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CONSTRUCTION MANAGEMENT
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WARRENTON AQUATIC & RECREATION FACILITY
OLD WATERLOO ROAD
WARRENTON, VA 20186
OCTOBER 5, 2007**



EXISTING CONDITIONS REPORT

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EXECUTIVE SUMMARY

The Warrenton Aquatic and Recreation Facility is located on Old Waterloo Road in the town of Warrenton, Virginia. The intent of this building is to provide an indoor swimming facility for not only competition purposes, but for leisure also. To do this the building incorporates exercise facilities, a competition pool, leisure pool, administrative office space, and snack bars. The project is being delivered by the traditional Design-Bid-Build with a CM Agent representing the owner, Warrenton Public Works.

The ensuing existing conditions report and subsequent Technical Assignment 1 is designed to gain a further understanding of the construction project with a focus on the construction management issues. Included in these two reports are: project summary schedule, buildings systems summary, project cost evaluation, site plans of existing conditions, local conditions, client information, project delivery system, and finally a staffing plan.

After completing the assignment and doing analysis, a few questions that arise are why does the project cost so much and how much did the project suffer from the GC and CM Agent not being present during the design phase? As for the price of the project, after comparing costs with both a D4 analysis and a comparative square foot analysis, the Warrenton Aquatic and Recreation Facility is significantly higher than even the highest project. And finally with regards to the design portion of the project, the GC and CM agent could have taken care of the different project issues beforehand and saved the owner some money. Rather than having the public works department ultimately having to sign change orders.

PROJECT SCHEDULE SUMMARY

The following project summary schedule is a useful tool to get a quick feel for how the project is going to progress through the different steps of construction. But first here are a few items to help understand in more detail how the foundation, structural, and finish sequences will progress.

Foundation

- Complete site work and excavation to the bottom of continuous and spread footings
- FRP continuous and spread footings
- Backfill gravel to grade level for slab-on-grade

Structural

- Steel erection completed by building, Start with lower level A, complete A, lower level B, and complete B
- FRP pool room concrete columns
- Pour slab-on-grade
- Place metal decking on upper level
- FRP upper level deck
- Place metal deck on penthouse levels
- FRP penthouse deck
- Erect steel trusses over pool
- Place roof deck

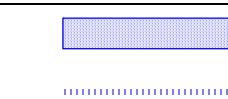
Finishes

- Finishes (drywall, paint, carpet, tile, ceiling tile, interior signage, etc...) will start in lower level A, then upper level A, lower level B, upper level B, competition pool area, and leisure pool area
- Finishes can start after building enclosure
- Finishes will work in a traditional ceiling to floor convention
- The pool areas will start finishes as soon as the shell is poured

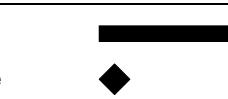
Warrenton Aquatic & Recreation Facility

Project: Project1.mpp
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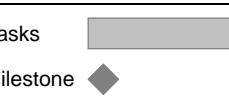
Progress Milestones



Project S



The image contains two small, semi-transparent icons. Each icon is a dark grey trapezoid pointing downwards, with a smaller light grey trapezoid pointing upwards and to the left attached to its top-left corner.



Deadline



BUILDING SYSTEMS SUMMARY

ARCHITECTURE

FUNCTION

The new building is designed to provide a recreation facility for the town of Warrenton. It will consist of a competition swimming pool with spectator seating, leisure pool complete with waterslide and lounge areas, juice bars, fitness rooms, and office space to run the facility. It also features a cylindrical entrance vestibule on the upper floor as its main entrance which enhances this aesthetically pleasing building.

DESIGN

The architecture of the building combines different types of building materials to enhance the buildings appearance. The light beige brick on the exterior walls cover the main building while the vivid red brick defines the cylindrical entrance vestibule. On top of the building, the standing seam metal roof is colored to be consistent with the metal shingles on top of the exterior walls as well as the architectural exposed steel members that support the roof. The base of the building is covered in a stone veneer that matches the surrounding sites retaining walls. The interior spaces are naturally lit by large, light glazed window systems that will give the building an open feeling.

BUILDING ENVELOPE

The building envelope consists of multiple materials on each exterior wall. These walls primarily consist of CMU block backing with a stone veneer base followed by brick veneer and metal shingles above. The walls also use aluminum framed, glazed curtain wall window system, cast stone sills, and architectural steel to complete its structure. To compliment this, the architect chose three types of roofing systems to accommodate the buildings needs. The bulk of the roof consists of a standing seam metal system on all the sloped and curved roofs, while a built-up roof resides on the upper, flat roofs. Also incorporated into the building is a small green roof located in the plaza area just outside the entrance vestibule that will be covered with grass.

CONSTRUCTION DESCRIPTION

The construction of the Warrenton Aquatic & Recreation Facility has some challenging tasks to be completed to ensure that the project runs smoothly and is a success. Construction starts in January of 2006 with excavation of the site in order to place the concrete foundation. The steel superstructure and metal roof and floor decks are set before the concrete is pumped in to complete the floor systems in the main building. To top out the competition and leisure pool areas, a series of eight 101'6" prefabricated roof trusses will be set via mobile crane, which had to be shipped in halves and welded on site before being placed. After the roof is in place, the buildings CMU walls and brick façade will be put into place using hydraulic scaffolding as well as the MEP rough-in will be taking place. The pool areas are the last portion of the building to be constructed. Their concrete pours will be in the winter months of 2007, so the building will have to have temporary heating to ensure proper construction. Because the leisure pool has so many curves and turns, elevation and location points will be set by modern surveying equipment for proper placement. The 19 month construction is planned to end in July with building turnover planned for the first of August.

MECHANICAL SYSTEM DESCRIPTION

The climate conditions in the building are supplied by four air handling units (AHU) and three energy recovery units (PHU & HRU). These units are housed in both penthouses while AHU-4 and HRU-1 are located in the lower level mechanical room. The two AHU's in Penthouse 2 service single zones only (Fitness (4800cfm) and Multi-Purpose Rooms(5500cfm)) while the PHU's are used primarily to save energy and supply heating and cooling to the competition and leisure pool areas (38,000cfm). The remaining air handler services the administration area of the building (14,575cfm). Also, hot water unit heaters are used to heat the penthouse areas while duct mounted reheat coils and air terminal units are being used to control air temperature in the common areas of the building. A series of fifteen pumps ranging in size from 20-1400gpm are used to supply water to the aforementioned air units. This water will come from five separate boilers during heating months and two chillers during the summer to cool the building. The

chillers are two different types, one being an air-cooled system rated at 415 tons while the water-cooled system is rated at 98.3 tons.

STRUCTURAL SYSTEM DESCRIPTION

The structural system for the building starts at the foundation with both continuous and spread footings. These footings are made of 3500psi concrete while the slab-on-grade concrete floors are also made of 3500psi. The upper level and penthouse floor systems are supported by W-shaped beams. The floor itself is a composite slab and deck system with concrete specified at 3000psi. Throughout the non-pool areas load from the W-shaped beams and girders are transferred to the steel columns that support the gravity load while the moment frames resist the lateral load. The pool area columns are constructed of typical concrete columns with concrete masonry units for walls. Above the pool areas, anchor bolts on top of the concrete columns connect the 101'6" long roof trusses to the structural system (8 total) that support the standing seam metal roof above. Over the non-pool areas the roof also consists of standing seam metal but these areas are supported by W-shaped members instead of the large prefabricated trusses.

ELECTRICAL SYSTEM DESCRIPTION

The electricity that is being brought into the Warrenton Aquatic and Recreation Facility is a 480/277V, 3-Phase 4 wire system. After entering the building the feeder goes to a 3000A main distribution switchboard where it is split up to service the main building systems. The panel boards that are serviced from the main feeder supply power to the pool pumps, air handling units, future building expansion slots, and other local panel boards. To further supply power to the building, eight step-down transformers are used for panel boards that supply power to the elevators and typical lighting and receptacle spaces. A 30kva K13 transformer is used to step down the power for the facilities office space to control the unbalanced loads produced by computers. Finally, an 85 KW emergency generator supplies power to the elevator, fire alarm system, and emergency lighting in the even of an emergency.

LIGHTING SYSTEM DESCRIPTION

The lighting inside of the Warrenton Aquatic and Recreation Center consists of metal halide, fluorescent, and incandescent lights. Most of these lights run off of 277V power with the exception of some specialty lighting that runs on 120V. The perimeter of the pool is interesting to note because the lighting is recessed in the walls so to change the bulbs the pool will not have to be drained. Typical 32W T-8 fluorescent bulbs are used throughout the building in the locker rooms, fitness areas, and mechanical rooms, while metal halides are used in the entrance vestibule with the area above the pool being indirect metal halide lighting. The wattages for these lights typically range from 70W to 150W with the lights above the pool being 1000W.

FIRE PROTECTION DESCRIPTION

The fire protection system for the building incorporates both ceiling and duct mounted smoke detectors as well as manual pull stations and heat detectors as protection triggering devices. To alert the population of an emergency, audio-visual devices will be used incorporating strobes and alarms. All of these systems are wired to both a central fire alarm controlled panel and an annunciator panel that have integral battery backup systems. To extinguish fires the building will use a wet-pipe sprinkler system that will be located on the upper floor and supplied with water through an outside stem and yoke valve.

BUILDING TRANSPORTATION DESCRIPTION

The Warrenton Aquatic and Recreation facility employs one elevator to service the building. It is centrally located for ease of accessibility and is operated using a typical hydraulic system. Three stair cases are also used to navigate through the building. These are located at the center of the building as well as the end of the west and south east corridors, respectively.

COMPETITION & LEISURE POOL DESCRIPTION

The main attraction of the Warrenton Aquatic and Recreation Facility are the competition and leisure pools. Each pool is slab-on-grade concrete and is cast-in-place.

The competition pool is an 8 lane, 25 meter pool with timing devices for competition and also features two, one meter diving boards. The leisure area contains a 143'6" waterslide that is just under 20' tall, spa, vortex pool, current channel, and a child amusement station. Both pools also have a handicap lift for ADA approved pool access as well as stairs, sloped grade entry, or ladders for easy pool access.

PROJECT COST EVALUATION

ACTUAL COST DATA

Warrenton Aquatic Actual Cost Data		
Description	Cost (\$)	Cost (\$)/ft ²
Construction Cost	20,500,000	343.16
Total Project Cost	22,000,000	368.27
Building Systems	Cost (\$)	Cost (\$)/ft ²
Mechanical	3,000,000	50.22
Electrical	1,700,000	28.46
Structural	2,500,000	41.84
Masonry	1,540,000	25.78
Leisure and Competition Pool	2,340,000	39.17

R.S. MEANS/COMPARATIVE ESTIMATE

Because of the uniqueness of the type of building that the Warrenton Aquatic and Recreation Facility is, R.S. Means is not a good source when trying to produce a square foot estimate. The closest match in facility type is a single story enclosed swimming pool that is 32,000 square feet. This building produces an estimate of \$195.20/s.f. Due to the fact that these numbers do not accurately relate to the Warrenton project and cannot produce a proper analysis, a comparison analysis chart of similar buildings that have recently been completed and consulted by The Sports Management Group (also consulting Warrenton) will be used to conduct a better analysis.

Aquatic Center Comparison Analysis			
Project Name	Sq. Ft.	Cost (\$)	Cost (\$)/ft ²
West Valley Family Fitness & Wellness Ctr.	96,000	13,000,000	135.41
Middleburg Heights Community Center	84,000	17,000,000	202.38
Dublin Community Recreation Center	76,000	11,500,000	151.32
Bethlehem Twp. Community Rec. Center	63,000	13,000,000	206.35
Germanton Aquatic Center	62,500	16,000,000	256.00

As you can see, the prices for the above projects are all significantly lower than the Warrenton Aquatic and Recreation Facility. However the finishes at the Warrenton project are at the higher end which can account for some of the cost. Other possible sources for the cost being so much higher can be inflation of materials, cost escalation over time, and the location of the building.

**The following is a list of projects use for the comparative analysis. They were chosen based on the buildings facilities and program as well as cost and size.*

West Valley Family & Wellness Center- West Valley City, Utah

http://www.sportsmgmt.com/expe_detail.asp?pid=23

Middleburg Heights Community Center- Middleburg Heights, Ohio

http://www.sportsmgmt.com/expe_detail.asp?pid=28

Dublin Community Recreation Center- Dublin, Ohio

http://www.sportsmgmt.com/expe_detail.asp?pid=27

Bethlehem Township Community Recreation Center- Bethlehem, Pennsylvania

http://www.sportsmgmt.com/expe_detail.asp?pid=27

Germantown Aquatic Center- Germantown, Maryland

http://www.forresterconstruction.com/case_germantown.html

D4 ESTIMATE

After running the D4 estimating software, the program came out with a projected \$250.64 per square foot. This projection comes from the calculation of combining four different projects (listed below) based on building size, cost, number of floors, and use, and then doing an average based on location and time. This number is higher than the actual building cost per foot (\$368.27) for a few reasons. The market in Washington D.C. typically uses concrete structures and the Warrenton building uses steel as its primary

structural element and the software does not take into account the major inflation of steel. Another reason for the buildings price being higher is because of the higher end finishes compared to most buildings. The last reason is that the building's features and aesthetics are much better than the four projects that were averaged, resulting in a much higher cost. A complete D4 estimate can be found on the following two pages.

D4 Selected Projects			
Project Name	Sq. Ft.	No. Floors	Cost (\$)
Community Recreation Center	130,244	2	21,965,253
YMCA	45,500	1	4,891,891
Finley Park Comm. Center & Aquatic	36,500	1	6,068,290
Splash Planet	33,045	2	5,741,257

Estimate of Probable Cost

Warrenton Prediction - Jul 2007 - VA - Other

Prepared By:

Prepared For:

Building Sq. Size: Bid Date: No. of floors: No. of buildings: Project Height: 1st Floor Height: 1st Floor Size:	, Fax: 61322	Site Sq. Size: Building use: Foundation: Exterior Walls: Interior Walls: Roof Type: Floor Type: Project Type:	, Fax: 556043
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Division		Percent	Sq. Cost	Amount
00	Bidding Requirements	2.39	5.98	366,722
	Bidding Requirements	2.39	5.98	366,722
01	General Requirements	6.47	16.22	994,394
	General Requirements	6.47	16.22	994,394
02	Site Work	14.50	36.34	2,228,651
	Site Work	14.50	36.34	2,228,651
03	Concrete	5.70	14.29	876,349
	Concrete	5.70	14.29	876,349
04	Masonry	7.01	17.57	1,077,236
	Masonry	7.01	17.57	1,077,236
05	Metals	7.37	18.47	1,132,640
	Metals	7.37	18.47	1,132,640
06	Wood & Plastics	2.75	6.90	423,242
	Wood & Plastics	2.75	6.90	423,242
07	Thermal & Moisture Protection	4.87	12.21	748,705
	Thermal & Moisture Protection	4.87	12.21	748,705
08	Doors & Windows	4.99	12.51	767,173
	Doors & Windows	4.99	12.51	767,173
09	Finishes	6.41	16.07	985,160
	Finishes	6.41	16.07	985,160
10	Specialties	1.53	3.84	235,189
	Specialties	1.53	3.84	235,189
11	Equipment	1.48	3.71	227,332
	Equipment	1.48	3.71	227,332
12	Furnishings	0.03	0.08	5,176
	Furnishings	0.03	0.08	5,176
13	Special Construction	10.69	26.79	1,642,765
	Special Construction	10.69	26.79	1,642,765
14	Conveying Systems	0.18	0.45	27,832
	Conveying Systems	0.18	0.45	27,832
15	Mechanical	11.67	29.25	1,793,796
	Mechanical	11.67	29.25	1,793,796
16	Electrical	6.95	17.42	1,068,166
	Electrical	6.95	17.42	1,068,166
22	Plumbing	0.70	1.75	107,427
	Plumbing	0.70	1.75	107,427

23	HVAC	1.99	4.99	306,200
	HVAC	1.99	4.99	306,200
26	Electrical	0.84	2.11	129,110
	Electrical	0.84	2.11	129,110
28	Electronic Safety and Security	0.03	0.06	3,849
	Electronic Safety and Security	0.03	0.06	3,849
31	Earthwork	0.70	1.76	107,627
	Earthwork	0.70	1.76	107,627
32	Exterior Improvements	0.22	0.55	33,449
	Exterior Improvements	0.22	0.55	33,449
33	Utilities	0.53	1.33	81,279
	Utilities	0.53	1.33	81,279
Total Building Costs		100.00	250.64	15,369,466