REQUEST FOR PROPOSALS

Double Tee Stem Dap Research Extension

Project:

This project is defined by the PCI Technical Activities Council and the PCI Research and Development Council as being a critical update to design and detailing procedures resulting from recent research on dapped ends in thin stem members. The complete description of the problem and the research objectives can be found in the attached Research Project Statement.

Proposer Qualifications:

The proposing agency shall have demonstrated experience in structural analysis, pretensioned concrete, structural concrete testing, and research project management. Facilities shall be available to conduct testing as described in the Research Project Statement.

Proposal Requirements:

The Proposal shall include identification of the agency, the Principal Investigator, and all staff and partners that will provide work to the Project including complete contact information. It shall further include a description of related experience and available testing facilities. The Proposal shall include a description of the proposed work plan to demonstrate an understanding of the subtleties of the problem and the path to achievement of the project objectives.

By Board resolution, PCI limits university indirect costs to 15 percent for funded projects. A sample PCI Research and Testing Agreement is attached and will be used as the contract form for the project. Any exceptions to terms of the agreement shall be noted in the proposal.

Proposals shall be submitted no later than 12:00pm Central Standard Time on January 6, 2020. The submittal shall be electronic in .pdf format. Submit to:

Roger Becker
Vice President Technical Services
Precast/Prestressed Concrete Institute
200 W Adams Street
Chicago, IL 60606
rbecker@pci.org

Proposal Review:

Proposals received by the stated deadline will be reviewed by an Industry Advisory Committee composed of representatives from the Research and Development Council. This group shall make a recommendation to the Research and Development Council for final project approval.
and proposer selection. PCI reserves the right to reject all proposals. It is anticipated that the final selection will be made by February 16, 2020.

**Payment Schedule:**

Payments to the successful agency shall be made according to the following schedule:

- 40% of lump sum cost upon notice to proceed
- 90% of lump sum cost upon delivery of draft final report
- 100% of lump sum cost upon acceptance of final deliverables and receipt of a paper submitted for publication in the PCI Journal.

**Attachments:**
Research Project Statement
Sample PCI Research and Testing Agreement
Research Project Statement
Double Tee Stem Dap Research Extension

Objective

Several recent recommendations for the design of double tee daps in the eighth edition of *The PCI Design Handbook* are unduly conservative and not necessarily supported by adequate testing verification. The objective of this study is to refine and revise those recommendations by further experimental evidence.

Background Information

Recently completed PCI funded research on the behavior of double tee stem daps yielded recommendations that resulted in design procedures published in the eighth edition of *The PCI Design Handbook* that experience and subsequent testing bring into question. Among these are:

- Shear strength limitations based on the number of strands within the nib (i.e., stipulation of two strand minimum in lieu of one).
- Strength limitations based on shear capacity for lightweight concrete at the nib/full depth stem interface.
- Increased minimum bend radius for the hanger reinforcement at the bottom corner of the stem (variable results may have been predicated by end cover on certain test specimens rather than side cover – also, no testing was performed to validate assumption of greater capacity with larger bend radius).
- The eighth edition did not change previous recommendations regarding when to ignore dap reinforcing and design as a notch using plain concrete bearing as the guide. The PCI research included only a single test, which produced results that weren’t reflected in the initial recommendations, but subsequently influenced a change introduced via errata. The current recommendation is for an overly conservative amount of horizontal reinforcement in the notch. Although the alert states that this horizontal reinforcement may be reduced by using the contribution of partially developed strand, it fails to provide clear direction. In addition, the current recommendation limits the shear strength in the full height section to a value lower than for a dap by not considering the contribution of strands in the nib.
- The maximum height of a notch for which dap design need not be considered may not be correct for deep stemmed members under heavy loading conditions. The design of these notches needs more accurate design equations based on recent producer sponsored test results.
- Although not investigated in the initial study, the current guidelines do not address at what height a vertical bottom recess should be designed as a hangar rather than a dap,
nor do they address at what length the force transfer mechanism requires other analysis; or in other words, at what height and what length of dap would the design of the end reinforcing not follow the guidelines. It seems prudent for those recommended limits to be established. Note, only the limits are being sought, not an analysis method for the extraordinary conditions.

Scope of Work

1. Create a test matrix to substantiate specific revisions to the recently published recommendations for double tee dap design as indicated in the Background Information section.
2. Perform the testing and record the data.
3. Perform the appropriate statistical analysis to warrant the level of confidence and then generate specific equations to serve as design guidelines.
4. Final report to include summary of test program, all test results, summary and discussion of results, and recommendations for design. Submit draft final report allowing 45 days for Advisory Committee review and comment. Final approval will be with the PCI Research and Development Council.

Anticipated Deliverables

1. Refinement/revision to specific elements of the dap design recommendations in the eighth edition of *The PCI Design Handbook*.
2. Interim report that defines and describes the test matrix and method, which also includes description of the reinforcing scheme(s) and the variables (i.e., f'c, MOE, etc.) impacting the design.
3. Final report to be published on the PCI website.
4. Recommendations within the final report regarding further research to determine the effect of skewed bearing conditions, as well as for stem openings within the 2H region of the end of the member.
5. Summary paper for publication in *The PCI Journal*.

**Duration:** 18 months

**Budget:** $150,000
SAMPLE RESEARCH AND TESTING AGREEMENT

THIS RESEARCH AND TESTING AGREEMENT (the “Agreement”), effective as of the ___ day of __________, 20__ (the “Effective Date”), is by and between Prestressed Concrete Institute, an Illinois not-for-profit corporation located at 200 West Adams Street, Suite 2100, Chicago, IL 60606 (hereinafter referred to as "PCI") and ______________________________ (hereinafter referred to as "University").

In consideration of the premises, the mutual covenants herein contained and intending to be legally bound, the parties hereto agree as follows:

Article 1 – Definitions

1.1 "Project" shall mean the performance of the scope work as defined in the research proposal entitled ___________________________________________________________ and dated _________. The scope of work is incorporated herein by reference as set forth in full in attachment A.

1.2 "Agreement Term" is from the Effective Date through _____________________ [date].

1.3 “Principal Investigator” shall mean the individual(s) identified as such in the research proposal for Project, who is/are the University faculty and/or staff member(s) responsible for supervision and administration of the Project.

1.4 “Intellectual Property” shall mean individually and collectively all inventions, improvements, copyrights, patents, proprietary information or discoveries that are conceived or made (i) by University or (ii) jointly by PCI and University in performance of Project.

1.5 “Report” shall mean the periodic or final summary of work performed by University related to the Project.

1.6 “Material Breach” for the purpose of this Agreement shall mean any event, situation, condition, or lack of performance in accordance with the work plan defined in Attachment A which causes the Project to be significantly modified, delayed or cancelled.

1.7 “Completion of Work” shall mean the completion of goals, objectives and other measurements as defined in Attachments A.

1.8 “Acceptance of Final Paper” shall mean the acceptance by PCI of the final deliverables defined in Attachment A at its sole discretion. The intent shall be a judgment of the quality of the deliverable and not a judgment on the results of the research.
**Article 2 – Conduct of Project**

2.1 University shall use reasonable efforts to commence the Project promptly after the Effective Date.

2.2 In the event that the Principal Investigator becomes unable or unwilling to continue Project, and a mutually acceptable substitution is not available, University and/or PCI shall have the option to terminate said Project, subject to the provisions of Article 8, by giving written notice to the other party of such termination.

2.3 PCI shall promptly provide University with such information or documents of whatever form or nature, or undertake such actions, as University may reasonably require in order to conduct the Project.

**Article 3 - Reports and Conferences**

3.1 Project reports will be provided by University to PCI as set forth in the Project proposal and a final report will be submitted by University at the conclusion of the Agreement Term or earlier termination of this Agreement.

3.2 PCI shall have the right to reproduce, publish, and disseminate any written reports or deliverables delivered to PCI by the University pursuant to this Agreement. Ownership and copyright for such reports or other materials shall vest in PCI.

3.3 During the Agreement Term, representatives of University will meet with representatives of PCI at such reasonable times and places as set forth in the Project proposal to discuss the progress and results of, as well as ongoing plans or agreed upon changes in the Project.

**Article 4 – Compensation and Expenses**

4.1 It is agreed to and understood by the parties hereto that except as may be otherwise agreed by the parties in writing, total costs to PCI for the Project hereunder shall not exceed the sum of ________________________________ ($______). Payment to University shall be made by PCI according to the following schedule:

\[
\text{[as defined in the project RFP]}
\]

4.2 University shall retain title to all equipment, materials, and supplies purchased and/or fabricated by it with funds provided by PCI under this Agreement unless otherwise stated in Attachment A.
Article 5 – Publicity and Use of Name

5.1 Neither party shall be allowed to use the name of the other party or its representatives in any advertising regarding the Project without the prior written consent of the other party. The University shall identify PCI as the sponsor in any publicity, advertising or news release regarding the Project. PCI shall be allowed to use the name of the University and the Principal Investigator for announcements of the project and for Project updates to the PCI membership and such announcements and updates shall not be considered advertising.

Article 6 - Publications

6.1 University may catalog and place reports of the Project in the University library and may issue publications based on the Project. The research results not proprietary to PCI, as agreed by PCI, may be used in University research and education programs. University shall provide PCI the opportunity to review any report or publication and will, upon the request of PCI, withhold publication for up to 90 days.

Article 7 – Intellectual Property

7.1 Title to all Intellectual Property developed in the course of performance of the Project, whether or not protectable by patent, trade secret, or copyright, shall reside in the party whose personnel conceived the subject matter and diligently pursued reducing the subject matter to practice, and such party may perfect legal protection therein in its own name and at its own expense. Jointly made or generated Intellectual Property shall be jointly owned by the parties unless otherwise agreed in writing.

Article 8 – Agreement Term and Termination

8.1 This Agreement shall become effective upon the Effective Date and shall continue in effect for the Agreement Term unless sooner terminated in accordance with the provisions of this Article. The parties hereto may, however, extend the Agreement Term for additional periods as desired under mutually agreeable terms and conditions which the parties shall reduce to writing and sign.

8.2 Either party may terminate this Agreement upon thirty (30) days prior written notice in the event of a Material Breach by the other party of any term or provision hereof, provided such breach remains uncured at the end of said thirty (30) day period. Such notice of a breach shall include a reasonable description of the facts surrounding the alleged breach and a proposed course of action to cure said breach, if applicable.

8.3 PCI shall pay the University any costs which have accrued or been encumbered up to the actual date of termination under this Article and shall not be relieved of the obligation to
pay such costs because of termination under this Article.

8.4 Termination of this Agreement by either party for any reason shall not affect the rights and obligations of the parties accrued prior to the effective date of termination of this Agreement.

8.5 No termination or expiration of this Agreement, however effectuated, shall release the parties hereto from their respective rights and obligations under Articles 3, 5, 6, 7, 8, 9, 10, 12, 13, 16, and 17, which such Articles shall survive in their entirety any termination or expiration of this Agreement.

Article 9 - Arbitration

9.1 In the event of any conflict or claim arising out of or relating to any provision of this Agreement or breach thereof, the parties shall make a good faith effort to resolve such conflict amicably between themselves, and if thereby failing, resolution by submission to mediation under the Construction Industry Mediation Rules of the American Arbitration Association, and if thereby failing, resolution by arbitration under the Construction Industry Arbitration Rules of the American Arbitration Association. The location of any mediation or arbitration shall be within the metropolitan area of Chicago, Illinois.

Article 10 - Disclaimer of Warranties

10.1 University disclaims any and all warranties, both express and implied, with respect to the services to be performed hereunder and any deliverables resulting therefrom, including their condition, conformity to any representation or description, the existence of any latent or patent defects therein, and their merchantability or fitness for a particular use or purpose.

Article 11 - Insurance

11.1 University shall carry the following insurance coverage with companies acceptable to PCI.

11.1.1 Commercial General Liability, including Contractual Liability and Completed Operations/Products Liability coverage, at the minimum limit of $2,000,000 per project/ per occurrence (depending on degree of risk, other limits may be appropriate) and $5,000,000 aggregate;

11.1.2 Automobile Liability at $1,000,000 each accident.

11.1.3 Workers' Compensation at statutory limits and Employer's Liability coverage at a minimum limit of $1,000,000;

11.2 Prior to commencement of the Project pursuant to this Agreement, University shall furnish PCI with proof of insurance, satisfactory to PCI in its sole discretion, evidenced by duly authenticated certificates of insurance, which certificates shall show the
insurance type, amount, class of operations covered, effective dates, and dates of expiration of policies.

**Article 12 – Independent Contractor**

12.1 In the conduct of the Project hereunder, University and PCI are and shall remain independent contractors and nothing herein shall be construed to create a partnership, agency or joint venture relationship between the parties. Neither party is authorized or empowered to act as agent for the other for any purpose and shall not on behalf of the other enter into any contract, warranty or representation as to any matter. Neither party shall be bound by the acts or conduct of the other. Each party shall be responsible for wages, hours, and conditions of employment of its personnel during the term of, and under, this Agreement.

**Article 13 - Governing Law**

13.1 This Agreement shall be governed by and construed in accordance with the laws of the State of Illinois.

**Article 14 - Notices, Invoices, and Payments**

14.1 Notices, invoices, communications and payments hereunder shall be deemed made if given in writing and addressed to the party to receive such notice, invoice, communication or payment at the address given below, or such other address as may hereafter be designated by notice in writing:

If to Sponsor:       Roger Becker  
                     Precast/Prestressed Concrete Institute  
                     200 West Adams St.  
                     Suite 2100  
                     Chicago, IL 60606

If to University:

**Article 15 - Force Majeure**

15.1 In the event that either party is unable, wholly or in part, to carry out its obligations under this Agreement by reason of acts of God or public enemy, wars, insurrections, civil disturbances, epidemics, labor disputes, failure of government approval, accidents, failure of utilities, material shortages, fires, storms, floods and any other causes, whether of the kind enumerated herein or otherwise, not within the control of the party unable to
perform, then the obligations of this Agreement shall be suspended during the reasonable continuance of any inability so caused.

Article 16 – Non-Discrimination

16.1 University and PCI shall not discriminate against any employee or applicant for employment because of race, color, sex, sexual preference, age, religion, national origin, disability, or because he or she is a disabled veteran or veteran of the Vietnam Era.

Article 17 - Assignment

17.1 This Agreement shall not be assigned by either party without the prior written consent of the other party hereto. This Agreement shall be binding upon and inure to the benefit of the respective successors and permitted assigns of the parties.

Article 18 - Agreement Modification

18.1 Any agreement to change the terms of this Agreement in any way shall be valid only if the change is made in writing and signed by a duly authorized representative of each party hereto.

Article 19 - Entire Agreement

19.1 This Agreement constitutes and expresses the entire agreement of the parties hereto with reference to the subject matter hereof, with all prior promises, undertakings, representations, agreements, understandings and arrangements relative thereto having been herein merged into this Agreement.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed, each by its duly authorized representative, to be effective as of the Effective Date defined herein.

UNIVERSITY:  PRESTRESSED CONCRETE INSTITUTE:

By:______________________________  By:________________________________
Title:_____________________________                Title: ______________________________
Date:_____________________________                  Date:_______________________________