



CHALMERS

UKÄ's Evaluation of Third-Cycle Programmes 2017

Self-evaluation

HEI: Chalmers University of Technology
Third-cycle programme subject: Architecture
Degree of Licentiate: yes
Doctorate: yes



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Introduction

PhD studies at Chalmers are organized in the form of graduate schools. Each graduate school has at least one Director of Graduate Studies who is responsible for course offer, seminars and study follow-up. The Vice President at Chalmers is leading the graduate studies with the help of the Doctoral Programmes Committee (FUN). FUN is composed of the Deputy Heads or Vice Heads for doctoral programmes from all the departments.

A graduate school of Architecture is organized within the Department of Architecture. Architecture is itself an area that spans a wide range of different subjects and disciplines, from engineering and social sciences to the arts and humanities. SCB research subject codes (what UKÄ calls third-cycle areas) are not the basis for Chalmers's division of research subjects.

As of May 1, 2017, the Department of Architecture will merge with the Department of Civil and Environmental Engineering and the Graduate School will thereafter be organized within the new Department of Architecture and Civil Engineering.

1 Aspect area: Environment, resources and area

1.1 Aspect: Third-cycle subject area

Assessment criteria:

The demarcation of the third-cycle subject area and its connection to scholarship or artistic practice and proven experience are adequate and appropriate. The third-cycle subject area's relationship to the area for third-cycle education is adequate (for the HEIs that have degree-awarding powers for an area in third-cycle education).

1.1.1 Architecture – description of subject

The subject of the doctoral programme is architecture. Architectural knowledge is the basis for giving form to the physical environment and its development. According to the General Study Plan (ASP)/Syllabus for the Doctoral Programme in Architecture. Architecture deals with artefacts and places, their spatial qualities and use, as well as systems, processes and methods related to buildings, interior space, the built environment, and development. This includes:

- architectural form and technique, e.g. spatial design and architectonic expression, material and construction;
- building design and urban design, and correspondences between these two fields;
- development of the built environment, including regions, cities and systems of movement and traffic as well as housing and premises and their adherent issues on planning processes, management, use, accessibility etc.;
- architectural theory and history;
- design theory and design methodology, including knowledge on and through design thinking.

Central questions within the subject of architecture deal with architectural theory and history, design theories and design methodology, relations between man, artefact and physical environment, cultural aspect of architecture, and knowledge on sustainable development integrated in the totality of architectural work.

With its background in design thinking and methods used by architects, architectural research often deals with complex problems based in specific situations. This research mainly uses integrated methods related to traditions of the humanities, social sciences, technical and natural science, and design-based and artistic production of knowledge. Architectural research methodology includes case studies, simulations, investigative architectural projects, analyses and interpretations, reflection and argumentation. Interdisciplinary often practice-based research field calls for effective cooperation.

1.1.2 Objectives for the doctoral programme

The objective of the Doctoral Programme in Architecture (see also the General Study Plan/Syllabus) aims at educating both architects and other professionals working in the field of architecture to become competent and qualified researchers. The programme trains students in the ability to independently perform and present research and conduct advanced development work within the field of architecture. It aims to give students high level of expertise in architectural research, including developing theories, methods and analyses, formulating research problems, and compiling, analysing, systematizing, critically examining and producing knowledge to support architectural professionals and actors within architecture and planning in a long-term sustainable development. Founded on design-based research, the

doctoral programme also aims to develop researchers who are able to develop innovative ideas as well as design strategies and artefacts.

The doctoral programme is executed with high demands on historical and theoretical awareness, relevance for problems of contemporary society, and with a strong perspective towards the future. The programme keeps in active contact with essential regional and international building and planning issues. It aims for an active exchange of knowledge with related research fields at Chalmers and Gothenburg University, and to further develop its collaboration with leaders in the field throughout the Nordic region and around the world.

The doctoral programme is broadened and deepened in response to contemporary challenges like climate change, resource scarcity, or the shortage of housing while promoting sustainable design solutions. It supports Chalmers's strategy for a sustainable future. The PhD projects are mostly externally funded and each application goes through a review by an external evaluation panel, usually addressing both scientific quality and social relevance.

A close exchange between the doctoral programme, research, and undergraduate studies is an important condition for the research-integrated architectural pedagogy that is the profile of Chalmers Architecture in an international context. The doctoral programme is seen here as an important link between research, undergraduate education, and society. For example, last winter's master of architecture theses were exhibited alongside the presentation posters of PhD student projects and on-going research to create opportunity to all visitors to get to know the research expertise of the school and to demonstrate the potential for new master's projects.

1.2 Aspect: Staff

Assessment criteria:

A. The number of supervisors and teachers and their combined expertise are sufficient and proportional to the content of the programme and its teaching/learning activities.

B. The combined expertise of supervisors and teachers and skill development are followed up systematically to promote high quality in the programme. The outcomes of the follow-up are translated, when necessary, into actions for quality improvement, and feedback is given to relevant stakeholders.

1.2.1 Supervisor resources

The Graduate School in Architecture has good capacity to supervise its PhD students. The following data concern the supervision resources during autumn semester 2016.

Main supervisors: There were a total of **17 researchers** filling Chalmers's requirements to be appointed as main supervisors – 12 professors (5 female, 7 male) and 5 associate professors (4 female, 1 male). There were also 2 external main supervisors appointed (2 males), one from Gothenburg University (Department of Social Science) and one from another department at Chalmers (Department of Civil Engineering). Of the 17, 12 (6 female and 6 male) were active as main supervisors for the doctoral students listed in Table 1a. All of them have a Swedish background. The maximum number of PhD students per main supervisor was 4.

Co-supervisors: There were an **additional 24** people (13 females and 11 males) that could act as co-supervisors (doctors, researchers, artistic professors, and professors of the practice). Together with the 17 researchers who were qualified to be main supervisors we had a **total of 41** people who could **co-supervise**.

The interdisciplinary character of research in architecture calls for contribution of researchers from different disciplines to effectively support the supervision of PhD students. Two of our main supervisors have engineering background and two have artistic backgrounds, and all hold a PhD in architecture. One of them is a professor both at Chalmers Architecture and at the Gothenburg University College of Arts, Crafts and Design. Additionally, there were about 13 people from other universities, companies or municipalities contracted as co-supervisors.

1.2.2 Supervisor competency

All main supervisors have associate professor (docent) qualification as it is required by [Chalmers Rules of Procedure – Doctoral Programmes](#). An associate professor's qualifications ensure that the main supervisor is established as an independent researcher with high scientific expertise in a certain subject area. To be acknowledged as an associate professor at Chalmers also requires the faculty member to complete the 'Supervision of Research' course (3 ECTS). A position as associate professor requires 15 ECTS in pedagogy in Higher Education. A main supervisor at Chalmers thus has both pedagogical and scientific merit.

All supervisors are continuously engaged in developing their scientific and pedagogical expertise. Chalmers offers a range of lectures and workshops to support main supervisors in their role (Decision C 2015-1272). Every third year they should attend at least one workshop or activity on topics such as the relationship between student and supervisor, responsiveness, a coaching approach, types of supervision versus student's profile and the actual stage of the studies, motivation and feedback. The workshops use the participants' experience as a basis for discussion. All main supervisors in our department have completed at least one development activity, and the overall impression has been positive among the participants. Despite difficulties in tracking the project benefits, the negative response in a 2005 survey on harassment of PhD students has now greatly improved: according to a 2016 survey of Chalmers employees, PhD students are now the group least exposed to harassment.

Within the group of directors of graduate studies, guidelines for good supervision have been developed. The guideline document is shared with all the newly appointed supervisors. However, according to the last interviews with PhD students in architecture the pedagogical skills of supervisors should be improved. One student says: 'It is important how you say that what I have done is wrong.' Chalmers offers a set of pedagogical courses that are now obligatory for all university teachers and advanced researchers. However, not all supervisors have completed these courses, and some completed the usually obligatory course 'Supervision of Research' a long time ago. That is why the Chalmers initiative for continuous improvement of pedagogical/supervision skills is really appreciated. The main challenge today is to convey the information and to get all supervisors to prioritize participation in these activities in their often pressured work situations.

Main supervisors are active (usually practice-oriented) researchers who engage in the research community by following the literature in their field of research, publishing and presenting their research at conferences and workshops, and through meetings with the business community and society. (Other opportunities for engagement include the relevant networks and platforms, like the Centre for Management of the Built Environment (CMB) and other centres integrated with the department or having close cooperation with them; see Chapter 1.3.3.) Thus, our main supervisors develop and maintain good contacts with different actors within research, development and practice. As a result of such activities we have at our research school one PhD student financed by CMB.

1.2.3 Supervision quality

An important part of the effort to ensure a high quality of graduate studies is the follow-up meeting, in which the PhD student, the supervisors and the examiner come to an agreement about content and organization of the studies (see Chapter 2.1.2). During the meeting the accomplished work, planned activities, and progression are discussed based on the doctoral student's updated Individual Study Plan (ISP) and a plan for the coming year is made. If the student has not made satisfactory progress, the director of PhD studies takes the initiative of more frequent follow-up meetings when a specific action plan has been elaborated. To sustain the high quality of supervision, extra co-supervisors could be proposed/appointed, for example to cover a gap in expertise within the interdisciplinary framework of the PhD project. We also had a case in which the main supervisor had been supported by the examiner acting as a co-supervisor. In another case in which our research environment was not sufficient to meet the extended needs of the PhD student, the research school helped him find a proper professor and university where he could work as a guest student for a year. The student has now successfully earned his doctoral degree. Additional supervision can be provided by a reference group that is often appointed for interdisciplinary doctoral projects. A reference group is driven by a mutual interest in the project outcome and can strengthen the supervision inputs.

According to the results of a recent survey of the doctoral students at Chalmers Architecture, elaborated by the PhD representatives, 'Mainly the PhD students are satisfied with their supervision; 72% rated their overall perception as good or very good. The study plan meetings held twice a year mainly work well, but need to be realized in the administrative framework as well [as a stronger link between supervisors, students and administrators].' Further, survey respondents who were not fully satisfied with the supervision requested more structured supervision meetings and more availability of the supervisor. These kinds of expectations should be formulated/discussed at the ISP meetings. Since 2014 we have reserved an extra fifteen minutes before each follow-up meeting devoted to the individual communication between the Director of Graduate Studies and the PhD student to prepare for the sensitive questions to be initiated by the director during the meeting. However, some PhD students are still not ready to discuss their needs.

Sometimes the question of replacing the main supervisor comes up, and there may be several reasons for this. It may be because the supervisor retires or takes a new job. A change of the main supervisor can also be caused by disagreements between the main supervisor and the student. The Human Resources Department (HR) at Chalmers has developed procedures to deal with such cases (see Doctoral Student Perspective). Any problems experienced by now have been resolved within the framework of the regular monitoring of our graduate programmes. During last five years, the main supervisors have been changed for four PhD students. In two cases, it happened because of the introduction of the new requirement that main supervisors hold associate professor qualifications. In the other two cases, supervisor-student interaction did not function well.

1.3 Aspect: Third-cycle programme environment

Assessment criteria:

A. Research and artistic research at the HEI has sufficient quality and scale for third-cycle education to be carried out at a high scientific/artistic level and within a good educational framework. Relevant collaboration occurs with the surrounding society, both nationally and internationally.

B. The third-cycle education environment is systematically followed up to ensure high quality. The result of the follow-up is translated, when necessary, into quality improvement actions and feedback is given to relevant stakeholders.

1.3.1 Curriculum and designations of the doctoral programme

The doctoral programme in architecture is run by the Graduate School in Architecture, which is represented by the Director of PhD Studies and the Vice Head of the Department.

Doctoral studies in architecture are carried out in one of five integrated research profiles:

- Form and Technology
- Space and Activity
- Conservation and Transformation
- Urban Design and Development
- Visualization

It is meant that the profiles indicate the direction of the PhD studies in case in which a PhD student does not have background of architectural education. Actually, we have one such PhD student, and she does highly appreciate the relevance of the profiles to position her work.

The course of study is divided into two parts. The first leads to a licentiate degree and the second to a doctoral degree, in accordance with the Chalmers Rules of Procedure – Doctoral Programmes. A PhD position is always set up for 48 months, but the employment contract is renewable after 12 and 36 months. For the final extension the end date is set to account for parental or sick leave, teaching tasks, and departmental administration responsibilities (see also Chapter 2.1.2). The doctoral programme is constituted by department-based courses, faculty courses, individual courses, and research work with supervision, resulting in a paper for licentiate examination and a doctoral thesis with a dissertation. The programme also requires the doctoral student to actively participate in seminars in the department and attend guest lectures etc. relevant for the subject. Doctoral students also take part in the undergraduate education or other work relevant to their personal development as teachers and researchers. In dialogue with the main supervisor and examiner, each doctoral student compiles an individual study plan (ISP). The examiner shall ensure that the doctoral programme for the research subject satisfies the quality requirements with regard to research tasks and other elements.

Our PhD students can benefit from the resources of the Master's Programmes in Architecture. Courses in the programmes are taught by research experts in the topics, and are available to PhD students. We offer two master's programmes: *Design for Sustainable Development* (MPDSD) and *Architecture and Urban Design* (MPARC). Both attract well-qualified local and international students (over 60% come from abroad), some of whom are interested in becoming doctoral students. For example, two of our previous master's students started their PhD studies in the autumn of 2016. The master's programmes provide breadth and depth not only in the courses that PhD students can take, but also in those they teach. Professional practitioners are very often contracted to teach in the bachelor's and the master's degree

programmes, and some of them are even temporarily employed at Chalmers as artistic teachers.

Our research groups foster strong links with private industry and public administration through collaboration and often through common projects. Current examples include joint projects with housing developers and property managers like HSB Living Lab and Riksbyggen, developers involved in the renewal of the Norra Älvstranden riverfront in Gothenburg, the Norwegian Public Road Administration, and RISE (the Swedish Research Institute). We also foster collaboration through our three research centres: Mistra Urban Futures, the Centre for Healthcare Architecture (CVA), and the Centre for Housing (CBA). These connections bring new perspectives to PhD students' projects, as well as opportunities for students to work with industrial and public policy issues.

PhD students in architecture join a research environment staffed by leading researchers in applying for funding for our various projects. Our work is funded with external research grants from the European Union, the Swedish Energy Agency, the Swedish Research Councils (Vetenskapsrådet and Formas), the Swedish Civil Contingencies Agency, and Sweden's Innovation Agency (Vinnova). But our primary source of funding are the frame grants 'In the Making', 'In Effect', and 'AIDAH' from Formas (see Chapter 1.3.3). The projects are usually developed together with partners from other universities (e.g. Lund University, the Royal Institute of Technology, the Umeå School of Architecture, the Swedish University of Agricultural Science, Gothenburg University), local and regional governmental administrations (e.g. the City of Gothenburg or the Swedish Association of Local Authorities and Regions).

The activities in our doctoral programme tend to be oriented towards a Swedish context. It can be useful for the Swedish work market and attractive for international PhD students. Hence, it is extra important to build up international networks. Students do this through participation in conferences and international doctoral schools and courses (see Chapter 1.3.2). Conferences help to initiate, deepen, and extend a researcher's academic network. Sometimes PhD students are encouraged to participate in conferences at the beginning of their graduate studies, even before they have work of their own to present, and this helps them to understand various research trends.

Requirements/Recruitment of doctoral students - to be accepted into the doctoral programme at the Department of Architecture, the applicant must have a professional degree in architecture in accordance with EU Directive (85/384/EEG). Applicants with other master's degrees must demonstrate qualifications and degrees with a close connection to the research subject for the doctoral studies. The recruitment process for PhD students is supported by the department's human resources staff and the Vice Head of the Department for research education. Each announcement of a PhD position is open to international students and receives around a hundred applicants. During the autumn of 2016, we had a total of 26 active doctoral students (62% female and 38% male). The majority of our graduate students (16 of 26) have been employed in graduate student positions. The remaining students have been funded by private industry (6 are employed by the funding company) or are employed by other universities (4). 6 of the 16 recruited PhD students (38%) have international backgrounds.

1.3.2 Courses

For the licentiate degree in architecture a minimum of 45 credits of coursework is required, and for the doctoral degree a minimum of 60 credits. Developing the professional skills to collaborate across disciplines and social communities has become increasingly important.

Personal skills in communications, interpersonal relations, networking, leadership, and entrepreneurship become highly valuable elements for successful career development. To meet the new demands in the field of personal and professional development, Chalmers has designed a program of activities and courses for PhD students and young scientists in **Generic and Transferable Skills** development (GTS). The graduate student (registered on September 2012 and later) is required to take at least 15 credits of the **GTS program** before receiving a PhD degree. Nine credits are expected to be obtained before the licentiate degree examination and another six credits before the PhD degree examination. Mandatory courses for the licentiate degree are: Teaching, Learning & Evaluation; Research Ethics & Sustainable Development; and Career planning: Your Personal Leadership. 1.5 of the required credits are electives to be chosen from among the GTS activities and courses. The 6 credits after the licentiate degree are also electives selected according to the student's need. The elective activities within GTS can be obtained from other providers, after advice from the examiner or supervisor and approval by the Vice Head of the Department in consultation with the Director of Research Studies. Further requirements are an oral popular science presentation to be performed prior to the PhD thesis defence and a written popular science presentation to be published on the back of the thesis.

A graduate school of architecture is organized within the Department of Architecture. Architecture-specific knowledge is often built through practical and creative work, where the aggregation of many perspectives is examined and evaluated. This means that architects often work together in collaboration with other disciplines and with professional practitioners in their research and teaching. Hence, it is important for architecture PhD students to have opportunities to train in different research schools in order to acquire skills and expertise in various areas, and training in disciplinary, multidisciplinary, interdisciplinary and transdisciplinary collaboration.

According to Chalmers's rules, all doctoral students shall be enrolled in a Chalmers graduate school. In addition, they can also join other graduate schools both in Sweden and abroad. In this context, Chalmers Architecture has been actively participating in the development of the Swedish Research School in Architecture (ResArc), IDEA League (a network of leading European universities focused on science and technology), and Mistra Urban Futures doctoral school. Some relevant courses will also be offered as part of the Building Futures platform, a Chalmers 'area of advance' or challenge-driven thematic profile. During 2016, approximately ten PhD students enrolled in the Graduate School of Architecture have joined ResArc and another two have joined the IDEA League.

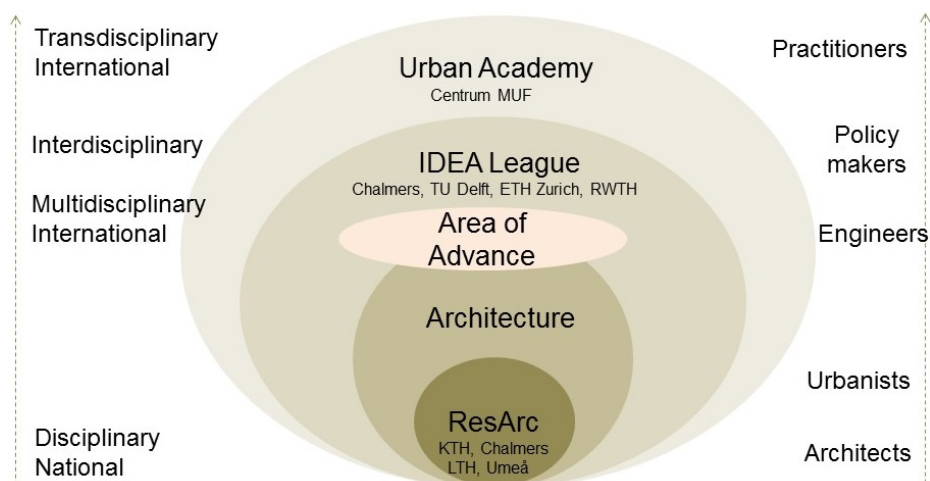


Figure 1. Overview of the research schools relevant to architectural research

ResArc started in 2012 and is funded by Formas through the end of 2017. The schools have agreed to continue the collaboration after the funding ends. ResArc is one of three programs initiated by 'Arkitekturakademin', a cooperative platform established to promote research and education set up by Sweden's four schools of architecture – Chalmers, the Royal Institute of Technology (KTH), the Faculty of Engineering at Lund University (LTH), and Umeå University. ResArc is administrated and located at LTH. The director of PhD studies at Chalmers Architecture is a member of the ResArc Program Committee and the Vice Head of the Department is a member of the ResArc Steering Committee. ResArc has enrolled 52 PhD students (23 female and 17 male) of which 15 (7 female and 8 male) are enrolled in our graduate school. The (recurrent) courses in ResArc have followed a sequence of themes that form the core of the architectural doctoral education: Tendencies (in contemporary architectural research); Approaches (to research design and methods); Philosophies (of current architecture theories); and Communication (of research in academic, professional, and popular contexts). Each of the four collaborating schools has been responsible for one of the basic courses. Chalmers Architecture has developed the Approaches course. The course were given high marks by the students who evaluated them: 5.8 (out of 7) for gaining new knowledge and skills in the subject of architectural research and 6.0 for the organization and contact with course administration and teachers. The successful collaboration among individuals working in groups across the time/space borders validated the integration/collaboration objective set for the course. As a result of ResArc's collaboration with other universities, other subject-specific courses and workshops have also been offered. For example, Chalmers Architecture has given the course Theories in Spatial Morphology as a result of the activity of the research group built around a newly recruited professor.

Other important goals of these courses, besides gaining new knowledge and skills, include giving students opportunities to expose their subject to other researchers, get feedback, and train in collaboration, and creating a network of PhD students within the broad field of architecture and urbanism. Apart from being led by the most qualified scholars in the field of architectural theory and research at each school, this initial course package has also included international professors and teachers from MIT, Carnegie Mellon University, University of Hertfordshire, KU Leuven, Aarhus University, University of Pennsylvania, University of Montreal, Sint-Lucas Brussel, University of Manchester, Leeds Metropolitan University, TU Wien, University of Sheffield, and Bartlett School of Architecture. ResArc has also helped to ensure that the students, from the very beginning of their studies, develop a large national (and to some extent even international) network including both senior researchers and fellow PhD students from the four Swedish schools of architecture.

IDEA League is a focused network of leading European universities in science and technology. It includes TU Delft, ETH Zurich, RWTH Aachen, and from January 2014 also Chalmers. The University Politecnico di Milano joined the group in 2016. IDEA League included a sequence of concentrated activities in which graduate students from the member universities participated under the leadership of researchers. Thanks to Chalmers's decision to join the network it was possible for Architecture to contribute to the development of a Graduate School on Urban Systems and Sustainability. It was designed to be an integral part of the PhD work of the participating students. During the first module, the students have developed a research question on which they would elaborate throughout the program, both individually and in interdisciplinary groups. The students participating in the program appreciated opportunities to do field studies in Singapore and China and to build up a cross-disciplinary network with students from other countries.

Chalmers Architecture has also contributed to the process of building a virtual doctoral school on the platform of Mistra Urban Futures in which even transdisciplinary collaboration

(interdisciplinary collaboration with continuous feedback from practitioners) is foreseen. This form of knowledge coproduction is especially important for architectural researchers, who are often practice-oriented.

1.3.3 Academic and industrial research networks

Between 2001 and 2011 the Research School of Architecture was embedded in a flat organization in which informal groups formed the research environment. PhD students were associated with one of five research profiles. In 2014 the Department of Architecture formed three divisions – Building Design, Urban Design and Planning, and Architectural Theory and Methods – as a basis for the research groups. The reorganization was designed based on interviews with all active researchers and eventually it was implemented accounting for the existing informal network revealed in those interviews. Thus, the local research environment probably has not changed much while we tightened our collaboration with the other centres (see Figure 2). These centres are national arenas for creation, translation, exchange and dissemination of knowledge within academia and professional practice. The various private and public organisations that join a centre support its activities financially. PhD students are often members of a research group or in other ways associated to the centres' activities. Four PhD students have been co-funded by the Mistra Urban Futures, and one PhD student has been co-funded by the Centre for Healthcare Architecture.

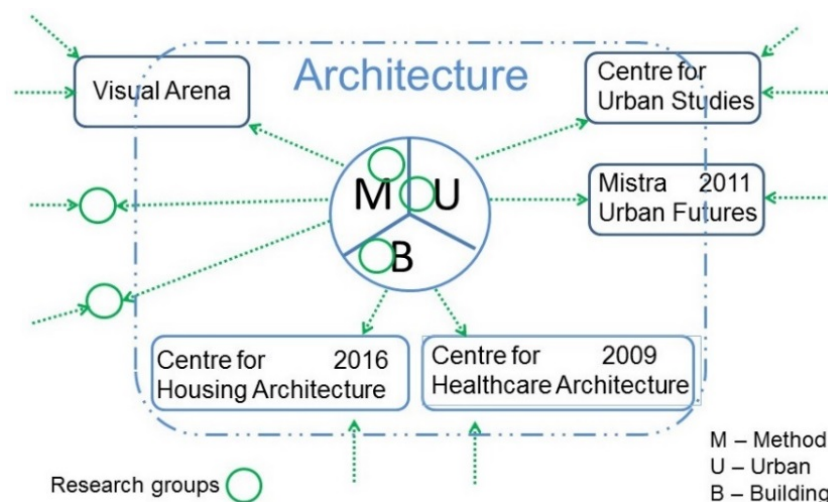


Figure 2. PhD students' collaboration within the organization

The initiative of 'Arkitekturakademin' has also included cooperation within the strong research environments 'Architecture in Effect' and 'Architecture in the Making', aiming to create coordinated research environments that approach architectural research from different but strategically complementary points of view. 'Architecture in the Making' emphasises architectural thinking and contemporary challenges for the practice, while 'Architecture in Effect' accentuates a critical understanding of the built environment and its societal effects. Both environments share a strategic identification of four areas of study recognized in contemporary challenges: material practices and conditions, the role of history, the generative processes of design and critical imagination, and professional and educational cultures. The general set-up of the three complementary programs has proven to be very successful, and led to a dynamic and constructive development within the schools involved, resulting in an interesting network of international and national collaborations. Together the programs contribute to strengthening the Swedish architectural research arena, in which the research environments function as drivers for theoretical and methodological development, while the research school forms a collaborative platform for research studies. The programme founded

by Formas and co-funded by the respective universities started in 2012 and will continue through the end of 2017.

The Architecture Department's initiatives to participate in networks of internationally recognised universities has played an important role in building the PhD networks. An example is the initiative to form the network BauHow5, the Alliance of Leading Research-Intensive European Universities in Architecture and the Built Environment, comprising TU Delft, the Bartlett UCL, Chalmers, TU Munich, and ETH Zurich. One of the first activities implemented was a conference entitled 'Positions on Circularity in the Built Environment' organised by TU Munich. It included a PhD session as well as a senior researcher day to support the exchange of ideas and to spark new collaborations.

According to Chalmers's Erasmus agreement, the Department of Architecture has an opportunity to host visiting PhD students from Istanbul University. We also have three PhD students enrolled from KU Leuven, and in the last year we've had three PhD students from ARDHI University in Dar es Salaam, Tanzania and one from the United States. Visiting PhD students enrich our research environment, mobilizing students and senior researchers to participate in the seminars and give feedback to our guests.

Academic networks help PhD students get in touch with many different academic settings, enriching their own research with methods and case studies or revealing opportunities for future collaboration. Professional networks help students to find relevant and realistic settings for testing methods or transferring ideas from theory into practice; such professional networks also help PhD students identify potential future employers.

1.3.4 Quality of the research environment

The third-cycle education environment is systematically followed up to ensure high quality. Chalmers conducts internal audits and evaluations of its graduate schools on a four-year cycle. The latest evaluations took place in 2012 (with the 2016 one replaced by this review). Each graduate school made a self-assessment of its own organization/operation. The graduate schools also reviewed each other. The last evaluation included the following issues: doctoral students' study conditions, equality and diversity, supervision and follow-up study, collaboration, and internationalization. Strengths and weaknesses of the graduate and postgraduate studies were identified, and action plans were developed. Among others the progress seminars (10%, 25%, 75%) (see Chapter 2.1.2) became organized more thoroughly to provide the opportunity for all students to sum up and present their projects as well as to get more feedback from senior researchers. We have observed that this has resulted in increased engagement in the research topics among both graduate students and other researchers. Moreover, the seminars have contributed to build up an extended network around PhD projects.

Furthermore, the interdisciplinary and transdisciplinary challenges of architectural research have called for opportunities for training the collaboration and coproduction skills where the field borders on the humanities, social sciences, the technical and natural sciences, and design-based and artistic production of knowledge. It became an incentive to initiate and contribute to the development of various doctoral schools (see Chapter 1.3.2). It also became an important platform for internationalization of the PhD studies.

Chalmers University of Technology conducts an annual employee survey. It is a tool to view, measure, develop and follow up actions in the work environment. The survey covers five focus areas: physical work environment, psychosocial work environment, leadership, organisation, and goals and strategies. Doctoral students are asked how they feel about the tutoring they receive, and if they have the resources they need to manage their studies

successfully. The questionnaire also includes issues of gender equality (see Chapter 5). According to the results of the 2016 inquiry, over 40% of the PhD students employed by Chalmers do not collaborate well in groups with other researchers. Chalmers Architecture has recently gone through some reorganization. Thus, the process of building effective research groups within the department's new divisions and the recruitment of new research leaders are still underway. At the ISP meetings we support PhD students in building the networks needed.

The follow-up meetings between the Director of Graduate Studies and the student, the examiner, and the supervisor group are an important element in efforts to ensure the quality of the research environment. Regular seminar activities within the research group and the progress seminars are parts of the quality process (see the following chapter).

2 Aspect area: Design, teaching/learning and outcomes

2.1 Aspect: Achievement of qualitative targets for 'knowledge and understanding'

Assessment criteria:

A. The programme ensures, through its design, teaching/learning activities and examination, that doctoral students who have been awarded their degrees show broad knowledge and understanding both within their third-cycle subject area and for scientific methodology/fine arts research methods in the third-cycle subject area.

B. The programme's design and teaching/learning activities are systematically followed up to ensure achievement of qualitative targets. The results of the follow-up are translated, when necessary, in actions for quality improvement, and feedback is given to relevant stakeholders.

2.1.1 Constructive alignment framework

The teaching/learning/assessment activities embedded in the constructive alignment framework are presented in Figure 3. They are elaborated to support the achievement of the Intended Learning Outcomes (ILOs) specified in Chalmers University of Technology's requirements for licentiate and PhD degrees and those formulated in the General Syllabus of the Doctoral Programme in Architecture (ASP). Achieving a broad knowledge and understanding is one of the important learning outcomes for licentiate and PhD degrees.

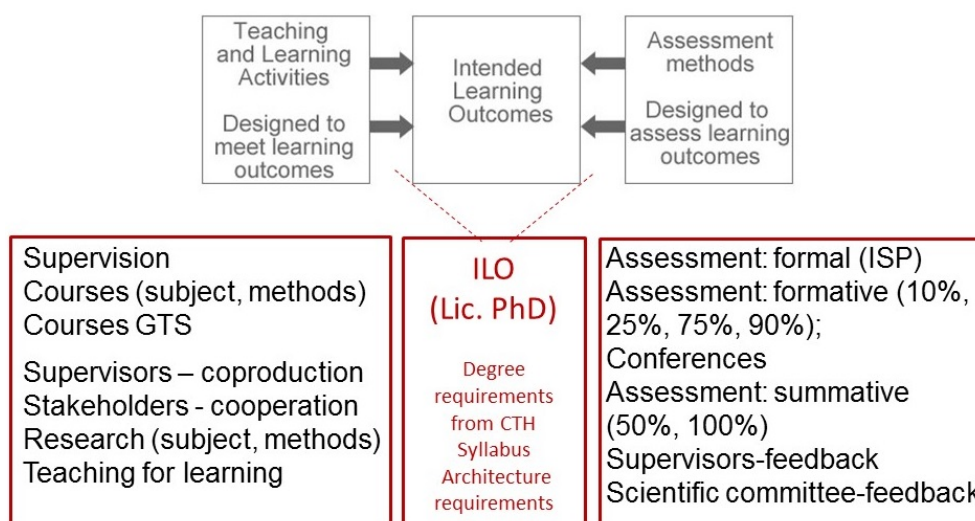


Figure 3. Constructive alignment framework applied to PhD studies in architecture

A student's progress in attaining knowledge, understanding, and mastery of scientific methodology is systematically supported by the continuous supervision, and often results in coproduction with the members of the research group (see the common papers written with supervisors). Depending on the project, there may be collaboration among various stakeholders. In addition to studying, PhD students are expected to attend both GTS and other subject-specific courses as explained in Chapter 1.3.2. They are offered in different settings, both at Chalmers and at other universities. Those organised with the contribution of Chalmers Architecture usually respond to actual needs of our PhD students (see Figure 1). However, according to our PhD students there is still limited access to relevant methodological courses in the social sciences. The seminars with guest researchers organised a year and a half ago became an incentive to look for further courses within the field. For example, we plan to collaborate with the researchers from GU to provide the courses on interview techniques and analysis.

2.1.2 Systematic follow-up

The progress of the graduate studies in relation to all Intended Learning Outcomes is assessed regularly throughout the entire study period. A four-year full-time course of graduate study is visualized in Figure 4. When departmental work (teaching, administration etc.) is included, the time for PhD study is prolonged up to one year, giving the maximum length of five years for an employment contract (excluding parental or sick leave). It is recommended that employed PhD students teach 20% of their working time and industrial PhD students 10%, in order to train their pedagogical skills and develop their own subject (teaching for learning).

A student's progress in learning, understanding, and mastery of scientific methodology is systematically monitored by the ISP (Individual Study Plan) meetings of the follow-up group (PhD student, examiner, supervisors) organised by the Director of Graduate Studies. The outcomes of the meetings guide the student and the supervisors.

ISP meeting is the formal follow-up assessment (see Figure 4) of the progression of a student in terms of research, coursework, time used, and departmental work. Generally, the Director of PhD Studies calls for a study plan meeting at least once a year, but preferably twice a year, usually in relation to the student's important progress milestones. Each time the plans for the coming year are discussed and approved by the examiner. A decision about whether to continue after 1 or 3 years of employment is made after the **ISP** meetings, as indicated in red in Figure 4.

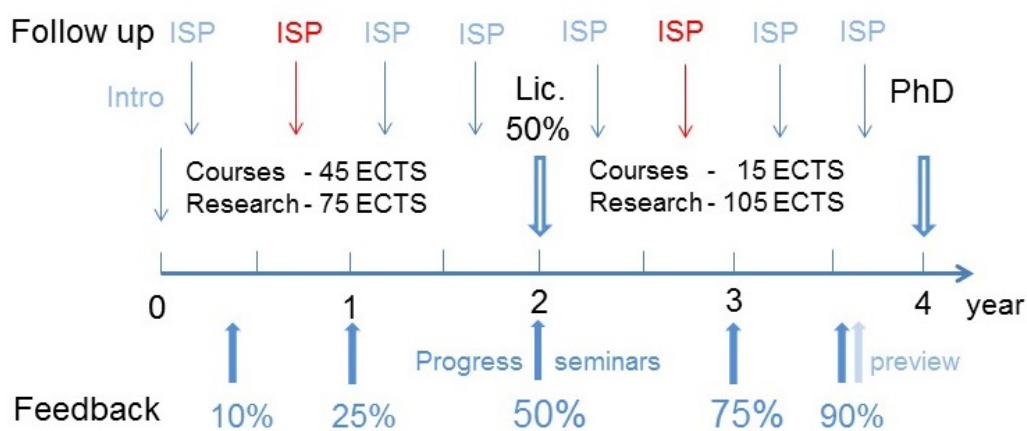


Figure 4. The research study progression process in the Graduate School in Architecture

Progress seminars (10%, 25%, 50%, 75%, 90%) have been organised since 2009 to follow up the scientific progression of the research work to get feedback (see Figure 4) and discuss the on-going research. They have a function of a 'formative assessment' and have become an important meeting platform for the research groups and invited consultants. For the majority of PhD students the 50% seminar is a licentiate seminar with a printed licentiate thesis. We strongly recommend that all our doctoral students print a thesis and hold a licentiate seminar.

Lic., PhD (50%, 90%, preview by the members of Scientific Committee, and Disputation) – can be in the form of either 'summative or formative assessment'. External experts (researchers) are assigned as discussion leader for the licentiate seminar (50%), opponent for the final seminar (90%), and opponent for the dissertation's public defence. The obligatory preview by the members of the Scientific Committee three months before the defence has been introduced by Chalmers recently. In the Graduate School of Architecture this procedure was practiced earlier as an additional quality assurance tool. It was introduced as a response to late detection of quality problem in two PhD theses.

The systematic follow-up of doctoral students in architecture has become a very important tool to facilitate study progress in the multi-, inter-, and transdisciplinary projects in which the standard organizational and supervisory solutions cannot always be applied. According to the results of the Chalmers Survey, the PhD students in architecture appreciate the study plan meetings along the course of graduate studies. A follow-up meeting is seen as a good platform to support planning. Moreover, the survey shows that 91% of them follow through with the plan as agreed upon during the ISP meeting, while 9% follow it partially. 95% of PhD students have their ISP accepted; the rest must work on it further together with their supervisors.

In general, it is not easy to organize the meetings/seminars with PhD students who work at other universities. Furthermore, three PhD students follow a double degree program. Practically it leads to compromises regarding the requirements from our university concerning ISP meetings and/or progress seminars. In such case much more responsibility for checking the progression of the research work lies on the main supervisor.

Following up on the students' progress, and accounting for their departmental responsibilities and sick or parental leave, is a rather time-consuming process. Chalmers has started a project to develop the process of quick and reliable production of a digital ISP based on the student's reporting and data from Chalmers that would facilitate the follow-up process.

2.2 Aspect: Achievement of qualitative targets for 'competence and skills'

Assessment criteria:

A. Through its design, teaching/learning activities and examination, the programme ensures that doctoral students whose degrees have been awarded can plan and use appropriate methods to conduct research and other qualified (artistic) tasks within predetermined time frames, and in both the national and the international context in speech and in writing, can authoritatively present and discuss research and research findings in dialogue with the academic community and society in general. Doctoral students shall also show they can contribute to the development of society and support the learning of others both in research and education and other qualified professional contexts.

B. Programmes are followed up systematically to ensure that their design and teaching/learning activities are of high quality and that the doctoral students achieve established qualitative targets. The results of the follow-up are translated, when necessary, into actions for quality improvement, and feedback is given to relevant stakeholders.

2.2.1 Planning and conducting research within predetermined time frames.

The student's ability to plan and carry out research using appropriate methods is developed in close collaboration with the supervisors, supported by the follow-up committee and by the activities of the student's research group. Regular supervision meetings provide training in choosing and evaluating research methods and in research planning, with emphasis on preparing publications. Taking part in a research project also develops skills in evaluating research methods and results, often in a group that contains more researchers than just the supervisors. Research group seminars provide additional training. It is important to learn to question the choices made in one's own research and those made by others. Unfortunately, not all of the research groups covered in this review have active research meetings. We have also realised that there is rather low activity among our professors and senior researchers in terms of presenting their own research at the seminars. Such seminars could complement the meetings of the research groups.

Conferences are a good opportunity for students to have their papers reviewed and get feedback on their work and presentations. Writing and presenting conference papers plays an important role in the architectural research community. PhD students are encouraged to write an article-based thesis instead of the monograph that was previously more common in the field of architecture. Conferences have strict submission deadlines, and writing conference papers teaches the ability to plan research and writing in order to meet these deadlines.

We need to further investigate the fact that the conditions for time-effective research work are not the same for every doctoral projects. Graduate students are recruited to the research school based on the following types of projects, which are characterized by differing levels of preliminary description of the research task:

- External research project with detailed description of the doctoral student's part
- External strategic (strong research environment) project with a general description of the research topic
- Internal (Chalmers funded) research project focused on the development of the subject linked to an individual researcher (usually a professor)
- Based on the request of the individual person or another university (secured funding and workplace outside of Chalmers).

A weak description of the PhD project creates a supervision challenge and can contribute to prolonging the studies. To partially address the situation when recruiting a doctoral student, specific requirements concerning the person's experience should be stated. However, experience has shown that often for various reasons either this is not done or it is not sufficient. We consider to coordinate the needs for enhanced supervision through the extra engagement of the supervisor in the doctoral project, with the introduction at Chalmers of the new system of distribution of faculty funding. In addition, a more flexible allocation of the obligatory number of credits at the time before and after licentiate could facilitate achieving the licentiate level in a timely manner.

Many PhD projects are closely connected to architectural practice and partially sponsored by private companies. Implementation and communication of the results in form of presentations and reports are both expected and appreciated. However, we should carefully follow up to distinguish what has been done within the PhD project and what has been done at the company's request, and may not be part of the research study process. In the latter case, it should not be treated as department work. In some cases, this problem has led to a time delay in the PhD studies and created a financial problem for the project.

2.2.2 Ability to present research and the research results

A major goal for every doctoral student is to develop skill and fluency in scientific writing. To develop those skills the supervisors teach the students about the process of writing papers, by working closely together on the paper and also by encouraging them to read and analyse high quality papers. As students gain experience in planning and writing papers, they are gradually given greater responsibility in the process. In addition, we encourage the students to participate in the Generic and Transferrable Skills courses in academic writing. The GTS program provides a sequence of three courses on different aspects of scientific writing.

Conferences provide a quick and direct way for students to communicate research results. Having first trained through presentations to their own research group or in progress seminars, students gradually train their skills in presenting with fluency and authority first for the local and then for an international, academic audience. At our department we have a policy that every PhD student should make at least one research visit or attend one conference before the licentiate, funded by the department if other suitable funding is lacking. PhD students are also supported by ResArc funding in order to participate in the doctoral courses they arrange.

The teaching doctoral students do develops their ability to explain and present architectural concepts and skills with authority. When teaching, doctoral students are exposed to undergraduate and masters students with varying levels of competence and interest in the subject being taught. In addition, each doctoral student is required to take a dedicated course in teaching. This course is 'Teaching, Learning and Evaluation' (3 ECTS) for PhD students at Chalmers. The course develops teaching skills and an understanding of the principles and practice of effective teaching in higher education.

Popular science presentations are an important way to build links to the surrounding world, and to train students to become effective communicators, even outside of academia. For PhD students at Chalmers, it is mandatory to do one popular science presentation. Students must present their research work to an audience that lacks deep knowledge of the area, for example at the Gothenburg Science Festival. Presenting one's research to the general public requires one to reflect on and discuss the overall potential and limitations of the research field and contribution from a societal perspective. Afterwards, the student has to hand in written reflections on the presentation. The main assessment criterion is the capability of presenting one's own research – its context, purpose and findings – to a lay audience in an accessible way. Workshops are available for students to help with preparation of the presentation and to follow up the result.

2.2.3 Contribution to the development of society

The majority of our doctoral students are initially employed on externally funded projects as described in Chapters 1.3.1 and 1.3.3. Financing comes from Formas, the Swedish Research Council (Vetenskapsrådet), the Swedish Energy Agency, EU programmes, the Swedish International Development Cooperation Agency (SIDA), often with contribution from building companies and municipalities. If project funding ends before the PhD student has completed the programme, faculty money is used to fund the student, but typically the research will continue to be related to the initial project. Being part of a project provides a context for the research, and often also contacts with researchers and practitioners in academia and industry, both locally and to certain extent internationally. The project typically aims to contribute to the solution of societal problems (climate change mitigation and adaptation, shortage of housing, aging society, segregation, etc.) and this link to the surrounding world is important in making the research meaningful for doctoral students, who through their projects and their communication contribute to the development of society.

Chalmers Initiative Seminars are one example of successful outreach activities in which topics of interest for the network of academic and private-sector partners are presented and discussed by distinguished invited speakers.

The framework of a PhD programme includes teaching undergraduate and graduate students, as described in previous chapters. Some of the students also supervise master's theses. In this way, important societal problems are addressed in higher education and followed further by alumni in their professional lives after graduation.

2.2.4 Systematic follow-up

The framework of constructive alignment given in Figure 3 shows which elements are important while checking the progress of the PhD studies. They are aligned with the PhD/Licentiate intended learning outcomes, in which the competences and skills listed above are important issues. In addition to what is written in the previous subchapters, the need for systematic follow-up is fulfilled through the ISP meetings and the progress seminars.

Longer-term planning of the research is tracked in the ISP and the follow-up meetings. The ISP documents include a list of published papers and the research and publication plan for the coming year. Each meeting considers the extent to which the plan has been followed, suggests solutions to problems that may have arisen, and documents a new plan for the coming year. The examiner in particular provides important feedback. When problems arise, follow-up meetings are held more frequently. Working with publications keeps the research planning concrete and sets clear goals for the student. Preparing the thesis also imposes strict deadlines and demands careful planning. The feedback from the external reviewers at the 50% (licentiate), and 90% (final) seminars guide the student to a successful and time-efficient research process.

It is also important to recognise other problems that could increase the risk of prolonged studies. In our graduate school we have two PhD students with reading/writing disabilities. When we were informed about the disabilities the students were encouraged to contact services for students with learning disabilities. They have support and some tools to overcome their problems.

2.3 Aspect: Achievement of qualitative targets for 'judgement and approach'

Assessment criteria:

A. Through its design, teaching/learning activities, and examination, the programme ensures that doctoral students who have been awarded degrees show intellectual independence, [artistic integrity], and scientific probity/disciplinary rectitude and the ability to make research ethics assessments. The doctoral student shall also have a broader understanding of the science or fine art's capabilities and limitations, its role in society, and people's responsibility for how it is used.

B. Programmes are followed up systematically to ensure that their design and teaching/learning activities are of high quality and that the doctoral students achieve the qualitative targets. The results of the follow-up are translated, when necessary, into actions for quality improvement, and feedback is given to relevant stakeholders.

2.3.1 Intellectual independence

The development of an individual learning process is the most essential goal of the doctoral student's daily research work. It includes knowledge acquisition, problem formulation, design of experiments and case studies, analysis, discussion and scientific communication. The doctoral student is supported by the supervisor and the surrounding research environment and encouraged in her/his development to become a creative, critical, reflective and independent

researcher. The students participate in seminars, project meetings, and not least the international conferences to present their findings and exchange their own ideas with other researchers.

Intellectual independence is one of the national objectives for the degree. To achieve the goal requires critical thinking in terms of both the student's own and others' work. Doctoral students' ability to evaluate and critically review their own and others' results is trained gradually through participating in seminars and group meetings at the departmental and institutional level, and through progress seminars, in which doctoral students must present their own findings and conclusions or give feedback to presentations made by colleagues. Intellectual independence is also trained by reading relevant literature and analysing one's own work in relation to the findings of other researchers. Exchange with the larger academic community, for example during conferences, is another important part of a student's independence process, fostering the ability to analyse and discuss their own and others' results and conclusions.

The majority of our students take a licentiate degree before the doctorate. Following the licentiate, the student is expected to be more independent and to take a greater lead in proposing research directions, choosing conference venues for publications and building a research network. Writing a licentiate thesis gives the doctoral student an opportunity to critically review and summarize his/her research results. The licentiate is followed by a unique opportunity for a PhD student to revise what they've achieved so far and to develop their own idea and the overall research question for the PhD project. The first ISP meeting after the licentiate seminar is partially devoted to discussing the student's idea about the research issue to be examined at the PhD level.

2.3.2 Research ethics

Research ethics in terms of academic integrity is about the researcher's own behaviour in the context of research, the intellectual honesty, trustworthiness, openness, and societal responsibility. Academic integrity is trained in the daily work of the interaction between tutor and student, in the analysis of results and the writing process, as well as through the peer-review process for scholarly papers.

Societal responsibility is about the analysis of consequences. It is about judging the overall positive and negative impact of one's contributions. In the Chalmers Common GTS courses, research ethics is highlighted and trained with a specific target in ethical, societal, and sustainability issues. In architectural research, ethical dilemmas are often discussed while analysing the societal consequences of the design. Three dimensions of sustainability – social, ecological and economic – are often referred to when formulating the design criteria. Thus, PhD students who work with the regenerative architecture or a circularity approach to design also become experts in ethics. Some stop attending the relevant GTS course because they realize they are trained enough already in the subject. Two PhD students were granted permission not to attend the GTS course. However, because their engagement in the course could be valuable for the other participating students, such a waiver should very seldom be granted.

The Graduate School in Architecture contributes to organising PhD activities concerning sustainable design issues like development of the IDEA League school within "Urban Systems and Sustainability". Additionally, a doctoral course "From conservation to regeneration – a history of sustainability" at the platform of ResArc as well as activities about circularity in the built environment are planned.

2.3.3 Systematic follow-up

The framework of constructive alignment given in Figure 3 shows important elements when checking progression of the PhD studies. They are aligned with the PhD/licentiate intended learning outcomes, in which intellectual independence and research ethics are important issues. The ISP meetings and the activities of the graduate school highlight the special responsibility of a designer to contribute to creating a sustainable built environment, supporting the progress of the PhD student in this field. Professional life perspective can be a real driving force in making qualified research and in responding to societal challenges.

3 Working life perspective

Assessment criteria:

A. The programme is useful and prepares students for an ever-changing working life.

B. The programme's design and teaching/learning activities are systematically followed up to ensure that it is useful and prepares students for working life. The results of the follow-up are translated, when necessary, into actions for quality improvement, and feedback is given to relevant stakeholders.

3.1 Research projects

Architectural knowledge is by nature transdisciplinary, strongly connected to practice and always pushed forward by the demands of society. Thus many research projects are connected to societal problems and needs (healthcare architecture, senior housing etc.) and are publicly funded. Many research projects therefore fit into the category of applied research, while maintaining a strong relationship to the category of basic research such as architectural theory and history, or design theory, architecture and philosophy. This connection is maintained and stimulated through internal seminars and debate articles published in newspapers, books, business magazines, journals and reviews.

Keeping a foot in societal issues through their projects helps PhD students remain aware of changes going on in the society and the consequences that affect working life. Furthermore, some PhD students are employed by companies (actually we have five industrial doctoral students), which strengthens the research tradition at the school. However, four of our five industrial PhD students are men. It may seem that the private companies are willing to invest more in their male staff.

3.2 Professional career

An architect with a PhD can choose between an academic career and employment in the private or public sector. To some extent the opportunities depends on the dissertation topic, its interest and relevance for the different sectors and current opportunities in the market. There is to a certain extent a discrepancy between research and the professional work outside the university (see Figure 5). According to a ResArc survey of PhDs in professional careers, approximately half feel they do not really use the expertise they have developed in their current positions.

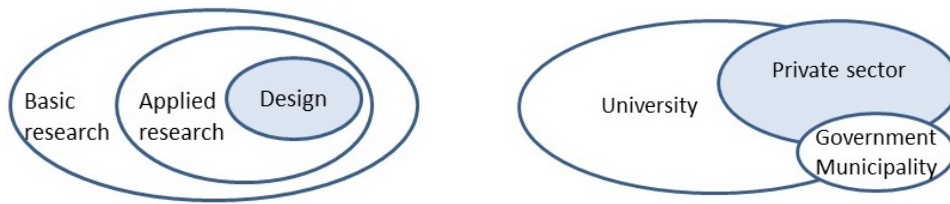


Figure 5. The type of research versus the kind of professional work

The reasons for that vary but the school can strengthen the connections between their activities and the work of other actors through enhanced collaboration with the business community and municipalities, as we do in our centres (see Chapter 1.3.3). Our PhD students whose research is connected to real project in society have, for example, written debate articles published in different newspapers. In all such cases the ties between society and university are maintained and developed. Some professors and teachers in architecture are employed by both Chalmers and private companies, or have their own firm. Post-doc employment in the private sector could drive the utilization of knowledge and enhance collaboration with the university.

According to the survey done in 2014 by the ResArc School about 60% of the PhDs in architecture who graduated between 2004 and 2013 continued their carrier at a university, 15% work for a municipality, and about 25% were employed in the private sector. For PhD students planning to complete their PhDs between 2015 and 2019, 60% expect to work at the university, 9% for a municipality, and 31% in the private sector. In other words, the majority of the PhD students would have to write grant proposals soon after completing their PhD education. Learning how to write a convincing grant proposal would be useful for any doctoral student, even those who do not intend to become academics. We should consider offering them a possibility to participate in writing proposals and stimulate it by assigning credits to the students who join proposal-writing workshops. For a now it is up to the individual researcher/supervisor to recommend appropriate funding sources and help prepare grant proposals. We recently experienced positive results when a communication/research project was awarded to a newly graduated PhD student.

The ResArc survey of PhD students from various universities also showed that students wished to have the opportunity to train or work together with different disciplines and to do more fieldwork. The Idea League doctoral school program responded well to those needs. The survey also showed the importance of personal networks (48%) and teaching experience (30%) for the professional career of former PhD students.

To conclude, the introduction of the pedagogical and career-focused GTS courses as the obligatory part of the PhD programme is appreciated by the Research School in Architecture. Chalmers students are required to take the course 'Career Planning: Your Personal Leadership'. These courses help students reach their goals by compiling a portfolio to highlight the expertise they develop over the course of their PhD studies. However, the courses should be complemented by more open discussion at the department level and the research group level about career opportunities and the prerequisites for successful employment as a PhD in architecture.

4 Doctoral student perspective

Assessment criteria:

- A. The programme allows the doctoral students to play an active part in the work of improving the programme and learning processes.
- B. The programme is systematically followed up to ensure that doctoral student input is used in quality assurance and improvement of the programme. The results of the follow-up are translated, when necessary, into actions for quality improvement, and feedback is given to relevant stakeholders.

4.1 Doctoral students in the preparation and decision processes

Generally graduate students participate in their department-s decision-making on the same basis as all other employees – by voicing their opinions in divisional and group meetings and performance reviews, and by participating in working groups.

At the university level, PhD students participate in several ways in preparation and decision-making and take an active part in efforts to develop and assure the quality of education. The Doctoral Student Guild (DS) annually elects representatives to the universities' various decision-making bodies (e.g. University Board, Doctoral Programmes Committee (FUN), Committee for Working Environment and Equality, and the Committee for Ethics and Misconduct). From 2017 Chalmers DS is also represented in the newly established group that prepares FUN meetings (FUN review team). Through meetings with the Vice President of Research Education, DS has ample opportunity to directly raise important questions.

DS representation contributes to a close collaboration between students and management that allows for early identification of graduate students' perspective and to connect graduate education decision-making and change management. At the same time, it is crucial that the representatives have the opportunity to make their voices heard during the meetings – so, for example, DS has a standing item on the agenda at Chalmers FUN meetings. Questions raised by DS that have led to policy changes include the decision that PhD students shall be employed in PhD student positions, simplified access for students to Ladok, clarified PhD student perspective in the employee survey, and the development of a web-based PhD student portal. One of our PhD students is a representative in DS.

4.2 Doctoral students in quality assurance and development of education

PhD students' representation in FUN, local committees, and course evaluations are all ways to gather views and feedback on course content and learning processes that are used for continuous improvement. A national poll of PhD students is used to capture students' feedback, and the compiled results form an important part of the overall assessment process. The evaluation concludes with action lists and activities that are communicated to FUN, DS and our management team for doctoral studies.

With few exceptions, our students participate in teaching at the undergraduate level (in Swedish) and/or master level (in English) as class assistants, supervisors and project leaders. Doctoral students also supervise bachelor's and master's theses, being involved in both planning and implementation, including assessment of the reports. One PhD student from Chalmers Architecture is representative in the Program Committee Board of ResArc Doctoral School.

4.3 *Doctoral students and work on physical and psychosocial work environment*

All our PhD students are employed either by Chalmers, another university, or a private company. The management group of the department responsible for the physical and psychosocial work environment are responsible for the graduate students in the same way as for all employees. Work environment includes components such as access to occupational health services, annual performance reviews, annual employee survey, and indicative information on the intranet. The annual appraisal meetings are conducted with the nearest manager, and the annual follow-up meetings (ISP) are conducted with the follow-up group. In this self-evaluation we have also used results from surveys carried out by the ResArc research school. However, to get more information about the present situation of the group of PhD students in our department, a short survey has been taken. Some findings are reported in the previous chapters and all results will be further analysed. Special emphasis will be given to analysing questions concerning supervision – structure of the meetings, communication, feedback from the supervisors, unspoken expectations etc.

At the initiative of DS and with their help, the annual employee survey has developed a strong PhD student perspective, and this work will continue. DS is represented in the Work and Gender Equality Committee, and also arranges other activities that aim to improve the work environment. Introductions for new PhD students at Chalmers and in the department also consider work environment issues. At the Graduate School in Architecture the introductory meeting led by the Director of Doctoral Studies is organized during the very first week of the student's work (see Figure 4). The meeting is about the whole process of PhD studies (the organization, content, working environment) and the important check points (ISP meetings, progress seminars). It enables the student and supervisors to start planning how to ensure good research but also the physical and psychosocial environment. Until 2013 when the PhD students were one division headed by the Vice Head for PhD Studies, it was easier to have a clear overview of all doctoral students' situations.

When serious problems appear, the Director of Graduate Studies, Vice Head for Graduate Studies, or DS are first informed. An occupational health representative (to which all employees are entitled three free visits without first having to obtain the employer's approval) can also highlight problems in a research environment without naming specific people. When problems become known, The Director of Graduate Studies, Vice Head of the Department, HR specialist, and occupational health representative try to resolve the situation. In cases of difficult management and/or supervision problems the doctoral students' representative (DOMB) is a very good support for the student. The DOMB is employed directly by the DS Board of Doctoral Students, and shall stay independent and neutral. The DOMB provides support and advice with strict confidentiality, and helps with contacts to union organizations. At the request of PhD students, the DOMB files cases with the Vice President of Research Education, writes reports, and proposes responses. The requirement of confidentiality, however, makes it difficult to learn from these cases since experience can only be discussed at a general level to avoid disclosing the claimant's identity. Periodically, the DOMB has had a heavy workload, which resulted in waiting time. While it is gratifying that those who need support increasingly know where to turn, the employee survey showed that not all students were aware of the DOMB, in particular at departments that lack local PhD councils. Therefore, DS works to spread information about this. According to the Chalmers survey, almost all architectural PhD students (95%) have confidence that they would get real support from the DOMB if they needed it.

In our department, we have a small group of PhD students that meets regularly. The series of PhD internal seminars was initiated by them to create a platform for mutual opposition and discussion. The meetings have stopped after a year because they demanded time-consuming preparation for opposition. This initiative shows that there is a need for continuous discussion and feedback on students' work from the perspectives of different unbiased researchers who would discuss the subject without judging the work or results. Moreover, the students wanted to deal with common challenges of structuring their own thoughts and developing effective oral and written communications. We have more work to do to support and increase students' involvement, support social/cooperation aspects, improve our work environment, and raise quality. Maybe spontaneous meetings would be an option. The new opportunities will appear together with the coming fusion of the Architecture and Civil Engineering Departments. Then the number of PhD students employed will exceed the critical mass needed for continuous contacts and activities.

5 Gender equality perspective

Assessment criteria:

A. A gender equality perspective is integrated into the programme's design and teaching/learning activities.

B. Systematic follow-up is performed to ensure that the programme's design and teaching/learning activities promote gender equality. The results of the follow-up are translated, when necessary, into actions for quality improvement, and feedback is given to relevant stakeholders.

It is possible to discern gender differences in the choice of subject area within the school. 'Building Design' tends to attract more women PhD students (9 female, 1 male), while other areas have better gender balance, such as 'Architectural Theory and Methods' (3 women, 5 men) and 'Urban Design and Planning' (4 women, 4 men). Some research is carried out in environments and contexts with stereotypical notions of gender. For example the topics of 'Healthcare Architecture' and 'Housing for Seniors', included in the division of 'Building Design', is part of such a context. When you look closer into different subjects there is also – as in practice – a gender imbalance between technology-based research and more human-centred research. In the process of recruiting new PhD students, gender balance is always a criterion.

There is a great awareness of the significance of collaboration and networking with industry. It is important for all PhD students to have the same opportunities. We realized that gender distribution among teachers is even; however, the majority of main supervisors are men (18 of 26). This is the result of recent recruiting and appointments of male professors who have built up research groups and secured funding for PhD projects. Expertise needs which are revised systematically through an annual staffing plan are not examined from the gender perspective. Due to reorganization, the work on gender issues at the institution where the research school is placed will start in 2018. But although this work has not begun yet, a series of seminars and workshops on gender themes has been implemented and graduate students as well as tutors were invited to participate.

Gender issues are also regularly raised at the collegial meetings. Gender equality aspects are included both in recruiting and the formation of various groups, such as scientific committees. Generally, in the field of architecture there are good opportunities for gender equality in recruiting. However, previously mentioned, some areas attract a disproportionate share of women or men. As about 60% of our 26 PhD students were recruited in open calls,

we had to accept that some PhD candidates were chosen by other units like companies (6 industrial PhD students) or collaborating universities (4 PhD students from other universities).

According to the annual employee survey no gender problems concerning supervision have been indicated. The level of gender equality in the department as experienced by doctoral students seems to be very high for men and women alike. Among the teaching staff, the degree of equality is questioned more than in the Chalmers community as a whole. Women – both students and faculty – perceive the environment as more equal than men do. This is unusual at Chalmers, where the inverse relationship is more common. The Swedish government has decided to integrate (gender) equality into all public organisations. Chalmers is currently working on recommendations that should be implemented in all operations in 2019. This effort includes a number of different surveys and a policy of listening from a gender perspective. The surveys include questions about the distribution of departmental work and the opportunity to participate in conferences. A particular focus is on issues of recruitment. This is part of Chalmers's efforts to achieve the recruitment targets that have been set, both by Chalmers and by the national government.

Chalmers's annual employee survey evaluates the psychosocial and physical work environment. The result can be divided by gender and type of employment. PhD students are asked how they experience supervision and whether they have the resources they need to carry out their studies successfully. There are also questions about gender and equality. Results cannot be viewed separately for the group of PhD students in the topic of architecture, but concern the entire group of PhD students at Chalmers. This has been useful to identify issues with higher levels of stress among graduate students within divisions, and work on improving the situation is in progress.

In general, the level of equality is perceived to be high at Chalmers, and PhD students perceive slightly more equality than other employees on average. Male students are slightly more satisfied than female. Those who are less satisfied with the level of equality specify gender aspects as the main reason. Lower satisfaction can often be related to the gender-unbalanced nature of the environment. To get in-depth knowledge about the situation of students in gender-unbalanced environments, interviews were conducted in 2016 with a selection of graduate students and their supervisors in four departments at Chalmers. The study identified a number of areas where changes will be implemented to improve the PhD students' work. For example, for students, regardless of gender, it was important to find ways to manage stress and develop an academic identity.

At Chalmers Architecture we wanted to get the feedback from our PhD students separately. The survey recently taken and analysed by the representative of PhD students asserts, 'In the answer a vast majority of PhD students discuss the combination of gender/age/social position/ethnic background that creates inequality. For example, men usually dominate the discussion at meetings, PhD presentations are primarily done by women, and professors are mostly men.' We are going to analyse and further investigate those opinions to draw practical conclusions.