Request for Proposal (RFP)

Power Transmission Foundation Design, Project ID: CEEn-2016CPST-005

Background Information

Kiewit Corporation was founded in 1884 and has become a Fortune 500 employee-owned company based in Omaha, Nebraska. Since its early beginning, Kiewit has grown into one of the largest construction companies in North America. By applying strong core values, Kiewit has become successful and respected enough to bid on billion-dollar mega-projects and successfully carry them out. All projects are carried out through Kiewit's network of offices located all over the United States, Canada, and Australia. The successful implementation of Kiewit's leadership in the construction industry, hard work, and ethics has lead to a multitude of company awards and recognition across the world.

Kiewit is providing design and construction services for replacing six miles of transmission lines in East Hanover, New Jersey. Project requires foundation designs for monopole and lattice tower structures. Proposed lattice tower structures are located along an existing walking trail in the New Jersey Meadow Lands. Monopole structures will be located by the Hackensack River near an existing rail yard. Tower quantities are as follows:

- Meadow Lands: 14 Lattice Towers, 1 Monopole
- Rail Yard: 2 Lattice Towers, 7 Monopoles

Project Description and Scope of Services

The student team will design foundations for one monopole and one lattice structure. The monopole will be located in the Meadow Lands and the lattice structure will be located in the Rail Yard. Students will be expected to review provided design basis, design codes, and each site's geotechnical data and develop design parameters for each transmission line. Students will design and detail deep foundations, pile caps, and steel connections and concrete reinforcement as required.

In addition to the designs, students will be expected to produce a bill of materials for their design and construction schemes associated with foundation and tower construction.

General Design Information:

Design basis includes:

- 80 Year Design Life
- Seismic Loading and Analysis is not required
- Concrete shall be sulfate resistant
- Corrosion protection system shall be specified by the Foundation Engineer
- Foundation testing requirements to be determined by the Foundation Engineer

- Vertical Settlement: Vertical settlement shall be 1inch or less for lattice tower and monopole foundations
- Differential Settlement: Differential settlement shall be 1inch or less for lattice tower foundations
- Lateral Displacement: Horizontal displacement shall be less than 1 inch under the working load condition

Design Codes:

- ACI 318-11 or 318-14
- AISC Steel Construction Manual 13th or 14th Edition
- 2009 or 2012 International Building Code (IBC)

Corrosion Values:

Pile Tidal Zone (External)	1.77 mils per year
Pile Tidal Zone (Internal)	Negligible
Pile Saturated Soil (External)	0.6 mils per year
Pile Saturated Soil (Internal)	Negligible

Elevations:

Structure ID	Top of Grade Elev. (Feet)	Mudline Elev. (Feet)	Top of Cap Elev. (Feet)	High Tide Elev. (Feet)	100 Year Elev. (Feet)	Structure Height (Feet)
K-A 4/11-1	-	1	4.5	5	9	115
K-A 1/7A-1	10.1	-	TBD	-	12	160

Lattice Tower Design Information:

Lattice Tower: K-A 4/11-1 (T-45-1):

- Lattice Tower Shoe Dimension: 19 ½”x 19 ½” x 1 ½”
- Lattice Tower Shoe Connection is to be detailed by the Foundation Engineer

Lattice Tower Loads: K-A 4/11-1 (T-45-1):

LOAD CASE	MAXIMUM COMPRESSION			MAXIMUM UPLIFT		
	COMP (KIPS)	SHEAR X (KIPS)	SHEAR Z (KIPS)	UPLIFT (KIPS)	SHEAR X (KIPS)	SHEAR Z (KIPS)
S-2-1 TOWERS						
NESC HEAVY	44	5.1	5.1	11	1.0	0.9
NESC EXT WIND+	107.8	11.8	14.2	84.7	9.7	11.1
NESC ICE & WIND+	74.8	8.6	8.7	27.5	2.9	2.8
HEAVY ICE+	48.4	5.8	5.2	0	-	-
BROKEN WIRE	88	12.5	6.6	55	1.7	9.2
T-45-1 TOWERS						
NESC HEAVY	192.5	20.8	21.9	143	15.4	16.2
NESC HEAVY (TERMINAL)	294.8	35.2	29.5	244.2	29.6	24.1
NESC EXT WIND+	253	27.1	30.9	216.7	23.5	26.7
NESC EXT WIND (TERMINAL)+	348.7	41.1	37.5	313.5	30.1	41.3
NESC ICE & WIND+	243.1	26.4	27.0	179.3	19.1	19.4
NESC ICE & WIND (TERMINAL)+	368.5	44.0	36.1	308	28.3	38.2
HEAVY ICE+	254.1	27.7	26.8	170.5	18.0	16.9
HEAVY ICE (TERMINAL)+	415.8	50.1	39.1	338.8	30.1	41.1
T-45-2 TOWERS						
NESC HEAVY	271.7	31.9	35.2	201.3	23.1	26.4
NESC HEAVY (TERMINAL)	422.4	51.3	52.0	357.5	43.1	43.9
NESC EXT WIND+	379.5	44.3	52.0	315.7	36.5	44.4
NESC EXT WIND (TERMINAL)+	522.5	62.9	67.8	462	55.7	60.5
NESC ICE & WIND+	334.4	39.3	42.4	255.2	29.4	32.5
NESC ICE & WIND (TERMINAL)+	518.1	62.7	62.8	446.6	53.9	53.8
HEAVY ICE+	346.5	40.7	42.7	255.2	29.3	31.4
HEAVY ICE (TERMINAL)+	584.1	70.8	69.3	502.7	60.8	59.2

* REACTIONS INCLUDE LOAD FACTOR OF 1.1 FOR LATTICE TOWERS, 1.25 FOR MONOPOLES.
+ FOUNDATION DEFLECTION CRITERIA DO NOT APPLY FOR LOAD CASE.

Monopole Design Information:

Monopole: K-A-1/7A (T-90-2):

- Monopole anchor bolts are approximately 10 foot long
- Bolt circle is approximately 10 feet in diameter
- Final anchor bolt length and bolt circle dimensions will be provided in the future.

Monopole Loads: K-A-1/7A-1 (T-90-2):

LOAD CASE	WORKING/ULTIMATE LOAD	VERT (KIPS)	TRANSVERSE LOADS		LONGITUDINAL LOAD		RESULTANT LOADS	
			SHEAR (KIPS)	MOMENT (K-FT)	SHEAR (KIPS)	MOMENT (K-FT)	SHEAR (KIPS)	BENDING MOMENT (FT-K)
K-A 1/5-1 S-2-2								
NESC HEAVY	ULTIMATE	91.39	25.39	3270.94	0.06	4.3	25.39	3270.94
NESC EXTR WIND	ULTIMATE/WORKING	49.06	48.79	5463.44	0.06	4.1	48.79	5463.44
NESC ICE & WIND	ULTIMATE/WORKING	81.26	14.66	1959.64	0.06	4.5	14.66	1959.65
HEAVY ICE	ULTIMATE/WORKING	105.34	5.26	790.49	0.07	6.4	5.26	790.52
NESC HEAVY (NO OLF)	WORKING	62.21	14.24	1846.39	0.06	4.27	14.24	1846.4
BROKEN CONDUCTOR	ULTIMATE	91.4	25.04	3223.19	19.79	3226.2	31.92	4560.41
BOUND STRINGING BLOCK	ULTIMATE	100.43	8.84	1114.16	14.6	2383	17.07	2630.6
PRECAMBER (EVERYDAY)	ULTIMATE/WORKING	48.2	1.64	223.51	0.07	5.6	1.64	223.58
BROKEN CONDUCTOR (NO OLF)	WORKING	62.21	14.03	1815.3	12	1892.06	18.46	2622.06
BOUND STRINGING BLOCK (NO OLF)	WORKING	50.21	4.42	530.36	7.3	1131.49	8.53	1249.62
K-A 1/7-1 B-15-2								
NESC HEAVY	ULTIMATE	112.16	58.18	7242.72	0.07	4.9	58.18	7242.72
NESC EXTR WIND	ULTIMATE/WORKING	62.41	73.06	8166.15	0.07	4.6	73.06	8166.15
NESC ICE & WIND	ULTIMATE/WORKING	95.85	40.51	5120.4	0.07	5	40.51	5120.4
HEAVY ICE	ULTIMATE/WORKING	120.48	39.2	5146.66	0.08	6.8	39.2	5146.66
NESC HEAVY (NO OLF)	WORKING	76.22	33.97	4222.38	0.07	4.79	33.97	4222.38
BROKEN CONDUCTOR	ULTIMATE	112.15	55.61	6849.76	19.8	3046.4	59.03	7496.65
BOUND STRINGING BLOCK	ULTIMATE	127.3	30.13	3645.01	14.6	2246.9	33.48	4281.9
PRECAMBER (EVERYDAY)	ULTIMATE/WORKING	61.63	12.4	1528.83	0.08	6.2	12.4	1528.84
BROKEN CONDUCTOR (NO OLF)	WORKING	76.22	32.41	3987.66	12	1808.45	34.56	4378.58
BOUND STRINGING BLOCK (NO OLF)	WORKING	63.64	15.07	1777.29	7.3	1088.6	16.74	2084.18
K-A 1/7A-1 T-90-2								
NESC HEAVY	ULTIMATE	226.6	224.51	27939.53	0.11	8	224.51	27939.53
NESC HEAVY (TERMINAL)	ULTIMATE	205.38	19.88	1923.95	141.9	18017.5	143.29	18119.93
NESC EXTR WIND	ULTIMATE/WORKING	133.36	194	22455.56	0.11	7.9	194	22455.56
NESC EXTR WIND (TERMINAL)	ULTIMATE/WORKING	123.68	51.68	4552.94	95.48	12004.1	108.57	12838.52
NESC ICE & WIND	ULTIMATE/WORKING	178.84	171.53	21613.57	0.11	8.1	171.53	21613.57
NESC ICE & WIND (TERMINAL)	ULTIMATE/WORKING	158.75	9.57	976.99	112.88	14366.6	113.28	14399.78
HEAVY ICE	ULTIMATE/WORKING	208.48	212.32	27233.17	0.14	11.8	212.32	27233.17
HEAVY ICE (TERMINAL)	ULTIMATE/WORKING	181.04	0.11	7.93	150.1	19226.1	150.1	19226.1
PRECAMBER (EVERYDAY)	ULTIMATE/WORKING	132.82	68.56	8575.24	0.14	11.4	68.56	8575.25
NESC HEAVY (NO OLF)	WORKING	153.65	133.88	16727.1	0.11	7.99	133.88	16727.1
NESC HEAVY (TERMINAL - NO OLF)	WORKING	139.58	9.87	1011.6	86	10888.54	86.56	10935.43

Expected Deadlines, Meetings, and Presentations:

A Final Presentation and final report, to Kiewit, will be prepared and presented no later than April 10, 2017. In addition, monthly progress reports will be prepared and given to Kiewit.

Students have already received all design basis and geotechnical information provided by Kiewit. Students will use the given data to develop a work timeline to complete the tasks above.

Final product must meet or exceed project criteria stated above.

Outcome and Performance Standards

Teams will provide the work “as is” meaning that there is no engineering stamp certifying the work.

Aside: The ability for the BYU Civil & Environmental Engineering Department to continue to receive support from outsides sponsors is somewhat contingent on the good work you do. As such, all Capstone students are expected to interact in a professional manner at all times with the mentor and project sponsor. Treating them with the utmost respect and consideration of their busy schedules. Support for future Capstone projects can be affected by your actions. While the focus of your capstone is to do the specified task, it is also important to learn team dynamics and leadership skills. As you work together to complete the project, you should look for ways to help each team member grow in his/her engineering confidence and abilities.

Deliverables

A final report with design alternatives for the project that include economic and environmental considerations. The report should include:

- Design calculations
- Design approach
- Any assumptions
- Code checks
- Detailed plans for each foundation
- Bill of materials
- Decided construction schemes.

Short monthly progress reports that include:

- Current Status of Capstone Project
- Any challenges the team has encountered
- Any progress overcoming these challenges
- Actions taken towards for these challenges

A poster reflecting a summary of your design project

A presentation summarizing your project to be presented to your sponsor.

All deliverables are tentatively due Monday April 10th.

Contractual Terms and Conditions

Non-monetary compensation with all project work on a “best effort” basis.

Team members are to spend 8 hours/week/student with at least 3 hours/week working together. Class time or time spent on class assignments counts toward these hours

The Team will consist of:

- A project manager/mentor: A graduate student who does not perform technical work on the project. He/she guides, facilitates and directs the team toward successful completion of the project by achieving customer objectives, adhering to schedule/time/cost, and promoting team unity.
- A project team lead: An undergraduate student team member who serves as the team's spokesperson and liaison among the team, its project manager, sponsor, faculty advisor and Capstone Committee advisors

Aside: Members of the student team may be asked to sign a non-disclosure agreement that simply states the work you do belongs to the project sponsor.

Payments, Incentives and Penalties

Most of the capstone work is graded by the graduate mentor. Evaluation will be based on:

- Team work and unity
- Project proposal
- Project Management Plan (PMP)
- Monthly status report
- Final report, poster, and presentation
- Customer satisfaction in satisfying project objectives and required deliverables

Submittal Requirements for the Proposal

Proposals are due Monday November 7, 2016 and should contain the following sections as a minimum:

- Cover page
- Letter of submittal / introduction
- Executive summary (one page or less)
- Work plan
  - Proposed approach, including innovative ideas, to complete the project
  - Weekly project work schedule for individual team members
  - Weekly team work/meeting schedule
- Section identifying necessary tools, data, equipment, etc. with brief explanations
- Project schedule including important milestones
- Engineering budget: Estimated hours for each phase/element of the proposed work plan
- Outcome and Performance Standards
- List of outside consultants (faculty, Capstone Committee member etc.) necessary for this project
- Statement of qualifications
- Appendices
  - Appendix A: 1 page resume for each team member

- Appendix B, C, etc. as necessary

Contacts

Graduate Mentor: Mikayla Hatch

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- Phone: 214-592-2279

Sponsor Contact: Jeramy Decker, Kiewit Infrastructure Engineers, Omaha, NE

- E-Mail: jeramy.decker@kiewit.com
- Phone: 401-271-2866

For any questions directed to the sponsor, allow and plan for a Time-Lag of 1 week to receive a response.

Proposal Evaluation Criteria

3 different graduate mentors will evaluate each proposal blindly and the average score between the 3 will be the student's grade for the proposal. Mentors will be using the following rubric:

Timeliness - 1 pt off per full hour late, up to 5.	5
Grammar/Spelling - 1 pt off per blatant error, up to 5.	5
Cover Page - Title, Data, Sponsor, Team Name, Team Members, Department of Civil & Environmental Engineering, Ira A. Fulton College of Engineering and Technology, Brigham Young University - 1 pt per piece of information included.	6
Cover Letter - brief letter of introduction that 1) states your intent to propose and 2) how you may be contacted.	6
Executive Summary 3/4 to 1 page that summarizes the contents of your proposal	12
Team Abilities Summary as a team of 1) relevant courses and experience, 2) abilities to complete the work on time and in a professional manner, 3) including use of specific engineering tools/software. Include résumés.	12
Key Personnel - 1) Identify which individuals will focus on which pieces of your potential tasks, and 2) some kind of organizational chart or visual describing how you will work together as a team.	12
Project Understanding - 1) Did they address specific items mentioned in the RFP? 2) Do they repeat basic background in somewhat new terms to *demonstrate their understanding* of the project? 3) Do they mention key deliverables they may need to provide? 4) Did they articulate a *specific* approach for developing design alternatives and deliverables? 6 pts max per piece.	24
Formatting - Does it look professional? Consistent?	6
Concise vs. Wordy, Meaningful vs. Fluffy, repetitive wording. 6 pts means concise, and accurate, and specific. 1 pt means often confusing, wordy, or vague.	6
Clear and professional flow of writing and style. 6 pts means that you would feel comfortable handing this in if it were your own; it is easy to read and understand; feels professional; 1 pt means it feels like it was cut-pasted, rushed, and done with little thought; hard to read; feels like a high school essay.	6
Total	100