

Learning and Teaching
Academic Standards Project
BUILDING AND CONSTRUCTION
Learning and Teaching
Academic Standards Statement
September 2011



AUSTRALIAN
LEARNING
& TEACHING
COUNCIL

Promoting excellence in higher education

An initiative of the Australian Government Department of Education, Employment and Workplace Relations

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BUILDING AND CONSTRUCTION STANDARDS

Learning and Teaching Academic Standards Project

Building and Construction Academic Standards Statement

September 2011

EXECUTIVE SUMMARY

The Learning and Teaching Academic Standards (LTAS) project in building and construction has proceeded under the guidance of the Australian Learning and Teaching Council (ALTC), Australian Deans of Built Environment and Design (ADBED) and a specially constituted Building Discipline Reference Group (BDRG). The learning outcome statements developed describe the minimum or threshold learning outcomes (TLOs) that all graduates of an Australian bachelor award in building and construction are expected to have met or exceeded.

The project involved extensive consultation with industry, professional bodies, academics, students and recent graduates. The views of the building and construction community were canvassed through an extensive series of workshops, online surveys, meetings, presentations and newsletters. Following an initial and widespread round of consultation, a draft set of TLOs were developed and refined through further rounds of national consultation involving all relevant professional bodies and higher education providers. The draft TLOs were mapped for comparison against a range of professional accreditation requirements, equivalent standards internationally, the TLOs of other disciplines, and the course learning outcomes for a number of Australian bachelor programs in building and construction.

The Building and Construction Academic Standards Statement covers the key themes of: knowledge, judgement, self-development, communication, innovation and engagement. The TLOs are supported by a set of explanatory notes that offer a helpful rationale and, where possible, provide some high-level suggestions about the kind of evidence that each statement might entail. The Statement is not prescriptive. Higher education providers are encouraged and expected to deliver programs of study with broader and more extensive learning outcomes than required by the TLOs. The TLOs represent a common expectation on the part of the building and construction community of what all graduates of a bachelor program of study in building and construction in Australia should know and be able to do.

Further work is now underway to ensure the various professional accreditation requirements and emerging national regulatory frameworks

are better aligned. This work is under the auspices of a Building and Construction Discipline Network (BCDN), funded by the ALTC and led by ADBED. The BCDN will comprise a broad representation of industry, professional bodies, academics, students and recent graduates. The LTAS project in building and construction has already stimulated interest in a common professional accreditation process based on learning outcomes. The BCDN initiative will also focus on higher education providers, by improving the consistency and specificity of course learning outcomes in a number of the existing programs of study in building and construction. Further, through a series of Best Practice Guides, the BCDN will provide more in-depth explanation and examples for each TLO.

The Discipline Scholar for Building and Construction gratefully acknowledges the strong level of support provided for this LTAS project by the entire discipline community. The degree of engagement, enthusiasm and consideration is testament to how significant the development of the Building and Construction Academic Standards Statement is for the discipline. Of particular note is the contribution of the BDRG, BDWP, ADBED and the key role played by professional bodies.

Endorsements

Australian Deans of Built Environment and Design

The Australian Deans of Built Environment and Design commend the 2010–2011 national consultation process undertaken by the Discipline Scholar Building, under the guidance of the Building Discipline Reference Group, for the development of threshold learning outcomes for building and construction.

The Council endorses the Learning and Teaching Academic Standards Statement for Building and Construction as a statement of the threshold learning outcomes that are required of building and construction graduates at bachelor level from any Australian higher education provider.

Building Discipline Reference Group

The Building Discipline Reference Group commends the comprehensive national consultation process that has been undertaken over 2010 and 2011 by the Learning and Teaching Academic Standards project to develop the threshold learning outcomes for the bachelor-level awards in building and construction.

The Building Discipline Reference Group endorses the Standards Statement for Building and Construction as an appropriate academic standard requirement for all bachelor-level graduates in building and construction in Australia.

Professional accreditation bodies

The exercise of the ALTC Building Discipline Scholar in developing high-level threshold learning outcomes for the bachelor degree programs in building and construction has been useful in distilling the essence of the requirements already in existence for professional accreditation of programs.

The outcomes complement effectively the existing accreditation requirements and provide a useful focus for framing these requirements into the future. They embrace the diversity of the degree programs provided by Australian higher education institutions and offer the flexibility to interpret them within the context of their particular programs.

The following professional accreditation bodies are pleased to endorse the threshold learning outcomes for building and construction and look forward to ongoing cooperation with the organisations given the responsibility for implementing these.

Australian Institute of Building
Australian Institute of Building Surveying
Australian Institute of Quantity Surveyors
Chartered Institute of Building
Royal Institution of Chartered Surveyors

Project Leaders

Discipline Scholar: Associate Professor Sidney Newton

Project officer: Ms Rosalie Goldsmith

1. Learning and Teaching Academic Standards Project Background

The Australian Government is developing a new Higher Education Quality and Regulatory Framework which includes the establishment of the Tertiary Education Quality and Standards Agency (TEQSA).

TEQSA will be a national body for regulation and quality assurance of tertiary education against agreed standards. In developing the standards, the Australian Government is committed to the active involvement of the academic community. The Australian Government has commissioned the Australian Learning and Teaching Council (ALTC) to scope aspects of the Learning and Teaching Academic Standards (LTAS) component of the framework. The approach was designed to ensure that discipline communities would define and take responsibility for implementing academic standards within the academic traditions of collegiality, peer review, pre-eminence of disciplines and academic autonomy.

In 2010–11, both directly through a specific contract and indirectly through base funding of the Australian Learning and Teaching Council, the Australian Government funded a demonstration project to define minimum discipline-based learning outcomes as part of the development of Learning and Teaching Academic Standards.

The project took as its starting point the award-level descriptors defined in the Australian Qualifications Framework (AQF). Threshold learning outcomes (TLOs) were defined in terms of minimum discipline knowledge, discipline-specific skills and professional capabilities including attitudes and professional values that are expected of a graduate from a specified level of program in a specified discipline area. The process took account of and involved the participation of professional bodies, accreditation bodies, employers and graduates, as well as academic institutions and teachers. These representatives of the discipline communities were encouraged to take responsibility for the project and the outcomes within broad common parameters. Some disciplines extended the brief to begin consideration of the implications of implementing standards at institutional level.

1.1 Discipline areas encompassed in the demonstration project

Broad discipline areas were defined according to Australian definitions of field of education from the Australian Standard Classification of Education. They correspond to the most common broad structural arrangements of faculties or aggregates of departments within Australian universities.

Ten broad discipline groups participated in the project:

- architecture
- arts, social sciences and humanities
- building and construction
- business, management and economics
- creative and performing arts
- education
- engineering and ICT
- health, medicine and veterinary science
- law
- science.

Discipline Scholars were appointed to lead each discipline area. The key deliverable for each Discipline Scholar was the production of a document of minimum learning outcomes for a specified discipline at an agreed AQF level or levels. This booklet represents that outcome for this discipline.

2. Building and Construction in the Learning and Teaching Academic Standards Project

2.1 Scope

This statement is intended to cover undergraduate degree programs of study in building and construction that are offered by higher education providers in Australia.

This statement does not cover building and construction awards below Level 7 or above Level 8 as defined in the Australian Qualifications Framework (AQF). Those levels will each be covered by a separate standards statement.

This statement does not presume any specific nomenclature for a degree in building and construction. It is the responsibility of the individual higher education provider to relate a particular study pathway to the appropriate standards statement(s).

This statement does recognise the importance of diversity in building and construction programs of study. It makes no prescription about any particular pedagogical approach in terms of the teaching and learning activities required to develop students to the appropriate level of achievement.

Similarly, this statement does not prescribe any particular set of assessment activities to demonstrate achievement of the building and construction academic standards. It does, however, provide some direction as to what might be deemed satisfactory evidence of student achievement through the use of examples to help specify each threshold learning outcome.

This statement makes no prescription about the suitability of any set of criteria or decisions relating to student admission.

2.2 Rationale

The broad area of architecture, building and design covers an interrelated and dynamic range of established and emerging disciplines, the principal concern of which is the planning, design, construction and operation of the built environment. This area extends across and beyond all real estate and infrastructure markets.

The appointment of two part-time Discipline Scholars provided the opportunity for each to focus on a separate aspect of architecture, building and design. In June 2010, the Australian Deans of Built Environment and Design endorsed a proposal for one Discipline Scholar to focus on architecture and the other to focus on building. The Building Discipline Scholar then consulted widely with key stakeholder groups to identify more specific guidelines for the LTAS project.

The most representative level of qualification within the broader scope of the building discipline is the bachelor award. This is the qualification level most recognised by the relevant professional accreditation bodies and represents the terminal qualification for the vast majority of graduates in the discipline. It is the key level of professional entry to the industry.

There are a number of professional bodies which accredit bachelor awards in the building discipline in Australia. They have a longstanding history of monitoring and developing the quality of academic standards. To be inclusive of this complex multi-professional constituency and reflect some of the changing conventions with terminology, reference to the discipline has been broadened to building and construction. This broadening of the term has received strong stakeholder support.

The LTAS project offered the building and construction communities a timely opportunity to reconsider the conventional approach to their professional accreditation, with its strong emphasis on input factors such as curriculum, staffing and entry qualifications. In recent history, attempts to better align the professional accreditation requirements of different professional bodies have been unsuccessful. In that context, there has been particular support for the development of a common overarching statement of output factors, expressed as threshold learning outcomes, to provide a common framework for course accreditation.

The LTAS project has also proven timely because direct student engagement in the industry during the course of study has grown substantially in recent years. Study and industry work commitments may often be in conflict. Through a process of key stakeholder consultation, the LTAS project has promoted a renewed sense of common purpose for industry and academia to work more collaboratively in the education enterprise.

2.3 Consultation and development process

The consultation and development process for the building and construction project has been comprehensive, iterative and evidence-based. The consultation has included all higher education providers of building and construction degrees in Australia, all relevant professional accreditation bodies (local and international), key industry professionals (representing small, medium and large organisational settings and a broad sample of industry sectors), key academic leaders, current students and recent graduates.

The initial, revised and final draft threshold learning outcomes were developed and agreed over three distinct stages. A wealth of data from workshop and forum transcripts, workshop exercises, survey responses and expert commentaries have been recorded and analysed using a combination of qualitative and quantitative methodologies. The findings of the work have been widely disseminated through seminars, scholarly conferences and scholarly publications across Australia and internationally.

A substantial Building Discipline Reference Group (BDRG) with an independent Chair was established early in the project to represent the interests of the broad discipline community, provide feedback and advice, promote engagement, confirm draft TLOs for circulation, and endorse the final statement. To provide more direct operational support to the project, a smaller Building Discipline Working Party (BDWP) was also formed. For membership details of these groups, see Appendix 1.

The initial draft of the TLOs (circulated in February 2011) was based on an extensive review of the academic literature, relevant professional accreditation requirements and an intensive round of national workshops and consultation. These workshops were specific to the academic staff of building and construction programs, industry practitioners and employers, and current students and recent graduates. The 14 workshops involved 150 registered project participants at locations across Australia. Each workshop was specific to a particular stakeholder group.

A revised draft of the TLOs (circulated in May 2011) was based on responses to the initial draft obtained through an online survey of registered project participants (with a response rate exceeding 30 per cent); a further series of national consultation and workshops; and a mapping exercise. The mapping exercise analysed the explicit learning outcomes for each subject in three different programs of study and the competency requirements of two different professional accreditation bodies against the draft TLOs. The analysis included scope and level comparisons which were then presented graphically. This mapping exercise confirmed the overarching utility of the draft TLOs, but also highlighted significant issues with the inconsistency in expression of subject learning outcomes and the lack of specificity in expression of current professional accreditation requirements.

A final draft of the TLOs (circulated in June 2011) was based on a number of more specific workshop exercises and a more extensive online survey. Workshops were held in Sydney, Brisbane and Melbourne where the results of the mapping exercise were presented and discussed along with specific wording issues for each TLO. A supporting online survey generated 435 responses, with an overwhelming majority

of those from industry practitioners. A national forum on work-integrated learning was also convened in Sydney, as that particular TLO statement (now termed 'engagement') had proven the most controversial. An online survey specific to work-integrated learning canvassed further feedback from 200 project participants (with a response rate of 15 per cent).

The Discipline Scholar presented project outcomes at various meetings of the Australian Deans of Built Environment and Design, Australasian Universities Building Education Association, Australian Institute of Building, Royal Institution of Chartered Surveyors, Chartered Institute of Building, Associated Schools of Construction, Pacific Association of Quantity Surveyors, Association of Researchers in Construction Management, and the International Council for Building.



3. Learning and Teaching Academic Standards Statement for Building and Construction

3.1 Nature and extent of building and construction

The discipline of building and construction draws together a substantial range of otherwise distinct communities of academic and professional practice, around a rich and dynamic mix of project activities. At the core of the discipline are a number of discrete professions such as construction management, quantity surveying, building surveying, facilities management and property development, united through a shared concern with the initiation, provision, operation and sustainability of the built environment. The broad nature and extent of building and construction can involve projects that vary in scale and complexity from a minor home renovation through to national-level infrastructure developments, with all levels of domestic, commercial and industrial activities in between.

With internal professional boundaries in a state of flux and the structure of the industry shifting, no clear definition of the discipline is likely to be agreed on by all stakeholders currently. There are further complications with the articulation of boundaries between building and construction and its allied disciplines such as architecture, civil engineering, business and law.

Broadly speaking, however, building and construction work includes activities such as planning, commissioning, design, construction, alteration, repair, operation and demolition of any structure that forms a permanent or temporary part of the environment. It is a highly significant market sector of any modern economy and is competitive and innovative. Most notably perhaps, it is very much a project-based industry. Any degree program in building and construction will, therefore, require students to study the science and technologies of multiple and varied forms of construction, the management of projects and people, market economics and finance, as well as the laws of business, contract and real property. As a consequence, building and construction programs of study draw upon knowledge, concepts and paradigms from a wide range of academic sources. A building and construction graduate has the potential to pursue a host of divergent and emerging careers, both nationally and internationally.

Building and construction professions operate as part of a multi-disciplinary team, often taking a leadership role. They are required to communicate formally and informally with the complete spectrum of stakeholders, from clients to subcontractors, lay public to technical specialists, and tradespeople to regulators. The project-by-project focus demands mental agility and analytical problem-solving capabilities that deliver specified building performance outcomes. Most critically, building and construction is a vocation. Practical experience is an essential element of any building and construction professional development. Fashioning the most effective relationship between academic and practical experience (their integration and balance) is perhaps the key challenge facing the discipline at this time.

3.2 Threshold learning outcomes for building and construction

The threshold learning outcomes (TLOs) for building and construction have been developed through extensive consultation and engagement with the key discipline stakeholder groups. Holistically, the TLOs represent what a graduate is “expected to know, understand and be able to do as a result of learning” (AQF, 2010). Each TLO is defined independently, but it is recognised that there are inevitable overlaps when graduates come to demonstrate each as part of a coherent assimilation of knowledge, skills and capabilities.

For example, in order for a graduate to exercise judgement effectively (TLO 2) they must do so critically and reflectively (TLO 3) in a way that integrates appropriate knowledge (TLO 1) having considered alternative methods (TLO 5), and communicate that advice (TLO 4) within a practical setting (TLO 6).

Thus, the expectation is that, within a diversity of study programs, a demonstration of the TLOs might come individually (for example, from a series of integrated curriculum outcomes) or collectively (for example, through a single, coherent assessment).

It is essential that all graduates enter the profession able to demonstrate adequate proficiency across each and every TLO in a coherent manner. However, integrating and evaluating building and construction knowledge is likely to remain the substantive focus of study.

The TLOs are expressed as the baseline for graduation. All providers of a bachelor-level degree program that promotes its graduates into the building and construction discipline would be expected to provide explicit evidence that they meet or exceed these standards at the time of graduation. Program diversity is valued and it is presumed that each relevant program of study will develop these and other learning outcomes beyond the baseline to a different extent, perhaps to reflect and distinguish their particular graduate profile from those of other providers. In particular, the current expression of the TLOs is most specific to the construction management profession. A different modification of this expression will be required to satisfy the separate professional outcomes of quantity surveying, building surveying, facilities management etc.

The bachelor-level degree is only one step on the pathway to full professional competence and only one element of an effective building and construction practitioner. Clearly, the industry is a key stakeholder in that continuing education process. Close and effective collaboration between all stakeholders remains essential. Both the industry and the profession must continue to take a leading role in setting academic standards and bridging the gap between graduate entry to the industry and full chartered status.

The TLOs are expressed under six broad themes and each is structured to include one or more action verbs (what the graduate must be able to do), the level of achievement (how well they must be able to do it) and scope (in which context or setting). For example, the level of achievement required recognises that practitioners move from novice (rigid adherence to taught rules or plans), through advanced beginner (all aspects of work treated separately but with equal importance), competent (multiple activities, deliberate planning, formulating routines), proficient (holistic view of a situation that perceives deviations from the normal pattern), to expert (intuitive grasp of situations based on deep, tacit understanding), and uses level descriptors accordingly. As far as has been practicable, the terms used to describe each TLO have also been drawn from the AQF Level 7 and Level 8 descriptors and the TLOs have been developed more generally to align with the AQF.

The relationship of the TLOs to professional accreditation and international academic standards is critical for building and construction because each program of study might be accredited by several different professional bodies with different accreditation requirements. However, the accreditation requirements of several relevant professional bodies are currently under review. At the same time, there is a move to better align the various professional accreditation requirements around a common outcomes-based approach. Appendix 2 provides a comparison of the TLOs against a range of current academic standards frameworks.

Upon completion of a bachelor degree in building and construction, graduates will be able to:

- integrate and evaluate the fundamental principles and technical knowledge of building and construction technology, management, economics and law
- identify and resolve typical building challenges with limited guidance, employing appropriate evidence-based problem-solving and decision-making methodologies
- critically and creatively reflect on personal behaviours and capabilities in the context of entry to professional practice
- interpret and negotiate building and construction information, instructions and ideas with various project stakeholders
- research and develop methods and strategies for the procurement and delivery of contemporary construction work
- demonstrate an integrated understanding of both the theory and practice of building and construction based on experience.

4. Notes on the Threshold Learning Outcomes for Building and Construction

4.1 General comments

This section lists the TLO statements and provides an important context to each TLO statement by way of further clarification. In the various review workshops and feedback mechanisms, it became clear that, whilst there was overall agreement on the themes and wording of the statements, there was also potential for significant differences in how each statement might be interpreted in practice. There was strong encouragement to supplement each TLO with further rationale and, where possible, to provide some suggestions about the kind of evidence that each statement might entail. These examples are provided for indicative purposes only. They should not be taken to be either exhaustive or prescriptive of the actual forms of evidence possible.

A number of key challenges were identified as critical learning outcomes for any graduate currently entering the building and construction profession. However, the currency of these challenges may be limited and new challenges might emerge. Rather than list these challenges separately, as additional TLO statements in their own right, the consensus view was that they might more effectively be integrated across the curriculum and be represented in each of the TLOs identified. In this way, as new challenges emerge and others wane, this can be reflected in the curriculum without requiring a revision of the TLOs. It is still the expectation that evidence will be provided that all students have demonstrated an appropriate level of capability in each of these key challenges.

At this point in time, the three key challenges identified are:

- (i) Ethics – ethical conduct is one of the pillars of professional practice. The building and construction discipline is constituted from a broad spectrum of participants from a variety of backgrounds and cultures. The development of an effective ethical framework and improved education focus are considered critical to meeting this challenge.
- (ii) Safety – safety has become of paramount importance in building and construction work. The safety record of the industry has certainly improved significantly over recent years but can still improve further. Greater safety awareness and improved safety procedures need to be infused through every aspect of building and construction graduate learning.
- (iii) Sustainability – building and construction has a major impact on a raft of sustainability issues in a multitude of different ways. Sustainability should potentially be intrinsic to every decision and commitment made.

4.2 Notes on the TLOs

Knowledge

TLO 1: *integrate and evaluate the fundamental principles and technical knowledge of building and construction technology, management, economics and law*

Technical knowledge is fundamental to the discipline and has remained the core focus of many building and construction professional accreditation requirements to this point. However, there is general agreement that the range of knowledge often prescribed is too broad and that the balance of breadth versus depth of knowledge needs more explicit management. Whatever is included as a requirement also needs to be deliverable by education providers. Four general areas of knowledge are specified, but it is recognised that construction technology has had, and should continue to have, the greater focus over other areas.

It is important to demonstrate construction technology knowledge across a range of construction types, from house building through to infrastructure. More specifically, this needs to include a thorough knowledge of the Building Code of Australia (Volumes One and Two), quality management of workmanship, supervision of work with subcontractors, environmental impacts and energy efficiency. The integration suggests an assessment task that moves through a construction project from an early stage to completion and perhaps beyond, requiring critical elements of construction technology, management, economics and law to be evaluated.

Management should be considered in the context of building and construction and might particularly include aspects of risk, people, planning and cost management.

Economics was highlighted as needing to cover both macro- and micro-economics to include relevant aspects of finance and accounting practices. Economics is also intended to include broader consideration of cost control, including lifecycle costing, cash flow, pricing and value concepts.

Construction law might usefully include contract, agency, real property and dispute resolution.

Judgement

TLO 2: identify and resolve typical building challenges with limited guidance, employing appropriate evidence-based problem-solving and decision-making methodologies

Independent judgement is an important capability for full professional status, but may be beyond the more immediate expectations of a graduate. Checking for logic and reasoning in how students respond to typical building challenges is important. Typical building challenges may represent complex and unusual problems to a graduate, but there are preferred and practised methodologies to address such problems. The idea of limited guidance presumes expectations somewhere across advanced beginner to competent in terms of the student's practical competence.

A key focus for judgement is safety, and this might usefully be taken as the basis for an assessment task relevant to judgement. The process could also build on the more formalised aspects of ethical decision-making.

Self-development

TLO 3: critically and creatively reflect on personal behaviours and capabilities in the context of entry to professional practice

Self-development is one of the most important characteristics of being a professional. Being sensitised to observe personal behaviours and capabilities, to reflect on these effectively and to demonstrate a capacity to change behaviours as a consequence represent the important circle of reflection that needs to be evidenced. The key issue is to establish the graduate as a lifelong learner and thoughtful practitioner.

It is important to see self-reflection as something that requires observation in the first instance and subsequent change as a result. A reflective journal could represent just one component of this learning outcome. The notion of a learning plan, which is developed, reviewed and modified, might provide a more comprehensive fit. Another focus might be in the transition to work, where reflective exercises can effectively draw the work experiences back into the classroom and develop better work experiences.

Communication

TLO 4: interpret and negotiate building and construction information, instructions and ideas with various project stakeholders

Communication is one of the broader themes that comprise the TLOs. Communication would typically be seen to span and contain various forms (oral, written, electronic etc), in different contexts (meetings, databases, hearings etc), and for particular purposes (technical, regulatory, social etc).

Effective communication certainly involves more than just issuing information; it also requires good listening skills and the perceptiveness to recognise whether the intended message is actually being understood – and the ability to adjust the communication accordingly. Further, the actual capabilities for effective communication change across the continuum of potential project stakeholders, from technical experts through to the general public and non-builders.

Whilst all aspects of communication are important, specific concern has been raised about the ability of graduates to interpret and negotiate information. This has resulted in a more contained TLO. The intention is that graduates, presented with a problematic situation or issue, should be capable of identifying the critical elements and negotiating with others to achieve a particular outcome. Negotiation is intended to cover a wide range of possibilities, from formal negotiation settings to coherent and reasoned argument in written submissions.

Innovation

TLO 5: research and develop methods and strategies for the procurement and delivery of contemporary construction work

Building and construction is a progressive industry which is not renowned for its innovation. Certainly, it is essential that graduates understand current industry development. There was broad concern, however, that graduates need to understand more than just the current industry practice. An awareness of emerging methods and strategies, coupled with the capability to research and develop entirely new possibilities and redevelop or repurpose existing options, was considered an essential if innovation is to be supported and grown. Of particular note were the methods and strategies for procurement and project delivery. Whilst innovation should apply across the industry, the consensus was that research and development capabilities could most usefully be exercised in the specific application context of procurement management.

Innovation generally refers to the creation or improvement of products, technologies or ideas but generally requires some formal structure to frame the process. Relevant research projects and case studies are obvious ways in which innovation might be evidenced.

Engagement

TLO 6: demonstrate an integrated understanding of both the theory and practice of building and construction based on experience

This TLO was previously termed work experience and then work-integrated learning. The progressive softening of focus was in response to a serious concern with the viability of requiring and policing a period of relevant and consistent work experience for all students. Its inclusion was in response to a very strong consensus about the need for the theory of building and construction to be integrated with the practice. A dedicated national forum examined and discussed a number of models for how students might usefully engage with and experience the practical situation of building and construction. Those models ranged from contextualised learning exercises (including lectures from guest practitioners and case studies of practice situations) through to meaningful and integrated work experience requirements.

As a threshold requirement, students could be required to demonstrate an integrated understanding of theory and practice through the application and critique of a particular theoretical framework to a particular practice situation (theory informing practice). Alternatively, students might challenge a particular theoretical context through the lens of particular work experiences or examples taken from industry (practice informing theory). The desired model of engagement would be to include a significant period of structured, full-time work experience in a variety of settings and in different roles with a formal reporting requirement. Whilst desirable and sufficient, without a significant undertaking on the part of industry the work experience model of engagement remains an unrealistic option as a mandatory requirement for every building and construction graduate. The preferred model takes a broader view of engagement.

Appendix 1: Terms of Reference and membership of the Building Discipline Reference Group and Building Discipline Working Party

Building Discipline Reference Group – Terms of Reference

- (i) to advise and assist the Discipline Scholar on the direction and development of a set of threshold learning outcomes for the bachelor of building or equivalent degree
- (ii) to consider and provide feedback on the draft threshold learning outcomes developed through consultation processes with stakeholders (professional, academic, industry and student communities)
- (iii) to facilitate and promote the national consultation process with appropriate stakeholder groups
- (iv) to act as the key group of discipline experts representing the discipline through its peak national bodies, and
- (v) to establish a Discipline Working Party to assist the Discipline Scholar with timely advice and prompt feedback.

Building Discipline Reference Group – Membership

Independent Chair

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ADBED

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Building Discipline Working Party – Terms of Reference

- (i) to review relevant pre-reading on current national and international context relevant to learning and teaching academic standards in building, eg UK Quality Assurance Agency benchmark statements, Tuning statements, Australian Qualifications Framework, international building education standards and accreditation guidelines
- (ii) to develop further drafts of threshold learning outcomes for bachelor-level graduates in building considering academic, professional, student and industry perspectives
- (iii) to engage actively, constructively and independently in face-to-face meetings and other forums, eg teleconference, and respond promptly to email requests for engagement
- (iv) to develop an appropriate template for receiving and dealing with discipline feedback on the circulated documents from the academic, professional, student and industry perspectives, and
- (v) to respond appropriately and promptly to feedback for subsequent draft and final versions.

Building Discipline Working Party membership

Chair

Associate Professor George Zillante	University of South Australia, George.Zillante@unisa.edu.au
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Other members

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Associate Professor Sidney Newton	Building Discipline Scholar, sidney.newton@altc.edu.au
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Appendix 2: Mapping the TLOs – an international, Australian Qualification Framework and professional accreditation comparison

This table provides a comparison of the building and construction threshold learning outcomes with more generic international standards.

Building and Construction Threshold Learning Outcomes	Australian Qualifications Framework: Specification for the Bachelor Degree: Level 7 criteria	Tuning All Disciplines (Dublin Descriptors) Qualifications that signify completion of the first cycle (Bachelor) are awarded to students who:	UK Quality Assurance Agency for Higher Education subject benchmark statements for Construction, Property and Surveying¹
<p>Integrate and evaluate the fundamental principles and technical knowledge of building and construction technology, management, economics and law.</p>	<p>Broad and coherent theoretical and technical knowledge with depth in one or more disciplines or areas of practice.</p>	<p>Have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study.</p>	<p>Should have acquired knowledge and understanding across the key concepts, theories and principles used in construction, property and surveying relevant to their specialism. These may include measurement; physical and financial appraisal of buildings; legal principles; economic theory and applied economics; design, construction, performance of buildings; resource management; investment analysis; corporate real estate management; and the application of business management theories.</p>
<p>Identify and resolve typical building challenges with limited guidance, employing appropriate evidence-based problem-solving and decision-making methodologies.</p>	<p>Well-developed cognitive, technical and communication skills to select and apply methods and technologies to analyse, generate and transmit solutions to unpredictable and sometimes complex problems.</p>	<p>Can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study.</p>	<p>The ability to devise solutions to routine and unfamiliar problems, including collecting, analysing and interpreting data.</p>

1. Includes only a relevant selection of the subject knowledge, understanding and skills actually included.

Building and Construction Threshold Learning Outcomes

Australian Qualifications Framework: Specification for the Bachelor Degree: Level 7 criteria

Tuning All Disciplines (Dublin Descriptors) Qualifications that signify completion of the first cycle (Bachelor) are awarded to students who:

UK Quality Assurance Agency for Higher Education subject benchmark statements for Construction, Property and Surveying¹

Critically and creatively reflect on personal behaviours and capabilities in the context of entry to professional practice.

Apply knowledge and skills to demonstrate autonomy, well developed judgement and responsibility in contexts that require self-directed work and learning.

Have the ability to gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues.

It is anticipated that graduates from programmes will continue to develop and refine their skills throughout their professional lives using both formal and informal methods that lead to a reflective approach to their lifetime learning and development.

The capacity for the critical evaluation of arguments and evidence and the application of it to building, construction management and real estate contexts the capacity for independent and self-managed learning such that they can analyse their own personal strengths and weaknesses and formulate strategies for improvement.

Interpret and negotiate building and construction information, instructions and ideas with various project stakeholders.

Well-developed cognitive, technical and communication skills to select and apply methods and technologies to transmit knowledge, skills and ideas to others.

Can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.

As well as being able to demonstrate a range of capabilities specific to the subject, graduates should also be able to demonstrate relevant personal and interpersonal skills that have value in many different areas of employment.

The ability to work effectively with others within the context of a multidisciplinary team respecting the respective inputs from fellow professionals, client(s), and other stakeholders and reflecting on one's own performance and role within the team.

Building and Construction Threshold Learning Outcomes

Australian Qualifications Framework: Specification for the Bachelor Degree: Level 7 criteria

Tuning All Disciplines (Dublin Descriptors) Qualifications that signify completion of the first cycle (Bachelor) are awarded to students who:

UK Quality Assurance Agency for Higher Education subject benchmark statements for Construction, Property and Surveying¹

Research and develop methods and strategies for the procurement and delivery of contemporary construction work.

Well-developed cognitive, technical and communication skills to select and apply methods and technologies to analyse and evaluate information to complete a range of activities.

Have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy.

The ability to present quantitative and qualitative information, together with analysis, argument and commentary, in a form appropriate to the intended audience, including appropriate acknowledgement and referencing of sources.

The ability to question standard practice, and to apply professional judgement in making recommendations and solving problems for future best practice.

Demonstrate an integrated understanding of both the theory and practice of building and construction based on experience.

Apply knowledge and skills to demonstrate autonomy, well developed judgement and responsibility within broad parameters to provide specialist advice and functions.

Can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study.

Programmes in construction, property and surveying should encourage students to develop personal and professional skills that broaden access to employment, but at the same time provide a broad-based education.

Graduates should be able to make a positive contribution to their place of work and to the wider community using the skills that they acquire.

The table below provides a comparison of the building and construction threshold learning outcomes with representative professional accreditation requirements.

Building and Construction Threshold Learning Outcomes	Australian Institute of Building	Australian Institute of Quantity Surveyors	Royal Institution of Chartered Surveyors
Integrate and evaluate the fundamental principles and technical knowledge of building and construction technology, management, economics and law.	<p>Entry level skills:</p> <p>Apply the properties and use of materials and systems in the building process.</p> <p>Describe the building certification process.</p> <p>Apply relevant legislation, regulations, standards and codes relevant to building work.</p> <p>Apply contract principles and law for building work.</p> <p>Apply the principles of managing finances for a building project.</p> <p>Apply the principles for managing human relations and resources for a building project.</p> <p>Apply the principles of managing time for a building project.</p> <p>Apply the principles of managing the building construction process.</p> <p>Apply quality management principles to a building project.</p> <p>Apply business management principles.</p>	<p>Basic skills:</p> <p>Quantification/measurement.</p> <p>Business and management skills.</p> <p>Construction technology.</p> <p>Construction law and regulation.</p> <p>Core competencies:</p> <p>Budgetary process.</p> <p>Cost estimating.</p> <p>Cost planning.</p> <p>Quantification, measurement and documentation.</p> <p>Account management.</p> <p>Construction change management.</p>	<p>Mandatory competencies:</p> <p>Accounting principles and procedures.</p> <p>Business planning.</p> <p>Core Competencies:</p> <p>Commercial management of construction.</p> <p>Design economics and cost planning.</p> <p>Construction technology and environmental services.</p> <p>Project financial control and reporting.</p> <p>Quantification and costing of construction works.</p> <p>Optional competencies:</p> <p>Capital allowances.</p> <p>Corporate recovery and insolvency.</p> <p>Insurance.</p> <p>Project evaluation.</p> <p>Risk management.</p> <p>Conflict avoidance, management and dispute resolution procedures.</p>
Identify and resolve typical building challenges with limited guidance, employing appropriate evidence-based problem-solving and decision-making methodologies.	<p>Entry level skills:</p> <p>Describe the principles for designing a building.</p> <p>Attributes of a professional:</p> <p>Recognise and solve problems.</p>	Nil.	Nil.

Building and Construction Threshold Learning Outcomes	Australian Institute of Building	Australian Institute of Quantity Surveyors	Royal Institution of Chartered Surveyors
<p>Critically and creatively reflect on personal behaviours and capabilities in the context of entry to professional practice.</p>	<p>Attributes of a professional:</p> <p>Understand the need for continuing professional development.</p> <p>Exhibit relevant professional knowledge and skills, including complying with the requirements of the AIB Code of Ethics.</p> <p>Innovate and challenge conventional thinking.</p>	<p>Basic skills:</p> <p>Personal and interpersonal skills.</p> <p>Professional practice.</p>	<p>Mandatory competencies:</p> <p>Conduct rules, ethics and professional practice.</p> <p>Team working.</p>
<p>Interpret and negotiate building and construction information, instructions and ideas with various project stakeholders.</p>	<p>Entry level skills:</p> <p>Prepare documentation for a building project.</p> <p>Interpret building documentation.</p> <p>Discuss with appropriate specialists, design considerations associated with the installation and operation of building services.</p> <p>Describe the principles for designing a building.</p> <p>Describe the building certification process.</p> <p>Attributes of a professional:</p> <p>Communicate effectively both orally and in writing, using all forms of communication.</p> <p>Participate effectively in a team, including the role of leadership.</p> <p>Understand the building industry and its place in the community.</p> <p>Have an international awareness and appreciation of cultural diversity.</p>	<p>Basic skills:</p> <p>Communication skills.</p> <p>Personal and interpersonal skills.</p> <p>Core competencies:</p> <p>Construction change management.</p>	<p>Mandatory competencies:</p> <p>Client care.</p> <p>Communication and negotiation.</p> <p>Conflict avoidance, management and dispute resolution procedures.</p> <p>Team working.</p> <p>Optional competencies:</p> <p>Due diligence.</p> <p>Conflict avoidance, management and dispute resolution procedures.</p>

Building and Construction Threshold Learning Outcomes

Australian Institute of Building

Australian Institute of Quantity Surveyors

Royal Institution of Chartered Surveyors

Research and develop methods and strategies for the procurement and delivery of contemporary construction work.

Entry level skills:

Prepare documentation for a building project.

Describe the building certification process.

Apply relevant legislation, regulations, standards and codes relevant to building work.

Apply contract principles and law for building work.

Apply the principles of managing the building construction process.

Apply quality management principles to a building project.

Attributes of a professional:

Innovate and challenge conventional thinking.

Perform and report research in relation to the building industry.

Core competencies:

Strategic planning.

Budgetary process.

General procurement advice.

Tender process.

Mandatory competencies:

Data management.

Core competencies:

Contract practice.

Procurement and tendering.

Optional competencies:

Contract administration.

Programming and planning.

Project evaluation.

Risk management.

Demonstrate an integrated understanding of both the theory and practice of building and construction based on experience.

Entry level skills:

Apply building principles and methods.

Attributes of a professional:

Acknowledge the place of a professional in society.

Exhibit relevant professional knowledge and skills, including complying with the requirements of the AIB Code of Ethics.

Understand the building industry and its place in the community.

Basic skills:

Professional practice.

Mandatory competencies:

Conduct rules, ethics and professional practice.

Note: In addition to the above, certain representative professional accreditation requirements map to the key challenges and broader issues included in the Building and Construction Academic Standards Statement. For the Australian Institute of Building this includes:

- entry level skills: apply environmental protection principles to building work; and apply the principles of OH&S on building sites
- attributes of a professional: exhibit relevant professional knowledge and skills, including complying with the requirements of the AIB Code of Ethics.

For the Australian Institute of Quantity Surveying this includes basic skills: computer and information technology.

For the Royal Institution of Chartered Surveyors this includes mandatory competencies: conduct rules, ethics and professional practice; health and safety; and sustainability.

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Appendix 4: Abbreviations

ADBED	Australian Deans of Built Environment and Design
AIB	Australian Institute of Building
ALTC	Australian Learning and Teaching Council
AQF	Australian Qualifications Framework
ARCOM	Association of Researchers in Construction Management
ASC	Associated Schools of Construction
AUBEA	Australasian Universities Building Education Association
BCDN	Building and Construction Discipline Network
BDRG	Building Discipline Reference Group
BDWP	Building Discipline Working Party
CIB	International Council for Building
CIOB	Chartered Institute of Building
LTAS	Learning and Teaching Academic Standards
OH&S	Occupational Health and Safety
PAQS	Pacific Association of Quantity Surveyors
RICS	Royal Institution of Chartered Surveyors
TEQSA	Tertiary Education Quality and Standards Agency (Australia)
TLO	threshold learning outcome

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