MS-RP
Master of Science in Research Practices

University of Minnesota
School of Architecture
It might seem complicated…
— a degree program
— a consortium of firms
— collaboratively developed research topics
  partnerships between architecture, engineering, and construction (AEC) industry competitors
— a blurring of the firewall between academia and practice
— open exchange of intellectual property
— professional licensure regulations
— tracking credit and internship hours
— matching students, faculty, firms, and ideas

But, it’s actually simple…
Together, we are changing the culture of the AEC industry to be research-oriented and evidence-based. The University of Minnesota created a pathway for highly qualified students to be directly tied into the strategic priorities of industry leaders. We provide opportunities for brilliant young professionals to fearlessly question industry assumptions. Along the way, we pioneered a path for licensure upon graduation that is now being adopted nationally, and we discovered a way to increase diversity in our industry.

The Consortium for Research Practices was founded to meet many agendas and address change at many scales. By layering and interweaving complementary priorities, we make progress towards the AEC industry we imagine. Every element in the Consortium is synergistic, leveraged, reciprocal, catalytic. Industry partners mentor the students, giving them access to high-level discussions on strategic directions within the firms. Collectively the firms debate about future trends and projections of new markets and prioritize the gaps most valuable to address. Individual students bring specific skills and can-do attitudes — unburdened by preconceptions of how the industry works. Collectively the students present a millennial take on technology and society that gives firms direct access to their next generation of clients, partners, and leaders. Faculty leverage expertise gained from years of research and teaching, connecting students and firms with a broad perspective and specific networks. In turn, faculty have a venue to apply and test ideas in “field conditions.”

It’s been 3 years — and 8 firms, 12 faculty, 16 research projects, and 21 students. And counting.
The relation between the architectural profession and academia has the potential to be a rich and interactive exchange leading to meaningful advancement of the discipline. MS–RP creates a robust knowledge loop in which the professionals identify problems in the course of practice and academic researchers communicate useful results back to practitioners.
What we've done
Changing the culture of AEC:
— Through demonstrated value of research, firms can prove worth to clients and partners.
— Simply identifying research topics creates dialogue and, for many firms, formal and informal processes have emerged.
— The compelling leadership path attracts diverse students. We particularly focus on those students from groups currently underrepresented in our fields.

And the best is yet to come. We are starting to see:
— Potential for growth to wider AEC industry partners, academically and professionally.
— Ties with research centers and academic partners from a broad range of areas: academic health, biosystems, and sustainable building research.
— New possibilities for using federally funded student support to bring in non-profit partners.
— Grant proposals begun on cutting edge topics.
— Potential for partnerships nationally and internationally for a connected network of faculty, firms, and students.

How it works
The foundation of the program rests on research practice internships, 25-hour-per-week research efforts conducted by highly qualified students who are either in or have completed architectural professional programs. Fifteen hours per week are paid for and supervised by the firm, 10 hours per week are academic work, done for credit or tuition reduction and supervised by faculty. Considered as a whole, the 25 hours per week over the course of a 15-week semester significantly advances a collectively defined research agenda.

Projects can take anywhere from one semester to two years, sometimes engaging multiple students and multiple faculty. Identification of a project is done through an interactive process that includes discussion among the firm representatives, individual conversations with the program director, and “lightning round” presentations by firms, students, and faculty. The matching of interests, qualifications, and logistics occurs in advance of each semester start, and is ongoing for longer-term planning horizons.

Consortium firms pay an annual $9000 membership fee, and when firms host a student intern, they compensate the student at fair market rate. Membership fees fund student tuition reductions and stipends (effectively making the post-professional degree debt-free) and small stipends for faculty. Overhead and administration is provided as match by the School of Architecture and College of Design. Additional assets such as data analysis and Virtual Reality Design Lab (VRDL) are often supported by the University of Minnesota, but sometimes require additional funding.
Research Projects

Trends affecting the building industry are part of ongoing discussions in multiple forums that encourage the participation of our consortium members, faculty, and students. Research projects are identified in the process of developing this collective awareness and leveraging firms’ internal dialogue around research. The projects included in this booklet originated from a range of sources: faculty research, students’ interests, and the priorities of collaborating firms.

Most often, the process begins with matching the firm’s medium- and long-term strategic goals with the expertise of our faculty and students. Research outcomes tend to fall into two categories: tools and processes. The more tool-oriented outcomes typically involve some level of scripting to create new tools or adapt existing tools. Process-oriented outcomes are sometimes scholarly, or might take the form of mapping and other graphic analyses.

Dissemination of the outcomes is central to our research endeavors. Whether through peer-reviewed journals, conferences, or web publication, research outcomes are designed to advance industry knowledge about critical issues facing our practices.
In the programming phase of new healthcare facilities, it is crucial to plan carefully to ensure the space meets functional, privacy and general wellness needs for both staff and patients. Major issues influencing the success of outpatient clinic design include the location of exam rooms and office spaces, movement patterns, and wayfinding. These factors impact operational costs and overall efficiency of any new clinic space. This research focuses on two outpatient clinics in the Minneapolis/St. Paul metropolitan area that were designed using two innovative planning layouts: on-stage/off-stage (separating patient path from clinician path) and neighborhood design (organizing the clinic staff into collective clusters).

The project aims to investigate ways in which the clinic models fosters or hinders effective care delivery as well as implications for associated costs. Our results will generate valuable information for the industry’s planning of future projects.
Recent engineering advances have opened up new structural potential for one of our industry’s oldest building materials: wood. HGA Architects and Engineers was interested in learning how they can better serve clients while maintaining industry pace in material research by integrating wood as a primary structural material into their current practice. This investigation followed newly engineered wood products and their methods of construction to be applied to a variety of occupancy types. Using these types, a prototype project explores the relationship of bay size and program flexibility, long-span structural systems, and anthropogenic benefits through the aesthetic of a natural material. The investigation included input from architects, engineers, and contractors from HGA and Mortenson Construction. It explored integrated wood systems within a prototype project in a way that not only lowered the carbon balance, but also provided viable options for standardized construction methods and aesthetic enhancements for the beautification of space.

To provide context for the study of direct wood replacement for three completed projects (hospital, performing arts center, office building), the student generated a matrix showing occupancy type, construction type, and massing. Actual construction strategies are in dotted squares, and a hypothetical exposed wood structural frame is highlighted in yellow.
This research assessed the impact of specific design elements on the effectiveness of teaching and learning. The team was interested in how the design elements of a series of renovated classrooms supported North Park Elementary School’s goals of fostering 21st-century skills for communication, collaboration, critical thinking, and creativity. We created a rigorous, in-depth, and longitudinal case study analysis that highlighted innovative approaches to collaborative design for the creation of active learning environments in conjunction with specific models of education. We did field observations of students and teachers, performed mapping analysis of their use of space and furniture, and interviewed parents, students, teachers, administrators, and designers.

Movement and cluster mapping in three different classroom configurations. Dark red lines indicate smart-board surfaces, a tracked area where students moved over time is shown in yellow, and locations of teachers are marked with red dots, with red lines showing their movement. Numbers mark the student cohorts that joined and separated over the course of a day.
Building Resilience: A Framework to Quantify and Assess Resilience

Student: Fiona Wholey
Consortium Firm: Perkins + Will, Mortenson Construction
Firm Advisors: Perkins + Will: Rick Hintz, Principal
Russell Philstrom, Project Architect
Doug Pierce, Senior Associate and Architect
Mortenson Construction: Clark Taylor, Vice President
Faculty Advisors: Jim Lutz, Lecturer, Co-Director MS Sustainable Design Program, IDP, School of Architecture

This project expands existing resilience frameworks to incorporate the changing risks from climate change and provide emphasis on principles of sustainability in the design of resilient buildings. By increasing the scope of discourse, we seek to reframe the discussion of resilient design from a cost-based hierarchy to one that includes societal benefits and reduced risk for communities and building owners. This study builds upon existing resilience assessment frameworks for disaster mitigation and integrates sustainability and climate change to develop a more inclusive framework to evaluate resilience. The ReLi Tool, in development by Perkins and Will, serves as the basis for testing this new framework using two schematic buildings, an office and a hospital located in the Midwest. The work stemmed from this research has been accepted in several papers after blind peer-review, one published in PW Research Journal and others presented at national conferences.

The student developed a three-part graphic toolkit to support the new firm-wide resilience framework. Shown here is the middle part of the kit, which addresses hazard preparedness. The visual tool is a quick way for designers to work with clients and partners to identify benefits, costs, and incentives so that they can compare multiple strategies at the early stage of design.
Our aim in this research was to produce a toolkit to be used by HGA Architects and Engineers to identify viable “fringe” materials and guide them in locating the information necessary to be able to propose the material for a project. The research identified innovative market-viable materials, collected the relevant information about selected materials to be communicated to the firm, and provided context for the material or manufacturing process that gives a deeper understanding of the product’s history and challenges of proposing the product for a project. The information provided primarily concerned a material’s properties, its benefits and limitations, and sourcing and installation.

Map of an ideal decision-making process to determine the viability of new materials in HGA projects. The process of creating this map helped to identify the nature and structure of the desired culture of material practice that the firm wished to instill.
<table>
<thead>
<tr>
<th>Project Phone #</th>
<th>Project Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>360-654-2262</td>
<td>Tulalip, Wa. 98271</td>
</tr>
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**Virtual Reality Technologies in the Operations of Mortenson Construction**

This research combined three related but distinct components. The first component involved spatial cognition in virtual reality. We carried out an extensive review of the literature on spatial cognition in virtual reality, designed, executed, and documented an experiment involving 40 subjects, and analyzed the data. The second component was the planning of a portable kit that facilitates an immersive virtual environment. The third component was a description of how emerging immersive virtual reality technology can complement and expand Mortenson’s virtual design construction activities.


**Firm Advisors:**
- Ricardo Kahn, Director of Integrated Construction
- Renee Cheng, Professor and Associate Dean of Research, School of Architecture
- Lee Anderson, Associate Professor, School of Architecture

**Consortium Firm:** Mortenson Construction

**Student:** William Adams

**Faculty Advisor:** Andrea Johnson, Assistant Professor, School of Architecture

**Assistant Professor:** William Adams, School of Architecture

**Spring 2014**

**Research Paper:**

- This paper explores the potential of immersive virtual reality technology in construction, focusing on how it can enhance design, construction, and operational efficiency. The research was conducted by Mortenson Construction, a leading general contractor, and involved collaboration with academic partners.

**Key Findings:**

- Immersive virtual reality technology can significantly reduce construction time and costs by facilitating earlier design decisions and streamlining operations.
- The technology can also help in training and preparing construction teams for complex projects.

**Conclusion:**

- Immersive virtual reality technology holds great promise for the future of construction, offering opportunities to improve efficiency, reduce costs, and enhance the overall construction experience.

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**Table: Labor Quantities**

<table>
<thead>
<tr>
<th>Position</th>
<th>QTY</th>
<th>NUMBER</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Eng.</td>
<td>N</td>
<td>6' / HR</td>
<td></td>
</tr>
<tr>
<td>4 Dock Leveler</td>
<td>3</td>
<td>3D</td>
<td>1/4&quot; = 1'-0&quot;</td>
</tr>
<tr>
<td>3 Dock Leveler Section 3</td>
<td>3</td>
<td>Depth Varies (TYP)</td>
<td>0' - 8&quot;</td>
</tr>
</tbody>
</table>

**Notes:**

- The table above provides a summary of labor quantities for various project positions.
- The labor requirements are based on specified sizes and durations, ensuring efficient planning and execution.

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**VDC Investment**

- VDC (Virtual Design and Construction) investment is crucial in optimizing project outcomes.
- Efficient use of VDC tools can result in significant cost savings and time reductions.

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**Punchlist Process:**

- The punchlist process is a critical step in construction, ensuring all necessary work is completed as per design specifications.
- A well-structured punchlist process can reduce rework and improve project delivery.

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**Concrete Mix Designs:**

- The table above lists different concrete mix designs with their specifications, ensuring the correct selection for various construction applications.

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**VDC Investment**

- VDC investment is focused on maximizing the potential of digital tools in construction.
- The investment can lead to significant improvements in project efficiency and cost reduction.

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**VDC Investment**

- VDC investment is a strategic approach to enhancing construction outcomes.
- It involves the integration of digital tools to streamline processes and improve decision-making.

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**Punchlist Process:**

- The punchlist process is a systematic approach to document and address outstanding work.
- It helps in ensuring project completion meets all quality standards.

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**Concrete Mix Designs:**

- The table provides a comprehensive list of concrete mix designs, each tailored for specific construction needs.
- Understanding the characteristics of each mix is essential for selecting the right materials for the project.

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**Summary:**

- The integration of digital technologies, particularly VDC tools, offers immense potential for construction projects.
- Effective implementation of these tools can lead to reduced costs, increased productivity, and improved project outcomes.

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**Conclusion:**

- The future of construction is increasingly digital, with virtual reality playing a pivotal role in enhancing the design and execution processes.
- Continued investment in VDC technologies is essential to stay competitive in the industry.

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**References:**


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**Acknowledgments:**

- The authors acknowledge the support of Mortenson Construction and the contributions of academic partners in making this research possible.
Spring 2014

Material Sustainability: Evaluating the Environmental Impacts of Building Materials

Student: Kaylyn Kirby
Consortium Firm: MSR

Firm Advisors: Tom Meyer, Principal and Architect
Chris Wingate, Associate and Designer
Simona Fischer, Designer
Rhys MacPherson, Senior Associate and Designer
Jack Poling, Principal and Architect
Rachelle Schoessler Lynn, Interior Designer and Senior Associate

Faculty Advisor: Blaine Brownell, Associate Professor, School of Architecture

This project aimed to reconcile existing environmental impact tools—lifecycle analysis—with current material research done at the firm MSR. Our research outcome was a robust methodology that could be used by the firm, in conjunction with designers and clients, to make educated material decisions appropriate to a specific situation, keeping in mind human health, and the environment. We compared the benefits and drawbacks of several commercially available tools used in architectural design. One tool in particular, TALLY, was further tested and customized using active and past case studies from MSR’s portfolios. Working closely with project teams, consultants, and firm leadership, we drew upon a national network of faculty, practitioners, and software developers to create a selected set of tools for MSR, customized from the wide range of capacities built into TALLY, and used feedback from this research to further the development of TALLY.

Above: the first phase of the research, which looked at three lifecycle analysis tools: BEES, Athena, and Tally. The student compared them for their depth of analysis, ease of use for designers, and level of integration between building elements, wall system, and building system.

Below: Tally was selected for the second-phase comparison of two projects in the office. Tally’s interface was customized to highlight relevant information used by designers.
In this research project we examined how parametric tools can be seamlessly woven into a typical iterative design process to inform designers of the implications of performance criteria such as energy, daylight, and other factors such as views and cost. We used customized and off-the-shelf commercial tools in a project which was active in schematic design phase, and carried out interviews with designers, consultants, software specialists, and others. Our research outcome was a method utilizing a series of parametric tools to inform the development of glazing on the primary facades.

For north-facing and south-facing facades, different design priorities have potentially contradictory optimal ranges of glass. This research does not try to optimize across all factors, but instead facilitates the iterative design process by making the optimal glass placement for each criterion clear.
Measuring and predicting effectiveness in project delivery is complex and poorly understood. This project was the first of a several-semester-long project that sought to better understand project delivery during the construction process. The overall goal was to determine metrics that will allow professionals in the architecture, engineering, and construction industry to more accurately predict results and achieve higher levels of success. The first semester of work on the project established a framework and methodology for active monitoring of multiple project teams during the construction phase, subsequent semesters continued the work resulting in presentation of preliminary results at a peer-reviewed AIA conference. Later phases of the research will include recruiting and active monitoring of over two dozen project teams, performing intake interviews, and setting up systems for data collection.

The scope of this project ranged from qualitative data drawn from interviews to quantitative data gained from surveys of the project teams. The goal of the research was to provide a holistic picture of dynamic factors contributing to team success; it did not assume a universal formula for success.

The analogy illustrated in the lower images is that gumbo or jazz can be successful with a wide variety of ingredients and combinations.
U.S.-based architectural firms engaged in projects overseas can benefit from their design teams working remotely having access to certain local information. This research used a case study of a pro-bono clinic in Africa designed by architects from several offices of Perkins and Will, a project that did not have a budget for designers to visit the site in person. The outcome of the research was a field guide for Perkins and Will’s social responsibility initiative to understand the context of building in the Serengeti Plains. We developed a working beta-level tool for mining reliable data relevant to the designer, including information on climate, socio-cultural context, economic context, material resources, and building conventions and regulations. We used interviews with designers, consultants, and software specialists to inform the development of the tool. Extracting these data in a highly selective graphic format, the database is intended for designers to use during schematic design. Subsequent application of the tool has expanded beyond the firm’s social responsibility initiative to include the commercial healthcare sector.

Sample spider graphs showing project needs along a range of axes. Three areas were studied: ecological context in green (water, waste, indoor air quality, site), project delivery in blue (cost, safety, communication, construction management), and cultural context in yellow (cultural expectations, community engagement, bio-climatic comfort). The higher the scale on the axis, the more influential the factor was in determining design goals.

The more well-rounded spider graph footprints indicate more holistic sets of factors that should be considered synthetically; the less-balanced footprints indicate a limited number of strong design drivers.
This project focused on a variable formed panel having potential for acoustic applications developed by Marc Swackhamer, a faculty member in the School of Architecture. Given the new system's potential to produce inexpensive customized panels with specific acoustical properties, this research effort investigated how designers could leverage it in the design of the side walls of a music performance hall. We found the primary obstacle for designers to be the lag time between design sketch and the results of the acoustical analysis.

The research produced a custom scripted tool that graphically simplified the source and receptor, allowing the designer to alter the pattern of the wall panels interactively. Beginning with the complex tools used by the acoustical consultants, we developed a simplified tool with information most relevant to designers. The outcomes of this research included the beta-level tool, physical and digital mock-ups of a hypothetical redesign for a surface in the completed project (the Ordway Theater and Northrup Auditorium in the Twin Cities), and an analysis of how the project would benefit from the variable “tuned” surface.
In this research we developed an energy modeling methodology for small to medium-sized architecture firms that can inform early concept, schematic, and design development decisions. We analyzed the typical design process and proposed pairing strategically targeted energy analysis programs, linking specific tools to specific outcomes.

Energy modeling tools are powerful, but the sheer volume of information can be overwhelming for a designer. Additionally, the tools do not always take into consideration the highly specific needs that designers have in different phases of the design process. The method was tested on an active project in several phases of its design, and mapping the process resulted in a recommended methodology for designers and an overall plan for the firm for its investments in training and software.

Above: After talking with designers and consultants in the office, the student mapped software tools and their common combinations. This provided context for how the new energy modeling tools might fit in the existing ecology of software within the office.

Below: Diagram showing the sequential steps in building an energy model from concept to analysis.
The use of virtual reality in the design of patient rooms in hospitals has the potential to reduce, replace, or complement extensive and costly physical patient room mock-ups. In this research we investigated the advantages and disadvantages of virtual reality in the design of patient rooms in a California hospital, as it compares with full-scale physical mock-ups of the same space. We developed the virtual reality version of the patient room, analyzed the physical mock-up and its evaluation criteria, and compared client input after viewing the physical mock-up and virtual experience. We also did a cost comparison of time and return on investment between the physical and virtual mock-ups. The results of this work were presented at a peer-review Healthcare Design Conference and have been incorporated into a book, Modern Clinic Design: Strategies to Impact Patient Experience authored by Chris Vickery of HGA and published by Wiley.
Consortium Members

Founding members of the consortium have played a critical role in forming its culture, establishing a balance of shared and distinct intellectual property and developing robust personnel processes. Firms share our goals of advancing industry, providing opportunities for future firm leaders, and investing in the continued development of their individual research cultures. Consortium members regularly engage in discussions with faculty and students regarding research trends, industry needs and opportunities. From these exchanges and internal strategic planning, firms develop priorities for research topics that can be pursued in the research practices program or other venues.
AECOM is a fully integrated technical services consulting firm with nearly 100,000 employees worldwide — including engineers, designers, planners, scientists, surveyors, architects, as well as management and construction services professionals. The firm serves clients in more than 150 countries in key markets including transportation infrastructure, environmental, energy, oil and gas, water, as well as corporate, government and healthcare facilities.

In the healthcare field AECOM is actively engaged in the application of evidence-based design, to inform project solutions and evaluate results. The firm is involved with a range of research-oriented organizations such as The Advisory Board Company, the Association for Patient Experience and the Center for Health Design with whom we are a Corporate Affiliate. AECOM design staff attends and present at national conferences including Healthcare Design Expo and Conference and the Healthcare Facilities Symposium & Expo.

The AECOM legacy firm Ellerbe Becket has had a long history with the UMN College of Design – both in the Architecture and Interior Design field, with staff members holding adjunct faculty positions and with regular participation in design critiques. The current collaboration with a student in the MS-RP program doing primary research on a topical issue of importance to our clients brings that engagement to a higher level.

Resulting research findings and design process tools can have direct relevance to solutions on real world projects. Benefits to the student include opportunities to engage directly with client concerns and develop a deeper understanding of the impact of design on facility users. And by sharing findings with our clients and the wider design community, we add to the body of research regarding successful facility design.

BWBR is a design solutions firm with practices in architecture, interior design, and master and strategic planning. One of the Upper Midwest’s oldest and largest firms and recent recipient of the AIA Minnesota Firm of the Year Award, BWBR has established a reputation for service and quality designing complex facilities in the healthcare, higher education, government, corporate, science+technology, secure environments, transportation, worship, and wellness+recreation markets.

Our clients live and work in complex environments. BWBR seeks to be a trusted design advisor to those clients – assisting them and innovatively leveraging those environments for a better world. Integrated design research helps our clients make informed decisions to utilize their facilities to best meet their mission.

Creating a design culture based in research offers a more critical approach to design; informing the design process from the beginning and measuring the success of those designs after implementation. We strive for continual improvement and innovation in our process and solutions to better serve our clients. This commitment to continual improvement creates a more engaged practice and inspires our team and our clients to exceed expectations. Research also allows us the opportunity to seek new knowledge and contribute to the industry’s body of knowledge.

We see the association with the MS-RP program as an opportunity to create new relationships with students and faculty that will inform our process and expand our ability to acquire knowledge and innovate in a rapidly changing environment. Investing time and talent with the MS-RP will be a catalyst for our continued growth and a reflection of our commitment to the design community in our region. Graduates with this unique research experience will help bring a new momentum to our industry, using their knowledge and skills to lead innovation and design higher performing buildings and environments.

BWBR is excited about this collaboration, the future impact the MS-RP on the practice of architecture, and the knowledge that will be generated and shared with our colleagues for years to come.
Awarded the American Institute of Architects Minnesota Firm Award in 2013, Cuningham Group transcends tradition with architecture, interior design, urban design and landscape architecture services for a diverse mix of client and project types. The firm's client-centered, collaborative approach incorporates trend-setting architecture and environmental responsiveness to create projects that weave seamlessly into the urban fabric. Founded in 1968, the firm is consistently recognized as a leader in the field of architecture and has grown to nearly 300 employees in offices seven national and two international offices.

Cuningham Group was recognized with its first education design award in 1992. Since then, the firm has received over 40 honors for its work planning and designing education facilities. In addition to planning awards, our education projects have been recognized for their interior design, their commitment to sustainability, and their impact on learning. This history of excellence is evidence of Cuningham Group's ability to develop and deliver design solutions for education that break ground in the ever changing world of teaching and learning. We believe our future lies in the field of evidence-based research and building performance for all of our project types, especially learning environments.

Beginning in the Spring of 2014, faculty and students at the University of Minnesota partnered with the Cuningham Group, Columbia Heights Public Schools, and the College of Education on a multi-year research project to document, analyze, and assess three retrofitted open learning studios (2nd, 3rd, and 4th grade) designed by Cuningham Group for the North Park Elementary School, in Fridley, MN (2011-14). These three, unique learning studios were designed through a collaborative charrette process involving school teachers and administrators and resulted in the merging of several traditional classrooms into larger, more open spaces through the removal of existing interior walls and the integration of flexible furniture, digital learning equipment, and technology-embedded partitions. The result has been a complete transformation of the school’s approach to teaching that privileges active, student-initiated, and self-directed learning.

The aim of the research, analysis, and documentation currently being conducted is to assess the impact of specific design elements on the effectiveness of teaching and learning in support of North Park Elementary’s goal of fostering 21st-century skills for communication, collaboration, critical thinking, and creativity. In turn, this research will also contribute to the architecture profession by providing a rigorous, in-depth, and longitudinal case study analysis that will highlight innovative approaches to collaborative design for the creation of active learning environments in conjunction with specific models of education.

DLR Group is an integrated design firm providing architecture, engineering, planning, interior design and building optimization to meet the unique needs of our clients in locations around the globe. Our promise is to elevate the human experience through design. This promise inspires our design and research for a diverse group of public and private sector client types including Civic, Courts, Detention, Energy Services, Higher Education, Hospitality, K-12 Education, Retail, Sports, and Workplace.

DLR Group joined the research consortium to further our on-going commitment to bring value to our clients, our community and our industry.

At a high level, our collaboration with the University of Minnesota Research Consortium helped our entire firm remember the key role research plays in our work, and how it can truly benefit everyone involved. Additionally, the collaboration helped our staff to make connections between research and the professional practice of design. This evolved into formalizing a leadership group, charged with guiding and communicating research that is happening throughout DLR Group.

The students contributed to furthering this conversation, which helped to establish a formal framework for research to occur, inside the company. Our students also provided a greater awareness around the importance of data aggregation and visualization. They created and communicated a visual connection to the research being performed, which became a useful communication tool.

Research is playing an expanded role in the work we do and the clients we serve. From evaluating the qualitative design aspects of our learning environments and relating them to student performance and social behavior; to informing our workplace clients of the relationship between daylighting and productivity; to energy consumption and predictive building performance models; research is playing an increasing role in our design processes.

Everyday our design teams are exposed to new challenges: new sets of big data produced by the industry or our own project experiences; new building performance expectations; new measures which make us even more relevant and more focused to the needs of our clients.

The next generations of architects, whom have engaged with research during their education, are entering the profession with a set of valuable skills. Their ability to ask the right questions, carefully study, transform and visualize results and then communicate those results to our owners and project teams, will elevate the quality of design that we ultimately evolve and deliver.
HGA is an integrated architecture, engineering and planning firm specializing in healthcare, arts, higher education, and public/corporate work. We help clients realize their organization’s vision potential through responsive, innovative and sustainable design informed by rigorous research and design investigation.

Our research efforts serve two basic functions:

1. to support thoughtful, informed decision-making on each project
2. to fuel new ideas and innovative, industry-leading practices

Our collaboration with the Consortium for Research Practices plays a unique role within our larger research platform, serving as an “incubator” to test emerging ideas, technologies, materials and processes. While much of our research work is driven by the market sectors we serve, the consortium has generally focused on topics with firm-wide applications. For example, we have explored emerging technologies such as virtual reality and computational design, non-traditional materials and assemblies, and frameworks to build our public interest design practice.

Design-oriented research is an emerging field, and many firms are developing systems to integrate research findings into their practice. MS-RP students are in a unique position to lead these integration efforts. Through this program students develop the skillsets needed to conduct rigorous research, coordinate diverse expertise, and address emerging industry concerns.

The MS-RP program has also proven to be a valuable vehicle to help students advance to leadership positions within a multi-generational practice. Many of our consortium projects have focused on emerging trends, and the students truly become the firm’s “thought leaders” within their topic areas. Most of our consortium students have taken full-time positions with HGA at the conclusion of their projects, and they are valued for both their research skills and for their heightened understanding of practice.

Mortenson Construction is a family-owned development and construction company headquartered in Minneapolis, MN. The firm has gained a reputation for partnering with their Customers, design teams, and trade partners to produce value through collaboration and goal alignment while striving to provide an exceptional experience for all involved with the project.

At Mortenson, we continually strive to improve the facilities we create for our customers, search out tools and processes to improve collaboration, and invest in the art and science of construction. These goals have led to significant R&D efforts and partnerships with academia. The collaboration with the University of MN has provided the opportunity to study team dynamics, and how the performance of a team can be directly tied to providing value to the creation of the design and construction of a facility. The research has also been very helpful in understanding the factors that lead to team cohesion and integration, as well as identifying the structure and encouraged behaviors that will lead to high team performance.

With the preliminary research data and analysis, we can use this information to shape the way that we train our professionals so that they can be more effective in team environments. The research also provides us context to train others in the industry and better influence selection criteria so that facility Owners can understand the value of collaborative and integrated relationships, be it both informal and contractual.

We see the value in MS-RP in that it provides aspiring architects a unique opportunity to interface with multiple design and construction firms, which is an opportunity that one rarely gets once in the workforce as we are typically working on a limited number of projects with a limited number of firms. The students get a high level of exposure to the more pressing issues within the industry, therefore gaining experience and the opportunity to comprehend the present day challenges and potential solutions being developed. The students are placed in direct contact with the leading edge thinkers of these industry leaders and get the opportunity to be part of the problem solving to advance the industry by leveraging academic resources.
MSR

MSR’s mission statement is to create exceptional and enduring architecture through a leading, self-renewing practice. Since 1981, our firm has produced work of enduring value: buildings that are expressly right for their time and place and that culturally and physically age gracefully. We have achieved this success by believing in the power of open, informed architectural discourse, exploration, and research to positively influence the way we work internally and the way we lead the interactions with our clients, consultants, and community.

MSR’s commitment to applied research helps us stay connected with the issues of our time, expand our knowledge, and develop new ways of working in order to serve as leaders in our profession. Collaborating with the University of Minnesota through the MS-RP program has been a cornerstone of our research strategy for the past three years. The program leverages the strengths of academia and professional practice by conducting mutually beneficial research. We have explored innovative processes, tools, and techniques with inquisitive and talented graduate students and University faculty, while providing a venue for the research to be applied to active architectural projects complete with budgets, schedules, and existing work flows. This feedback loop between academic research and professional application results in innovative methodologies that expand beyond conceptual exercises. They are ready to be adopted and applied by our staff to enhance our design process. Through our collaboration with the University of Minnesota MS-RP program, we have developed and applied sustainable design methodologies focused on operating energy, embodied energy, daylight, and material life cycle assessments.

The MS-RP program also helps develop the future leaders of our profession. The MS-RP program offers an invaluable opportunity for graduate students to gain experience and make connections in the profession, while learning a unique skill set that makes them attractive to future employers. By definition, students working on research projects are developing new knowledge for our firm and become the in-house experts on their research topic. This privilege comes with a responsibility to work with our in-house teams to direct and disseminate the research. This interaction helps students develop strong communication and organizational skills as they incorporate feedback from firm leadership and work with staff to apply what they have learned. The MS-RP program trains students to become leaders as they learn how to leverage research to develop the ways we will all work tomorrow, while navigating the constraints we face today.

MS-RP at UMinn Architecture

Perkins+Will is an interdisciplinary, research-based architecture and design firm established in 1935 and founded on the belief that design has the power to transform lives and enhance communities. The firm’s 1,800 professionals are thought leaders in developing 21st-century solutions to inspire the creation of spaces in which clients and their communities work, heal, live, and learn. In 2015, Fast Company ranked Perkins+Will among “The World’s Top 10 Most Innovative Companies in Architecture.”

Perkins+Will explores interdisciplinary research to address materials, building technologies, environmental concerns, computational design, automation in construction and design delivery methods. We seek to bring together researchers, design practitioners, funders, educators and students to bridge the gap between academic and practice-led research efforts, thus setting a new direction of architectural research. The University of Minnesota’s College of Design’s enhanced pedagogy and research strategies are essential to the future relevance and growth of our research-driven practice.

Our three specific faculty/student/practice research collaborations clearly furthered our aims in practice, social responsibility and envisioning a resilient future. Student Dan Raznick’s research examined data and parametric processes during schematic design to more deeply integrate environmental simulation with spatial performance. Student Matthew Tierney’s research produced a field guide for our Social Responsibility Initiative (SRI) to assist when designing in unfamiliar cultures. Student Fiona Wholey research became an article “Designing for Health, Long-term Benefits of Resilient Design for Healthcare” that was published in Contract Magazine Online, April 2, 2015 as part of a Perkins+Will healthcare series.

Research in architectural design and the built environment is diversifying and reaching exciting new directions. Technological changes in materials, representations, and construction techniques have accelerated the need to advance knowledge across design disciplines. At Perkins+will, collaborative interdisciplinary research is rapidly emerging as a core component to our design practice. We presently employ a number of full-time research staff who focus on critical thought leadership and produce a peer reviewed research journal twice each year (volumes available on our website). We also fund a bi-annual Innovation Incubator program for staff with micro-grants of money and time supporting small research projects that push forward creativity and experimentation.

The University of Minnesota’s College of Design Masters in Research Practices is an exciting initiative that we see as part of positive global changes transforming the design professions. Architectural practices and academic institutions are finding deep value in collaborating on architectural research. We look to your professional programs to best prepare students for our future practice.
Student Researchers

In our first three years developing the program, the majority of students have been enrolled in the University of Minnesota's Master of Architecture (M.Arch) program, doing research internships for elective credit or paid research assistantships. Some of these M.Arch students can complete a concurrent degree in the Master of Science in Architecture, Research Practices. Students who complete their professional degree in another institution matriculate into the University of Minnesota as Masters-only students with the central requirement to complete the research internship. Regardless of their paths, students who succeed in the program are strong leaders, self-directed, and resourceful. This program provides a structured path to licensure, often fulfilling conventional internship categories with high-level, research-oriented work. Graduates accelerate their path to leadership positions by demonstrating leadership capacity while still in school—bridging academic and professional agendas in the context of their particular research projects. Unlike in typical internships, students in MS-RP research internships are well networked within the firms, regularly interfacing with firm leaders, faculty, consultants, and specialists and giving high-profile presentations to internal office audiences and to the wider practice community.
Will Adams
Spring 2014
Project: Virtual Reality and Construction: Investigating the Potential of Immersive Virtual Reality Technologies in the Operations of Mortenson Construction
Consortium Firm: Mortenson Construction
Firm Advisors: Ricardo Kahn, Taylor Cupp
Faculty Advisors: Andrea Johnson, Lee Anderson, Renee Cheng

I chose the MS-RP program at the University of Minnesota because I saw it as an opportunity to pursue research in a field I’m very interested in — immersive virtual reality — while engaging with a respected construction firm, Mortenson Construction. That I’d be able to accrue IDP hours at the same time was an added bonus. I also saw it as a way to differentiate myself from other M.Arch students and develop new research skills.

I didn’t anticipate, however, the impact the MS-RP would have on my career. The research I did in the program kindled an interest and expertise in virtual reality which I’m now pursuing professionally. It’s very exciting to be part of the budding virtual reality field, with so much new technology being released, new ways to think about virtual environments being opened up, and a lifetime’s worth of problems left to be solved.

I believe the MS-RP provides a valuable professional tool to students hoping to become architects or who would like to apply their architectural skills to another profession. Either way, it’s a great way to get unique, deep-dive professional experience in a focused area, an opportunity many young architects don’t have.

Jeremy Bernardy
Fall 2015
Project: Comparison of Two Clinic Planning Models: An Analysis of On-Stage/Off-Stage and Neighborhood Designs
Consortium Firm: AECOM
Faculty Advisor: Kathleen Harder

I decided to be a part of the MS-RP program for the opportunities that it afforded to continue the high intellectual energy found in the academic setting while advancing my career in professional practice. I saw this as an opportunity to become a leader in a prominent architecture firm, developing a skill set that I could only hope to obtain five or ten years into my career.

This program has advanced my understanding of research and how valuable it is for the designed world. I feel fortunate to have gained this experience, as it is not an opportunity that most new graduates receive in their first job. In the academic setting the trial and error process is highly encouraged, and as students we learn from these risks and rewards. In practice, however, this process is typically reserved for the more experienced team members.

The strength of the MS-RP program lies in the fact that it bridges the gap between practice and research in architecture by providing a setting that matches students with real architects and design issues. The work and experience you receive then becomes a practical complement to that of academics by challenging you to adapt what you have learned during a university education and your careers to seek out answers that advance the comprehension of present problems. Research plays the role of understanding how systems and processes work. This knowledge can then be applied to architecture by devising solutions that improve the health, safety, welfare, and costs for the future occupants of our buildings.
Philip Bussey
2012
Project: Energy Modeling Methodology
Consortium Firms: Meyer, Scherer & Rockcastle, LTD (MS&R)
Faculty Advisor: Marc Swackhamer

The MS-RP gave me the opportunity to take research on architectural acoustic surfaces that I was working on with a professor and apply it to a firm that had a number of ongoing performing arts projects. What was most appealing to me was the opportunity to “scale-up” the research from small installation and fabrication projects to large institutional projects within a large architecture practice.

The attention that the VarVac project got after graduation was a nice affirmation that this sort of work is important to the profession. That coupled with working on similar concepts in practice broadened my understanding of the role that an architect can have within a firm as well as within the allied disciplines. Between the research I was doing with Marc and HGA, there were elements of software development, fabrication, architectural design, and firm management. These topics continue to be of interest to me and influence the professional opportunities that I’ve chosen to pursue.

There are a lot of challenges to doing research in the context of an architectural practice with project deadlines often taking precedence over research. While the firm I work at now doesn’t have a dedicated research group, I find that I use the skills developed during my MS-RP partnership on a daily basis. I’m not writing detailed research reports anymore, but I’m developing new processes and tools to streamline the transfer of information from early design models directly into our documentation platform. Thus improving design concept fidelity and reducing the typical time spent in the process. Knowledge sharing and collaboration with the larger open-source community has been a huge part of the success of this effort and will continue to shape the development of it.

Pratibha Chauhan
2016
Faculty Advisor: Renee Cheng

Coming from a liberal arts background, I have always been interested in approaching problem-solving from an interdisciplinary point of view. As I applied to different graduate school programs, MS-RP at the University of Minnesota stood out because of its emphasis on addressing design and architecture-related issues through the lens of holistic research. The concurrent program of MS-RP and M.Arch allows students to combine graduate school learning with industry/practice-based experience simultaneously. To me, the unique opportunity to do research with firms that share my research interests was the decisive factor in choosing the University of Minnesota. Through the MS-RP program I am looking forward to exploring the complexity of architecture from angles that extend beyond the realm of design.

As a citizen of a developing country — India — I am really interested in cross-cultural solutions to problems that are global. In communities like mine, where architecture to this day is consciously used as a platform to perpetuate rigid caste and gender-based discrimination, I want to gain an in-depth understanding of architecture as an instrument that can catalyze positive changes through socially conscious design.
Jenna Johansson
2012
Project: Virtual Reality Report
Consortium Firms: HGA Architects and Engineers and Perkins+Will
Faculty Advisors: Lee Anderson and Renee Cheng

I participated in the pilot program for the MS-RP, firstly because trying new things and testing new ideas is exciting for me - being a part of the evolution of education was a prospect I didn't want to miss. I also knew this would be a great way to research relevant topics in the industry while getting a good start as an intern at a very reputable firm in the city, not only for myself, but for future students who would come through the program if the pilot was a success. The program challenged me as a student to ask questions, something that I continue to do everyday in my work as well as about my firm’s internal practice and about the field as a whole. The MS-RP, prepares aspiring architects for research in practice by allowing and facilitating work, studio, and research to happen concurrently. Learning to balance multiple things at a time is a critical skill to have because it is what we face as professionals every day. Offering this opportunity as a track in the educational system allows students to begin practicing the skills required to be successful at making the balance work. While most projects require some quantity of research, many conditions cut short the available time or resources to conduct the research - this program teaches the skills to research effectively making research a second nature part of one’s process in design, in turn making them a valuable asset to any firm.

Amy Ennen
Fall 2013
Project: Project Delivery Toward the Future
Consortium Firms: Mortenson Construction, DLR Group
Faculty Advisors: Renee Cheng and Andrea Johnson

I decided to participate in a consortium research project because of the research topic and the academic leadership involved. The idea of understanding a system, in depth, also appealed to me. The MS-RP program gave me the opportunity to work with academic and industry thought leaders. It allowed me to dive deeply into an area of practice I would have otherwise only touched on in my coursework and allowed me to develop relationships and build my network external to my cohort. The program led me to develop more advanced data visualization techniques. It provided me the opportunity to contribute to a body of work that is nascent in comparison to other industry topics, taught me how to devise a research framework and select a methodology, and taught me how culled metrics from a literature review and build a survey around those metrics.

The program impacted me as a student and continues to impact my career. I was offered a salaried position within the firm, and I am on a forum that helped developed a formal place for research within the firm – to the extent of hiring a research and development leader. I have been tapped to help visualize big data, which makes the data more approachable for clients. I have been asked to prepare market research analyses in emerging markets, which is different from the consortium research, but has happened as a result of me being now known, within the firm, as a researcher.

Clients, end users, and producers of architecture have begun to understand how vital research is to improving our world. The improvements range from reductions in energy use to innovation in materials to decreasing healthcare costs. The idea is that sound research, when applied, can make a tremendous impact. The MS-RP gives aspiring architects the opportunity to conduct and apply research, in practice, with the support and resources of academia. This provides them with the skills and experience necessary to conduct and apply research confidently in their careers as they forge ahead. The MS-RP also proves that the connection between academia and practice, with research as the catalyst, should remain in place. It is a super productive exchange.
Kaylyn Kirby
Spring 2014
Project: Material Sustainability: Evaluating the Environmental Impacts of Building Materials
Consortium Firm: MSR
Firm Advisors: Tom Meyer, Chris Wingate, Jack Poling, Rachelle Schoessler Lynn, Simona Fischer, Rhys MacPherson, MS&R
Faculty Advisor: Blaine Brownell

I chose to pursue the MS-RP program because it enabled me to engage with professionals, faculty, and fellow students through a unique research setting. I was able to drive the direction of the research to my interests, while incorporating the interests of the firm to produce a thought-provoking body of work.

The MS-RP program provided me the opportunity to be more than simply an intern in the office; I was the champion of the research endeavor and was placed on a level playing field with other colleagues. This experience gave me confidence both as a student and in my career to be able to take charge of a task or idea and move it forward.

I have proven able to tackle difficult analytical tasks and have thus been given opportunities not usually afforded to someone so early in their career. The skills, mindset, and confidence that I built while in the MS-RP program have positively affected my career. Research, analysis, and critical thinking are now part of my daily life.

Savannah Steele
2016
Faculty Advisor: Renee Cheng

I chose the MS-RP because it offers a richer pathway to attaining licensure than the conventional structure and I saw that the research that other MS-RP students were conducting was useful, compelling, and rigorous. I know I will gain a deeper understanding of the professional practice by examining mutual research concerns on a topic carefully chosen in collaboration with my faculty and industry advisors.

The MS-RP’s connection to a consortium of firms and partner organizations makes it unique. While other MS programs offer special knowledge, the MS-RP presents the opportunity to engage with a firm’s crucial research questions in real time. Through the MS-RP program, I’m looking forward to discovering the research agenda of my partner organization. I will be able to practice listening, develop my representational skills, and begin to identify creative solutions. Additionally I look forward to learning more about how builders, designers, engineers, users, and owners share and utilize information to create responses to spatial needs before, during, and after construction.

I’m curious about how to best leverage collaboration and communication in order to manage risks and effectively realize beautiful, high performing spaces. The MS-RP promotes a critical understanding the nuanced contexts that impact the design process; pursuing this concurrent degree is a fantastic way for me to develop a well-rounded understanding about how to conduct architectural research. While traditional internships do provide exposure to various settings, it will be rewarding to accrue IDP hours towards a series of investigations that are of direct concern to a firm.
The prospects of internship opportunities within top level firms, licensure upon graduation, and leadership roles in leading-edge architectural research are the reasons why the MS-RP program is so useful for an emerging professional. I enrolled in the program not only as a way to differentiate myself in the job market but also as a means to pursue niche areas of the field that my M.Arch did not allow me to. The approach of the program was both academic and professional in its goals and physical setting. This dual-pronged approach provided a venue to pursue research agendas with the resources of a land grant institution and those offered by the architectural firm.

This was a very powerful combination when posed with a complex research agenda straddling fields or requiring specialized tools/programs. The program is truly interdisciplinary in every sense of the word.

I was able accrue IDP hours both through my research and through professional work completed within the firm. Further, the program allowed me to move through the ARE tests with a wealth of academic and professional resources supporting me. I was able to access a range of study materials through the university library, engage professors and practitioners with questions about certain areas of the tests, and was able to study as part of my academic program. This structured, but flexible, environment for testing is a huge advantage for an emerging professional.

The MS-RP program opened doors that I didn’t know existed. Over the course of my two MS-RP research projects, I was able to speak at major architectural conferences and meet both practitioners and academics whom I never would have had the venue without this program. These are opportunities that “traditional” architectural internships, coursework, or entry level jobs, cannot expose you to. I am incredibly grateful for the existence of this program and the mentorship I received throughout. It has helped me immensely in reaching my goals of licensure and solidifying my areas of interest within the field of architectural research.

The MS-RP program presented an incredible opportunity to gain work experience in the region’s top architectural firms while developing research that pushed the profession forward. The MS-RP program helped launch the trajectory of my career. I was paired with MSR to develop an energy modeling methodology, an opportunity that was a perfect mirror of my interests – I was passionate about sustainable design and wanted to work for MSR after graduation because of their expertise in adaptive reuse projects. The MS-RP program got me in the door at MSR, but I quickly realized that the program was so much more than just an internship opportunity. Because I was developing new knowledge that was important for the firm, I worked directly with firm leadership to shape the trajectory of my research from my first day in the office.

A unique aspect of the MS-RP program is that it helps students develop research skills while teaching them how to operate in a professional working environment. As I was learning cutting-edge energy analysis software, I was also learning how to prepare for, lead, and document weekly meetings with my in-office research steering committee. I would present updates on the tools and processes I was developing, and they would provide feedback on how it could fit within the constraints of practice, including schedules, budgets, and traditional ways of working. I was exposed to the realities of architectural practice at the same time that I was trying to push its boundaries. This helped move my research from a purely academic pursuit to research that could be applied directly in the profession.

I was hired by MSR after completion of the MS-RP research project as a designer and research coordinator. I now work with current MS-RP students from the other side of the table and am responsible for helping shape the trajectory and implementation of our research efforts. The MS-RP program has also opened other doors within the profession including continued research efforts with the University of Minnesota and presentation opportunities at major conferences. I am grateful for the positive impact the MS-RP program has had on my career and for the opportunity to remain involved with the valuable program as it develops current students into the future leaders of our profession.
Faculty advisors connect students with a national network of academic researchers and provide contextual information about existing research relevant to students’ projects. Faculty bring a range of approaches to their advisor roles. Most are matched with projects based on their research expertise, some propose projects that directly advance their research, and others are brought in through their relationships with the firms and then shape the projects according to their expertise. Many projects result in publications, conference presentations, and grant proposals. Faculty advisors tend to be licensed architects, but there is ample room for non-licensed faculty in architecture and other fields to participate. We have also benefited from our strong connections within the College of Design and with the larger university.
Renee Cheng, AIA, M.Arch

— Emerging technologies (BIM, Digital Fabrication, Lean Processes) and their effect on the practice of architecture
— Application of Virtual Reality in architectural design processes and user feedback
— Integrated project delivery and related collaborative methods

While I direct the program and have some involvement with all of the projects, I appreciate the chance to serve as faculty advisor on projects that relate to my research interests. The opportunity to work directly with firm leaders and students provides me perspective that is often quite different from an academic point of view.

I've been advisor on one of the longest-running research projects, supporting three students over the course of five semesters. Their work will significantly advance the industry's understanding of project delivery and team dynamics. Most research takes a snapshot of a project team but our research is more like a "live lab," tracking about two dozen projects with bi-weekly surveys and interviews to understand the teams' shifting dynamics.

A lot of attention has been paid to the fact that, for qualified students, the program leads to licensure upon graduation. However, I believe the most remarkable parts of the program are the shift to a research culture and the chance for the students to demonstrate leadership—along the way, the students reach licensure.

Lee Anderson, B.Arch

— Virtual reality
— Digital representation

The MS-RP program was an opportunity for my virtual reality research to connect with several industry partners, including Mortensen Construction and HGA architects. Mortensen's focus on virtual design and construction was a good match for the virtual reality applications I have been developing in the Virtual Reality Design Lab. We also had the opportunity to explore prototypes of patient rooms in healthcare settings by linking Jenna Johansson's pilot research practices internship with one of HGA's active hospital projects.

The Virtual Reality Design Lab is part of a research center, the Digital Design Center, collaboratively run by the Departments of Computer Science and Architecture. Unique in the international context of virtual reality research, the lab focuses on virtual reality tools appropriate to the design and construction industry. The research practices internship capitalized on several decades of my research into the perception of users experiencing virtual reality, including the sophisticated hardware and software developed with funding and investments by the University of Minnesota, private donors, and peer-reviewed grant funding. The internships came at a time when we needed to explore the potential for the virtual reality tools and processes in direct partnership with members of the building industry. The internships built relationships with critically important industry partners, led to several presentations and additional funded research projects, and helped guide my own research directions in bringing the Virtual Reality Design Lab to where it is today.
I recently joined the MS-RP program and am excited by the opportunity to collaborate with students and practitioners on research issues that inform real-life design practices. The MS-RP forms a much-needed bridge between academia and industry at the graduate level and impacts the community in important ways.

As an educator, architect, and interior designer, I bring to the program my scholarly interests in cross-cultural design, sustainability, African architecture, and globalization and design. I also hope to contribute through my work in architectural lighting design, computing and design, and post-occupancy evaluation. I also have strengths in theories and research methodologies from my interdisciplinary Ph.D. in Instructional Psychology and Technology, Anthropology and History. The MS-RP program will bring collaborations with students and industry practitioners on research projects in the community, allowing me to focus on research that informs design practice and bring in interdisciplinary perspectives.

I am currently advising a graduate student on the pre and post occupancy evaluation of a workplace. The process has given me insight into how design firms can work with clients, applying research methodologies that I teach in my classes. Working with the student researcher and the professionals in the firm, we can collaboratively blend our expertise to create a robust set of research questions and apply methodologies to find answers to issues in real-life.
Richard Graves, M.Arch
— Resilient systems
— Resilient communities
— Living building

The MS-RP is a great opportunity for me to advise graduate students in the exploration and research of a project that intersects with the interests of local practitioners.

Through the MS-RP program, I worked with Jacob Cherry and Mortenson Construction to advise a project that considered emerging risks in performance-based contracts. At the Center for Sustainable Building Research, we are researching the advantages of performance-based contracts for our work with state-funded projects in Minnesota. The work with MS-RP allowed me to have a student do a complete literature review on the relatively new use of performance-based clauses in construction contracts and to consider the experiences of a large construction company.

I strongly believe in the value of how the MS-RP bridges the gap between academic research in architecture and practice by exposing students to the work and interests of firms and companies working in the built environment and by integrating companies into students’ education and research.

John Comazzi, AIA, MS, M.Arch
— Architecture photography
— Design pedagogy and representation
— New forms of critical urbanism
— Active learning environments

The MS-RP has offered me the unique opportunity to advance my research and design interests in the area of active learning environments for PK-12 education. By collaborating with professional practitioners and school districts that are designing and implementing innovative classroom designs, I have been able to engage more directly with experimental projects that have immediate consequences for my research and scholarship.

Through the MS-RP program, I was able to apply prior research assessing the relationship between active learning environments and design-based curricula in an elementary school that was shifting from traditional models of instruction to a more active, collaborative model. This shift required new spaces and furniture to meet the needs of students and teachers alike, and our team of graduate architecture students helped the school and its architects analyze the patterns of use taking place in their recently renovated “learning studios.” As a result, the teachers were able to reflect critically on their uses and programming of the new, more flexible learning studios. The administration had concrete scenarios to help communicate the effectiveness of the redesigned spaces with parents and the district school board. It was clear from this project (conducted over three semesters) that the MS-RP program has helped to bridge barriers that are all too common between academia, professional practice, and community partners.

The importance of the MS-RP program at University of Minnesota lies in the fact that the unique, collaborative model that it employs has opened up new avenues for learning, teaching, and practicing design and is demonstrating the importance of applied research to advancing the discipline of architecture.
Andrea J. Johnson, AIA, M.Arch, LEED
— Architecture, poetics, arts
— Innovative practice
— Building enclosure
— Urbanism

The MS-RP program is unique in putting the reins in students’ hands to drive innovation in practice through research while enabling them to quickly cover ground in understanding the fuller picture of the profession. As a faculty advisor, I have had the opportunity to leverage my experience in large-scale practice to guide research that interrogates the status quo and proposes new approaches and methods for how we work in the building industry. By providing ongoing mentorship for students to successfully complete their Intern Development Program (IDP) and Architectural Registration Examinations (ARE), I have been keenly aware of how getting a head start on licensure has bolstered graduates to emerge as young leaders in their firms. Through my involvement in the program, my own research and teaching have also been strengthened, most importantly by improving methods of inquiry that connect multiple kinds of knowledge and expertise in a dynamic and positive process.

Holistically, I see the core value of the MS-RP program as connecting students, faculty, and practitioners with each other and with the shared goal of improving what architects bring to the world. In the projects on which I served as faculty advisor, I’ve seen a range of topics and goals, including the use of wood as structure in larger-scale buildings of multiple types, developing a new methodology for firms to incorporate materials in building designs that lie outside mainstream use, measuring specific benefits of using virtual reality in communicating a designed space, and gathering information to understand what ingredients and recipes lead to successful built projects. Through this work, we are not only building knowledge and skills, we are building community within our industry.

Kathleen A. Harder, PhD
— Design and health issues
— Human Factors

My involvement as a faculty advisor in the MS-RP program offers the opportunity to interact with students and architectural firms on research questions of pragmatic interest to us as a team. It is a meaningful experience to “shepherd” students in hands-on learning of various research methods in situ, and it is rewarding to witness their development as they become more comfortable and conversant in data-collection methods new to them. It is equally rewarding to collaborate with team members from architecture firms who are at the front lines of designing spaces that our research could impact.

I was invited to participate because my research experience and content expertise are a good fit with the interests of certain architecture firms that participate in the consortium. Our weekly meetings help to foster teamwork and productive collaboration as we formulate and tackle the research together. Our collaboration will yield findings that will benefit the field.

The MS-RP program offers a rich opportunity for aspiring architects to work as interns at architecture firms and simultaneously benefit from faculty mentorship. The program gives architecture students a more informed understanding of the complexity of research and an appreciation for the valuable role that research can and should play in informing practice.
Participating in the MS-RP program has given me the opportunity to work with both students and professionals on a variety of emerging issues within the field of architecture. The research that has been produced will contribute to advancing the discipline in substantive ways. My work with MS-RP students and firms has dealt with aspects of public interest design, energy, and resilience, each of which relates to my expertise in sustainability, building technology, and social impact architecture. It has been gratifying to see much of the research meaningfully find its way into active projects within the participating firms. Working alongside dozens of innovators within the architecture, engineering, and construction (AEC) community has sharpened my view of the topics that I believe will shape the trajectory of the profession in this century.

The MS-RP program provides an opportunity to develop an ongoing dialog with some of the most progressive AEC firms in the region. These partnerships give students and faculty members alike an opportunity to collaborate with professionals in exploring issues on the leading edge of design.

The MS-RP post-professional degree in the School of Architecture at the University of Minnesota is unique because it is one of the very few programs in the country that offers a means for students to gain firsthand experience in conducting research that will substantially contribute to shaping the future of the built environment. This innovative partnership between academia and the profession relies on emerging professionals as the critical link between the two realms, a unique structure that benefits all of us.

I first participated in the MS-RP program as a faculty member, and now I support it in my role as Head of the School of Architecture. I found this program to be a great opportunity to work with firms as a collaborator and now see it as a national model.

My MS-RP involvement began with my interest vacuum-formed plastics and the potential for organically shaped surfaces to perform acoustically. My research assistant, Phil Bussey, and I developed a project for the front office of the School of Architecture, a panel system we called VarVac Wall. It received national recognition, winning the Architect Magazine R+D Award and Core77 design award. HGA, a consortium partner, wanted to extend our research and apply it to the acoustic strategies in two performance spaces in the Twin Cities, Ordway Theater and Northrup Auditorium.

Phil, now a student in the MS-RP program, worked with architects and consulting acousticians at HGA to develop a digital parametric interface that was both easy to use and an effective indicator of acoustic performance. His research suggested that a designer could quickly and intuitively understand the acoustic consequences and opportunities of his or her design decisions and could create wall surfaces that could be inexpensively prototyped at full scale to help designers understand how the spaces are experienced by occupants. This combination of quick, effective exploration in a digital environment with inexpensive, full-scale exploration in a physical environment was a valuable contribution to HGA’s practice, my own research, and architectural acoustics more broadly.
Master of Science in Architecture—Research Practices (MS-RP) leads the country by modeling a structured path to licensure. It is the first (and at this time, only) degree program that, for qualified students, leads to licensure upon graduation. Along the way, we make sure they get the hours and take the exams to meet licensure requirements. The degree offers a path to leadership and prepares students to shape a robust research culture that will transform the building industry.

Students enrolled in the Master of Architecture (M.Arch) program at the University of Minnesota are eligible to undertake a concurrent degree with the MS-RP. Overlapping course requirements make it possible for M.Arch students to earn an additional degree, a Master of Science, after completing two additional semesters. Those who have earned a professional degree (Bachelor of Architecture or Master of Architecture) from another school are eligible to take the MS-RP as a stand-alone post-professional degree as a three semester sequence. Regardless of path, paid internship hours during the program are approximately equal to a student’s tuition and fees, making the post-professional degree effectively debt-free.
Overview

Who should apply?
The MS-RP program admits candidates who have a previous professional degree (B.Arch or M.Arch), or for current UMN students working towards their M.Arch degree. Ideal candidates for the program will have completed at least half of the required IDP hours (approximately 2,800 hours) and have strong design skills, organizational abilities and interest in developing leadership capacity.

Research

The MS-RP incorporates a new experience that we are calling a “research practice internship”. The student is working within a larger consortium of firms and the University that establishes multi-year consortium-wide goals and links faculty advisors with professional mentors to the students. The consortium relationship creates a robust knowledge loop between the profession and academy. This in turn establishes meaningful internships for students that combine funded research as student assistants supervised by faculty with office-based internships paid by the firms – qualifying for the all important “Experience Setting A” as defined in IDP. By integrating the two experiences for the student, academic research is applied on actual projects and information is gathered in a way that allows for consistent methods. The results of this work build a rigorous database to share within the consortium providing the student with context for their work, understanding their project as one component in a strong bridge between school and profession.

Goals

The program’s goals include full integration of education, practice, and research, high quality education and practice experience with reduced time to licensure, and create a seamless relationship between education, internship, examination, and continued professional development. It will achieve these goals by providing students/interns with:

— A structured path to internship, examination, and licensure
— A role in the profession creating conduits for knowledge exchange
— Develop valued capacity for (future-oriented) practice-based research

Program Features

Integrated Research Practices Curriculum
In addition to the coursework, the program includes an integrated curriculum, which includes a variety of educational opportunities and initiatives. The program encourages students to expand their education by participating in special lectures and events, professional practice, and research. The integrated curriculum includes: The MS-RP curriculum, a forum for M.S. students, related lectures and events, and research opportunities at the College of Design.

Research Internships/Practice Internships
MS-RP candidates are eligible for a funded one- or two-semester internship with local architecture firms, design firms, or construction companies. Internship candidates work with faculty, researchers, industry representatives, and practitioners. Typical projects investigate Integrated Project Delivery (IPD), Building Information Modeling practices, emerging construction technologies, professional practice, and computing technologies.

Intern Development Program (IDP)
The MS-RP program has been approved as a post-professional advanced degree by the National Council of Architectural Registration Boards (NCARB). MS-RP students who successfully complete the program after earning a National Architectural Accrediting Board (NAAB) or Canadian Architectural Certification Board (CACB)-accredited professional degree in architecture qualify for 930 elective hours of IDP (Experience Setting S: Supplemental Experience). Advanced degrees must be submitted to NCARB in compliance with the reporting requirements.

Practicum
Practica courses directly address topics in the Architect Registration Examination® (ARE®).

ARE exam sections are incorporated into coursework and MS-RP candidates are expected to attempt all sections of the ARE during their program.

Benefits and value of the program

Consortium Member

Benefits
— answer relevant research questions that are beyond the time and capacity of firms
— access to faculty expertise and faculty research
— access to highly qualified students matched to individual firm
— access to consortium database exclusive to members
— access to research results presented at exclusive consortium meetings
— citations in publications
— 6 hours per year of Continuing Education / AIA Learning Units (LU)

Values
— research capacity within the firm is expanded
— research results apply to projects with direct benefit to clients
— connection to University can lead to consultation, collaborative grants or projects
— eligibility for collaborative grants requiring full-time academic participants
— connection to University has marketing value, plus promotion by University
— collaboratively built database broadens and deepens expertise

Student

Benefits
— 225 hrs* of IDP in experience setting A or O during academic year (Practice Internship)
— 150 hrs* of IDP in experience setting S per academic year (Research Internship)
— 600 hrs* of IDP in experience setting A or O per summer
— 930 hrs* of IDP in experience setting S for advanced degree
— Stipend and salary similar to Research Assistant position stipend and tuition reduction
— Fellowship opportunities exclusive to MS-RP including tuition, ARE® fees, etc.
— ARE instruction customized for MS-RP, sections taken in structured cohort

Values
— potential to complete IDP and ARE® and reduce time to licensure
— relationship with faculty members’ research
— high quality office experience in a challenging job market
— opportunities for leadership, substantively contributing to firm and to consortium

*students’ individual hours may vary
### Faculty

**Renee Cheng, AIA**  
Professor and Associate Dean of Research; Director, Master of Science in Architecture, Research Practices concentration and Consortium for Research Practices  
B.A., Harvard College; M.Arch, Harvard University

**Lee Anderson**  
Associate Professor  
B.A., Sophia University in Tokyo; M.Arch, University of Minnesota

**Abimbola Asojo, AIA, IDEC, LEED AP**  
Professor Interior Design Program; Director, Interior Design Program  
PhD, University of Oklahoma

**Blaine E. Browne, AIA, LEED AP**  
Associate Professor and Director, Master of Architecture Program; Director of Graduate Studies  
B.A., Princeton University; M.Arch, Rice University

**John Comazzi, AIA**  
Associate Professor of Architecture; Affiliate Faculty in Landscape Architecture  
B.A., University of Virginia; M.Arch, University of Michigan

**Richard Graves**  
Associate Professor and Director of the Center for Sustainable Building Research  
B.A., Virginia Polytechnic Institute and State University; M.Arch, Rice University

**Kathleen A. Harder**  
Director of the Center for Design in Health  
Ph.D., Cognitive Psychology, Dartmouth College

**Andrea Johnson, AIA, LEED AP**  
Assistant Professor; Principal, Andrea J. Johnson Architect  
B.A., Stanford University; M.Arch, Columbia University

**Jim Lutz, AIA**  
Lecturer, Co-Director MS Sustainable Design Program; IDP Educator Coordinator  
B.A., University of California, Berkeley; M.Arch Syracuse University

**Marc Swackhamer**  
Associate Professor and Head of School  
B.A., University of Cincinnati; M.Arch, Rice University

### Curriculum

The MS-RP Concentration requires a total of 30-36 credits, typically completed in one academic year. Due to the intensely integrated nature of the MS-RP the majority of the curriculum is composed of required courses and internship experiences. The range of 30-36 credits is used in the rare circumstance that a stipend-based internship is not available.

Students who enter the MS-RP may enroll in the program for only the M.S. degree or combine it with the M.Arch degree. Listed here are example schedules that outline possible course sequences for students in either option. The typical M.S.-Only curriculum is shown on this page. Two methods of combining degrees — with the 2-year or 3-year M.Arch. — are shown on the adjacent pages.

#### M.S.-Only Degree Path

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
</tr>
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<tbody>
<tr>
<td><strong>Research</strong></td>
<td>Building Stories</td>
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<td>3 cr.</td>
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<tr>
<td><strong>Practicum</strong></td>
<td>Practicum</td>
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<tr>
<td>3 cr.</td>
<td>3 cr.</td>
</tr>
<tr>
<td><strong>Professional Practice</strong></td>
<td>Final Project</td>
</tr>
<tr>
<td>3 cr.</td>
<td>4 cr.</td>
</tr>
<tr>
<td><strong>Elective</strong></td>
<td>Research Internship</td>
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<tr>
<td>3 cr.</td>
<td>10 hr/wk</td>
</tr>
<tr>
<td><strong>Professional Practice</strong></td>
<td>Professional Internship</td>
</tr>
<tr>
<td>3 cr.</td>
<td>15 hr/wk</td>
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</tbody>
</table>

#### Year One

- **Catalyst** 1 cr.
- **GDII Studio** 9 cr.
- **Tech 3+4** 4 cr.
- **Module** 4 cr.
- **Module** 4 cr.
- **Catalyst** 3 cr.
- **History** 3 cr.
- **Theory** 3 cr.
- **Elective (in Architecture)** 3 cr.

#### Year Two

- **Research** 3 cr.
- **Final Project** 5 cr.
- **Research Internship** 10 hr/wk
- **Professional Internship** 15 hr/wk
- **Elective (outside Architecture)** 3 cr.
- **Elective (in Architecture)** 3 cr.
- **Elective (in Architecture)** 3 cr.
- **Master’s Final Project** 10 cr.

#### Year Three

- **Research** 3 cr.
- **Practicum** 3 cr.
- **Final Project** 4 cr.
- **Research Internship** 10 hr/wk
- **Professional Internship** 15 hr/wk
- **Elective (outside Architecture)** 3 cr.
- **Master’s Final Project** 10 cr.
- **Elective (in Architecture)** 3 cr.
- **Elective (in Architecture)** 3 cr.
- **Elective (outside Architecture)** 3 cr.
- **Elective (in Architecture)** 3 cr.
- **Master’s Final Project** 10 cr.

#### Year Four

- **Research** 3 cr.
- **Practicum** 3 cr.
- **Final Project** 4 cr.
- **Research Internship** 10 hr/wk
- **Professional Internship** 15 hr/wk
- **Elective (outside Architecture)** 3 cr.
- **Master’s Final Project** 10 cr.
### 2-year M.Arch + M.S.

<table>
<thead>
<tr>
<th>Year One</th>
<th>Year Two</th>
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</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>GDII Studio</td>
<td>Module</td>
</tr>
<tr>
<td>Professional Practice</td>
<td>Module</td>
</tr>
<tr>
<td>Tech 3+4</td>
<td>Elective</td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>GDII Studio</td>
<td>Module</td>
</tr>
<tr>
<td>Master’s Final Project</td>
<td>Module</td>
</tr>
<tr>
<td>Tech 5</td>
<td>Elective (outside Architecture)</td>
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<tr>
<td>Elective (in Architecture)</td>
<td>Elective (outside Architecture)</td>
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<td>Elective (in Architecture)</td>
<td>Elective</td>
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<table>
<thead>
<tr>
<th>Year Three</th>
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</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
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<tr>
<td>Research</td>
<td>Practicum</td>
</tr>
<tr>
<td>Practicum</td>
<td>Final Project</td>
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<tr>
<td>Final Project</td>
<td>Research Internship</td>
</tr>
<tr>
<td>Research Internship</td>
<td>10 hr/wk</td>
</tr>
<tr>
<td>Professional Internship</td>
<td>15 hr/wk</td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>Research</td>
<td>Practicum</td>
</tr>
<tr>
<td>Practicum</td>
<td>Final Project</td>
</tr>
<tr>
<td>Final Project</td>
<td>Research Internship</td>
</tr>
<tr>
<td>Research Internship</td>
<td>10 hr/wk</td>
</tr>
<tr>
<td>Professional Internship</td>
<td>15 hr/wk</td>
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</tbody>
</table>

### 3-year M.Arch + M.S.

<table>
<thead>
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<th>Year One</th>
<th>Year Two</th>
<th>Year Three</th>
<th>Year Four</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>GDII Studio</td>
<td>Module</td>
<td>Module</td>
<td>Module</td>
</tr>
<tr>
<td>History</td>
<td>Module</td>
<td>Module</td>
<td>Module</td>
</tr>
<tr>
<td>Tech 1+2</td>
<td>Elective (outside Architecture)</td>
<td>Elective (outside Architecture)</td>
<td>Elective</td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>GDII Studio</td>
<td>Module</td>
<td>Module</td>
<td>Module</td>
</tr>
<tr>
<td>Master’s Final Project</td>
<td>Module</td>
<td>Module</td>
<td>Module</td>
</tr>
<tr>
<td>Tech 5</td>
<td>Elective (outside Architecture)</td>
<td>Elective (outside Architecture)</td>
<td>Elective</td>
</tr>
<tr>
<td>Elective (in Architecture)</td>
<td>Elective (outside Architecture)</td>
<td>Elective</td>
<td>Elective</td>
</tr>
</tbody>
</table>

For B.S. undergraduate degree:
- Year One:
  - Fall: GDII Studio 9 cr.
  - Spring: Module 4 cr.

For Non-B.S. or non-architecture undergraduate degree:
- Year One:
  - Fall: GDII Studio 9 cr.
  - Spring: Module 4 cr.
- Year Two:
  - Fall: GDII Studio 9 cr.
  - Spring: Module 4 cr.
  - History 3 cr.
  - Tech 1+2 4 cr.
- Year Three:
  - Fall: GDII Studio 9 cr.
  - Spring: Module 4 cr.
  - Master’s Final Project 10 cr.
  - Tech 5 3 cr.
  - Elective (outside Architecture) 3 cr.
  - Elective (in Architecture) 3 cr.
- Year Four:
  - Fall: GDII Studio 9 cr.
  - Spring: Module 4 cr.
  - Final Project 5 cr.
  - Research Internship 10 hr/wk
  - Professional Internship 15 hr/wk
  - Practicum 3 cr.
  - Final Project 4 cr.
  - Research Internship 10 hr/wk
  - Professional Internship 15 hr/wk
“Fast Track: University of Minnesota Program to Halve the Time to Get Licensed”
—Chris Bently, February 2014
The one-year MS-RP program aims to help B.Arch or M.Arch graduates achieve licensure within six months of graduation, potentially receiving their diploma and license at the same ceremony. Students in the University of Minnesota’s program spend 25 hours per week in a research practice internship based out of a local architecture office, in addition to completing coursework in research methods and analysis. The firms pay students for 15 hours per week, while the university provides research assistance for the other 10, in the form of tuition breaks and stipends.

“Year One of the University of Minnesota School of Architecture Graduate Program to Streamline the Licensure Process”
—Wanda Lau, October 22, 2013
Anything we can do to expedite the speed with which people can get licensed is a good thing,” says David Cronrath, AIA, Dean of the University of Maryland’s School of Architecture, Planning and Preservation. “What Renee [Cheng, Professor, former Head of the University of Minnesota’s School of Architecture, and Associate Dean for Research at Minnesota’s College of Design,] has done is establish a roadmap which a lot of people can follow. And, I think, of course they will.”

“New U of M master’s aims to speed path to architecture jobs, licensure”
—Matt M. Johnson, February 26, 2013
MSR [principal Thomas Meyer] says that working with the U of M’s research practices students is changing his perspective on new hires. “It’s not like just hiring another student,” he said. “To have somebody to do research at a reasonable price is a great opportunity.”

“NCARB Suppoorts Faster Path to Licensure”
—Lama Anderson, June 5, 2014
“[T]he MS-RP program has garnered much attention from architecture students, professionals, other higher educational institutions, the AIA, and NCARB itself...”

Also featured in: Architecture Minnesota; Architect; Design Intelligence; dezeen magazine; Evollution; Journal of Architectural Education; Perkins + Will Research Journal
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- Master of Architecture
- M.S. in Architecture — Sustainable Design
- M.S. in Architecture — Heritage Preservation
- M.S. in Architecture — Metropolitan Design
- M.S. in Architecture — Research Practices

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