Final Report

Using Mobile Computers to Automate the Change Order Prediction Cost for Highway Construction Projects

Performing Organization: University of Puerto Rico at Mayaguez

July 2017

University Transportation Research Center - Region 2

The Region 2 University Transportation Research Center (UTRC) is one of ten original University Transportation Centers established in 1987 by the U.S. Congress. These Centers were established with the recognition that transportation plays a key role in the nation's economy and the quality of life of its citizens. University faculty members provide a critical link in resolving our national and regional transportation problems while training the professionals who address our transportation systems and their customers on a daily basis.

The UTRC was established in order to support research, education and the transfer of technology in the field of transportation. The theme of the Center is "Planning and Managing Regional Transportation Systems in a Changing World." Presently, under the direction of Dr. Camille Kamga, the UTRC represents USDOT Region II, including New York, New Jersey, Puerto Rico and the U.S. Virgin Islands. Functioning as a consortium of twelve major Universities throughout the region, UTRC is located at the CUNY Institute for Transportation Systems at The City College of New York, the lead institution of the consortium. The Center, through its consortium, an Agency-Industry Council and its Director and Staff, supports research, education, and technology transfer under its theme. UTRC's three main goals are:

Research

The research program objectives are (1) to develop a theme based transportation research program that is responsive to the needs of regional transportation organizations and stakeholders, and (2) to conduct that program in cooperation with the partners. The program includes both studies that are identified with research partners of projects targeted to the theme, and targeted, short-term projects. The program develops competitive proposals, which are evaluated to insure the mostresponsive UTRC team conducts the work. The research program is responsive to the UTRC theme: "Planning and Managing Regional Transportation Systems in a Changing World." The complex transportation system of transit and infrastructure, and the rapidly changing environment impacts the nation's largest city and metropolitan area. The New York/New Jersey Metropolitan has over 19 million people, 600,000 businesses and 9 million workers. The Region's intermodal and multimodal systems must serve all customers and stakeholders within the region and globally.Under the current grant, the new research projects and the ongoing research projects concentrate the program efforts on the categories of Transportation Systems Performance and Information Infrastructure to provide needed services to the New Jersey Department of Transportation, New York City Department of Transportation, New York Metropolitan Transportation Council , New York State Department of Transportation, and the New York State Energy and Research Development Authorityand others, all while enhancing the center's theme.

Education and Workforce Development

The modern professional must combine the technical skills of engineering and planning with knowledge of economics, environmental science, management, finance, and law as well as negotiation skills, psychology and sociology. And, she/he must be computer literate, wired to the web, and knowledgeable about advances in information technology. UTRC's education and training efforts provide a multidisciplinary program of course work and experiential learning to train students and provide advanced training or retraining of practitioners to plan and manage regional transportation systems. UTRC must meet the need to educate the undergraduate and graduate student with a foundation of transportation fundamentals that allows for solving complex problems in a world much more dynamic than even a decade ago. Simultaneously, the demand for continuing education is growing – either because of professional license requirements or because the workplace demands it – and provides the opportunity to combine State of Practice education with tailored ways of delivering content.

Technology Transfer

UTRC's Technology Transfer Program goes beyond what might be considered "traditional" technology transfer activities. Its main objectives are (1) to increase the awareness and level of information concerning transportation issues facing Region 2; (2) to improve the knowledge base and approach to problem solving of the region's transportation workforce, from those operating the systems to those at the most senior level of managing the system; and by doing so, to improve the overall professional capability of the transportation workforce; (3) to stimulate discussion and debate concerning the integration of new technologies into our culture, our work and our transportation systems; (4) to provide the more traditional but extremely important job of disseminating research and project reports, studies, analysis and use of tools to the education, research and practicing community both nationally and internationally; and (5) to provide unbiased information and testimony to decision-makers concerning regional transportation issues consistent with the UTRC theme.

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16. Abstract

Currently, UPRM is working on a mobile computing application for automating the collection process of field inspection data using iPads or Android Tablets. The application contains standard forms of the specifications that appear in the Standard Specification of Road and Bridge Construction book. Because of their high mobility characteristics and due to their small size and light weight, these mobile devices can be used in the construction field to perform various tasks including development and evaluation of a change order and extra work.

This report presents an extension to the application by automating the prediction of the project cost by the implementation of change orders and extra work in highway construction projects. The proposed prediction models would allow the officers along the decision-making chain to consider not only the technical aspects of a required change order, but also, the opportunity cost of their timely decision. This would streamline the decision process and has the capability to generate important cost and time savings predictions that could allow finishing highway construction projects in a timely manner and within the expected budget. The development of this application could also result in faster transfer of information between the parties along the decision-making chain in a highway construction project, therefore improving the current communication process. In addition, automating the change order process and subsequent reporting and information transfer flow could result in improvements in the overall process, reducing the overall project delivery cycle. In order to accelerate project delivery, there is a need to improve the current methodology to consider and approve change order and extra work. Once the application has been developed, the research team will test it using the information of a recently finished highway construction project to verify its suitability and perform any adjustment to fit the models to the real world.

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Progress reports of the project, including change orders and extra work orders, are used to measure project progress and current estimated cost. Continuous monitoring of the progress of the project allows management to effectively complete the project within the planned time and costs. Given the dynamic nature of projects there are always change orders, which were not planned at the beginning of the project. It is important to predict how much these changes will affect the project in terms of cost and time.

Current practices to manage change orders and extra work are based on written documentation that is submitted to the project manager. These documents are handled by different personnel until they reach the person in charge of making the decision to approve or deny a change order. To facilitate the decision process, mathematical models of prediction of cost and time of project are used to prepare different scenarios for the owner according to the actions that can be implemented. These mathematical models could be executed in a mobile application to accelerate the transfer of information. Currently, UPRM is working on a mobile computing application for automating the collection process of field inspection data using iPads or Android Tablets. The application contains standard forms of the specifications that appear in the Standard Specification of Road and Bridge Construction book. Because of their high mobility characteristics and due to their small size and light weight, these mobile devices can be used in the construction field to perform various tasks including development and evaluation of a change order and extra work.

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1. INTRODUCTION

The completion of road construction projects within the project scope established as a variable of time and cost is the main goal for all transportation agencies. In Puerto Rico, the PRHTA (Puerto Rico Highway and Transportation Authority), which is part of the PRDTPW (Puerto Rico Department of Transportation and Public Works), is responsible for managing the construction of transportation projects. This agency must ensure that all projects are completed within schedule and according to the allocated budget.

One of the main factors that generates increase in project budget is known as change orders. Change orders are additions to the initial contract agreement between the project owner, contractor and designers to carry out work that is not within the original scope of the project. Change orders or additional work could occur for the following reasons: unexpected conditions at the project site, adverse weather, changes in materials due to unavailability, omissions in existing conditions, poor planning or design errors, among others.

Peterson (2013) established the owner's look at projecting the estimated cost at completion. After a project is completed, estimated costs are compare to actual costs. The main reason to determine actual expenses is to better understand behavior in terms of project changes. In addition, as change orders are received and executed, the new project cost must be estimated. A well-executed project will guarantee a satisfied customer and a profitable company capable of managing unexpected activities and establishing trusting relationship between all parties involve.

This research project is an extension to the application developed in the earlier research project "Automating the Reporting and Progress Monitoring Process using Mobile Computers for Highway Construction Projects", which was also funded by UTRC. The mobile app originally developed was designed to assist with the quality control of highway construction. To further support project control, the existing app is now being enhanced with the addition of several features. The third phase of the automation process will provide an extension to the application by automating the prediction of the project cost by the implementation of change orders and extra work in highway construction projects. The proposed prediction models would allow officers, along the decision-making chain, to consider not only the technical aspects of a required change order but also the opportunity cost of their timely decision. This would streamline the decision process and would allow generating important cost and time savings to finish highway construction projects in a timely manner and within the expected budget. The development of this application could also result in faster transfer of information between the parties along the decision making chain in a highway construction project, therefore improving the current communication process. In addition, automating the change order process and subsequent reporting and information transfer flow could result in improvements in the overall process, reducing the overall project delivery cycle and improve the current methodology to consider and approve change order and extra work. Assessing the value and effect in time and cost of a change order process in advance of its approval could be beneficial in the sense that involved parties could decide that the change order is not

necessary. Moreover, owner representatives could assess the impact in the project schedule that the delay in approving the change order could represent.

2. JUSTIFICATION

A change order is a contract modification, approved by the Owner, to change the terms of the prevailing contract due to adverse situations such as unforeseen conditions, design errors, deficiencies, increased quantities, upgrading materials, compensation for delays, additional work of the same type, among others. A request for a change orders can be generated by the contractor or the owner, as appropriate, to incorporate any change that is less than 30% of the identified project budget. In the PRHTA case, change orders are a key portion of the contingency measures pre-established as part of the project cost estimate to cover for uncertainties as a safe measure during project implementation. Generally, these changes will impact the project plan and the project cost. Is important to established metrics of the extensions for a clear overview of project behavior to make adjustments without affecting the customer-contractor relation. In addition, to change order there is another type of contractual change in construction projects known as extra work order. An extra work order consists of work that is outside and entirely independent of the contract. Essentially, it is work that, according to the original contract, does not need be performed in order to satisfy the terms of the original drawings and specifications. Materials and labor not contemplated by the contract and which are required by subsequent changes in the plans and specifications are assumed as extra work.

One way to identify how a change order or extra work impact the total project is through the progress curve (the S curve). The S curve plots the project cost over time. This curve is an excellent tool to show the progress of the project. In construction projects, the S curve is included in the monthly payment orders. It is used to compare whether the project is within cost and planned itineraries. Figure 1 shows an example of the curve S. To generate this curve, the current project time and total cost of the project are plotted. With this information, the curve gets updated with respects to cost and time, and the owner can compare whether the project is on time and within cost estimates or the project is late. It will be created on a daily/weekly/monthly basis.
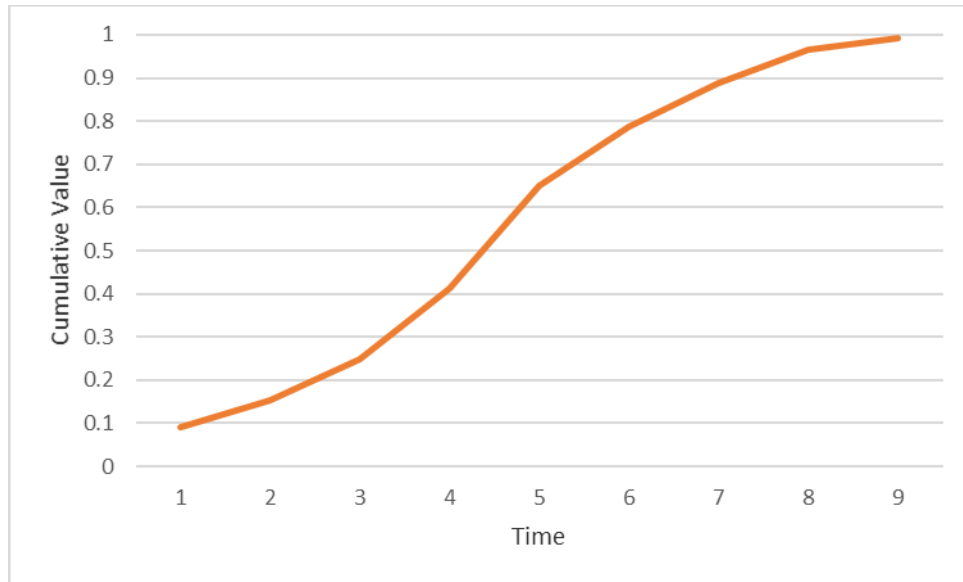
Figure 1: Example of the S Curve

Using the S curve as a method for measuring project progress and evaluating a mathematical model to predict project costs due to change orders and extra work allows the project owner to know a priori estimate of the added cost and time to the project changes. With this model the owner can assess the impact on project costs caused by approving a change order or extra work that is generated during the current month or at later stages. The model serves as a tool to predict changes in costs and project completion time and when it is convenient for the owner to approve identified change orders.

3. METHODOLOGY AND RESULTS

The methodology related to this research is the following. As a first step, the research team performed a literature review related to change order prediction cost and time, related to accelerated project delivery and strategies applicable to Puerto Rico. As a second step, the team collected the necessary data to perform the study. Data from 68 projects from the Puerto Rico transportation agencies were collected. In addition, informal contractor interviews were performed. After that, as a third step, the data was processed and different analytical methods like window analysis, probabilistic models for prediction tools, among other predictive tools were studied. In the fourth step, implementation of the models and strategies based in the research results took place. Figure 2 presents a methodology flowchart.

Step 1 - Literature Review

• Related to change order prediction cost and time
• Related to accelerated project delivery
• Strategies applicable to Puerto Rico

Step 2 - Data Collection

• PRHTA
• Contractor Interviews

Step 3 - Data Processing

• Statistical Description
• Models for Cost and Time Predictions

Step 4 - Implementation
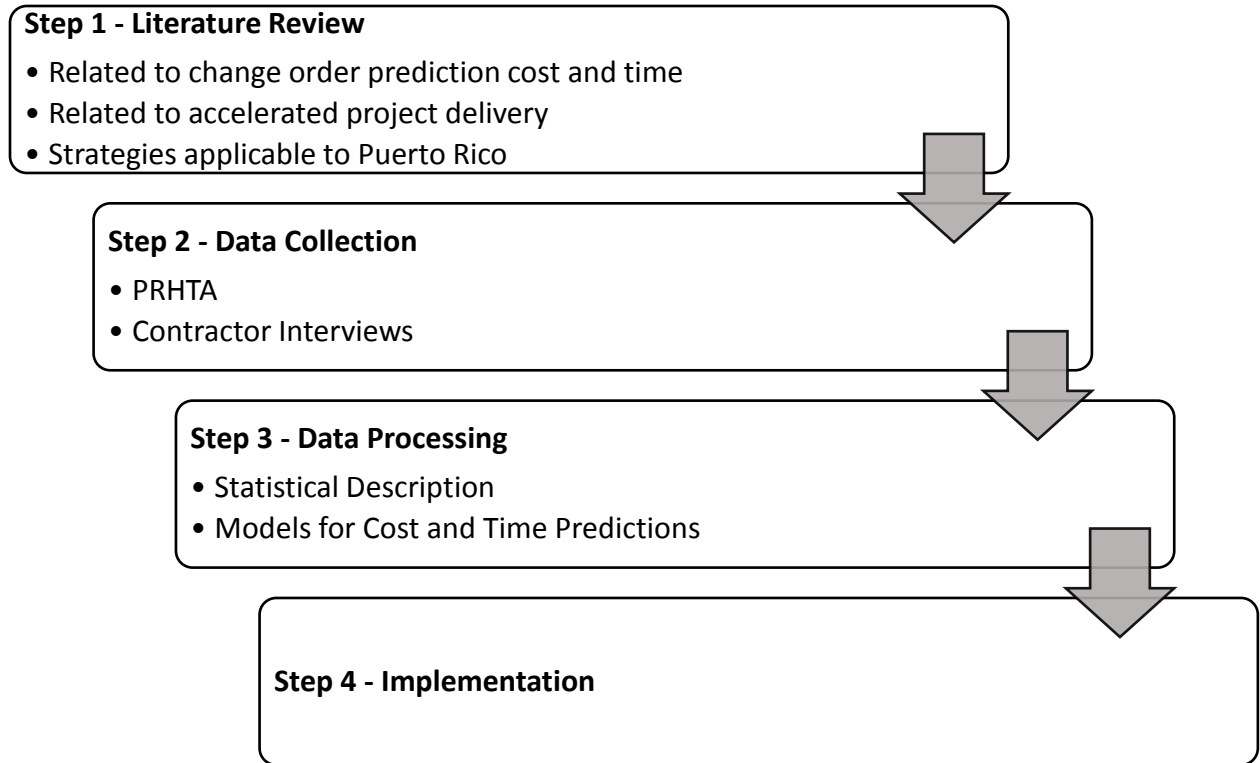
Figure 2: Methodology Flowchart

The research team developed an electronic application for a standard change order form to be used in a web based application design for project administrator. This application will consider all aspects of the standard form. The electronic version of the standard form will be an exact copy of the paper-based form. Other project documentation such as specifications, closure documents, among others, are included. The mathematical models for predicting impact on project cost and time due to change orders are developed and implemented in the application. Finally, the updated application was tested in a number to be determined of construction projects of the PRHTA.

An overview of the framework in development is presented in Figure 3. This framework provides the base for the automation of the new features to be implemented in the mobile device and the web base applications.
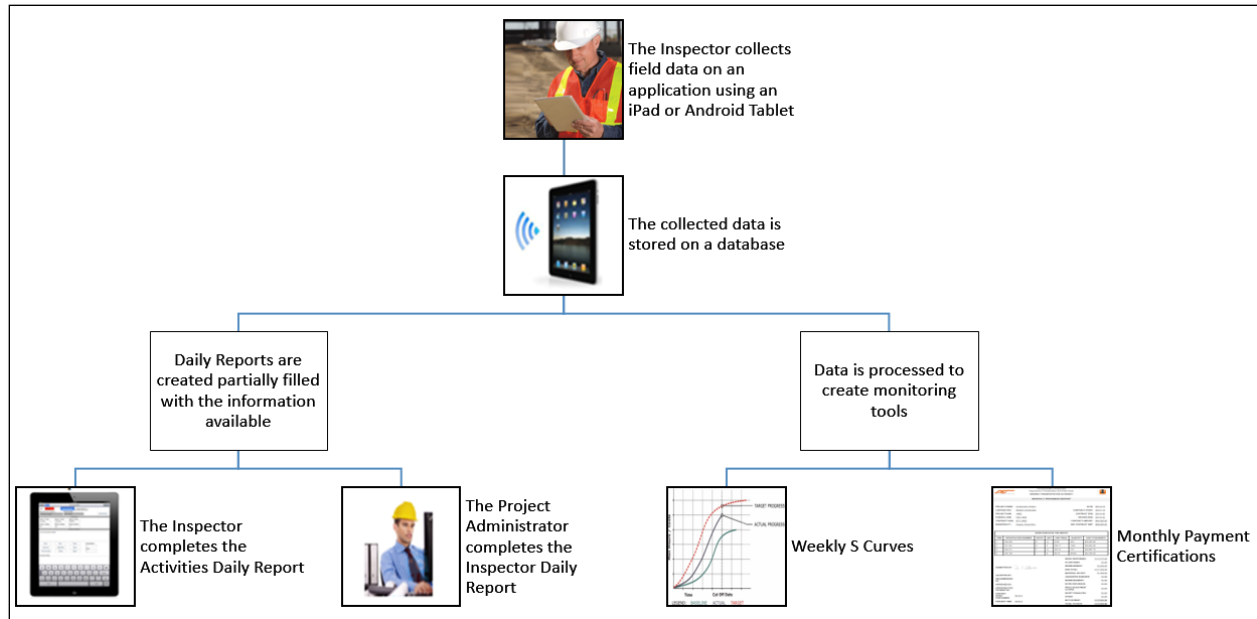
Figure 3: Conceptual implementation of mobile devices applications for automated field data collection and change order/extra work processing

Project Data

This research is focused on Highway Construction Projects in Puerto Rico. Only projects completed between 2000 to 2014 were evaluated. Sixty-eight highway construction projects from the following projects categories were evaluated: Road construction, Road reconstruction/repair, Special lane construction, Roundabout construction, Bridge construction and Bridge reconstruction/repair. The contract price considered to the research include projects that cost up to $25,000,000 with public or federal funding. The proponent of all projects are the Puerto Rico transportation agencies.

The projects data were divided into two groups to facilitate the different types of analysis. The category of the groups is based by the final project cost, such as final project cost less than one million dollars and final project cost more than one million dollars. A T-Test of difference was performed to identified if statistical difference between groups exist. This test and all the data analysis were performed in a statistical software, Minitab 17 Version 17.1.0. Figure 4 presents the T-Test results; the test was performed between the Total Changes (TC) of each group.

```
Difference = μ (TC) - μ (TC_1)
Estimate for difference:  21.22
95% CI for difference:  (12.05, 30.39)
T-Test of difference = 0 (vs ≠): T-Value = 4.69  P-Value = 0.000
```

Figure 4: T-Test of Difference Between Projects Less than 1 Million Cost and More than 1 Million Cost

The hypothesis test establish that no statistical difference exists if the results is 0. The T-Test results is 4.69, more than 0, and a P-Value of 0.000 means that the hypothesis of no difference between the projects needs to be rejected and accept that significant difference exists. The estimate for difference of compared groups is 21.22, this number is between the 95% confidence interval for difference validating the test.

Sixty-eight projects from the PRHTA were evaluated, 34 of them with final cost more than 1 million dollars and 34 with final project cost more than 1 million dollars. In terms of cost, the projects present an average of cost overrun of 22% of their original project estimated cost. In the United States, the average cost overrun of highway projects is between 10 and 15%. Jacoby (2001) studied 74 highway contract projects with estimated cost of more than 10 million dollars and found that the average cost overrun for this type of project cost in the USA is more than 25%.

Data Analysis

As found in the literature, some projects are analyzed per cost category. Two categories were developed: projects below 1-million-dollar cost have an average 16% of cost increment over the original budget while projects over 1-million-dollar cost have an average of 21% cost overrun, or cost over the original budget. Figure 5 depicts a graph of cost of changes as ratio of the original budget.

Cost of Changes as Ratio of Original Budget
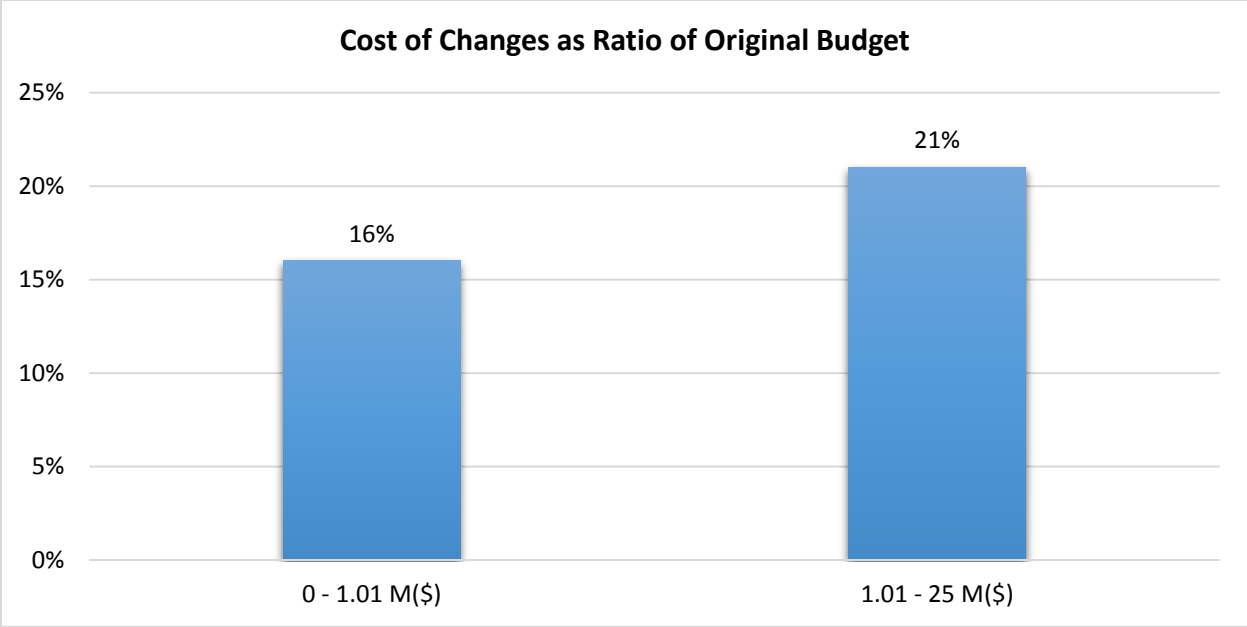
Figure 5: Cost of Change as Ratio of Original Project Budget

In terms of time extension for projects with construction cost categories, the projects below 1 million dollars has an average of time extension, over the schedule completion time, of around 22% while projects with construction costs higher than 1 million dollars have an average time extension ratio of 78%. Figure 6 depicts the time extension as ratio of scheduled completion time graph.

Time Extension as Ratio of Scheduled Completion Time
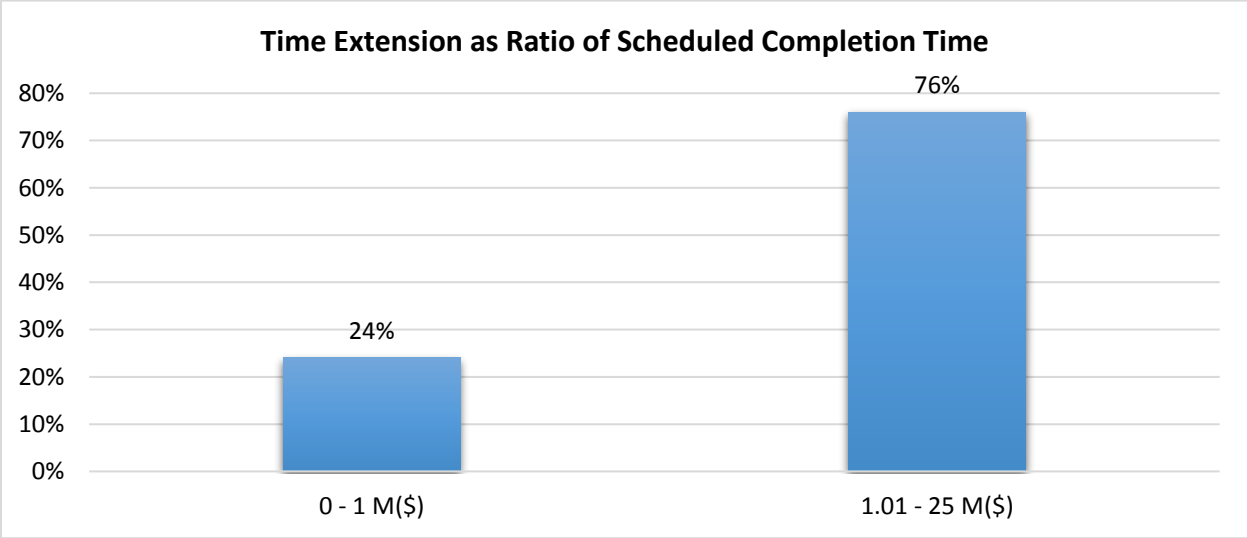
Figure 6: Time Extension as Ratio of Project Scheduled Completion Time

For the identification of how changes affect the final cost and construction time of the project, several data analyses were performed. The data analysis includes a risk analysis in the Primavera P6 software package to perform a what-if scenarios, one of the best tools to assess the impact of events in schedules. The use of this tool would allow to

assess the impact in cost and time that the delay in approving a change would have on the project. In addition, by using this technique the effect of possible Change Orders could be assessed before it has been approved. Another data analysis performed is the probabilistic approach to consider some of the uncertainty and risk in construction projects by assigning probabilities to occurrence of certain events. In this case, the team consider the frequency of the changes, time to approved changes, and the original scheduled time and cost to model and predict the effect of project changes with 5% of uncertainty. Finally, the team consider a Monte Carlo Simulation (MCS) through a scheduling simulation software add on ProbSched in the STROBOSCOPE simulation Language. Monte Carlo Simulation allows to consider high risk and uncertainty while planning construction projects. MCS is based on estimating the occurrence of events and then this events from which the effect on project schedule is calculated.

As a result, there is a better understanding of how changes affect the final project cost and construction time. That understanding provide us the projects scenarios to include in TAIP Web application to create a project progress S-Curve with changes simulation.

Web and Mobile Application

New implementations in TAIP 3.0 Mobile Application and Web Administrator Site:

1. Migrated *Inspector Web Application* from *Phonegap* to the Ionic framework for improving cross platform compatibility, scalability and user experience.
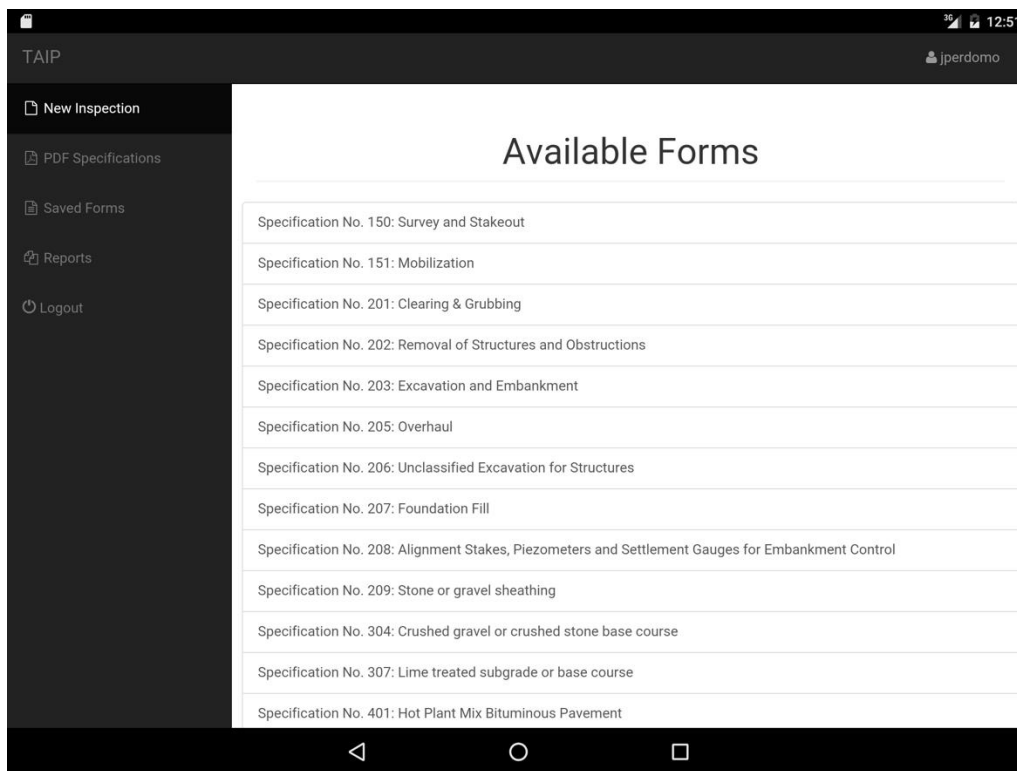
Figure 7: TAIP 2.0 Inspector Mobile Application
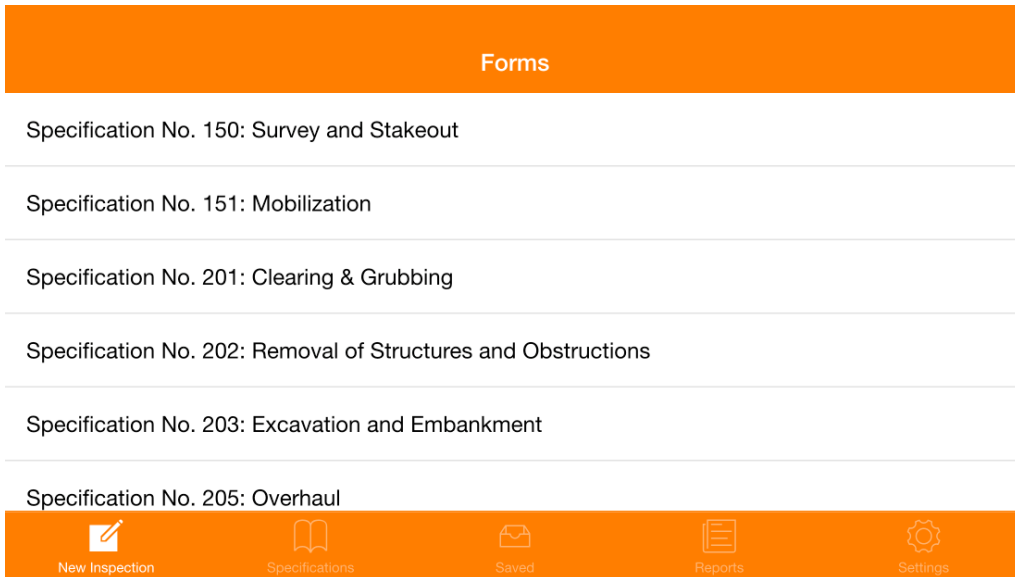
Figure 8: TAIP 3.0 New Inspector Mobile Application

2. Implemented and integrated Material on Site in the *Administrator Web Application* and *Mobile Application* for automating Project Material On Site Management.
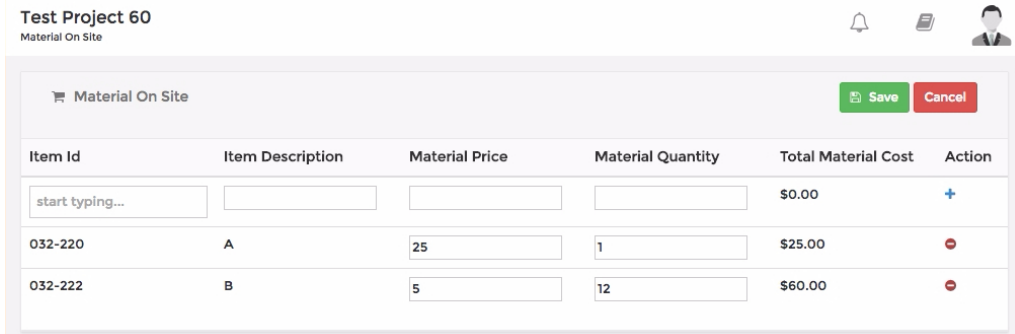
Figure 9: TAIP 3.0 Material On Site Management page (Administrator Site)

Figure 10: TAIP 3.0 Material On Site input form (Mobile Application)

3. Implemented logic and views for the Extra Work feature in the *Administrator Web Application* with a new manual input interface as an alternative to excel sheet upload*.*

Figure 11: TAIP 3.0 Extra Work management page (Administrator Site)

4. Implemented logic and views for *Project Closeout*, developed automated generation of project closeout pdf documents and integrated them to with *Project Closeout* page.

i Close Project

Project Items Review

Item ID	Item Description	Revised Quantity	Quantity to Date	Revised Quantity – Quantity to Date
032-220	A	1,200	50	1,150
032-222	B	4,899.58	0	4,899.58
032-226	C	850	0	850
031-361	D	2,240	0	2,240
003-150	E	500	0	500
003-311	F	775	0	775
003-345	G	200	120	80
005-130	H	90,000	0	90,000

Closing change order

Upload the following Excel spreadsheets:

Change Order Items
[Choose File] No file chosen

Change Order Cost Schedule
[Choose File] No file chosen

Constructor End of Project Documents

Liquidation
⬇ Download PDF

Waiver
⬇ Download PDF

Enter signature pin | Sign

Close Project

Figure 12: TAIP 3.0 Project Closeout page (Administrator Site)

Other changes integrated to the TAIP 3.0 Mobile Application and Web Administrator site:

- Improved *Administrator Web Application* security by implementing an SSL security certificate, encrypting password and pins in the database, and implementing token based login.
- Fixed issues in the *Web Application* that prevented change orders from being stored correctly in the database and made improvements to the interface for submitting change orders to the system.

- Implemented a search filter for the Project Items table in the *Administrator Web Application* which dynamically filters rows on the table upon user input in the search box.
- Improved the S-Curve logic by optimizing the code that display project data from the database into the S-Curve and performed fixes on the logic that automatically updates project data used to generate S-Curves
- Integrated an email notification system to the Web Application that notify administrator of project related events.
- Implemented Inspector Settings with update signature option to the mobile application. Additionally, the mobile application functionality and usability were improved by updating the user interface logic and applying general fixes for cross platform compatibility.

4. IMPLEMENTATION

Several meetings were conducted with personnel from the PRHTA in order to implement the application in real construction projects. In the first meeting, the application was explained to six supervisors and the application was installed in their mobile devices. After two months, a meeting was conducted in order to obtain feedback from the supervisors. The feedback provided allowed for implementing additional features in the application such as accounting for labor, materials and equipment used in each activity.

Once the application was updated, a meeting was conducted with the supervisors and the new features were explained. The supervisors took the application to their projects and tested. Another meeting was conducted to gather feedback. The last meeting took place on June and the research team presented the mobile device application and the web based application for managing the projects. The Director of the Construction area of the PRHTA was present during the meeting. Personnel from the PRHTA have established a dedicated server for the application. The agency will buy at least ten tablets to test the application in ten different projects with the idea of implementing the application in more projects in the near future.

5. CONCLUSIONS

The developed prediction models would allow officers, along with the decision-making chain, to consider not only the technical aspects of a required change order, but, the opportunity cost of their timely decision. The identification of type of changes that produce more cost overrun and time extensions provide the transportation officers the opportunity of concentrate efforts preventing changes in those areas. Analysis of project data from 2000-2014 allowed assessing how critical is the situation with respect to cost increases and time increases due to change orders and extra work orders.

There is no study on how these changes affect the overall performance of the project, therefore changes are common and accepted. There have being instances were more than 100 change orders have been approved. The increase in cost that they represent is

considerable. This number suggests that there is a problem managing projects and in consequence such changes.

Improving the administration of highway construction projects by developing and improving the change management methods is a major contribution. The results of this research could be replicated and implemented in other jurisdictions. The models presented in this study allow the transportation officers quantify how much time and cost increase in highway construction projects due to construction changes.

As a recommendation, the transportation agencies need develop a change orders and extra work orders management process that evaluated the impact of changes to the projects and create a timely decision process. In addition, the transportation agencies need to develop and implement procedures to collect changes information to facilitate their evaluation. Is recommended develop an inspection process of bid information for errors and omissions in the design and construction area. This can help to minimize the quantity of project changes.

6. FUTURE WORK

There are different areas in which future work related to this project could be conducted. One possibility is to expand the inspection process in the application to other transportation systems, such as airports, railroads, and ports. Another possibility is to expand the application to consider construction project, with different specifications, in other locations. This can be achieved by making direct contact with other state DOTs interested in the application. A third option for future work is to expand the application allow implementing the maintenance process of roads.

A fourth option is to identify a validation process for cost and time prediction models for Puerto Rico highway construction projects, and develop prediction analysis by type of projects. In addition, to explore different prediction analysis using probabilistic models.

APPENDIX 1: ADMINISTRATOR DASHBOARD USER MANUAL

Transportation Automated Inspection Process (TAIP)

Administrator Dashboard User Guide

1.Administrator Site Login and Initial Setup

To access the Administrator Dashboard open your preferred web browser and navigate to http://taip.uprm.edu. Here you will see the login screen for initiating your session in the site. Administrator is required to have an account created by the assigned project I.T. Administrator or beforehand. After logging in you will be redirected to the appropriate home screen based on your access permissions.
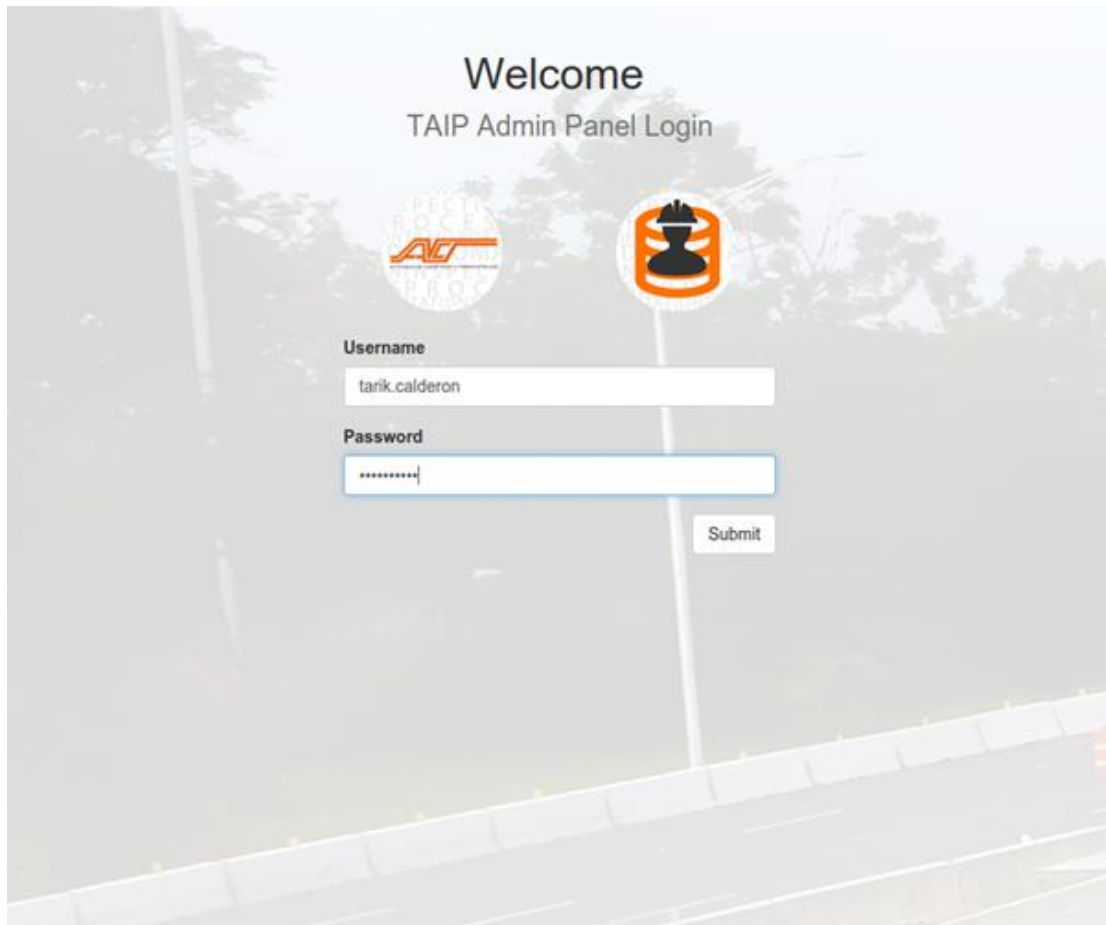
Figure 1-A: Login Screen

If the user is logging in for the first time, you will be asked to set up your signature. To setup your signature it is required that login with your account through a touch enabled mobile device. In the signature setup screen the administrator has to enter a 4-digit pin number in the provided pin number text box and draw the signature in the provided canvas. Administrator can erase the signature inside the canvas by clicking in the reset button next to the submit button.
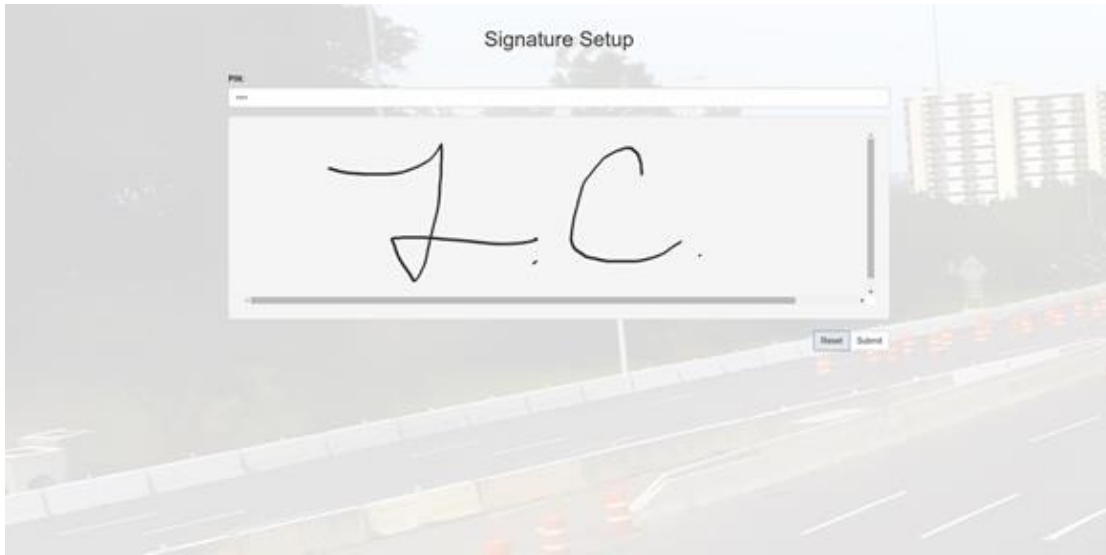
Figure 1-B: Signature Setup

After setting up your signature, you will be redirected to the Dashboard's Create New Project page. On this screen, the administrator is required to fill all the text input fields with the requested Project Information and upload initial Project Files. The Project Files section requires the administrator to upload initial Specifications, Cost Schedules, Personnel and Equipment tables in excel format. Administrator should download the files from the Downloads page, fill them and upload them in the form. See images below for excel examples.

Figure 1-C: Dashboard's Create New Project Page

Figure 1-D: Dashboard's Create New Project Page Left Section

Figure 1-E: Dashboard's Create New Project Page Right Section
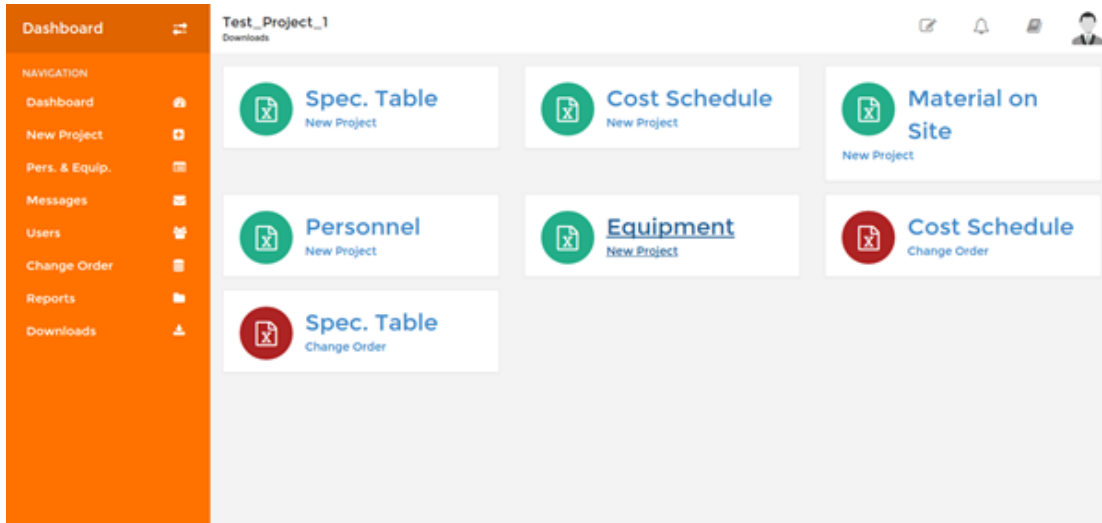
Figure 1-F: Downloads page with required excel formats

MonthNumber	Month	Cost
1	Enero	175,000
2	Febrero	175,000
3	Marzo	90,000
4	Abril	35000

Figure 1-G: Cost Schedule Excel Table Example

EntryNumber	SpecificationNumber	Entry	Unit	UnitPrice	OriginalQuantity
1	032-220	A	CY	$ 100.00	1000
2	032-222	B	CY	$ 152.00	3500
3	032-226	C	CY	$ 153.00	850
4	031-361	D	lf	$ 154.00	2240
5	003-150	e	CY	$ 155.00	500
6	003-311	F	CY	$ 156.00	775
7	003-345	G	SY	$ 157.00	200
8	005-130	H	lb	$ 158.00	90000
9	005-120	I	lb	$ 159.00	65500
10	005-812	J	lb	$ 160.00	3200

Figure 1-H: Specifications Excel Table Example

name	classifications
Tarik	Wiring
Lugo	Operator

Figure 1-I: Personnel Excel Table Example

type	description
Digger	BOBCAT
Digger	CATERPILLAR

Figure 1-J: Equipment Excel Table Example

2.Navigation Options and User Menu

On the orange rectangle in Figure 2-A you can see the navigation menu. The navigation menu contains all the available options in the dashboard site. Clicking one item of the will redirect to the corresponding section of the site. The *User Menu*, located on the top right, provides the administrators with notifications, project selection list and logout button.
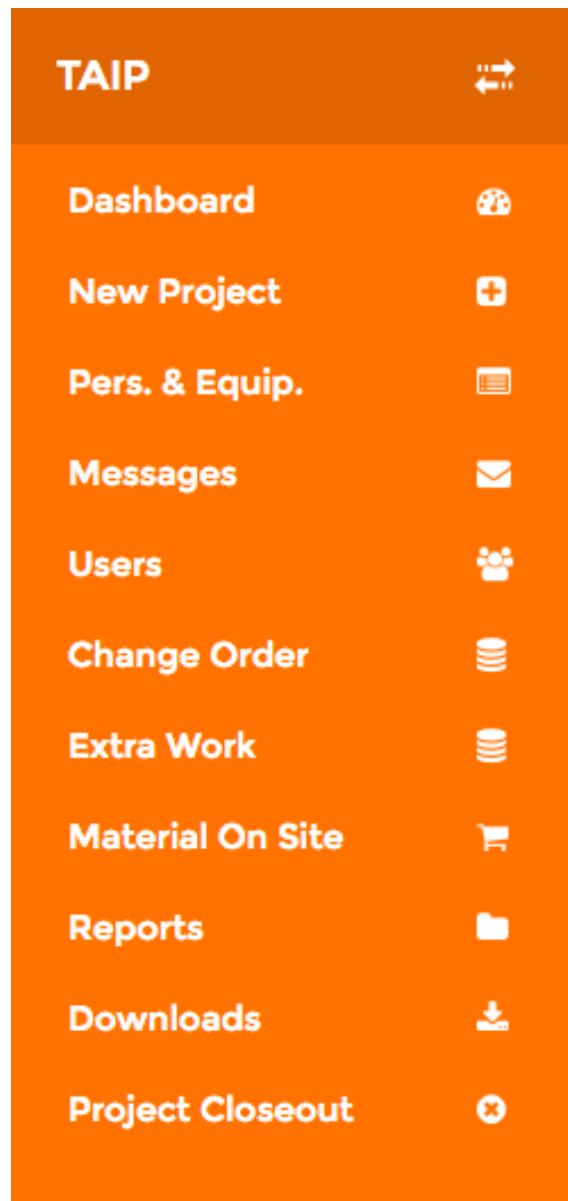
Figure 2-A: Navigation Menu
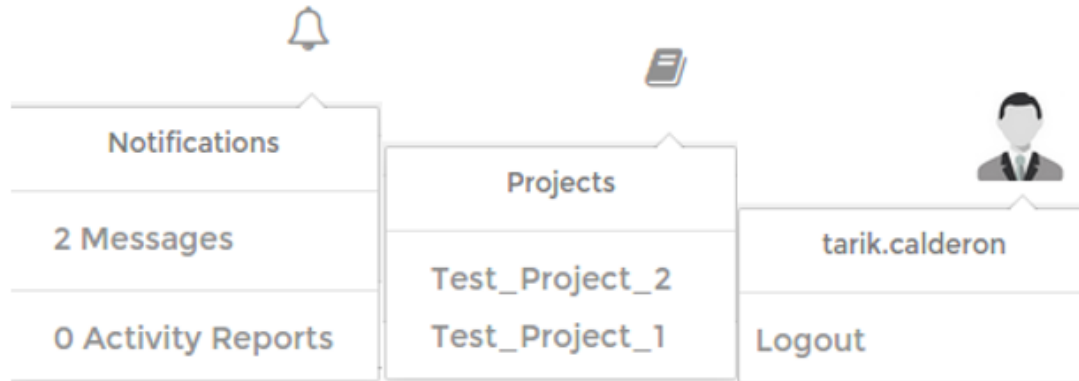
Figure 2-B: Notifications, Project Selection and Logout in administrator Menu

3.Administrator Dashboard

Administrator will be redirected to the Administrator Dashboard when there are projects stored in database or right after administrator has created a new project. In the Dashboard, the Administrator can keep track of the project by reviewing the provided S-curves and specifications table. The S-Curve in the top left, provides information about the project's estimated cost percentage per month with a blue curve and project cost percentage to date with a red curve. The S-Curve on the top right provides the same information, with the addition of the predicted cost percentage of approved change orders which is presented with an orange curve. Below the S-curves, the administrator can view updated information about the project specifications. For example, Specification worked quantity to date and Specification worked amount this month. In addition, the administrator can filter specific items by searching on the search bar located in the top right of the Specifications Table. The table will be automatically filtered based on the user's search query.
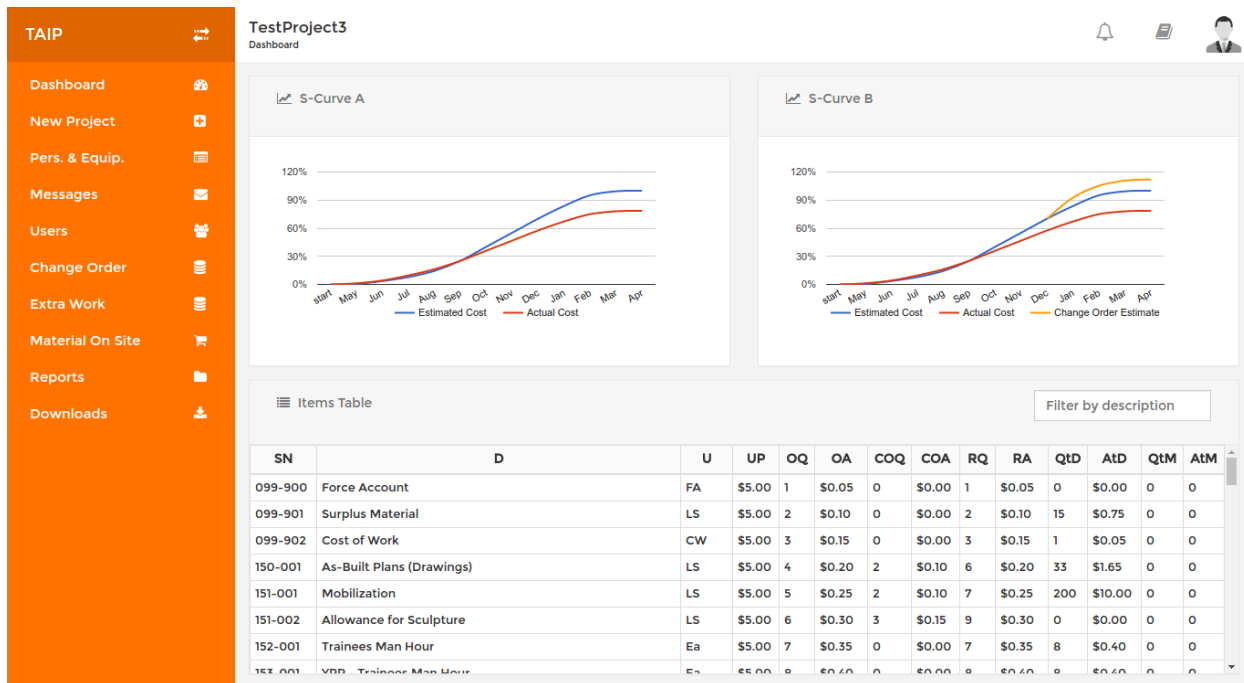
Figure 3-A: S-Curves and Specifications table

4.Personnel and Equipment

In the Personnel and Equipment page the administrator can search, add, edit or delete personnel and equipment from the project. You can search personnel by role or by name by typing your search query in the "Search for Personnel" search bar. To add, edit or delete project personnel, simply press on the green edit button to enter *edit mode.*

In edit mode, you can add new personnel by typing a new Name and Role in the blank text fields and then pressing the green small plus button to the right of the text fields. To edit existing personnel, change the information in the pre-filled text fields. To delete personnel simply press the red small minus button to the right of the text fields. When done making changes, the administrator must press the green save button for storing the changes in the database. The same procedure can be used for searching, adding, editing or deleting project equipment.

NOTE: The Personnel and Equipment presented on this page is available for the inspector to use in the TAIP mobile application inspector form.

Figure 4-A: Personnel list

Figure 4-B: Personnel list in edit mode

5.Messages

The administrator can receive messages from the system when new Daily Activity Reports are generated or when another project member has a concern regarding the Monthly Payment Report approval. If there are no messages to view the administrator will see a message notifying that there are no available messages to view.
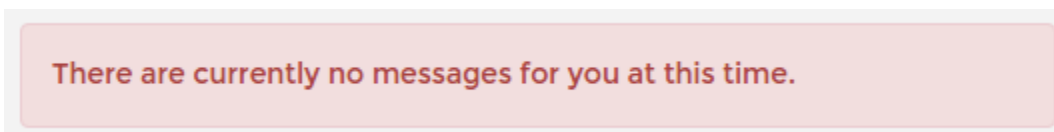
Figure 5-A: No message notification
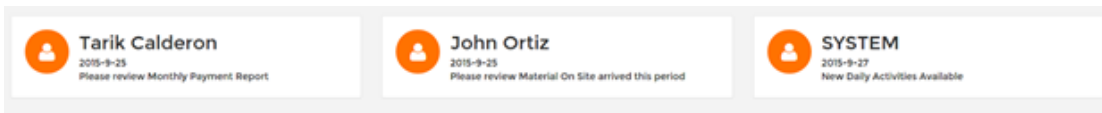
Figure 5-B: Project Messages example

6.Project Users

The Users page is where the administrator grants access to inspectors allowed in the project and non-administrator users allowed in the Monthly Payment Report approval process. Only the inspectors in

the project inspector list are able to login to the project in the TAIP inspector mobile application. Similarly, only administrators in the project allowed user list are able login to the Dashboard and sign Monthly Payment Reports.

The process for adding, editing and deleting items in the list is similar to the Personnel and Equipment process. However, in the Users page, the administrator has an autocomplete feature enabled in the search bar to facilitate the user and inspector search. Also, in the Inspector section only where the user can add new inspectors to the system database. To do so, simply click in the small green button that says "New" and a form will be displayed with text input boxes for adding new inspectors. After the form has been filled, submit the *New Inspector* form and the newly added inspector will be available for searching in the autocomplete search bar. After inspector has been added to database, it is still required to add the inspector through the edit mode process in order for the inspector to be part of project. To add an inspector, search for the username in the inspector section and select the inspector username from the list by pressing the plus button. Afterwards press the "save" button and the inspector will be added to the authorized inspector list for the project.
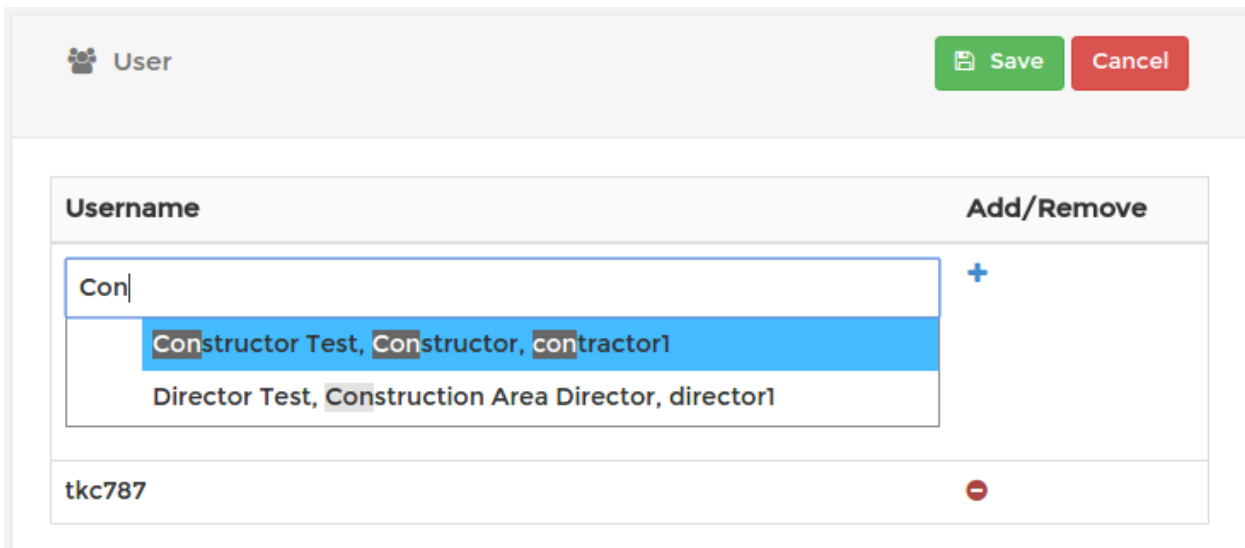
Figure 6-A: Autocomplete for searching users in database

Figure 6-B: Inspector section for adding new inspectors to project and/or managing allowed inspectors.

Figure 6-C: New inspector form for adding new inspectors to database.

7.Change Orders

The *Change Orders* page allows the administrator to enter approved changed orders to the project. When a new change order has been submitted, the data will be stored in the database and the S-Curves and *Specifications Table* in the *Dashboard* will be updated. To add a new change order, the administrator should have first downloaded and filled the *Change Order Specifications Excel Table* and the *Change Order Cost Schedule Excel Table.* After the tables are ready, the administrator can upload the approved change order by pressing the green button on top named "Add a Change Order", then pressing the "choose file" buttons and selecting the respective Excel files and finally pressing the submit button. When data has done uploading, the administrator will receive a notification stating that the change order has been successfully submitted.

Change Orders are stored in the database and can be retrieved by date. In order to view stored change orders, click on the grey multi-value button named "Archived" and a list of dates will appear. Click on the desired date, and the selected Change Order will be displayed below.

Figure 7-A: Change Order Page

8. Extra Work

The Extra Work page is used similarly to the Change Order page. The user can upload Excel sheets containing the required data for adding new items to the project or alternatively the user can manually input Extra Work by filling the sheet form available in the page. Each time User can also see submitted Extra Work in the same manner as in the Change Orders Section by clicking on the grey multi-value button named "Archived" and then clicking on the desired date of the requested Change Order

Figure 8-A: Extra Work Add Page

9.Material On Site

The Material on Site page allows Administrators to define the items on the project that are will be bought in advanced before installation. Providing this information is necessary, if Material On Site is expected, because the *Inspector Mobile Application* uses the information provided in this page to aid in the inspection process by helping the inspector to easily identify and document when an item is bought in advance. Material on site can be predefined during project creation by writing "YES" under the column named "Material On Site" on the excel sheet and the specific cell that corresponds to the desired item. To update or add new items to the Material On Site list, click on the "Edit" button and fill in the form with the required information. When all fields have been filled, press the blue plus button to add it to the list. **IMPORTANT:** In order to upload all items that have been added to the list, the Administrator must press the "Save" button in the top right of the page section. Upon completion, the system will notify the Administrator that the transaction was successful and the items added to the list can be viewed on the Material On Site list.

Figure 9-A: Change Order Page

10.Reports

In the *Reports* page, the administrator can view Daily Activity Reports generated by inspectors through the TAIP mobile application and both view and generate Daily Inspection Reports and Monthly Payment Reports. Reports can be searched and sorted by ID, date or inspector name. Search can be done by writing your search query in the search bar located in any of the report section (i.e. Daily Activities, Daily Inspection or Monthly Reports) and data in the table will be filtered based on your search automatically. Sorting can be achieved by pressing one of the three buttons located to the right of the search bar of each section. For example, in the Daily Activity Reports section pressing the button with the calendar icon will sort the table by date and the other buttons can be used for sorting by title and inspector respectively.

To create a new Daily Inspection or a Monthly Payment Report, click on the small green button with the plus icon located next to the search bar in the respective report section. Pressing the button, will redirect you to a form. Filling and submitting the form will create a new report. NOTE: Creating a Monthly Payment Report will automatically close the current period and begin the new period.

Figure 10-A: Reports Page

11. Daily Inspection Report Form

To create a new Daily Inspection Report, the administrator must completely fill Daily Inspection Report Form. The top section of this form contains project information, inspector name, weather data, worked hours, rain time if any and date. At the table at the center, the administrator can see all the activities in which work was performed with their respective inspectors, per day. At the bottom section there are input for the administrator to fill in before submitting the form. To submit a form, the administrator must sign the form first by entering administrator pin number. If pin number is correct the form will immediately retrieve the administrator signature and display it right on top of the pin number input box. See image in figure 9-A to see an example form.

Figure 11-A: Daily Inspection Report Form Top Example

i Form

Visits

Lost Time

Control Number

Meetings

Tasks

Issues

Other

Security Aspects

Observations

Signature Pin:

Enter Pin ####

Sign | Submit

Figure 11-B: Daily Inspection Report Form Bottom Example

12.Monthly Payment Report Form

To create a Monthly Payment Report, the administrator must completely fill in the *Monthly Payment Report Form.* The top section of this form contains project information, and three tables which display information about Items Activities worked during the active period and all the Materials On Site Received during the currently active period**.** The bottom section contains all the form inputs, a calculation preview and the pin number input for validating administrator and signing the form.

The *Material On Site Received* Table serve as an aid for keeping track of the materials on site received and installed. Items are automatically added to the Material On Site Received table by inspections submitted through the Inspector Mobile Application. Material On Site quantities are aggregated and automatically included in the calculations. However, a Material on Site field is provided for manually overriding the calculated value in case it is needed.

Additionally, the report form automatically aggregates all activities that have been submitted through the *Mobile Application* during the active period and calculates the total amount worked based on the activities performed and the stablished *Unit Price*. For instance, the Percent Work Performed, Percent Time, and T*otal Work Performed* is pre-calculated upon loading and displayed to the user in the corresponding fields.

All the form fields receive numbers as input and these fields are calculated either by pressing the "submit" button or pressing the calculate button in the *Calculation Preview*. It is recommended to always press the "calculate" button and before submitting the form. All form inputs in this form will be summed or added by default and if the administrator wishes to subtract a value, he/she can do so by writing the desired number with a negative sign on front (i.e. -5000). If an error was made during the calculations, the administrator can press "reset" button which to restore all the values in the form to their original state. When the form is submitted, the system automatically closes the current period and initiates a new period.

Figure 12-A: Example Monthly Payment Report Form

Figure 12-B: Monthly Payment Report Form Top Section

Items worked this Month

Specification Number	Description	Unit	Unit Price	Quantity	Cost this Month
032-220	A	cy	$100.00	50	$5,000.00

Percent Work Performed (%1.45):
1.45

Percent Time: (%25)
25.00

Work Performed ($5,000.00):
5000

Percent Retained (%0):
0

Amount Retained (-$0.00):
0

Reimbursement(WP) ($0.00):
0

Sub-Total ($0.00):
0

Material on Site ($0):
0

Liquidated Damages ($0.00):
0

Reimbursement(LqD) ($0.00):
0

Extra Retained (0):
0

Price Adjustment Clause ($0.00):
0

Safety Penalties ($0.00):
0

Other ($0.00):
0

Net Payment ($0.00):
0

Total to Date ($23,960.00):
23960

i   Calculate

Calculation

Preview

Sub-Total: $0.00

Net-Payment: $0.00

Total Amount to date: $23,960.00

Signature Pin:

Enter Pin ####

Sign   Reset Data   Submit

Figure 12-C: Monthly Payment Report Form Bottom Section

MONTHLY PROGRESS REPORT

Project Name:	Construction_Project	**Date:**	2015-9-4
Constructor:	Western Construction	**Contract Start:**	2015-10-3
Project Number:	14852	**Contract End:**	2015-4-22
Federal Number:	FED-14852	**Revised End:**	2015-4-22
Contract Number:	ACT-14852	**Contract Amount:**	$649,980.65
Municipality:	Caguas, Puerto Rico	**Revised Contract Amount:**	$689,980.64

Work Executed This Month						
Item Number	Specification Number	Item Description	Unit	Unit Price	Quantity	Cost this Month
1	032-220	A	cy	$100	250	$25,000.00
4	031-361	D	lf	$35.71	1680	$59,992.80
6	003-311	F	cy	$51.61	775	$39,997.75
9	005-120	I	lb	$0.76	65500	$49,780.00

Submmited by: _____
Project Administrator

Accepted by: Pending Approval
_____
Contractor

Recommended By: Pending Approval
_____
Area Supervisor/Regional Director

Approved by: Pending Approval
_____
Construction Area Director

Approved for Payment by: Pending Approval
_____
Finance Area Director

Percent Work Performed: 25.33 %

Percent Time: 20.00 %

Work Performed:	$ 174,770.55
% Retained:	$ -8,738.53
Reimbursement:	$ 5,000.00
Sub-Total:	$ 171,032.02
Material on Site:	$ 1,000.00
Liquidated Damages:	$ 0.00
Reimbursement:	$ 0.00
Extra Retainage:	$ 0.00
Price Adjustment Clause:	$ 0.00
Safety Penalties:	$ 0.00
Other:	$ 0.00
Net Payment:	$ 172,032.02
Total to Date:	$ 172,032.00

Figure 12-D: Monthly Progress Report Form Example

13. Project Closeout

The *Project Closeout* page allows the Administrator to close and currently active project. This page is divided in three sections: *Project Items Review, Closing Change Order* and *Constructor End Of Project Documents.*

i Close Project

Project Items Review

Item ID	Item Description	Revised Quantity	Quantity to Date	Revised Quantity - Quantity to Date
032-220	A	1,200	50	1,150
032-222	B	4,899.58	0	4,899.58
032-226	C	850	0	850
031-361	D	2,240	0	2,240
003-150	E	500	0	500
003-311	F	775	0	775
003-345	G	200	120	80
005-130	H	90,000	0	90,000

Closing change order

Upload the following Excel spreadsheets:

Change Order Items

Choose File | No file chosen

Change Order Cost Schedule

Choose File | No file chosen

Constructor End of Project Documents

Liquidation

⤓ Download PDF

Waiver

⤓ Download PDF

Enter signature pin | Sign

Close Project

Figure 13-A: Monthly Progress Report Form Example

In the first section, the Administrator can see a table containing all the Project Items that have not been completed and provides the Administrator with the amount required to finish the project. In the second section, the administrator can submit a new Change Order using as reference the table presented in the first section. And, in the *End Of Project Documents* section, the Administrator can download the Waiver and Liquidation PDF's for distribution to Constructor Representatives. To complete the *Project Closeout,* it is required to submit a Change Order in the *Closing Change Order* section and to validate account pin number for signature. When the pin number is validated and Change Order has been submitted, the user signature will be displayed on top of the signature input and the Administrator will be able to click the "Close Project" button.

Mon Dec 19 2016

Tamrio, Inc.
PO 455
Mayaguez PR, 00681

PROYECTO AC-200252/B000002452/LP-2(61)
Reemplazo de Puentes Núm 1121 y 1122 (Con Tecnología RGS)

Estimados señores(as):

Nuestra oficina ha completado el proceso de liquidar el contrato de construccion del proyecto de referencia. El costo inicial del mismo fue de $1,711,481.25 y su costo final de $2,294,436.24. Para poder procesar la certificación final para pago en este proyecto, solicitamos los siguientes documentos:

1. Relevos de la compañia aseguradora para el "Payment and Performance Bonds"
2. Relevos de la Corporación del Fondo del Seguro del Estado (CFSE)
3. Relevos de Arbitros Municipales
4. Declaración jurada donde indique que no tiene deuda alguna con segundas o terceras personas que realizaron trabajos en el proyecto

Como mecanismo alterno a la presentación de los requerimientos antes mencionados, ACT permitirá al contratista someter, **2 (dos)** relevos general (General Waiver & Release) que se incluyen como anejo en esta comunicación. Si se utiliza el mecanismo alterno del General Waiver & Release tambien se debe entregar un relevo de la compñia aseguradora "Payment and Performance Bond".

Sin nada más al particular quedo.

Cordialmente,

L. Calderón Ortiz

Ing. Adalberto Feliciano Rivera
Director Regional Oeste

Anejo

6508/MTL/mtl

Figure 13-B: Sample Liquidation Form

COMMONWEALTH OF PUERTO RICO

DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS

HIGHWAY AND TRANSPORTATION AUTHORITY

GENERAL WAIVER AND RELEASE

This General Waiver and Release is entered into this <u>Wed Dec 14 2016</u> in the city of <u>Mayagüez, PR</u>, Puerto Rico by an on behalf of <u>West Constructor</u>, (CONTRACTOR), a corporation organized under the laws of the commonwealth of Puerto Rico and with employer Social Security Number _____, (hereinafter the "Contractor") acting true duly authorized representative, _____ of legal age, **single/married** and resident of _____, Puerto Rico.

Whereas, Section 107.02 of the Standard Specifications for Road Bridge and Construction - 2005 (hereinafter the "General Provisions"), state that "the Contractor shall procure all required permits and licenses and pay all fees, taxes royalties, and changes and gives all necessary and incidental to the due and lawful prosecution of work".

Whereas Section 109.09 (a) of the General Provisions, states that "when the final acceptance of the project has been made as provided in Article 105.16, the Engineer will prepare the final estimate of the work performed. If the Contractor approves the final estimate or files no claim or objections to the quantities therein, within 30 days of receiving the final estimate, the Puerto Rico Highway Authority will process the payment for final payment. However, the final payment will not be made until the contractor has filled with the Puerto Rico Highway Authority the consent of the surety to payment of the final estimate and satisfactory evidence by affidavit, or as otherwise required by the Puerto Rico Highway Authority, that all his indebtedness by reason of the contract has been fully paid or satisfactorily secured".

NOW, THEREFORE, in view of above, the Contractor freely and voluntarily hereby represents, in regard to project **ACT-Project**. (Hereinafter the "Contract") that it:

1. Has paid or satisfactorily secured all payments due by reason of the Contract, including but not limited, to "Colegio de Ingenieros y Agrimensores" stamps to cover the difference between the final estimate and the original Contract estimate; amounts for any and all change orders and extra works orders; all payrolls, bills for materials and equipment and other indebtedness in any way connected with the Contract; and any all taxes assessable against any services, materials, equipment, processes or operations under or incidental to, or involved in the performance of the Contract, either by the municipality of _____ or the Commonwealth of Puerto Rico, the State Insurance Fund Corporation and any other government instrumentality with the capacity to assess fees and liens pertaining the Contract.

2. Has approved the final estimate and has no claim or objection to the quantities submitted in said document.

3. That its acceptance of the final payment shall operate as, and shall be, a general waiver and release to the Puerto Rico Highway Authority (hereinafter the "PRHTA") from any and all liabilities, claims, demands, damages, legal and/or administrative costs, disputes, suits, actions, claims for relief and causes of action, whether known or unknown, from the beginning of the work to the date of this General Waiver and Release and thereafter, for anything done or furnished or relating to the work under Contract.

Figure 13-C: Sample Waiver PDF

14. Monthly Payment Report Approval Process

After a form has been submitted successfully, it becomes available for signing and approval. The project administrator approves the Monthly Payment Report automatically when signing the form. However, to finish the report approval, the report must have the signature of users with the following roles:

· Contractor
· Area Supervisor
· Construction Area Director
· Finance Representative

Roles and access permissions are assigned to users by the I.T. Administrator when accounts are created. Users with roles from the list above, can sign in to the TAIP Administrator Dashboard for viewing and signing Monthly Payment Reports. Users who have no projects assigned, will receive an error message notifying them that they have no projects assigned. The project administrator must grant access to users in the *Project Users* page so that users can successfully login to a specific project and view the *Report Approval* page.

In the *Report Approval* page, users can see a list of pending reports that require approval on the *Pending Reports* tab and a list of signed reports on *Signed Report* Tab. Users can also search and sort reports using the search bar and the sort by date button. User can view the reports from either tabs by clicking on the blue hyperlinked text.

Users can sign reports by clicking on the "sign" button located in the navigation bar on the bottom of the page and submitting your signature by validating your pin number in the pin number form input. Also, if the user does not agree with something in the report, the user can reject the report and send a message to the project administrator by pressing the "reject" button, filling the text input with the desired message and pressing the "reject" button to submit the message.
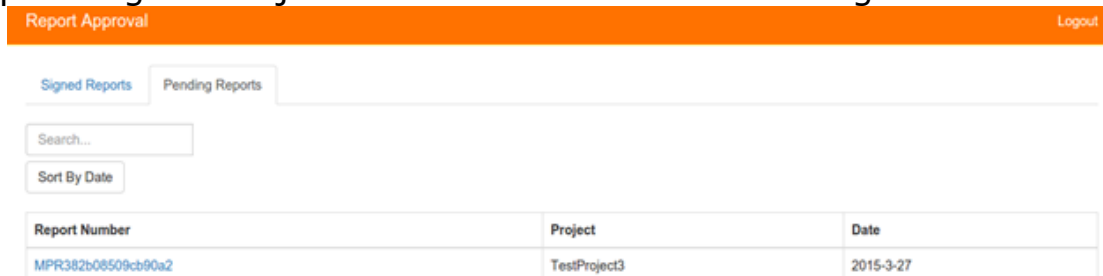
Figure 14-A: Report Approval Page (Pending Reports Tab)

Figure 14-B: Report Approval Page (Signed Reports Tab)

Figure 14-C: Sign Report Page

Figure 14-D: Report Approval Sign Form

Figure 14-E: Report Approval Reject Form

APPENDIX 2: INSPECTION MOBILE APPLICATION MANUAL

Transportation Automated Inspection Process (TAIP) User Guide

Introduction

TAIP is an application built to support highway construction inspectors in the quality control tasks. The application provides inspectors with specification checklists to verify that the work is being performed according to the standard specifications of highway construction. After completing the inspection checklists, reports are generated by the application and saved in a database. The application also provides easy sharing of the reports via e-mail.

Forms
Specification No. 150: Survey and Stakeout
Specification No. 151: Mobilization
Specification No. 201: Clearing & Grubbing
Specification No. 202: Removal of Structures and Obstructions
Specification No. 203: Excavation and Embankment
Specification No. 205: Overhaul

New Inspection   Specifications   Saved   Reports   Settings
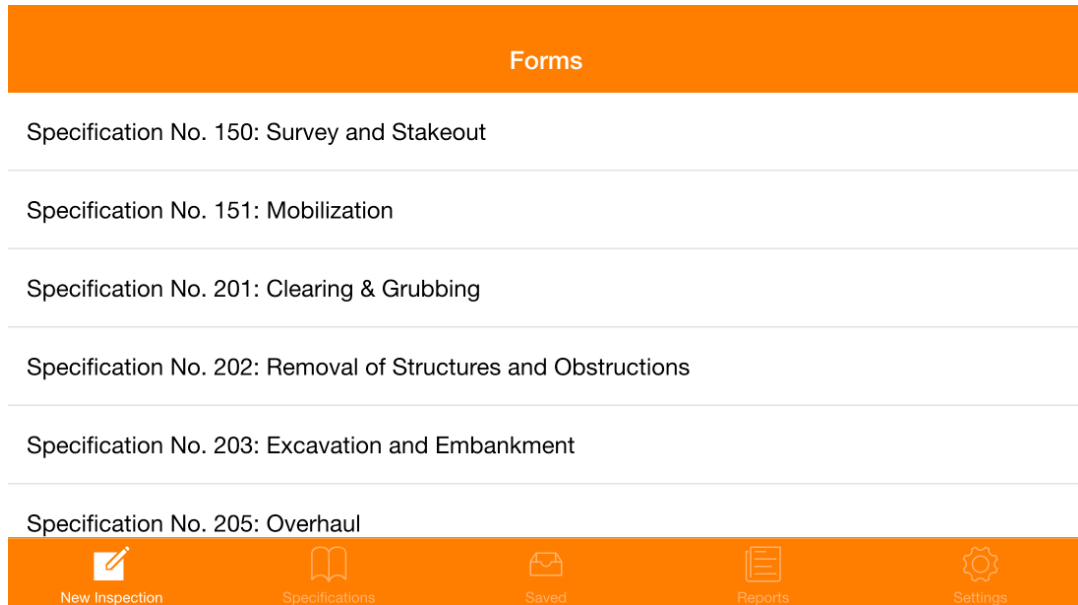
Main Menu

1. Inspectors & Projects Basic Information

The application stores the Inspectors and Project basic information that is input into the inspection forms. The first time the application is run, there will be no inspector selected or project selected. The project administrator must create an inspector and a project on the TAIP Administrator Dashboard before proceeding to logging in to the mobile application. See TAIP Dashboard Administrator Manual for more information about how to create projects, creating inspectors and adding them to projects. After an inspector has been added as an approved inspector in the project, the inspector will be able to login and pull all the project information from the database. In following visits to the application the inspector will only need to login to the application and specify the project id of the desired project to work on during login. The application can be used in English and Spanish. To select a

language, click on the multiple selection button and select your desired language before signing in to the application.

Inspector Login Window

1.1 Projects

The application can be used to inspect different projects; the Inspector is required to select the correct Project upon logging in before proceeding to fill in a specification form. To change project, the inspector must logout of the application and login once again with a different project id.

2. Specifications

The "Specification Forms" is the main window of the application, in here the Inspector will have all available forms which will be turned into a complete inspection form. To reach this window from the Main Menu the user first selects "New Inspection". If the inspector can create a new inspection by selecting the desired specification to work on from the "Specification Forms" list.
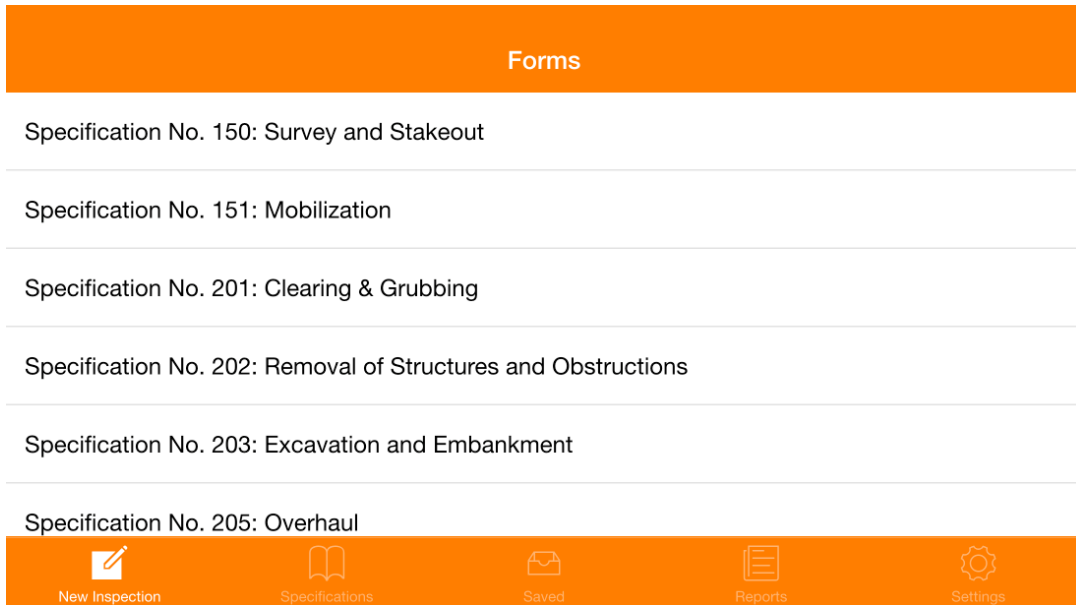
Specifications Form Main Window

3. Forms

Upon clicking a specification in the "Specifications Form" windows, a form will be generated based on the selected specification.
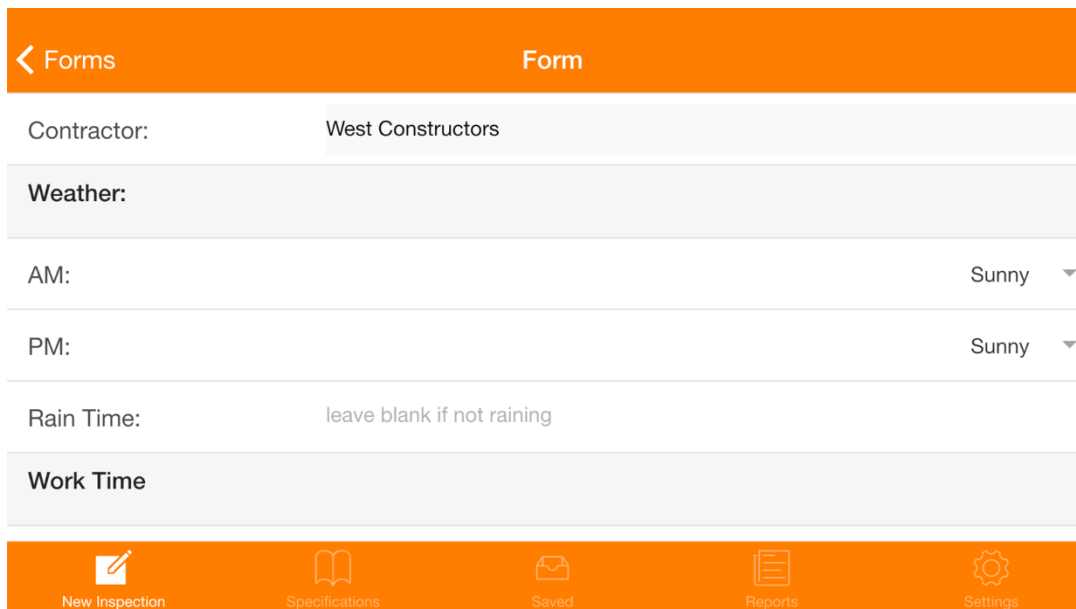
Specification Form Top Section

3.1 Activities

The inspector section has an auto complete feature which provides the inspector with a list of possible activities based on the entered text in activity name. This help the inspector with selecting the correct Activity. To initiate the auto-complete feature, touch the "Activity Name" field and a modal window will open displaying a search bar where the user can search for Activities. When an option from the list is selected, the Activity ID, Unit and Activity Name fields are automatically filled. The inspector needs only to fill the measured quantity field. Inspector can add multiple Activity fields by pressing the plus button to the right.
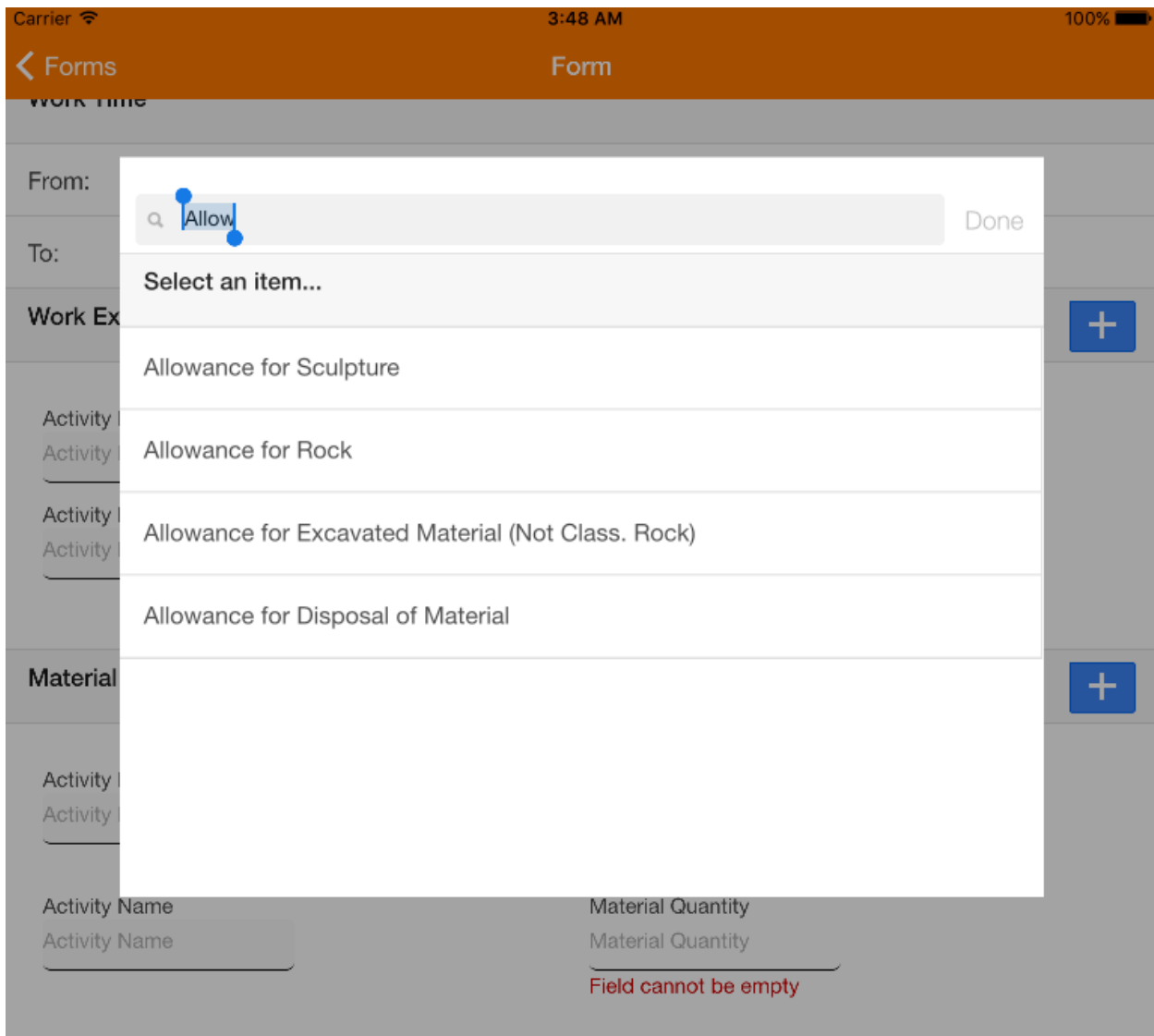
Activities with Auto Complete Feature

3.2. Material On Site

Optionally, inspector can update the received quantity from expected Material On Site upon arrival. To update, the inspector can touch the "Show" button in the "Material On Site" section of the form. This will display additional fields required for updating Material On Site quantity. Similarly, to the "Activities" section, Material On Site section has an auto complete feature which uses pre-configured Material On Site items that must be submitted first through the Administrator Web Application. To initiate the auto-complete feature, touch the "Activity Name" field.

Material On Site

3.3. Aspects

The aspects list, are the characteristic of the project that are being inspected, the inspector must mark them as either approved, not approved or not inspected. To mark an aspect, click on the arrow in the right section of the screen and select "Yes", "No" or "N/A" from the selection list.

Aspects

3.4. Photos

The inspector is able to take photos using the device's built-in camera; these photos can be attached along the form as evidence of the inspection and/or any other photo taking worthy item. To take a photo simply click on the take picture button and the application will automatically launch the device's default camera application. Once a photo has been taken the user can discard pictures by pressing the red button with a cross icon. Below the thumbnail of a photo the user can fill in a comment possibly describing the photo.

Photo's Thumbnails

3.5. Distribution

The distribution list dictates to whom the filled inspection form may concern and those that must act based on such form. To select the personnel for distribution simply mark the respective checkboxes and when the form is submitted the personnel marked in the distribution list will receive a link to the report.

Distribution Selection List and Force Account

3.6. Force Account

Selecting the Force Account check mark on the form will add the following items to the form: Contractor Signature, Contractor Representative and Material Supplier. These new items will be located just below the designated inspector signature space. If a form has this option marked, the newly added fields and the Contractor Representative signature is required for submitting the form to the database.

Contractor Signature input displayed when Force Account is checked

New form items added when Force Account is checked

3.7. Drawing

The inspector can make drawing if necessary by using the provided drawing pad. To access the drawing pad, simply press the blue "Draw" button and the drawing space will appear on screen. Inspector can undo by pressing the "Undo" button and clear drawing by pressing the "Clear Drawing" button.
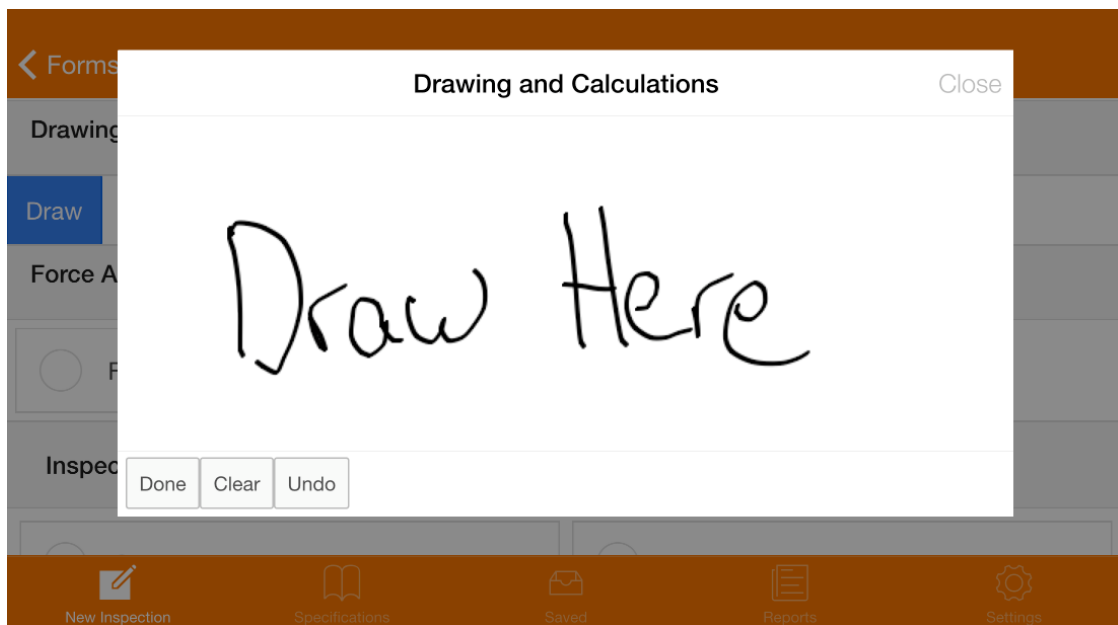
Drawing Pad

3.8. Signature

To successfully complete a form, the Inspector must sign it first. The signature can be configured in *Settings > Signature Setup,* where the user can sign and link his/her signature to a pin number for simplifying the signature process. Before submitting the user shall press the sign button where a Pin Dialog window will request the number and will be validated in the server. After the pin has been validated the user can proceed to submit the form.
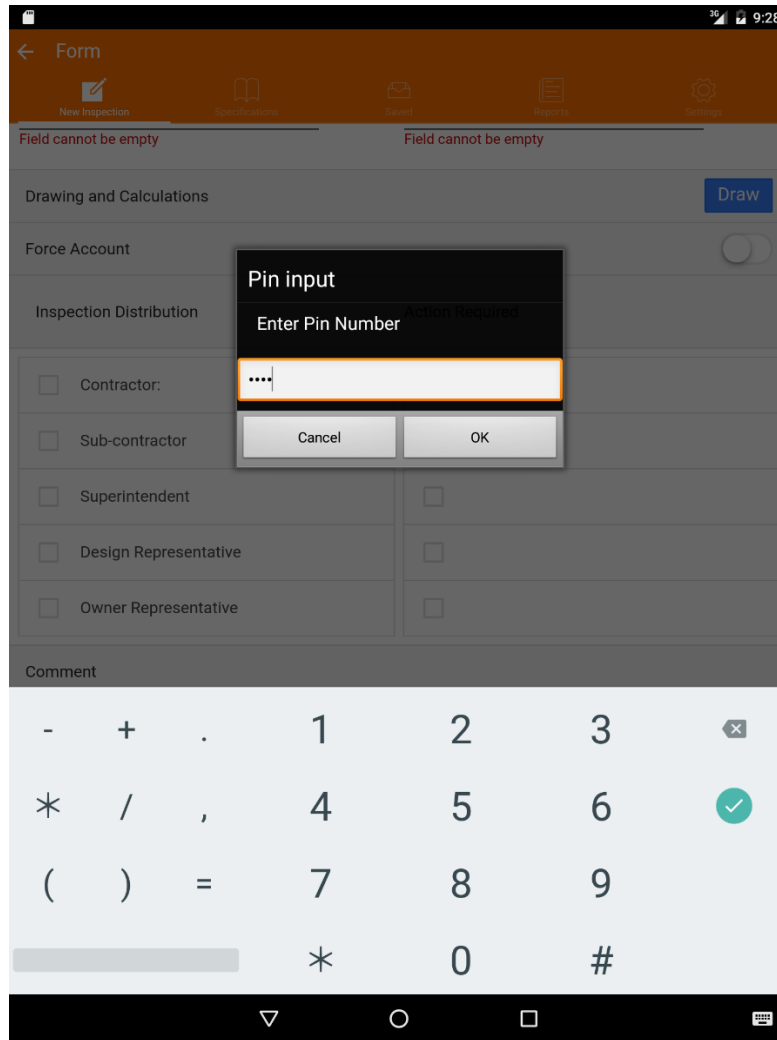
Signature Section

3.9. Saving

The application has local storage enabled for saving forms. To save a form the user must click the "Save" button on the Specification Form Sub Menu located on the bottom of the form just below the sign button. Saved forms can be edited or deleted later.

3.10. Submitting

In order to submit the form to the database the inspector must submit the form. To submit a form, the user must click the "Submit" button on the Specification Form Sub Menu located on the bottom of the form just below the signature. Submitted forms cannot be edited or deleted later.

3.11. Reports

The user can view submitted reports by clicking on the "Reports" option in the navigation menu. On the "Reports" windows the inspector will see a list with all the submitted reports. To view a report, click on the blue hyper-linked title and a new window will appear on screen displaying your report.

3.11.1. Searching Reports

In the "Reports" Window the user can search by title, date or location simply by typing the desired search query. For example, to search for a date, simply type the date in the search bar and the list will display all the reports with the date searched.
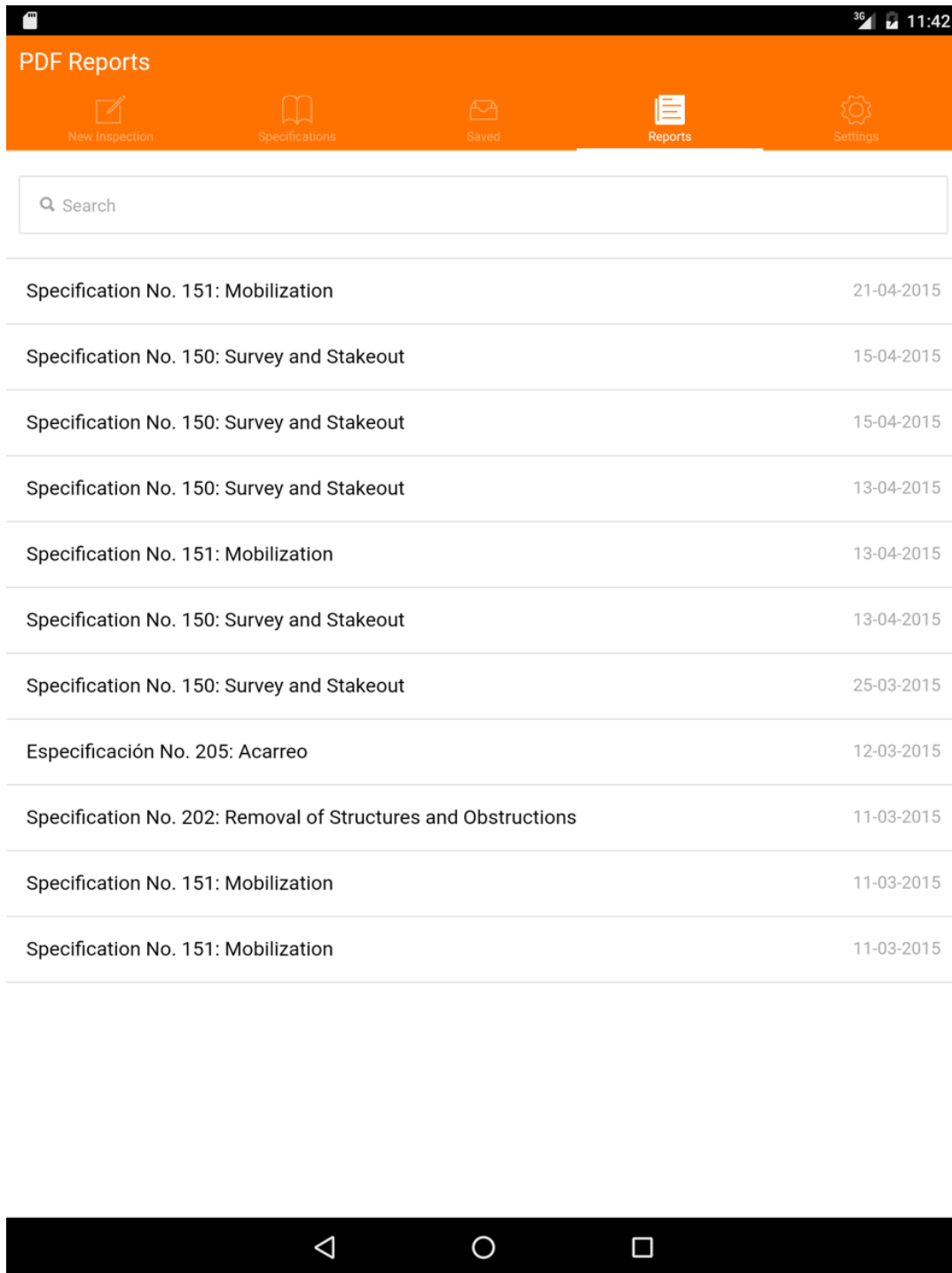
Reports view with search bar

3.11.2. Daily Activity Report Example

Commonwealth of Puerto Rico
Department of Transportation and Public Works

HIGHWAY TRANSPORTATION AUTHORITY

DAILY ACTIVITIES REPORT

PROJECT NUMBER:	321987
PROJECT NAME:	TestProject3
MUNICIPALITY:	Mayaguez, Puerto Rico
CONTRACTOR:	West Construction

DATE:	2015-4-21
WEEKDAY:	Tuesday
INSPECTOR:	Tarik Calderon
WEATHER:	AM: Sunny PM: Sunny
TIME LOST:	NONE

WORKING HOURS: 8:00am TO 5:00pm

WORK EXECUTED			
ACTIVITY ID	**ACTIVITY NAME**	**QUANTITY MEASURED**	**UNIT**
150-001	As-Built Plans (Drawings)	25	LS

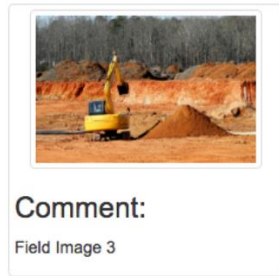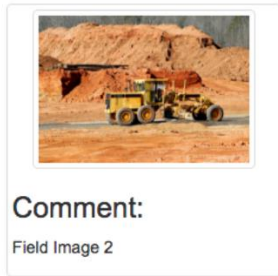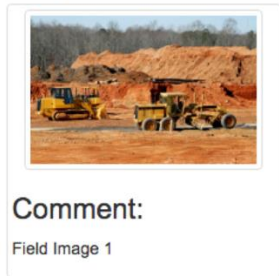| INSPECTION	
INSPECTED ITEM	**APPROVAL**
The Project Manager made sure that the form Stake-Out Survey Breakdown has been approved. Comment:	Yes/Sí
The Inspection Brigade offered the Contractor control points. Comment:	Yes/Sí
The Inspector wrote down the work done in accordance to the breakdown submitted by the Contractor and approved by the Authority. Comment:	Yes/Sí

Daily Activity Report (Top Section)

WORK FORCE			
NAME	CLASSIFICATION	HOURS WORKED	OBSERVATIONS
Tarik Calderon	Engineer	5	none

EQUIPMENT			
TYPE	DESCRIPTION	HOURS ACTIVE	HOURS INACTIVE
Digger	Big	8	0

DRAWING/COMPUTATIONS

Images Taken

Comment:

Field Image 1

Comment:

Field Image 2

Comment:

Field Image 3
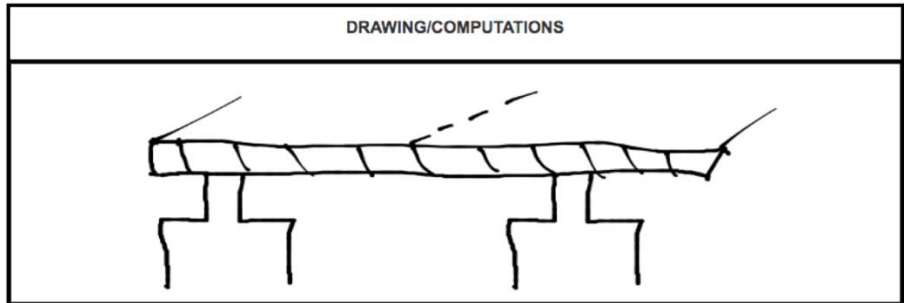
REPORT DISTRIBUTION		
Personnel	Distribution	Action Required
Contractor	✓	
Sub-Contractor	✓	✓
Superintendent	✓	
Desing Representative	✓	✓
Owner Representative	✓	

Inspector Name: Tarik Calderon

Daily Activity Report (Top Section)

4. Specification Books

For reference the application contains the Specification Book in PDF format separated by chapters. To open the selected chapter of the book the user must click on the list item with the title of the desired book. This will load the PDF in the device's default PDF viewer.
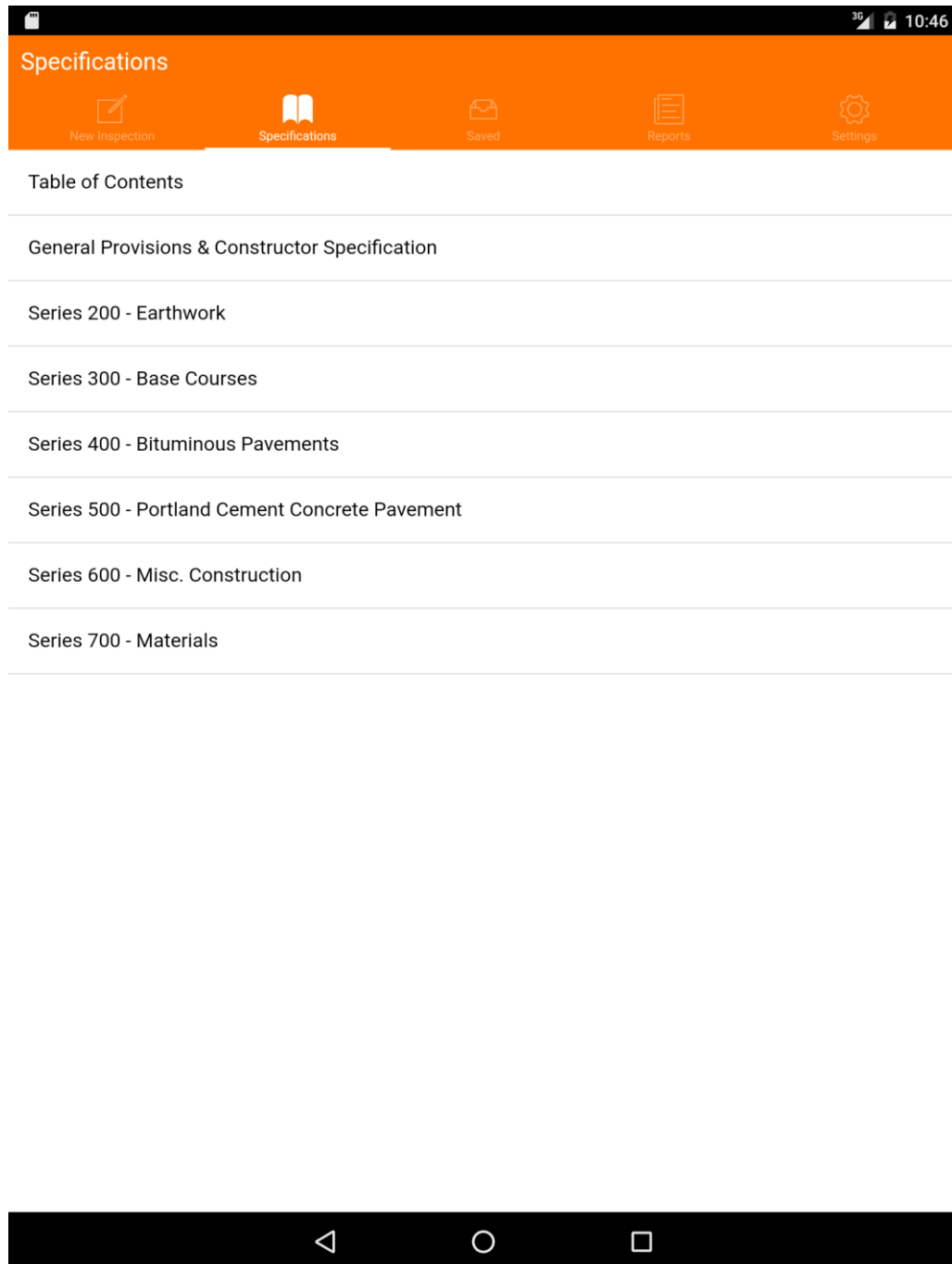
Specification Book Chapters

5. Settings

In the settings tab the inspector can logout or configure user signature.
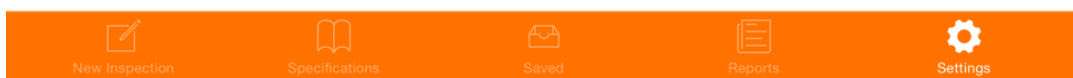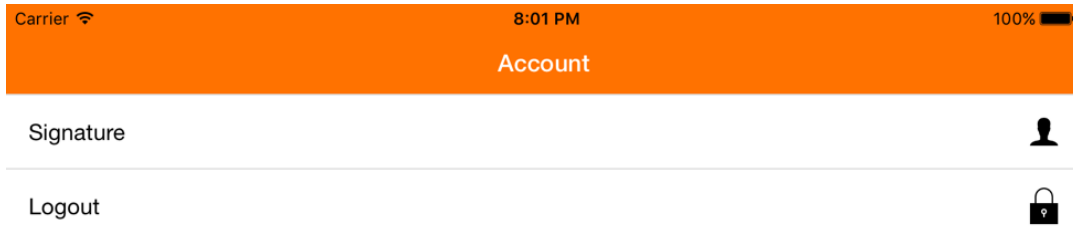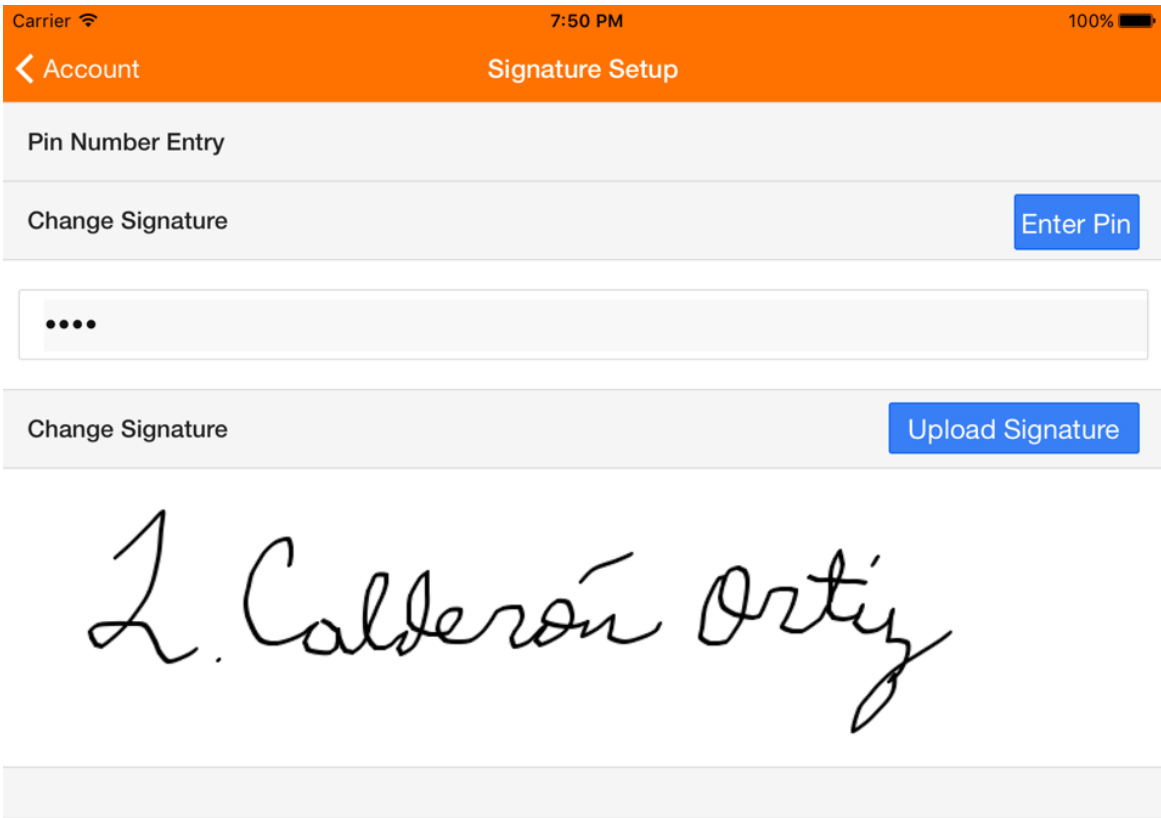

Settings Page

5.1. Logout

Inspector can logout of the application by pressing the logout button which is the first option in the Settings window. Logging out will take you back to the login page.
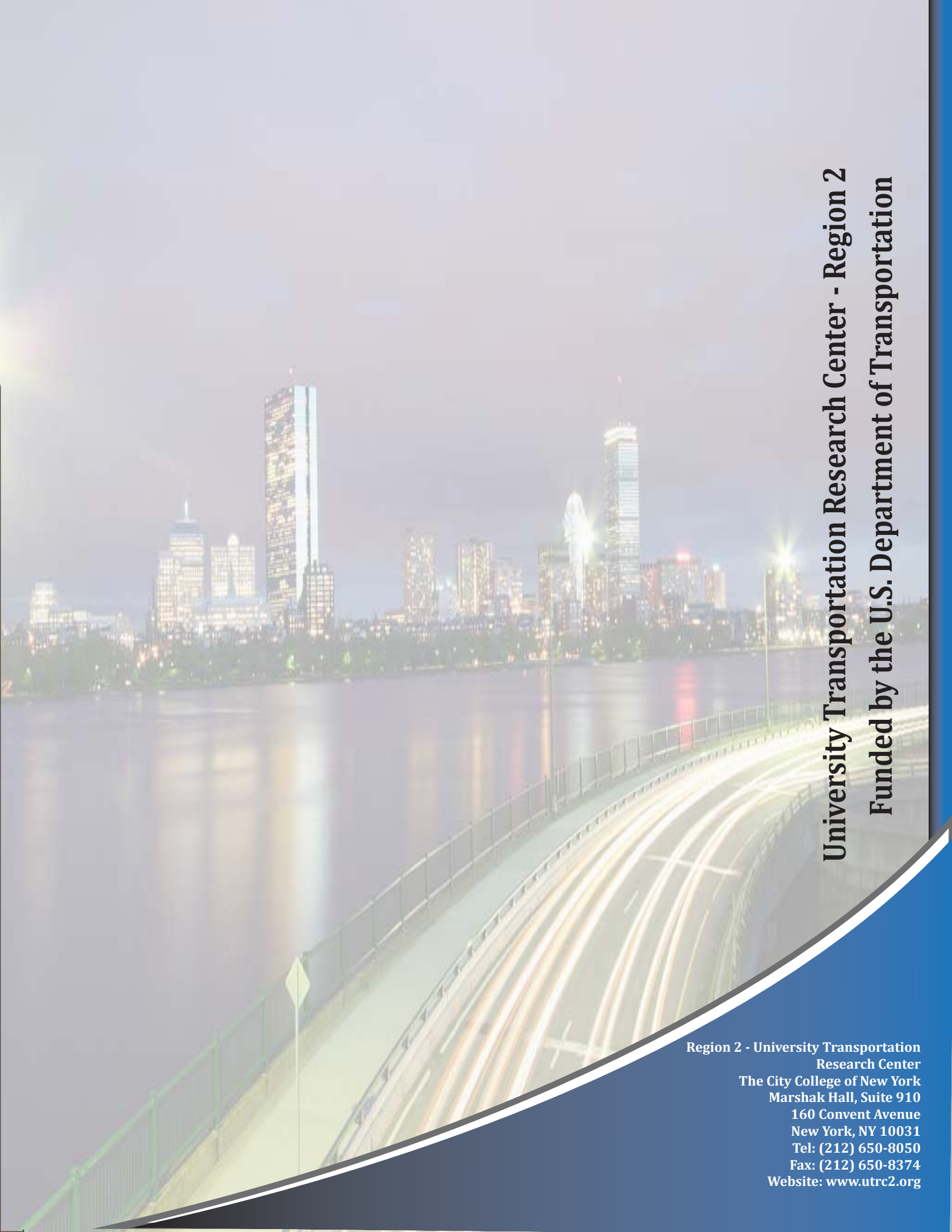
5.2. Signature Setup

To configure the user signature, follow these steps:

1. Touch the "Signature" option in the Settings window
2. Input your signature in the provided signature space
3. Press the "Enter Pin" button and input the desired pin number in the pin dialog.
4. Press the "Upload Signature" button and wait for server validation. After, validation has been the user can sign forms using the pin number configured on this window.

Pin Number Entry

Change Signature   **Enter Pin**

••••

Change Signature   **Upload Signature**

New Inspection   Specifications   Saved   Reports   **Settings**

Signature Setup Page