

**Solicitation
for
Dennis R. Mertz Bridge Research Fellowship Applications for 2021**

The **Precast/Prestressed Concrete Institute** is pleased to announce the solicitation for applications under the Dennis R. Mertz Bridge Research Fellowship program for the 2021-2022 academic year. This fellowship award of up to \$40,000 is intended to engage the interest of an engineering student in the precast concrete bridge industry while providing valuable research experience to the student and PCI.

Students are invited to submit one application for the Mertz Fellowship program. Faculty are invited to submit multiple applications if advising more than one student. If the proposed research is part of a larger research project, the scope of work under the Mertz Fellowship must be clearly delineated. Completion of the proposed research program should not be contingent upon any subsequent approval of funding for related research.

Attached are three documents regarding the Mertz Fellowship program:

1. The fellowship program rules from the PCI Research and Development Council.
2. An example Review and Rating form used by the PCI Transportation Activities Council and PCI Research and Development Council to evaluate applications. Please note the weighting of the five evaluation criteria.
3. A PCI research needs list summarizing topics of interest to the industry. This list is provided for guidance on topics of interest; applications need not be limited to these topics.

Of significance is the relevancy of the proposed research to improving the state of the art of precast, prestressed concrete bridge design, fabrication, materials, or construction. As shown in the research needs, projects need not be limited to structural components or materials testing. However, the research must be primarily related to precast, prestressed concrete bridges. Innovative ideas to improve design, fabrication or erection are viewed very positively. In parallel is the potential for market impact of the research.

Please note the importance of industry support in the review criteria. The intent is for applicants to solicit support from one or more precast producer members of PCI for their proposed research program. See the fellowship program rules for additional information. Though not weighted the highest, final award deliberations will be significantly influenced by industry support. It is further suggested that a visit to a precast concrete plant to gather potential research topics would be helpful and potentially provide for a more relevant proposal. If any assistance is required in locating a potential industry partner, please use the contact information below.

The application shall include the following information:

1. Title page with the names of the university and the research team including all contact information and signatures of the advising professor and department chair.
2. Description of the proposed research program (3 pages maximum).
3. Time and cost schedule, including any additional support.
4. Brief résumé of the faculty advisor (2 pages maximum).
5. Brief statement by student candidate describing personal objectives and interest in the subject of the proposed research (1 page maximum).
6. Evidence of precast industry support.

Applications are due at PCI headquarters no later than **August 16, 2021**. Please submit electronically to:

technical@pci.org

PCI is a non-profit organization and the fellowship funded under this program by the Institute does not cover indirect overhead costs. Therefore, the fellowship award of up to \$40,000 should be exclusively used for supporting a graduate student and the research and should not include any indirect costs.

The PCI Research and Development Council will meet in September to select the awards. Awardees will be notified in October with funding provided by December 31, 2021.

We are excited to be able to continue this program and encourage your participation.

Very truly yours,



Greg Force
Chair
PCI Research and Development Council

cc: PCI Research and Development Council
PCI Staff Managers
PCI Regional Directors

Dennis R. Mertz Bridge Research Fellowship

Goal: To engage the interest of young engineering students in the precast concrete bridge industry while providing a research experience of value to both the student and PCI.

Rules:

Eligibility: The fellowship program is open to any university in North America with the facilities to conduct structural research. Students may be PhD candidates, but Masters students are preferred. Competition is restricted to North America to ensure interaction with one or more PCI Producer members in the development and execution of the project.

Grant: The amount of the fellowship will be established by the PCI Research and Development Council as part of the budgeting process. The funds will be provided to the advising professor with the stipulation that they are an unrestricted grant and, therefore, no university overhead may be taken from the funds. All funds are to be used in support of the student and the project.

Solicitation: A solicitation shall be distributed by PCI staff in July of each year with a due date for applications established to allow six weeks for council review prior to the fall meeting of the council. The solicitation shall include a listing of research topics identified as being high priority for the institute.

Applications: Applications shall be submitted electronically no later than the due date established in the solicitation. Applications submitted after the due date will not be considered. Application shall include the following minimum information:

1. Title page with the names of the university and the research team including all contact information and signatures of the advising professor and department chair.
2. Description of the proposed research program (3 pages maximum).
3. Time and cost schedule, including any additional support.
4. Brief résumé of the faculty advisor (2 pages maximum)
5. Brief statement by student candidate describing personal objectives and interest in the subject of the proposed research (1 page maximum).
6. Evidence of precast industry support.

Project: It is intended that the project would be relevant to design, materials, or construction of precast concrete bridges. Where the proposed project is part of a larger project, the work proposed for fellowship funding shall be clearly identified. Applications that are contingent on approval of other funding will be rejected.

Industry support: Applicants are encouraged to solicit support for the proposed project from members of PCI. Support requested could range from a letter endorsing the project to financial participation. Letters of support must address the merits of the proposal. Specifically, the letters must address why the problem is of interest to PCI or the precast concrete industry and how this proposal will address that problem. If possible, the industry support letters should state why the approach has a reasonable chance of success. Industry support letters which simply support the researcher, the student or the University and do not address the merits of the proposal will not be considered.

Evaluation: The PCI Transportation Activities Council and the PCI Research and Development Council will be expected to evaluate submitted applications. Evaluation criteria shall include relevancy, market impact, research capability, supplemental support, and overall quality. PCI Producer support is highly desirable. Evaluation criteria and scoring may be modified each year by the council, but evaluation criteria shall be distributed with the Mertz Research Fellowship solicitation.

Award: The Transportation Activities Council shall submit a recommendation to the Research and Development Council for award. A simple majority vote of attending Research and Development Council members (assuming a quorum is present) will be required to approve an award. Awarded funds shall be distributed approximately by December 1.

Advisory Committee: At the time of selection, an advisory committee shall be appointed to monitor and provide guidance to the project. The chair of the advisory committee shall be a research council member but the advisory committee can be composed of any PCI members with interest or expertise in the subject of the project and will especially include members representing transportation.

Deliverables: Because the fellowship funds are provided as an unrestricted grant, no deliverables can be required of the recipient. PCI shall request a copy of the final student report or thesis and shall encourage the student and professor to publish a summary paper in the PCI Journal. The professor and student will also be invited to present updates and final results at the education sessions at the annual PCI Convention.

DENNIS R. MERTZ BRIDGE RESEARCH FELLOWSHIP PROGRAM

Application Review and Rating Form

Project:	Weight	Rating	Score
Relevancy of Research: Is the research relevant to precast, prestressed concrete bridge design, fabrication, materials, or construction? Will the research contribute to the state-of-the-art or advance the usage?	5		
Potential Impact on Market: Is there potential for this research to improve current products or systems or provide thrust into new markets? Are there innovative features in the application?	4		
Research Capability: Is the faculty advisor experienced in precast, prestressed concrete research or the subject matter? Are there suitable facilities and equipment available? Has the graduate student been identified?	3		
Supplemental Support: Is there support from either a producer or the regional association? Is there support from the university or other funding agencies that contributes directly to the fellowship? (Support must be financial or tangible if rating is 3 or above. On analytical applications 3 or more support letters will count as support for ratings 3 or higher.)	4		
Overall Quality: Are the objective and scope clearly identified? Is there a research plan and a budget? Can the research plan be accomplished within the budget? Is the application well written?	4		
Total Score:			

Ratings:

Outstanding - 5 Very Good - 4 Good - 3 Fair - 2 Poor - 1 Not Provided - 0

Rank this application relative to the other applications (rank of 1 being best)	
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If the fellowship is part of a larger project being carried out for a sponsor other than PCI, that part must be clearly identified and the evaluation shall be made only with respect to the part that pertains to the fellowship.

PCI Transportation Research Needs List

June 2021

Category	Subject	Comments
Component Design	Shear strength in end regions of pretensioned bridge components	Address anchorage of longitudinal reinforcement (tension tie) for reliable shear strength.
	Release stresses in pretensioned members	Consider all sections where compression and tension must be considered. Increase allowable compressive stress from 0.6 to 0.7 or 0.75. Determine minimum concrete strength requirements at release of prestressing.
	Components that require more prestress than a plant can pull on beds/abutments	Methodology for strength and stresses for combined pretention (with strain compatibility) and unbonded post-tensioning (without strain compatibility)
	Use of high strength reinforcement for spirals in prestressed piles	Permit allowable yield strength of spirals to increase to 120 or 150 ksi.
	Effects of partial debonding of prestressing strands	Include consideration of lightweight concrete
	Detailing for durability	Girder to girder, girder to pier and girder to abutment recommended detailing to improve durability.
	UHPC Piling	Evaluate feasibility of pretensioned hollow UHPC pile, designed to be filled for in-service condition, as a durable alternative to steel pipe piles.
	Minimum spacing requirements for large prestressing strands	
	Post cracking shear strength of bridge girders using self-consolidating concrete	
	Headed deformed bars as shear reinforcement	
	Simplified connections of prestressed bridge girders to deck	

Category	Subject	Comments
Sustainability	Life-cycle costs for pretensioned concrete bridges	Limited information is available on life-cycle assessments for pretensioned concrete bridges. A comparison of life-cycle costs for pretensioned concrete bridges to other typical bridge systems, in particular simple- and short-span bridges is needed.
Materials	Cement replacement in concrete mixes	Investigate alternative cementitious materials or carbon sequestration materials to reduce embodied carbon in precast elements. Note that most precast elements require high-early strength concrete mixtures to facilitate prestress release or stripping and handling.
	Characteristics of SCC	Include creep, shrinkage, early age modulus and shear strength
	Provisions for concrete strengths less than PCI-UHPC	PCI-UHPC has a compressive strength of 17.4ksi (120MPa) along with flexural strength about 2ksi and other tensile property requirements. Determine procedures for concrete strengths that develop flexural strengths higher than conventional concrete, along with tensile ductility, but do not meet PCI-UHPC criteria.
	Rate of tensile strength gain vs compressive strength gain in lightweight concrete	This information would contribute to knowledge on early age strength of anchorage in concrete
	Delayed ettringite formation (DEF)	This research will evaluate the use of the “delta ettringite” testing method, which was developed as part of a PCI funded study in the late 1990’s. This proposed work will extend the scope to include measurements of concrete at later ages.
	Structural design guidelines for sand lightweight concrete	
Effects of elevated temperatures from fire on fiber reinforcement and FRP composites in precast concrete structural members		

Category	Subject	Comments
<p>Anchorage to Concrete</p>	<p>Effects of reinforcement in concrete anchorage breakout zones</p>	<p>Anchorage reinforcement is allowed in Chapter 17 of ACI 318, but the provisions are limited to direct transfer of shear and tension forces in the direction of the load and require development of the reinforcement on either side of the breakout surface. There is a need to develop resistance to side-face breakout using shear friction reinforcement with development achieved by longitudinal reinforcement inside the bends of ties or hairpins.</p>
	<p>Simplification of anchorage calculations</p>	<p>Combine with a study of lightweight vs normalweight concrete</p>