



COLLEGE OF BUSINESS

LAMAR UNIVERSITY

Reese Construction Management Program

INSTITUTIONAL SELF EVALUATION STUDY

VOLUME II – APPENDIX C

Submitted by

Name of Institution:

Lamar University

Member the Texas State University System

4400 MLK Blvd., PO Box 10009, Beaumont, Texas 77710

Name of Educational Unit:

College of Business

Title of the Degree Program:

Reese Construction Management Program

Degree – B.S. in Construction Management

Submitted on: May 7, 2019

C.5.5 Formal Assessment of SLOs and Results (Volume I – 3.1.5.3. D, E, F, G; 3.2.1 ~ 3, 9.1.4.2, 9.1.4.3, 9.1.4.4)

Each SLO report includes:

- Specific assessment measures

- Assessment tools

- Results of assessment

- Example of graded student work

SLO reports follow on the next page.

SLO 01

Analysis of SLO Measure Results and Action Plan (Completed every three years according to the analysis cycle)	
SLO 01: Create effective written communication appropriate to the construction discipline. Metric: Following courses-course learning outcomes as direct measures. CMGT 4270 Strategic Analysis and Evaluation CLO 1(AD) Apply effective oral, written and graphic communication skills. CMGT 4470 Capstone Construction Project CLO 1(AD) Apply effective oral, written and graphic communication skills, including shop drawing development.	
Date:	
Course	Analysis and Action
CMGT 4270 Strategic Analysis and Evaluation	Analysis:
	Action Plan:
CMGT 4470 Capstone Construction Project	Analysis:
	Action Plan:

SLO 01

Student Learning Outcomes – Measure 1 (Completed each year by Instructor after review of student work)			
For each course, select whether the student learning outcome was met, partially met, unmet, or not reported. Attach documentation supporting the findings, including student's work example, rubrics, questions, or criteria, used in this determination.			
SLO 01: Create effective written communication appropriate to the construction discipline. CMGT 4270 Strategic Analysis and Evaluation CLO 1(AD) Apply effective oral, written and graphic communication skills. Target: Average score of class to be 70 or higher out of 100 points.			
Semester: Spring 2018	Metric: Senior Paper	Instructor: McCrary	Date: 9/25/2018

Findings

Enrollment	Min. Score	Max. Score	Ave. Score	Met/Part/Unmet/NR
12	70.4%	96.3%	85.2%	Met
Note: See the attached sample.				
Final Exam Total Possible Point is 160.				

#	Student	Score
1	Student 1	77.5%
2	Student 2	94.4
3	Student 3	84.4
4	Student 4	84.4
5	Student 5	97.8
6	Student 6	76.9
7	Student 7	81.3
8	Student 8	96.3
9	Student 9	70.4
10	Student 10	81.3
11	Student 11	81.3
12	Student 12	96.3
13		
14		
15		

#	Student	Score
16		
17		
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19		
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21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

#	Student	Score
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		

Collected Student Work: Place the collect student's work after this page for each course, each time taught.

- Make sure sentences are structured correctly and each sentence has a meaning and a message. If a sentence does not read well or is cumbersome, do not hesitate to rewrite it.
- Avoid long sentences. Even if they are logically correct, the meaning gets lost when too many phrases and conditions are put together.

FONT SIZE, TYPE AND LINE SPACING

1. Use the font type, size and style consistently throughout the document.
2. For text, use Times New Roman size 10, double line spacing throughout the document. Quotations from another reference should be in quotation marks and single-spaced. Figure and table titles should also be single-spaced.
3. For figure and table titles, use Times Roman size 8, single spacing.
4. Chapter titles, section and subsection titles should use Times New Roman size 10, bold, single-spaced.
5. Avoid using different types of font faces and do not change the font size.
6. Avoid using combined features (bold, underline and italics).
7. Use margins of one inch on all sides of the page.

COPY-AND-PASTE = PLAGIARISM

- Do **NOT** copy-and-paste from other sources as it may be considered plagiarism. Online services detect whether plagiarism is involved or not; you need to be very careful not to tarnish your name.
- Again, do **NOT** copy-and-paste others' work which may include tables, figures, text, etc.
- Always provide a reference when you refer to the others' work. This applies to text as well as figures and tables - if used. It is strongly recommended that all material used in this document including figures and tables be original, and not cut-and-paste from other sources, which lowers the originality of the work. Show references as follows: This line of work has been addressed by researchers since the 2000s [6].

Research Resources:

1. **Internet sources:** Journal Articles; Conference Proceedings; Web Sites; Weblogs / Blogs; Discussion Lists, and Multimedia.
2. **Traditional print sources:** Books and Textbooks; Newspapers; Academic and Trade Journals; Government Reports and Legal Documents; Press Releases and Advertising; Flyers, Pamphlets, Leaflets; Multimedia.
3. **Local industry experts**

4270

TERM PROJECT for CMGT 4199 — STRATEGIC ANALYSIS AND EVALUATION

This is an individual homework

The purpose of the research project is for the students to learn how to formulate and report a senior paper. The brief writing guides below aim to introduce you both to the specific methods and conventions of writing original research in the area of concentration and to effective writing process. Please do not hesitate to contact me anytime, if you have any questions.

Project Learning Objective

- Use and present data/information to support ethical decision making and critical thinking;
- Apply effective oral, written and graphic communication skills;
- Understand, apply, analyze, or create various types of construction management learning outcomes through an exit examination;
- Demonstrate an entry-level ability to determine appropriate methods and proper sequence on real construction projects;
- Develop and implement project/process plans.

Grading of Course Project

Your Report should try to answer the following questions:

What is the problem?

Why is it interesting and who would use it when solved?

What data will you use? How will you collect the data?

What work do you plan to do in the project?

Which algorithms/techniques/models do you plan to use/develop?

How will you test and support your idea?

Your report will have the following Elements:

Literature review

Methodology

Organization of paper

Results and Discussion

Structure and Approach

Conclusion/ Acknowledgements

References

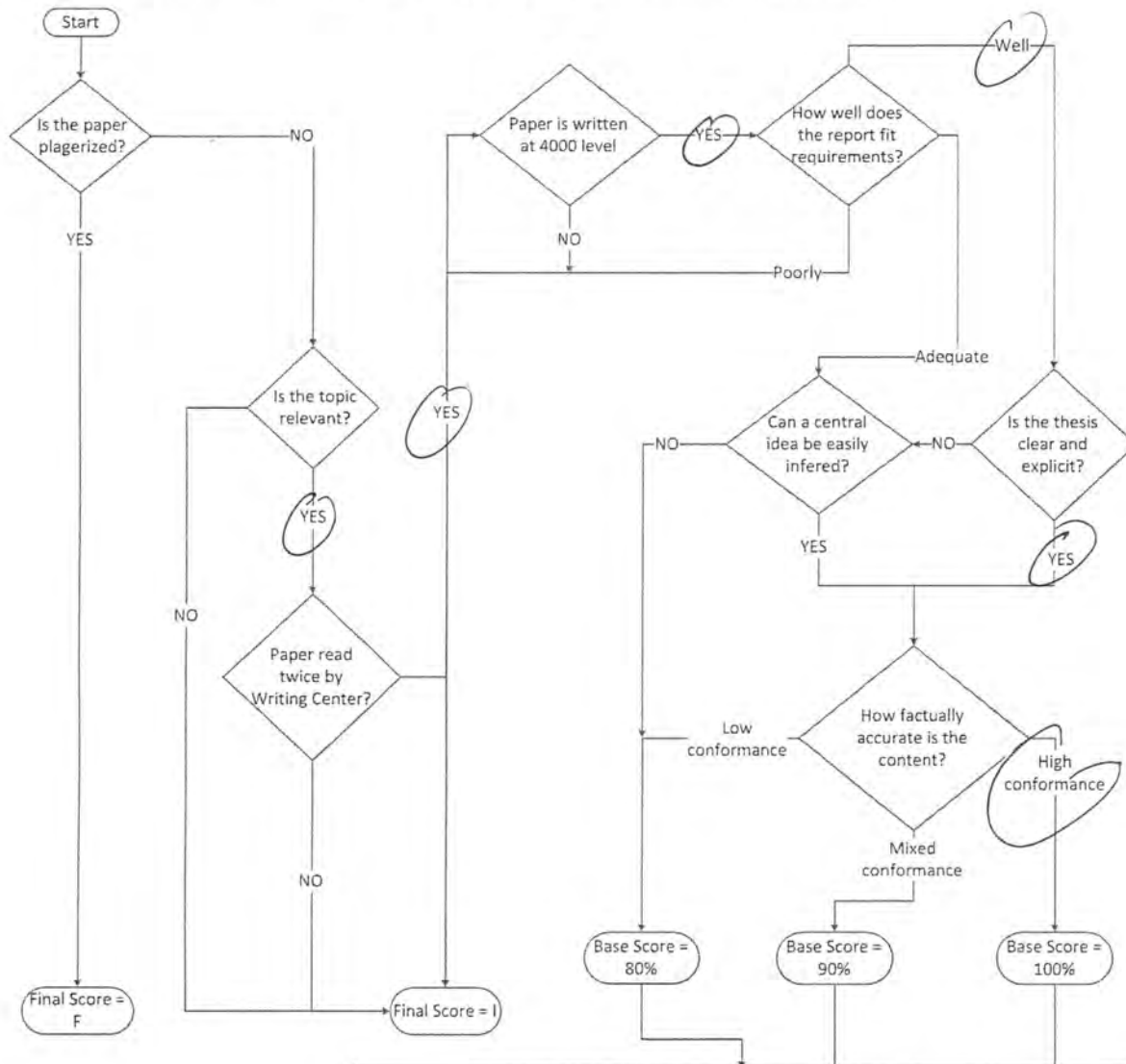
Guide for Writing this project report The report document should have a structure that clearly identifies the information contained in it.

- Title should capture the essence in a few words.
- Abstract should describe the entire work in a few hundred words (usually one paragraph).
- Use formal language and prefer the tone used in textbooks. Even the opinions should be stated in a formal, neutral tone.

Category	Excellent (exceeds standards)	Good (occasionally exceeds)	Acceptable (meets standards)	Unacceptable (below standards)	Pts.
Introduction	Strong introduction of topic's key question(s), terms. Clearly delineates subtopics to be reviewed. Specific thesis statement.	Conveys topic and key question(s). Clearly delineates subtopics to be reviewed. General thesis	Conveys topic, but not key question(s). Describes subtopics to be reviewed. General theses statement.	Does not adequately convey topic. Does not describe subtopics to be reviewed. Lacks adequate thesis statement.	20%
Focus & Sequencing	All material clearly related to subtopic, main topic. Strong organization and integration of material within subtopics. Strong transitions linking subtopics, and main topic.	All material clearly related to subtopic, main topic and logically organized within subtopics. Clear, varied transitions linking subtopics, and main topic.	Most material clearly related to subtopic, main topic. Material may not be organized within subtopics. Attempts to provide variety of transitions	Little evidence material is logically organized into topic, subtopics or related to topic. Many transitions are unclear or nonexistent.	20%
Support Sources	Strong peer reviewed research based support for thesis.	Sources well selected to support thesis with some research in support of thesis.	Sources generally acceptable but not peer-reviewed research (evidence) based.	Few sources supporting thesis. Sources insignificant or unsubstantiated.	15%
C - 55 Conclusion	Strong review of key conclusions. Strong integration with thesis statement. Insightful discussion of impact of the researched material on topic.	Strong review of key conclusions. Strong integration with thesis statement. Discusses impact of researched material on topic.	Review of key conclusions. Some integration with thesis statement. Discusses impact of researched material on topic.	Does not summarize evidence with respect to thesis statement. Does not discuss the impact of researched material on topic.	15%
General formatting	The paper is free of grammatical errors and spelling & punctuation.	Grammatical errors or spelling & punctuation are rare and do not detract from the paper.	Very few grammatical, spelling or punctuation errors interfere with reading the paper.	Grammatical errors or spelling& punctuation substantially detract from the paper.	15%
Citations & References	All references and citations are correctly written and present.	One or two reference or citations missing or incorrectly written	Several references or citations missing or incorrectly written.	Reference and citation errors detract significantly from paper	15%

Base Score Flowchart

Base Score: The "Base Score" for your paper will be determined as follows:



What level of analysis does the paper exhibit?
 Good analysis, but mostly a summary...Deduct 10%;
 Some analysis, but mostly a summary...Deduct 20%;
 Little to no analysis, almost entirely a summary...Deduct 30%.
 Page Length / Required Length...Deduction %.

Is ethics addressed in the paper?
 Add 15%.

Uses offensive, racist, sexist, or biased language?
 Deduct 50%.

Transfer the "Base Score" to the bottom of the Evaluation Rubric that begins on the next

continue

Base Score: 100%

CMGT 4199: Senior Paper

Evaluation Rubric

Original Score	Revised Score	Pts	Item to be Assessed
34		40	<p>I. Outline.</p> <ul style="list-style-type: none"> • Outline Format <ul style="list-style-type: none"> <input type="checkbox"/> Prepare an outline that includes an Introduction, 3 Subject Headings, Conclusion, and Works Cited. <input type="checkbox"/> Include a thesis statement in the introduction. <input type="checkbox"/> Make no conclusions. <input type="checkbox"/> Each heading should include a minimum of 2 Subheadings. <input type="checkbox"/> Each heading and subheading should preserve parallel structure, i.e. if the first heading is a noun, then the following headings should be nouns. <input type="checkbox"/> All the information contained in Heading 1 should have the same significance as the information contained in Heading 2, Heading 3, etc.. The same goes for subheadings. <input type="checkbox"/> The information in the headings should be more general, while information in the subheadings should be more specific. <input type="checkbox"/> Fonts: Main Title: Arial 14 size, bold; headings and subheadings: Arial 12 size, bold. <input type="checkbox"/> Provide evidence of paper being read twice by the Writing Center. <input type="checkbox"/> Provide evidence of changes made by taking the paper to the Writing Center. • Outline Content <ul style="list-style-type: none"> <input type="checkbox"/> Provide a clear and concise Thesis Statement of a construction or construction-related topic. <input type="checkbox"/> Provide meaningful and appropriate evidence to develop the issue, showing clear direction. <input type="checkbox"/> Provide clear organization with concise points that support the Thesis Statement <input type="checkbox"/> Provide clear organization with concise sub-points that develop points. <input type="checkbox"/> Provide at least one sub-point that addresses an ethical issue associated with this topic. • Citation and Source Requirements <ul style="list-style-type: none"> <input type="checkbox"/> Six or more correctly cited sources, listed in alphabetical order. <ul style="list-style-type: none"> <input type="checkbox"/> Primary Sources (at least two) <ul style="list-style-type: none"> <input type="checkbox"/> Journal <input type="checkbox"/> E-mail or Face-to-face interview pre-approved by instructor, maximum of 1. <input type="checkbox"/> Secondary Sources (at least three) <ul style="list-style-type: none"> <input type="checkbox"/> Industry periodicals <input type="checkbox"/> Newspaper articles <input type="checkbox"/> General magazines <input type="checkbox"/> Books <input type="checkbox"/> Tertiary Sources (unlimited quantity) <ul style="list-style-type: none"> <input type="checkbox"/> Unpublished articles, pre-approved by instructor <input type="checkbox"/> General Internet sources, pre-approved by instructor. <input type="checkbox"/> Encyclopedias <input type="checkbox"/> Sources reflect the current scholarship on the topic. <input type="checkbox"/> List only those sources to be used in the paper. <input type="checkbox"/> Citations are in numeric or alphabetic order. <input type="checkbox"/> Format citations correctly. <input type="checkbox"/> Citations are single spaced within the citation. double spaced between citations.

CMGT 4199: Senior Paper

Evaluation Rubric

Original Score	Revised Score	Pts	Item to be Assessed
			II. Final Submission. Do not turn in a draft!!
15		15	<ul style="list-style-type: none"> • Proper Format: each counts as one error: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Attached these Evaluation Criteria. <input checked="" type="checkbox"/> Cover Page to include: Name, Due Date, Title, Semester, Writing Format Style: either APA or MLA, with the exceptions listed below. Cover Fonts: Arial. <input checked="" type="checkbox"/> Written at the 4000-level according to content and clarity. <input checked="" type="checkbox"/> Paper is fully 8 - 10 pages long, double-spaced, with one (1) inch margins; indent first line of paragraphs. Images, appendices, and works cited to not count toward total page length. <input checked="" type="checkbox"/> Paper Fonts: Main Headings: Arial 14 size, bold; Sub-heading: Arial 12 size, bold; Body: Times New Roman 11 size font. <input checked="" type="checkbox"/> Provide at least one sub-point that addresses an ethical issue associated with this topic. <input checked="" type="checkbox"/> Clearly divide paper into section below, with title and sub-titles. <input checked="" type="checkbox"/> Include page numbers at the bottom of each page. <input checked="" type="checkbox"/> Images are encouraged, but not required. Images do not count towards overall page length. <input checked="" type="checkbox"/> Submitted in a manila envelope (or equivalent), properly addressed to the course instructor, in the following order: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Cover Page <input checked="" type="checkbox"/> Outline <input checked="" type="checkbox"/> Abstract <input checked="" type="checkbox"/> Introduction/Body/Conclusion of Research Paper <input checked="" type="checkbox"/> Works Cited Page <input checked="" type="checkbox"/> Appendix <input checked="" type="checkbox"/> Provide evidence of paper being read twice by the Writing Center. <input checked="" type="checkbox"/> Provide evidence of changes made by taking the paper to the Writing Center. <input checked="" type="checkbox"/> Photocopied pages of any information you have used from sources. Highlight the portions of the pages you have used. (Required to earn credit for this paper.)
4.5	5	5 <i>a little weak</i>	<ul style="list-style-type: none"> • Abstract (a short version of the paper in one or two paragraphs) <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Carefully, clearly, and concisely contains all information necessary for the reader to determine: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> objectives of the study; <input checked="" type="checkbox"/> process for conducting the study was done; <input checked="" type="checkbox"/> results obtained; <input checked="" type="checkbox"/> significance of the results, <input checked="" type="checkbox"/> avoids using questions.
9	10	10	<ul style="list-style-type: none"> • Introduction/Thesis Statement (one or two paragraphs) <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Clearly introduced the problem. <input checked="" type="checkbox"/> Provide adequate background information (including major stakeholders, if applicable). <input checked="" type="checkbox"/> Clearly, completely, and correctly listed and explained the major issues. <input checked="" type="checkbox"/> Near the end of the introduction, provide a clear thesis statement for the entire paper.

CMGT 4199: Senior Paper

Evaluation Rubric

Original Score	Revised Score	Pts	Item to be Assessed
11.25	15	15	<ul style="list-style-type: none"> • Body: Methodology and Scope <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Provide a literature review that gives appropriate context for the specific thesis or topic provided. <input checked="" type="checkbox"/> Correct citations are made. <input checked="" type="checkbox"/> Place a topic sentence near or at the beginning of each paragraph. <input checked="" type="checkbox"/> Provide clear organization with concise points that support the Thesis Statement. <input checked="" type="checkbox"/> Show and use the outline. <input checked="" type="checkbox"/> Use topics and concepts in the paper that appropriately support the subject. <input checked="" type="checkbox"/> Provide at least one sub-point that addresses an ethical issue associated with this topic. <input checked="" type="checkbox"/> Create cohesive paragraphs where <ul style="list-style-type: none"> <input checked="" type="checkbox"/> each sentence relates to the topic sentence; and <input checked="" type="checkbox"/> each sentence connects to the previous sentence and leads into the next sentence. <input checked="" type="checkbox"/> Provide good transitions from one paragraph to the next. <input checked="" type="checkbox"/> Address the limitations of the paper's content (what is included and what is not). <input checked="" type="checkbox"/> Avoid quotations. Use only when it directly contributes to the point of the paragraph or thesis. <input checked="" type="checkbox"/> Avoid using questions.
15	20	20	<ul style="list-style-type: none"> • Body: Analysis and Development <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Thoroughly, yet succinctly, develop a complete analysis of the original thesis. <input checked="" type="checkbox"/> Develop a logically coherent analysis from paragraph-to-paragraph, and section-to-section. <input checked="" type="checkbox"/> Provide an intellectually sound argument, i.e. each piece of information must be appropriately and accurately cited. <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Place no personal opinions in the body of the paper.
13.5	15	15	<ul style="list-style-type: none"> • Conclusions <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Go beyond a mere summary and draw plausible conclusions from the analysis. <input checked="" type="checkbox"/> Provide findings that are original and significant, but are supported by the text in the body of the work. <input checked="" type="checkbox"/> Wrap up the thesis and provide your analysis of the thesis and current state of information, as supported in the body of the work. <input checked="" type="checkbox"/> Include future changes, solutions, or legislation, etc., about the topic.
15		15	<ul style="list-style-type: none"> • Citation and Source Requirements <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Six or more correctly cited primary sources, listed in alphabetical order. <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Primary Sources (at least two) <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Journal, peer reviewed. <input checked="" type="checkbox"/> E-mail or Face-to-face interview pre-approved by instructor, maximum of 1. <input checked="" type="checkbox"/> Secondary Sources (at least five, and can be replaced with Primary Sources) <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Industry periodicals <input checked="" type="checkbox"/> Newspaper articles <input checked="" type="checkbox"/> General magazines <input checked="" type="checkbox"/> Books <input checked="" type="checkbox"/> Tertiary Sources (unlimited quantity) <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Unpublished articles, pre-approved by instructor <input checked="" type="checkbox"/> General Internet sources, pre-approved by instructor. <input checked="" type="checkbox"/> Encyclopedias <input checked="" type="checkbox"/> Sources reflect the current scholarship on the topic. <input checked="" type="checkbox"/> List only those sources cited in the paper. (If you used additional sources, do not list them.) <input checked="" type="checkbox"/> Present an average of 1-2 source(s) per paragraph, or more in-text citations referencing sources. <input checked="" type="checkbox"/> Citations are in numeric or alphabetic order. <input checked="" type="checkbox"/> Format citations correctly. <input checked="" type="checkbox"/> Citations are single spaced within the citation, double spaced between citations.

CMGT 4199: Senior Paper

Evaluation Rubric

Original Score	Revised Score	Pts	Item to be Assessed
20.5	25	25	<ul style="list-style-type: none"> • General Effort and Writing Style: <ul style="list-style-type: none"> <input type="checkbox"/> Followed directions and answered the assigned question or statement. <input type="checkbox"/> Used paraphrasing and student's wording only; no quotations. <input type="checkbox"/> Indicates original, independent, believable, meaningful experience of the material. <input type="checkbox"/> Avoided unbiased and sensational writing. <input type="checkbox"/> Avoided spelling errors. <input type="checkbox"/> Avoided grammatical errors, especially: <ul style="list-style-type: none"> <input type="checkbox"/> Sentence structure (noun-verb agreement, complete sentences, no run-ons); <input type="checkbox"/> Appropriate use of capitalizations and abbreviations; <input type="checkbox"/> Parallel tenses among sentences and paragraphs; <input type="checkbox"/> Avoided first person. Avoided second person. <input type="checkbox"/> Avoided using questions in the text. <input type="checkbox"/> Organized, thorough but concise, coherent, smooth, easy to follow.
103.75	$\frac{96.25}{2} = 8.125$ 12		
112	140	140	Sub-Totals
			III. Correction and Resubmit.
	40	40	<ul style="list-style-type: none"> • General Effort and Writing Style: <ul style="list-style-type: none"> <input type="checkbox"/> Corrected all marked comments. <input type="checkbox"/> Corrected the paper for unmarked issues.
		Total	
152		Total Revised Score: _____ Base Score: <u>100</u> (from flow chart)	Base Score X Revised Score = TOTAL SCORE: (max 100%) <u>152</u> <u>94.9%</u>

Bio-concrete: A Better Alternative to Regular Concrete?

Dylan Armstrong

CMGT 4199

4/19/18

Spring 2018

APA

Outline

- **Abstract**
- **Introduction**
- **Physical Properties of Bio-concrete**
 - Strength
 - Durability
 - Sustainability
- **Constructability of Bio-concrete**
 - How It is Made
 - Application of Bio-concrete
- **Economics of Bio-concrete**
 - The Cost of Bio-concrete
 - Value of Bio-concrete
 - Disadvantages/Advantages of Bio-concrete
 - Ethical Issue with Bio-concrete
- **Conclusion**

Abstract

Each day brings technological advancements in the construction industry. These advancements bring about new materials and ways to construct objects. This paper studies the technological advancement of bio-concrete. The overall objective of this study was to compare the strengths and weaknesses of the product to its counter-part and to see if it is a viable material to be used in the industry today. This study was done by reviewing multiple sources of relevant literature on this subject. If the results show that this product is indeed a viable material to use, then we can see its implementation in the construction industry in 15 to 20 years.

Introduction

In the construction industry today, concrete is one of the most widely used materials for both structures and infrastructure. It is used so often because of its versatile capabilities, and its use is only limited to the formwork that holds it in place. In terms of physical capabilities, concrete is very strong compressively but weak in terms of tensile strength. This weakness is remedied by the introduction of reinforcing steel making concrete a more viable material. In terms of its sustainability, old concrete can be crushed and re-used for either a gravel sub-base for new concrete or used as aggregates in a mix design. For all intents and purposes, concrete seems to be an excellent building material, but it has its limitations. Concrete, and concrete structures have a shelf life of about 50 to 75 years before repairs are needed. These repairs, while costly, are necessary for maintaining the structural integrity and functionality of concrete. However, what if concrete could repair itself? Created by Henk Jonkers and Eric Schlangen, bio-concrete does exactly that (Genuth, 2018). Bio-concrete uses bacteria inside of the concrete to mend or “self-heal” cracks. This feature has the potential to make bio-concrete a vastly superior building material, but is it too good to be true? In terms of its physical properties, constructability, and economics, is Bio-concrete a better alternative than other types of concrete? And what of sustainability? Having a concrete structure that can self-heal would certainly have an impact on the sustainable construction movement, but do contractors have an ethical duty to use products that are sustainable no matter how high the cost? In this paper, I will explore these topics in detail and draw a conclusion based on my review of the relevant literature.

Physical Properties of Bio-concrete

To answer the question of whether Bio-concrete is superior to regular concrete, we must first examine the physical properties of bio-concrete. As mentioned earlier in this paper, it uses bacteria to self-heal cracks, but these bacteria are not limited to a single species. *Bacillus pasteurizing*, *Bacillus sphaericus* and *Escherichia coli* are just some of the species that can be used in the bio-concrete mixture. However, how are the bacteria incorporated into the concrete mix design? In addition, what about its

other physical properties such as strength, durability, and sustainability? In the next sections of this paper, we will examine these attributes of bio-concrete and compare them with regular concrete.

Strength

Regular concrete can be inherently very compressively strong depending on the type of mix design used. In 2015, a conference was held called “Advances in Civil, Structural and Mechanical Engineering”. In this conference, several studies were presented that suggested that with the integration of special bacteria in the design, the overall strength of concrete can improve. A study was done by P Ghosh and S Mandal that “added bacterial cells at different concentrations” to test specimens of mortar and concrete (Ghosh et al, 2006). It was found that the overall compressive strength of mortar containing the live bacterial cells was increased. The study also showed that the compressive strength increased 22.62% in concrete and 19% in mortar (Ghosh et al, 2006). Based on these studies, one would think that bio-concrete is stronger than regular concrete.

Durability

While concrete is strong compressively, has an issue with durability. This is the reason why concrete structures have a limited shelf life. Not only is concrete susceptible to physical weathering but it is also susceptible to chemical weathering as well. Studies have shown that bio-concrete is more durable than regular concrete. In 2014, researchers took a sample of bio-concrete and a sample regular Portland cement and immersed them in different types of acid from sulfuric to hydrochloric, then weighed them and tested their compressive strength (Andalib et al, 2014). It was found that the bio-concrete sample had lost less weight and compressive strength from the erosion of the acid when compared to the regular Portland cement (Andalib et al, 2014). This means that because bio-concrete is more durable, it can be used in harsher environments where structures are subjected to chemical attacks.

Sustainability

In terms of sustainability, bio-concrete seems to be more sustainable when compared to regular concrete. As mentioned earlier, regular concrete structures eventually require maintenance. This

maintenance has various costs depending on the type of structure that must be repaired. In any case, owners must spend resources to repair their structures which directly affects the environment. Even though not much research has been made concerning the environmental impact of structural repair, we can see that repeated repairs to a structure are not sustainable (Li, 2012). If a road is to be repaired, the owner must hire a demolition crew, an excavation crew, and a concrete crew to come in and repair the road. Each crew uses vehicles that produce carbon dioxide which is bad for the environment. However, if the owner had decided to use bio-concrete, the life cycle of his structures would greatly increase because any structural damage would be repaired. Sustainability would also improve.

Constructability of Bio-concrete

So far, we have examined the physical properties of bio-concrete. Based on what we have reviewed, it would certainly seem as though bio-concrete is physically superior to regular concrete but how exactly is it constructed and how can it be used in other structures? In the next section of this paper, we will explore how bio-concrete is created and how it can be applied to various structures.

How It Is made

There are two ways to integrate the bacteria in the concrete. The first way is to encapsulate the bacteria along with a calcium-based nutrient called calcium lactate and add the capsules to the mix when it is wet (Breugel, 2007). Once the concrete sets, the capsules are held in place just like the aggregates are. When a fracture starts to form and intersects where a capsule is located, the bacteria will react with the oxygen and become active. When active, the bacteria will consume the calcium lactate. After the calcium nutrient is consumed, an insoluble limestone biproduct is produced which forms in between the cracks thus, sealing them off (Rahman, 2017). This phenomenon is especially beneficial in concrete that is supported with re-enforcing steel. Because the bacteria use oxygen to germinate, there is less of that oxygen within the concrete itself to cause oxidation in the steel members. The second way is to integrate the bacteria and calcium nutrient directly to the concrete mix without the capsules. When the concrete cures and it is exposed to water, the bacteria will germinate and consume the calcium nutrient. Again,

when the calcium nutrient is consumed, a limestone biproduct is produced which seals off any potential fracturing that has occurred within the sample (Rahman, 2017). Now that we have talked about how its bio-concrete is made, we will now examine what kinds of structures it can be applied.

Application of Bio-concrete

Based on the qualities of bio-concrete we have examined so far, we can see that it has potential to be implemented in multiple building structures. Owners could implement this product in their builds, bridges, roads, and side-walks. Because the bacteria in bio-concrete can survive in harsh alkaline environments (Andalib et al, 2014), bio-concrete can be used to make bridge piers. A bridge pier made of this material would not only be extremely durable, but it would also be safer seeing as how any cracks that would form in the pier would be self-healed. Because of its durability, bio-concrete could be used for paving, especially on highways with heavy traffic. Any cracks that form because of truck loads and traffic would be self-healed thus extending the life of the road before repairs are needed. Bio-concrete mortar could be used to make bricks, and theoretically, it can even be used to construct a bio-concrete house. The house would have a shelf life of about 200 years and it would be totally sustainable. However, what about the impact of bacterial application in concrete to humans? Would people want to occupy these “living” structures? In 2015, a study was conducted by Amirreza Talaiekhazani and Mohanadoss Ponraj at the Universiti Teknologi in Malaysia. Students and faculty were provided with a questionnaire which asked them about their views on staying in a bio-concrete structure. The questionnaire showed that 81% of people interviewed would stay in a bio-concrete structure and 19% of people interviewed would not (Ponraj et al, 2015). The study also revealed that 38% of the people interviewed, believed that staying in a bio-concrete structure would cause illness. 76% of people would recommend others to stay in the structure and 24% would not (Ponraj et al, 2015). This study shows that there is understandable apprehension against structures made with a biological agent. As mentioned earlier, there are many different forms of bacteria that can be applied to bio-concrete, and some of these bacteria are harmful to humans while others are not. *Bacillus lentus* is a bacterium that can be used in a concrete mix design that

is not harmful to humans; however, *Escherichia coli* can cause urinary track infections. Are there any true risks to living in a structure containing this bacterium? I believe the answer lies with the integration process of bacterial concrete. If the bacteria are integrated directly into the mix, then there is an obvious health risk, but if the bacteria are encapsulated along with a calcium-based nutrient, then there is no real contact between the bacteria and humans.

Economics of Bio-concrete

Up until now, we have examined both the physical properties and the constructability of bio-concrete. Bio-concrete certainly seems to be a miracle product. It is compressively strong, durable, sustainable and relatively simple to construct. But what of its economic cost and value? Is this product too expensive to produce on a larger scale and would people want to buy it? In the next section of this paper, we will examine the economic value of bio-concrete and explore the potential ethical issue with this product.

The Cost of Bio-concrete

The price for regular concrete is increasing over time. In 2007 the average price of cement was reported to be 104 USD per metric ton. In 2017, the most recent price was reported to be 113 USD. Why is the price for cement increasing? This is partly due to the nature of the product. Concrete, while strong compressively, is not very durable. As was mentioned earlier, these concrete structures require maintenance which drive the demand for concrete up. That in turn, drives the price of concrete up as well as the CO₂ emissions from the cement plants. There is also a cost of time that must be paid by the owner to perform the maintenance. The owner must take the time to close off the road or close a section of a building to perform the repairs which incurs an opportunity cost as well. All these costs can become problematic to the owner however; these problems can be remedied using bio-concrete. In Europe, the product was set to hit the market in 2015. Unfortunately, bio-concrete is significantly higher than regular concrete. The disparity in price has largely to do with the bacterial integration method. In Europe, regular concrete costs 80 euros to make, while bio-concrete costs twice as much to produce. This is because the

actual calcium nutrient along with the bacteria are very expensive to produce and encapsulate. As of right now, there is research being done to find alternative nutrients for the bacteria to consume such as sugar. If successful, the price of the production would fall between the range of 85 to 100 euros.

Value of Bio-concrete

With the price of bio-concrete being so high, is it truly a valuable material? The answer to that question is “yes” and “no”. In the short term the answer is “no” because bio-concrete is far too expensive to use for structures that are only at a location temporarily. If I as a constructor required an access road, I would not order bio-concrete to construct it with. In the long term however, the answer is a resounding yes. If the owner is willing to invest in this higher building material, they will be able to save on direct and indirect costs associated with repairs and maintenance (Breugel, 2007). While bio-concrete’s true value lies in its ability to save on direct and indirect costs, it also has the potential to be valued more by society because it uses “green” technology. With the monetary cost of bio-concrete being valued so highly, and society valuing the product extrinsically, are there any disadvantages to this product that could be potentially overlooked? In the next section of this paper, we will explore this topic.

Economic analysis is weak.

Disadvantages/ Advantages of Bio-concrete

Even though, bio-concrete has the potential to change the construction industry at its very foundation, there are some disadvantages to consider. The one disadvantage is that the lifespan of the product is longer compared to its regular counterpart. Because it can extend the lifespan of structures without costly repairs, bio-concrete has the potential to decrease a demand for cement (Ponraj et al, 2015). This decrease in demand will have a ripple effect across the industry. Companies that specialize in cement repair and maintenance would eventually go out of business unless they adapt. Another disadvantage to bio-concrete is the lack of data present on the subject. “There are no standard designs in practice for bacterial concrete design mix to obtain the optimum performance. The suitable amount of bacteria and its type is always changing depending on the applications” (Ponraj et al, 2015). As

mentioned earlier, bio-concrete is rather costly compared to its regular counterpart. This factor alone gives the product the disadvantage of being costly to research. “The methods to investigate involving the studies related to calcite precipitation are always costly because it involves techniques like Electron Microscopy (SEM) which is costly and requires a skilled personnel to run the test” (Ponraj et al, 2015). While the product has its disadvantages, it also has advantages that prove to outweigh the flaws of bio-concrete. One advantage is an increase in compressive strength and stiffness of the concrete (Ponraj et al, 2015). This advantage can offset the disadvantage of being a costly product because the cost of repairs would significantly reduce thus, saving money over time. Another advantage is the increased resistance to freezing and thawing because of the bacterial process (Ponraj et al, 2015). This is another advantage that offsets the financial disadvantage of bio-concrete. Another advantage is that because bio-concrete has a higher amount of carbonation, its porosity and permeability are decreased, thus giving the product resistance to carbonation and chloride attack (Ponraj et al, 2015). While costly, this product certainly seems to pay for itself in the long term but are these advantages enough to motivate constructors to integrate this material into building practices? Are there any ethical issues concerning this product? In the next section of this paper, I will explore the topic of ethics.

Ethical Issue with Bio-concrete

In the construction industry today, sustainability is a very important topic. Companies will hire organizations to come and teach them how to reduce waste. Communities view organizations who are more sustainable favorably over organizations who are not, and more building materials are coming out on the market that are environmentally friendly. These building materials include products such as Hemcrete, which is concrete that uses hemp as a main ingredient, and Straw bale construction, which uses straw as building materials in an efficient manner. With the advent of these new and sustainable building materials, there are certain costs that come with them. If the goal of every owner and contractor is to build for the future, then they must use sustainable products. But what if the products are extremely costly? Here is the ethical issue. Do owners and contractors have an ethical obligation to society and the

environment, to use products that are costly, but are otherwise sustainable? The answer is “yes”. While the goal of any business is to make money, that business has a responsibility to the community that supports it. Business owners and consumers have a symbiotic relationship. Without a community’s support, businesses would no longer exist. Without a business, the community would do without goods and services that were once provided. By providing a service to a community in an ethical and responsible way, businesses are insuring their own survival. The construction industry takes this concept a step further. With the construction industry, owners must be able to provide buildings that are safe, durable and clean to the community whilst simultaneously, having as little effect on the environment as possible. While the goal of the owner is to make money just like other businesses, they should also have the goal of making structures that help the environment no matter how high the cost because they are a part of it.

Conclusion

Through out this paper, we have examined and compared bio-concrete to regular concrete. After reviewing the relevant literature, I have concluded that bio-concrete is far superior to regular concrete. Not only is the product compressively stronger, physically more durable, and as versatile as regular concrete but it is also self-healing. While the main disadvantage of bio-concrete is its high cost, there is currently research being done to remedy this. Bio-concrete also opens new job opportunities for individuals that work in this aspect of the construction industry. While studies show that there will be apprehension when it comes to accepting bacterial agent use in construction, with proper education and safe practices, all of society will grow to accept it, and we could see bio-concrete being used everywhere in 15 to 20 years.

Works Cited

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- Rahman, F. (2017, September 17). *Bacterial Concrete or Self Healing Concrete For Crack Repairs*. Retrieved from The Constructor: <https://theconstructor.org/concrete/bacterial-concrete-self-healing-concrete/13751/>

SLO 01

<h2 style="text-align: center;">Student Learning Outcomes – Measure 2</h2> <p style="text-align: center;">(Completed each year by Instructor after review of student work)</p>			
<p>For each course, select whether the student learning outcome was met, partially met, unmet, or not reported. Attach documentation supporting the findings, including student's work example, rubrics, questions, or criteria, used in this determination.</p>			
<p>SLO 01: Create effective written communication appropriate to the construction discipline.</p> <p>CMGT 4470 Capstone Construction Project</p> <p style="text-align: center;">CLO 1(AD) Apply effective oral, written and graphic communication skills, including shop drawing development.</p> <p>Target: Average score of class to be 80 or higher out of 100 points.</p>			
Semester: Spring 2018	Metric: Project Report	Instructor: Hwang	Date: 9/25/2018

Findings

Enrollment	Min. Score	Max. Score	Ave. Score	Met/Part/Unmet/NR
12	72.15%	100.00%	90.74%	Met
Note: See the attached sample.				

#	Student	Score
1	Leoany	83.25
2	Dylan	99.00
3	Brittan	86.95
4	Casey	72.15
5	Brittany	99.00
6	Brett	99.00
7	Esther	91.58
8	Ryan	92.50
9	Luis	82.33
10	Samantha	90.65
11	Rhett	100.0
12	Spencer	92.50
13		
14		
15		

#	Student	Score
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

#	Student	Score
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		

Collected Student Work: Place the collect student's work after this page for each course, each time taught.

Student	Group	Evaluation Score (X/4.0)	Peer Evaluation (10)	Personal Credit (%)
Leoany	1	3.70	9.00	83.25
Dylan	2	4.00	9.90	99.00
Brittan	3	3.70	9.40	86.95
Casey	3	3.70	7.80	72.15
Brittany	2	4.00	9.90	99.00
Brett	2	4.00	9.90	99.00
Esther	1	3.70	9.90	91.58
Ryan	1	3.70	10.00	92.50
Luis	1	3.70	8.90	82.33
Samantha	3	3.70	9.80	90.65
Rhett	2	4.00	10.00	100.00
Spencer	3	3.70	10.00	92.50
				90.74

Outcome 2: Written Communication Rubric

Student:

Group 1

Date:

Reviewer:

Hwang

Course:

4470

Skill/Trait	No/Limited Proficiency (1)	Some Proficiency (2)	Proficiency (3)	High Proficiency (4)	Score
Content	Topic is poorly developed. Supporting details are absent or vague. Trite ideas and/or unclear working reflect lack of understanding of topic and audience.	Topic is evident. Few supporting details. Less than adequate job meeting the requirements of the assignment.	Topic is developed, with supporting details. Generally meets the requirements of the assignment.	Topic is well developed, effectively supported and appropriate for the assignment. Effective thinking is clearly and creatively expressed.	<i>4</i>
Organization	Writing is rambling and unfocused. Main theme and supporting details presented in a disorganized, unrelated way.	Writing demonstrates some grasp of organization. Has discernable theme and supporting details.	Writing is mostly organized around a central theme. Each paragraph is relatively clear and, in most cases, relates to the other paragraphs in a well-planned format.	Writing is clearly organized around a central theme. Each paragraph is clear and relates to the other paragraphs in a well-planned framework.	<i>4</i>
Mechanics	Writing lacks sentence variety. Significant deficiencies in word selection and usage, spelling, grammar, punctuation or presentation. Sources, if consulted, are poorly cited.	Limited variety of sentence structures. Several major errors in word selection and usage, spelling, grammar, and punctuation. Few cited sources used.	Variety of sentence structures. Relatively free from errors in word selection and usage, spelling, grammar, and punctuation. Some cited sources used.	Wide variety of sentence structures. Excellent word selection and usage, spelling, grammar, and punctuation. Multiple sources correctly cited. Effective integration of information.	<i>3</i>
Overall Evaluation					<i>3.7</i>

Outcome 2: Written Communication Rubric

Student: _____

Date: _____

Reviewer: _____

Course: _____

Reviewer: <i>Gouper</i>		Course: <i>Huang</i>		4470	
Skill/Trait	No/Limited Proficiency (1)	Some Proficiency (2)	Proficiency (3)	High Proficiency (4)	Score
Content	Topic is poorly developed. Supporting details are absent or vague. Trite ideas and/or unclear working reflect lack of understanding of topic and audience.	Topic is evident. Few supporting details. Less than adequate job meeting the requirements of the assignment.	Topic is developed, with supporting details. Generally meets the requirements of the assignment.	Topic is well developed, effectively supported and appropriate for the assignment. Effective thinking is clearly and creatively expressed.	4
Organization	Writing is rambling and unfocused. Main theme and supporting details presented in a disorganized, unrelated way.	Writing demonstrates some grasp of organization. Has discernable theme and supporting details.	Writing is mostly organized around a central theme. Each paragraph is relatively clear and, in most cases, relates to the other paragraphs in a well-planned format.	Writing is clearly organized around a central theme. Each paragraph is clear and relates to the other paragraphs in a well-planned framework.	4
Mechanics	Writing lacks sentence variety. Significant deficiencies in word selection and usage, spelling, grammar, punctuation or presentation. Sources, if consulted, are poorly cited.	Limited variety of sentence structures. Several major errors in word selection and usage, spelling, grammar, and punctuation. Few cited sources used.	Variety of sentence structures. Relatively free from errors in word selection and usage, spelling, grammar, and punctuation. Some cited sources used.	Wide variety of sentence structures. Excellent word selection and usage, spelling, grammar, and punctuation. Multiple sources correctly cited. Effective integration of information.	4
Overall Evaluation					4.0

Outcome 2: Written Communication Rubric

Student: _____

Date: _____

Reviewer: _____

Reviewer: _____		Course: _____			Score
Skill/Trait	No/Limited Proficiency (1)	Some Proficiency (2)	Proficiency (3)	High Proficiency (4)	
Content	Topic is poorly developed. Supporting details are absent or vague. Trite ideas and/or unclear working reflect lack of understanding of topic and audience.	Topic is evident. Few supporting details. Less than adequate job meeting the requirements of the assignment.	Topic is developed, with supporting details. Generally meets the requirements of the assignment.	Topic is well developed, effectively supported and appropriate for the assignment. Effective thinking is clearly and creatively expressed.	4
Organization	Writing is rambling and unfocused. Main theme and supporting details presented in a disorganized, unrelated way.	Writing demonstrates some grasp of organization. Has discernable theme and supporting details.	Writing is mostly organized around a central theme. Each paragraph is relatively clear and, in most cases, relates to the other paragraphs in a well-planned format.	Writing is clearly organized around a central theme. Each paragraph is clear and relates to the other paragraphs in a well-planned framework.	4
Mechanics	Writing lacks sentence variety. Significant deficiencies in word selection and usage, spelling, grammar, punctuation or presentation. Sources, if consulted, are poorly cited.	Limited variety of sentence structures. Several major errors in word selection and usage, spelling, grammar, and punctuation. Few cited sources used.	Variety of sentence structures. Relatively free from errors in word selection and usage, spelling, grammar, and punctuation. Some cited sources used.	Wide variety of sentence structures. Excellent word selection and usage, spelling, grammar, and punctuation. Multiple sources correctly cited. Effective integration of information.	3
Overall Evaluation					3.7

CMGT 4470: Capstone Project Report Evaluation Rubric

Student (Group) Names:	
Total (Max. 100 points):	

<i>Proper Report Format (10 points)</i>		
✓	Cover Page to include: Course Name, Due Date, Title, Semester, Team Members.	1
✓	Length of report – Min. 50 pages, Max. 80 pages, including drawings, images, appendices, etc.	4
✓	Style (font, spacing, page number, margin, organization, etc.) – Follow instructions provided in class and may use a template.	3
✓	Submit a report (both a softcopy and a printout)—the softcopy should be a single word file.	2
<i>Introduction (10 points)</i>		
✓	Address the goals and objectives of the tasks performed in this course.	3
✓	Introduce your capstone project—general information, major stakeholders, location, size and function, contractual arrangements, and the major issues to be solved with the project.	7
<i>Project Definition, Organization, and Requirements (10 points)</i>		
✓	Write the invitation to bid and main contract agreement.	1
✓	Develop the written requirements for bonds and insurance.	2
✓	Produce a scope statement, including description of project deliverables, milestones, and target dates.	2
✓	Describe the procedures for changing project scope. i.e., change order management procedure, including a sample of 'Request for Change Order.'	1
✓	Develop an organization-responsibility matrix at the level of contract package.	2
✓	Discuss mobilization plan and project site layout along with constraints, risk, and strategies, demonstrating compliance with codes and sustainability.	2
<i>Design and Value Engineering (10 points)</i>		
✓	Produce a preliminary design.	2
✓	Create a complete BIM model and generate design documents from the model.	3
✓	Discuss technical specifications and compliance of codes/regulations of major systems/components.	2
✓	Conduct value engineering on two cases at the system level—present a summary.	3
<i>Procurement Management (10 points)</i>		
✓	Create a prequalification system used to evaluate selection of subcontractors and suppliers.	2
✓	Create a purchase order form and two samples.	3
✓	Derive a milestone schedule for ordering major materials and equipment.	3
✓	Write a plan for handling surplus materials.	2

Time Management (10 points)			
✓	Explain contingencies and assumptions involved in time management and provide strategies to handle those.	3	
✓	Using Primavera P6, produce a resource-loaded schedule and update it after 50% of time consumed.	3	
✓	List resources and site constraints that affect time management.	3	
✓	Perform time-cost trade-off, resource leveling, and schedule compression/decompression.	1	
Cost Management (10 points)			
✓	Discuss uncertainty/risk associated with cost management and contingency plan.	2	
✓	Produce a report of quantity and estimates, including all direct/indirect costs—use Timberline and spreadsheet.	2	
✓	Estimate 2 activities using local data—productivity, unit costs.	2	
✓	Prepare a budget plan and create a cash flow plan.	2	
✓	Conduct an earned value analysis by associating with time management at 50% completion.	2	
Quality Management (10 points)			
✓	Create a construction method statement, in which quality statement is included.	4	
✓	Discuss a plan for organizing and implementing the quality circle.	1	
✓	Develop an inspection and test plan for 2 activities.	2	
✓	Draw a sample cause and effect chart for an activity.	1	
✓	Generate a written sample of a 'Request for Information form.'	1	
✓	Create a 'Non-Conformance Report' form and an example case for an activity.	1	
Safety Management (10 points)			
✓	Design a safety management plan.	2	
✓	Discuss the roles and the timings for reporting and tracking safety.	2	
✓	Describe the safety communication channels among the roles listed above.	1	
✓	Assess, list, and specify the safety and hazards unique to this project.	2	
✓	Describe the process for performing risk response audits.	1	
✓	Design an incident report form.	2	
Conclusions (10 points)			
✓	Create an executive summary (place it right after cover page).	3	
✓	Describe problems encountered, including level of attaining original objectives of this project.	3	
	Discuss lessons learned in detail.	4	

Intro to Course & A Selected Project

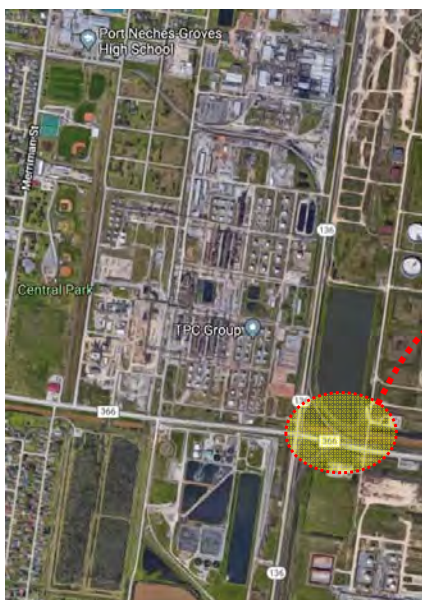
Seokyon Hwang, Ph.D.

Outline

A Selected Project

Intro to course

2



**ATLANTIC CANAL IMPROVEMENTS PROJECT
KCS RAILWAY CULVERT CROSSING REPLACEMENT (BID A)**
Refer to the drawings provided to find the details of project design.

LOWER NECHES VALLEY AUTHORITY

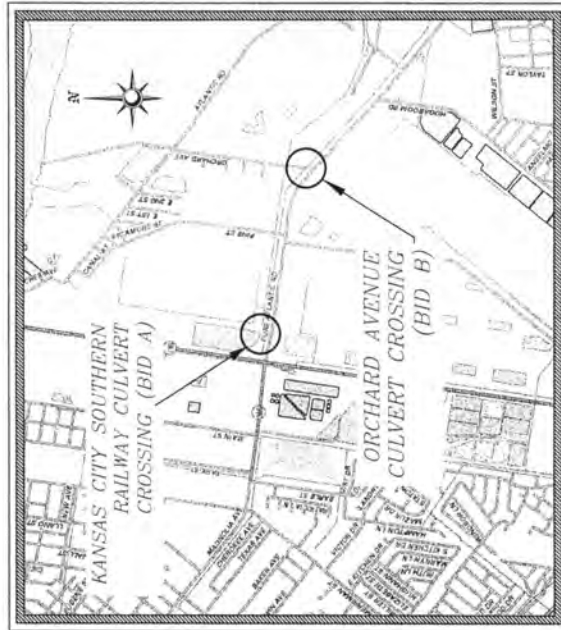
ATLANTIC CANAL IMPROVEMENTS PROJECT KCS RAILWAY CULVERT CROSSING REPLACEMENT (BID A) AND ORCHARD AVENUE CULVERT CROSSING REPLACEMENT (BID B)

LOWER NECHES VALLEY AUTHORITY

STEVEN McREYNOLDS..... PRESIDENT
OLAN WEBB..... VICE PRESIDENT
CALEB SPURLOCK..... TREASURER
IVY PATE..... SECRETARY
JORDAN REESE..... DIRECTOR
LONNIE B. GRISSOM, JR. DIRECTOR
KAL A. KINCAID..... DIRECTOR
STEVE LUCAS..... DIRECTOR
JEANIE TURK..... DIRECTOR

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KCS PROPOSED PLAN AND PROFILE.....	5
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PROJECT LOCATION
N.T.S.

APPROVED
LOWER NECHES VALLEY AUTHORITY

BY: *Scott Ball*
SCOTT BALL, P.E.
GENERAL MANAGER
DATE: 3/16/2016

BY: *Quane Browning*
QUANE BROWNING, P.E.
ASSISTANT GENERAL MANAGER
DATE: 3/16/2016

LJA ENGINEERING, INC.
BY: *Allen B. Sinc*
ALLEN B. SINC, P.E. NO. 42085
DATE: 3/16/16



PREPARED BY
LJA ENGINEERING, INC.
BEAUMONT, TEXAS
Texas Registered Engineering Firm F-1286
JANUARY 2016

The Contractor shall maintain acceptable drainage throughout the limits of the Project during all construction phases. At the conclusion of the project, the project limits shall be inspected. All excess materials which are in the LMA easements resulting from the project work shall be removed by the contractor at no additional cost to the owner.

Utility locations shown on the plans are for informational purposes only and are not exact. The Engineer and the Owner assume no responsibility for variation in location and grades. Contractor shall verify location and elevation of existing facilities prior to construction of proposed facilities. Discrepancies between the two shall be immediately reported to the Owner or Engineer.

The Contractor shall be responsible for locating and protecting all utility lines during construction. The Contractor shall be responsible for any damage to existing utilities and shall promptly repair same, or make arrangements for such repair with the Owner of the utility involved.

6.0 WORK SCHEDULING

3. Contractor shall notify Kansas City Southern Railway, no later than 3 weeks prior to the date of installation of culverts.

7.0 SUBMITTALS

B.O. KANSAS CITY SOUTHERN RAILWAY NOTES

72" diameter corrugated metal culverts shall be 3 ft 10 gauge double fluted polymer coated per MCHTO M-246

Minimum height of cover is $3/2$ but not less than $3/4$. Below base of tie.

	THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY
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5. The size and length of pipe installed by the Contractor shall be as shown in the Construction Plans. Pipe installation shall conform to the lines and grades as shown on the plans.

2. Shoring shall be required for excavations deeper than 5 feet or the side slopes shall be cut back a sufficient amount to prevent slides, the minimum slope shall be 1:1.

shall inspect and approve this area prior to the placement of any bedding material. Should the Engineer require an area to be undercut, the Contractor shall undercut the area in accordance with Items 140 and Item 150.

5. Bedding material shall be placed and compacted under the haunches of the pipe extending from the bottom of (ASTM D698-91).

Bedding one foot or more shall be placed to within two (2) percent above or below the volumetric moisture content of the material being used.

before being joined. Sections of pipe shall be positioned against each other before the band is closed. When closing the band on corrugated metal pipe, corrugations at the band shall line up with the corrugations of the

existing pipe and that is damaged. Culverts shall be constructed as shown in the plans. When joining to existing culvert, the existing culvert shall be cleared out.

water pipes are first thoroughly inspected, inspected and approved by the Engineer, the trench excavation shall be backfilled using suitable materials placed alongside the pipe in uniform layers with excavated material from the trench, structural reinforcement from the reinforced concrete

4. Subballast shall be crushed rock with a minimum of one fractured face meeting the quality requirements of ASTM Designation: C 1241 and approved by the Engineer.

5. Impervious subballast shall be uniformly graded and shall meet the following gradation requirements

$1/\alpha$	
No. 4	65-30
No. 3	20-55
No. 2C0	15-20
	7-15

Substrate shell be lapped with minimum one flat of

A. Track work shall be performed by KCS approved track contractor ONLY.

RIGHT OF WAY PERMIT:
Contractor shall obtain a Right of Entry Permit from KCS.

RAILROAD FLAGGING: Contractor shall obtain railroad flagging prior to entering MCS right of way. Flagging shall also be obtained when any

Contractor shall obtain and provide proof of insurance prior to working within ACS ROW. Refer to Right of Entry Permit for more details.

COMPANY	CONTACT	PHONE NUMBERS
TELEAS ONE CALL SYSTEM	N/A	1-800-245-1945
TELEAS EXCAVATION, SAFETY SYSTEM	N/A	1-800-DIG-TESS (8)
ENERGY	MR. PHILIP SCOTT	(409) 982-5830
SOUTHWESTERN BELL TELEPHONE	MR. HAYWOOD GREEN	(409) 839-7887
CITY OF PORT NECHES WATER & SEWER	MR. TAYLOR SHELTON	(409) 719-4204
TELEAS GAS COMPANY	MR. ART THOMAS	(409) 993-7126
TIME WARNER	MR. HERSCHEL STACCIER	(409) 720-5501
TIME USA, INC.	MR. JEROME CASAS	(409) 284-0464

COMPANY	CONTACT	PHONE NUMBERS
HUNTSMAN PIPELINE	CLYDE BEARDON	(405) 626-1350
IPC PIPELINE	CHARLIE HATTAWAY	(405) 724-4700
KINDER MORGAN PIPELINE	"PAUL LINGER	(800) 533-0184
STRAHAN OXYGEN PIPELINE		(405) 465-1295
TEX AIR LIQUID PIPELINE		(713) 864-7194
		(800) 864-1378

COMPANY	CONTACT	PHONE NUMBER	TITLE
OWEN HOOVER VALLEY AUTHORITY	MR. SCOTT HALL, P.E.	(405) 892-4011	(GENERAL MANAGER)
JAR ENGINEERING, INC.	MR. ALLEN SAMS, E.E.	(405) 833-1353	(CONSULTANT)
KANSAS CITY SOUTHERN RAILWAY	SIR WOLFEUR	(816) 983-1158	(CONSTRUCTION DIRECTOR)

SPONSORED BY SOUTHERN.COM

1. ALL WORK PERFORMED WITHIN THE AREA SHALL BE COMPLETED BY THE
RCS RAILWAY CO.
2. CONTRACTOR SHALL NOTIFY ALL UTILITY AND PRELINE COMPANIES WITH
EXISTING FACILITIES IN AREA OF CONSTRUCTION AT LEAST 48 HOURS BEFORE
BEGINNING CONSTRUCTION IN THAT AREA.
3. PRAMPAR REQUIRES ALL EXCAVATION WITHIN 2' OF THEIR PRELINE TO BE

Contractor shall provide sharing as noted in the attached MCS sharing requirements.

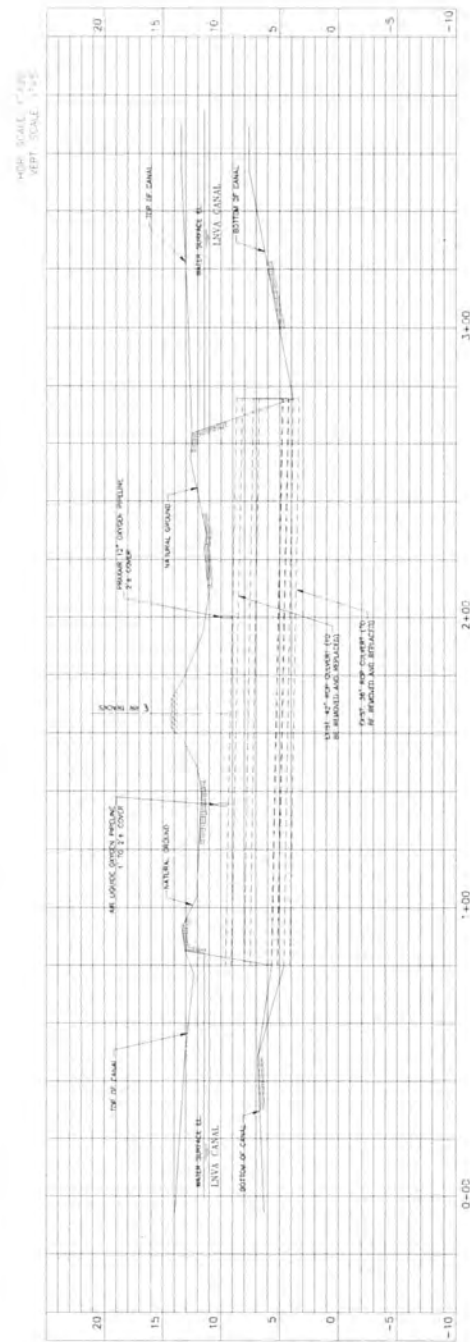
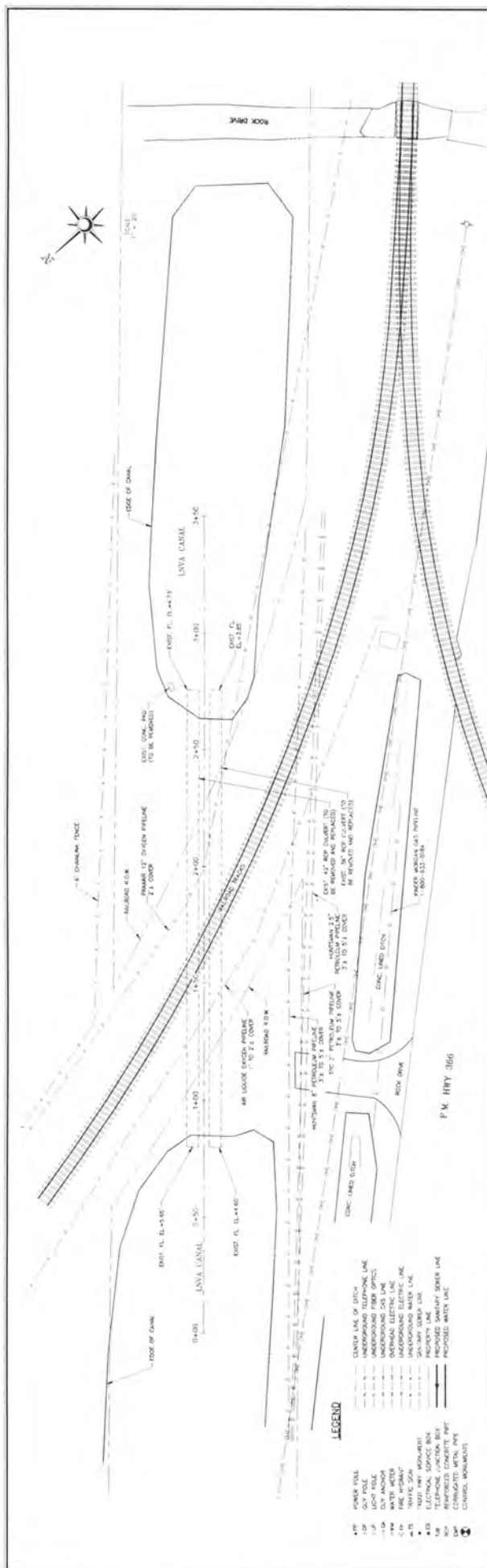
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ALLEN C. SMITH, R.E. BROWN, ON 3/16/20 16

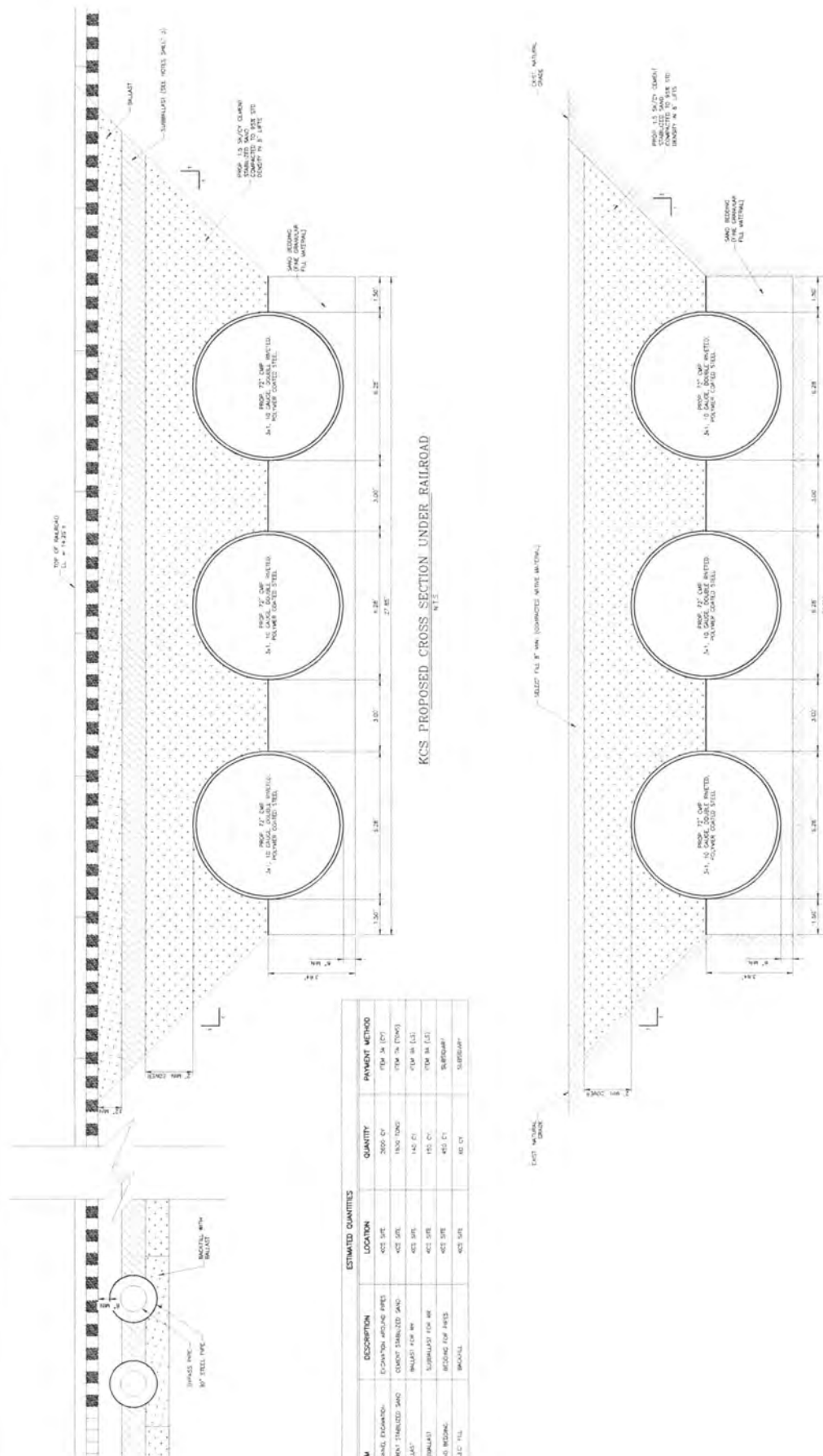
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LJA Engineering, Inc.
3120 Fannin St
Beaumont, Texas 77701
FRN - F-1386

ATLANTIC CANAL IMPROVEMENTS PROJECT
KCS RAILWAY CULVERT CROSSING REPLACEMENT (BID A)
AND ORCHARD AVENUE CULVERT CROSSING REPLACEMENT (BID B)

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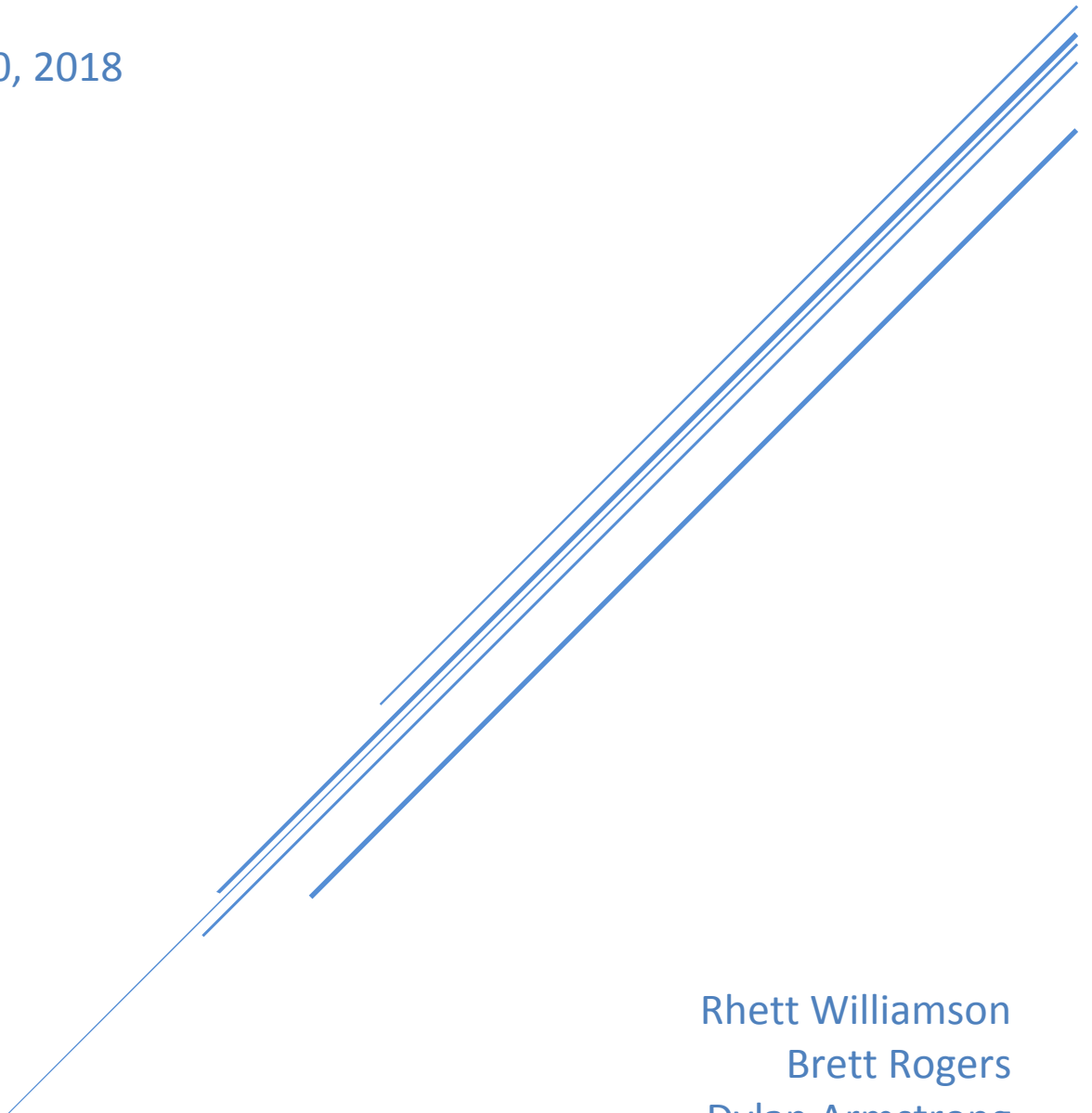
ESTIMATED QUANTITIES			PAYMENT METHOD	
ITEM	DESCRIPTION	LOCATION	QUANTITY	
CHIMNEY EXHAUST	CHIMNEY EXHAUST PIPES	425 SFE	2659.07	ITEM 34 (27)
COND' FANILIZED PANS	COND' FANILIZED PANS	425 SFE	1535.7200	ITEM 36 (2904)
BRACKET	BRACKET FOR W	425 SFE	142.21	ITEM 38 (33)
SUPPLEMENT	SUPPLEMENT FOR W	425 SFE	145.07	ITEM 38 (33)
SAFETY RESCUE	RESCUE FOR PIPES	425 SFE	401.07	SUBTOTAL
BRACKET	BRACKET	425 SFE	102.07	SUBTOTAL

<div>THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY ALLEN C. SMITH, P.E., BOARD, ON 5/14/2014</div> <div></div>	<div>LJA Engineering, Inc. 3120 Fannin St. Baumont, Texas 77701 FRN - F-1386</div> <div>Phone 409.833.3363 Fax 409.833.0317</div>	<div>ATLANTIC CANAL IMPROVEMENTS PROJECT KCS RAILWAY CULVERT CROSSING REPLACEMENT (BID A) AND ORCHARD AVENUE CULVERT CROSSING REPLACEMENT (BID B)</div> <div>KCS PROPOSED CULVERT CROSS-SECTIONS</div>	<table><tr><th>Station</th><th>Station</th><th>Date</th></tr><tr><td>2+00</td><td>2+2</td><td>1/18</td></tr><tr><td>2+40</td><td>2+40</td><td>1/18</td></tr><tr><td>2+60</td><td>2+60</td><td>1/18</td></tr><tr><td>2+80</td><td>2+80</td><td>1/18</td></tr><tr><td>3+00</td><td>3+00</td><td>1/18</td></tr><tr><td>3+20</td><td>3+20</td><td>1/18</td></tr><tr><td>3+40</td><td>3+40</td><td>1/18</td></tr><tr><td>3+60</td><td>3+60</td><td>1/18</td></tr><tr><td>3+80</td><td>3+80</td><td>1/18</td></tr><tr><td>4+00</td><td>4+00</td><td>1/18</td></tr><tr><td>4+20</td><td>4+20</td><td>1/18</td></tr><tr><td>4+40</td><td>4+40</td><td>1/18</td></tr><tr><td>4+60</td><td>4+60</td><td>1/18</td></tr><tr><td>4+80</td><td>4+80</td><td>1/18</td></tr><tr><td>5+00</td><td>5+00</td><td>1/18</td></tr><tr><td>5+20</td><td>5+20</td><td>1/18</td></tr><tr><td>5+40</td><td>5+40</td><td>1/18</td></tr><tr><td>5+60</td><td>5+60</td><td>1/18</td></tr><tr><td>5+80</td><td>5+80</td><td>1/18</td></tr><tr><td>6+00</td><td>6+00</td><td>1/18</td></tr><tr><td>6+20</td><td>6+20</td><td>1/18</td></tr><tr><td>6+40</td><td>6+40</td><td>1/18</td></tr><tr><td>6+60</td><td>6+60</td><td>1/18</td></tr><tr><td>6+80</td><td>6+80</td><td>1/18</td></tr><tr><td>7+00</td><td>7+00</td><td>1/18</td></tr><tr><td>7+20</td><td>7+20</td><td>1/18</td></tr><tr><td>7+40</td><td>7+40</td><td>1/18</td></tr><tr><td>7+60</td><td>7+60</td><td>1/18</td></tr><tr><td>7+80</td><td>7+80</td><td>1/18</td></tr><tr><td>8+00</td><td>8+00</td><td>1/18</td></tr><tr><td>8+20</td><td>8+20</td><td>1/18</td></tr><tr><td>8+40</td><td>8+40</td><td>1/18</td></tr><tr><td>8+60</td><td>8+60</td><td>1/18</td></tr><tr><td>8+80</td><td>8+80</td><td>1/18</td></tr><tr><td>9+00</td><td>9+00</td><td>1/18</td></tr><tr><td>9+20</td><td>9+20</td><td>1/18</td></tr><tr><td>9+40</td><td>9+40</td><td>1/18</td></tr><tr><td>9+60</td><td>9+60</td><td>1/18</td></tr><tr><td>9+80</td><td>9+80</td><td>1/18</td></tr><tr><td>10+00</td><td>10+00</td><td>1/18</td></tr><tr><td>10+20</td><td>10+20</td><td>1/18</td></tr><tr><td>10+40</td><td>10+40</td><td>1/18</td></tr><tr><td>10+60</td><td>10+60</td><td>1/18</td></tr><tr><td>10+80</td><td>10+80</td><td>1/18</td></tr><tr><td>11+00</td><td>11+00</td><td>1/18</td></tr><tr><td>11+20</td><td>11+20</td><td>1/18</td></tr><tr><td>11+40</td><td>11+40</td><td>1/18</td></tr><tr><td>11+60</td><td>11+60</td><td>1/18</td></tr><tr><td>11+80</td><td>11+80</td><td>1/18</td></tr><tr><td>12+00</td><td>12+00</td><td>1/18</td></tr><tr><td>12+20</td><td>12+20</td><td>1/18</td></tr><tr><td>12+40</td><td>12+40</td><td>1/18</td></tr><tr><td>12+60</td><td>12+60</td><td>1/18</td></tr><tr><td>12+80</td><td>12+80</td><td>1/18</td></tr><tr><td>13+00</td><td>13+00</td><td>1/18</td></tr><tr><td>13+20</td><td>13+20</td><td>1/18</td></tr><tr><td>13+40</td><td>13+40</td><td>1/18</td></tr><tr><td>13+60</td><td>13+60</td><td>1/18</td></tr><tr><td>13+80</td><td>13+80</td><td>1/18</td></tr><tr><td>14+00</td><td>14+00</td><td>1/18</td></tr><tr><td>14+20</td><td>14+20</td><td>1/18</td></tr><tr><td>14+40</td><td>14+40</td><td>1/18</td></tr><tr><td>14+60</td><td>14+60</td><td>1/18</td></tr><tr><td>14+80</td><td>14+80</td><td>1/18</td></tr><tr><td>15+00</td><td>15+00</td><td>1/18</td></tr><tr><td>15+20</td><td>15+20</td><td>1/18</td></tr><tr><td>15+40</td><td>15+40</td><td>1/18</td></tr><tr><td>15+60</td><td>15+60</td><td>1/18</td></tr><tr><td>15+80</td><td>15+80</td><td>1/18</td></tr><tr><td>16+00</td><td>16+00</td><td>1/18</td></tr><tr><td>16+20</td><td>16+20</td><td>1/18</td></tr><tr><td>16+40</td><td>16+40</td><td>1/18</td></tr><tr><td>16+60</td><td>16+60</td><td>1/18</td></tr><tr><td>16+80</td><td>16+80</td><td>1/18</td></tr><tr><td>17+00</td><td>17+00</td><td>1/18</td></tr><tr><td>17+20</td><td>17+20</td><td>1/18</td></tr><tr><td>17+40</td><td>17+40</td><td>1/18</td></tr><tr><td>17+60</td><td>17+60</td><td>1/18</td></tr><tr><td>17+80</td><td>17+80</td><td>1/18</td></tr><tr><td>18+00</td><td>18+00</td><td>1/18</td></tr><tr><td>18+20</td><td>18+20</td><td>1/18</td></tr><tr><td>18+40</td><td>18+40</td><td>1/18</td></tr><tr><td>18+60</td><td>18+60</td><td>1/18</td></tr><tr><td>18+80</td><td>18+80</td><td>1/18</td></tr><tr><td>19+00</td><td>19+00</td><td>1/18</td></tr><tr><td>19+20</td><td>19+20</td><td>1/18</td></tr><tr><td>19+40</td><td>19+40</td><td>1/18</td></tr><tr><td>19+60</td><td>19+60</td><td>1/18</td></tr><tr><td>19+80</td><td>19+80</td><td>1/18</td></tr><tr><td>20+00</td><td>20+00</td><td>1/18</td></tr><tr><td>20+20</td><td>20+20</td><td>1/18</td></tr><tr><td>20+40</td><td>20+40</td><td>1/18</td></tr><tr><td>20+60</td><td>20+60</td><td>1/18</td></tr><tr><td>20+80</td><td>20+80</td><td>1/18</td></tr><tr><td>21+00</td><td>21+00</td><td>1/18</td></tr><tr><td>21+20</td><td>21+20</td><td>1/18</td></tr><tr><td>21+40</td><td>21+40</td><td>1/18</td></tr><tr><td>21+60</td><td>21+60</td><td>1/18</td></tr><tr><td>21+80</td><td>21+80</td><td>1/18</td></tr><tr><td>22+00</td><td>22+00</td><td>1/18</td></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	1/18	21+20	21+20	1/18	21+40	21+40	1/18	21+60	21+60	1/18	21+80	21+80	1/18	22+00	22+00	1/18	22+20	22+20	1/18	22+40	22+40	1/18	22+60	22+60	1/18	22+80	22+80	1/18	23+00	23+00	1/18	23+20	23+20	1/18	23+40	23+40	1/18	23+60	23+60	1/18	23+80	23+80	1/18	24+00	24+00	1/18	24+20	24+20	1/18	24+40	24+40	1/18	24+60	24+60	1/18	24+80	24+80	1/18	25+00	25+00	1/18	25+20	25+20	1/18	25+40	25+40	1/18	25+60	25+60	1/18	25+80	25+80	1/18	26+00	26+00	1/18	26+20	26+20	1/18	26+40	26+40	1/18	26+60	26+60	1/18	26+80	26+80	1/18	27+00	27+00	1/18	27+20	27+20	1/18	27+40	27+40	1/18	27+60	27+60	1/18	27+80	27+80	1/18	28+00	28+00	1/18	28+20	28+20	1/18	28+40	28+40	1/18	28+60	28+60	1/18	28+80	28+80	1/18	29+00	29+00	1/18	29+20	29+20	1/18	29+40	29+40	1/18	29+60	29+60	1/18	29+80	29+80	1/18	30+00	30+00	1/18	30+20	30+20	1/18	30+40	30+40	1/18	30+60	30+60	1/18	30+80	30+80	1/18	31+00	31+00	1/18	31+20	31+20	1/18	31+40	31+40	1/18	31+60	31+60	1/18	31+80	31+80	1/18	32+00	32+00	1/18	32+20	32+20	1/18	32+40	32+40	1/18	32+60	32+60	1/18	32+80	32+80	1/18	33+00	33+00	1/18	33+20	33+20	1/18	33+40	33+40	1/18	33+60	33+60	1/18	33+80	33+80	1/18	34+00	34+00	1/18	34+20	34+20	1/18	34+40	34+40	1/18	34+60	34+60	1/18	34+80	34+80	1/18	35+00	35+00	1/18	35+20	35+20	1/18	35+40	35+40	1/18	35+60	35+60	1/18	35+80	35+80	1/18	36+00	36+00	1/18	36+20	36+20	1/18	36+40	36+40	1/18	36+60	36+60	1/18	36+80	36+80	1/18	37+00	37+00	1/18	37+20	37+20	1/18	37+40	37+40	1/18	37+60	37+60	1/18	37+80	37+80	1/18	38+00	38+00	1/18	38+20	38+20	1/18	38+40	38+40	1/18	38+60	38+60	1/18	38+80	38+80	1/18	39+00	39+00	1/18	39+20	39+20	1/18	39+40	39+40	1/18	39+60	39+60	1/18	39+80	39+80	1/18	40+00	40+00	1/18	40+20	40+20	1/18	40+40	40+40	1/18	40+60	40+60	1/18	40+80	40+80	1/18	41+00	41+00	1/18	41+20	41+20	1/18	41+40	41+40	1/18	41+60	41+60	1/18	41+80	41+80	1/18	42+00	42+00	1/18	42+20	42+00	1/18	42+40	42+00	1/18	42+60	42+00	1/18	42+80	42+00	1/18	43+00	43+00	1/18	43+20	43+00	1/18	43+40	43+00	1/18	43+60	43+00	1/18	43+80	43+00	1/18	44+00	44+00	1/18	44+20	44+00	1/18	44+40	44+00	1/18	44+60	44+00	1/18	44+80	44+00	1/18	45+00	45+00	1/18	45+20	45+00	1/18	45+40	45+00	1/18	45+60	45+00	1/18	45+80	45+00	1/18	46+00	46+00	1/18	46+20	46+00	1/18	46+40	46+00	1/18	46+60	46+00	1/18	46+80	46+00	1/18	47+00	47+00	1/18	47+20	47+00	1/18	47+40	47+00	1/18	47+60	47+00	1/18	47+80	47+00	1/18	48+00	48+00	1/18	48+20	48+00	1/18	48+40	48+00	1/18	48+60	48+00	1/18	48+80	48+00	1/18	49+00	49+00	1/18	49+20	49+00	1/18	49+40	49+00	1/18	49+60	49+00	1/18	49+80	49+00	1/18	50+00	50+00	1/18	50+20	50+00	1/18	50+40	50+00	1/18	50+60	50+00	1/18	50+80	50+00	1/18	51+00	51+00	1/18	51+20	51+00	1/18	51+40	51+00	1/18	51+60	51+00	1/18	51+80	51+00	1/18	52+00	52+00	1/18	52+20	52+00	1/18	52+40	52+00	1/18	52+60	52+00	1/18	52+80	52+00	1/18	53+00	53+00	1/18	53+20	53+00	1/18	53+40	53+00	1/18	53+60	53+00	1/18	53+80	53+00	1/18	54+00	54+00	1/18	54+20	54+00	1/18	54+40	54+00	1/18	54+60	54+00	1/18	54+80	54+00	1/18	55+00	55+00	1/18	55+20	55+00	1/18	55+40	55+00	1/18	55+60	55+00	1/18	55+80	55+00	1/18	56+00	56+00	1/18	56+20	56+00	1/18	56+40	56+00	1/18	56+60	56+00	1/18	56+80	56+00	1/18	57+00	57+00	1/18	57+20	57+00	1/18	57+40	57+00	1/18	57+60	57+00	1/18	57+80	57+00	1/18	58+00	58+00	1/18	58+20	58+00	1/18	58+40	58+00	1/18	58+60	58+00	1/18	58+80	58+00	1/18	59+00	59+00	1/18	59+20	59+00	1/18	59+40	59+00	1/18	59+60	59+00	1/18	59+80	59+00	1/18	60+00	60+00	1/18	60+20	60+00	1/18	60+40	60+00	1/18	60+60	60+00	1/18	60+80	60+00	1/18	61+00	61+00	1/18	61+20	61+00	1/18	61+40	61+00	1/18	61+60	61+00	1/18	61+80	61+00	1/18	62+00	62+00	1/18	62+20	62+00	1/18	62+40	62+00	1/18	62+60	62+00	1/18	62+80	62+00	1/18	63+00	63+00	1/18	63+20	63+00	1/18	63+40	63+00	1/18	63+60	63+00	1/18	63+80	63+00	1/18	64+00	64+00	1/18	64+20	64+00	1/18	64+40	64+00	1/18	64+60	64+00	1/18	64+80	64+00	1/18	65+00	65+00	1/18	65+20	65+00	1/18	65+40	65+00	1/18	65+60	65+00	1/18	65+80	65+00	1/18	66+00	66+00	1/18	66+20	66+00	1/18	66+40	66+00	1/18	66+60	66+00	1/18	66+80	66+00	1/18	67+00	67+00	1/18	67+20	67+00	1/18	67+40	67+00	1/18	67+60	67+00	1/18	67+80	67+00	1/18	68+00	68+00	1/18	68+20	68+00	1/18	68+40	68+00	1/18	68+60	68+00	1/18	68+80	68+00	1/18	69+00	69+00	1/18	69+20	69+00	1/18	69+40	69+00	1/18	69+60	69+00	1/18	69+80	69+00	1/18	70+00	70+00	1/18	70+20	70+00	1/18	70+40	70+00	1/18	70+60	70+00	1/18	70+80	70+00	1/18	71+00	71+00	1/18	71+20	71+00	1/18	71+40	71+00	1/18	71+60	71+00	1/18	71+80	71+00	1/18	72+00	72+00	1/18	72+20	72+00	1/18	72+40	72+00	1/18	72+60	72+00	1/18	72+80	72+00	1/18	73+00	73+00	1/18	73+20	73+00	1/18	73+40	73+00	1/18	73+60	73+00	1/18	73+80	73+00	1/18	74+00	74+00	1/18	74+20	74+00	1/18	74+40	74+00	1/18	74+60	74+00	1/18	74+80	74+00	1/18	75+00	75+00	1/18	75+20	75+00	1/18	75+40	75+00	1/18	75+60	75+00	1/18	75+80	75+00
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LNVA ATLANTIC CANAL IMPROVEMENTS

Capstone Project
CMGT 4470

April 30, 2018



Rhett Williamson
Brett Rogers
Dylan Armstrong
Brittany Stutes

EXECUTIVE SUMMARY

Project Description

This project has been commissioned by the Lower Neches Valley Authority to replace the existing Atlantic Canal Crossing and improve the water flow. The following report is a comprehensive evaluation and summary of this project.

This project was awarded to and completed by our company, WARS Construction. We are a heavy civil contractor specializing in activities such as concrete and drainage.

The summary of this project is the removal of two small culverts and replacing them with three 72 in. culverts. To do this, we must remove the railway that crosses over these culverts. For the duration of the project, we must also utilize bypass pumping to maintain the existing water flow.

Procurement Management

The pre-bid process for this project consisted of pre-bid meetings, contractor prequalification process and vendor/subcontractor prequalification.

The noteworthy materials for this project include piping and backfill materials. The procurement and delivery of these materials reflects throughout many items within this report. Our estimate includes a surplus material contingency plan for piping and materials such as backfill and spoils. These contingencies were developed to mitigate any delays that could occur due to trucking and deliveries.

Time Management

Significant risks for this project were scheduling delays and their associated damages, and the installation of two large cofferdams. The total duration for the project was

estimated to take 27 days, 7 of which were to be 24 hour working days. This 24 hour schedule encompasses the rail outage.

Cost Management

The cost for this project was estimated at a total of \$829,990.00. Important factors to be considered for this cost were the rail closure and piping. The total duration for the project was estimated to take 27 days, 7 of which were to be 24 hour working days. This 24 hour schedule encompasses the rail outage.

Quality Management

Our Quality Circle group at WARS Construction consist of the Safety Manager, General Contractor, Sub Contractor, and Superintendent. Their mission to help our employees complete the best work possible and use the most productive techniques for the operation at hand

Safety Management

The Safety Management Plan at WARS Construction defines the mechanisms for interaction and oversight for the seven primary functions involved. This plan includes Safety, Security, Hazardous Materials and Wastes, Emergency Management, Fire/Life Safety, Medical Equipment, Utilities Management. The overall objective of this plan is to define methods/processes for the identification and management/minimization of the inherent safety risks associated with our construction operations. Several safety hazards were identified including Drowning, Lifting Materials, Traffic Interference, Existing Pipelines, Oil Leaks/Spills, and Crushing Hazards.

Conclusion

This project was incredibly educational and provided a lot insight into our future in construction. The values most reflected throughout this project were time management, communication, team work, and relationships.

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1. INTRODUCTION

The project discussed is the Lower Neches Valley Authority Atlantic Canal Improvements Project. The scope of work this project includes the removal of existing culvert crossings at the locations specified and replacing these crossings with the culvert materials as shown in the plans and specifications. The work will include all related and incidental construction work, including, but not limited to, clearing and grubbing, railroad spur removal and replacement, and construction of concrete headwall structures

The owner for this project is the Lower Neches Valley Authority known as LNVA. The LNVA provides for the present and long term freshwater needs of municipal, agricultural and industrial customers. They are responsible for protecting the water quality in the Neches River and Coastal Basin. LNVA insures affordability of the water supply while enhancing the economic development in the Authority's jurisdiction.

1 PROJECT DESCRIPTION

1.1 Invitation to Bid

The invitation to bid (ITB) is a formal set of documents issued by the client to the proposed contractors with which they build their proposal. The template for an invitation to bid depends on the owner and the type of work being performed. In this instance, the owner is a government agency and therefore has incredibly detail terms for the bid process. The following sections give an overview of the invitation to bid for this project.

1.1.1 Introduction

This section of the ITB is known as the Advertisement for Bids. It consists of a one page summary of important details pertaining to the contract. This is where information such as the due date and location of bid opening are listed.

1.1.2 Scope of Work

Considered to be the most important section in this ITB is the Scope of Work. This outlines the client's request for work to be performed in the form of a brief list. Further details pertaining to the scope of work are explained throughout this report.

1.1.3 Bid Item Notes

The client typically defines the structure of the proposal by requesting the contractors break their estimate down into Bid Items. Bid Items are most often Pay Items that match items in the owner's budget followed by a brief description of what the item consists. The 12 bid items for this project are listed below and are expounded upon throughout this report.

- Mobilization
- Pipeline Protection and Support
- Channel Excavation
- Earthen Dams
- Remove Existing Culvert Crossing

- 72in Corrugated Metal Pipe
- Cement Stabilized Sand Backfill
- Concrete Lining
- Trench Safety System
- Final Grading and Seeding
- General Source Controls
- Bypass Pumping

1.1.4 Measurement and Payment

Payment for this contract is based on the provided plan quantities given with each bit item. Typically, payments are billed each month based on percentage of given quantity completed that month. This will be explained in further detail in section 0.

1.1.5 General Notes

This section includes the assumptions and additional information that establishes the responsibilities of the contractor and the client. There are several sections including surveying, general construction notes and drainage notes.

1.1.6 Utility Coordination

This project has several existing underground lines and an additional overhead powerline that pose significant safety issues. These utility lines can be extremely costly if damaged. This section of the ITB outlines the responsibility of the contractor in identifying these lines and maneuvering work around them.

1.1.7 Work Scheduling

A portion of the work for this project requires the removal of an active railway to install new culverts. Shutting down an active railway has high associated costs and it is incredibly pertinent to the client that this work is performed in a timely manner. In addition to these costs, there are high costs accompanying large amounts of overtime. The client wishes to balance these costs by allowing the contractor a 24 hour schedule during the rail closure and

defining a 7 day work schedule for the significant portion of the remaining work that requires bypass pumping.

1.1.8 Submittals

With a project this detailed, it is not uncommon to see a large amount of requirements from the client. One of these requirements are the submittal of certain documents throughout the project to maintain transparency between the contractor and client. In this project, the client requires a bar type schedule and concrete mix designs along with final as-built drawings prior to approval of final payment.

1.1.9 Instructions to Bidders

This section describes all terms and instructions associated with the contractor's submittal of a bid. There 23 articles outlining the requirements for bidder qualifications, liquidated damages, bid opening, wage rates, etc. Failure to meet these requirements will automatically disqualify the bidder regardless of their estimate.

1.1.10 Bid Form

As mentioned earlier, the client defined a list of bid items and quantities. The bid form, in the form of articles, outlines who is receiving the bid, who is sending the bid and what conditions the bid is contingent on. The contractor populates this form by breaking their estimate into the 12 bid items and their corresponding unit rates and subtotals. This form is crucial to the contractor as submittal of this form acts as contract acceptance should they be the lowest qualified bid.

1.2 Bonds and Insurance

1.2.1 Bid Bond

In order for a bid to qualify, one of the requirements of the bidder is to provide a bid bond. This bond ensures the contractor will enter into contract if their estimate is chosen. The bid bond must be, at a minimum, equal to the proposed contract amount.

1.2.2 Performance Bond

Another bond required by the owner is a performance bond. The purpose of this bond is to guarantee the contractor performs the work as stated in the contract. This bond is also equal to the contract value.

1.2.3 Payment Bond

To guarantee the financial obligations and responsibilities of the contractor to pay their vendors and subcontractors, the owner requires a payment bond. This relieves the owner of any responsibility of paying anyone but the contractor. This bond is issued in conjunction with the performance bond and is also equal to the contract value.

1.2.4 Insurance

The contractor is required to maintain applicable insurance for the duration of the project.

There are several types of insurance coverage required by this contract. They are listed below with a brief description.

Workers' Compensation

- Providing wage replacement and medical benefits to employees injured in the course of employment in exchange for mandatory relinquishment of the employee's right to sue their employer for the tort of negligence.

Commercial General Liability – Claims

- Covers against claims for damages because of bodily injury, sickness or disease, or death of any person other than the contractor's employees.

Commercial General Liability – Form and Content

- Covers the project after completion for three years after final payment against claims brought on by product deficiencies.

Automobile Liability

- Covers against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle.

Umbrella or Excess Liability

- Covers against any claims that exceed the coverage of the policies listed.

Contractor's Pollution Liability

- Covers against third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

Contractor's Professional Liability Insurance

- In the event that the contractor provides design services for any portion of this contract, this insurance protects against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable.

1.3 Scope

1.3.1 Project Charter

1.3.1.1 Purpose

This project was deemed necessary by the LNVA in order to maximize the capacity of the Atlantic Canal which provides firewater to the local refineries and drinking water to the local municipalities.

1.3.1.2 Objective

The objective of this project is to remove the existing inefficient culvert system and replace it with a more effective culvert system as designated by LNVA.

1.3.1.3 Stakeholders

In addition to LNVA, This project's success or failure will greatly impact the refineries located downstream of this canal crossing along with a large population of people dependent on this water supply for their drinking water.

1.3.1.4 Funding

This project shall be funded by LNVA which is a subsidiary of the federal government.

1.3.1.5 Project Milestones

Invitation to Bid – January 15th, 2018

Mandatory Pre-bid Meeting – January 22nd, 2018.

Bid Submittal and Opening – February 5th, 2018

Project Start Date – March 1st, 2018

Project shall be completed in no more than 150 calendar days. In that time, Kansa City Railway shall not be out of service for more than 10 consecutive days.

1.4 Change Order Procedure

The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1.4.1 Change Orders

Amendments to the contract price or contract time must be made in the form of a change order and must be agreed upon by the owner and the contractor. The owner and contractor may amend those terms and conditions of the Contract Documents that do not involve the performance or acceptability of the Work, the design, or other engineering or technical matters, without the recommendation of the Engineer.

1.4.2 Work Change Directives

Work change directives are issued by either the owner or engineer and do not have to be agreed upon by the contractor upon initial issuance. This acts in place of a change order until a change order can be negotiated.

1.4.3 Field Orders

The engineer may authorize minor changes in the work if the changes do not involve an adjustment in the contract price or the contract times and are compatible with the design concept of the completed project as a functioning whole as indicated by the contract documents. These minor changes are known as field orders.

1.4.4 Change Order Requests

To process a change order, a change order request must be submitted. The contractor or the owner may submit the change order to the other. The Change Order Request Form must be filled out in its entirety to be admissible. This form includes the requestor information along with the description and reason for requesting this change. This information is followed by the effects the change shall have on the project. The bottom of the form has a location for the status of the change including approval or rejection.

Change Order Request Form

Project Name		Change Number	
Requested By		Date of Request	
Presented To			
Change Name			

Description of Change:

Reason for Change:

Effect on Deliverables (including a list of any affected deliverables):
--

Effect on Organization:

Effect on Schedule (including Estimated Completion Date for this change):
--

Effect on Project Cost:

Item Description	Hours		Dollars	
	Reduction	Increase	Reduction	Increase
Total Net Change in Cost:	\$ 0.00		\$ 0.00	

Effect of NOT Approving this Change:

Reason for Rejection (if applicable):
--

Functional Project Manager			
<input type="checkbox"/> Approved	Signature:		
<input type="checkbox"/> Rejected	Title:	Date:	

STATUS			
<input type="checkbox"/> Approved	Signature:		
<input type="checkbox"/> Rejected	Title:	Date:	

1.5 Responsibility Matrix

At the contract level, responsibility is divided between four parties: Owner (LNVA), Engineer, Contractor and KCS Railway. To eliminate any confusion or misunderstandings, the following responsibility matrix has been developed.

RESPONSIBILITY	OWNER	ENGINEER	CONTRACTOR	KCS Railway
Planning	R/A	C	I	C/I
Design	R/C	R/A	I	C/I
Construction	I/A	C	R/A	C/I
Rail Removal and Installation	I	C	I	R/A
Change Orders	R/A	C	R/A	-
Inspection	C/I	R	A	I
Reporting	I	C	R/A	I
Payments	R/A	C	I	-
R – Responsible; A – Accountable; C – Consulted; I – Informed				

2 PROCUREMENT MANAGEMENT

2.1 Prequalification System

Before selecting a vendor for a project, they must complete a prequalification process before their quotes can be considered. The following sections outline the prequalification process as outlined in the request for bid.

2.1.1 Prequalification Form

The standardized prequalification form (PQF) is used throughout the industry to provide a thorough description of their services and qualifications. Our company uses this information to determine if subcontractors and vendors meet requirements for our projects.

The form begins with a General Information. This section contains pertinent company information including key officers and contact information. This is also where insurance policies are broken out by type of coverage. Next, there is a section for Organization which includes the type of company such as Partnership or Corporation. This is where a potential vendor or subcontractor may list additional services they provide to be considered for future projects. This section is followed by the Company Work History. This establishes the subcontractor or vendor's financial reliability by providing their major projects in progress as well as completed. They also provide their Dun and Bradstreet® number which helps to predict the reliability and/or financial stability of the company in question.

The next few sections are where the company breaks down their safety information. The Safety and Health Performance section begins with the details of their Experience Modification Rate or EMR. This number is used by insurance companies to gauge both past cost of injuries and future chances of risk. The lower the EMR of a company, the lower their worker compensation insurance premiums will be. An EMR of 1.0 is considered the industry average. Following the EMR is the summary of the company's OSHA logs for the past three years. The

OSHA logs serves as a log to record incidents then classifies these work-related injuries and illnesses and to note the extent and severity of each case. This allows our company to examine their safety statistics as related to total man hours to determine their commitment to safety. Next, the safety training policies of a company are investigated through a questionnaire. This questionnaire contains over one hundred yes/no questions pertaining to the type of safety training system implemented by the company in question. These questions range from orientation schedule to site safety practices. This section also includes craft training and medical testing information.

When submitting a PQF, a potential vendor must also include copies of the following information:

- EMR documentation from your insurance carrier
- Insurance Certificate(s)
- OSHA 200/300 Logs (Past 3 Years)
- Safety & Health Program
- Safety & Health Incentive Program
- Substance Abuse Program (Include Substances Tested & Levels)
- Hazard Communication Program
- Respiratory Protection Program
- Housekeeping Policy
- Accident/Incident Investigation Procedure
- Unsafe Condition Reporting Procedure
- Safety & Health Inspection Form
- Safety & Health Audit Procedure or Form
- Safety & Health Orientation (Outline)
- Safety & Health Training Program (Outline)
- Example of Employee Safety & Health Training Records
- Safety & Health Training Schedule (Sample)
- Safety & Health Training for Supervisors (Outline)

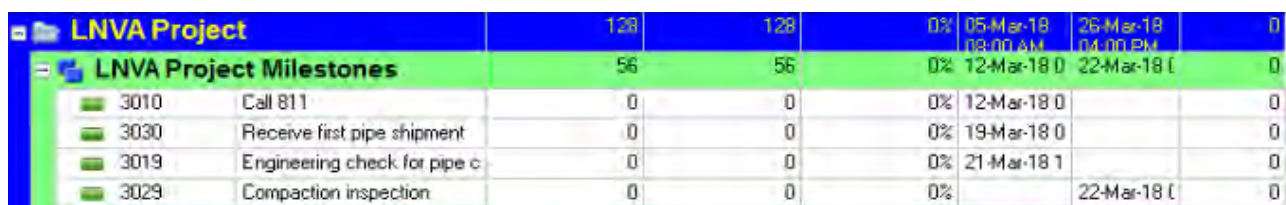
2.2 Purchase Order System

A purchase order for a project may consist of ordering materials or it could even be that we purchased our 72inch corrugated metal culverts. The purchase order for our project included the location of our project so that way the vendors could show us the cost to have the materials shipped to our work site. For our example it shows when we ordered our 60/40 select

fill from Ross Ridge and it also shows the total quantities that we ordered as well as the cost per yardage when it is delivered to the site. The reason that the yardage price is listed is this price per unit allows us to be able to calculate the total cost of the materials for the project including the cost of all of our backfill materials. The use of a purchase order allows us to calculate the specific cost for all aspects of the job.

2.3 Procurement Milestones

Milestones are built into the P6 schedule to ensure that the proper materials are on site at the correct time. This also gives the project team access to upcoming inspections and specific



LNVA Project		128	128	0%	05-Mar-18 08:00 AM	26-Mar-18 04:00 PM	0
LNVA Project Milestones		56	56	0%	12-Mar-18 0	22-Mar-18 1	0
3010	Call 811	0	0	0%	12-Mar-18 0		0
3030	Receive first pipe shipment	0	0	0%	19-Mar-18 0		0
3019	Engineering check for pipe c	0	0	0%	21-Mar-18 1		0
3029	Compaction inspection	0	0	0%		22-Mar-18 1	0

Figure 2.1

task on the project. Milestones for this project will include ordering material, delivery dates, and also inspection points on the job as shown in Figure 2.1. An example of a milestone in the schedule that can affect duration tremendously is the inspection of the installed pipe before backfill is installed. If inspection does not occur then the project cannot continue resulting in the entire project being pushed out.

Procurement for piping will be just-in-time delivery method. This method was chosen due to the limited space we have available to us on the project. The schedule was design with the intention of ordering pipe so that it is on site as close to when it will actually



Figure 2.2

be installed. This limits the amount of double-handling material and also leaves more room on site for other equipment and materials. Our piping, as shown in Figure 2.2, will come in 50 ft.

joints resulting in limited amounts of space to lay the pipe down on site. All banding for the pipe will come already on the pipe so after the pipe is in the correct location then the bands simply just need to be tightened. The purchase order for this material is included in section 0.

2.4 Surplus Material Plan

Our plan for handling surplus materials on site will consist of a just-in-time delivery for piping and dirt work. For spoils and excavated materials, we will place the spoils in the bottom of the dewatered canal if they cannot be hauled off site. Dirt that is considered to be contaminated will be hauled off site immediately.

2.5 Procurement Documents

Attachments and documents pertaining to this section of the report are listed below and immediately follow this section.

Standardized Pre-Qualification Form (PQF)

Piping Purchase Order

Standardized Pre-Qualification Form (PQF)

GENERAL INFORMATION				
1. Company Name:		Telephone:		Fax:
Street Address:		Mailing Address:		
		Web site:		
Contact Person:		e-mail:		
Telephone:		Fax:		
2. How many years has your organization been in business under your present firm name?				
2a. If less than 10 Years as present firm name, what is your previous firm name?				
3. Contact for Insurance Information:				
Title:	Telephone:		Fax:	
4. Insurance Carrier(s):				
Name	Type of Coverage	Telephone		
5. Are you self insured for Worker's Compensation Insurance? Yes <input type="checkbox"/> No <input type="checkbox"/>				
6. PQF Completed By:				
Title:	Telephone:		Fax:	
ORGANIZATION				
7. A. Do you normally employ? Union Personnel <input type="checkbox"/> Non-Union Personnel <input type="checkbox"/> Leased Personnel <input type="checkbox"/>				
If union, list trades/locals:				
B. Average number of employees for last 3 years				
8. Largest Job During the Last 3 Years:				
9. Major jobs in progress:				
Customer/Location	Type of Work	Size \$M	Customer Contact	Telephone

10. Major jobs completed in the past three years:																
Customer/Location	Type of Work	Size \$M	Customer Contact	Telephone												
11. Are there any judgments, claims or suits pending or outstanding against your company? If yes, please attach details. Yes <input type="checkbox"/> No <input type="checkbox"/>																
12. Are you now or have you ever been involved in any bankruptcy or reorganization proceedings? If yes, please attach details Yes <input type="checkbox"/> No <input type="checkbox"/>																
SAFETY & HEALTH PERFORMANCE																
13. Primary NAICS / SIC Code: Secondary NAICS / SIC Code:																
14. Workers Compensation Experience Modification Rate (EMR) Data a. EMR is: <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <input type="checkbox"/> Interstate rate <input type="checkbox"/> Intrastate rate <input type="checkbox"/> Monopolistic State rate <input type="checkbox"/> Dual rate </div> <div style="width: 45%;"> b. EMR for last three calendar years (specify): <div style="display: flex; justify-content: space-between;"> <div>YR 1:</div> <div>EMR:</div> </div> <div style="display: flex; justify-content: space-between;"> <div>YR 2:</div> <div>EMR:</div> </div> <div style="display: flex; justify-content: space-between;"> <div>YR 3:</div> <div>EMR:</div> </div> </div> </div>																
c. State of Origin: <div style="float: right;">d. EMR Anniversary Date:</div>																
15. Injury and Illness Data: a. Employee hours worked last three calendar years excluding subcontractors) <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 25%;">Hours / Year</td> <td style="width: 15%;">YTD</td> <td style="width: 15%;">YR 1:</td> <td style="width: 15%;">YR 2:</td> <td style="width: 15%;">YR 3:</td> </tr> <tr> <td style="text-align: center;">Total</td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>					Hours / Year	YTD	YR 1:	YR 2:	YR 3:	Total						
Hours / Year	YTD	YR 1:	YR 2:	YR 3:												
Total																
b. Provide the following data (excluding subcontractor) using your OSHA 300 Forms from the past three (3) calendar years: <small>Notes: (1) Data should be the best available data applicable to the work in this region or area. (2) If your company is not required to maintain OSHA 300 forms, (please provide information from your Worker's Compensation insurance carrier itemizing all claims for the last 3 calendar years) (3) if data is being provided after July 31st please include current YTD cumulative.</small> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 45%;">YTD</td> <td style="width: 15%;">YR 1:</td> <td style="width: 15%;">YR 2:</td> <td style="width: 15%;">YR 3:</td> </tr> <tr> <td style="text-align: center;">Rate</td> <td style="text-align: center;">Rate</td> <td style="text-align: center;">Rate</td> <td style="text-align: center;">Rate</td> </tr> <tr> <td style="height: 40px; vertical-align: bottom;">Total OSHA Recordable Injury Rate</td> <td> </td> <td> </td> <td> </td> </tr> </table>					YTD	YR 1:	YR 2:	YR 3:	Rate	Rate	Rate	Rate	Total OSHA Recordable Injury Rate			
YTD	YR 1:	YR 2:	YR 3:													
Rate	Rate	Rate	Rate													
Total OSHA Recordable Injury Rate																
16. Have you received any regulatory (EPA, OSHA, MSHA etc.) citations in the last three years? If yes, please attach copies. Yes <input type="checkbox"/> No <input type="checkbox"/>																

SAFETY & HEALTH MANAGEMENT		
17. Highest ranking safety/health professional in the company:		Title:
Contact:	Telephone:	Email:
18. Do you have or provide: a. Full time Safety/Health Director Yes <input type="checkbox"/> No <input type="checkbox"/> Name:		

		Telephone:	
b.	Full time Site Safety/Health Supervisor	Yes <input type="checkbox"/>	No <input type="checkbox"/> Name:
		Telephone:	
c.	Full Time Job Safety/Health Coordinator	Yes <input type="checkbox"/>	No <input type="checkbox"/> Name:
		Telephone:	

SAFETY & HEALTH PROGRAMS & PROCEDURES

19. a.	Do you have a written Safety and Health Program?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
b.	Does the program address the following key elements?			
1.	Management commitment and expectations	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
2.	Employee participation	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
3.	Accountabilities and responsibilities for managers, supervisors, and employees	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
4.	Resources for meeting safety & health requirements	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
5.	Periodic safety and health performance appraisals for all employees	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
6.	Safety Recognition Program	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
7.	Hazard recognition and control	Yes <input type="checkbox"/>	No <input type="checkbox"/>	

20.	Does the program include work practices and procedures such as:			
a.	Equipment Lockout and Tagout (LOTO)	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
b.	Confined Space Entry	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
c.	Injury & Illness Recording	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
d.	Fall Protection	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
e.	Personal Protective Equipment	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
f.	Portable Electrical/Power Tools	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
g.	Vehicle Safety	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
h.	Compressed Gas Cylinders	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
i.	Electrical Equipment Grounding Assurance	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
j.	Powered Industrial Vehicles (Cranes, Forklifts, JLGs, etc.)	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
k.	Housekeeping	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
l.	Accident/Incident Reporting	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
m.	Unsafe Condition Reporting	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
n.	Emergency Preparedness, including evacuation plan	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
o.	Waste Disposal	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
p.	Back Injury Prevention	Yes <input type="checkbox"/>	No <input type="checkbox"/>	

21.	Do you have written programs for the following:			
a.	Hearing Conservation	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
b.	Respiratory Protection	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>
	Where applicable, have employees been:			
	Trained	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
	Fit tested	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
	Medically approved	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
c.	Hazard Communication	Yes <input type="checkbox"/>	No <input type="checkbox"/>	

Have employees been trained	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
d. Program to support the contractor requirements of the OSHA Process Safety Management of Highly Hazardous Chemicals; Explosives and Blasting Agents Standard (29 CFR 1910).	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
22. Do you have a substance abuse program?	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
If yes, does it include the following?				
• Pre-placement Testing	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
• Random Testing	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
• Testing for Cause	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
• DOT Testing	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
• Post Incident Testing	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
23. Do your employees read, write, and understand English such that they can perform their job tasks safely without an interpreter?	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
If no, provide a description of your plan to assure that they can safely perform their jobs.				
24. Medical				
a. Do you conduct medical examinations for:				
•	Pre-placement	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>
•	Preplacement Job Capability	Yes <input type="checkbox"/>		
No <input type="checkbox"/> N/A <input type="checkbox"/>				
•	Hearing Function (Audiograms)	Yes <input type="checkbox"/>		
No <input type="checkbox"/> N/A <input type="checkbox"/>				
•	Pulmonary	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>
•	Respiratory	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>
b. Describe how you will provide first aid and other medical services for your employees while on-site. Specify who will provide this service:				
c. Do you have personnel trained to perform first aid and CPR?	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
25. Do you hold site safety and health meetings:	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Frequency	
Are the safety and health meetings documented?			Yes <input type="checkbox"/>	No <input type="checkbox"/>
26. Personal Protection Equipment (PPE)				
a. Is applicable PPE provided for employees?	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
b. Do you have a program to assure that PPE is inspected and maintained?	Yes <input type="checkbox"/>	No <input type="checkbox"/>		
27. Do you have a corrective action process for addressing individual safety and health performance deficiencies?				
Yes <input type="checkbox"/> No <input type="checkbox"/>				
28. Equipment and Materials:				
a. Do you maintain operating equipment in compliance with regulatory requirements?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
b. Do you maintain the applicable inspection and maintenance certification records for operating equipment?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
29. Inspections and Audits				
a. Do you conduct safety and health inspections?	Yes <input type="checkbox"/>	No <input type="checkbox"/>		

b. Do you conduct safety and health program audits?	Yes <input type="checkbox"/> No <input type="checkbox"/>
c. Are corrections of deficiencies documented?	Yes <input type="checkbox"/> No <input type="checkbox"/>

SAFETY & HEALTH TRAINING

30. Safety & Health Training

a. Do you know the regulatory safety and health training requirements for your employees?	Yes <input type="checkbox"/> No <input type="checkbox"/>
b. Have your employees received the required safety and health training and retraining and is it documented?	Yes <input type="checkbox"/> No <input type="checkbox"/>
c. Do you have a specific safety and health training program for supervisors?	Yes <input type="checkbox"/> No <input type="checkbox"/>
d. Are all employees trained in the work practices needed to safely perform his/her job?	Yes <input type="checkbox"/> No <input type="checkbox"/>
e. Is each employee instructed in the known potential of fire, explosion, or toxic release hazards related to his/her job, the process and the applicable provisions of the emergency action plan?	Yes <input type="checkbox"/> No <input type="checkbox"/>

INFORMATION SUBMITTAL

Please provide copies of the items listed below with the completed PQF:

1. EMR documentation from your insurance carrier
2. Insurance Certificate(s)
3. OSHA 300 Logs (Past 3 Years)
4. Safety & Health Program
5. Substance Abuse Program (Include Substances Tested & Levels)

Fill in below Name & Title of Company Officer responsible for assuring the accuracy of this document:

Title	Name	Date
-------	------	------

PQF EVALUATION
-- OWNER USE ONLY --

DO NOT FILL OUT - OWNER USE ONLY

Contractor is:

☐ Acceptable for Approved Contractor List

☐ Conditionally acceptable for Approved Contractor List

Conditions:

Reviewer _____ Date: _____

Piping Purchase Order



PURCHASE ORDER

TO:
Matt Waters
 Pipe Supply Co.
 123 Pipe Ave
 Beaumont, Texas 77713
 409-555-1234

SHIP TO:
Brett Rogers
 WARS Construction
 HWY 336
 Nederland, Texas
 409-555-5678

P.O. NUMBER:
12-345-6789
*[The P.O. number must appear on
 all related correspondence,
 shipping papers, and invoices]*

P.O. DATE	REQUISITIONER	SHIPPED VIA	F.O.B. POINT	TERMS
3/15/2018	Brett Rogers	Truck		NET 30
QTY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
660	LF	72in Corr. Metal Pipe	217.00	\$143,220.00
SUBTOTAL				143,220.00
SALES TAX				[8.2%]
SHIPPING AND HANDLING				750.00
OTHER				0.00
TOTAL				\$157,714.04

1. Please send two copies of your invoice.
2. Enter this order in accordance with the prices, terms, delivery method, and specifications listed above.
3. Please notify us immediately if you are unable to ship as specified.
4. Send all correspondence to:
 Brett Rogers
 5678 Contractor Lane
 Beaumont Texas 77713

Authorized by Brett Rogers

2/15/2018

3 TIME MANAGEMENT

3.1 Risks and Contingencies

The contract for this project includes heavy liquidated damages if the time constraints are not met. While the KCS Railway is out of service, there is a penalty of \$5,000.00 per day for the first ten days after which time, the rate increases to \$10,000.00 per day until the rail is returned to service. In addition to these penalties, the client shall also charge \$5,000.00 for each day the project runs over the agreed upon schedule.

To maximize our productivity with such stringent time constraints, we scheduled the project with the intention of preventing rework and delayed activities. Each activity of the job was scheduled to be start-to-finish relationship due to crew size. Due to limited workspace, we did not include additional man power to run multiple activities at one time. This would save cost by cutting the size of our crew down. We had contingency plans for piping, dirt work and as well as bypass bumping to eliminate potential risk of schedule failure. For piping, our contingency plans consisted of installing two I-beams across a concrete-lined ditch on the perimeter of the project. This would serve as temporary storage in between our truck routes. For backhaul, we planned to haul all excavated material off site immediately if there were a truck available to do so. If trucks were not available spoils were to be temporarily stored in the bottom of the dewatered canal on the southern end of the project until trucking became available.

3.2 Schedule

LNVA project had a total duration of 27 days starting March 5th. During the 27 day duration a 7 day – 10 hour and 24 hour schedule would be worked. The schedule was created by breaking down the job into piping, earthwork, site work, and railroad. This allowed for us to create a Work Breakdown Structure (WBS) so that we can begin to build activities within this

set up. Each part of the job had different activities which is how the WBS is created. After a breakdown of each section of the work, I went back and set up the job logic. This is how the sequence of the work is determined. We mobilized on site we began to install cofferdams and install bypass pumping. After these items were completed, we began to excavate to find existing lines. Once the lines were exposed, we would remove the railroad. After the rails were successfully removed, we continued excavating and removing the existing culverts. Subsequent to the complete removal of culverts, the new pipe was installed followed by the reinstallation of the railroad. Finally, we would be able to restore the site and commission the project.

3.3 Constraints

Time management was severely dependent upon the delivery and removal of materials. Contingencies were writing to handle these situations; however, this was a singular redundancy plan. In the event that the contingency failed, we would strictly be at the mercy of truck drivers.

A second constraint that was detrimental to our success was the engineering hold points. At several key stages of completion, there were hold points at which we were instructed to wait for engineer approval before continuing with construction. We have no control over the schedule of the inspector at this point in the project and the schedule impact cannot be estimated beforehand. Therefore, any delays would be directly reflected in the schedule.

The final constraint impacting our schedule would be the closure of the rail. The client built in incentives to maintain the proposed schedules by charging for each day the rail is out service and for each day the schedule goes over. This creates a very constricted schedule allowing little to no room for error. Each task absolutely must be completed on or before their completion date.

3.4 Schedule Analysis

The original schedule during the track outage period had duration of 8 days while working a 24 hour schedule. After comparing the duration of 24 hour schedule to 7 day – 10 hour schedule we decide that the 24 schedule had to be done to prevent liquidated damages on the project which were \$10,000 per day. The 24 hour schedule activities were completed within 8 days as shown in Figure 3.1. The 7 day – 10 hour scheduled activities lasted for 15 days. Not only would there be liquidated damages added to the cost but additional charges for equipment and bypass pumping.

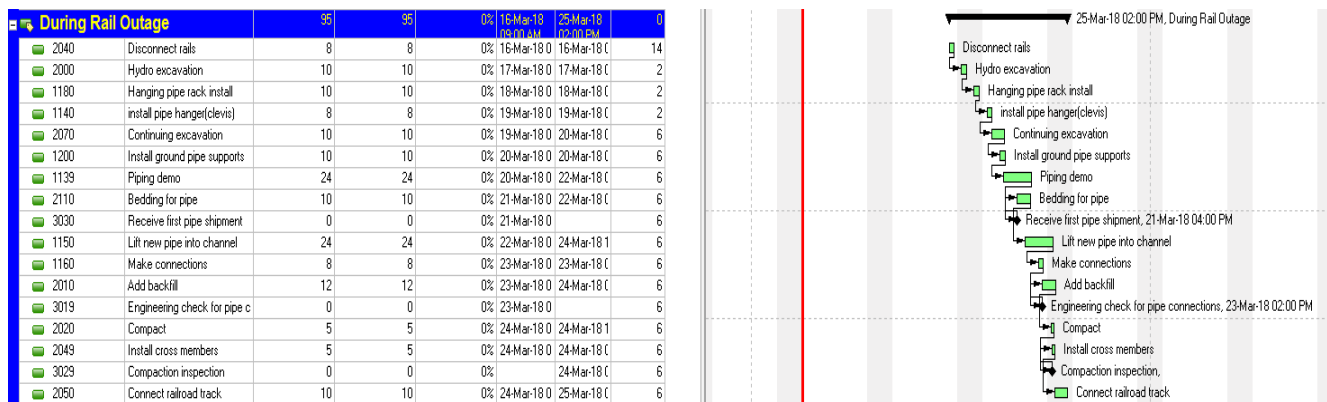


Figure 3.1

4 COST MANAGEMENT

4.1 Risks and Contingencies

From a cost standpoint, the largest risk associated with this project is liquidated damages. There are two areas where cost can be incurred due to schedule impacts: the railway closure and delays to the overall schedule.

Fortunately, rail closure penalties are automatically included in this is cost upfront and the burden can be passed through to the client. The cost for closing the rail begins at \$5,000 per day up to ten days. After ten days, the cost doubles to \$10,000. This is incentive to reinstall the rail quickly and efficiently to prevent going over those ten days. Our schedule has us completing the rail in 7-8 days, resulting in only \$35- to \$40,000 in penalties. We have included cost for the full 10-day window; therefore, any time remaining will add to our profit margin. While we only added cost for the 10-day window, this leaves us unprotected should the schedule be delayed and the rail remain closed for longer than ten days. We weighed this risk carefully and decided to only include cost for ten days but this was only after establishing the work could comfortably be performed in less than ten days with a two to three day buffer.

The second penalty comes in the form of liquidated damages due to schedule slippage. For every day the project goes over schedule, there is a penalty of \$5,000. This cost is difficult to add to the estimate as it has no tangible calculation; therefore, we had to build float time into our schedule to compensate for these possible delays. These delays are also why we have contingency plans in procurement.

4.2 Cost Report

We have broken the project out in two ways: a Unit Price Report shown in Table 2 and a Direct/Indirect Breakdown shown in Table 1. The Directs/Indirects Breakdown is a summary of the total cost in relation to the Labor, Equipment and Materials necessary to perform the entire

project. These items are then broken down further into Direct Costs, Indirect Costs and Mark Up. The client typically does not see the mark up unless the performing a Cost Plus contract. In the case a Unit Rate contract such as this, the client will pay based on the quantities they provide at the rate provided by the contractor. The Unit Price Breakdown is how the client asked the bid to be submitted. This format translates to pay items that correspond to their project budget.

Direct/Indirect Breakdown

Table 1

	DIRECT	INDIRECT	SUBTOTAL	MARK UP	TOTAL
Labor	\$122,250.00	\$131,470.00	\$253,720.00	\$34,600.63	\$288,320.63
Equipment	\$123,380.00	\$65,735.00	\$189,115.00	\$25,790.23	\$214,905.23
Materials	\$265,640.00	\$21,910.00	\$287,550.00	\$39,214.14	\$326,764.14
TOTAL	\$511,270.00	\$219,115.00	\$730,385.00	\$99,605.00	\$829,990.00

Unit Rate Breakdown

Table 2

DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	BID TOTAL
Mobilization	1	LS	\$31,847.00	\$31,847.00
Pipeline Protection And Support	1	LS	\$28,540.00	\$28,540.00
Channel Excavation	2600	CY	\$16.75	\$43,550.00
Earthen Dams	1	LS	\$114,715.00	\$114,715.00
Remove Existing Culvert Crossing	1	LS	\$45,658.00	\$45,658.00
72in CMP	660	LF	\$286.00	\$188,760.00
Cement Stabilized Sand Backfill	1800	TONS	\$55.00	\$99,000.00
Concrete Lining	150	SY	\$1,095.00	\$164,250.00
Trench Safety System	660	LF	\$58.50	\$38,610.00
Final Grading And Seeding	0.50	ACRE	\$8,100.00	\$4,050.00
General Source Controls	1	LS	\$8,450.00	\$8,450.00
Bypass Pumping	1	LS	\$62,560.00	\$62,560.00
			Bid Total	\$829,990.00

4.3 Detailed Estimate

For this project, the railway, cofferdam and piping portions account for most of the precarious and intricate details of this report. These items have been discussed comprehensively; therefore, the focus of this segment shall be the installation of the concrete lining and the activities associated with it. The following is an excerpt from the full cost report exported from Heavy Bid, the estimating software used for this project.

The activities required to install the concrete lining are the installation of formwork, installation of reinforcements, pouring and finishing the concrete, and removing formwork. In large font on the left hand side of the

Detailed Cost Report is a four digit number. This represents the contractor bid items. Since we estimate projects differently than the way clients budget for them, we can create our items then sort them into client items later on. The client number is located on the same row of the report as the bid item although it is significantly smaller. The client number for Concrete Lining is eight as it is the eighth bid item provided. In the center of the row is the description of the bid item and the quantities. The bid quantity is provided by the engineer and the takeoff quantity is the estimator's quantity. For this project, these quantities are considered equal.

The first section of this report contains the bid item summary for the parent item: Concrete Lining. This is strictly a cost report; therefore, no markup information is shown. The total cost for installing the lining is \$127,161.68 with a unit cost of \$847.74.

Following the summary section, the first activity is the installation of forms, bid item 1001. This bid item section is divided into three sections: summary, activity information, and resources. We did not use multiple activities per bid item as it was not necessary for this project. In the activity information under the bold line, there are several important field such as number of shifts, the calendar used for this activity, and number of crew members and equipment. At the bottom of the activity, there is a list of resources used in estimating the cost

of this activity. These items are broken down by number of pieces, quantity, unit cost, taxes and the total. This information can later be used to resource load the schedule.

The purpose of this cost report is to allow the contractor to get a clear image of the components need to complete the activity. Having this report on hand during construction can help the site supervisor manage the project effectively and efficiently as he or she will know what crews should be on site for which activities along with pertinent materials and equipment.

Detailed Cost Report

Biditem

8

CONCRETE LINING

Takeoff Qty: 150.000 SY

Client #: 8

Bid Qty: 150.000 SY

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
U. Cost	120.67	67.57	188.24	48.08	206.43	405.00	0.00	0.00	0.00	0.00	847.74
Total	18,100.35	10,136.18	28,236.53	7,211.25	30,963.90	60,750.00	0.00	0.00	0.00	0.00	127,161.68

	Manhours	Unit/MH	MH/Unit	\$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
	975.0000	0.1538	6.5000	130.4222	18.5645	28.9605	0.0000

Biditem

1001

Install Forms

Takeoff Qty: 1.000 LS

Client #: 8

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
U. Cost	2,349.82	1,315.90	3,665.72	1,060.00	0.00	60,750.00	0.00	0.00	0.00	0.00	65,475.72
Total	2,349.82	1,315.90	3,665.72	1,060.00	0.00	60,750.00	0.00	0.00	0.00	0.00	65,475.72

	Manhours	Unit/MH	MH/Unit	\$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
	120.0000	0.0083	120.0000	545.6310	19.5818	30.5477	0.0500

Activity:	50401	Fabricate Falsework	Quantity:	3000	Unit:	SF
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	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
U. Cost	0.78	0.44	1.22	0.35	0.00	20.25	0.00	0.00	0.00	0.00	21.83
Total	2,349.82	1,315.90	3,665.72	1,060.00	0.00	60,750.00	0.00	0.00	0.00	0.00	65,475.72

	Crew \$/Unit	Crew Hrs/Unit	Units/Crew Hr	\$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	\$/Shift
	1.5752	0.0067	150.0000	236.2860	2.0000	1,500.0000	0.0007	32,737.8600

	Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
	120.0000	25.0000	0.0400	30.5477	0.7833

Calendar: 710 7 10 Hour Days Hrs/Shift: 10 WC: Code not found.

Crew: CCFS Conc Culverts - Form/Strip Prod: S 2 Eff: 100.00 Crew Hrs: 20.00 Labor Pcs: 6.00 Equipment Pcs: 3.00

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
3FW20	Wood Wall Forms	1.00	4,050.00	SF	15.00	100.00	15.00	60,750.00
8CON9	Carpenter Tools	1.00	20.00	HR	10.00	100.00	10.00	200.00
8T10	Form Truck	1.00	20.00	HR	30.00	100.00	30.00	600.00
8T2	Pick-up Truck	1.00	20.00	HR	13.00	100.00	13.00	260.00
CARP	Carpenter	2.00	40.00	MH	17.27	110.00	29.64	1,185.41
CARPHelp	Carpenter Helper	1.00	20.00	MH	13.44	110.00	23.06	461.26
FOREMAN	Foreman w/crew rain out	1.00	20.00	MH	31.83	110.00	54.62	1,092.41
LABSKILL	Laborer Skilled	2.00	40.00	MH	13.50	110.00	23.17	926.64

Biditem

Install Rebar

1002

Takeoff Qty: 1.000 LS

Client #: 8

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
U. Cost	3,847.97	2,154.86	6,002.83	690.00	19,825.00	0.00	0.00	0.00	0.00	0.00	26,517.83
Total	3,847.97	2,154.86	6,002.83	690.00	19,825.00	0.00	0.00	0.00	0.00	0.00	26,517.83

Manhours	Unit/MH	MH/Unit	\$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
225.0000	0.0044	225.0000	117.8570	17.1021	26.6792	0.0333

Activity: 54502 Chair & Tie Steel/Mesh Quantity: 10800 Unit: LB

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
U. Cost	0.36	0.20	0.56	0.06	1.84	0.00	0.00	0.00	0.00	0.00	2.46
Total	3,847.97	2,154.86	6,002.83	690.00	19,825.00	0.00	0.00	0.00	0.00	0.00	26,517.83

Crew \$/Unit	Crew Hrs/Unit	Units/Crew Hr	\$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	\$/Shift
0.6197	0.0028	360.0000	223.0943	3.0000	3,600.0000	0.0003	8,839.2767

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
225.0000	48.0000	0.0208	26.6792	0.3563

Calendar: 710 7 10 Hour Days Hrs/Shift: 10 WC: Code not found.

Crew: RBLRG Rebar - Large Paving Prod: S 3 Eff: 100.00 Crew Hrs: 30.00 Labor Pcs: 7.50 Equipment Pcs: 2.00

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
2CRS60E	Gr 60 Rebar, Epoxy Coated	1.00	14,500.00	LB	0.85	100.00	0.85	12,325.00
2REBAR	Rebar Supplies	1.00	5.00	EA	1,500.00	100.00	1,500.00	7,500.00
8CON9	Carpenter Tools	1.00	30.00	HR	10.00	100.00	10.00	300.00
8T2	Pick-up Truck	1.00	30.00	HR	13.00	100.00	13.00	390.00
CARP	Carpenter	3.00	90.00	MH	17.27	110.00	29.64	2,667.18
CARPHelp	Carpenter Helper	2.00	60.00	MH	13.44	110.00	23.06	1,383.78
FOREMAN	Foreman w/crew rain out	0.50	15.00	MH	31.83	110.00	54.62	819.31
LABCOMM	Laborer Common	2.00	60.00	MH	11.00	110.00	18.88	1,132.56

Biditem

Pour Concrete

1003

Takeoff Qty: 1.000 LS

Client #: 8

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
U. Cost	9,367.06	5,245.54	14,612.60	4,541.25	11,138.90	0.00	0.00	0.00	0.00	0.00	30,292.75
Total	9,367.06	5,245.54	14,612.60	4,541.25	11,138.90	0.00	0.00	0.00	0.00	0.00	30,292.75

Manhours	Unit/MH	MH/Unit	\$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
490.0000	0.0020	490.0000	61.8219	19.1164	29.8216	0.0286

Activity: 54207 Handwork Place & Finish Quantity: 65 Unit: CY

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
U. Cost	144.11	80.70	224.81	69.87	171.37	0.00	0.00	0.00	0.00	0.00	466.04
Total	9,367.06	5,245.54	14,612.60	4,541.25	11,138.90	0.00	0.00	0.00	0.00	0.00	30,292.75

Crew \$/Unit	Crew Hrs/Unit	Units/Crew Hr	\$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	\$/Shift
294.6746	0.5385	1.8571	547.2529	3.5000	18.5714	0.0538	8,655.0714

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
490.0000	0.1327	7.5385	29.8216	144.1086

Calendar: 710 7 10 Hour Days Hrs/Shift: 10 WC: Code not found.

Crew: BCPOUR Pour Bridge Deck Prod: S 3.5 Eff: 100.00 Crew Hrs: 35.00 Labor Pcs: 14.00 Equipment Pcs: 6.85

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
2C50	5000 PSI Concrete	1.00	76.82	CY	145.00	100.00	145.00	11,138.90
8AC1	Air Compressor	0.25	8.75	HR	15.00	100.00	15.00	131.25
8CON10	Finisher Tools	0.80	28.00	HR	15.00	100.00	15.00	420.00
8GEN1	Generator Portable	0.80	28.00	HR	5.00	100.00	5.00	140.00
8GR9	Concrete Pump Truck	2.00	70.00	HR	30.00	100.00	30.00	2,100.00
8T2	Pick-up Truck	1.00	35.00	HR	13.00	100.00	13.00	455.00
8T3	Flatbed Service Truck	1.00	35.00	HR	25.00	100.00	25.00	875.00
8WP1	Water Pump 2"	1.00	35.00	HR	12.00	100.00	12.00	420.00
CARP	Carpenter	1.00	35.00	MH	17.27	110.00	29.64	1,037.24
FINPAV	Finisher Paving	5.00	175.00	MH	15.74	110.00	27.01	4,726.72
FOREMAN	Foreman w/crew rain out	1.00	35.00	MH	31.83	110.00	54.62	1,911.71
LABSKILL	Laborer Skilled	5.00	175.00	MH	13.50	110.00	23.17	4,054.05
OPCRANE	Operator Crane	1.00	35.00	MH	30.00	110.00	51.48	1,801.80
OPHVY	Operator Heavy Equipment	1.00	35.00	MH	18.00	110.00	30.89	1,081.08

Biditem

Finish and Wreck Forms

1004

Takeoff Qty: 1.000 LS

Client #: 8

Bid Qty: 1.000 LS

	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
U. Cost	2,535.50	1,419.88	3,955.38	920.00	0.00	0.00	0.00	0.00	0.00	0.00	4,875.38
Total	2,535.50	1,419.88	3,955.38	920.00	0.00	0.00	0.00	0.00	0.00	0.00	4,875.38

Manhours	Unit/MH	MH/Unit	\$/MH	Base Labor/MH	Total Labor/MH	Unit/CH
140.0000	0.0071	140.0000	34.8241	18.1107	28.2527	0.0500

Activity:	50504	Form&Strip Abut.Backwall&Wings	Quantity:	3000	Unit:	SF
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	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
U. Cost	0.85	0.47	1.32	0.31	0.00	0.00	0.00	0.00	0.00	0.00	1.63
Total	2,535.50	1,419.88	3,955.38	920.00	0.00	0.00	0.00	0.00	0.00	0.00	4,875.38

Crew \$/Unit	Crew Hrs/Unit	Units/Crew Hr	\$/Crew Hour	Shifts	Units/Shift	Shifts/Unit	\$/Shift
1.6251	0.0067	150.0000	243.7690	2.0000	1,500.0000	0.0007	2,437.6900

Manhours	Unit/MH	MH/Unit	Total Labor/MH	Base Labor/Unit
140.0000	21.4286	0.0467	28.2527	0.8452

Calendar: 710 7 10 Hour Days Hrs/Shift: 10 WC: Code not found.

Resource	Description	Pcs/Wste	Quantity	Unit	Unit Cost	Tax/OT %	Actual UC	Total
8AC1	Air Compressor	0.50	10.00	HR	15.00	100.00	15.00	150.00
8CON9	Carpenter Tools	1.00	20.00	HR	10.00	100.00	10.00	200.00
8EX3	Rubber Tire Backhoe	0.50	10.00	HR	31.00	100.00	31.00	310.00
8T2	Pick-up Truck	1.00	20.00	HR	13.00	100.00	13.00	260.00
CARP	Carpenter	2.00	40.00	MH	17.27	110.00	29.64	1,185.41
CARPHelp	Carpenter Helper	2.00	40.00	MH	13.44	110.00	23.06	922.52
FOREMAN	Foreman w/crew rain out	1.00	20.00	MH	31.83	110.00	54.62	1,092.41
LABCOMM	Laborer Common	2.00	40.00	MH	11.00	110.00	18.88	755.04

Report Summary

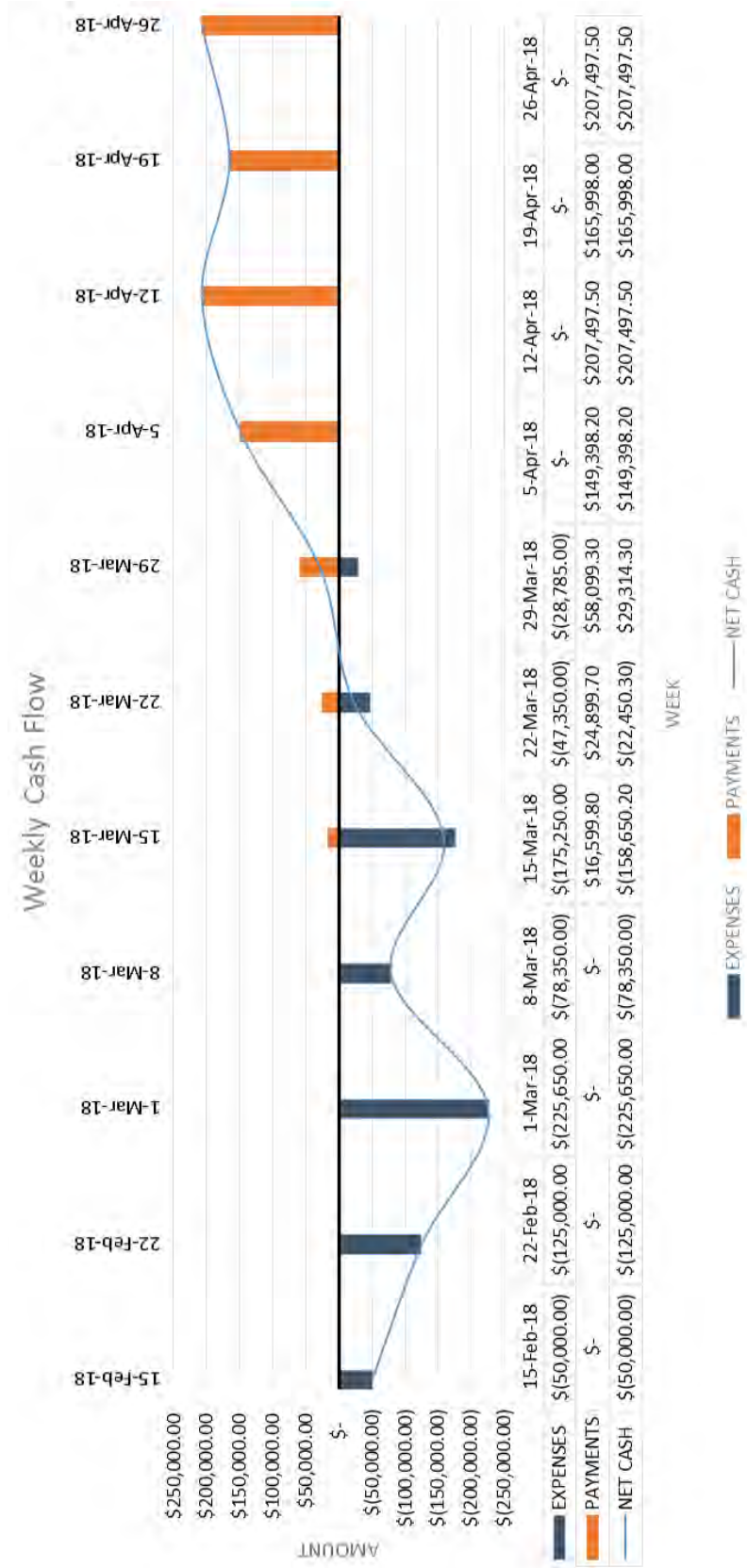
	Base Labor	Burden	Total Labor	Equipment	Perm Matls	Const Matls	Sub	Haul - Out	Haul - In	Rent/Op Eq	Total
Total	18,100	10,136	28,237	7,211	30,964	60,750	0	0	0	0	127,162

4.4 Budget and Cash Flow

As mentioned earlier, this project is divided into bid items. The piping item has 660 LF of piping; however, this bid item includes all activities associated with the installation of this pipe including backfill and bedding. Even though the estimate has a price per linear foot of pipe installed, this includes installation all of the material above and below each foot of pipe in addition to the pipe itself. Payment for this item will be based on linear of pipe installed regardless of other quantities installed. All pipe bedding is installed prior to pipe stabilization; however, the first payment is not made until pipe installation has begun. For the first week of the project, hardly any payments can be invoiced due to the nature of bid items. According to the Weekly Cash Flow Table, the first payment would not be made until second week of March even though the expense was incurred February 15th when the first materials were ordered.

Weekly Cash Flow Table

Table 3



5 QUALITY MANAGEMENT

5.1 Construction Method Statement

Our Construction Method Statement for this project had the roll of showing some of the key activities within our project. The idea of a Construction Method Statement is to allow others to view the document that has the details of the way certain activities will be completed throughout the project. Not only does the statement have a detailed description of the processes of activities, it also has a detailed schedule along with it as well as the design of some of the key aspects that are to evolve within the activity. For example, our earthen cofferdams that we will be installing are listed in our method statement, and in the description of this activity in the statement, it talks about the equipment that will be utilized, the design aspects, the materials to be used, as well as the erection process. The construction method statement in its whole serves a big purpose to allow us to take a look at certain aspects to clarify what needs to be done as well as some of the safety hazards that may arise within that specific scope of work.

5.2 Quality Circle

Our quality circle for this project consisted of four representatives that viewed our project to allow a chance to improve certain aspects that would prove to enhance our work for the project. Our representatives included the Safety manager, the General Contractor, the Subcontractor, and the superintendents that were on site. The purpose of our quality circle is to let the management side take a look at the work that was going on and allow them to be able to give us feedback to ensure that the project was being completed in a timely manner and to allow adjustments to be made to the project to ensure we completed work professionally. The mission of our quality circle is to ensure that our employees did the safest work possible. While our goal of the quality circle was to ensure that our employees were able to complete the best work possible with the best and most effective techniques and operations at hand.

5.3 Inspection and Test Plan

For this specific project we came up with our ITP of specifics that would hinder the work operation if not completed correctly. For our materials we had to make sure that they were the correct materials before they were installed. So while we had a hold for the materials once they got to site it allowed us to view the materials to see that it was in fact the correct thing which would allow us to be able to begin our backfill. If we did not have any type of testing or planning done for our materials, our suppliers could have sent us the wrong materials, which could have hindered the way that our compaction was needed for the project. As for our pipe banding we had a hold put on the operation by the engineers that designed the project because the pipe banding ensured that the joints of pipe were installed correctly and that we completed this activity effectively. Once the engineers laid their eyes on the joints of pipe and seen that they were executed correctly we were then able to begin backfilling our trench which would allow us to haul in our new materials for the project as well as begin our haul off of excavated materials.

5.4 Cause and Effect Analysis

We used a cause and effect analysis (Figure 5.1), also known as a fishbone diagram, to show the importance of our quality of work on our cofferdams. A fishbone diagram, also called a cause and effect diagram, is a visualization tool for categorizing the potential causes of a problem in order to identify its root causes.

In cause and effect analysis, the diagram shows that if we were to use low quality materials for our cofferdams, the weak strength materials that would wash out due to heavy rain fall and could result in the failure of the cofferdam. Next, we took a look at the environment impact on the cofferdams. If we had excessive rainfall resulting in the water

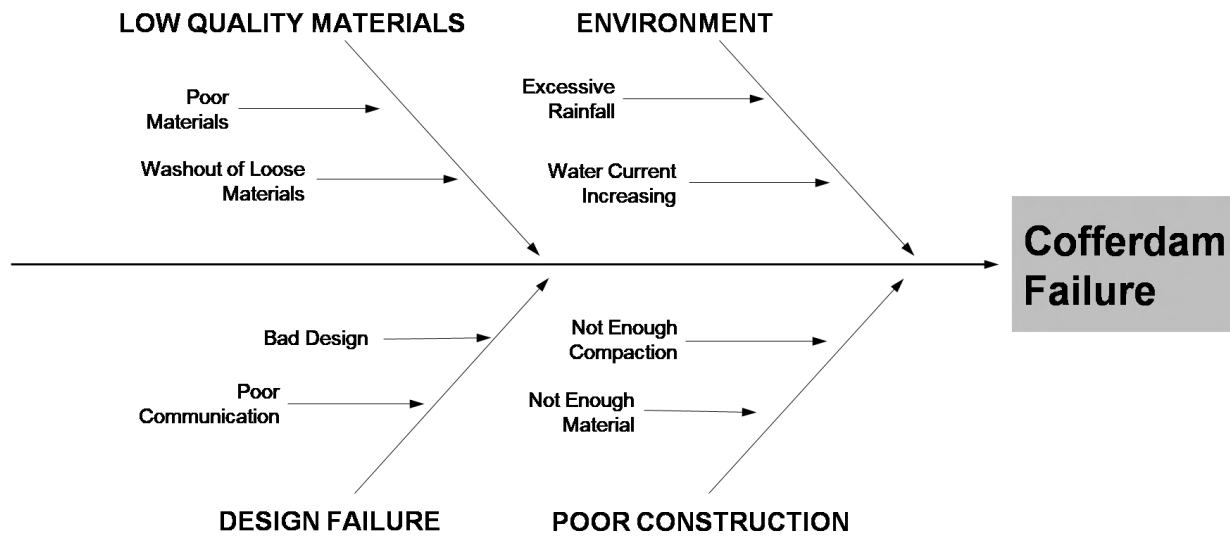


Figure 5.1

current increasing in the canal, it could put too much pressure on our dams and cause the top embankment to be ruptured. This would result in the loss of the project as well as potentially killing personnel inside the trench. If our cofferdam was not constructed to the specific design by the architect and engineers, we could see catastrophic failure before beginning the work on the main project. In the third section of our analysis, poor construction methods such as failure to compact the materials or not following the construction plan then we could have a cofferdam failure almost immediately, compromising the project in its entirety. The use of a fish bone diagram will allow us the chance to compare certain aspects before the project begins. It allows us to analyze the little things that we don't always see in the beginning and allows us to make corrections on things that may need minor changes.

5.5 Request for Information Process

The use of a Request for Information for this project was very important because there were certain aspects of the project that needed to be handled before the work could even begin. For instance we needed to know if we would be able to use the existing ballast and sub ballast for our project so we could lower our cost and lower our scheduled time for the rail-road by not having to bring in the new materials to the work site. The use of an RFI will allow us to be able to communicate with the owners if we see certain details of the project that could allow us to

share some insight with them that could result in a better-finished project. An RFI mainly allows our company to be able to receive the necessary information to put forth the best project that we can. Without being able to ask the owner key information we could potentially do certain activities the wrong way or even miss crucial information that is not involved in the drawings for the project.

5.6 Non-Conformance Report Process

On projects dealing with the installation of materials such as pipe, there are engineering specifications that must be met. Any deviations from these specifications can lead to costly and dangerous issues in the future. These deviations are called Non-Conformances. To ensure that these specifications are met, there are audits on the project to hold contractors accountable for their work. A non-conformance report records the details of a non-conformance identified in a quality audit or project inspection. The objective of the report is to make a concise summary of the problem so that corrective action can and be initiated by management. Inspectors shall complete the Non Conformance Report where areas of non-conformance are identified or specific risks noted as a result of inspections of contractor operations. The report should be issued following consultation with the subcontractor's representative and an agreed time frame should be documented on the report for the correction of the non-conformance. The report should be signed by the site supervisor and subcontractor's representative and verified within the agreed timeframe. If the subcontractor does not remedy the issue within the agreed timeframe, a second Non-Conformance report may be issued or our company may consider suspension or termination of the contract if the issue is of sufficient consequence.

The following information should be recorded on the Non Conformance Report:

- Details of non-conformance
- Actions required
- Completion date
- Verification of completion

5.7 Quality Management Documents

Attachments and documents pertaining to this section of the report are listed below and immediately follow this section.

Inspection and Test Plan

Request for Information

Non-Conformance Report

Inspection and Test Plan

Inspection and Test Plan									
Project Name: LNVA CANAL IMPROVEMENTS Project Code: 6789 Contract No: 12-345-6789			Customer/Client: LNVA Document No: ITP 1 Rev. No. 0						
NO	Process Description	Activity	Procedure	Acceptance Criteria	Frequency	Inspection Involvement Level			
						Supplier	Contractor	Third Party	Customer/Client
1.0	Material Receiving								
1.1		Check Material Certificate	No. SP-M-02	Material Spec No. MS-E-01	100%	H	W	W	R
1.2		Visual Check	No. SP-M-02	Material Spec No. MS-E-01	100%	W	W	SW	R
2.0	Banding Pipe								
2.1		Check Pipe Surface	Banding Procedure Specification	BPS No. 30-SS-01	100%	H	W	SW	R
2.2		Pipe Banding	Banding Procedure Specification	BPS No. 30-SS-01	100%	H	W	SW	R

Request for Information

Construction RFI			
Project Number	RFI Number	Date of Request	Drawing Number
180001	2	2/18/2018	3-3163-2323
Description			
Can the existing sub ballast be reused for backfilling purpose later in the project?			
Change in Cost		Change in Time	
Line 10	\$ 10,000.00	N/A	
RFI Status		Date of Response	
Approved []	Declined [x]	2/20/2018	
Engineer Comments			
Soil will be considered to be contaminated.			
Additional Attachments Included: <input type="checkbox"/> Drawings/Field Sketch <input type="checkbox"/> Specifications <input type="checkbox"/> Other:			

Non-Conformance Report

Non Conformance Report			
Contractor: Pump Co		Departmental Representative: Brittany Stutes	
Contract Name: LNVA Atlantic Canal Bypass Pumping		Contract No: 12-345-6789	
Contractor's Representative: Bob McPump		Telephone: 409-555-8679	
Telephone: 409-555-0258			
Signature: <i>Bob McPump</i> Date: 3/15/18		Signature: <i>Brittany Stutes</i> Date: 3/15/18	
Details of Non Conformance	Action Required	Completion Date	Verification of Completion
Pump maintenance not performed as designated in contract.	Maintenance to be performed immediately	3/16/18	3/16/18 <i>BM BS</i>
Comments: Contract states pump maintenance shall be performed every 200 hours. Pump maintenance was not performed by 250 hours. Issued NCR.			

6 SAFETY MANAGEMENT

6.1 Safety Management Plan

At WARS construction, the topic of safety is paramount in our operations both on and off the jobsite. We believe that we have a duty to our employees to keep them safe. Our unique safety plan covers a wide range of topics including safety, security, hazardous materials/waste, emergency management, fire/life safety, medical equipment and equipment management. We design safety plans specifically tailored for each project. This customization allows us to investigate and identify any potential hazards associated with each project. The overall objective of this plan is to define methods and processes for the identification and mitigation of safety risks and hazards associated with our daily operation. The seven topics covered in our safety plan will be expounded upon in the next sections of this report.

6.1.1 Safety

As a company, all of our employees receive training through the International Safety Training Council including their standardized basic safety training and site specific course as needed. When selecting subcontractors, we take into consideration their EMR and we only select subcontractors who have an excellent safety record. Before work begins, we require our sub-contractors to sign an agreement that states that they will adhere to the safety policies set forth by WARS and OSHA. In addition to the previously mentioned policies, WARS reserves the right to remove anyone who does not recognize and adhere to the company policies set forth.

6.1.2 Jobsite Security

As a company, we also believe in the security of our employees in addition to the security of our jobsite. This means that we secure our jobsites from unauthorized personnel by installing a temporary construction fence around the perimeter where permitted. At the end of shift, any

small tools and materials shall be locked in the onsite tool trailer. All large equipment shall be parked out of the way and powered off with all available parking brake methods engaged. In addition to locking down equipment, we also may hire a third-party security contractor if security is high risk in the project vicinity. Lastly, we rely on our employees to maintain a code of ethics in the office and at the worksite. Our employees are encouraged to remain vigilant at all times and to report any conspicuous persons to a supervisor. This practice invokes the mantra of “If you see something, say something.”

6.1.3 Handling of Hazardous Materials and Waste

We regularly train our employees in the proper way to handle hazardous materials and waste. All new employees are required to go through this training and we have annual refresher training on how to properly dispose of hazardous waste and what to do in case of emergency concerning toxic materials. Environmental safety is also incredibly important. We diligently and consistently practice environmentally friendly habits and techniques to dispose of materials. We also implement environmental protection systems to prevent hazardous waste from entering the environment such as oil or fuel from equipment. These systems include drip pans under stationary equipment for containment and spill kits in the event of a leak or spill.

6.1.4 Fire Fighting

No employee shall fight a fire that is beyond the incipient stage (able to be put out with a fire extinguisher), enter if the building is on fire to conduct search and rescue, or provide advanced medical care and treatment. These situations must be left to emergency services professionals, who have the necessary training, equipment and experience

6.1.5 Medical Equipment use

At WARS Construction, we believe that it is important for employees to know how to administer first aid. We make classes available to our employees that teach them how to manage and use medical equipment such as first aid kits and defibrillators.

6.1.6 Equipment Management

In our safety plan, we teach employees how to properly use and manage equipment in a safe and responsible manner. From small equipment such as shovels to large equipment such as excavators, we believe that each piece of equipment warrants proper education in its use.

6.2 Safety Tracking

There are several techniques that we use to monitor our safety program and to track its success. One technique we implement is Toolbox Talks. Before each shift, the supervisor for each crew delivers the topic for that day as designated by the safety manager. The supervisor explains the hazard being discussed along with ways to mitigate the hazard and work safely. This allows employees to learn about hazards they may not have considered and be prepared before encountering the hazard themselves. The Toolbox Talk takes place before the shift to encourage employees to start the day safe and allows them to keep safety in the forefront of their minds.

In addition to Toolbox Talks, we have implemented a rewards program. This allows us to reward safe behavior rather than punish unsafe behaviors. This creates a positive work environment where employees can look forward to practicing safe behavior. Employees can earn points for doing certain actions and exhibiting safe behavior. Those points can then be redeemed at our in-house company shop for gifts. We encourage our employees to take an active role in our safety program by training them to identify hazards before work operations begin and materials arrive. If we are set for a material delivery, a superintendent will choose an employee

to do a quick but thorough hazard identification exercise. This is beneficial for both parties as the employee may identify something the superintendent did not and vice versa.

Lastly, we like to foster a culture of being your “brothers' keeper”. This means that not only are we responsible for our own safety, but we are responsible for the safety of our co-workers. We encourage employees to be vigilant of their surroundings as well as those employees working around them. Employees should feel safer knowing that they have somebody watching out for them.

6.3 Safety Communication

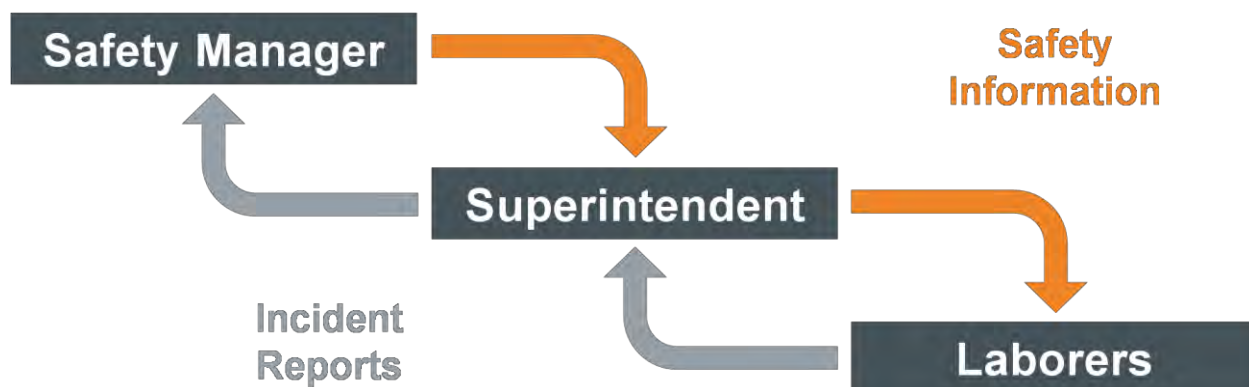


Figure 6.1

Figure 6.1 is a diagram of the safety communication channels both onsite and offsite at WARS Construction. The safety manager is responsible for relaying all safety information and policies to the superintendent. The superintendent communicates that information in a clear and understandable manner to the laborers. Should an incident occur, this information flows in the opposite direction beginning with laborers and reporting up to the superintendent then to the safety manager. This reporting process is explained further in section 6.6. Incident Report Process

6.4 Safety Hazard identification

There are several hazards to be considered across any jobsite however, we have identified four unique hazards specific to this jobsite. Drowning, lifting, crushing, traffic interference, existing pipelines, oil leaks and spills are just some of the unique hazards that come with this job. When working at or around the cofferdam, there is a risk of drowning. To mitigate this risk, WARS Construction requires all employees working in those areas to use personal flotation devices in addition to their personal protective equipment. There is a lifting hazard associated with this job. Hauling heavy materials, lifting mats, and moving equipment around can cause employees to incur lifting injuries especially if the material is extremely heavy. To mitigate this hazard, we require that if any material is too heavy for employees to lift alone, then machines will be used to move the material. In addition, we prohibit any employee from lifting more than 30 pounds alone. This should eliminate the lifting hazard all together and employees can perform their tasks without risk of personal injury. When placing mats, there is a hazard of crushing. To mitigate this hazard, we require our employees to maintain a certain distance away from the machines when the mat placing operation is going on. In addition to this, we require spotters to be used around the machines to account for any human error that might occur. We tell our employees that if you cannot see the machine operator, then he/she cannot see you. Because we are working next to the highway, and we are using a lane on the road as a lay down area, there is risk of traffic interference. Traffic could come in and damage our materials and endanger our employees. To mitigate this risk, we will use barricades, flaggers, warning signs, spotters and communicators in the area where traffic is concerned. This should slow the traffic down so our operation can continue without disruption and our employee's safety would not be in jeopardy. Because we are working in an industrial area, there is a risk of hitting existing pipelines that carry dangerous substances to certain locations. To mitigate this risk, we will use a professional pipe surveyor to locate where the

pipes are. Because we are using equipment that requires oil to run, there is a risk of an oil leak or a spill incurring. To mitigate this risk, we will have spill kits in common areas on the jobsite. Generators that are used will be kept in a polymer container and fire-extinguishers will be kept onsite.

6.5 Risk Response Audits

At WARS Construction, it is the responsibility of project manager to perform the risk response audits. The project manager would first generate a list of people to interview during the audit. This list could include the project team as well as a few employees. Once the list is generated a scoring system is created to assess how well processes are going. The next step is to begin gathering evidence. In this step, interviews are conducted with the project staff in time constraint of about 20 hours. The interviews are conducted in a back-to-back manner so that individuals do not have time to discuss the kinds of questions asked during the interviews and cross-contamination is avoided. After the interviews are conducted and evidence is taken, it is then promptly examined by the project manager. The project manager examines the data and based on the responses of the interview samples, comes up with the appropriate response to a risk.

6.6 Incident Report Process

The incident report is comprised of three forms (Section 7.8.1). First, there is an Employee Report of Injury Form This is where an employee documents all information after he or she is involved in an incident including, but not limited to an injury, illness or “near miss”, where there was opportunity for an incident even though one did not occur. The second portion consists of a Supervisor Accident Investigation Form where the supervisor records all information gathered during investigation or the employee’s injury/incident. Finally, there is an Incident Investigation Report which is filled out as an in-depth investigation is executed. It

includes sections for reporting the details of the injury itself, the incident causing injury, causes for the incident, corrections and plan for prevention of similar incidents, and summary of who completed the investigation.

6.7 Emergency Management Plan

6.7.1 Purpose

The goals of this emergency response plan are, in order of priority, to protect the lives and health of employees, and protect and minimize damage to client and company property in the event of an emergency.

6.7.2 Priorities

The objectives of this plan are, in order of importance:

- To evacuate and account for all employees and visitors
- To contact local emergency service organizations
- To assemble the company's Emergency Response Team (ERT) for implementation of the response plan
- Contact pertinent regulatory agencies
- Conduct search-and-rescue operations
- Turn off necessary utilities
- Control any hazardous chemical spills or releases
- Prevent further property damage through protective measures or by removing property
- Perform cleanup and salvage as needed
- Conduct post-incident critique and evaluation
- File any applicable reports with regulatory agencies

6.7.3 Responsibilities

Facility Management

- Evaluate the number and types of hazards expected based on past experience and general knowledge to plan and develop Emergency Response Plan specifics
- Provide training to all employees for their roles in all emergency plans
- Conduct drills to practice response to emergency situations
- Conduct an annual drill to practice confined-space rescue
- All other activities necessary to the development and implementation of an effective Emergency Response Plan
- Make emergency response team assignments

Maintenance Manager

- Maintain sufficient inventory of emergency response equipment
- Ensure maintenance and inspection of emergency response equipment
- Help train emergency response team members

40-Hour OSHA-Trained Personnel

- Assist in the training of emergency response teams
- Assume active positions on the response teams

Safety manager

- Provides assistance in developing and carrying out emergency response plans.

6.7.4 Training

WARS Construction will train all employees on the procedures contained in this plan.

New employees will be trained upon hiring, and retrained any time the employees responsibilities under the plan change or whenever the plan changes. The company will provide copies of all emergency response plans to be kept in employee handbooks and operation manuals, and will post copies on employee bulletin boards. The company also will designate and train a sufficient number of employees to assist in the safe and orderly evacuation of employees and visitors. These employees will be trained and re-trained as needed.

Training will cover:

- Emergency reporting
- Evacuation routes
- Alarm systems
- Specific assigned duties

Periodic drills will be held to ensure that all employees know the appropriate action to take in case of an emergency. The company will provide additional training and frequent drills for employees with specific emergency-response duties; and invite local emergency service units to participate in training whenever possible.

6.7.5 Emergency Response Procedures

6.7.5.1 Incident Reporting

Management Notification

- If an emergency, or situation that could become an emergency, occurs, inform management immediately.
- Safety Manager will maintain an up-to-date emergency notification list.

Emergency Response Team Notification

- ERT Members shall carry radios set to a predetermined channel at all times while on the jobsite.

Employee Notification

- The alarm system, public address system, or direct supervisory contact can be used to notify employees of emergency situations in the facility.

External Notification

- Contact the local fire or police department, emergency medical service or other emergency-response units.

Corporate Notification

- Contact the corporate office as soon as possible of property damages, theft, or cargo losses.

6.7.5.2 Evacuation Procedures

After the senior manager on the scene determines that evacuation is necessary, the evacuation alarm will be sounded, with instructions issued over the public address system.

Specific responsibilities are as follows:

Production Supervisors

- Lead employees from work areas when the evacuation alarm sounds
- Assist any employees with disabilities
- Escort employees to the designated assembly area
- Account for all employees upon reaching the designated assembly area
- Notify human resources of any employee not accounted for
- Ensure that employees stay in the assembly area

6.8 Safety Documents

Attachments and documents pertaining to this section of the report are listed below and immediately follow this section.

Employee's Report of Injury Form

Supervisor's Accident Investigation Form

Incident Investigation Report

Employee's Report of Injury Form

Instructions: Employees shall use this form to report all work related injuries, illnesses, or “near miss” events (which could have caused an injury or illness) – no matter how minor. This helps us to identify and correct hazards before they cause serious injuries. This form shall be completed by employees as soon as possible and given to a supervisor for further action.

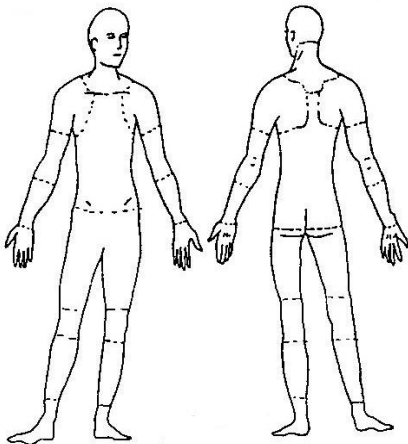
I am reporting a work related:		<input type="checkbox"/> Injury	<input type="checkbox"/> Illness	<input type="checkbox"/> Near miss
Your Name:				
Job title:				
Supervisor:				
Have you told your supervisor about this injury/near miss?			<input type="checkbox"/> Yes	<input type="checkbox"/> No
Date of injury/near miss:			Time of injury/near miss:	
Names of witnesses (if any):				
Where, exactly, did it happen?				
What were you doing at the time?				
Describe step by step what led up to the injury/near miss. (continue on the back if necessary):				
What could have been done to prevent this injury/near miss?				
What parts of your body were injured? If a near miss, how could you have been hurt?				
Did you see a doctor about this injury/illness?			<input type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, whom did you see?			Doctor's phone number:	
Date:			Time:	
Has this part of your body been injured before?			<input type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, when?			Supervisor:	
Your signature:			Date:	

Supervisor's Accident Investigation Form

Name of Injured Person					
Date of Birth				Phone Number	
Address					
City		State		Zip	
<input type="checkbox"/> Male <input type="checkbox"/> Female					
What part of the body was injured? Describe in detail.					
What was the nature of the injury? Describe in detail.					
Describe fully how the accident happened? What was employee doing prior to the event? What equipment, tools being using?					
Name(s) of witness(es):					
Date of Event				Time of Event	
Exact location of event					
What caused the event?					
Were safety regulations in place and used? If not, what was wrong?					
Employee went to hospital?		<input type="checkbox"/> Yes <input type="checkbox"/> No			
If yes,	Doctor Name				
	Hospital Name				
Recommended preventive action to take in the future to prevent reoccurrence.					
Supervisor Signature					Date

Incident Investigation Report

Instructions: Complete this form as soon as possible after an incident that results in serious injury or illness. (Optional: Use to investigate a minor injury or near miss that could have resulted in a serious injury or illness.)

This is a report of a: <input type="checkbox"/> Death <input type="checkbox"/> Lost Time <input type="checkbox"/> Dr. Visit Only <input type="checkbox"/> First Aid Only <input type="checkbox"/> Near Miss			
Date of incident:		Report Completed By: <input type="checkbox"/> Employee <input type="checkbox"/> Supervisor <input type="checkbox"/> Team <input type="checkbox"/> Other _____	
Step 1: Injured employee (complete this part for each injured employee)			
Name:		Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	Age:
Department:		Job title at time of incident:	
Part of body affected: (shade all that apply) 		Nature of injury: (most serious one) <input type="checkbox"/> Abrasion, scrapes <input type="checkbox"/> Amputation <input type="checkbox"/> Broken bone <input type="checkbox"/> Bruise <input type="checkbox"/> Burn (heat) <input type="checkbox"/> Burn (chemical) <input type="checkbox"/> Concussion (to the head) <input type="checkbox"/> Crushing Injury <input type="checkbox"/> Cut, laceration, puncture <input type="checkbox"/> Hernia <input type="checkbox"/> Illness <input type="checkbox"/> Sprain, strain <input type="checkbox"/> Other _____	This employee works: <input type="checkbox"/> Regular full time <input type="checkbox"/> Regular part time <input type="checkbox"/> Seasonal <input type="checkbox"/> Temporary Months with this employer: Months doing this job: Comments:
Step 2: Describe the incident			
Exact location of the incident:			Exact time:
What part of employee's workday? <input type="checkbox"/> Entering or leaving work <input type="checkbox"/> Doing normal work activities <input type="checkbox"/> During meal period <input type="checkbox"/> During break <input type="checkbox"/> Working overtime <input type="checkbox"/> Other _____			
Names of witnesses (if any):			
Number of attachments:	Written witness statements:	Photographs:	Maps / drawings:

What personal protective equipment was being used (if any)?	
Describe, step-by-step the events that led up to the injury. Include names of any machines, parts, objects, tools, materials and other important details.	
Description continued on attached sheets: <input type="checkbox"/>	
Step 3: Why did the incident happen?	
Unsafe workplace conditions: (Check all that apply) <input type="checkbox"/> Inadequate guard <input type="checkbox"/> Unguarded hazard <input type="checkbox"/> Safety device is defective <input type="checkbox"/> Tool or equipment defective <input type="checkbox"/> Workstation layout is hazardous <input type="checkbox"/> Unsafe lighting <input type="checkbox"/> Unsafe ventilation <input type="checkbox"/> Lack of needed personal protective equipment <input type="checkbox"/> Lack of appropriate equipment / tools <input type="checkbox"/> Unsafe clothing <input type="checkbox"/> No training or insufficient training <input type="checkbox"/> Other: _____	Unsafe acts by people: (Check all that apply) <input type="checkbox"/> Operating without permission <input type="checkbox"/> Operating at unsafe speed <input type="checkbox"/> Servicing equipment that has power to it <input type="checkbox"/> Making a safety device inoperative <input type="checkbox"/> Using defective equipment <input type="checkbox"/> Using equipment in an unapproved way <input type="checkbox"/> Unsafe lifting <input type="checkbox"/> Taking an unsafe position or posture <input type="checkbox"/> Distraction, teasing, horseplay <input type="checkbox"/> Failure to wear personal protective equipment <input type="checkbox"/> Failure to use the available equipment / tools <input type="checkbox"/> Other: _____
Why did the unsafe conditions exist?	
Why did the unsafe acts occur?	
Is there a reward (such as “the job can be done more quickly” or “the product is less likely to be damaged”) that may have encouraged the unsafe conditions or acts? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe:	
Were the unsafe acts or conditions reported prior to the incident? <input type="checkbox"/> Yes <input type="checkbox"/> No	

7 CONCLUSIONS

7.1 Project Summary Report

7.1.1 Problems Encountered

During this project there were many issues that began to come forth throughout the duration of the project. For starters when the project was first introduced to us we were given some restrictions that were involved in the work site. The work area was already so small and now with the restrictions that were in place we were forced to come up with a plan to either have a lay down yard somewhere else or to come up with a plan on how to store our materials on our work site.

7.1.2 Gathering Information

Other problems that were encountered were that we were not getting any information from any vendors in a very relative amount of time so it was forcing us to cram other aspects of the project together which started to aggravate some of our group members because we were running out of time and starting to feel like we would not have a solid presentation for the project. Communication was not as big of a problem between the group members but it began to trickle into effect when it came down to understanding the little details or sharing information with one another in the right type of software. It began to play an important role in making sure that our information was being shared correctly so we could add it to our project.

7.1.3 Attaining Objectives

As far as attaining the original objectives of our project, for the most part we understood what was needed and how we needed to address the information that was handed to us. Once we broke the project down into sections for specific individuals to do the certain task allowed us to complete all the information that we needed. It also allowed us the chance to help one

another because the strengths of our group member varied upon certain aspects. Once we were able to compare our information and give feedback it allowed us to be able to answer any of the questions about the materials before it got too late in the project to where we would miss key information.

7.2 Lessons Learned

7.2.1 Team Work

Our group learned a key lesson on how to work as a team. At first it was a little tricky because we were cocky and thought the project would be a piece of cake to where some of our group members did not fully comprehend the project. So our level of teamwork as the project began to unfold showed our weaknesses and strengths. As we began approaching the end, we were able to help ourselves when comparing information and coming up with different plans to show that our information was in fact correct and was easier to present. It also felt good among our group to help other members by showing them and telling them how some aspects of the project worked and how some of the materials must be used in order to get the most out of that specific task.

7.2.2 Communication

Communication was the key to ensuring that our project became successful. Majority of our group members were either shy or very competent which meant that some of us would either be scared to ask questions or we would feel that the information was obvious and we might get thought of differently if we asked questions. But as the project unfolded it showed that the more we communicated the more we were able to produce and the more we were able to learn. When we began building the final aspects of our power point we were able to share

needed information to help have a better understanding of what is being asked by the owners of the project to help us come up with a plan to make a successful project.

7.2.3 Time Management

As far as time management goes that is the biggest part of this course for our group. We were given certain deadlines that we had to have information delivered by in order to present certain information. For our first presentation we failed to meet the certain deadlines for the cost management phase of our project and failed to have any type of estimate to deliver. After our first presentation we began to realize that we were falling behind and we began to push forward and get the required information together in order to deliver the required materials. At no point in the project did our group just straight procrastinate during the execution of the report, but we began to slack on getting the information we needed. So learning about how to get the quotes we needed and to get information from certain vendors played a big time role in how we would deliver the project. As the end rolled near we took our chances and begin non-stop communication with vendors and it paid off in a time crunch manner to get all the required materials. Learning time management help our group reach where the level of completeness we were able to achieve. It showed that even if we were not able to get the materials we needed, we needed to push on and try and complete other aspects of the project in order to assure that we would complete the project as needed.

SLO 02

Analysis of SLO Measure Results and Action Plan (Completed every three years according to the analysis cycle)	
SLO 02: Create oral presentations appropriate to the construction discipline. Metric: Following course-course learning outcome as direct measure and exit interview as indirect measure. CMGT 4470 Capstone Construction Project <div style="text-align: center; margin: 10px 0;">CLO 1(AD) Apply effective oral, written and graphic communication skills, including shop drawing development.</div> Exit Interview – Question 28	
Date: Click or tap to enter a date.	
Course	Analysis and Action
CMGT 4470 Capstone Construction Project	Analysis:
	Action Plan:
Exit Interview – Question 28	Analysis:
	Action Plan:

SLO 02

Student Learning Outcomes – Measure 1 (Completed each year by Instructor after review of student work)			
For each course, select whether the student learning outcome was met, partially met, unmet, or not reported. Attach documentation supporting the findings, including student's work example, rubrics, questions, or criteria, used in this determination.			
SLO 02: Create effective oral communication appropriate to the construction discipline. CMGT 4470 Capstone Construction Project <div style="text-align: center; margin: 10px 0;"> CLO 1(AD) Apply effective oral, written and graphic communication skills, including shop drawing development. </div> Target: Average score of class to be 80 or higher out of 100 points.			
Semester: Spring 2018	Metric: Capstone Project Presentation	Instructor: Hwang	Date: 9/25/2018

Findings

Enrollment	Min. Score	Max. Score	Ave. Score	Met/Part/Unmet/NR
12	73.32%	96.0%	89.1%	Met

Note: See the attached sample.

Group Project report measured at 100-point scale.

#	Student	Score
1	Student 1	81.90
2	Student 2	95.04
3	Student 3	88.36
4	Student 4	73.32
5	Student 5	95.04
6	Student 6	95.04
7	Student 7	90.09
8	Student 8	91.00
9	Student 9	80.99
10	Student 10	92.12
11	Student 11	96.00
12	Student 12	94.00
13		
14		
15		

#	Student	Score
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

#	Student	Score
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		

Collected Student Work: Place the collect student's work after this page for each course, each time taught.

Student	Group	Evaluation Score (X/4.0)	Peer Evaluation (10)	Personal Credit (%)
1	Leoany	91	9.00	81.90
2	Dylan	96	9.90	95.04
3	Brittan	94	9.40	88.36
3	Casey	94	7.80	73.32
2	Brittany	96	9.90	95.04
2	Brett	96	9.90	95.04
1	Esther	91	9.90	90.09
1	Ryan	91	10.00	91.00
1	Luis	91	8.90	80.99
3	Samantha	94	9.80	92.12
2	Rhett	96	10.00	96.00
3	Spencer	94	10.00	94.00
Average				89.41

CMGT 4470: CAPSTONE PROJECT
PRESENTATION
EVALUATION FORM

Group 1. 91/100

NAMES OF GROUP MEMBERS:

	Excellent (10-9.3)	V.Good (9.2-8.3)	Satisfactory (8.2-7.0)	Unsatisfactory (6.9-0)	Score
Structure					
o..Introduction--Opening got audience's attention; provided purpose.		effective opening	very little opening	no introduction, poor or no purpose	10/10
o..Organization--Very well planned, logical, creative, and coherent; does not jump around.		logical, but missing crisp organization; jumps around some.	hard to follow, needs more organization.	unclear, repetitive, difficult to follow	9/10
o..Conclusion--Gave more than a summary of the presentation, used the points from the introduction and presentation in conclusion.		merely summarizes the presentation	has an insufficient ending	no conclusion	9/10
Delivery					
o..Professionalism--Dressed appropriately; avoided slang or chewing gum; took presentation seriously and thoughtfully; properly used the allotted time.		92-83% compliance	82-70% compliance	69-0% compliance	9/10
o..Enthusiasm/Elocution--Motivated others to listen; varies tone or pace; clear volume, enunciation and pronunciation; appropriate eye contact; appropriate movement and gestures; avoids reading.		some minor problems in enthusiasm or elocution.	speaker no more than 2 major distractions	lethargic, mumbles, or not motivated, reads directly	9/10
Content					
o..Knowledge--Showed a full, intelligent, and correct understanding of the subject matter.		mostly complete understanding	some material is incorrect	fails to demonstrate understanding	9/10
o..Technical Questions--Addressed the technical questions needed to meet the purpose of the assignment.		addressed most of the questions	weak attempt at answering questions	very poor attempt or worse	9/10
o..Coverage--Accurately covered the most important and relevant materials.		some unimportant material covered	some important material missed	unimportant or inaccurate coverage	9/10
General					
o..Preparation--Came early to set up; prepared Powerpoint presentation; able to use computer, projector and Powerpoint; prepared visuals/handouts that are clean, and professional.		minor set-up problems; visuals mostly enhance the presentation, but have minor deficiencies.	some pre-class preparation, but does not enhance presentation.	read directly from paper, lack of preparation is obvious.	9/10
o..Effect--Identified and focused on concepts (i.e., the why's) more than with facts (the what's); represents the full potential of the presentation.		less concerned with facts than concepts	too many facts, not enough concepts.	delivered facts only, concepts absent.	9/10

Comments:

Total 91/100

Your Name:

Hwang

CMGT 4470: CAPSTONE PROJECT
PRESENTATION
EVALUATION FORM

Group 2

NAMES OF GROUP MEMBERS:

	Excellent (10-9.3)	V.Good (9.2-8.3)	Satisfactory (8.2-7.0)	Unsatisfactory (6.9-0)	Score
Structure					
o..Introduction--Opening got audience's attention; provided purpose.		effective opening	very little opening	no introduction, poor or no purpose	10/10
o..Organization--Very well planned, logical, creative, and coherent; does not jump around.		logical, but missing crisp organization; jumps around some.	hard to follow, needs more organization.	unclear, repetitive, difficult to follow	10/10
o..Conclusion—Gave more than a summary of the presentation, used the points from the introduction and presentation in conclusion.		merely summarizes the presentation	has an insufficient ending	no conclusion	10/10
Delivery					
o..Professionalism--Dressed appropriately; avoided slang or chewing gum; took presentation seriously and thoughtfully; properly used the allotted time.		92-83% compliance	82-70% compliance	69-0% compliance	9/10
o..Enthusiasm/Elocution--Motivated others to listen; varies tone or pace; clear volume, enunciation and pronunciation; appropriate eye contact; appropriate movement and gestures; avoids reading.		some minor problems in enthusiasm or elocution.	speaker no more than 2 major distractions	lethargic, mumbles, or not motivated, reads directly	9/10
Content					
o..Knowledge--Showed a full, intelligent, and correct understanding of the subject matter.		mostly complete understanding	some material is incorrect	fails to demonstrate understanding	10/10
o..Technical Questions--Addressed the technical questions needed to meet the purpose of the assignment.		addressed most of the questions	weak attempt at answering questions	very poor attempt or worse	10/10
o..Coverage—Accurately covered the most important and relevant materials.		some unimportant material covered	some important material missed	unimportant or inaccurate coverage	9/10
General					
o..Preparation--Came early to set up; prepared Powerpoint presentation; able to use computer, projector and Powerpoint; prepared visuals/handouts that are clean, and professional.		minor set-up problems; visuals mostly enhance the presentation, but have minor deficiencies.	some pre-class preparation, but does not enhance presentation.	read directly from paper, lack of preparation is obvious.	9/10
o..Effect--Identified and focused on concepts (i.e., the why's) more than with facts (the what's); represents the full potential of the presentation.		less concerned with facts than concepts	too many facts, not enough concepts.	delivered facts only, concepts absent.	10/10

Comments:

Total 96 /100

Your Name: _____

Hwang

**CMGT 4470: CAPSTONE PROJECT
PRESENTATION
EVALUATION FORM**

NAMES OF GROUP MEMBERS:

Group 3.

	Excellent (10-9.3)	V.Good (9.2-8.3)	Satisfactory (8.2-7.0)	Unsatisfactory (6.9-0)	Score
Structure					
o..Introduction--Opening got audience's attention; provided purpose.		effective opening	very little opening	no introduction, poor or no purpose	9/10
o..Organization--Very well planned, logical, creative, and coherent; does not jump around.		logical, but missing crisp organization; jumps around some.	hard to follow, needs more organization.	unclear, repetitive, difficult to follow	10/10
o..Conclusion--Gave more than a summary of the presentation, used the points from the introduction and presentation in conclusion.		merely summarizes the presentation	has an insufficient ending	no conclusion	10/10
Delivery					
o..Professionalism--Dressed appropriately; avoided slang or chewing gum; took presentation seriously and thoughtfully; properly used the allotted time.		92-83% compliance	82-70% compliance	69-0% compliance	9/10
o..Enthusiasm/Elocution--Motivated others to listen; varies tone or pace; clear volume, enunciation and pronunciation; appropriate eye contact; appropriate movement and gestures; avoids reading.		some minor problems in enthusiasm or elocution.	speaker no more than 2 major distractions	lethargic, mumbles, or not motivated, reads directly	9/10
Content					
o..Knowledge--Showed a full, intelligent, and correct understanding of the subject matter.		mostly complete understanding	some material is incorrect	fails to demonstrate understanding	10/10
o..Technical Questions--Addressed the technical questions needed to meet the purpose of the assignment.		addressed most of the questions	weak attempt at answering questions	very poor attempt or worse	9/10
o..Coverage--Accurately covered the most important and relevant materials.		some unimportant material covered	some important material missed	unimportant or inaccurate coverage	10/10
General					
o..Preparation--Came early to set up; prepared Powerpoint presentation; able to use computer, projector and Powerpoint; prepared visuals/handouts that are clean, and professional.		minor set-up problems; visuals mostly enhance the presentation, but have minor deficiencies.	some pre-class preparation, but does not enhance presentation.	read directly from paper, lack of preparation is obvious.	9/10
o..Effect--Identified and focused on concepts (i.e., the why's) more than with facts (the what's); represents the full potential of the presentation.		less concerned with facts than concepts	too many facts, not enough concepts.	delivered facts only, concepts absent.	9/10

Comments:

Total 94 /100

Your Name:

Hwang

Intro to Course & A Selected Project

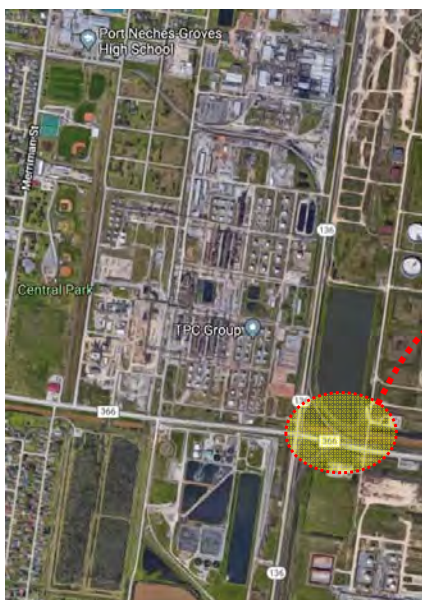
Seokyon Hwang, Ph.D.

Outline

A Selected Project

Intro to course

2



ATLANTIC CANAL IMPROVEMENTS PROJECT
KCS RAILWAY CULVERT CROSSING REPLACEMENT (BID A)
 Refer to the drawings provided to find the details of project design.

LNVA ATLANTIC CANAL IMPROVEMENTS

WARS CONSTRUCTION, LLC

Rhett Williamson
Dylan Armstrong
Brett Rogers
Brittany Stutes

Introduction

Pre-Bid Process

Scope of Work

Safety Management

Site Management

Quality Management

Contract Deliverables

Summary

ABOUT THE COMPANY



We are a local construction company specializing in heavy civil construction. We are based out of Beaumont, Texas and serve all of Southeast Texas as well as Western Louisiana.

SERVICES





Existing Railroad

Existing Underground Lines

- Pre-Bid Meeting
- Pre-Qualifications
- Review Drawings
- Vendor and Subcontractor Pre-Qualifications

VENDOR AND SUBCONTRACTOR PRE-QUALIFICATION

- Standardized Prequalification Form (PQF)
 - Financial information
 - Health, Safety and Environmental information
- W-9 for Payment Setup
- OSHA Logs for past 3 years
- Certificate of Insurance
- Experience Modification Rate (EMR)

C - 167

Introduction

Pre-Bid Process

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Summary

EXCAVATION AND DEWATERING OF CANAL

SCOPE OF WORK

1. Set mats for site access
2. Install Earthen Dams
3. Pumping begins
4. Begin Channel Excavation
5. Hydro-excavation shall be performed around existing pipelines
6. Excavate Remaining Material

HIGHLIGHTS

- Spoils shall be hauled offsite during the day and stockpiled at night for removal during day shift.
- Bank shall be sloped to eliminate the need for shoring outside Railroad Right-of-way.
- Laminated mats shall be placed in the bottom of canal after excavation to provide stable work area.

EXCAVATION EQUIPMENT

CAT 325 Excavators



Hydro Excavation Pump Truck



BYPASS PUMPING

SCOPE OF WORK

1. Install five 14in bypass pumps
2. Install four 2in dewatering pumps
3. Install drainage trench along bottom of canal
4. Fill trench with 1x3 rock
5. Cover with mats

HIGHLIGHTS

- Continuous 24 Hour Pumping
- Pump Mechanic on site full time

BYPASS PUMPING REDUNDANCY PLAN



KCS RAILROAD REMOVAL

SCOPE OF WORK

1. Kansas City Southern Rail to remove tracks and cross ties.
2. WARS to remove all material below rail for pipe removal and installation.
3. WARS to reinstall material including ballast and sub ballast for rail.
4. KCS to reinstall railway.

HIGHLIGHTS

- 24 Hour Flagging and Supervision
- Existing Rails shall be stored on site and will be reinstalled once the culvert is complete

PIPING REMOVAL AND INSTALLATION

SCOPE OF WORK

1. Install Pipe Supports for existing underground pipelines
2. Disconnect existing pipe
3. Haul demo'd pipe offsite
4. Receive new pipe sections in temporary lane closure
5. Place pipe and install banding

HIGHLIGHTS

- Contingency for loading/unloading pipe shall be to temporarily install W12x65 I Beams across the concrete lined ditch as temporary storage between truck routes.
- Engineer approval required before backfill.

PIPE BEDDING AND BACKFILL

SCOPE OF WORK

1. Install sand for pipe bedding
2. Install remaining sand
3. Backfill remaining depth of trench with cement stabilized sand and select fill
4. Install sub ballast and ballast according to KCS specifications
5. Install material in 8 inch lifts and compacted
6. Shoring shall be in place during excavation near the rail way

HIGHLIGHTS

- Once Materials are in place, Excavators will use Mop Pipe to level areas in between Existing lines.
- Manual Compactors will be used for first levels until pipe is completely covered.

BACKFILL EQUIPMENT

Mop Pipe Attachment



Manual and Roller Compactors



PURCHASE ORDER OF SOIL MATERIALS

- 60/40 Material for Cofferdams
- Haul Off for Excavated Materials once Cofferdam is removed

ROSS RIDGE SAND COMPANY L.P.			
QUOTATION			
PREPARED BY: KEITH TURNER		Quote #:	
Date: 4/2/2018		Phone #:	
Customer Name: WARS Construction		Fax #:	
Address:		Email:	
City, State & Zip:			
Customer Contact: Rhett Williamson			
MATERIAL TYPE	APPROXIMATE QUANTITY	PRICE PER CUBIC YARD	DELIVERY LOCATION
60/40	1250 YDS	\$12.00 PER YD DELV	6128-6178 Pure Airline Rd, Port Neches, TX 77851
SAND	400 YDS	\$14.00 PER YD DELV	
BACKHAUL		\$8.00 PER YD DELV	
HAUL OFF		\$7.50 PER YD	
TERMS OF PAYMENT: NET 30 DAYS			
QUOTED PRICE IS GOOD FOR 90 DAYS AND IS BASED ON TODAY'S FUEL PRICES			
Comments: YOU WILL ONLY BE ABLE TO BACK HAUL WITH THE 60/40 NOT WITH THE SAND			
<div style="display: flex; justify-content: space-between; align-items: center;">  <div style="text-align: center;"> <small> P.O. Box 105 Neches, TX 77851 (800) 727-1470 OFFICE (800) 727-1221 FAX 10010 ROSSRIDGEAND.COM KEITH@ROSSRIDGEAND.COM INFO@ROSSRIDGEAND.COM </small> </div>  </div>			

REQUEST FOR INFORMATION FORM

Construction RFI			
Project Number	RFI Number	Date of Request	Drawing Number
180001	2	2/18/2018	5-5163-2323
Description			
Can the existing subbase be reused for backfilling purpose later in the project?			
Change in Cost		Change in Time	
Line 10	\$ 10,000.00	N/A	
RFI Status		Date of Response	
Approved [] Declined [x]		2/20/2018	
Engineer Comments			
Soil will be considered to be contaminated.			

Requested Information points to the Description field.

Cost and Schedule Impact points to the Change in Cost and Change in Time fields.

Response points to the Engineer Comments field.

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Summary

SAFETY MANAGEMENT PLAN

- Safety
- Security
- Hazardous Materials and Wastes
- Emergency Management
- Fire/Life Safety
- Medical Equipment
- Equipment Management

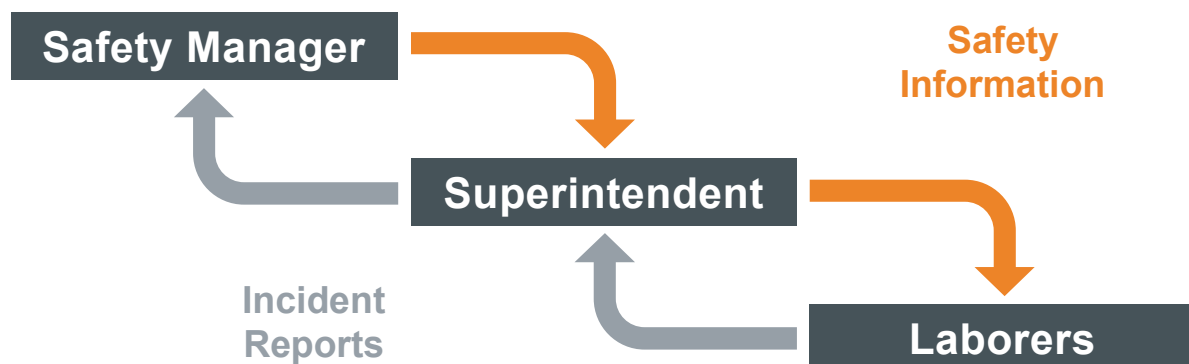
SAFETY MONITORING PROGRAM

- Safety Briefings before each shift
- Incentive Program for safe work
- Identify Hazards before Materials arrive
- Be your Brothers Keeper

SPECIFIC SAFETY HAZARDS AND MITIGATIONS

Drowning	<ul style="list-style-type: none"> All employees working in areas at or near the earthen dam are required to wear PFD(personal flotation device).
Lifting Materials/Crushing Hazards	<ul style="list-style-type: none"> Flagmen and signs around power lines Spotters and Communication
Traffic Interference	<ul style="list-style-type: none"> Control the traffic with a Flagman, Barricades, Safety Signs.
Existing Pipelines	<ul style="list-style-type: none"> Pipeline Technician on site
Oil Leaks/Spills	<ul style="list-style-type: none"> Pumps will have supervision. Fire extinguishers will be kept in the vicinity. Generators will be kept in a polymer container and be grounded.

SAFETY COMMUNICATION ON AND OFF SITE



INCIDENT REPORT

WARS Construction-Port Neches, Texas

INCIDENT REPORT FORM

LOCATION INFORMATION		WHERE ACCIDENT OCCURED	
Date of this report: <u>March 25, 2018</u>		Address: <u>1301 Grassman Lane, Dallas, Texas</u>	
Site Location: <u>Port Neches LNVA Canal off HWY 366 and HWY 136</u>		Phone Number: _____	
Address: <u>FM 366, Port Neches, TX 77651</u>	TYPE OF INJURY	Date of Birth: _____	
City/State: <u>Port Neches</u>		Where did Accident Occur? <u>In bottom of canal</u>	
Person Reporting Incident: <u>Dylan Armstrong</u>		Were photos taken? Yes _____ / No <u>yes</u>	
Phone number: <u>409-867-5309</u>		Email: <u>D.Armstrong@WARS.com</u>	
Date of accident: <u>March 24, 2018</u> Time: <u>1:30 PM</u> AM/PM		What was injured person doing at time of injury? <u>Helping place bans around pipe to join the two sections together</u>	
Injured Person was: Student _____ / Volunteer _____ / Employee: Yes _____ / Other _____		Type of injury: <u>Crushing</u>	
Name of Injured Person: <u>Tony Romo</u>	WITNESSES	Details of incident: <u>Employee was in the most hazard area and was not paying attention to the signs from the spotter and operator to know that the pipe was about to be placed on the bedding</u>	
		Injury requires physician/hospital visit? Yes _____ / No _____ Was Ambulance Called? <u>No</u>	
		Who call ambulance? <u>Nobody</u> Phone: _____	
		Name of physician/hospital: _____	
		Address: _____	
		Name of witnesses: _____ Phone: _____	
		Ricky Bobby _____ Phone: _____	

Risk Management

Factors	Potential Consequences
Late Delivery of Materials	Liquidated Damages (10 day window)
Cofferdam Failures	Loss of Lives, damages to in-progress/completed work
Hitting Existing Pipelines & Power Lines	Explosion, Concussions, Leaks
10 Day Liquidated Damages Risk	Higher Incentive for Delaying Rail-Road
Lifting Hazards	Over head Power Lines may energize machine

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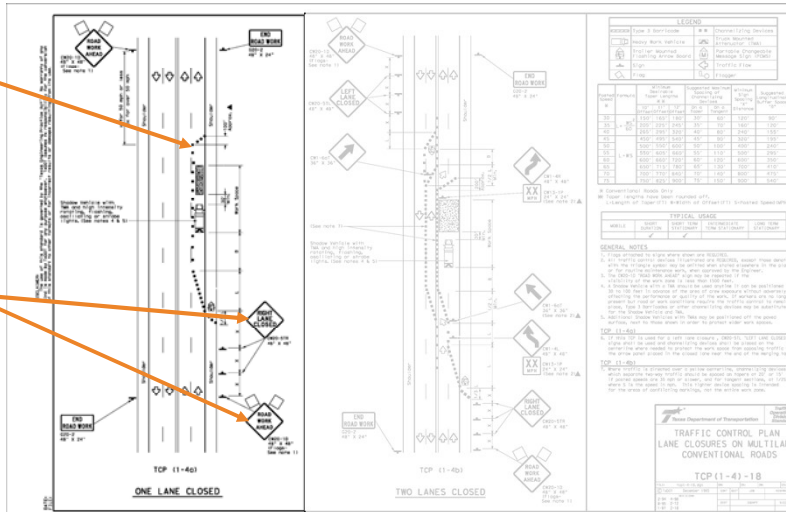
SITE MANAGEMENT



TRAFFIC CONTROL PLAN

Traffic Cones

Signage



TRAFFIC CONTROL PLAN

Receiving Area

Traffic Cones

Signage



Surplus Material

Just-In-Time Delivery

- Receiving Culverts at once
- Assemble temporary Pipe Rack across concrete ditch

Back-Haul Materials

- Have a spoils pile in bottom of the dewatered canal to prevent loss of work space

Introduction

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CONSTRUCTION METHOD STATEMENT

1. General
2. Companies Organization and Responsibilities
3. Cofferdam Procedure
4. Bypass Pumping Schedule and Plan
5. Dewatering Work Area Schedule and Plan
6. Railroad Removal Schedule
7. Excavation and Hydro Excavation Schedule
8. Removal and Installation of Culverts Plan and Schedule
9. Backfill Method, Testing, and Schedule
10. Seeding and Site Restoration Plan

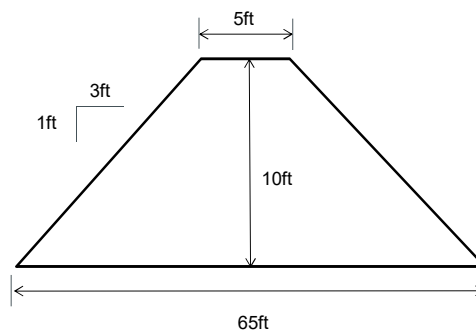


Further Discussed next

Cofferdam Method Statement

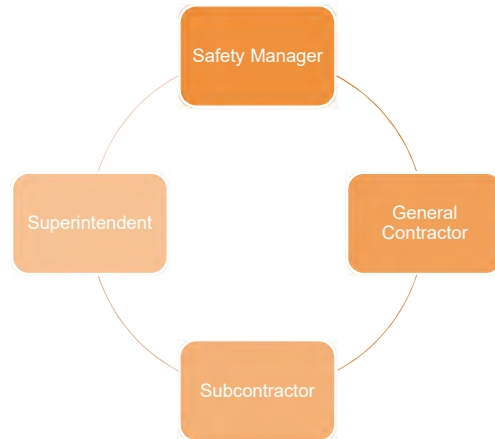
Table of Contents

- Introduction
- Cofferdam Schedule
- Erection Procedure
- Materials Required
- Construction Equipment List
- Appendices
- Design Report



QUALITY CIRCLE

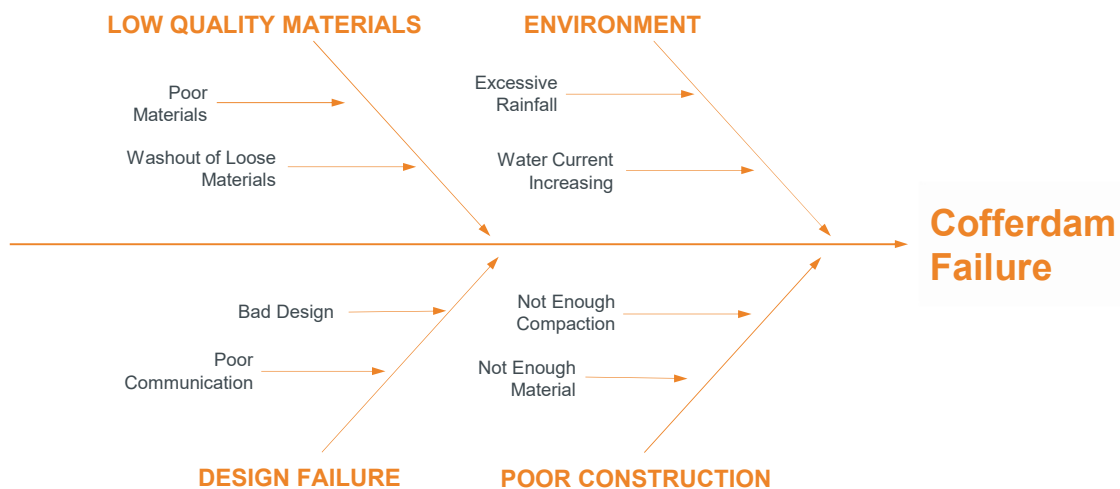
- Our Quality Circle group at WARS Construction consist of the **Safety Manager**, **General Contractor**, **Sub Contractor**, and **Superintendent**.
- The Mission:** Our Quality Circle is to help our employees complete the best work possible
- The Goal:** To help our employees use the most productive techniques for the operation at hand



INSPECTION AND TEST PLAN

Inspection and Test Plan									
Project Name: LNVA CANAL IMPROVEMENTS					Customer/Client: LNVA				
Project Code: 18001-02					Document No: ITP 1				
Contract No: 18001					Rev. No.				
NO	Process Description	Activity	Procedure	Acceptance Criteria	Frequency	Inspection Involvement Level			
						Supplier	Contractor	Third Party	Customer/Client
1.0	Material Receiving								
1.1		Check Material Certificate	No. SP-M-02	Material Spec No. MS-E-01	100%	H	W	W	R
1.2		Visual Check	No. SP-M-02	Material Spec No. MS-E-01	100%	W	W	SW	R
2.0	Banding Pipe								
2.1		Check Pipe Surface	Banding Procedure Specification	BPS No. 30-SS-01	100%	H	W	SW	R
2.2		Pipe Banding	Banding Procedure Specification	BPS No. 30-SS-01	100%	H	W	SW	R

COFFERDAM CAUSE AND EFFECT



NON-CONFORMANCE REPORT

Non Conformance Report			
Contractor: Pumps Co.		Departmental Representative: Rhett Williamson	
Contract Name: LNVA Atlantic Canal Improvements		Contract No: 32-8733	
Contractor's Representative: Bob McLaughlin		Telephone:	Fax:
Telephone:	Fax:	Signature:	
Signature:		Date:	

Details of Non Conformance	Action Required	Completion Date	Verification of Completion
Pump maintenance not performed as scheduled	Maintenance to be performed immediately	3/15	3/16

Comments: Pumping contractor performed maintenance at 250 hours.

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ESTIMATE INFORMATION

- 1A – Mobilization
 - Includes site preparations and demobilization
- 2A – Pipeline Protection and Support
- 3A – Channel Excavation
 - Includes Hydro Excavation
- 4A – Earthen Dams
- 5A – Remove Existing Culvert Crossing
 - Includes removal of railway
- 6A – 72in Corrugated Metal Pipe
 - Includes pipe bedding, backfill, ballast and sub ballast, and reinstalling railway
- 7A – Cement Stabilized Backfill
- 8A – Concrete Lining
- 9A – Trench Safety System
- 10A – Final Grading and Seeding
- 11A – General Source Controls
 - Erosion Control
- 12A – Bypass Pumping
 - Includes Canal Dewatering

ESTIMATE INFORMATION

BY BID ITEM

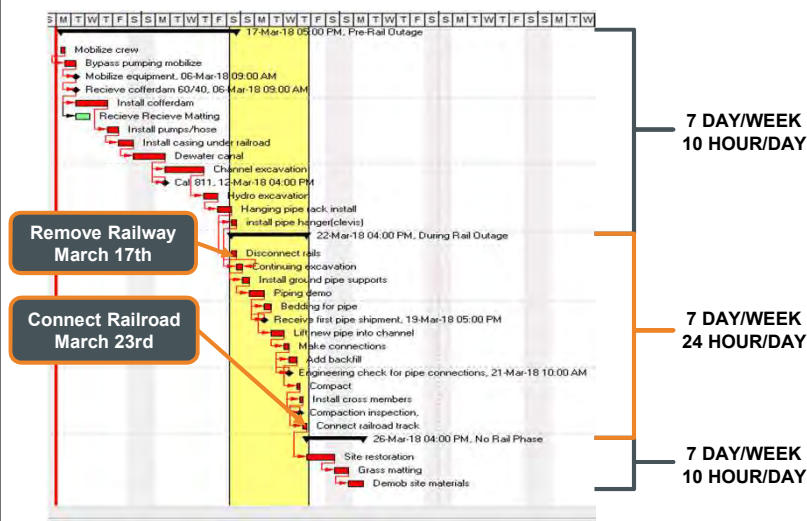
1A – Mobilization	\$31,995.00
2A – Pipeline Protection and Support	\$28,540.00
3A – Channel Excavation	\$43,450.00
4A – Earthen Dams	\$114,715.00
5A – Remove Existing Culvert Crossing	\$45,658.00
6A – 72in Corrugated Metal Pipe	\$188,985.00
7A – Cement Stabilized Backfill	\$98,748.00
8A – Concrete Lining	\$164,199.00
9A – Trench Safety System	\$38,676.00
10A – Final Grading and Seeding	\$4,041.00
11A – General Source Controls	\$8,414.00
12A – Bypass Pumping	\$62,563.00

DIRECT/INDIRECT

Indirects	\$219,116.00
<u>Directs</u>	<u>\$511,269.00</u>
Subtotal	\$730,385.00
12% Markup	\$99,599.00

TOTAL \$829,984.00

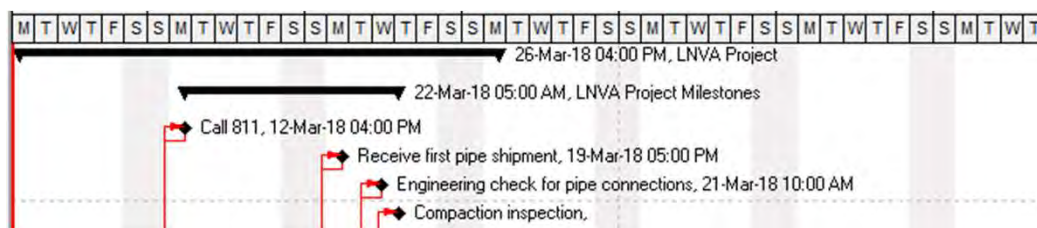
SCHEDULE



**TOTAL PROJECT DURATION
27 DAYS**

MATERIAL MILE STONES

		Duration	Complete			
LNVA Project		128	128	0%	05-Mar-18 08:00 AM	26-Mar-18 04:00 PM
LNVA Project Milestones		56	56	0%	12-Mar-18 0	22-Mar-18 0
3010	Call 811	0	0	0%	12-Mar-18 0	0
3030	Receive first pipe shipment	0	0	0%	19-Mar-18 0	0
3019	Engineering check for pipe c	0	0	0%	21-Mar-18 1	0
3029	Compaction inspection	0	0	0%		22-Mar-18 0



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SLO 02

Student Learning Outcomes – Measure 2 (Completed each year by Instructor after review of student work)			
For each course, select whether the student learning outcome was met, partially met, unmet, or not reported. Attach documentation supporting the findings, including student's work example, rubrics, questions, or criteria, used in this determination.			
SLO 02: Create effective oral communication appropriate to the construction discipline. Considering that your education is to prepare you for an entry level management position related to construction, how do you rate yourself concerning the following? Choose the appropriate number. Use a scale of 1 to 5. Exit Interview - Question 28: I am confident in my ability to communicate with oral effectiveness Target: Average score of class to be 70 or higher out of 100 points.			
Semester: Spring 2018	Metric: Exit Interview - Q28	Instructor: McCrary	Date: 9/25/2018

Findings

Enrollment	Min. Score	Max. Score	Ave. Score	Met/Part/Unmet/NR
12	60%	100%	81.82%	Met
Note: See the attached sample.				

#	Student	Score
1	Williamson	4
2	Thayer	5
3	Wommack	4
4	Rogers	3
5	Stanley	4
6	Free	n/a
7	Suarez	4
8	Brown	4
9	Armstrong	3
10	Salazar	5
11	Alvarez	4
12	Burleigh	5
13		
14		
15		

#	Student	Score
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

#	Student	Score
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		

Collected Student Work: Place the collect student's work after this page for each course, each time taught.

5202.

Considering that your education is to prepare you for an entry level management position related to construction, how do you rate yourself concerning the following? Choose the appropriate number. Use a scale of 1 to 5 as follows:

1 Disagree strongly 2 Disagree 3 Mixed feelings/Neutral 4 Agree 5 Agree Strongly

8. I feel well prepared for professional work. ☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5 ☐ NA
9. I have the ability to estimate using computer spreadsheets. ☐ 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐ NA
10. I have the ability to estimate using the computer program Heavy Bid. ☐ 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐ NA
11. I have the ability to schedule using CPM and computers. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☒ NA
12. I have the ability to set up cost accounts and variance reports. ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐ NA
13. I am confident in my ability to manage the safety operations of a company. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ NA
14. I am aware of the major issues concerning contract law. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ NA
15. I have the ability to manage and inspect the work of plumbers and pipe fitters. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☒ NA
16. I have the ability to manage and inspect the work of the earthworkers. ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐ NA
17. I have the ability to manage and inspect the work of the electricians. ☐ 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐ NA
18. I have the ability to manage and inspect the work of the HVAC subcontractors. ☐ 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐ NA
19. I have the ability to manage and inspect the concrete and masonry work. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ NA
20. I am able to read and interpret contract plans, specifications and documents. ... ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ NA
21. I am capable of working on a survey or layout crew. ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐ NA
22. I am able to communicate effectively with the engineers concerning main engineering principles and practices. ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐ NA
23. I understand and can apply the basic principles of ethics. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ NA
24. I understand the basic fundamentals of business management. ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐ NA
25. I understand the basic fundamentals of project management. ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐ NA
26. I have the ability to work with BIM projects. ☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5 ☐ NA
27. I understand sustainability principles. ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5 ☐ NA
28. I am confident in my ability to communicate with oral effectiveness. ☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5 ☐ NA
29. I am confident in my ability to communicate effectively in writing. ☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5 ☐ NA
30. Would you advise a friend with similar interests to select CM as their major? ☐ Y ☐ N ☒ Undecided
31. If you were starting over, would you choose the same major? ☐ Y ☐ N ☒ Undecided

32. For 30 and 31, whether yes or no, please tell why?

While the program is good, it is general and more locally focused. If my friend is going to be living in Beaumont and working in the plant, then I would recommend this program.

33. How would you change this form?

I would add this question: "Which classes did you find to be most difficult and why?"

Other Comments?



4/30/2018

Student Signature

Date

Program Chair Signature

Date

Program Chair Comments: