

JORGE ANDRES RUEDA-BENAVIDES

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February 4, 2016

Faculty Search Committee
Department of Civil Engineering
Auburn University
Auburn, AL 36849

Dear Committee Members,

I am writing to apply for the tenure-track position at the Assistant Professor level in Construction Engineering and Management in the Department of Civil Engineering at Auburn University. I am currently pursuing my PhD in Civil Engineering with emphasis in Construction Engineering and Management at Iowa State University (ISU) under the direction of Dr. Douglas Gransberg. My expected graduation date is May 2016. At present, I am writing a dissertation entitled "Indefinite Delivery/Indefinite Quantity (IDIQ) Project Selection Framework Using Stochastic Methods." This study combines qualitative and quantitative research methods to identify suitable transportation projects to be executed through IDIQ contracting techniques.

My research experience includes preconstruction/construction cost estimating, transportation infrastructure asset management, risk management, data mining, alternative contracting methods, and decision-making modeling. As a result of this experience, I have submitted, published, and presented various abstracts, papers, and research reports. I was co-principal investigator on the *National Cooperative Highway Research Program (NCHRP) Synthesis 473* aimed to document effective IDIQ contracting practices and benchmark the state-of-practice in the use of this alternative contracting approach by state and federal transportation agencies. I also co-authored an IDIQ implementation guide for the Minnesota Department of Transportation (MnDOT), which has allowed MnDOT to award several construction and maintenance/repair contracts by effectively managing the high level of risk inherent in IDIQ contracts.

Aiming towards a future career in academia, I have eagerly taken advantage of every opportunity to develop and improve my teaching skills. At ISU, I was given the opportunity to teach *CE594A Planning and Scheduling* at the graduate level. Additionally, I proposed and developed the curriculum for a course intended to teach graduate students how to use a number of research methods applied to the construction industry. I taught this course (CE595C) in the Fall 2014 semester. This course included topics such as forecasting methods, data collection/cleaning/analysis procedures, stochastic modeling, and statistical significance testing. During the Fall 2015 semester, I taught *ConE 322 Construction Equipment and Heavy Construction Methods* at the undergraduate level. This course covers management, economic, and technical considerations associated with heavy civil projects and the use of different pieces of

construction equipment. I am currently teaching a graduate core course entitled *ConE 502 Construction Project Engineering and Management*. Topics covered in this course include project administration and control techniques, risk management strategies, quality management, construction process simulation, and data-driven decision analysis.

In addition to the professional credentials listed in my CV, I am preparing myself to present the Fundamentals of Engineering (FE) exam in Spring 2016 as well as planning for a Professional Engineer (PE) certification.

As illustrated in my CV, my teaching, mentoring, and tutoring experiences, make me a strong candidate to teach and develop both undergraduate and graduate courses in different construction engineering and management topics. Additionally, my knowledge associated with the use of a broad range of qualitative and quantitative research methods gives me the ability to conduct interdisciplinary research on many other areas, even on topics outside the Department of Civil Engineering.

I am enclosing my CV, statements of research and teaching interests, and names and contact information for three professional references. Please let me know if I can provide additional information or documentation to aid you in the evaluation of my application. I can be reached by email (JRueda@iastate.edu) or at 641-745-9422.

Thank you for your time and consideration. I look forward to hearing from you.

Sincerely,

A handwritten signature in black ink, appearing to read 'JRueda', with a long horizontal line extending to the right.

Jorge A. Rueda-Benavides

CURRICULUM VITAE

JORGE ANDRES RUEDA-BENAVIDES

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EDUCATION

- **Doctor of Philosophy**, Civil Engineering, Construction Engineering and Management. Iowa State University, Ames, Iowa. Anticipated Graduation Date: May 2016.
 - Doctoral Dissertation: Indefinite Delivery/Indefinite Quantity Project Selection Framework Using Stochastic Methods. (In preparation)
- **Master of Science**, Civil Engineering, Construction Engineering and Management. Iowa State University, Ames, Iowa. 2013.
 - Master's Thesis: Develop a Price Escalation Method for Minnesota Department of Transportation Indefinite Delivery/Indefinite Quantity Contracts: AxE Bidding.
- **Bachelor of Science**, Civil Engineering. Universidad Industrial de Santander, Bucaramanga, Colombia. 2010.
 - Bachelor's Thesis: Simplified Guide for Supervision of Structural Masonry Construction with Clay Bricks.

PUBLICATIONS AND RESEARCH PRESENTATIONS

Book Chapters

- Gransberg, D.D., Lopez del Puerto, C., and **J.A. Rueda-Benavides**, Book Chapter *Mapping Project Complexity in Five Dimensions*, The Handbook of Complex Delivery: Managing Complexity in Projects and Programs, Varga, K., Editor, Gower Publishing, ISBN 978-1-4724-4208-6, UK (In Press – Anticipated publication date: July 2016).

Monographs (Peer-Reviewed)

- Gransberg, D.D., **Rueda-Benavides, J.A.**, and M.C. Loulakis, *Indefinite Delivery/Indefinite Quantity Contracting Practices, NCHRP Synthesis 473*, Transportation Research Board, National Academies, Washington D.C. 2015, ISBN 978-0-309-27173-8, 131 pp.

Peer-Reviewed Journal Articles

- **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Indefinite Delivery/Indefinite Quantity Contracting: A Case Study Analysis*, Transportation Research Record No. 2408, Journal of the Transportation Research Board, National Academies, 2014, pp. 17-25.
- Miller, C., **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Applying Social Return on Investment to Risk-Based Transportation Asset Management Plans in Low Volume Bridges*, Transportation Research Record No. 2473, Journal of the Transportation Research Board, National Academies, 2015, pp. 75-82.

Peer-Reviewed Journal Articles or Proceeding Papers – In press/Review

- Lee, M., **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Utility Management System Cost/Time Benefits and Implications from the Local Agency Perspective*, Journal of Infrastructure Systems, ASCE, No. ISENG-724 (Accepted for publication. Publication Date TBD).
- **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Effective Risk Management Strategies in Construction and Maintenance Indefinite Delivery/Indefinite Quantity Contracts*, 2016 Transportation Research Board Annual Meeting Compendium of Papers, Paper 16-6287, National Academies (Accepted for presentation in lectern session – Session 555).
- Gardner, B., Gransberg, D.D., and **J.A. Rueda-Benavides**, *Stochastic Conceptual Cost Estimating of Highway Projects to Communicate Uncertainty using Bootstrap Sampling*, Journal of Risk and Uncertainty in Engineering Systems, ASCE (Submitted December, 2015).

Peer-Reviewed Proceeding Papers – Full Paper

- **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Fundamentals of Indefinite Delivery/Indefinite Quantity Contracting: A Primer for Public Transportation Agencies*, 2014 Transportation Research Board, Paper 14-0631, National Academies, January 2014. pp. 247. 1-15.
- **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Suitability Analysis of Existing Construction Cost Indexes for the Minnesota Department of Transportation Construction Projects*, 2015 Transportation Research Board Annual Meeting Compendium of Papers, Paper 15-2293, National Academies, January 2015, Session 237, 16 pp.
- **Rueda-Benavides, J.A.**, E. Scheepbouwer, and D.D. Gransberg, *US Major Task Order Contracting and NZ Collaborative Alliances Comparison*, CDR-1878, 2015 AACE International Annual Meeting, June 28-July 1, 2015, Las Vegas, NV.
- Gransberg, D.D., and **J.A. Rueda Benavides**, *Expediting Emergency Construction Procurements: Case Studies in Success*, Proceedings, Canadian Society of Civil Engineers International Construction Specialty Conference, Vancouver, British Columbia, Canada, June 8-10, 2015.
- Gransberg, D.D., Gad, G.M., and **J.A. Rueda-Benavides**, *Implementing Alternative Technical Concepts in Design-Bid-Build Projects*, Proceedings, Canadian Society of Civil Engineers International Construction Specialty Conference, Vancouver, British Columbia, Canada, June 8-10, 2015.
- Miller, M.C., **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Evaluating Social Return on Investment for Rural Infrastructure Funding Decisions*, OWN-1879, 2015 AACE International Annual Meeting, June 28-July 1, 2015, Las Vegas, NV.

Major Research Reports

- Gransberg D.D., and **J.A. Rueda-Benavides**. *Indefinite Delivery/Indefinite Quantity*. Minnesota Department of Transportation, July 2014, 310 pp.
 - The report includes the *MnDOT Indefinite Delivery/Indefinite Quantity Implementation Guide* as an appendix.

Lectures and Conference Presentations

- Gransberg, D.D., **Rueda-Benavides, J.A.**, and J.M. Mason, *Indefinite Delivery/Indefinite Quantity Contracting Practices*. Transportation Research Board Webinar. (Date TBD. Selected for the first half of 2016)
- Miller, C., **Rueda-Benavides, J.A.**, and D.D. Gransberg. *Tools to Generate a More Transparent Decision for Bridges*, 2015 AASHTO Subcommittee on Maintenance Conference, Des Moines, IA, July 2015.
- **Rueda-Benavides, J.A.**, E. Scheepbouwer, and D.D. Gransberg, *US Major Task Order Contracting and NZ Collaborative Alliances Comparison*, 2015 AACE International Annual Meeting, June 2015, Las Vegas, NV.
- **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Develop a Price Escalation Method for Single Award Indefinite Delivery/Indefinite Quantity Contracts: AxE Bidding*, 2014 Construction Research Congress (CRC2014), Atlanta, GA, January 2014. (Poster)
 - Included in top 20 research topics among 80 participants.
- **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Indefinite Delivery/Indefinite Quantity (IDIQ)*, 2013 Mid-Continent Transportation Research Symposium, Iowa State University, Ames, Iowa, August 2013.
- **Rueda-Benavides, J.A.**, and D.D. Gransberg, *Effective Practices for the Optimization of Construction Costs in Indefinite Delivery/Indefinite Quantity Contracts*, 2015 Mid-Continent Transportation Research Symposium, Iowa State University, Ames, Iowa, August 2015.
- **Rueda-Benavides, J.A.**, *Methods to Predict Construction Cost Escalation Over Time*, Virtual Guest Speaker, The University of Puerto Rico at Mayaguez, February 24, 2015.

FUNDED RESEARCH PROJECTS

- **Co-Principal Investigator**, *Indefinite Delivery/Indefinite Quantity Contracting Practices*, NCHRP Project 45-09, 2013-2014, \$40,000 (Douglas D. Gransberg and Michael C. Loulakis).
- **Graduate Research Assistant**, *Indefinite Delivery/Indefinite Quantity*, MnDOT Project 2012-221, 2012-2014, Minnesota DOT, \$87,390 (PI: Douglas D. Gransberg).
- **Graduate Research Assistant**, *Pre-construction Services Cost Estimating Guidebook*, NCHRP Project 15-51, 2012-2015, \$425,000 (Douglas D. Gransberg and David Jeong).

ACADEMIC EXPERIENCE

- **Instructor**, *CE 502 Construction Project Engineering and Management*. Graduate Core Course. Department of Civil, Construction, and Environmental Engineering; Iowa State University, Ames, Iowa. Scheduled for Spring 2016.
- **Instructor**, *ConE 322 Construction Equipment and Heavy Construction Methods*. Undergraduate Course. Department of Civil, Construction, and Environmental Engineering; Iowa State University, Ames, Iowa. Fall 2015.

- **Instructor**, *CE 595C Qualitative and Quantitative Research Tools Applied to the Construction Industry*. Graduate Course. Department of Civil, Construction, and Environmental Engineering; Iowa State University, Ames, Iowa. Fall 2014.
- **Instructor**, *CE 594A Planning and Scheduling*. Graduate Course. Department of Civil, Construction, and Environmental Engineering; Iowa State University, Ames, Iowa. Summer 2014.
- **Graduate Research Assistant**, Department of Civil, Construction, and Environmental Engineering; Iowa State University, Ames, Iowa. May 2012 – Present.
- **Tutor**, finite math, algebra, and computer programming. Tutoring Program, Des Moines Area Community College, Des Moines, Iowa. Spring 2012.
- **Teaching Assistant**, *Statics*. Undergraduate Course. Department of Civil Engineering; Universidad Industrial de Santander, Bucaramanga, Colombia. February 2008 – August 2009.

PROFESSIONAL EXPERIENCE

- **Superintendent/Internship**, Union Temporal Limonar Campestre, Barrancabermeja, Colombia. March 2010 – December 2010.
 - Supervised activities related to the construction of single family homes for low income communities.
- **Superintendent**, D&N Constructores LTDA, Bucaramanga, Colombia. October 2009 – December 2009.
 - Supervised the construction of a reinforced concrete retaining wall.
- **Project Assistant**, B&R Ingeniería, Bucaramanga, Colombia. June 2006 – July 2006.
 - Assisted in the development of a project for the restoration of the hydraulic infrastructure of a commercial building.
- **Soldier**, Colombian National Army, Bucaramanga, Colombia. December 2002 – December 2003.

HONORS, RECOGNITIONS, AND OUTSTANDING ACHIEVEMENTS

- **Graduate Incentive Fellowship**, \$25,000.00, Department of Civil, Construction, and Environmental Engineering, Iowa State University, Ames, Iowa. Summer 2014 – Spring 2015.

SERVICE AND VOLUNTEER WORK

Service

- **Paper Reviewer**, Transportation Research Board, National Academies of Engineering, Standing Committee on Project Delivery Methods (AFH15). 2014-2015.
- **Paper Reviewer**, Transportation Research Board, National Academies of Engineering, Standing Committee on Transportation Asset Management (ABC40). 2015.
- **Graduate Student Mentor**, Iowa State University McNair Program, Ames, Iowa. 2014.

Volunteer

- **Volunteer**, Colombian Red Cross, Bucaramanga, Colombia. 2001-2002.

Statement of Research Goals

Jorge Andres Rueda-Benavides

My primary research interests include the effective utilization of data mining techniques to optimize decision making procedures, facilitate planning, estimating and scheduling activities, and improve, as well as develop, procurement methods and risk management strategies in the construction industry. There are large amounts of valuable data collected by public and private organizations that may be used to enhance various procedures throughout the life cycle of construction projects from planning to operation and maintenance activities. However, some owners and contractors lack the tools to process this data into meaningful applicable information. As a construction engineering and management graduate, I am interested in developing effective procurement/construction procedures that meet the specific requirements of each project and the needs and capabilities of different agencies and construction companies.

My future plans are to improve and expand my current research topics and skills as well as explore other research fields at the local, national, and international level. The following are specific research projects that I am planning to develop in the near future. All these studies are related to construction engineering and management topics; however, the utilization of various qualitative and quantitative research tools enables me to participate in interdisciplinary studies.

- Development of a decision making framework for an optimal selection of sustainable construction technologies in a technically, financially, and contextually constrained environment: The primary objective of this project will be to create a tool that allows an optimal utilization of green construction technologies and materials in order to maximize the number of Envision® points to be earned by infrastructure projects. The Envision® sustainable infrastructure rating system is a framework that allows for the measurement of the socioeconomic and environmental benefits of various types of infrastructure projects.
Potential Funding Source(s): Institute for Sustainable Infrastructure; National Science Foundation; or funds from local or state agencies that support sustainable construction initiatives.
- Development of a multi-dimensional sensitivity analysis for the assignment of maintenance funding for bridges using the SROI index: This study will consist of an upgrade of a two-way sensitivity analysis approach that I developed in a previous study. This study will allow comparing the SROI values of all bridge candidates by simultaneously changing their AADT values. A multi-dimensional sensitivity analysis will allow for the evaluation of the bridge inventory as a whole, taking into consideration correlations between AADT values of all bridges, which are ignored in a typical pairwise comparison.
Potential Funding Source(s): NCHRP; Federal Highway Administration State Planning and Research (SP&R); or Iowa DOT Research Program.
- Development of a risk-based data-driven construction cost estimating framework for transportation agencies: This project will be an extension of a data-driven method developed for my dissertation to estimate unit prices in terms of the bid quantities. Once the total average cost for a given project is determined, it will be modified in accordance with other factors that may impact the final construction cost such as anticipated adverse weather, location, and technical complexity.
Potential Funding Source(s): NCHRP; Federal Highway Administration State Planning and Research (SP&R); or funds from the state research program of a state DOT.

Statement of Teaching Philosophy

Jorge Andres Rueda-Benavides

As a teacher, I believe in active learning techniques where students are highly involved in classroom sessions through practical exercises, group discussions, collaborative learning groups, case studies, and other activities that, besides engaging students in learning, promote critical thinking. Active learning requires from me a strategic preparation and presentation of the course content to catch students' interest and provide all the information and knowledge required for them to participate in class activities.

I have actively used blended/flipped teaching techniques at ISU. I would be interested in applying this active learning approach to my courses taking into account the teaching philosophy in the Department of Civil Engineering at Auburn University. In blended/flipped learning, the traditional classroom learning and homework assignments approach is reversed using online lectures and other prerecorded media to be reviewed by students before class. In the classroom, students engage in individual and group practical activities with the assistance of the instructor. In a traditional course, students have only one chance to capture the concepts and knowledge being transmitted by the instructor, and instructors have only one opportunity to clearly transmit this knowledge to all students. The use of prerecorded lectures and other online material allows students to manage their own time. Students can spend the amount of time they consider necessary for a complete understanding of each topic. This learning approach addresses the fact that each student has a unique set of learning skills. Additionally, prerecorded media used in these types of courses can be reviewed and modified by the instructor multiple times until finding the best way to deliver the content of the course.

My primary teaching interests, at both the undergraduate and graduate level, are in construction planning, scheduling and estimating, risk management, cost engineering, alternative project delivery methods, construction equipment and heavy construction methods, economics principles applied to the construction industry, and. Likewise, I would be interested in teaching graduate students the use of different qualitative and quantitative research tools. I would be particularly interested in the development of the following courses at Auburn University:

- *Risk Management in the Construction Industry*: The constant appearance of new technologies, contracting methods, and construction techniques during the last two decades is increasing the demand for construction professional with outstanding planning skills to ensure the achievement of project goals. At the end of this course, students will have the knowledge and skills to identify, assess, and prioritize potential adverse events on a per-project basis. Students will be taught how to use various advanced methods and tools to quantify and minimize the probability of occurrence of risk events and minimize their impact if they actually occur.
- *Alternative Delivery Methods and Contracting Approaches*: The increasing use of innovative procurement techniques among public and private owners suggests that in a few years dealing with alternative delivery methods and contracting approaches (i.e. Design-Build, Construction Manager /General Contractor, Indefinite Delivery/Indefinite Quantity, cost plus time bidding, partnering, value engineering, etc.) will be an everyday task for construction managers. The course would be intended to teach the fundamentals, advantages, disadvantages, and limitations of various alternative procurement techniques in the construction industry.
- *Qualitative and Quantitative Research Tools Applied to the Construction Industry*: I proposed, developed, and taught this course at Iowa State University (ISU) at the graduate level (CE 595C) during the Fall 2014 semester. This course consists of a flexible curriculum to be adjusted at the beginning of each semester based on the needs and research topics of the students. Topics that may be covered in this course include design, development, and analysis of online surveys, data collection and cleaning, statistical significance testing, multiple regression, neural networks, advanced decision-making methods, stochastic modeling (Monte Carlo simulation), advanced sensitivity analysis, formal content analysis, and research validation strategies. This course would aim to increase the existing top quality of graduate research in the Construction Engineering and Management program at Auburn University.