Proposal

Towson Tiger Arena

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Construction Management

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EXECTUTIVE SUMMARY

The following proposal is intended as an overview of the analysis to be performed for Towson Tiger Arena. These analysis topics include a fabric duct system, pre-assembled electrical conduit, production planning of MEP systems in the trusses, and the integration of Cisco StadiumVision.

Analysis one includes a mechanical breadth and the implementation of a fabric duct system within the arena trusses. This is a very common system for sporting arena and large recreational centers due to its high level of efficiency and flexibility. Applying this system at Tiger Arena could greatly help improve the safety and quality of site logistics, as well as provide potential cost and schedule savings.

Analysis two looks at the potential benefits of pre-assembling electrical conduit sections. Tiger Arena has a large demand for electricity and AV/IT, which requires a large amount of provision. Pre-assembly or pre-fabrication is not a new production tool and has been shown to have drastic improvements when planned and managed properly. Planning to pre-assemble a large portion of the highly repetitive electrical conduit could increase production of the electrical systems greatly.

Analysis three explores LEAN construction and the how production planning can improve or increase quality, schedule, and value to the customer. Production planning has many functions such as utilization of resources, steady flow of production, provide better work environment, ensure optimum inventory, and reduction in production costs. All the functions of production planning will be analyzed to help improve the overall production of the MEP systems within the trusses.

The final analysis includes an electrical breadth and involves the research of Cisco's new StadiumVision, a new, innovative application for sporting venues that helps promote fan engagement and growth. Cisco has been an industry leader with technology and innovative designs geared to provide a higher level of customer service and create a better business model. The integration of a system like this to the already advanced and cutting edge arena would set Towson U apart from the rest and continue to aid in the growth of the university and basketball program.

Additionally, included in this report you will find a weighted matrix detailing the emphasis expected to be spent on each analysis topic. Lastly, a detailed schedule outlines the expected work timeline and milestone dates to be followed during the Spring 2013 semester.

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Project Overview

Building Function	Sports Arena
Overall Project Cost	$56 Million
Size	120,000 S.F.
Number of Stories	4
Project Delivery Method	CM at Risk
Contract Type	GMP

Project Team

Owner	Towson University
Construction Manager	Gilbane Building Solutions
Architect	Hord Coplan Macht, Inc.
Civil Engineer	Site Resources, Inc.
Structural Engineer	Faisant, Inc.
M/E/P Engineer	James Posey Associates

ARCHITECTURE

This arena, scheduled at 120,000 (GSF), will house approx. 5000 seats, several executive level suites and concession stands. Press boxes and audio/video equipment rooms will allow for broadcasting sporting events. The exterior of the new arena consists of Terra cotta, metal panels, 12" & 6" C channel, storefront glazing, curtain wall, a clear story, and split face CMU's.

STRUCTURE

Tiger Arena is built on foundation systems consisting of retaining walls, spread and continuous footings, and grade beams. CIP concrete walls, columns and beams, will be resting on theses foundations systems and support the above slabs and structural steel. Precast Concrete Seat riser sections will be support by steel risers and beams from below. To complete the structure is a Pratt truss system consisting of 11, three piece trusses.

MEP SYSTEMS

Heating for this building will be provided by two 400hp, four pass, fire tube boilers. Two centrifugal Chillers rated at 450 tons each will provide chilled water for the building and two cooling towers rated at 450 tons each will provide cooling water for the chillers, each cooling tower will be rated for 1125 GPM and 450 tons of cooling. Chilled and heating water will be circulated through the building to various air handlers for temperature and humidity control within the arena. Power to the existing center arena is supplied by 15kV underground feeders. Switch gear for these 15kV lines will be provided with the new construction and transformers will be used to step down to 480/277V 3 Phase. Three 150kW generators will be installed for emergency power and will be located near the boiler room outside the existing Towson Center. Air handling units, pumps, fans and other specialties will be furnished with variable frequency drives for motor control where specified.

ANALYSIS 1 | FABRIC DUCT SYSTEM

PROBLEM IDENTIFICATION

The trusses of Towson Tiger Arena have presented many problems during installation of the building MEPF systems. Access to this area of the building is limited due to the 20' spacing truss to truss. This limitation makes it hard for large ductwork to be safely installed. During duct install, the mechanical contractor would hang chain pullies and set the duct from man lifts, usually involving two or three lifts and four crew members. In addition to the issue of space in the trusses, the bowl is limited to staging capacity. Some pieces of duct work exceeded 10' in width and took up hundreds of square feet in staging on the bowl floor. Not only do these problems create a logistics nightmare but is a safety hazard to the other trades working in the bowl.

POTENTIAL SOLUTION

A clean and safe site is a large driver for productivity on a construction project. The current sheet metal duct system requires the staging and install of oversized and dangerous pieces, not only to the mechanical contractor but all contractors in the area. It is possible that the implementation of a fabric system will greatly decrease this issue of safety and congestion on site due to its compact size and flexibility. Not only will this help to improve the productivity of the team members within the bowl, it will greatly increase the productivity of the mechanical contractor's installation. Eliminating the oversized, awkward sheet metal pieces and installing very light fabric will require much less time to erect.

BACKGROUND RESEARCH

Through background research, the following was identified as advantages of fabric ductwork:

- Lighter
- Easier to install
- Cheaper
- Faster install time
- Reduction in staging room

METHODOLOGY

The following approach will be taken to analyze the supplementation of a fabric duct system:

- Research various fabric duct systems and compare the advantages and disadvantages of each type
- Contact several manufactures to receive design assist and added impute towards system selection
- Analyze the current system to the proposed fabric system
- Evaluate the capacity of the new system compared to the output of the current air handling units
- Analyze the cost and schedule saving potential
- Complete a constructability review of the system

RESOURCES & TOOLS

The following resources and tools will be used to analyze the supplementation of a fabric duct system:

- Manufactures / Vendors
- Towson Tiger Arena Construction Documents and Specifications
- Gilbane Project Members
    - Corey Sarver (Senior Project Manager)
    - Ryan Becker (MEP Project Engineer)

EXPECTED OUTCOME

After analyzing a fabric duct alternative, it is expected that a large schedule savings will occur as well as a substantial increase in install productivity and decreased manufacturing cost. Detailed analysis of site logistics will show a decrease in onsite congestion and the creation of a cleaner and safer site. Lastly, after examining the current mechanical system we should see a decrease in service load of the AHU's and decrease operations cost.

ANALYSIS 2 | PRE-ASSEMBLED ELECTRICAL CONDUIT

PROBLEM IDENTIFICATION

The congestion created in the bowl by all the trades attempting to complete work at the same time has greatly impacted the electrical contractor's productivity. Currently all the conduit between the trusses is built in place and is very time consuming due to access limitations. The mechanical contractor has the most critical equipment between the trusses due to the size and restriction of the duct and the plumbing slopes. The electrical contractor is sidelined time after time to allow for these other systems to be installed. This problem has led to schedule delays for the electrician and created safety and quality issues to try and maintain the current schedule.

POTENTIAL SOLUTION

If the large conduit runs were pre-assembled in racks on the ground they could be easily hosted into the trusses and attracted to anchor rods. The implementation of pre-assembling the work would help increase the quality, safety, time and possibly cost. Conduit racks could be assembled in manageable segments on site in a designated location.

BACKGROUND RESEARCH

Through background research, the following was identified as advantages of pre-assembling systems:

- Reduction in labor and labor costs
- Use BIM to design sections and coordinate installation
- Increased Quality
- Construction time decreased
- Minimize onsite construction and congestion
- Less waste
- Increase in worker safety

METHODOLOGY

The following approach will be taken to analyze pre-assembling the truss conduit:

- Perform research on the application of pre-assembling systems and the planning required
- Design pre-assembled sections/racks
- Identify staging location for the pre-assembly of the racks
- Produces a lifting plan for how they will be safely hoisted and supported
- Analyze cost and schedule savings of the system
- Complete a constructability review of the system

RESOURCES & TOOLS

The following resources and tools will be used to analyze pre-assembling the truss conduit:

- BK Truland Team Members (Electrician)
- Gilbane Team Members
- Industry Members
- Towson Tiger Arena Model

EXPECTED OUTCOME

Pre-fabrication has been an increasingly popular production tool for jobs requiring a fast paced schedule and redundant systems. The use of pre-assembly would help solve the issue of over congestion on the bowl floor, create a safer more controlled working environment for the electrical contractor, increase production and schedule of the electricians work within the trusses, and create an easier installation process.

ANALYSIS 3 | PRODUCTION PLANNING OF MEP SYSTEMS IN THE TRUSSES

PROBLEM IDENTIFICATION

The MEP work within the trusses of Tiger Arena is very intense and involve a large amount of coordination between all the responsible parties and the manager. Issues began when the misc. steel, electrician, plumber, and sheet metal crews were all fighting for space that wasn't there. Tiger Arena is an open concourse arena with very little use of area to access the truss work other than from the bowl floor. With less than 10,000 SF of usable space for staging, hoisting and equipment, there isn't much room for work to flow. Essentially the contractors were scheduled to complete all their work within the scoped time and no further guidance for sequencing or coordination of space.

POTENTIAL SOLUTIONS

Production planning is a term to describe the process used to improve work flow within a given space or project through advanced planning and problem identification early on. Production planning uses several tools to identify parameters and propose solutions such as last planner, quality circles, house of quality, space planning, design structure matrix, SIPS, production sequence planning, labor tracking, and a long list of others. For Tiger Arena, a more detailed approach to production planning would help greatly in improving the work flow and production of all the trade contractors within the trusses.

BACKGROUND RESEARCH

Through background research, the following was identified as advantages of production planning:

- Value added to customer
- Increased quality
- Schedule reductions
- Safety
- Cost savings
- Increased productivity

METHODOLOGY

The following approach will be taken to analyze increased production planning of the truss MEP:

- Research production planning tools and select the most appropriate tool to improve the issues faced in the bowl of Tiger Arena
- Interview Towson members to greater understand their goals and expectations of Tiger Arena
- Identify all problems that could or have been faced by construction team
- Evaluate the goals of Towson University and potential problems to select an appropriate tool
- Implement and analyze the tool selected
- Analyze the re-sequencing of work with the application of fabric duct and pre-assembled conduit
- Compare the new sequencing and planning methods to the original
- Feasibility study of implementing the selected tool

RESOURCES & TOOLS

The following resources and tools will be used to analyze the production planning of the truss MEP:

- Gilbane Team Members
- Towson Personnel
- Dr. Leicht
- AE 570 Material

EXPECTED OUTCOME

Through the implementation of production planning, the installation of MEP systems will be improved and decrease the congestion of the bowl floor. The work will be re-sequenced into an organized and manageable process that best fits all the needs of the contractors. By planning the process more efficiently and detailed, the value to the owner can be better identified and executed. Increased planning will eliminate the contractors from working over top of each other in the same spaces to try and install there system according to the default schedule. Additionally, the coordination between each foreman and weekly look a heads to identify what each trade will be doing will help eliminate safety hazards and confusion between what the contractor is responsible for at a given time. In conclusion, advanced production planning will help improve the schedule, site congestion, cost savings to Towson, and overall value added by identify and meeting the owners wants.

RESEARCH ANALYSIS | CISCO STADIUMVISION

OPPORTUNITY & PROBLEM IDENTIFICATION

"State of the Art Technology throughout… A basketball fan's dream"; Towson's vision for the Tiger Arena when it was designed, "The best basketball facility in the Mid-Atlantic". Not only is this possible, it's right in front of them. With amenities including a hospitality room, hall of fame room, multipurpose room, and several high end donor/president suites, innovative technologies would be a perfect fit. The ultimate fan experience is what Towson wants, and through creating a technologically wired building from head to toe they will excel in creating the ultimate experience.

Towson has created a poor reputation for itself within the basketball community through many losing seasons. To change this reputation, Towson made a bold move to rebuild their program from the ground up, with the plan to clear this reputation and create a winning one. A huge challenge for sports organizations, especially Towson with their previous reputation, is getting fans to come. The options presented to home spectators has greatly increased and become more interactive with HDTV, DVR's and PCs. This forces sports and entertainment venues to place increased focus on upgrading the sporting experience for their fans.

POTENTIAL SOLUTIONS

The solution is simple; create the ultimate experience with Cisco StadiumVision, an innovative, end to end video and digital content distribution solution that transform the look and feel of a venue. Design to easily and cost effectively deliver live game video and programming, target advertising and promotions, and customized content to any display, on a per event basis, the "total package" for Towson .With near limitless capabilities for promoting themselves and creating an interactive environment within the arena, Cisco StadiumVision can help meet Towson's vision.

BACKGROUND RESEARCH

Through background research, the following was identified as advantages of Cisco StadiumVision:

- Enhanced fan experiences
- New revenue streams
- Greater operational efficiencies

METHODOLOGY

The following approach will be taken to analyze Cisco StadiumVision

- Interview Towson Personnel to evaluate their exact wants/needs out of the system
- Interview current system users to gather their inputs on the system
- Research Cisco StadiumVision and other case studies through online examination
- Evaluate the electrical demands of an upgraded system
- Examine construction cost to install system
- Analyze the potential benefits to Towson and the fans
- Present the system to Towson for further input and final thoughts for future implementation

RESOURCES & TOOLS

The following resources and tools will be used to analyze Cisco StadiumVision:

- Towson Personnel
  - Operations Manager
  - Construction Manager
  - AV/IT Manager
- Cisco Personnel
- Towson Tiger Arena Construction Documents and Specifications
- Other industry professionals

EXPECTED OUTCOME

Cisco StadiumVision makes the difference. The implementation of a technology such as this will create a unique, compelling experience that keeps fans coming back to Tiger Arena again and again. Towson will also generate exciting new business opportunities through the many powerful applications of this system.

ANALYSIS WEIGHT MATRIX & TIMELINE

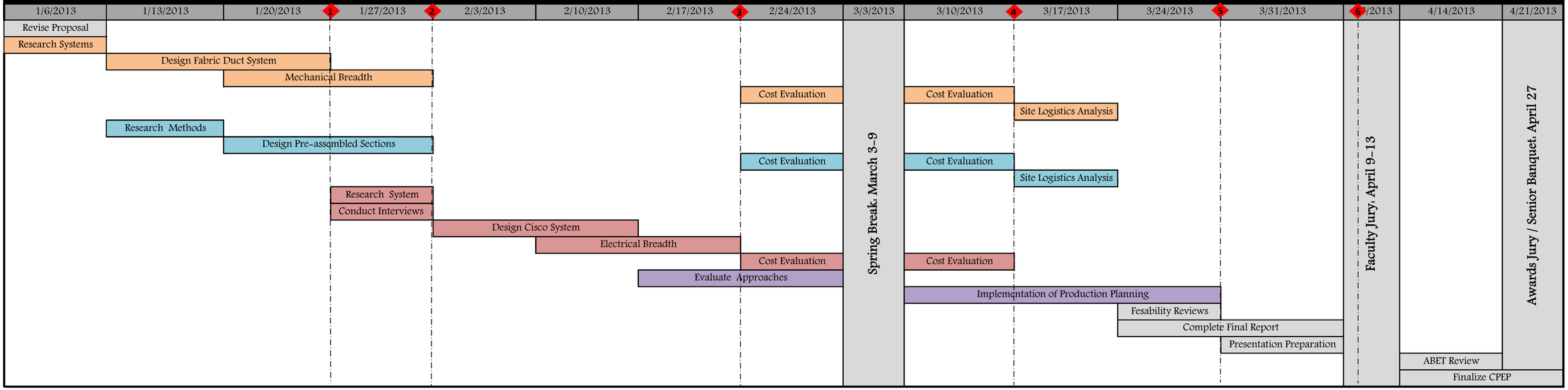
A weighted matrix has been created to illustrate the focus of research, value engineering, construction review, and schedule reduction related to each analysis topic. In addition to the weighted matrix, you will find a schedule of where time will be focused next semester for each analysis topic. Within the schedule you will find important milestone date that identify when research will be completed, go/ no-go date, design completion, and final review and assembly of presentation and the report. All this information will be tracked and followed to insure the analysis is on schedule for completion by the end of Spring 2013.

Analysis Description	Research	Value Engineering	Construction Review	Schedule Reduction	Total
Fabric Duct System	5%	5%	10%	10%	30%
Pre-assemble Electrical Conduit	5%	5%	10%	10%	30%
Production Planning	5%	10%	-	10%	25%
Cisco Stadium Vision	10%	5%	-	-	15%
Total	25%	25%	20%	30%	**100%**

Proposed Spring 2013 Thesis Schedule

January 2013 - May 2013

Derek Stoecklein | Towson Tiger Arena | Construction Option | Advisor: Ray Sowers



Analysis	
	Analysis 1: Fabric Duct System
	Analysis 2: Pre-assembled Electrical Conduit
	Analysis 3: Production Planning
	Analysis 4: Cisco StadiumVision

Milestones	
	Milestone 1: 1/27/2013 - Fabric Duct Design Complete & Mechanical Breadth
	Milestone 2: 2/3/2013 - Pre-assembled Electrical Coinduit Design & Mechanical Breadth Complete
	Milestone 3: 2/24/2013 - Cisco StadiumVision Design & Electrical Breadth Complete
	Milestone 4: 3/17/2013 - Cost Evaluation Completed
	Milestone 5: 3/31/2013 - All Analysis Complete
	Milestone 6: 4/9/2013 @ 3:40PM - Presentation

RESOURCES

Sports and entertainment. (n.d.). Retrieved from http://www.cisco.com/web/strategy/sports/index.html

DBIA 2012 National Convention and Expo, New Orleans

AE 570 Course Materials

Tiger arena. (n.d.). Retrieved from http://www.tigerarena.com/TigerArena.dbml?DB_OEM_ID=21300

APPENDIX A: Breadth Topics

BREADTH TOPICS:

The following demonstrates the understanding and evaluation of a breadth outside the construction management option. Through the analysis topics above, two will be evaluated in the area of electrical and mechanical. These topics include a fabric duct system (Mechanical) and Cisco's StadiumVision (Electrical), each evaluated in greater detail due to the importance of a detailed investigation in the given breadth area.

MECHANICAL BREADTH

Technical Analysis 1 involves supplementing a typical sheet metal duct system with a fabric duct system. Through this analysis, a large effort will involve the analysis of the mechanical service to the duct and meeting the required CFM around the arena. Indoor air quality is a large part of operating a sporting arena, creating a comfortable atmosphere for the spectators.

A mechanical breadth will allow for analysis of the existing system and how it may change, upgrade or downgrade, with a new system being installed. Not only could the equipment change but the required service load could change, either increasing or decreasing the operation cost of the system. All of these areas will be analyzed and compared to the existing system through a mechanical breadth.

ELECTRICAL BREADTH

Cisco StadiumVision is an solution that delivers more powerful, personalized fan experience's, realize new growth opportunities and drive competitive advantages. The capabilities of Cisco's systems are nearly endless but they could cost you in the electrical system. The addition of a system like this may have a huge demand for electricity, weather low voltage or high voltage integration; it must be powered and linked. Not only could there be an increase in electric demand but the data needed for the devices to communicate and stream content would greatly increase. Several approaches can be made such as daisy chaining the connections together to decrease individual runs. The problem with this would be limitations of personalizing each interface. Through a detailed electrical breadth, all these potential issues will be identified, analyzed, and a proper supplementation will be provided.