of water sprays and the effects of wind on system performance. Computational fluid dynamics simulations are also being used to improve the understanding of how well these spray systems perform and where they can be usefully deployed.[xix]

New research like that being undertaken by the Sustainable Building Research Centre, along with evidence collected following the 2019-20 Bushfire season must result in a technical revision of the relevant Australian Standards currently in operation. This should include a reassessment of the regulatory and practical benefits of installing water spray systems, including removing the regulatory limitation around BAL-19.

Recommendation

22. Evidence collected from the 2019-20 Bushfire season must be used to revise Australian Standard *AS 5414-2012: Bushfire water spray systems*. This should include a reassessment of the regulatory and practical benefits of installing water spray systems on both new and existing dwellings in both residential and commercial settings and seek to remove the regulatory limitation stating that water spray systems are only suitable for use in situations up to Bushfire Attack Level BAL-19.

Private bushfire shelters

The 2009 Black Saturday bushfires in Victoria led to the highest loss of life in Australian history from bushfire. Of the 173 people who died, 113 were inside houses or other structures. Personal bushfire bunkers were not common, and those that did exist were not regulated.

Private bushfire bunkers are purpose-built structures to provide temporary shelter from a bushfire event. They can provide protection from direct flames, radiant heat and smoke. Bunkers can be above or below ground but are separate from a house. Informal bunkers like shipping containers, cellars and self-built bunkers have been used during bushfires. Eight people died using informal bunkers during the Black Saturday bushfires.

According to the CSIRO, during the 2019-20 fire season, there were six known instances in Victoria where individuals sheltered inside bunkers during burnovers of varying intensity. Burnovers occur when a fire overruns a location too fast for anyone to retreat. In all six instances, these bunkers were provided by accredited suppliers and no injuries or loss of life occurred, yet three of the six houses were destroyed.[xx]

For existing housing stock, in remote locations with a single access approach, surrounded by bush and without any support infrastructure or any potential for a fire break, it should be seriously considered if the installation of an accredited private bushfire bunker should be made mandatory. In all other instances, where existing housing is unable to be upgraded to a suitable BAL level as fire threats increases due to climate change, the installation of an accredited bushfire bunker should be strongly encouraged.

For the many existing properties already in these circumstances, consideration must be given to updating the Australian Building Codes Board (ABCB) *Performance Standard Guideline: Private Bushfire Shelters (2014*). This document requires design by a certified Fire Engineer - to the criteria established in the *Guidelines* - and then review and acceptance by another such professional before submission for approval.

This double certification is a major disincentive and has resulted in a lack of "pre-approved" bushfire shelters available for purchase and installation. Another associated issue is that in NSW a "private" shelter is only applicable to Class 1a dwellings, whereas Victoria permits up to 12 persons in a Class 1b structure. A detailed and considered review of options to bring a wider array of accredited bushfire bunkers to the market should be undertaken.

As fire risk continues to increase due to climate change it is increasingly likely that the insurance industry will begin to refuse coverage for dwellings in bushfire prone areas, and or death and disability insurance for individuals living in these regions. Appropriate regulation to support the installation of water spray systems and/or accredited bushfire bunkers could assist to alleviate this issue.

Due to the scale and severity of the mega-bushfires we are now seeing it is likely that any building exposed to an intense bushfire will most likely burn down whether it complies with relevant Australian Standards or not. This creates a significant risk for occupants as outlined in *AS3959-2018: Construction of Buildings in Bushfire-prone areas*:

> *Although this standard is designed to improve the performance of buildings when subjected to bushfire attack in designated bushfire-prone areas, there can be no guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions.*

If evidence from the 2019-20 bushfire season confirms that there is no such thing as a bushfire proof house, and the legacy of our existing built environment means we are unable to guarantee the safety of occupants in buildings during bushfire, we could be best placed to look overseas at other approaches. In the United States, rather than requiring the upgrading of existing homes to resist tornadoes or wildfires, the Federal Emergency Management Agency encourages the use of shelters, with state and local authorities often making them mandatory.

The Royal Commission should work with the Building Ministers Forum and Australian Building Codes Board to consider the merits of a wider application of approved shelters within bushfire prone areas both for individual "private" use for rural/remote properties, and selected community buildings in sub/urban areas being designed, built and approved as "public" bushfire shelters - whilst also maintaining their important everyday public use.

For example, selected school buildings, public libraries or community halls in high or extreme bushfire prone areas could be designed and built to BAL-FZ standards (*AS 3959-2018* with regard to refuge guidelines) including good access, parking, defendable space and more, as needed for emergency function as a recognised public "safer-place" refuge.

Recommendations

23. A detailed and considered review of options to bring a wider array of accredited bushfire bunkers to the market should be undertaken.
24. The Building Ministers Forum and Australian Building Codes Board should consider the merits of approved bunkers within bushfire prone areas for both private and public use including using community buildings as "safer-place" refuges.

6. INSTITUTE RESPONSE TO THE 2019-20 BUSHFIRE SEASON

In response to the 2019–20 Australian bushfire season the Institute immediately provided full unrestricted access to a wide range of relevant Acumen practice notes providing a resource base covering information on building in bushfire prone zones and on the provision of pro bono services. We also moved quickly to develop a series of online education and continuing professional development resources.

Fires and other natural disasters affect more and more areas across Australia with increasing frequency and intensity. Accordingly, it is not just a subset of architects such as those who are practicing in rural and regional areas who need to be upskilled. The Institute is motivated to ensure that communities that need expertly equipped professionals such as architects to help them build back better have access to that expertise.

The Institute has also positioned itself to leverage the skills of members to provide pro bono architectural services for bushfire affected homeowners – Architects Assist - and as a complementary program have launched a Foundation to supporting post-fire design and rebuild programs across Australia over the longer term. Key details of these initiatives are outlined below and all resources mentioned can be accessed at:

www.architecture.com.au/about/national-bushfire-response/

6.1 Architects educate: Acumen practice notes

A range of Acumen practice notes have been made freely available, rather than only to members of the Institute. Two key practice notes include:

- ***Designing to heal: post-disaster rebuilding to assist community recovery***

  Increasing the chances that recovery projects will resonate with the community requires getting the process and the product of design right. This resource outlines the relevance and significance of disasters and post-disaster recovery and highlights the need for designers to harness community skills. There is an emphasis on survivor participation in the planning and realisation of their post-disaster environment and suggests some characteristics of design that may smooth the path to recovery.

- ***Development in bushfire prone areas***

  Bushfire has long been a part of the Australian landscape however there are now new levels of bushfire frequency, severity, and unpredictability across much of Australia – and indeed globally – requiring a greater regulatory response. The previous bushfire season pattern is no more, with record heat and drying creating extreme fire weather patterns.

Bushfire risk is spreading from the rural and urban-bushland interface, across more of the landscape and into towns and cities. This resource provides an overview of bushfire attack, the Fire Danger Index, the regulatory framework and outlines regulatory and development concerns currently applicable at the state and territory level.

6.2 Architects educate: continuing professional development

The Institute has developed a suite of online education and professional development training to prepare and support architects and built environment professionals to contribute successfully to disaster recovery. This training will be available free of charge via the Institute website until late May 2020.

Two themes have been covered. The first "Building back better" uses case studies and a wide range of expert presenters to explore ecology, impact, design, planning, building, and rebuilding after a bushfire. The second theme covers interacting with clients and community after trauma and addresses interpersonal communication and process management between architects and clients after traumatic events. Key details of this training include:

- ***Building back better***

  The three seminars that make up this training pack include (1) Bushfire – Ecology and Impact, (2) Bushfire – Design and (3) Bushfire – Planning, Building, Rebuilding, Landscaping, Codes and Australian Standards. Over 350 architects, other design professionals (interior architecture and landscape architecture) and members of the public registered to attend the training, with each seminar filmed to create the online resource.

- ***Interacting with clients and community after trauma***

  While this training forms a critical part of the response by the Institute to the 2019/20 bushfires it is also applicable to other situations, disasters or extreme events causing trauma. As noted above this training seeks to address interpersonal communication and process management between architect and client after a traumatic event and explores how disasters disrupt many aspects of community life. The potential role of architects in helping communities recover after disasters and how this differs from normal circumstances is also covered.

6.3 Architects Assist: http://architectsassist.com.au/

As the 2019 bushfires claimed first homes, architecture and design practices began responding with offers of assistance to those who had lost everything and did not have sufficient means to start rebuilding their lives and livelihoods. However, with the growing scale of the disaster, it soon became obvious that the resources of individual firms would not be enough to assist all those requiring help.

Architects Assist (AA) was established by Jiri Lev on 4 January 2020 as an initiative of the Institute. By February, it represented a coordinated effort of over 550 architecture firms from across Australia, dedicating their resources to pro bono work, with an additional 1500 students and graduates of architecture also registering to assist.

In late February 2020, AA also began to integrate professionals from related fields across the built environment industry, such as landscape architects and planners.

AA acts as a referral service between potential clients – bushfire affected homeowners and businesses - and registered architects. AA does not provide architectural services. AA will seek to encourage built outcomes that are: architecturally considered, owner-builder friendly, resilient in natural disasters, built with sustainable materials, compact and spatially efficient and affordable.

6.4 Architects Donate: supporting post-fire design and rebuild programs across Australia

The “Architects Donate” Foundation aims to draw donations from Institute members to support rebuilding efforts following the bushfires. Architects Donate seeks to drive financial support from the 12,500 Institute members and their communities and is designed to allow all members and colleagues to play their part. Staff of the Institute have also been encouraged to donate a day’s pay to the Foundation. 100 percent of the funds donated will be used to directly support rebuilding efforts following disasters and will be aimed at Australian communities most in need. All donations above $2 are tax-deductible.

[i] https://www.theguardian.com/environment/2020/jan/17/its-heart-wrenching-80-of-blue-mountains-and-50-of-gondwana-rainforests-burn-in-bushfires
ii https://www.sbs.com.au/news/the-numbers-behind-australia-s-catastrophic-bushfire-season
[iii] https://www.theguardian.com/australia-news/2020/jan/08/economic-impact-of-australias-bushfires-set-to-exceed-44bn-cost-of-black-saturday
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[vii] https://www.theguardian.com/world/2020/jan/17/hundreds-of-thousands-of-fish-dead-in-nsw-as-bushfire-ash-washed-into-river
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https://www.theguardian.com/australia-news/2020/jan/07/australian-bushfire-smoke-drifts-to-south-america-un-reports
[x] https://time.com/5754990/australia-carbon-emissions-fires/
xi https://www.sgep.com.au/publications/insights/the-growing-risk-from-natural-perils
[xi] https://www.abc.net.au/news/2019-04-01/is-australia-on-track-to-meet-its-paris-emissions-targets/10920500
[xii] https://www.unenvironment.org/resources/emissions-gap-report-2019
[xiii] Australian Institute of Architects Acumen Practice Note, *Climate Change Adaptation for Building Designers: an introduction*, Mark Snow and Deo Prasad, 2011
[xiv] Australian Institute of Architects Acumen Practice Note, *Heat Stress Resistant Residential Design in Australia*, Gertrud Hatvani-Kovacs, 2019
[xv] Australian Sustainable Built Environment Council (ASBEC) and ClimateWorks Australia 2018, *Build to Perform – Zero Carbon Building Cod*e, ASBEC, Sydney, p 20
[xvi] Australian Sustainable Built Environment Council (ASBEC) and ClimateWorks Australia 2016, *Low Carbon High Performance Report,* ASBEC, Sydney
[xvii] Australian Institute of Architects Acumen Practice Note, *Development in Australian bushfire prone areas*, Nigel Bell, 2019 https://www.architecture.com.au/wp-content/uploads/Development-in-Australian-bushfire-prone-areas-Australian-Institute-of-Architects.pdf
[xviii]https://www.architectureanddesign.com.au/people/sensible-design-advised-for-bushfire-rebuilding
[xiii] AAMI 2016, 'Check that your home is properly covered in the event of a bushfire', https://www.aami.com.au/home-insurance/bushfireprevention.html
[xiv] https://www.abc.net.au/news/2020-01-14/nerrigundah-fire-town-will-rebuild-after-bushfire-crisis/11863354
[xix] https://www.bnhcrc.com.au/research/phd-sprinklersystems
[xx] https://blog.csiro.au/bunker-down-with-bushfire-bunkers/