**Project Title:** Benefit, Cost, and Risk Analysis to Determine Construction Inspection Needs

**Project Description:**
Proper quality assurance inspection ensures the traveling public receives a product of the highest quality that will last for an acceptable period of time. It is not uncommon for an area office to manage more construction projects than inspectors. This research project will investigate the staffing needs for quality assurance inspection based on a benefit and cost analysis. In addition to including benefit and cost, risk should be considered and analyzed to help determine staffing needs. The research project will investigate what should be considered a benefit and what should be considered a cost when evaluating a construction project. These benefits and risks should extend beyond project costs and into variables such as lane mile, ADT, project type, etc. For example, how should benefit of a construction project be defined and what is the risk associated with providing adequate inspection to the project? From a benefit perspective, seal coat projects affect a significant number of lane miles, what benefit should lane miles contribute to the analysis of staffing needs? On the other hand, a rehabilitation project affects significantly fewer lane miles, but should have a longer life. How should the longer life affect the analysis of staffing needs? These questions merely provide a beginning for the multiple variables that can be considered a benefit or cost associated with a construction project. This research project must look at the pay items associated with construction projects, not simply the cost of the project as a whole. To adequately perform the analysis the scope of each project must be understood. For example, in construction of a bridge, how should the inspection staffing for drilled shafts be determined? How is this compared to the staffing requirements for column and cap construction? The bridge example also brings into focus the need to quantify risk. Failure associated with a bridge is much more costly than typical “on-the-ground” pavement failure. This project must quantify and account for that risk through risk analysis procedures such as Monte Carlo simulations. Ultimately the goal of the research project is to quantify benefits and costs, and account for risk to determine and justify inspection staffing requirements.

**Who is impacted by the problem?**
Area Office personnel, particularly Area Engineers and construction inspectors (lab personnel as well). District construction staff will also be impacted. Ultimately, this will help manage inspection forces at the project level and could affect the number of FTEs across TxDOT depending on the analysis.

**What is the significance / scope of the problem?**
This research project affects the way construction inspection is handled throughout the state. The analysis should quantify and define the benefits, costs, and risks associated with construction projects. Benefits could include lane miles treated, ADT within the project, projected life of the treatment, while costs should include actual project costs, reduction in project life due to poor construction, vehicle operating costs associated with performing the construction versus not performing the construction, lastly risks should attempt to capture the value associated with public safety and capital reinvestment in the event of failure. The research project should evaluate a variety of construction projects to perform this benefit/risk analysis. This should include everything from district seal coat projects to new construction.

**What are the technical objectives of this project?**
1. Perform a detailed study of the types of construction projects currently/recently...
constructed in Texas and identify the most common construction operations or items of work. The study should include the inspection levels currently assigned to these operations by Area and Construction Engineers.

2. Bench mark the information collected above with the information from other typical DOTs.

3. Develop a model to define the benefits, costs, and risks associated with the types of construction projects identified in No 1 above. The model should account for variables such as lane miles treated, ADT, projected life of the work, etc., while risks should include reduction in project life due to poor construction, vehicle operating costs due to poor ride quality, public safety in the event of failure, etc. Defining benefit should include not only what benefit is, but how it is quantified and accounted for in the analysis. Many components considered in the analysis might not directly be measured in monetary value, an integral component of the analysis that must be overcome. Costs of the project must also be defined and could include costs above and beyond the capital costs associated with construction. Risks must be defined and quantified through a risk analysis procedure. The benefits and risks should be evaluated against the costs to help determine and justify the amount of inspection required on projects.

4. Define the minimum and desirable level of inspection for common construction operations or items of work identified in No 1 above based on the benefits, costs, and risks determined by the model developed in No 3 above.

5. Develop new guidelines on assigning inspection for maintenance and construction projects.

What benefits would this project deliver, and how would the results be used within TxDOT?
One of the major benefits of this project would be the creation of an analysis to help districts determine and justify the number of inspectors required for construction. The desirable inspection level would take into account the benefits and risks of the project where the minimum level would not. It would help Area Engineers monitor construction inspection and offer time management suggestions. It would allow districts to evaluate future construction to determine how inspectors should be shared across Area Office lines to ensure adequate inspection occurs. The project also provides a perspective on the value of construction projects and quality assurance inspection based on risks and benefits beyond contract costs. This project should be a true benefit and risk analysis of construction projects using many variables that are affected by the project to determine and justify the number of inspectors required on a construction project.

Minimum Deliverables:

- Stand-alone Products:
  - Products as deemed appropriate by the researchers.

- Reports:
  - Complete documentation of work performed, methods used, and results achieved. Report will include: (1) A list of benefits, costs, and risks considered in the analysis and how these were quantified and evaluated against a list of costs; and (2) An implementation procedure or method for supervisors to evaluate the benefits, costs, and risks of a project at a District or Area Office and determine the minimum and desirable staffing level for commonly used construction operations or items of work.
  - Project Summary Report

Proposal Requirements:

1. Proposals will be considered non-responsive and will not be accepted for technical evaluation if they are not received by the deadline or do not meet the requirements stated in Chapters 3 and 4 of RTI's University Handbook.
2. Proposals should be submitted in PDF format, 1 PDF file per proposal. File name should include project number and university abbreviation.
3. All proposals should be submitted through the university’s Research Liaison to RTI, as instructed in the RFP announcement.
### Pre-proposal Meeting:

Tuesday, February 7, 2012, 10:15am – 10:45am  
Austin Riverside Campus  
118 E. Riverside Dr  
RTI Conference Room, 1st Floor  
Austin, Texas 78704  

WebEx Information Below:

1. Link to join the online meeting:  
2. First time users of WebEx click on the yellow bar at top of your screen to run "Active X-Control".  
3. When you join the meeting select either “Call me at a new number” or “I will call in”. The phone number and code below can be used for either internet or without internet access.  
   - Dial toll free: 1-877-668-4493  
   - Meeting Code: 734 360 214

### Notifying RTI of Intent to Propose:

In order to be notified if additional project information is distributed by TxDOT, you must contact Frank Espinosa, Jr., at (512) 416-4741 or frank.espinosa@txdot.gov by January 25, 2012, if you plan to propose.

### Proposal Deadline:

Proposals are due to RTI by 4:00 p.m. Central Time, March 22, 2012. Email submissions should be sent to rtimain@txdot.gov.