

**DEPARTMENT OF EDUCATION
Australia's Economic Accelerator (AEA)
Application for Funding Commencing in 2023**

AE

Grant Opportunity ID: AE230100056

Lead Entrepreneur: Dr Alireza Kashani

Lead Organisation: The University of New South Wales

Total number of sheets contained in this Application: 20

Part A - Administrative Summary (AE230100056)

A1. Project Title

Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production

A2. Person Participant Summary

Number	Name	Participant Type	Current Organisation(s)
1	Dr Alireza Kashani	Lead Entrepreneur	The University of New South Wales

A3. Participating Organisations Summary

Number	Name	Participant Type
1	The University of New South Wales	Lead Organisation
2	ADBRI	Partner Organisation
3	AUSTRALIAN STEEL MILL SERVICES PTY LIMITED	Partner Organisation

A4. National Reconstruction Priorities

Renewables and low emission technologies

A5. Project Objectives

Conducting laboratory tests on full-scale concrete masonry units produced using the developed technology and the low-emission concrete binder for quality control assurance and compliance with AS 3700 and AS/NZS 4455 standards for breaking load and water resistance, as well as CO2 uptake measurement.

Conducting cost and supply chain analysis of the developed masonry units to ensure commercial feasibility followed by materials and process optimisation to meet or exceed benchmark product quality and standard requirements, and reduce costs and carbon footprint.

A6. Project Summary

This project aims to create a new market for captured CO₂ from industry sectors with hard-to-abate emissions. The captured CO₂ will be used to make a new low-emission concrete masonry. Hard-to-abate industries including cement production are responsible for 16% of emissions in Australia and 33% of global emissions. The developed low-emission technology recycles captured CO₂ from hard-to-abate industries and steel slag (a by-product of steel making) to make a concrete binder in which 86% of high-emitting Portland cement is replaced by steel slag. Also, the developed binder utilises ^{5.97(11)kg} kg of CO₂ per ton of binder during the carbon utilisation (CU) process. This project will demonstrate that the low-carbon concrete masonry units produced using this technology are compliant with Australian standards to ensure quality assurance. Also, cost and supply chain analysis followed by materials and process optimisation will be conducted in partnership with key industries to ensure commercial feasibility. The ultimate aim is to reduce 439,000 tons of CO₂ emissions per year after the successful adoption of the technology by all prefabricated concrete manufacturers in Australia. It also introduces a new alternative for cement i.e. steel slag with a production rate of 130 million tons per year around the world, negligible carbon footprint and costs. The project will pave the way for the Australian economy to be part of the \$5.9 trillion per year market for utilising captured carbon.

A7. Proposed Length of Project

(Select one option.)

12 Months

A8. ANZSIC

Code

203 - Cement, Lime, Plaster and Concrete Product Manufacturing

A9. Field of Research (FOR-2020)

Code	Percentage
400505 - Construction materials	70
410101 - Carbon sequestration science	30

A10. Socio-Economic Objective (SEO-2020)

Code	Percentage
120301 - Cement and concrete materials	70
120699 - Environmentally sustainable construction activities not elsewhere classified	30

A11. Current Technology Readiness Level

Technological Readiness Level

Level

Explanation (Up to 1250 characters, approximately 200 words)

The developed technology currently fits in TR which the proof of concept has been carried out and some laboratory investigations showed promising results of using the CU technology to create a strong concrete binder with 86% of cement replaced with industrial waste (i.e. steel slag). The binder made with the CU technology provides high early strength during an accelerated CO₂ curing process and reaches the strength of MPa in one day, i.e. times higher compared to without using the carbon utilisation process. Using this binder in concrete masonry production reduces production time and causes higher productivity. The developed binder also reaches a strength of MPa in days which is considerably high considering that 86% of cement in the binder has been replaced with steel slag (a non-hydraulic material which normally does not contribute to strength if the CU technology is not used). Also, the developed binder utilises kg of CO₂ per ton of binder during the carbon utilisation process.

A12. Anticipated Technology Readiness Level

Technological Readiness Level

Level

Explanation (Up to 1250 characters, approximately 200 words)

The project will advance to TRL to by conducting laboratory tests on full-scale concrete masonry units produced using the developed technology for quality control assurance and compliance with standards, and by conducting cost and supply chain analysis of the developed masonry units to ensure commercial feasibility followed by materials and process optimisation. If the current proposed phase of commercialisation (this project) was successful,

with stronger support from Adbri (See B2, Letter of Support), ASMS, and other future potential partners.

A13. How many research students will contribute to this project?

Number of Research Student Places (FTE) - PhD

1

Number of Research Student Places (FTE) - Masters

0

Number of Research Student Places (FTE) - Honours

2

A14. How many research students will be funded from this grant?

Number of Research Student Places (FTE) - PhD

1

Number of Research Student Places (FTE) - Masters

0

Number of Research Student Places (FTE) - Honours

0

A15. Does this project involve interdisciplinary research?

No

Specify the ways in which the research is interdisciplinary by selecting one or more of the options below.

Indicate the nature of the interdisciplinary research involved. (Up to 1250 characters, approximately 200 words)

A16. Does the proposed research involve international collaboration?

No

A17. If the proposed research involves international collaboration, please specify the country/ies involved.

Part B - Business Case (AE230100056)

B1. Business Case

Uploaded PDF file follows on next page.

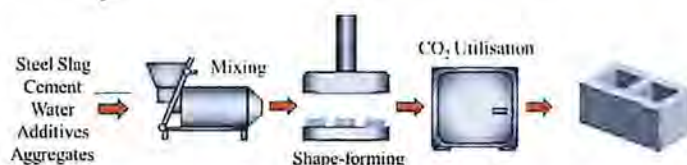
Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production

AIMS & BACKGROUND

This project aims to create a new market for captured CO₂ from industry sectors with hard-to-abate emissions. The captured CO₂ will be used to make a new low-emission concrete masonry. The developed low-emission technology uses recycled CO₂ and steel slag (a by-product of steel making) to make a concrete binder with 86% Portland cement replacement. The purpose of this project is to demonstrate compliance with relevant standards for low-carbon concrete masonry made by the developed technology and to conduct cost and supply chain analysis to ensure commercial feasibility. The seed funding will allow the developed technology to increase its TRL for attracting further investments from industry partners and investors.

Industries with hard-to-abate emissions including cement production are responsible for about 16% (or 82Mt of CO₂-e) of emissions in Australia and almost 33% of global emissions¹. Concrete is the second most widely used material in the world after water, but its production accounts for 6-8% of global greenhouse emissions. Between 60-70% of CO₂ is released during the chemical reaction during Portland cement (i.e. conventional concrete binder) production, and this part of the emissions cannot be avoided by using renewable energies so it must be captured and then stored or utilised.

One approach is to capture CO₂ emissions from cement production and use it as feedstock for concrete production. This carbon utilisation (CU) technology will reduce carbon emissions and transform the captured CO₂ into a solid product permanently. Dr Ali Kashani (the Lead Entrepreneur) is an academic at UNSW who has been studying carbon utilisation in concrete. He founded a start-up company called Sinkrete [sinkrete.com.au] in 2021 to commercialise the CU technology which he developed based on the principles of 'circular economy' to add value to wastes as new construction materials. The developed CU technology allows replacing 86% of cement with steel slag with negligible emission and uses recycled CO₂ from cement production which otherwise would be emitted into the atmosphere. The simplified CU process to produce concrete masonry units is demonstrated below.



The binder made with the CU technology provides high early strength during an accelerated CO₂ curing process and reaches the strength of ^{s 47(1)(b)} MPa in one day, i.e. ^{s 47(1)(b)} times higher compared to without using the carbon utilisation process. Using this binder in concrete masonry production reduces production (curing) time and causes higher productivity. The developed binder also reaches a strength of ^{s 47(1)(b)} MPa in ^{s 47(1)(b)} days which is considerably high considering that 86% of cement in the binder has been replaced with steel slag (a ^{s 47(1)(b)}-hydraulic material which normally does not contribute to strength if the CU technology is not used). Also, unlike other low-emission concrete products in the market (e.g. geopolymers or low-cement concrete), this technology does not rely on conventional supplementary cementitious materials (SCM) used in concrete such as fly ash (from coal power plants) and blast furnace slag (also a by-product of steel making but with significantly better hydraulic activity compared to steel slag). These SCMs are high in demand with limited local supply which caused importing from overseas with considerable transport emissions. Instead, the developed technology uses steel slag which is not normally used for conventional concrete production, but it is abundantly available with limited use (about ^{s 47G(1)(a)} tons of reserved steel slag is available according to Australian Steel Mill Services). Also, the developed technology utilises ^{s 47(1)(b)} kg of CO₂ per ton of concrete binder during the carbon utilisation process.

This project is a proposed partnership between the Lead Entrepreneur, Adbri, and Australian Steel Mill Services (ASMS) to create new low-emission concrete masonry products by utilising CO₂ and steel slag. Adbri [adbri.com.au] is the second-largest cement producer and the largest masonry producer in Australia. ASMS [asms.com.au] is the main supplier of steel slag in Australia.

SIGNIFICANCE

This project is aligned with the National Reconstruction Fund in the priority funding area of low-emission technologies. The outcomes contribute to lower emissions in primary industries in Australia and support the government's net zero carbon policy because of the following reasons.

¹ CO₂ Utilisation Roadmap – CSIRO – <https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/energy-and-resources/co2-utilisation-roadmap>

- 10 Gt per year of CO₂ must be removed to keep the global temperature rise under 2°C by 2050². However, less than a hundred projects have been developed worldwide, with a combined estimated capacity of around 32 Mt per year of CO₂ removal (or about 0.32% of total CO₂ which needs to be removed)³. The Australian concrete decarbonisation roadmap⁴ also allows for a 33% emissions reduction by carbon capturing and utilisation to achieve net zero by 2050 but currently, limited projects and technologies are available to achieve such an ambitious target. These statistics show the urgency for more technologies that not only capture CO₂ but also those which could reuse/recycle CO₂ into new products. The potential global market for recycled CO₂ products could be \$5.91 trillion a year, of which \$1.37 trillion includes cement, concretes, asphalts, and aggregates made by CU technologies⁵. s 47G(1)(a)
- One tonne of Portland cement production in Australia produces 770 kg of CO₂-eq emissions⁶. s 47G(1)(a)

s 47G(1)(a)

ACTIVITIES & TIMELINE

s 47(1)(b)

² The International Panel on Climate Change – www.ipcc.ch/reports

³ The Business Case for Carbon Capture (BCG) – www.bcg.com/publications/2019/business-case-carbon

⁴ Australian concrete decarbonisation roadmap – https://cement.org.au/wp-content/uploads/2021/10/Decarbonisation_Pathways_Australian_Cement_and_Concrete_Sector.pdf

⁵ Carbon 180 report on global and US available markets for carbon-tech – <https://carbon180.org/reports>

⁶ Cement Industry Federation report – <https://cement.org.au/australias-cement-industry/industry-report/>

⁷ IBIS report on Concrete Product Manufacturing in Australia – <https://my.ibisworld.com/au/en/industry/c2034/about>

s 47(1)(b)

s 47G(1)(a)

VALUE PROPOSITION

s 47G(1)(a)

⁸ CO₂ Utilisation Roadmap – CSIRO – <https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/energy-and-resources/co2-utilisation-roadmap>

⁹ Shi, J. Mater. Civ. Eng. 16 (3), 230-236 – 2004

¹⁰ Carbon 180 report on global and US available markets for carbon-tech – <https://carbon180.org/reports>

IP: The background intellectual property (IP) of this project belongs to UNSW and the Lead Entrepreneur. Any new IP created during the project will be shared among creators including the Lead Entrepreneur (UNSW).

CAPABILITY & RESOURCES

s 47G(1)(a)

Dr Ali Kashani (UNSW's Lead Entrepreneur): Dr Kashani is a Senior Lecturer at the School of Civil and Environmental Engineering at UNSW Sydney. His main area of research is sustainable construction materials for the 'Circular Economy' including waste valorisation, carbon utilisation, and low-carbon concrete. Dr Kashani has 15 years of experience in the research and commercialisation of sustainable construction materials. He has led seven industry-funded projects to successful completion with high-impact outcomes in publication and/or commercialisation. He founded a UNSW spin-out start-up on CO₂ utilisation in waste-based concrete, Sinkrete [sinkrete.com.au], in 2021. Sinkrete was a co-winner of a Pitch Contest by the Fifth Estate journal which is a prestigious construction industry journal. Dr Kashani was trained in a series of workshops organised by Climate-KIC Australia for business modelling and pitch creation which was followed by Sinkrete entrance to the Climate Launchpad national competition (the world's largest green business ideas competition).

Dr Kashani will contribute 0.5 FTE of his time to this project. s 47F(1), s 47G(1)(a)
s 47F(1), s 47G(1)(a)

Research Assistant: The RA will be employed for this project at 1 FTE s 47G(1)(a)
s 47G(1)(a)

PhD and Honours students: s 47F(1), s 47G(1)(a)
s 47F(1), s 47G(1)(a)

s 47F(1), s 47G(1)(a)

Project Governance: The project board includes all stakeholders in the project listed above and will be chaired by the Lead Entrepreneur. The project board is responsible for overall project governance and provides strategic direction, approves major decisions, and ensures that the project is aligned with the goals and objectives. The project board meeting will be held monthly. The Lead Entrepreneur will be the Project Manager and will work closely with the project board to ensure that the project is delivered on time, within budget, and achieves the expected outcomes.

COMMERCIAL POTENTIAL

Size and value of the potential market: Concrete masonry is the beachhead market for the developed technology which has about 20% share of prefabricated concrete products (i.e. the whole accessible market for this technology)¹¹. About 2.8 million tons of prefabricated concrete will be produced in 2028 which is a significant market for this technology and if this technology is adopted to this market then 439,000 tons of CO₂ emissions can be saved per year as detailed on Page 2 (Significance).

s 47G(1)(a)

Competitive advantages: Currently there are no companies in Australia offering CU technologies for prefabricated concrete. Other in-progress CU technologies are for the carbonation of recycled aggregates (with no cost benefits) and mixing liquid CO₂ during concrete batching (with a negligible amount of CO₂ uptake and carbon saving).

s 47G(1)(a)

s 47G(1)(a)

¹¹ IBIS report on Concrete Product Manufacturing in Australia – <https://my.ibisworld.com/au/en/industry/c2034/about>

B2. Industry Support and/or Partnerships

This project is a unique partnership between the UNSW's Lead Entrepreneur of the developed technology, Adbri, the potential manufacturer to adopt the technology and ASMS, the supplier of steel slag required for the developed product. s 47G(1)(a)

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RE: Carbon Utilisation in Masonry - AEA Seed Funding Proposal

Australian Steel Mill Services (ASMS) Pty Ltd is a joint venture between the Cement Australia Group and the Edward C Levy Co (USA) formed in 1989 to service the slag-handling contract for both Iron and Steel Making processes at BlueScope Port Kembla NSW.

ASMS is responsible for the processing and marketing of approximately 1.2 million tonnes of slag per year. ASMS has supported sustainable and low-emission construction materials which use slag.

ASMS would like to confirm his support of UNSW's AEA Seed Funding Proposal in relation to the "low-emission carbon dioxide recycling technology for concrete masonry production" proposal.
s 47G(1)(a), s 47F(1)

Kind regards,
s 47F(1)

13-Mar-23

13th March 2023

Dr Ali Kashani
Senior Lecturer (Assistant Professor) in Sustainable Concrete and 3D Printing UNSW
UNSW High Street
Kensington NSW 2052

By email: ali.kashani@unsw.edu.au

Dear Sir

RE: Carbon Utilisation in Masonry - AEA Seed Funding Proposal

Adbri Ltd produces and distributes cement, lime, concrete, aggregates, masonry products and industrial minerals that have helped build a better Australia for 140 years. Adbri is the second-largest cement producer and the largest masonry producer in Australia with 1500 employees across more than 200 locations in Australia. Adbri operates two emissions-intensive and hard-to-abate processes that integrate the manufacturing of clinker, cement and lime. Adbri's Net Zero Emissions Roadmap sets out the targets and actions to decarbonise our business by creating new low-emission products and collaborating with key partners.

We wish to confirm that Adbri supports UNSW's AEA Seed Funding Proposal in relation to its emerging technology regarding "Carbon Utilisation in Masonry". s 47G(1)(a), s 47F(1)

Yours Sincerely

s 47F(1)

Part C - Budget and Financial Information (AE230100056)

C1. What is the proposed budget for your project?

Total requested budget: \$199,865

Year 1

Description	Department of Education	Lead Organisation		Partner Org	
	Cash	Cash	In-kind	Cash	In-kind
Total	199,865		57,913		s 47G(1)(a)
Personnel	s 47G(1)(a)				
Lead Entrepreneur (Level C Step 2) - 0.3 FTE (cash) + 30% on-costs					
Lead Entrepreneur (Level C Step 2) - 0.2 FTE (in-kind) + 30% on-costs					
Research Assistant (Level 7 Step 1) - 1 FTE + 30% on-costs					
Adbri staff time - 0.1 FTE					
ASMS staff time - 0.1 FTE					
PhD student top-up scholarship					
Plant & Equipment					
Use of UNSW laboratory space, equipment, and consumables for making and testing masonry products					
Other					
Materials					

Partner Organisation

Organisation	Year 1	
	Cash	In-kind
ADBRI		s 47G(1)(a)
AUSTRALIAN STEEL MILL SERVICES PTY LIMITED		
Total		
Committed Total		

C2. Budget Explanation - AEA, Lead Organisation, Collaborating Organisation/s

Personnel:

-Lead Entrepreneur (Level C Step 2) - 0.3 FTE (cash) + 30% on-costs: LE Kashani will contribute 0.5 FTE of his

time s 47F(1), s 47G(1)(a)
s 47F(1), s 47G(1)(a)

-Lead Entrepreneur (Level C Step 2) - 0.2 FTE (in-kind) + 30% on-costs: s 47G(1)(a)
s 47G(1)(a)

-Research Assistant (Level 7 Step 1) - 1 FTE + 30% on-costs: s 47G(1)(a)
s 47G(1)(a)

-PhD student top-up scholarship: s 47F(1), s 47G(1)(a)
s 47F(1), s 47G(1)(a)

s 47G(1)(a)

C3. Budget Explanation - Partner Organisation/s

Personnel:

-Adbri staff time - 0.1 FTE s 47F(1), s 47G(1)(a)
s 47F(1), s 47G(1)(a)

-ASMS staff time - 0.1 FTE s 47F(1), s 47G(1)(a)
s 47F(1), s 47G(1)(a)

C4. Previous funding for this project

No

Part D - Personnel (Dr Alireza Kashani)

D1. Entrepreneur

Participation Type

Lead Entrepreneur

Title

Dr

First Name

Alireza

Middle Name

Kashani

Family Name

Kashani

Email Address

ali.kashani@unsw.edu.au

Gender

Male

Languages other than English

D2. Qualifications

Conferral Date	AQF Level	Degree/Award Title	Discipline/Field	Awarding Organisation	Country of Award
s 47F(1)	Doctoral Degree	PhD	Engineering (Concrete)	The University of Melbourne	Australia

D3. What will your time commitment be to research activities related to this project?

0.5

D4. 10 Year Employment History

Description	Department	Contract Type	Employment Type	Start Date	End Date	Organisation
Senior Lecturer	Civil and Environmental Engineering	Permanent	Full Time	s 47F(1)		The University of New South Wales
Lecturer	Civil and Environmental Engineering	Contract	Full Time			UNSW Sydney
Research Fellow	Infrastructure Engineering	Contract	Full Time			The University of Melbourne

D5. ORCID Link

<https://orcid.org/0000-0002-1080-645X>

D6. Research Outputs (Up to 10 most relevant outputs/projects)

Research Outputs Listing

Generated research output document follows on the next page

Ten Career-Best Research Outputs

- [1] * Gupta, S., Kashani, A. & Mahmood, A.H. 2022, 'Carbon sequestration in engineered lightweight foamed mortar ? Effect on rheology, mechanical and durability properties', *Construction and Building Materials*, vol. 322 (Refereed Journal Article)
- [2] * Gupta, S., Kashani, A., Mahmood, A.H. & Han, T. 2021, 'Carbon sequestration in cementitious composites using biochar and fly ash ? Effect on mechanical and durability properties', *Construction and Building Materials*, vol. 291 (Refereed Journal Article)
- [3] Gupta, S. & Kashani, A. 2021, 'Utilization of biochar from unwashed peanut shell in cementitious building materials ? Effect on early age properties and environmental benefits', *Fuel Processing Technology*, vol. 218 (Refereed Journal Article)
- [4] Kashani, A., San Nicolas, R., Qiao, G.G., van Deventer, J.S.J. & Provis, J.L. 2014, 'Modelling the yield stress of ternary cement-slag-fly ash pastes based on particle size distribution', *Powder Technology*, vol. 266, pp. 203-209 (Refereed Journal Article)
- [5] Tuan D. Ngo, Alireza Kashani, Gabriele Imbalzano, Kate T.Q. Nguyen & David Hui 2018, 'Additive manufacturing (3D printing): A review of materials, methods, applications and challenges', *Composites Part B: Engineering*, vol. 143, pp. 172-196, doi:10.1016/j.compositesb.2018.02.012 (Refereed Journal Article)
- [6] Kashani, A., Provis, J.L., Qiao, G.G. & Van Deventer, J.S.J. 2014, 'The interrelationship between surface chemistry and rheology in alkali activated slag paste', *Construction and Building Materials*, vol. 65, pp. 583-591 (Refereed Journal Article)
- [7] Alireza Kashani, Tuan D. Ngo & Ailar Hajimohammadi 2019, 'Effect of recycled glass fines on mechanical and durability properties of concrete foam in comparison with traditional cementitious fines', *Cement and Concrete Composites*, vol. 99, pp. 120-129, doi:10.1016/j.cemconcomp.2019.03.004 (Refereed Journal Article)
- [8] Nguyen, T., Kashani, A., Ngo, T. & Bordas, S. 2019, 'Deep neural network with high-order neuron for the prediction of foamed concrete strength', *Computer-Aided Civil and Infrastructure Engineering*, vol. 34, no. 4, pp. 316-332 (Refereed Journal Article)
- [9] Mohammadi Golafshani, E., Kashani, A., Kim, T. & Arashpour, M. 2022, 'Concrete chloride diffusion modelling using marine creatures-based metaheuristic artificial intelligence', *Journal of Cleaner Production*, vol. 374 (Refereed Journal Article)
- [10] Shahmirzadi, M.R., Gholampour, A., Kashani, A. & Ngo, T.D. 2021, 'Shrinkage behavior of cementitious 3D printing materials: Effect of temperature and relative humidity', *Cement and Concrete Composites*, vol. 124 (Refereed Journal Article)

D7. Research Outputs Context

I have been researching carbon utilisation/sequestration in concrete since 2020 and my team and I have published two articles (top 1-2 in D6) on this subject in the high-rank journal of Construction and Building Materials (one of the top three journals in concrete materials research). However, due to the commercial sensitivity of the developed binder and the CU technology which will be used for this project, we have not yet published our results to keep an option for patent application.

To give context to my research outputs listed in D6, I mostly publish high-quality and novel research outputs in top-tier journals and books with an emphasis on quality and impact. My publications are in the areas of developing, optimising and enhancing concrete mix designs in terms of sustainability, durability, mechanical, and structural performance, as well as 3D printing which is beneficial knowledge background to de-risk the successful completion of this project. All my journal papers except two are published in the top Q1 journals in my field and 75% of my papers are in the top 10% of journals worldwide. In terms of the impact, one-half of my papers are among the top 10% of most cited publications worldwide, including two outputs in the top one percentile of most cited papers. My Field- Weighted Citation Impact (FWCI) is 3.82 which is much higher than my peers in the same academic levels in my field.

D8. Commercialisation and industry collaboration experience

I founded a UNSW spin-out start-up on CO2 utilisation in waste-based concrete, Sinkrete [sinkrete.com.au], in 2021. Sinkrete was a co-winner of a Pitch Contest by the Fifth Estate journal which is a prestigious construction industry journal. Our start-up has been featured in a recently published e-book (Moonshot 2030) by the Fifth Estate. I, as Sinkrete's founder, was trained in a series of workshops organised by Climate-KIC Australia for business modelling and pitch creation which was followed by Sinkrete entrance to the Climate Launchpad national competition. Climate Launchpad is the world's largest green business ideas competition which is managed by Climate-KIC Australia.

Moreover, I have been the Project Lead for eight industry-funded R&D projects (total of \$1M Cat 2-4 grants) during my academic career. I developed the ideas, drafted the applications, and brought some of the industry partners for these projects. My effective communication with our partners and my managerial skills, as well as my knowledge, and expertise of the team, led to the successful completion of these projects with high-impact outcomes in the publication and/or commercialisation.

I have been leading two R&D projects at UNSW on the development of sustainable and low-carbon concrete with recycled glass as an aggregate and cement replacement s 47G(1)(a) throughout 2019-2022. s 47G(1)(a)

The non-confidential results were published in the Journal of Materials and Structures. s 47G(1)(a)

I also contributed as the Project Lead in four industry projects with Prof. Ngo at The University of Melbourne from 2016 to 2022. Novel normal and lightweight concretes were developed by replacing aggregates with recycled glass and tyres in collaboration with various industry partners including KBR, John Holland, Hanson, Saferoads, PrefabAUS, VicRoads, Sustainability Victoria, and Tyre Stewardship Australia. The developed concrete with unwashed recycled glass was trialled in a level crossing project at Reservoir station in Victoria and then used in other projects by Level Crossing Removal Authority. VicRoads specification for structural concrete was also changed to include unwashed waste glass based on the results of this project. The developed concrete road safety barrier with recycled tyres was successfully tested in a car crash and will be commercially available by Saferoads.

Also, my team and I developed a 3D-printing mortar for our industry partner, Contour 3D, suitable for onsite printing conditions with high early strength. This mortar was commercialised and used for the first 3D-printed building in Australia in 2022 for Channel 9's Block show and then a few other projects across Australia.

Certification

I certify that—

- I have read, understood and complied with the AEA Seed Program Guidelines (2023 edition), and, to the best of my knowledge all details provided in this proposal and in any supporting documentation are true and complete in accordance with the grant guidelines.
- Proper enquiries have been made and I am satisfied that the participants and the organisations listed in this proposal meet the requirements specified in the grant guidelines. The Department of Education (the department) reserves the right to audit any evidence on which a proposal is based. I will notify the department if there are changes to any named participant or organisation after the submission of this proposal.
- The listed participants are responsible for the authorship and intellectual content of this proposal, and have appropriately cited sources and acknowledged significant contributions to this proposal.
- To the best of my knowledge, all material personal and financial interests and Conflicts of Interest relating to parties involved in or associated with this proposal have been disclosed to the Lead Organisation, and, if the proposal is successful, I agree to manage all Conflicts of Interest relating to this proposal in accordance with the Australian Code for the Responsible Conduct of Research (2018), the department's Conflict of Interest and Confidentiality Policy located on the department's website and any relevant successor documents.
- I have obtained the agreement, attested to by written evidence, of all the relevant persons and organisations necessary to allow the project to proceed. This written evidence has been retained and will be provided to the department if requested.
- This proposal complies with the eligible research requirements set out in the AEA Seed Program Guidelines (2023 edition), located on the department's website.



Australian Government

Department of Education

Australia's Economic Accelerator Launch Program

Conditions of Grant under Part 2-3 of the *Higher Education Support Act 2003*

I, s 22(1)

, as the delegate of the Minister for Education:

- A. approve under section 41-20 of the *Higher Education Support Act 2003* (the "Act") a grant ("Grant") to the University of New South Wales, 57 195 873 179 (the "Recipient"), in respect of the project ("the Project") set out in the Project Management Plan in Schedule 2;
- B. determine under paragraph 41-30(b) of the Act that the amount of the Grant in respect of the Project is \$199,865.00; and
- C. determine under subsection 41-25(2) of the Act that the Grant is made on the Conditions of Grant ("the COG") contained in Schedule 1.

s 22(1)

Signed

Dated

13 Oct 2023

s 22(1)

Research Division

Department of Education

Conditions of Grant

Schedule 1 – Conditions

In this CoG, the following are defined terms:

"AEA Executive Director"	may hold responsibilities as the assessor, negotiator and relationship manager on behalf of the Department
"Asset"	personal, real or incorporeal property which has a value over \$5,000 created or purchased wholly or partly from the Grant, but not including Intellectual Property Rights or the Reports
"Auditor-General"	the office established under the <i>Auditor-General Act 1997</i> and includes any other entity that may, from time to time, perform the functions of that office
"Conflict"	refers to the Recipient engaging in any activity or obtaining any interest that would interfere with or restrict it from carrying out its obligations under these Conditions fairly, independently and otherwise in accordance with these Conditions of Grant
"Department"	the Commonwealth Department responsible for administering Part 2-3 of the Act
"Existing Material"	means all Material owned by the Recipient in existence prior to the commencement of these Conditions of Grant: (a) incorporated in (b) supplied with or (c) required to be supplied with, or as part of, the Project Material
"Expert Adviser(s)"	an adviser with research commercialisation expertise within a priority area that may provide input into suitable projects
"Grant"	the grant referred to in this CoG and includes any interest earned on the Grant
"Grant Amount"	the amount determined by the Program Delegate and listed in item b above
"Grant Funds"	the funds making up the Grant Amount
"Grant Funding"	has the same meaning as Grant Funds
"Intellectual Property Rights"	also "IPRs" - includes all copyright (including rights in relation to phonograms and broadcasts), all rights in relation to inventions (including patent rights), plant varieties, registered and unregistered trademarks (including service marks), registered designs, circuit layouts and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields
"Material"	any document, equipment, software (including source code and object code), goods, information and data stored by any including all copies and extracts of the same
"Personal Information"	has the meaning given in the Privacy Act

"Privacy Act"	the <i>Privacy Act 1988</i> as amended from time to time
"Program"	the Australia's Economic Accelerator Launch Program, also known as the Australia's Economic Accelerator Seed Program.
"Program Delegate"	the person that has the delegated authority to make decisions for the program. The Project Delegate's contact details are set out in item 1.
"Project"	the project undertaken by the Recipient as specified in the Project Management Plan in schedule 2
"Project Management Plan"	the plan setting out the way the Project is to be conducted in Schedule 2
"Project Material"	all Material: (a) brought into existence for the purpose of performing this Conditions of Grant, including the Project proposal submitted by the Recipient, the Project Management Plan and the Reports (b) incorporated in, supplied or required to be supplied along with the Material referred to in paragraph (a) or (c) copied or derived from Material referred to in paragraphs (a) or (b)
"Project Period"	the period specified in item 2 during which the Project must be completed
"Recipient"	the body corporate which is responsible for the Project listed in item 1
"Records"	includes documents, information and data stored by any and all copies or extracts of the same
"Report or Reports"	the Report or Reports referred to in item 6 and the Project Management Plan
"Technology Readiness Levels"	the methodology developed by the Department of Defence to assess the maturity level of a particular technology
"Third-party IPRs"	the IPRs in any Third-party Material
"Third-party Material"	any Material incorporated or supplied with the Report in which the IPRs are owned by a third party alone or jointly with any other party (including the Recipient)

Project details

1. Project information

This Project forms part of the 'Australia's Economic Accelerator Launch Program', also known as 'Australia's Economic Accelerator Seed Program'.

Title of Project:

Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production

Recipient information:

Lead Organisation	The University of New South Wales
ABN / ACN	57 195 873 179
Lead Entrepreneur	Alireza Kashani
Lead Entrepreneur contact details	s 47F(1) ali.kashani@unsw.edu.au
Lead Organisation representative	Nicholas Fisk Debbie Docherty
Lead Organisation representative contact details	dvcrc@unsw.edu.au d.docherty@unsw.edu.au

Commonwealth information:

The Commonwealth of Australia represented by the Department of Education located at 50 Marcus Clarke Street, Canberra ACT 2600

Program Delegate contact details	s 22(1) Research Division Department of Education LOC: C50MA7 GPO Box 9880 CANBERRA ACT 2601 Australia s 47E(d)
Program Manager contact details	s 22(1) Department of Education LOC: C50MA7 GPO Box 9880 CANBERRA ACT 2601 Australia accelerator@education.gov.au .

2. Project period

The Project Period for this Project is from 15 January 2024 until 11 July 2025.

3. Payment of grant

The manner and time of payment for each part of the Project is as provided for in Schedule 3.

Conditions

4. Conduct of project

- 4.1 The Recipient must carry out the Project:
- (a) in accordance with the Program Objectives set out in paragraph 3.5 of the *Other Grants Guidelines (Research) 2017* and these Conditions;
 - (b) at the times and in the manner specified in these Conditions;
 - (c) in accordance with the Project Management Plan in Schedule 2 and the Budget in Schedule 3;
 - (d) in accordance with the Project Management Plan submitted by the applicant;
 - (e) within the Project Period set out in item 2;
 - (f) diligently, effectively and to a high standard;
 - (g) in accordance with any necessary ethics approvals and requirements; and
 - (h) in accordance with the milestones, if any, set out in the Project Management Plan, unless otherwise approved by delegate.
- 4.2 Any activity undertaken by the Recipient must have the objective of progressing the Project from one Technology Readiness Level to a higher Technology Readiness Level.
- 4.3 The Recipient must take all reasonable steps to minimise delay in completion of the Project. If the Recipient becomes aware that the Project will not be completed by the date specified in item 2, the Recipient must immediately notify the Commonwealth and take any steps the Commonwealth directs the Recipient in writing to undertake to address the delay.
- 4.4 The Lead Entrepreneur must:
- (a) take significant intellectual responsibility for the conception and implementation of the Project and for any strategic decisions required in its pursuit and the communication of results;
 - (b) ensure effective supervision, support and mentoring at all times of project personnel;
 - (c) be an employee or PhD student of, or hold an honorary or equivalent position with, the Lead Organisation at the commencement date of the grant and for its duration; and
 - (d) make a minimum commitment of 0.5 FTE to the project over its term.

5. Management of Grant Funds

- 5.1 The Recipient must use the Grant Funds in accordance with the approved Project Management Plan in Schedule 2, and Budget as set out in Schedule 3.
- 5.2 The Recipient must use any interest generated on Grant Funds for the purposes of the Project.

6. Reporting

- 6.1 The Recipient must provide **Progress Reports** to the Program Delegate which, at a minimum, must separately and distinctly address the following matters:
- (a) a report of work done for each item set out in the Project Management Plan from Project commencement to due date of the relevant milestone in the Project Management Plan;

- (b) evidence of completion of the relevant milestones for the period set out in the Project Management Plan;
 - (c) a statement of actual versus budgeted income and expenditure for the year, including details of expenditure of the Grant and interest earned on Grant Funds;
 - (d) a statement describing the IP frameworks and practices being utilised to support the Project and any solutions regarding accessing IP to support industry participation in the Project; and
 - (e) a statement signed by a person authorised to do so on behalf of the Recipient that the reports are, to the best of their knowledge, a true and accurate statement of the status of the Project.
- 6.2 A template for the Progress Report will be provided by the Department and Progress Reports must be in this format.
- 6.3 Progress Reports must be provided to the Program Delegate as follows:
- | | |
|-------------------|--------------|
| Progress Report 1 | 10 June 2024 |
|-------------------|--------------|
- 6.4 The Recipient must provide a **Final Report**, covering the period from the Project commencement to the Project completion as set out in item 2, to the Program Delegate and must contain, at a minimum:
- (a) evidence that the Project specified in the Project Management Plan has been completed;
 - (b) a statement describing the objectives and outcomes achieved as a result of the Grant for the activities specified in the Project Management Plan;
 - (c) copies of any published reports, pamphlets or other documentation relevant to the Project which has not already been included in Progress Reports;
 - (d) a statement describing the IP frameworks and practices utilised to support the Project and solutions to access IP to support industry participation in the Project; and
 - (e) an Acquittal Report as set out below.
- 6.5 A template for the Final Report will be provided by the Department and the Final Report must be in this format.
- The Final Report, including the Acquittal Report, must be provided to the Program Delegate by 10 March 2025.
- 6.6 The Recipient must provide the **Acquittal Report** to the Program Delegate as part of the Final Report and it must contain, at a minimum:
- (a) a certificate signed by the Recipient's chief executive officer (or equivalent) or any other senior officer of the Recipient's organisation acceptable to the Program Delegate, that all Grant Funding received was expended for the Project and in accordance with these Conditions of Grant;
 - (b) an audited detailed statement of income and expenditure in respect of the Grant Funding, which must include a definitive statement as to whether the financial accounts are true and fair;
 - (c) an audited statement that the Grant Amount was expended for the Project and in accordance with these Conditions of Grant; and
 - (d) any other requirements set out in these Conditions of Grant or any other information required by the Program Delegate and advised by the Program Delegate to the Recipient.

- 6.7 Unless otherwise approved by the Program Delegate in writing, the audits referred to above must:
- (a) comply with the Australian Auditing Standards; and
 - (b) be carried out by a person who is:
 - i. registered as a company auditor under the *Corporations Act 2001*, or a member of Chartered Accountants Australia and New Zealand in Australia (who is entitled to use the letters CA or FCA), or of CPA Australia (who is entitled to use the letters CPA or FCPA) or the Institute of Public Accountants (formerly the National Institute of Accountants) (who is entitled to use the letters MNIA, FNIA, PNA or FPNA); and
- 6.8 At any time up to thirty-six (36) months after the end of the Project Period, the Commonwealth may request additional information from the Recipient for the purposes of any review or evaluation that the Commonwealth may undertake of the Program or of the Project.
- 6.9 The Progress and Final Reports must be:
- (a) provided at the times specified in this item 6 or as otherwise notified by the Department to the Recipient from time to time; and
 - (b) in the manner specified, including any particular format specified, in item 6, or in the manner, including any particular format, otherwise notified by the Department to the Recipient from time to time.
- 6.10 The Recipient must make any amendments to the Progress and Final Reports as reasonably requested by the Program Delegate, for example, to ensure that Grant Funding has been used appropriately and to assess compliance with the Project Management Plan.

7. Liaison and monitoring

- 7.1 The Recipient must:
- (a) liaise with and provide information to the Program Delegate, or a person nominated by the Program Delegate, as reasonably required by the Program Delegate;
 - (b) collaborate with, liaise with and provide timely information to the Department or nominated representative as reasonably required for the satisfactory completion of the Project in accordance with these Conditions; and
 - (c) comply with all reasonable requests, directions, or monitoring requirements received from the Program Delegate.

8. Assets

- 8.1 The Recipient must not use Grant Funds to purchase any Asset other than as set out in the Project Management Plan, unless otherwise approved by the Program Delegate.
- 8.2 The Recipient must not use Assets for any purpose other than the performance of the Project during the Project Period unless it has obtained the prior written approval of the Program Delegate.
- 8.3 The Recipient must:

- (a) not encumber or dispose of any Asset, or deal with any Asset other than in accordance with these Conditions of Grant, without having obtained the prior written approval of the Program Delegate;
- (b) safeguard all Assets against theft, loss, damage or unauthorised use;
- (c) maintain all Assets in good working order;
- (d) be fully responsible for, and bear all risks arising in relation to, the use or disposal of any Asset;
- (e) maintain appropriate insurances for all Assets to their full replacement value, and provide satisfactory evidence of this on request from the Department;
- (f) maintain a register of all Assets, recording the date of purchase or lease, the purchase or lease price, Asset description, Asset location, the proportion of the Grant used to create or acquire the Asset, details of disposals of the Asset, including the sale price; and
- (g) as and when requested, provide copies of the register of Assets to the Program Delegate.

9. Insurance

- 9.1 The Recipient must, for as long as any obligations remain in connection with the Grant, ensure that it has appropriate insurance, including:
- (a) workers' compensation insurance for an amount required by the relevant state or territory legislation; and
 - (b) public liability insurance (i.e. insurance that covers a Recipient's liability arising out of negligent acts or omissions that cause personal injury to other people or damage to the property of another person or organisation) for an amount of not less than ten million dollars (\$10,000,000) per claim.
- 9.2 The Recipient must, on request by the Department, provide certificates verifying the currency of the insurances specified in item 9.1.

10. Indemnity

- 10.1 The Recipient must indemnify the Commonwealth against any:
- (a) loss or liability incurred by the Commonwealth;
 - (b) loss of or damage to Commonwealth property; or
 - (c) loss or expense incurred by the Commonwealth in dealing with any claim against the Commonwealth, including legal costs and expenses on a solicitor/own client basis and the cost of time spent, resources used, or disbursements paid by the Commonwealth;
- arising from:
- (d) any act or omission by the Recipient, or any of the Recipient's employees, agents, or subcontractors in connection with these Conditions of Grant, where there was fault on the part of the person whose conduct gave rise to that liability, loss, damage, or expense;
 - (e) any breach by the Recipient or any of the Recipient's employees, agents, or subcontractors of obligations or warranties under these Conditions;
 - (f) any use or disclosure by the Recipient, or its officers, employees, agents or subcontractors of Personal Information held or controlled in connection with these Conditions; or

- (g) the use by the Commonwealth of the Reports, including any claims by third parties about the ownership or right to use Intellectual Property Rights, or moral rights (as defined in the *Copyright Act 1968*), in the Report.
- 10.2 The Recipient's liability to indemnify the Commonwealth in item 10.1 will be reduced proportionally to the extent that any fault on the part of the Commonwealth contributed to the relevant loss, damage, expense, or liability.
- 10.3 The Commonwealth's right to be indemnified is in addition to, and not exclusive of, any other right, power, or remedy provided by law, but the Commonwealth is not entitled to be compensated in excess of the amount of the relevant loss, damage, expense or liability.
- 10.4 In this item 10, "fault" means any negligent or unlawful act or omission or wilful misconduct.

11. Intellectual Property

- 11.1 The Recipient must, on written request from the Commonwealth, provide the Commonwealth with a copy of any Project Material in the format reasonably requested by the Commonwealth.
- 11.2 The Recipient must grant to the Commonwealth a permanent, irrevocable, free, world-wide, non-exclusive licence (including a right of sub-licence) to use, reproduce, adapt and exploit the Intellectual Property Rights in the Reports for any purpose.
- 11.3 To the extent that the Reports contain Existing Material or Third-Party Material the Recipient must grant the Commonwealth, or must obtain for the Commonwealth, a permanent, irrevocable, world-wide, royalty free, non-exclusive licence (including the right to sub-licence) to use, reproduce, adapt, modify and communicate that Material.
- 11.4 The Recipient must obtain for the Commonwealth written moral rights consents (other than in relation to acts of false attribution) from all authors of Reports and Third-Party Material to the use of that Material by the Commonwealth prior to that Material being provided to the Commonwealth.
- 11.5 The Recipient is encouraged to engage with end-users of research, collaborating and industry partners in the innovative use of clear, accessible and simply IP frameworks. This may include but is not limited to:
 - (a) providing details on the use of IP in the project and the ownership of IP created by the project
 - (b) warranting ownership of and access to, or the beneficial use of, any IP necessary to carry out the project
 - (c) offering agreements drawn from the Higher Education Research Commercialisation IP Framework (HERC IP Framework) to partners or beneficiaries of the project.
- 11.6 The Recipient must, if requested by the Commonwealth to do so, bring into existence, sign, execute or otherwise deal with any document which may be necessary or desirable to give effect to this item.

12. Access to premises and records

- 12.1 The Recipient must provide the Commonwealth (including the Auditor-General and any Information Officer under the *Australian Information Commissioner Act 2010*), or any persons authorised in writing by the Commonwealth:
- (a) access to premises where the Project is being performed and/or where Material relevant to the Reports is kept within the time period specified in a Commonwealth notice; and
 - (b) permission to inspect any Material relevant to the Reports.

13. Records

- 13.1 The Recipient must keep and make available to the Department on the Department's request, full and accurate Records of the conduct of the Project including the receipt and use of Grant Funding (in accordance with the Australian Accounting Standards).
- 13.2 The Recipient must retain Records for 7 years after the completion of the Project and, if requested by the Commonwealth, shall promptly allow persons authorised by the Commonwealth access to such records.

14. Acknowledgment

- 14.1 The Recipient must acknowledge the contribution made by the Commonwealth to the Project in all related promotional material. In particular, the Recipient should ensure that:
- (a) the acknowledgment is prominently recorded and commensurate with that given to state or local government, corporate or other sponsors;
 - (b) any formal statement issued in relation to any aspect of the Project, including speeches, media releases, and brochures, should make reference to the Commonwealth contribution as well as the Australia's Economic Accelerator Launch Program;
 - (c) any signs and plaques erected in association with the Project must acknowledge the Commonwealth's assistance; and
 - (d) where an official opening or launch is proposed for the Project the Minister for Education is to be invited to attend or to send a representative.

15. Protection of personal information

- 15.1 The Recipient must agree to:
- (a) comply with all of the requirements of the Privacy Act (including the Australian Privacy Principles in Schedule 1 of that Act) in relation to the Project and these Conditions of Grant, as if the Recipient were an agency as defined in the Privacy Act;
 - (b) deal with Personal Information received, collected, created or held by the Recipient for the purposes of these Conditions of Grant only to fulfil the Recipient's obligations under these Conditions of Grant; and
 - (c) ensure that any contractor engaged by the Recipient to perform any of its obligations under these Conditions of Grant is contractually bound to comply with the Australian Privacy Principles in Schedule 1 of the Privacy Act.

16. General

- 16.1 The Recipient must, in carrying out its obligations under these Conditions of Grant, comply with:
- (a) all relevant statutes, regulations, by-laws and requirements of any Commonwealth, State, Territory or local authority, including the *Commonwealth Modern Slavery Act 2018*;
 - (b) the Australian Code for the Responsible Conduct of Research;
 - (c) the Guidelines to Counter Foreign Interference in the Australian University Sector;
 - (d) the National Action Plan to Combat Modern Slavery 2020-2025; and
 - (e) any Australian Government policies relevant to the Grant and notified to the Recipient by the Minister for Education at the time of the Grant.
- 16.2 The Recipient must make reasonable enquiries to ensure that no Conflicts of interest exist in relation to the conduct of the Project. If a Conflict arises during the Project, the Recipient must immediately make full disclosure of the Conflict to the Commonwealth and take any steps that the Commonwealth requires to resolve or address the Conflict.

Conditions of Grant

Schedule 2 – Project Management Plan

17. Purpose of project management plan

17.1 This document is aligned to Section 10 of the AEA Seed Guidelines

The Project Management Plan is designed to provide a simple summary of the key elements of the project and should include:

- (a) A clear implementation timetable and tangible milestones
- (b) A comprehensive budget and financial management strategy, including additional cash and in-kind contributions
- (c) A clear approach to tracking, assessing, and reporting on progress; and
- (d) A risk management plan identifying key risks and mitigation strategies.

18. Project aim

Project Aim	The captured CO₂ from industry sectors will be used to make a new low-emission concrete masonry. This technology uses recycled CO₂ and steel slag (a by-product of steel making) to make a concrete binder with 86% Portland cement replacement This project will progress from TRL 3 to TRL 6 by conducting laboratory tests on full-scale concrete masonry units produced using the developed technology for quality control assurance and compliance with standards, and by conducting cost and supply chain analysis of the developed masonry units to ensure commercial feasibility followed by materials and process optimisation.
--------------------	--

19. Project objectives

Project Objectives	• Conducting laboratory tests on full-scale concrete masonry units produced using the developed technology and the low-emission concrete binder for quality control assurance and compliance with AS 3700 and AS/NZS 4455 standards for breaking load and water resistance, as well as CO₂ uptake measurement. • Conducting cost and supply chain analysis of the developed masonry units to ensure commercial feasibility followed by materials and process optimisation to meet or exceed benchmark product quality and standard requirements and reduce costs and carbon footprint.
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20. Project participants

20.1 Project team

Position	Name	Organisation	Role and responsibility	Time commitment (FTE)
Lead Entrepreneur	Dr Alireza Kashani	University of New South Wales	Lead Responsible for project management, design, test, and analysis	0.5 FTE

20.2 Partner Organisations

Registered Business Name	Trading Name (if relevant)	ABN / ACN	Country	Sector	Size
Australian Steel Mill Services (ASMS) Pty Ltd		40003705673	Australia	Industry	Small
Adbri Ltd		15007596018	Australia	Industry	Medium

20.3 Students

Name	University	Academic level (Honours, Masters, PhD)	Role and responsibility	Time commitment (FTE)
s 47F(1)	UNSW	PhD	Cost and supply chain analysis	0.1 FTE
TBA	UNSW	Honours	Study of carbon utilisation in concrete masonry	0.1 FTE
TBA	UNSW	Honours	Study of carbon utilisation in concrete masonry	0.1 FTE

~~OFFICIAL~~-Sensitive//Legal-Privilege

21. Timeline and outcomes

A milestone is a point in the project where a group of tasks or activities have been undertaken to reach this point. This can be represented in a table, timeline or on a Gantt chart (this can be completed in programs like MS Project, Visio or Excel). Tangible products generated as part of the project are deliverables. Include in this section a list of the deliverables and their contents (if appropriate) to be produced during the project. Use this table to list specific deliverables agreed upon by the Lead Entrepreneur.

Measures of success - the following table must reflect each outcome or result against which the measures of success will be reported in Progress and Final Reports.

For the purposes of the AEA Seed Program Measures of success can include:

- Improving the TRL of the project
- Increased industry engagement through collaboration, investment, product development
- Securing IP, Licensing or Patent agreements for the research
- Improved capability and understanding of the commercial opportunities relevant to your field of research
- Enhanced researcher/academic preparedness to explore research projects with identifiable commercial outcomes
- A spinout/startup or SME (small medium sized enterprises)

Milestone / Project phase description	Deliverable/outcome	Program measure of success this milestone relates to	End Date
1 Conducting laboratory tests on full-scale concrete masonry units produced using the developed technology and the low-emission concrete binder for quality control assurance and compliance with AS 3700 and AS/NZS 4455 standards for breaking load, water resistance, and CO2 uptake measurement.	s 47G(1)(a)		13/05/2024
2 Conducting cost and supply chain analysis of the developed masonry units to ensure commercial feasibility followed by materials and process optimisation to meet or exceed benchmark product quality and standard requirements and reduce costs and carbon footprint.	s 47G(1)(a)		13/01/2025

~~OFFICIAL~~-Sensitive//Legal-Privilege

22. Project deliverables and evaluation

	Deliverable	Delivery date
Reports	Progress report	As outlined in clause 6.3
	Final report	As outlined in clause 6.6
	Evaluation report	As outlined in clause 2

23. Risk management plan

Type of risk	Identified risks	Mitigation
Business	s 47G(1)(a)	
Technical		

24. Certification

By submitting this Project Management Plan, you are certifying that:

- an authorised person from the Lead Organisation (This can be the Lead Entrepreneur or Research translation team) has completed the Project Management Plan.
- the information in this report is accurate, complete, and not misleading.
- you have complied with the relevant grant opportunity guidelines, as well as all funding conditions and relevant legislation applicable to the delivery of the Research Activity, as described in the Grant Guidelines and Conditions of Grant.
- you are aware that if you breach a condition imposed on the grant, the Minister may reduce the grant amount, or require repayment of grant funds already paid, in accordance with Part 2-5 of *Higher Education Support Act 2003*.

s 22(1)

From: Ali Kashani
Sent: Friday, June 21, 2024 11:34 AM
To: Education - Accelerator
Cc: Mark Sterbic ; EDUC - AEA.CRM ; s 22(1)
Subject: RE: UNSW's AEA grant update [SEC=OFFICIAL]

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Dear AEA team,

I am the Lead Entrepreneur of an AEA grant with the title of "Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production" which was funded last year.

I would like to update you that the interim report will be sent with a delay. We missed the first Milestone report due 10th of June 2024. We experienced some technical problems of our lab facilities and delays in making and testing masonry concrete blocks. I would be able to submit the report by Thursday the 27th. Please note the total duration of the project and the final project delivery time would not be impacted.

Thank you in advance for your help and consideration of this request. I will look forward to hearing from you.

Best Regards,

Ali Kashani

Senior Lecturer in Sustainable Concrete and 3D Printing @ [UNSW](#)

National Award winner of 'Excellence in Concrete' in Technology and Innovation

Churchill Fellow

P: +61 (2) 9385 5766

E: ali.kashani@unsw.edu.au

[Research profile](#)

[Publications](#)

[LinkedIn](#)



From: s 22(1)

Sent: Friday, June 21, 2024 9:20 AM

To: Ali Kashani <ali.kashani@unsw.edu.au>

Cc: Mark Sterbic <m.sterbic@unsw.edu.au>; Education - Accelerator <accelerator@education.gov.au>; EDUC - AEA.CRM <s 47E(d)>

Subject: RE: UNSW's AEA grant update [SEC=OFFICIAL]

Hi Ali,

Send your enquiries to the accelerator inbox accelerator@education.gov.au

Regards,

s 22(1)

s 22(1), Australia's Economic Accelerator

Research Division

Australian Government Department of Education

M s 22(1) | E s 22(1)

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The Department of Education acknowledges the traditional owners and custodians of country throughout Australia and their continuing connection to land, waters and community. We pay our respects to them and their cultures, and Elders past, present and emerging.

From: Ali Kashani <ali.kashani@unsw.edu.au>

Sent: Thursday, June 20, 2024 9:30 AM

To: s 22(1)

Cc: Mark Sterbic <m.sterbic@unsw.edu.au>; EDUC - AEA.CRM <s 47E(d)>

EDUC - AEA.CRM <s 47E(d)>

Subject: RE: UNSW's AEA grant update [SEC=OFFICIAL]

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hi s

No problem. Will do. Could you please let me know who is the contact person in the department to reach out to and the email address? Thank you.

From: s 22(1)

Sent: Thursday, 20 June 2024 9:24 AM

To: Ali Kashani <ali.kashani@unsw.edu.au>

Cc: Mark Sterbic <m.sterbic@unsw.edu.au>; EDUC - AEA.CRM <s 47E(d)>

EDUC - AEA.CRM <s 47E(d)>

Subject: RE: UNSW's AEA grant update [SEC=OFFICIAL]

Hi Ali,

I would still send an email to the department and let them decide how to deal with your situation i.e. if the project is delayed by only 2 or 3 weeks, the department may not require a variation. However, any delay in submitting the progress report will also delay the next grant payment.

Regards,
s 22(1)

Australia's Economic Accelerator
Research Division
Australian Government Department of Education
M s 22(1) | E s 22(1)

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From: Ali Kashani <ali.kashani@unsw.edu.au>

Sent: Wednesday, June 19, 2024 9:38 AM

To: s 22(1)

Cc: Mark Sterbic <m.sterbic@unsw.edu.au>; EDUC - AEA.CRM s 47E(d)

Subject: RE: UNSW's AEA grant update [SEC=OFFICIAL]

You don't often get email from ali.kashani@unsw.edu.au. [Learn why this is important](#)

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hi s

Thanks for getting back to me. We would be able to send the report next week and the total duration of the project and the final project delivery time would not be impacted. Could you please confirm whether still a variation request required as it would create a rather lengthy admin process between the department and AEA. Thanks for confirming your availability for the meeting in July, I will reach to other stakeholders and let you know.

Thank you

Ali

From: s 22(1)

Sent: Wednesday, June 19, 2024 8:53 AM

To: Ali Kashani <ali.kashani@unsw.edu.au>

Cc: Mark Sterbic <m.sterbic@unsw.edu.au>; EDUC - AEA.CRM s 47E(d)

Subject: RE: UNSW's AEA grant update [SEC=OFFICIAL]

Some people who received this message don't often get email from peter.milic@education.gov.au. [Learn why this is important](#)

Hello Ali,

Apologies for my delayed response.

Regarding the delay in project timelines please email the department and CC me in as well as a variation will need to be generated.

I'm available to meet with stakeholders in July (but preferably not Monday after 3pm or Friday mornings).

Regards,
s 22(1)

Australia's Economic Accelerator
Research Division
Australian Government Department of Education
M s 22(1) E s 22(1)

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From: Ali Kashani <ali.kashani@unsw.edu.au>

Sent: Thursday, June 13, 2024 6:21 PM

To: s 22(1)

Cc: Mark Sterbic <m.sterbic@unsw.edu.au>

Subject: UNSW's AEA grant update

You don't often get email from ali.kashani@unsw.edu.au. [Learn why this is important](#)

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Dear s 22(1)

My name is Ali and I am the Lead Entrepreneur of an AEA grant with the title of "Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production" which was funded last year. I wanted to reach out and introduce myself and also provide an update with regards to our project.

The project is running well, and we have almost achieved our initial targets for the first milestone. However, due to some technical problems of our lab facilities and delays in making and testing masonry concrete blocks, the project is a little bit behind the schedule. We missed the first Milestone report due 10th of June 2024. I would like to request an extension by the 30th of June if possible.

We would like to organise a meeting with all stakeholders and project partners to present our first Milestone results in the 1st or 2nd week of July. Could you please let me know your availabilities over these two weeks? We can organise it online or hybrid.

Thank you in advance for your help and consideration of this request. I will look forward to hearing from you.

Best Regards,

Ali Kashani

Senior Lecturer in Sustainable Concrete and 3D Printing @ [UNSW](#)

Churchill Fellow

P: +61 (2) 9385 5766

E: ali.kashani@unsw.edu.au

Text Description automatically generated



CRICOS Provider Code 00098G

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From: [Ali Kashani](#)
To: [Education - Accelerator](#)
Cc: [Mark Sterbic](#); [EDUC - AEA.CRM](#); s 22(1) ; [Zunaira Naseem](#); [RGC MyResearch Go](#); s 47F(1) s
Subject: UNSW's AEA grant M1 report
Date: Thursday, 27 June 2024 3:15:23 PM
Attachments: [image002.png](#)
[image003.jpg](#)
[Low-Emission Concrete Masonry Progress Report June 2024.pdf](#)

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To: Australia's Economic Accelerator Branch | Research Division

Dear Sir/Madam,

I am delighted to share our progress report regarding AE230100056 grant for 'Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production'. We have achieved set targets for Milestone 1 in which we developed and tested a low-carbon product with 75% lower embodied carbon footprint compared to the benchmark traditional concrete masonry unit.

Please find the report attached and let us know if you have any questions or comments.

We are looking forward to continuing our collaboration with our partners in the next phase of the project towards commercialisation of this technology. Thank you for supporting this project.

Best Regards,

Ali Kashani

Senior Lecturer in Sustainable Concrete and 3D Printing @ [UNSW](#)

National Award winner of 'Excellence in Concrete' in Technology and Innovation

Churchill Fellow

P: +61 (2) 9385 5766

E: ali.kashani@unsw.edu.au

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Progress Report (June 2024)

Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production

Dr Ali Kashani (Lead Entrepreneur) and Dr Zunaira Naseem (Project Lead)

Executive Summary

This project aims to develop cost-efficient and economically feasible low-emission concrete masonry units for commercialisation using the CO₂ utilisation technology and an industrial by-product of steel making (steel slag). In the first milestone of this project, extensive experimental laboratory trials have been carried out to optimise the mix design and CO₂ utilisation. The results indicate promising potential for the successful implementation of this low-carbon masonry concrete. A concrete mix design was developed, replacing 50% of Portland cement with steel slag. s 47(1)(b)

s 47(1)(b)

s 47(1)(b) The use of steel slag as a partial cement replacement (50%) and CO₂ utilisation not only reduced the embodied carbon of concrete masonry units by 75% but also improved its early strength.

s 47(1)(b)

Looking ahead, in the second milestone (M2) of the project, mix design and CO₂ utilisation parameters will be further refined to target an ultra-low carbon footprint while meeting or exceeding the required properties. This phase will focus on showcasing a high-quality and cost-effective prototype suitable for commercialisation. s 47G(1)(a)

s 47G(1)(a) Therefore, a comprehensive cost and supply chain analysis of materials and processes will be conducted in collaboration with Adbri and ASMS. s 47(1)(b)

s 47(1)(b)

The aim is to develop a cost-efficient and economically feasible prototype ready for commercialisation.

s 47G(1)(a)

The successful outcome of this project is expected to produce a new potential market for carbon utilisation in the production of low-emission concrete as well as utilising industrial wastes for low-carbon construction to support the net zero carbon emissions target set by the Australian government.

1. Background

This project aims to create a new market for captured CO₂ from industry sectors with hard-to-abate emissions. The captured CO₂ is used to make a new low-emission concrete masonry. The developed low-emission technology uses recycled CO₂ and steel slag (a by-product of steel making) to make a concrete binder for concrete masonry units' fabrication. The purpose of this project is to demonstrate compliance with relevant standards for low-carbon concrete masonry made by the developed technology and to conduct cost and supply chain analysis to ensure commercial feasibility.

Concrete is the most used construction material for the construction globally with around 20 billion tons manufactured annually. The main primary binder of the concrete is Ordinary Portland cement (OPC) which is utilised to meet the strength, durability and efficiency of construction [1]. However, OPC production is an energy-intensive process and consumes a larger amount of natural resources such as limestone [2]. 55% of emissions from Australian cement manufacturing come from calcination, which is the process of converting limestone into clinker and carbon dioxide. A further 26 per cent comes from the fuel used to heat cement kilns, 12 per cent is from electrical energy use, and the rest is from transport [3]. The OPC production accounts for almost 6-8% of global greenhouse (GHG) emissions [4]. More than half of these emissions stem from CO₂ emitted as the result of burning limestone and could not be evaded with the use of renewable resources. Hence, it is essential to find a solution to capture and utilise CO₂ from cement production and also to reduce OPC usage in concrete production.

One potential decarbonisation solution is via CO₂ capture and utilising these hard-to-abate emissions into construction materials. The Australian concrete decarbonisation roadmap allows for a 33% emissions reduction by carbon capturing and utilisation to achieve net zero by 2050 [3]. However, limited projects and technologies are available to achieve this ambitious target. These statistics show the urgency for more technologies that not only capture CO₂ but also those that could reuse/recycle CO₂ into new products. The potential global market for recycled CO₂ products could be \$5.91 trillion a year, of which \$1.37 trillion includes cement, concretes, asphalts, and aggregates made by CU technologies [5].

The developed CU technology of this project will create a new market for utilising CO₂ in concrete masonry production in Australia. This project aligned with the National Reconstruction Fund in the priority funding area of low-emission technologies. The outcomes contribute to lower emissions in primary industries in Australia and support the government's net zero carbon policy for a clean climate. The CO₂ recycling technique is the most sustainable and feasible solution for a clean environment and for resolving climate change issues globally [6]. This technology also utilises steel slag as a partial replacement of OPC in concrete masonry units. Steel slag is being produced in large quantities worldwide as a by-product of the steel-making process [7]. Steel slag is not normally used for conventional concrete production. Still, it is abundantly available with limited use (about one million tons of reserved steel slag is available according to Australian Steel Mill Services).

Therefore, the objective of this project is to develop a low-emission concrete masonry product by utilising CO₂ utilisation technology and steel slag as a partial replacement for high-emission OPC. A schematic illustration of this product is shown in Fig. 1. In the first milestone of the project, the cement was successfully replaced with 50% steel slag in the concrete masonry units. The steel slag particle size characteristics, mix design, curing regime and CO₂ curing are varied and optimised to achieve the targeted strength and other properties required as per commercial market requirements and standards. In the second milestone of the project, a comprehensive cost and supply chain analysis will be performed to ensure a cost-efficient and economically feasible prototype for commercialisation. The novel outcome of this study highlights the successful implementation of this CU technology in terms of performance and decarbonisation efficiency to produce low-emission concrete masonry products. The outcomes contribute to lower emissions in primary industries in Australia and support the government's net zero carbon policy. The developed CU technology in this project will create a new market for utilising CO₂ in concrete masonry production in Australia.

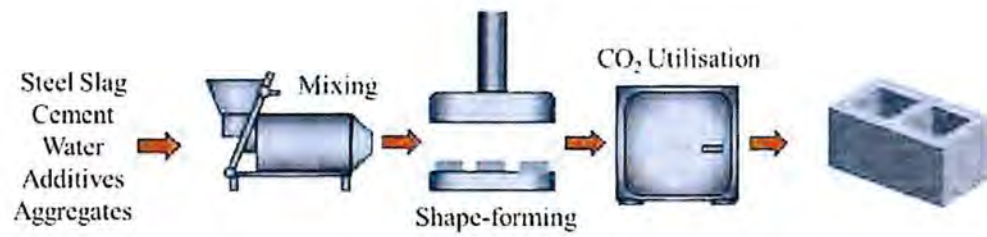


Fig. 1. Schematic illustration of the fabrication of low-emission concrete masonry units utilising CO₂ utilisation technology and steel slag as a partial replacement for high-emission Portland cement.

2. Results and Discussion

s 47(1)(b)

s 47(1)(b)

s 47(1)(b)

s 47(1)(b)

3. Conclusions

s 47(1)(b)

s 47(1)(b)

4. Future works

s 47G(1)(a)

Appendix

s 47(1)(b)

s 47(1)(b)

References

- [1] KL Scrivener, VM John, EM Gartner (2018) Cement and concrete Research 114: 2.
- [2] R Feiz, J Ammenberg, L Baas, M Eklund, A Helgstrand, R Marshall (2015) Journal of Cleaner Production 98: 272.
- [3] VDZ (2021),
https://www.ccaa.com.au/CCAA/CCAA/Public_Content/SUSTAINABILITY/Decarbonisation_Pathways_Report.aspx
- [4] RM Andrew (2018) Earth System Science Data 10: 195.
- [5] Carbon 180 (accessed 2024), <https://carbon180.org/wp-content/uploads/2024/01/Carbon180-TAMsforCarbontech-ExecSummary.pdf>
- [6] D Wang, J Xiao, Z Duan (2022) Construction and Building Materials 314: 125646.
- [7] LV Fisher, AR Barron (2019) Resources, conservation and recycling 146: 244.
- [8] L Mo, F Zhang, M Deng (2016) Cement and Concrete Research 88: 217.

From: [RGC MyResearch Go](#)
To: [Education - Accelerator; Ali Kashani](#)
Cc: [Mark Sterbic; EDUC - AEA.CRM; s 22\(1\)](#) [Zunaira Naseem; s 47F\(1\)](#) [s 47F\(1\)](#) [; s 47F\(1\)](#) [ITU CASD Mailleater RGC](#)
Subject: FW: UNSW's AEA grant M1 report
Date: Tuesday, 2 July 2024 11:03:55 AM
Attachments: [image002.png](#)
[image003.jpg](#)
[image001.jpg](#)
[Low-Emission Concrete Masonry Progress Report June 2024.pdf](#)
[RG230800_FIN_Statement Jan-May24_MK.pdf](#)

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Dear AEA Research Team,
 Please also find attached a Financial Statement to accompany Dr Kashani's Progress Report.
 Please let me know if you require additional information.

Warm regards

s 47F(1)

s 47F(1)

Research Grants and Contracts
 Research Grants & Contracts
 UNSW SYDNEY NSW 2052 AUSTRALIA

T:

W: <https://research.unsw.edu.au/research-grants-and-contracts-rgc>

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%request_id=4243457

From: Ali Kashani

Sent: Thursday, June 27, 2024 3:14 PM

To: Education - Accelerator

Cc: Mark Sterbic ; EDUC - AEA.CRM ; s 22(1) ; Zunaira Naseem ; RGC MyResearch Go ; s 47F(1)
 s 47F(1) ; s 47F(1) s 47F(1)

Subject: UNSW's AEA grant M1 report

To: Australia's Economic Accelerator Branch | Research Division

Dear Sir/Madam,

I am delighted to share our progress report regarding AE230100056 grant for 'Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production'. We have achieved set targets for Milestone 1 in which we developed and tested a low-carbon product with 75% lower embodied carbon footprint compared to the benchmark traditional concrete masonry unit. Please find the report attached and let us know if you have any questions or comments.

We are looking forward to continuing our collaboration with our partners in the next phase of the project towards commercialisation of this technology. Thank you for supporting this project.

Best Regards,

Ali Kashani

Senior Lecturer in Sustainable Concrete and 3D Printing @ [UNSW](#)

National Award winner of 'Excellence in Concrete' in Technology and Innovation
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SYDNEY
ABN 57 195 873 179

STATEMENT OF INCOME AND EXPENDITURE
FOR THE PERIOD
15 January 2024 to 31 May 2024

TITLE: Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry
SPONSOR REF: Department Of Education: AE230100056
MANAGER: Alireza Kashani
PROJECT NO: RG230800

Life to Date			Current Period
\$		\$	\$
	OPENING BALANCE		0.00
	OPERATING INCOME	s 47G(1)(a)	
159,892.00	Funds received		
0.00	Interest		
159,892.00	* TOTAL OPERATING REVENUE		159,892.00
s 47G(1)(a)	OPERATING EXPENDITURE		
	Salaries		
	Equipment		
	Materials / Supplies		
	Scholarships		
	Travel		
60,505.51	TOTAL OPERATING EXPENDITURE		60,505.51
99,386.49	CLOSING BALANCE		99,386.49

s 47F(1)

CONFIRMED TO UNSW LEDGER

s 47F(1) 20-Jun-2024
s 47F(1)
UNSW Sydney

* Where GST has been received in addition to the grant funds above,
the GST has been forwarded to the Australian Taxation Office.

From: [Education - Accelerator](#)
To: ["Ali Kashani"](#)
Cc: [Education - Accelerator; "Mark Sterbic"](#)
Subject: RE: AE230100056 - notification of delay in report submission - Variation request - UNSW
Date: Tuesday, 15 April 2025 8:35:00 AM
Attachments: [image001.png](#)
[image002.png](#)

Hi Ali,

Thank you for your enquiry.

RE: AE230100056 - notification of delay in report submission - Variation request - UNSW

Request

UNSW request **an extension for the submission of the financial report until the end of April**. As communicated last year, there was a delay in starting the project, and at the beginning of this year, we also had a change in staff, which further impacted our timeline.

We have a few remaining tasks to complete and anticipate finalizing them by the mid to end of April. This will allow us to submit both the Final Report and the Audited Financial Acquittal Report by **May 9th (the latest)**.

AEA Response

Given that we are now halfway through April 2025, the AEA program management team is happy to provide an extension of time (**9th May 2025**) to complete your final project activities and submit your final report which includes your project's final financial acquittal.

Please not however, if you can not meet this revised milestone deadline, you will have to submit an official project variation request for the delegate to consider.

I hope this answers is satisfactory and I look forward to receiving your final report.

If you have any questions in regard to submission, please let me know

Regards,

s 22(1)

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Australian Government Department of Education

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The Department of Education acknowledges the Traditional Owners and Custodians of Country throughout Australia and their continuing connection to land, waters and community. We pay our respects to them and their cultures, and Elders past and present

From: Ali Kashani <ali.kashani@unsw.edu.au>

Sent: Monday, 17 March 2025 10:48 AM

To: Education - Accelerator <accelerator@education.gov.au>

Cc: EDUC - AEA.CRM s 47E(d) >; Mark Sterbic <m.sterbic@unsw.edu.au>

Subject: RE: AEA Seed Final report template for AE230100056 [SEC=OFFICIAL]

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Dear s 22(1)

Thank you for sharing the final report template.

I would like to request **an extension for the submission of the financial report until the end of April**. As communicated last year, there was a delay in starting the project, and at the beginning of this year, we also had a change in staff, which further impacted our timeline. We have a few remaining tasks to complete and anticipate finalizing them by the mid to end of April. This will allow us to submit both the Final Report and the Audited Financial Acquittal Report by **May 9th (the latest)**.

Please let us know if this extension is feasible. We appreciate your understanding and support.

Best regards,

Ali

From: Education - Accelerator <accelerator@education.gov.au>

Sent: Friday, 14 March 2025 4:11 PM

To: Ali Kashani <ali.kashani@unsw.edu.au>

Cc: EDUC - AEA.CRM s 47E(d) >; Mark Sterbic <m.sterbic@unsw.edu.au>; Education - Accelerator <accelerator@education.gov.au>

Subject: RE: AEA Seed Final report template for AE230100056 [SEC=OFFICIAL]

Hi Ali,

Thank you for your enquiry.

RE: AEA Seed Final report template for AE230100056

As requested, please find attached AEA Seed Final Report Template (which includes financial acquittal requirements as well.

Please also refer to your Conditions of grant (CoG):

- clause 6.6 for acquittal Report requirements and;
- clause 6.7 for whom can undertake a financial acquittal.

If you have any other questions regarding the submission of your final report, please let me know.

Regards,

s 22(1)

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The Department of Education acknowledges the Traditional Owners and Custodians of Country throughout Australia and their continuing connection to land, waters and community. We pay our respects to them and their cultures, and Elders past and present

From: Ali Kashani <ali.kashani@unsw.edu.au>

Sent: Friday, 14 March 2025 4:03 PM

To: Education - Accelerator <accelerator@education.gov.au>

s 47E(d)

Cc: EDUC - AEA.CRM

; Mark Sterbic <m.sterbic@unsw.edu.au>

Subject: Final report template

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Re: Department of Education/Australia's Economic Accelerator Seed Grants

Reference: AE230100056

Title: "Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production"

Dear Sir/Madam,

I would like to inform you that we will be submitting the final report for our project within the next few weeks. Could you please share any specific template we should use or let us know if any specific criteria we need to include in the report besides the project results, TRL advancement, and outcomes? Thank you.

Best Regards,

Ali Kashani

Senior Lecturer in Sustainable Concrete and 3D Printing @ [UNSW](https://www.unsw.edu.au)

National Award winner of 'Excellence in Concrete' in Technology and Innovation

Churchill Fellow

P: +61 (2) 9385 5766

E: ali.kashani@unsw.edu.au

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SYDNEY
ABN 57 195 873 179

STATEMENT OF INCOME AND EXPENDITURE
FOR THE PERIOD
1 June 2024 to 30 April 2025

TITLE: Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry
SPONSOR REF: Department Of Education: AE230100056
MANAGER: Ali Kashani
PROJECT NO: RG230800

Life to Date			Current Period
\$		\$	\$
	OPENING BALANCE		99,386.49
s 47G(1)(a)	OPERATING INCOME	s 47G(1)(a)	
	Funds received		
	Interest		s 47G(1)(a)
182,994.78	* TOTAL OPERATING REVENUE		
s 47G(1)(a)	OPERATING EXPENDITURE		
	Salaries		
	Equipment		
	Materials / Supplies		
	Scholarships		
	Travel		
202,980.78	TOTAL OPERATING EXPENDITURE		
(19,986.00)	CLOSING BALANCE		(19,986.00)

s 47F(1)

CONFIRMED TO UNSW LEDGER

s 47F(1) 29-Apr-2025
s 47F(1)
UNSW Sydney

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Australia's Economic Accelerator

Seed Project Final Report

Version 1.0 September 2024

Project Final Report

Consistent with clause 6 (Reporting) in the Conditions of Grant (CoG) imposed upon all AEA Seed grants, the Lead Organisation is required to provide a Final Report. As set out in the CoG, the Department of Education (the department) reserves the right to amend this, and other requirements as needed.

Please note:

- Any delays in submitting this final report within the timeframe stipulated in your CoG may result in the delayed payment of the final funding milestone.
- Variations cannot be requested through this Final Report. Please contact the department at accelerator@education.gov.au if you require a variation to your CoG.

Project Information

Application number	AE230100056
Lead Organisation	UNSW
Priority and Focus Area	AEA seed grant – Low-carbon technology
Project Title	Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production
Lead Entrepreneur	Dr Ali Kashani
Priority Manager	s 22(1)
Grant Period (Research Activity Start and End Dates)	15 January 2024 – 30 April 2025

Instructions:

All AEA grant recipients must provide a **Final Report**, covering the period from the Project commencement to the Project completion as set out in clause 6.4 of the CoG, to the Program Delegate and must contain, at a minimum:

- evidence that the Project specified in the Project Management Plan has been completed.
- a statement describing the objectives and outcomes achieved because of the Grant for the activities specified in the Project Management Plan.
- copies of any published reports, pamphlets, or other documentation relevant to the Project which has not already been included in Progress Reports.
- a statement describing the frameworks and practices utilised to support the Project and solutions to access Intellectual Property (IP) to support industry participation in the Project; and
- an Acquittal Report as set out below.

Project Outcomes

The department requires AEA grant recipients to submit a final report (as per clause 10.3 of the *Program Administrative guidelines*) at the end of their project.

Project outcomes are captured in the agreed project milestones and can include achievements such as patents, trademarks or plant breeders' rights awarded; joint researcher/industry publications; spin-out and start-up companies established; jobs created; options and assignments on IP taken up (see Table 1: Project Summary Table).

The following summary table must reflect each outcome or result against which the measure of success is reported in the final report. For the purposes of the AEA Seed Program Measures of success can include:

- improving the Technology Readiness Level (TRL) of a project
- increased industry engagement through collaboration, investment, product development
- securing IP, licencing agreements for the research
- improving capability and understanding of the commercial opportunities relevant to your field of research
- enhanced researcher/academic preparedness to explore research projects with identifiable commercial outcomes
- a spinout/startup or small medium sized enterprise.

Table 1: Project Summary Table

	Milestone/Project Phase description	Deliverable/Outcome	Program measure of success this milestone relates to
1	Laboratory testing and performance evaluation of full-scale masonry units produced using the developed binder and CO ₂ curing technology	Developed and validated a novel low-emission masonry product by replacing 50% of cement with steel slag and applying CO ₂ curing. Reduced GWP by 73% compared to commercial blocks.	Improving the Technology Readiness Level (TRL) of the project from s 47G(1)(a)
2	Cost, supply chain, and commercial feasibility	Conducted full cost modelling and life-cycle assessment showing	Improved capability and understanding of commercial opportunities

	analysis with materials and process optimisation	competitive unit price and 73% GWP reduction compared to s 47G(1)(a)	relevant to the research; Increased industry engagement through collaboration and product development.
--	--	--	--

Final report statement

Please address the questions below in your final report statement. You may also attach evidence of the completion of agreed milestones and outcomes as described in your Project Plan.

(word limit: 2000 words).

1. How well did the final project outcomes align with those specified in the COG? (refer to project milestones and objectives)
2. Describe how satisfied are you with your project outcomes.
3. Describe any intellectual property (IP), licensing agreements generated, or commercial agreements put in place as a direct result of the project collaboration.
4. Has the project attracted further investment interest? From whom?
5. How will your project attract further investment in the future?
 - a. If your project involved international collaboration, has this been advantageous for the project and will this continue?
6. Is the commercial relationship including industry collaboration expected to continue post project?
7. What were the obstacles that prevented you from reaching of your project outcomes?
8. How helpful was the priority manager assigned to your project?
9. What would you like to see improved with AEA grant applications, progress reporting and final reporting?
 - a. How could AEA service delivery be improved?

Final Report Statement – AEA Seed Program Project: Carbon Dioxide Recycling Technology for Concrete Masonry Production

1. **Alignment of Final Outcomes with COG and Project Milestones**

The project outcomes strongly aligned with the milestones and objectives set out in the Conditions of Grant (COG). The project aimed to develop a commercially viable, low-emission concrete masonry unit using captured CO₂ and steel slag—a by-product of steelmaking—as a partial cement replacement. We achieved all deliverables outlined in both milestones:

 - *Milestone 1* focused on validating the performance of full-scale masonry units,^{s 47(1)(b)}
 - *Milestone 2* delivered an in-depth cost, supply chain, and life-cycle analysis, confirming economic feasibility and benchmarking our blocks as 73% lower in GWP than commercial equivalents. The project successfully advanced from ^{s 47G(1)(a)} validating the process in a relevant environment and establishing a foundation for pilot-scale trials.
2. **Satisfaction with Project Outcomes**

We are highly satisfied with the outcomes of the project. The technology was demonstrated at scale, passed all technical performance benchmarks, and proved to be cost-competitive. The team developed a robust foundation for industrial implementation

and clearly demonstrated the viability of combining carbon capture with construction material manufacturing.

3. Intellectual Property and Commercial Agreements

s 47G(1)(a)

4. Attraction of Further Investment Interest

s 47G(1)(a)

5. Future Investment Potential

The project offers compelling future investment opportunities in three areas:

s 47G(1)(a)

6. Ongoing Industry Collaboration Post-Project

s 47G(1)(a)

7. Obstacles Faced

s 47G(1)(a)

8. Support from Priority Manager

The support from the assigned Priority Manager was helpful, particularly in navigating reporting expectations and aligning the project with AEA goals.

9. Suggestions for AEA Program Improvement

Overall, the AEA Seed Program was well-structured, and the guidance was clear.

Audited Financial Acquittal Report

As part of the reporting requirements as described in the COG (clause 6.7) and reproduced below, the Recipient must provide an acquittal report to the program delegate as part of the final Report and it must contain, at a minimum:

- a. a certificate signed by the recipient's chief executive officer (or equivalent) or any other

senior officer of the recipient's organisation nominated by the chief executive officer (or equivalent) who is acceptable to the program delegate, that all grant funding received was expended for the Project and in accordance with the Conditions of Grant.

- b. an audited detailed statement of income and expenditure in respect of the grant funding, which must include a definitive statement as to whether the financial accounts are true and fair.
- c. an audited statement that the grant amount was expended for the project and in accordance with these conditions of grant; and
- d. any other requirements set out in the Conditions of Grant or any other information required by the program delegate and advised by the program delegate to the recipient.

Attachments

- a. the required documents listed in **clause 6.7** of the Conditions of Grant and any other evidence to demonstrate the project has met project milestones and deliverables.
- b. copies of any published reports and promotional material relating to the project.

Project Promotional material

The AEA intends to publish case studies highlighting the progress and outcomes of AEA funded projects on the AEA website. If you would like to provide content or a case study relating to your project for inclusion on the AEA website, please provide the department with a plain English project summary which highlights the project's objectives and success(es) to date.

As this content may be used in public communications about the AEA (e.g., in the AEA annual report) please be mindful of whether your submission contains any sensitive or commercial-in-confidence information.

The AEA will contact you prior to publishing to confirm your comfort with the intended public content.

Project Title:

A New Technology for Low-Carbon Concrete Masonry Production

Plain Summary:

This project developed a breakthrough low-emission concrete masonry product by utilising carbon dioxide (CO₂) and industrial steel slag, a by-product from the steel industry. Led by Dr Ali Kashani at UNSW, the team designed and tested new masonry blocks that use 50% less cement and are cured using CO₂ mineralisation technology, significantly reducing greenhouse gas emissions.

The results have been highly promising: the new blocks meet all relevant Australian standards and show a 73 % reduction in carbon footprint compared to commercially available alternatives. The CO₂-curing process also improved the strength and durability of the blocks, making them a strong candidate for mainstream use in construction.

To support commercialisation, the team analysed cost, logistics, and supply chain feasibility. A scalable production model was developed, showing strong potential for industry adoption.

This innovation supports Australia's net-zero goals by offering a practical, circular-economy solution while reducing reliance on traditional cement.

Certification

By submitting this final report, you are certifying that:

- an authorised person has completed the report.
- the information in this report is accurate, complete, and not misleading and that you understand the giving of false or misleading information is a serious offence under the *Criminal Code 1995* (Cth).
- you have complied with the relevant grant opportunity guidelines, as well as all funding conditions and relevant legislation applicable to the delivery of the Research Activity, as described in the Conditions of Grant.
- you are aware that if you breach a condition imposed on the grant, the Minister may reduce the grant amount, or require repayment of grant funds already paid, in accordance with Part 2-5 of the *Higher Education Support Act 2003*.

Name: Dr Alireza Kashani

Position: Senior Lecturer and Lead Entrepreneur
s 47F(1)

Signature: _____

Date: 05/05/2025



Instrument of Variation to the determination of the Conditions of Grant issued under paragraph 41-25 of the *Higher Education Support Act 2003*

I, s 22(1), a delegate of the Minister:

- A. Vary, under subparagraph 41-25 of the *Higher Education Support Act 2003* (the "Act"), the Conditions of Grant for the Grant made to the **University of New South Wales 57 195 873 179** for the project **AE230100056** ("the Project"), dated 13 October 2023, in the manner and terms set out in this Instrument; and
- B. Determine that the consolidated and amended version of the Conditions of Grant as referenced by this Instrument are the varied Conditions of Grant for the purposes of subparagraph 41-25 of the Act.

This instrument takes effect from the date it is signed.

Dated 16/05/2025

s 22(1)

Australia's Economic Accelerator Branch
Research Division
Department of Education



Higher Education Support Act 2003

**University of New South Wales
ABN: 57 195 873 179**

Varied Conditions of Grant for AE230100056

APPROVAL OF A GRANT TO AN ELIGIBLE BODY CORPORATE UNDER SECTION 41-20

DETERMINATION OF THE AMOUNT OF A GRANT UNDER PARAGRAPH 41-30

AND

**DETERMINATION UNDER SUBPARAGRAPH 41-25 OF THE CONDITIONS ON WHICH A
GRANT IS MADE**

CONDITIONS OF GRANT

**Original Conditions of Grant made on 13 October 2023
and as amended on 16 May 2025**

This work is copyright. Apart from any use permitted under the *Copyright Act 1968*, no part may be reproduced by any process without the written permission of the Commonwealth of Australia acting through the Department.

Conditions of Grant

Schedule 1 — Conditions

In this CoG, the following are defined terms:

"AEA Executive Director"	may hold responsibilities as the assessor, negotiator and relationship manager on behalf of the Department
"Asset"	personal, real or incorporeal property which has a value over \$5,000 created or purchased wholly or partly from the Grant, but not including Intellectual Property Rights or the Reports
"Auditor-General"	the office established under the <i>Auditor-General Act</i> 1997 and includes any other entity that may, from time to time, perform the functions of that office
"Conflict"	refers to the Recipient engaging in any activity or obtaining any interest that would interfere with or restrict it from carrying out its obligations under these Conditions fairly, independently and otherwise in accordance with these Conditions of Grant
"Department"	the Commonwealth Department responsible for administering Part 2-3 of the Act
"Existing Material"	means all Material owned by the Recipient in existence prior to the commencement of these Conditions of Grant: (a) incorporated in (b) supplied with or (c) required to be supplied with, or as part of, the Project Material
"Expert Adviser(s)"	an adviser with research commercialisation expertise within a priority area that may provide input into suitable projects
"Grant"	the grant referred to in this CoG and includes any interest earned on the Grant
"Grant Amount"	the amount determined by the Program Delegate and listed in item b above
"Grant Funds"	the funds making up the Grant Amount
"Grant Funding"	has the same meaning as Grant Funds
"Intellectual Property Rights"	also "IPRs" - includes all copyright (including rights in relation to phonograms and broadcasts), all rights in relation to inventions (including patent rights), plant varieties, registered and unregistered trademarks (including service marks), registered designs, circuit layouts and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields
"Material"	any document, equipment, software (including source code and object code), goods, information and data stored by any including all copies and extracts of the same
"Personal Information"	has the meaning given in the Privacy Act

"Privacy Act"	the <i>Privacy Act 1988</i> as amended from time to time
"Program"	the Australia's Economic Accelerator Launch Program, also known as the Australia's Economic Accelerator Seed Program.
"Program Delegate"	the person that has the delegated authority to make decisions for the program. The Project Delegate's contact details are set out in item 1.
"Project"	the project undertaken by the Recipient as specified in the Project Management Plan in schedule 2
"Project Management Plan"	the plan setting out the way the Project is to be conducted in Schedule 2
"Project Material"	all Material: (a) brought into existence for the purpose of performing this Conditions of Grant, including the Project proposal submitted by the Recipient, the Project Management Plan and the Reports (b) incorporated in, supplied or required to be supplied along with the Material referred to in paragraph (a) or (c) copied or derived from Material referred to in paragraphs (a) or (b)
"Project Period"	the period specified in item 2 during which the Project must be completed
"Recipient"	the body corporate which is responsible for the Project listed in item 1
"Records"	includes documents, information and data stored by any and all copies or extracts of the same
"Report or Reports"	the Report or Reports referred to in item 6 and the Project Management Plan
"Technology Readiness Levels"	the methodology developed by the Department of Defence to assess the maturity level of a particular technology
"Third-party IPRs"	the IPRs in any Third-party Material
"Third-party Material"	any Material incorporated or supplied with the Report in which the IPRs are owned by a third party alone or jointly with any other party (including the Recipient)

Project details

1. Project information

This Project forms part of the 'Australia's Economic Accelerator Launch Program', also known as 'Australia's Economic Accelerator Seed Program'.

Title of Project:

Low-Emission Carbon Dioxide Recycling Technology for Concrete Masonry Production

Recipient information:

Lead Organisation	The University of New South Wales
ABN / ACN	57 195 873 179
Lead Entrepreneur	Alireza Kashani
Lead Entrepreneur contact details	s 47F(1) ali.kashani@unsw.edu.au
Lead Organisation representative	Nicholas Fisk Debbie Docherty
Lead Organisation representative contact details	dvcrc@unsw.edu.au d.docherty@unsw.edu.au

Commonwealth information:

The Commonwealth of Australia represented by the Department of Education located at 50 Marcus Clarke Street, Canberra ACT 2600

Program Delegate contact details	s 22(1) Research Division Department of Education LOC: C50MA7 GPO Box 9880 CANBERRA ACT 2601 Australia s 47E(d)
Program Manager contact details	s 22(1) Department of Education LOC: C50MA7 GPO Box 9880 CANBERRA ACT 2601 Australia accelerator@education.gov.au

2. Project period

The Project Period for this Project is from 15 January 2024 until 11 July 2025.

3. Payment of grant

The manner and time of payment for each part of the Project is as provided for in Schedule 3.

Conditions

4. Conduct of project

- 4.1 The Recipient must carry out the Project:
- (a) in accordance with the Program Objectives set out in paragraph 3.5 of the *Other Grants Guidelines (Research) 2017* and these Conditions;
 - (b) at the times and in the manner specified in these Conditions;
 - (c) in accordance with the Project Management Plan in Schedule 2 and the Budget in Schedule 3;
 - (d) in accordance with the Project Management Plan submitted by the applicant;
 - (e) within the Project Period set out in item 2;
 - (f) diligently, effectively and to a high standard;
 - (g) in accordance with any necessary ethics approvals and requirements; and
 - (h) in accordance with the milestones, if any, set out in the Project Management Plan, unless otherwise approved by delegate.
- 4.2 Any activity undertaken by the Recipient must have the objective of progressing the Project from one Technology Readiness Level to a higher Technology Readiness Level.
- 4.3 The Recipient must take all reasonable steps to minimise delay in completion of the Project. If the Recipient becomes aware that the Project will not be completed by the date specified in item 2, the Recipient must immediately notify the Commonwealth and take any steps the Commonwealth directs the Recipient in writing to undertake to address the delay.
- 4.4 The Lead Entrepreneur must:
- (a) take significant intellectual responsibility for the conception and implementation of the Project and for any strategic decisions required in its pursuit and the communication of results;
 - (b) ensure effective supervision, support and mentoring at all times of project personnel;
 - (c) be an employee or PhD student of, or hold an honorary or equivalent position with, the Lead Organisation at the commencement date of the grant and for its duration; and
 - (d) make a minimum commitment of 0.5 FTE to the project over its term.

5. Management of Grant Funds

- 5.1 The Recipient must use the Grant Funds in accordance with the approved Project Management Plan in Schedule 2, and Budget as set out in Schedule 3.
- 5.2 The Recipient must use any interest generated on Grant Funds for the purposes of the Project.

6. Reporting

- 6.1 The Recipient must provide **Progress Reports** to the Program Delegate which, at a minimum, must separately and distinctly address the following matters:
- (a) a report of work done for each item set out in the Project Management Plan from Project commencement to due date of the relevant milestone in the Project Management Plan;

- (b) evidence of completion of the relevant milestones for the period set out in the Project Management Plan;
 - (c) a statement of actual versus budgeted income and expenditure for the year, including details of expenditure of the Grant and interest earned on Grant Funds;
 - (d) a statement describing the IP frameworks and practices being utilised to support the Project and any solutions regarding accessing IP to support industry participation in the Project; and
 - (e) a statement signed by a person authorised to do so on behalf of the Recipient that the reports are, to the best of their knowledge, a true and accurate statement of the status of the Project.
- 6.2 A template for the Progress Report will be provided by the Department and Progress Reports must be in this format.
- 6.3 Progress Reports must be provided to the Program Delegate as follows:
- | | |
|-------------------|--------------|
| Progress Report 1 | 10 June 2024 |
|-------------------|--------------|
- 6.4 The Recipient must provide a **Final Report**, covering the period from the Project commencement to the Project completion as set out in item 2, to the Program Delegate and must contain, at a minimum:
- (a) evidence that the Project specified in the Project Management Plan has been completed;
 - (b) a statement describing the objectives and outcomes achieved as a result of the Grant for the activities specified in the Project Management Plan;
 - (c) copies of any published reports, pamphlets or other documentation relevant to the Project which has not already been included in Progress Reports;
 - (d) a statement describing the IP frameworks and practices utilised to support the Project and solutions to access IP to support industry participation in the Project; and
 - (e) an Acquittal Report as set out below.
- 6.5 A template for the Final Report will be provided by the Department and the Final Report must be in this format.
- The Final Report, including the Acquittal Report, must be provided to the Program Delegate by 9 May 2025.
- 6.6 The Recipient must provide the **Acquittal Report** to the Program Delegate as part of the Final Report and it must contain, at a minimum:
- (a) a certificate signed by the Recipient's chief executive officer (or equivalent) or any other senior officer of the Recipient's organisation acceptable to the Program Delegate, that all Grant Funding received was expended for the Project and in accordance with these Conditions of Grant;
 - (b) an audited detailed statement of income and expenditure in respect of the Grant Funding, which must include a definitive statement as to whether the financial accounts are true and fair;
 - (c) an audited statement that the Grant Amount was expended for the Project and in accordance with these Conditions of Grant; and
 - (d) any other requirements set out in these Conditions of Grant or any other information required by the Program Delegate and advised by the Program Delegate to the Recipient.

- 6.7 Unless otherwise approved by the Program Delegate in writing, the audits referred to above must:
- (a) comply with the Australian Auditing Standards; and
 - (b) be carried out by a person who is:
 - i. registered as a company auditor under the *Corporations Act 2001*, or a member of Chartered Accountants Australia and New Zealand in Australia (who is entitled to use the letters CA or FCA), or of CPA Australia (who is entitled to use the letters CPA or FCPA) or the Institute of Public Accountants (formerly the National Institute of Accountants) (who is entitled to use the letters MNIA, FNIA, PNA or FPNA); and
- 6.8 At any time up to thirty-six (36) months after the end of the Project Period, the Commonwealth may request additional information from the Recipient for the purposes of any review or evaluation that the Commonwealth may undertake of the Program or of the Project.
- 6.9 The Progress and Final Reports must be:
- (a) provided at the times specified in this item 6 or as otherwise notified by the Department to the Recipient from time to time; and
 - (b) in the manner specified, including any particular format specified, in item 6, or in the manner, including any particular format, otherwise notified by the Department to the Recipient from time to time.
- 6.10 The Recipient must make any amendments to the Progress and Final Reports as reasonably requested by the Program Delegate, for example, to ensure that Grant Funding has been used appropriately and to assess compliance with the Project Management Plan.

7. Liaison and monitoring

- 7.1 The Recipient must:
- (a) liaise with and provide information to the Program Delegate, or a person nominated by the Program Delegate, as reasonably required by the Program Delegate;
 - (b) collaborate with, liaise with and provide timely information to the Department or nominated representative as reasonably required for the satisfactory completion of the Project in accordance with these Conditions; and
 - (c) comply with all reasonable requests, directions, or monitoring requirements received from the Program Delegate.

8. Assets

- 8.1 The Recipient must not use Grant Funds to purchase any Asset other than as set out in the Project Management Plan, unless otherwise approved by the Program Delegate.
- 8.2 The Recipient must not use Assets for any purpose other than the performance of the Project during the Project Period unless it has obtained the prior written approval of the Program Delegate.
- 8.3 The Recipient must:

- (a) not encumber or dispose of any Asset, or deal with any Asset other than in accordance with these Conditions of Grant, without having obtained the prior written approval of the Program Delegate;
- (b) safeguard all Assets against theft, loss, damage or unauthorised use;
- (c) maintain all Assets in good working order;
- (d) be fully responsible for, and bear all risks arising in relation to, the use or disposal of any Asset;
- (e) maintain appropriate insurances for all Assets to their full replacement value, and provide satisfactory evidence of this on request from the Department;
- (f) maintain a register of all Assets, recording the date of purchase or lease, the purchase or lease price, Asset description, Asset location, the proportion of the Grant used to create or acquire the Asset, details of disposals of the Asset, including the sale price; and
- (g) as and when requested, provide copies of the register of Assets to the Program Delegate.

9. Insurance

- 9.1 The Recipient must, for as long as any obligations remain in connection with the Grant, ensure that it has appropriate insurance, including:
- (a) workers' compensation insurance for an amount required by the relevant state or territory legislation; and
 - (b) public liability insurance (i.e. insurance that covers a Recipient's liability arising out of negligent acts or omissions that cause personal injury to other people or damage to the property of another person or organisation) for an amount of not less than ten million dollars (\$10,000,000) per claim.
- 9.2 The Recipient must, on request by the Department, provide certificates verifying the currency of the insurances specified in item 9.1.

10. Indemnity

- 10.1 The Recipient must indemnify the Commonwealth against any:
- (a) loss or liability incurred by the Commonwealth;
 - (b) loss of or damage to Commonwealth property; or
 - (c) loss or expense incurred by the Commonwealth in dealing with any claim against the Commonwealth, including legal costs and expenses on a solicitor/own client basis and the cost of time spent, resources used, or disbursements paid by the Commonwealth;
- arising from:
- (d) any act or omission by the Recipient, or any of the Recipient's employees, agents, or subcontractors in connection with these Conditions of Grant, where there was fault on the part of the person whose conduct gave rise to that liability, loss, damage, or expense;
 - (e) any breach by the Recipient or any of the Recipient's employees, agents, or subcontractors of obligations or warranties under these Conditions;
 - (f) any use or disclosure by the Recipient, or its officers, employees, agents or subcontractors of Personal Information held or controlled in connection with these Conditions; or

- (g) the use by the Commonwealth of the Reports, including any claims by third parties about the ownership or right to use Intellectual Property Rights, or moral rights (as defined in the *Copyright Act 1968*), in the Report.
- 10.2 The Recipient's liability to indemnify the Commonwealth in item 10.1 will be reduced proportionally to the extent that any fault on the part of the Commonwealth contributed to the relevant loss, damage, expense, or liability.
- 10.3 The Commonwealth's right to be indemnified is in addition to, and not exclusive of, any other right, power, or remedy provided by law, but the Commonwealth is not entitled to be compensated in excess of the amount of the relevant loss, damage, expense or liability.
- 10.4 In this item 10, "fault" means any negligent or unlawful act or omission or wilful misconduct.

11. Intellectual Property

- 11.1 The Recipient must, on written request from the Commonwealth, provide the Commonwealth with a copy of any Project Material in the format reasonably requested by the Commonwealth.
- 11.2 The Recipient must grant to the Commonwealth a permanent, irrevocable, free, world-wide, non-exclusive licence (including a right of sub-licence) to use, reproduce, adapt and exploit the Intellectual Property Rights in the Reports for any purpose.
- 11.3 To the extent that the Reports contain Existing Material or Third-Party Material the Recipient must grant the Commonwealth, or must obtain for the Commonwealth, a permanent, irrevocable, world-wide, royalty free, non-exclusive licence (including the right to sub-licence) to use, reproduce, adapt, modify and communicate that Material.
- 11.4 The Recipient must obtain for the Commonwealth written moral rights consents (other than in relation to acts of false attribution) from all authors of Reports and Third-Party Material to the use of that Material by the Commonwealth prior to that Material being provided to the Commonwealth.
- 11.5 The Recipient is encouraged to engage with end-users of research, collaborating and industry partners in the innovative use of clear, accessible and simply IP frameworks. This may include but is not limited to:
- (a) providing details on the use of IP in the project and the ownership of IP created by the project
 - (b) warranting ownership of and access to, or the beneficial use of, any IP necessary to carry out the project
 - (c) offering agreements drawn from the Higher Education Research Commercialisation IP Framework (HERC IP Framework) to partners or beneficiaries of the project.
- 11.6 The Recipient must, if requested by the Commonwealth to do so, bring into existence, sign, execute or otherwise deal with any document which may be necessary or desirable to give effect to this item.

12. Access to premises and records

- 12.1 The Recipient must provide the Commonwealth (including the Auditor-General and any Information Officer under the *Australian Information Commissioner Act 2010*), or any persons authorised in writing by the Commonwealth:
- (a) access to premises where the Project is being performed and/or where Material relevant to the Reports is kept within the time period specified in a Commonwealth notice; and
 - (b) permission to inspect any Material relevant to the Reports.

13. Records

- 13.1 The Recipient must keep and make available to the Department on the Department's request, full and accurate Records of the conduct of the Project including the receipt and use of Grant Funding (in accordance with the Australian Accounting Standards).
- 13.2 The Recipient must retain Records for 7 years after the completion of the Project and, if requested by the Commonwealth, shall promptly allow persons authorised by the Commonwealth access to such records.

14. Acknowledgment

- 14.1 The Recipient must acknowledge the contribution made by the Commonwealth to the Project in all related promotional material. In particular, the Recipient should ensure that:
- (a) the acknowledgment is prominently recorded and commensurate with that given to state or local government, corporate or other sponsors;
 - (b) any formal statement issued in relation to any aspect of the Project, including speeches, media releases, and brochures, should make reference to the Commonwealth contribution as well as the Australia's Economic Accelerator Launch Program;
 - (c) any signs and plaques erected in association with the Project must acknowledge the Commonwealth's assistance; and
 - (d) where an official opening or launch is proposed for the Project the Minister for Education is to be invited to attend or to send a representative.

15. Protection of personal information

- 15.1 The Recipient must agree to:
- (a) comply with all of the requirements of the Privacy Act (including the Australian Privacy Principles in Schedule 1 of that Act) in relation to the Project and these Conditions of Grant, as if the Recipient were an agency as defined in the Privacy Act;
 - (b) deal with Personal Information received, collected, created or held by the Recipient for the purposes of these Conditions of Grant only to fulfil the Recipient's obligations under these Conditions of Grant; and
 - (c) ensure that any contractor engaged by the Recipient to perform any of its obligations under these Conditions of Grant is contractually bound to comply with the Australian Privacy Principles in Schedule 1 of the Privacy Act.

16. General

- 16.1 The Recipient must, in carrying out its obligations under these Conditions of Grant, comply with:
- (a) all relevant statutes, regulations, by-laws and requirements of any Commonwealth, State, Territory or local authority, including the *Commonwealth Modern Slavery Act 2018*;
 - (b) the Australian Code for the Responsible Conduct of Research;
 - (c) the Guidelines to Counter Foreign Interference in the Australian University Sector;
 - (d) the National Action Plan to Combat Modern Slavery 2020-2025; and
 - (e) any Australian Government policies relevant to the Grant and notified to the Recipient by the Minister for Education at the time of the Grant.
- 16.2 The Recipient must make reasonable enquiries to ensure that no Conflicts of interest exist in relation to the conduct of the Project. If a Conflict arises during the Project, the Recipient must immediately make full disclosure of the Conflict to the Commonwealth and take any steps that the Commonwealth requires to resolve or address the Conflict.

Conditions of Grant

Schedule 2 — Project Management Plan

17. Purpose of project management plan

17.1 This document is aligned to Section 10 of the AEA Seed Guidelines

The Project Management Plan is designed to provide a simple summary of the key elements of the project and should include:

- (a) A clear implementation timetable and tangible milestones
- (b) A comprehensive budget and financial management strategy, including additional cash and in-kind contributions
- (c) A clear approach to tracking, assessing, and reporting on progress; and
- (d) A risk management plan identifying key risks and mitigation strategies.

18. Project aim

Project Aim

The captured CO₂ from industry sectors will be used to make a new low-emission concrete masonry. This technology uses recycled CO₂ and steel slag (a by-product of steel making) to make a concrete binder with 86% Portland cement replacement.

This project will progress from TR ⁴⁷⁰ to TR ⁴⁷⁰ y conducting laboratory tests on full-scale concrete masonry units produced using the developed technology for quality control assurance and compliance with standards, and by conducting cost and supply chain analysis of the developed masonry units to ensure commercial feasibility followed by materials and process optimisation.

19. Project objectives

Project Objectives

- Conducting laboratory tests on full-scale concrete masonry units produced using the developed technology and the low-emission concrete binder for quality control assurance and compliance with AS 3700 and AS/NZS 4455 standards for breaking load and water resistance, as well as CO₂ uptake measurement.
- Conducting cost and supply chain analysis of the developed masonry units to ensure commercial feasibility followed by materials and process optimisation to meet or exceed benchmark product quality and standard requirements and reduce costs and carbon footprint.

20. Project participants

20.1 Project team

Position	Name	Organisation	Role and responsibility	Time commitment (FTE)
Lead Entrepreneur	Dr Alireza Kashani	University of New South Wales	Lead Responsible for project management, design, test, and analysis	0.5 FTE

20.2 Partner Organisations

Registered Business Name	Trading Name (if relevant)	ABN / ACN	Country	Sector	Size
Australian Steel Mill Services (ASMS) Pty Ltd		40003705673	Australia	Industry	Small
Adbri Ltd		15007596018	Australia	Industry	Medium

20.3 Students

Name	University	Academic level (Honours, Masters, PhD)	Role and responsibility	Time commitment (FTE)
s 47F(1)	UNSW	PhD	Cost and supply chain analysis	0.1 FTE
TBA	UNSW	Honours	Study of carbon utilisation in concrete masonry	0.1 FTE
TBA	UNSW	Honours	Study of carbon utilisation in concrete masonry	0.1 FTE

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21. Timeline and outcomes

A milestone is a point in the project where a group of tasks or activities have been undertaken to reach this point. This can be represented in a table, timeline or on a Gantt chart (this can be completed in programs like MS Project, Visio or Excel). Tangible products generated as part of the project are deliverables. Include in this section a list of the deliverables and their contents (if appropriate) to be produced during the project. Use this table to list specific deliverables agreed upon by the Lead Entrepreneur.

Measures of success - the following table must reflect each outcome or result against which the measures of success will be reported in Progress and Final Reports.

For the purposes of the AEA Seed Program Measures of success can include:

- Improving the TRL of the project
- Increased industry engagement through collaboration, investment, product development
- Securing IP, Licensing or Patent agreements for the research
- Improved capability and understanding of the commercial opportunities relevant to your field of research
- Enhanced researcher/academic preparedness to explore research projects with identifiable commercial outcomes
- A spinout/startup or SME (small medium sized enterprises)

Milestone / Project phase description	Deliverable/outcome	Program measure of success :this milestone relates to	End Date
1 Conducting laboratory tests on full-scale concrete masonry units produced using the developed technology and the low-emission concrete binder for quality control assurance and compliance with AS 3700 and AS/NZS 4455 standards for breaking load, later resistance, and CO2 uptake measurement.	s 47G(1)(a)	s 47G(1)(a)	13/05/2024
2 Conducting cost and supply chain analysis of the developed masonry units to ensure commercial feasibility followed by materials and process optimisation to meet or exceed benchmark product quality and standard requirements and reduce costs and carbon footprint.	s 47G(1)(a)	s 47G(1)(a)	13/01/2025

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22. Project deliverables and evaluation

	Deliverable	Delivery date
en ge a.	Progress report	As outlined in clause 6.3
	Final report	As outlined in clause 6.6
	Evaluation report	As outlined in clause 2

23. Risk management plan

Type of risk	Identified risks	Mitigation
Business	s 47G(1)(a)	
Technical		

24. Certification

By submitting this Project Management Plan, you are certifying that:

- an authorised person from the Lead Organisation (This can be the Lead Entrepreneur or Research translation team) has completed the Project Management Plan.
- the information in this report is accurate, complete, and not misleading.
- you have complied with the relevant grant opportunity guidelines, as well as all funding conditions and relevant legislation applicable to the delivery of the Research Activity, as described in the Grant Guidelines and Conditions of Grant.
- you are aware that if you breach a condition imposed on the grant, the Minister may reduce the grant amount, or require repayment of grant funds already paid, in accordance with Part 2-5 of *Higher Education Support Act 2003*.

Conditions of Grant
Schedule 3 — Budget and Schedule of payments

Table 1 - Budget

Expenditure Items	Grant Funds	Lead Organisation Contributions		Partner Organisation Contributions		
	Cash	Cash	In-kind	Cash	In-kind	Total
Personnel	s 47G(1)(a)					
Plant & Equipment						
Other						
Total	\$199,865	\$0	\$57,913	\$0	s 47G(1)(a)	

Table 2 - Payments

Milestone	Due date	Instalment	GST (if applicable)
s 47G(1)(a)			nil
			nil
			nil
Sub total		\$199,865.00	
Add GST		nil	
TOTAL		\$199,865.00	