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May 31, 2012

David Thomas
City of Austin
Contract and Land Management Department
Professional Services Procurement
505 Barton Springs Road, Suite 1045
Austin, Texas 78704

SUBJECT: **Engineering Services at Austin Convention Center**
Preliminary Water Collection Feasibility Study - Final
Austin Convention Center
Austin, Texas
FEA Project No.: R03.2009.000276.009

Dear Mr. Thomas:

Facility Engineering Associates, Inc. (FEA) has completed our water collection feasibility study. This report provides a brief description of the project information, our findings, and our recommendations for modifications that can be made to the existing building infrastructure to accommodate rainwater and condensate recapture. Our services have been provided in accordance with our proposal dated February 3, 2012 and Supplemental Amendment No. 4, executed on February 29, 2012. This report was prepared by FEA, Encotech Engineering Consultants, and Winterowd Associates, Inc.

We appreciate your consideration of FEA for this work and look forward to working with you on other projects.

Sincerely,

FACILITY ENGINEERING ASSOCIATES, P.C.

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1.0 EXECUTIVE SUMMARY

The Austin Convention Center asked our team to determine the feasibility of capturing and storing rainwater runoff from the roof surfaces and condensate water from the building HVAC equipment for distribution and non-potable uses such as landscape irrigation. The intent is to reduce the water consumption at the property and to promote the sustainability efforts for both the facility and the City of Austin, Texas. This report identifies potential volume of water available from rainfall and HVAC condensate, potential spaces to accommodate the rainwater collection system components including storage and piping, how the collected water will be used, and the best system option recommendation.

The observations and opinions presented are based on the following:

- Existing information on the drawings provided by the City of Austin and the Austin Convention Center.

- Field observation of the building to verify the existing conditions.

- Site visit discussions with City of Austin and Austin Convention Center personnel to discuss building systems and operations.

Based on domestic and irrigation metering data[1], the building's estimated total water demand is just over 9.9-million gallons annually. The irrigation demand is estimated to be 210,900-gallons annually. The proposed recommended system is a roof-mounted system, comprised of 34 water storage tanks, each at 5,700-gallons, and three underground storage tanks in the service yard area, each at 50,000-gallons. This solution will supplement all of the building's irrigation demands as well as providing the facility additional water capacity for other non-potable needs.

[1] Based on metering data spanning 2005 to May 2011.

2.0 SCOPE OF SERVICES

FEA retained the services of Encotech Engineering Consultants, Inc. and Winterowd Associates, Inc. to provide evaluation services to determine the feasibility and logistics for the collection and storage of rainwater and HVAC system condensate water. Specifically, our scope included the following:

- Review existing construction drawings to identify the locations of HVAC system condensate water within the building and estimate the anticipated quantity of condensate water that could be collected from the building mechanical systems.
- Review the locations for possible water storage tanks in or adjacent to the building, in the existing wet pond east of the main building, and the piping and pump systems that will be needed for transporting collected HVAC system condensate water to the storage location(s).
- Review the feasibility of rainwater collection from the roof surfaces and roof drainage system.
- Identify possible flow control system(s) to allow for multiple scenarios of water distribution: (1) from new storage tank(s), (2) the existing pond, and (3) last option switch to standard potable water sources.
- Provide conceptual opinions of cost for design and implementation of water collection systems and options will be provided.
- Prepare a written report documenting the findings of the feasibility review.

The report is limited in scope. It does not consider other repairs or improvements that may be under consideration for other portions of the property. It also does not provide an opinion of cost for the remodel work proposed in the conceptual design.

3.0 INTRODUCTION

Building Description

The building is comprised of approximately 930,452 square feet, combined area of the north and south building. Event space for the convention center consists of approximately 830,452 square feet with approximately 414,541 visitors annually and 50 full time employees. The event space includes pre-function rooms, ballrooms, banquet halls, meeting rooms, and exhibit halls.

Summary of Building Operations

The Austin Convention Center operates year-round. The HVAC equipment for the exhibit halls, banquet halls, corridors, meeting rooms, and pre-function rooms operates as necessary and are dependent upon the events that are being held at the convention center. On the days when there are no events in the building, the air handling units serving the administration areas are primarily the only ones in operation, except to maintain non-occupied set points. There are no days that the building is completely shut down. Holidays observed are dependent upon the event schedule of the convention center and can vary from year to year.

The administration areas of the building typically operate for 70 hours per week, with typical operating hours of 7am to 5pm. The event areas typically operate for 84 hours per week on average; the hours of operation vary widely depending on event schedules.

Water Harvesting Overview

Rainwater harvesting can ensure an independent water supply during water restrictions, though this is somewhat dependent on end-use and maintenance. It can reduce peak storm water runoff and resultant maintenance. For the City of Austin, reducing storm runoff is especially important, because excess runoff during heavy storms leads to the discharge of raw sewage from outfalls when treatment plant capacity cannot handle the combined flow. Rainwater harvesting systems are relatively simple to install and operate, relatively inexpensive to operate, and can provide water at the point of use.

For the convention center, harvesting the rainwater from the building roofs and condensate water from the HVAC units can provide irrigation to the surrounding and future landscapes and provide makeup water for the nearby convention center wet pond beside Waller Creek. There is also potential to supply excess stored water to Austin Energy for their chiller plant makeup water, supply excess water to the new adjacent hotel (for non-potable uses), feed into the City of Austin Water Department's non-potable water piping distribution system, and flush current and future toilets and urinals as part of the 2014 Expansion Master Plan.

The proposed collection and utilization system includes the existing roof drains, new piping connected to these drains to direct water to the cisterns, cisterns to collect rain, and condensate water and pumps to distribute the water. The condensate collection piping is expected to remain. Some rerouting and pipe extensions may result depending on the collection points. Other features of the system will include a piping loop for tank equalization, a circulation system for freeze protection, a booster system for flushing, and filtration. While the collection and reuse of rain and condensate water is an effective way to provide water for multiple uses, it also simultaneously reduces the strain on the existing water infrastructure, and reduces the impact of storm water runoff.

4.0 FINDINGS

Existing Water Demands

Based on historic metering data, the total water demand was estimated for the Austin Convention Center. The calculations include the amount of water needed on average as well as during peak demands during the largest annual conventions such as South by Southwest. Historic metering data for a one year period and the estimated annual water demand are summarized in Table 4-1. Additional data from 2009 through May 2011 is shown in Figure 4-1.

Table 4-1. Water Consumption

Month	North Water Use (Gallons)	South Water Use (Gallons)	Irrigation Water Use (Gallons)
May-11	304,000	143,200	11,800
April-11	570,300	329,600	2,400
March-11	444,400	239,600	-
February-11	364,100	189,800	-
January-11	514,100	160,200	5,200
December-10	393,800	308,400	20,660,000*
November-10	304,700	321,000	15,980,000*
October-10	291,000	784,000	39,800
September-10	296,900	863,000	-
August-10	425,800	724,900	28,200
July-10	322,600	779,700	82,200
June-10	246,300	506,800	41,300
Total	**4,478,000**	**5,350,200**	**210,900**
Estimated Annual Total Water Demand for Building (Gallons):			**9,944,200**

**Unusually high water use due to water line breakage*

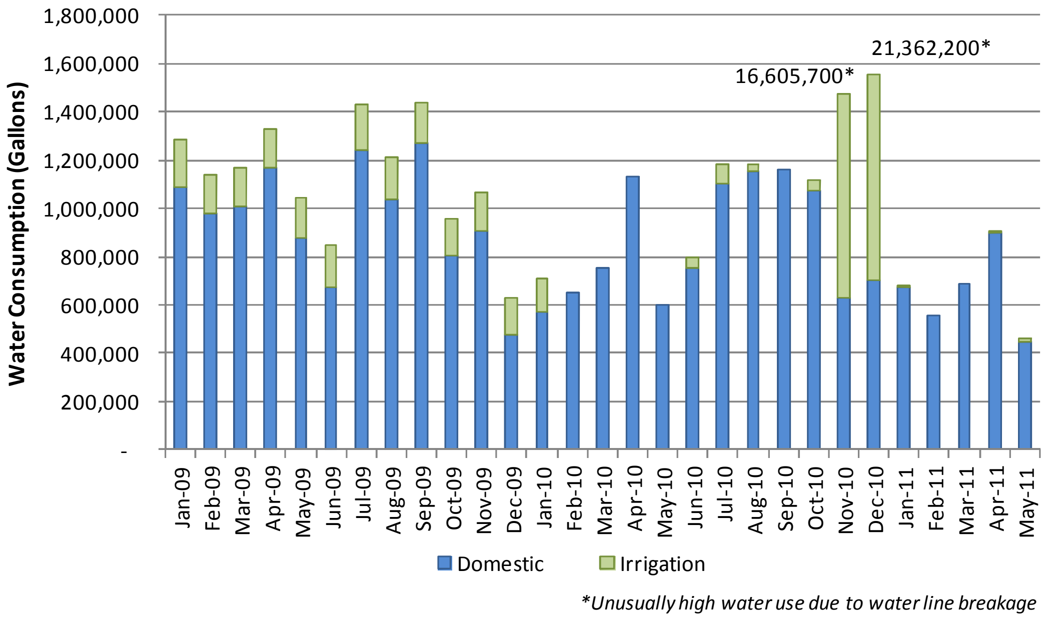


Figure 4-1. Historic Water Consumption

In addition to evaluating the historic trends, the specific planting areas were reviewed. There are three separate sites that comprise the existing irrigation system attributed to the Austin Convention Center, totalling 21,305 square feet. One is at the convention center site (15,350 SF) and is found in a series of drip-irrigated shrub and groundcover beds as well as bubbler-irrigated trees along Cesar Chavez Street, Trinity Street, and Fourth Street. The second site is 802 SF, found at the Parking Garage along 2nd Street, where landscaping is confined to small drip-irrigated shrub beds. The third site is the water quality pond along 4th Street which has a total of 5,153 SF of aquatic plants and shrubs, none of which are irrigated. However, make-up water for this pond to help maintain a permanent pool elevation is provided as needed from the irrigation system.

In recent years, the irrigation system has had issues with breaks and inaccurately estimated water needs, which has led to a wide variation in the amount of water used for irrigation purposes. Scheduling conflicts within the system causing it to exceed design capacities and exacerbate leaks and breaks, along with an automatic fill schedule for the pond beyond the capacity needed, have led to high water usage volumes. For the year of 2011, actual water usage was over 278,000 gallons, while calculations of the actual water use need was just less than 87,000 gallons and estimated at 174,000 gallons when additional factors are considered.

The amount of water calculated to meet the needs of the existing groundcovers, shrubs, and trees of the convention center sites was determined based on a variety of historical rain and climate data balanced with water needs of the specific plant types found at the site. These factors included rainfall averages, Evapotranspiration Rates, Microclimate factors, species and planting density factors. While the result of these factors gives a fixed number of gallons needed, allowances for human factors, unanticipated climate influences and inevitable mechanical failures within the system will in actuality require a larger water need.

From time to time, landscapes will be changed, resulting in new plantings that for a period of time will need more water than established plants. Whether this water is applied specifically to the newly planted

plants by hand watering, or through the use of the irrigation system, applications for this time period can easily double or triple the normal water requirements.
Meter and water usage data for the late summer and fall of 2011 was not available when previous calculations were made but will undoubtedly show higher water use needs than typical due to the ongoing and severe drought in the Austin area coupled with unusually high temperatures. This ongoing trend of low rainfall and higher than normal temperatures which is anticipated at least through the middle of 2012 will impact the existing landscape and its water requirements. Either more water will be applied through the system to compensate for higher evapotranspiration rates, or more water will be required to replace plants later in the year that do not survive the climate impacts.

Mechanically, irrigation systems are prone to malfunctions even when well maintained. Drying soil levels can lead to underground shifts which damage or break pipes. Adjacent construction activities, always an issue in the downtown area of Austin, create further damage likelihood. The moving parts of the irrigation system that are electrically actuated wear down over time, rubberized components dry out, and equipment exposed to the elements and pedestrians become damaged. All this can lead to water leaks or unmonitored flows which can greatly impact the bottom line of water usage.

Incorporating these factors, we have applied estimates to the calculated water needs that will include an allowance for additional and unintentional water usage. This allowance can be assumed to increase the calculated need for 87,000 gallons per year to a figure that is twice the normal need, or 174,000 gallons. Should an unforeseen event occur such as a main line break, if it is unnoticed for a significant period of time, it could easily exceed these estimates[2].

Overall, the building's total water demand (domestic and irrigation combined) is estimated at just over 9.9-million gallons. By providing the facility the ability to use collected rain and condensate water, this opportunity to save water can greatly benefit the City of Austin.

Existing Building Mechanical Systems Overview

The Austin Convention Center mechanical and plumbing systems are summarized below. The proposed rain and HVAC condensate water collection system will be incorporated to work adjacent with these systems.

HVAC System
The mechanical systems within the facility consist of 33 air handling units serving the south section; 31 air handing units serving the north section; 12 fan coil units; approximately 100 fan-powered, constant volume air terminal units serving the south section; and 93 fan-powered variable air volume units and damper modulating variable air volume units serving the north section. Chilled water and heating water is provided to these AHUs, fan-coil units, and perimeter air terminal units via district chilled water. District chilled water for the north section is supplied to two heat exchangers that then supply chilled water to the entire north section of the building.

District chilled water for the south section is supplied to four Austin Energy-owned heat exchangers that then supply chilled water to the entire south section of the building. One boiler in the south section and two boilers serving the north section provide heating water for the facility. Chilled and heating water is pumped via dedicated chilled and heating water pumps to coils in the air handling units, fan coils, and air terminal units throughout the facility.

[2] July 2011 irrigation use reportedly reached 317,000 gallons.

Plumbing System

Domestic water for the building is provided by three separate services: north section, south section, and irrigation systems. Domestic water pumps are not required since the city water pressure at this location is sufficient to maintain adequate water pressure throughout the facility. The plumbing fixtures located in the building are as follows:

- Water closets with automatic sensor control – 1.6 gpf
- Urinals with automatic sensor control – 1.0 gpf
- Lavatories and aerators mixed automatic sensor and manual control – 0.5 gpm
- Showers – 2.5 gpm

Any new plumbing fixtures added to the facility will need to adhere to the current City of Austin standards which are:

- Water closets with automatic sensor control – 1.28 gpf
- Urinals with automatic sensor control – 0.25 gpf
- Lavatories and aerators mixed automatic sensor and manual control – 0.5 gpm
- Showers – 1.5 gpm

Rainwater and HVAC Condensate Calculations

Using the regional weather and rainfall history data, Tables 4-2 and 4-3 summarize the rainfall and condensate water volumes. This data is used to estimate available water and possible water storage system size to supplement the building's needs.

Table 4-2. Historic Rainfall, 30-year Average (1981-2010)

Month	30-year Normal (In/Month)	North Roof (Gallons/Month)	South Roof (Gallons/Month)	Total (Gallons/Month)
Jan	2.23	278,283	325,894	604,177
Feb	2.37	295,754	346,353	642,107
Mar	2.51	313,224	366,813	680,037
Apr	2.28	284,522	333,201	617,723
May	2.66	331,943	388,734	720,677
Jun	4.38	546,583	640,096	1,186,679
Jul	2.45	305,737	358,045	663,782
Aug	1.63	203,409	238,209	441,618
Sep	2.49	310,728	363,890	674,619
Oct	3.95	492,923	577,256	1,070,179
Nov	2.95	368,132	431,115	799,247
Dec	2.25	280,779	328,817	609,595
Totals		**4,012,017**	**4,698,424**	**8,710,440**

Data Source: National Oceanic and Atmospheric Administration (NOAA)

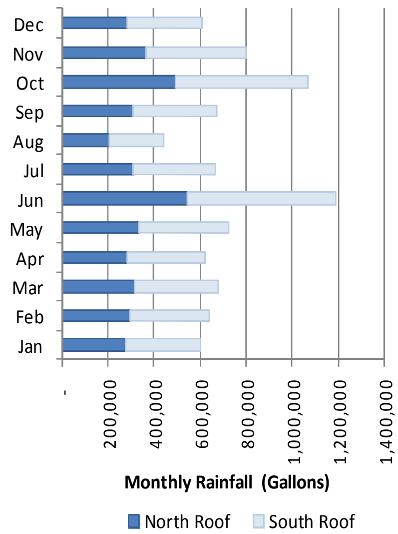


Figure 4-2. Historic Rainfall, 30-year Average

Based on a historic rainfall records over a 30-year period, the estimated potential amount of rainwater that can be collected is about 8.7 million gallons gross, 6.4 million gallons net (assuming a 75% capture). The maximum estimated water volume in a given month occurs in June, with a potential gross capture of almost 1.2 million gallons.

Based on an average monthly production of condensate water for each air handling unit in the building, both north and south sections, the total annual amount of condensate water that can be collected is nearly 680,000 gallons annually. Table 4-3 summarizes the condensate water recapture estimates.

Table 4-3. Estimated Condensate Recapture

Month	North Roof Equipment		South Roof Equipment	
	Gallons/ Day	Gallons/ Month	Gallons/ Day	Gallons/ Month
Jan	-	-	-	-
Feb	306	5,146	301	5,051
Mar	1,423	26,472	1,398	26,010
Apr	1,639	29,497	1,610	28,980
May	2,124	39,503	2,087	38,811
Jun	2,684	48,314	2,637	47,469
Jul	2,550	47,427	2,505	46,598
Aug	2,550	47,427	2,505	46,598
Sep	2,159	38,856	2,121	38,177
Oct	1,661	30,887	1,632	30,347
Nov	1,313	23,640	1,289	23,211
Dec	228	4,243	224	4,164
Totals	**18,637**	**341,412**	**18,309**	**335,415**

Calculations assume a 60% run-time diversity factor

Comparing the estimated irrigation requirement of 87,000 gallons annually along with a doubling safety factor, the estimated available condensate is sufficient to meet the irrigation needs. Figure 4-3 illustrates a monthly comparison based on average monthly climate conditions.

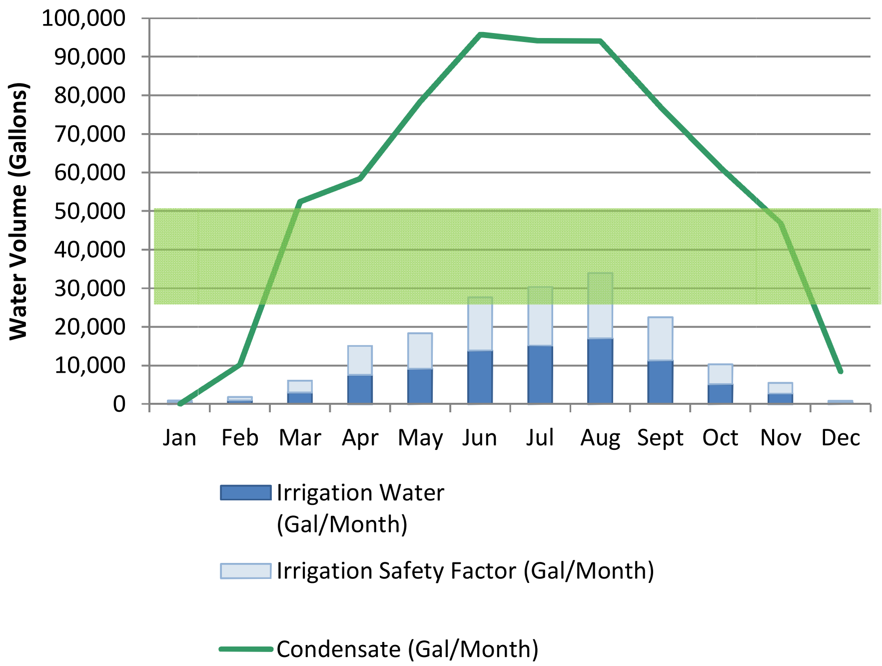


Figure 4-3. Estimated Monthly Irrigation and Condensate Recapture

Water Collection Technologies

Rainwater

Rainwater harvesting systems collect, convey, and store precipitation for non-potable applications (toilet and urinal flushing, cooling tower make-up, outdoor irrigation systems, etc). The rainwater harvesting system works in conjunction with pumps, float valves, and back flow preventers to utilize makeup water when lack of rainfall prevents the cistern from filling with harvested rainwater

In this system, the rainwater is directed from the roof via the existing roof drains and laterals into cisterns on the roof which will be connected together by a water loop. There will be a roof drain relief piped to the storm drain to eliminate any back-up rainwater on the roof during high-intensity rainfalls. In certain areas, coordination, additional pumping and piping may be required in order to get the water to the cisterns.

Once stored, the water will be used to supplement the non-potable water needs of the building such as irrigation, filling the nearby detention pond, and flushing water closets and urinals.

HVAC Condensate

One of the most effective permanent water saving reductions is to divert HVAC condensate water into the rainwater collection system. On hot, humid days, HVAC units discharge water condensate. Even during the winter months, noticeable amounts of condensate water can be recaptured.

The condensate extracted by the HVAC units during the cooling cycle will be collected into the rainwater system. The condensate collected is just over 680,000 gallons annually per Table 4-3. This will supplement the rainwater collected. According to facility management personnel, currently all of the roof-mounted air handling units drain condensate into the roof drains. This violates current code, which requires condensate to be routed to wastewater piping, but this would be advantageous allowing collecting rainwater and condensate in the same piping. Austin code officials will allow condensate to go to roof drains if it is all collected.

In certain areas, coordination, re-routing of condensate piping and additional pumping may be required in order to get the water to the cisterns. This can become a complicated design especially for units located on the other side of the building. The design would require a significant amount of new condensate lines to be added/re-routed, additional pumping, additional controls, and added electrical load to the building system.

Rainwater tanks will be constructed from materials such as plastic (polyethylene), concrete, galvanized steel, fiberglass, or stainless steel which are rust and chemical-resistant. Tanks will be opaque to prevent the exposure of stored water to sunlight and to decrease algal bloom.

All the cistern options are noted in the table below. Each system option will also have additional volume attributed to the rainwater retained in the underground piping loop. The maximum capacity that can be installed on the facility is 435,200-gallons between all three solutions identified in Table 4-4 and based on the available space. If more capacity is desired, off-site tank locations will have to be explored. Space will be dependent on the capacity desired.

Table 4-4. Cistern Size Options

Cistern Size Options				
Tank Location	**Size**	**(Each)**	**Estimated Number of Tanks**	**(Gallons)**
Service Yard	88' / 10' dia.	50,000	3	150,000
Roof (Cooling Tower)	18' / 24' dia.	5,700	34	193,800
Next to Admin Area	13.4' / 21' dia.	17,000	4	91,400
	18' / 12' dia.	11,700	2	
TOTAL (Gallons):				**435,200**

Typical rainwater collection systems seek uniform levels in the overall system. The cisterns will be equipped with both a low and high level sensor to protect operation of the circulation pump and the control of the valve to switch to domestic water. The low level sensor insures that there is adequate water available for pump suction so that the circulation pump is protected.

Water will be filtered to prevent clogging of flush valves and irrigation emitters.

Water Storage Possibilities

Mechanical Room KM01

One of the best and most accessible locations to locate part of the system is in Mechanical Room KM01. This room at one point housed fourteen 6,000-gallon capacity ice storage tanks. The room has the capacity to house water storage tanks. Part of the room is currently being used as a mechanical and storage room which is scheduled to be demolished making the room an ideal location. The building managers have expressed a desire to be able to retain some storage capacity in this area.

The mechanical room is an option due to most of the existing equipment being planned for decommissioning. The challenge for the room is the existing piping being routed on the ceiling, limiting any installation equipment to 8'-0" maximum height. For water storage tanks, this may hinder the capacity. This area would be best suited to house the pumping and controls for the water storage system.

Existing Cooling Tower Area on Roof

Building Managers also noted that the existing Cooling Tower on the roof can be removed, and that space used for water storage. Building Managers noted that some RTUs are located on the roof directly above the former ice storage and chiller room, which would allow easy collection from those units. Encotech observed a 1" copper condensate drain down from that roof to a lower roof drain. The roof area, aside from the abandoned cooling tower and associated piping, has little to no obstacles and would be an ideal location for the water collection tanks.

A structural study will need to be coordinated and further investigated to evaluate this option. A typical roof-mounted cistern as described in Table 4-4 that is full of water (8.346 lbs/gallon) roughly weighs about 48,000-lbs. Based on the roof load information of 150lbs/sq-ft, giving the total maximum weight that can be added on at about 58,000-lbs, the roof mounted tank proposed in Table 4-4 is the maximum size tank that can be installed without having to reinforce the roof structure. The tanks would have to be mounted on 24-foot centers. This equates to approximately 34 tanks distributed throughout the roof. The tanks will be 10'-9" height (about 12'-0" with their associated mounting bracket) which will be shorter than the current cooling tower, avoiding visibility issues from both a City Ordinance and aesthetic perspective. Refer to the appendix for a schematic layout.

Beneath Service Yard
Underground water storage tanks can possibly be located underneath the service yard. The service yard currently is used for building deliveries and can accommodate large semi-trucks. The Austin Convention Center's master plan currently contains plans to cover the existing service yard with a fourth floor for additional gathering/meeting spaces. Because of this, careful coordination will be required to accommodate the tanks with the future building expansion. The tanks will have to be placed between future column grids and be constructed to accommodate truck traffic.

For the service yard, a maximum of three-50,000 gallon underground tanks (total 150,000 gallon capacity) can be installed in the area based on the BRAE Rainwater fiberglass tank BFRP model. The structural integrity and utility coordination of the service yard will have to be further investigated to verify the feasibility of this option.

Adjacent to Administrative Area
Above ground storage tanks can possibly be located in the space, adjacent to the administrative area, on the east side of the building, along the future boardwalk area. This area is currently walled off but is suspected of being an open space underneath the raised outdoor staircase. Based on the square-footage of this area, the water storage capacity is estimated at about 91,400-gallons spread out through six tanks of different sizes. The challenge for this area is the unknown existing conditions of this space and the maximum height for installing water storage tanks which will limit the overall capacity.

Water Uses

Rain and condensate water from a properly designed rainwater storage system can be used without further treatment (other than basic filtration) for landscape irrigation, garden ponds, and most exterior applications. When rainwater is used within buildings, supplemental filtration is essential. Building Managers noted that the irrigation system has been renovated from the original designed system and uses drip irrigation primarily.

For toilet and urinal flushing and other non-potable, non-exterior water applications, a sediment filter will be required in the system to remove suspended solids which can clog and damage flush valves, and an activated-carbon filter will remove dissolved organic matter which can cause discoloration and odors.

The Austin Convention Center currently is planning to use the collected water to meet its irrigation needs. Additional uses may included supplying water to the neighboring detention pond, and selling water to other nearby municipalities. There is also a desire to accommodate the system for future non-potable uses such as flushing toilets and urinals as part of the 2014 Building expansion.

The Austin Convention Center has identified additional potential uses for excess water including supplying any excess stored water to Austin Energy for their chiller plant makeup water, to the new adjacent hotel for non-potable use, and to the City of Austin Water Department's non-potable water piping distribution system.

Currently the detention pond (behind the Trask House) is kept to a minimum level with domestic water via an irrigation meter. It is proposed to use the collected rain and condensate waters to replenish the pond.

Building Managers noted that in 2014 they plan on performing a remodel of Ballrooms A, B & C, dividing it into two floors and adding one men's and one women's restroom. Renovation work occurring can incorporate re-piping of non-potable water to the water closets and urinals at this time.

Based on a rough calculation, it will take approximately 365,000-gallons annually to meet the water demands for the water closets and urinals.

5.0 RECOMMENDATIONS

Based upon our findings, we present the following rain and condensate water collection option for the Austin Convention Center.

The ideal location for the rainwater collection tanks is on the roof where the abandoned cooling tower is located. The cooling tower and associated piping will have to be demolished. This location gives the maximum amount of space and storage capacity for the facility. Other locations were evaluated but are restricted by clearance space and would limit the capacity of the storage tanks. The roof gives the potential of installing 34 rainwater tanks, each with a capacity of 5,700 gallons of storage. The roof structural capacity will have to be evaluated to accommodate the tanks. The condensate piping from the existing mechanical units will be rerouted from their existing connections to the roof drains to the new collection system.

In addition, installing the three (3) underground tanks in the service yard is also recommended. The system will serve the irrigation needs for the facility and supplement water for the nearby detention pond. The system will also be designed to serve future water closets and urinals as part of the 2014 Expansion.

Mechanical Room KM01 will be used as the rain and condensate water control room, housing the necessary pumps, piping, and controls for system operations. The mechanical room is in close proximity to the location of the storage tanks and would keep the piping lengths to a minimum. The decommissioned chiller and associated pumps will have to be demolished in order to make room for this new equipment.

The total estimated maximum capacity for installing cisterns at all the noted locations is about 343,000-gallons.

We have developed an opinion of cost for the major components of the proposed system. Allowances have been estimated for demolition and ancillary equipment. The information provided is for planning purposes only and is not a construction estimate. Costs such as performance and payment bonds, permitting fees, and taxes are not included. The information is summarized in the Table 5-1.

Table 5-1. Opinions of Cost

Item Description	Quantity	Unit	Unit Price	Opinion of Cost
Demolition				
Demolish existing cooling tower	1	LS	$5,000	$5,000
Demolish existing chillers and pumps	1	LS	$5,000	$5,000
Demolish associated electrical	1	LS	$2,000	$2,000
Category Sub-total				*$12,000*
Electrical				
Feeders & connections to rainwater pumps	1	LS	$35,000	$35,000
Associated electrical (disocnnects, breakers, etc.)	1	LS	$15,000	$15,000
Category Sub-total				*$50,000*
Rainwater Systm				
Rainwater system (pumps, controls, valves, tanks)	1	LS	$1,479,511	$1,479,511
Service Yard excavation for tanks	1	LS	$400,000	$400,000
Structural reinforcement of roof	1	LS	$170,000	$170,000
Condensate water line rerouting	1000	LF	$16	$16,000
Connections to existing plumbing system	1	LS	$5,000	$5,000
Category Sub-total				*$2,070,511*
Non-potable System (2014 Expansion)				
Integration into existing plumbing system	1	LS	$200,000	$200,000
Category Sub-total				*$200,000*
Sub-total				$2,332,511
Overhead & Profit			20%	$466,502
Sub-total				$2,799,013
Contingency			20%	$559,803
Grand Total				**$3,358,816**

6.0 CONCLUSIONS

The Austin Convention Center has a unique opportunity to incorporate a rain and condensate water collection system. Based on a site investigation and water study, the building will benefit by supplementing rain and condensate water for its irrigation, detention pond, and future non-potable water needs.

Baseline irrigation requirements will at minimum require 86,711 gallons per year, with the highest requirements occurring during the months of June, July and August. Baseline plus anticipated additional needs for supplemental watering, minor breaks and maintenance occurrences may double this amount. The additional needs will likely be heavier during the growing season from April through October, but could happen at any time of the year. Significant irrigation events related to unmonitored breaks are not able to be predicted, but could easily use most or all of the stored amount of water at any time. The best way to prevent a huge loss of stored water is to provide frequent monitoring of water levels and rates of discharge.

The roof area where the current abandoned cooling tower exists is the best location to install the water storage tanks due to accessible area and the least amount of limitations for storage capacity. The location will also keep the piping runs to a minimum. Mechanical Room KM01 will house the associated system components such as pumps and controls.

Based on our estimates, the building will have sufficient quantities of non-potable water utilizing recaptured condensate water alone. This solution will give the facility approximately 343,000 gallons of storage capacity divided between 34 tanks on the roof, and 3 underground tanks. Because the current irrigation water demands are 210,900-gallons annually, the system water capacity amount will meet 100% of the annual irrigations needs leaving amount 132,900-gallons of excess water capacity to be used for other non-potable needs such as filling the detention pond and flushing water closets and urinals. All other solutions presented will only have the capacity to partially meet the irrigation needs.

The tanks adjacent to the administration area can also be added to the solution adding an additional capacity of about 91,400-Gallons. However, little is known about this areas and further investigation would need to be conducted to confirm this as a feasible approach.

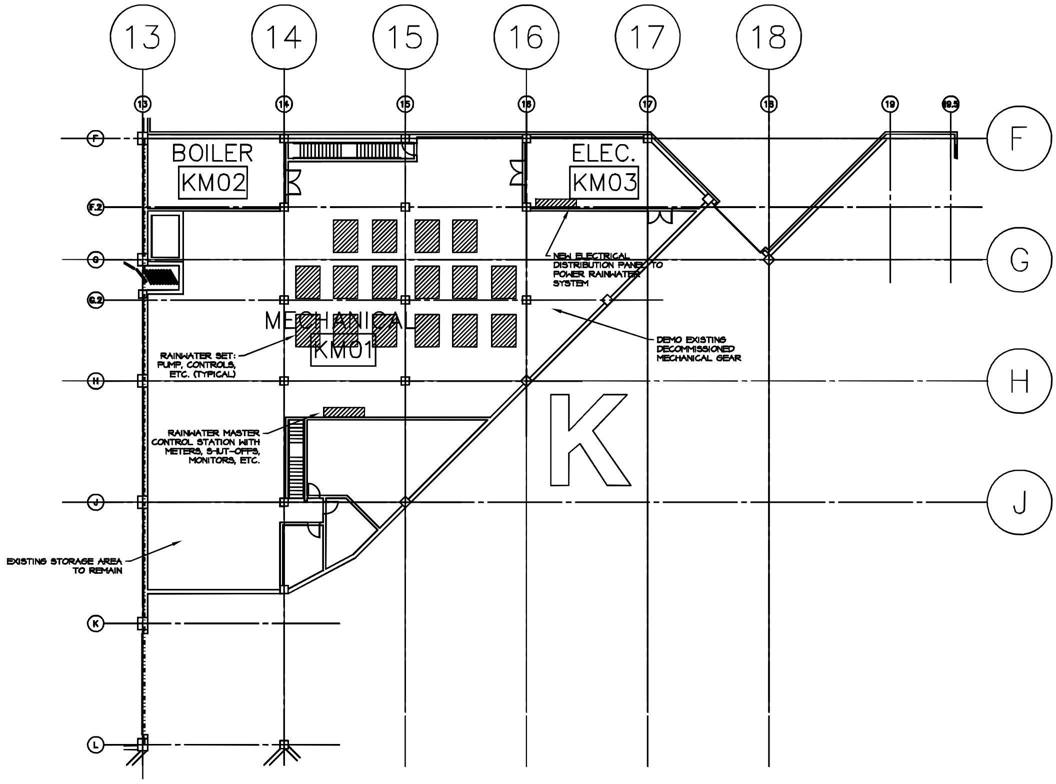
The following supplementary information has been provided in the Appendices:

1. Rainwater Storage Locations Sketches
   a. Drawing APP-1 - Mechanical Room KM01 Rainwater Pump Gear Sketch
   b. Drawing APP-2 – Water Storage System Sketch
   c. Drawing APP-3 - Service Yard Cisterns Sketch
   d. Drawing APP-4 - Adjacent Admin Area Cisterns Sketch
   e. Roof Cistern Concept

2. Water Tank Cutsheets
   a. BRAE Series BCG Above Ground Storage Tanks
   b. BRAE Series BFRP Below Ground Fiberglass Tanks

3. Opinion of Cost
   a. BRAE Rainwater System – budgetary estimate

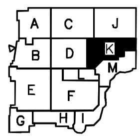
APPENDICES



AUSTIN CONVENTION CENTER

500 EAST 1st STREET
AUSTIN, TEXAS 78701

PROJECT NUMBER 493 827 1000
CAPITAL IMPROVEMENTS PROGRAM



KEY PLAN NORTH

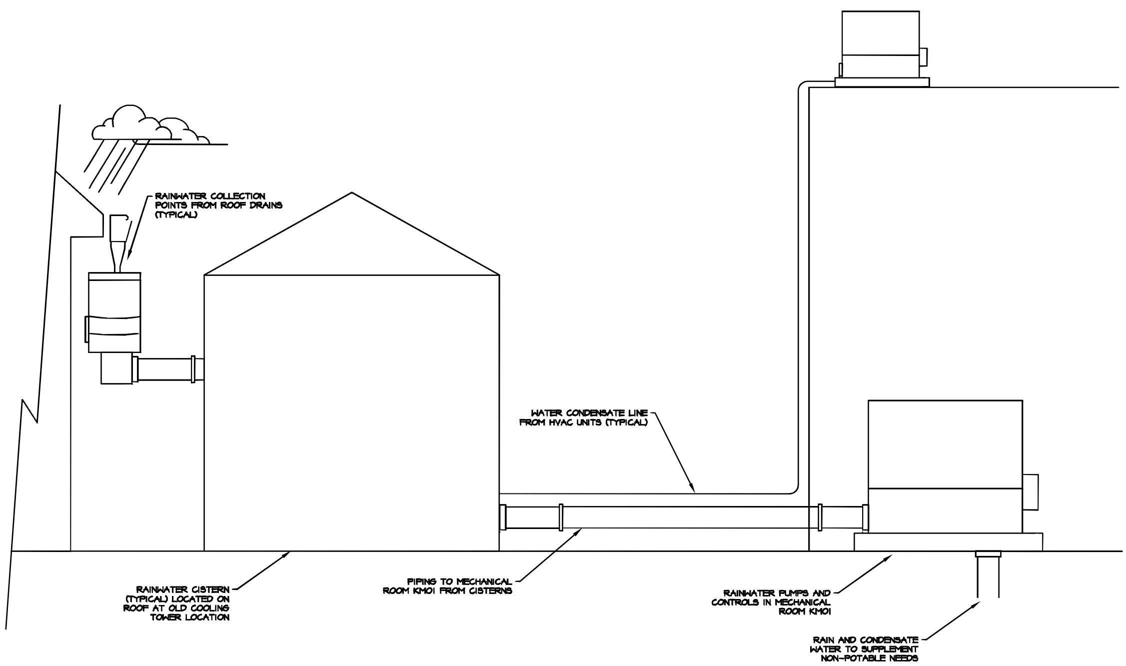
DRAWING TITLE:

MECHANICAL ROOM KM01
RAINWATER PUMP GEAR

SCALE: NO SCALE

DATE: 4/2/2012

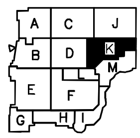
APP-1



AUSTIN CONVENTION CENTER

500 EAST 1st STREET
AUSTIN, TEXAS 78701

PROJECT NUMBER 493 827 1000
CAPITAL IMPROVEMENTS PROGRAM

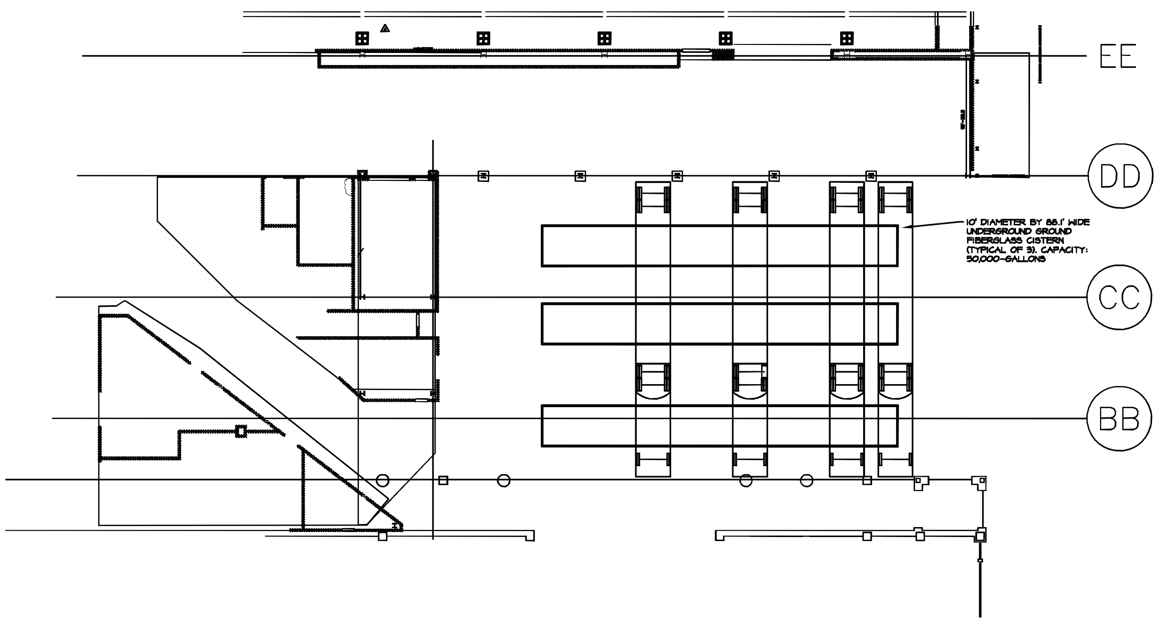


WATER STORAGE
SYSTEM SKETCH

NO SCALE

4/2/2012

APP-2

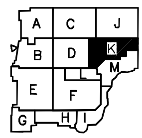


CITY OF AUSTIN
FOUNDED 1839

AUSTIN CONVENTION CENTER

500 EAST 1st STREET
AUSTIN, TEXAS 78701

PROJECT NUMBER 493 827 1000
CAPITAL IMPROVEMENTS PROGRAM



KEY PLAN NORTH

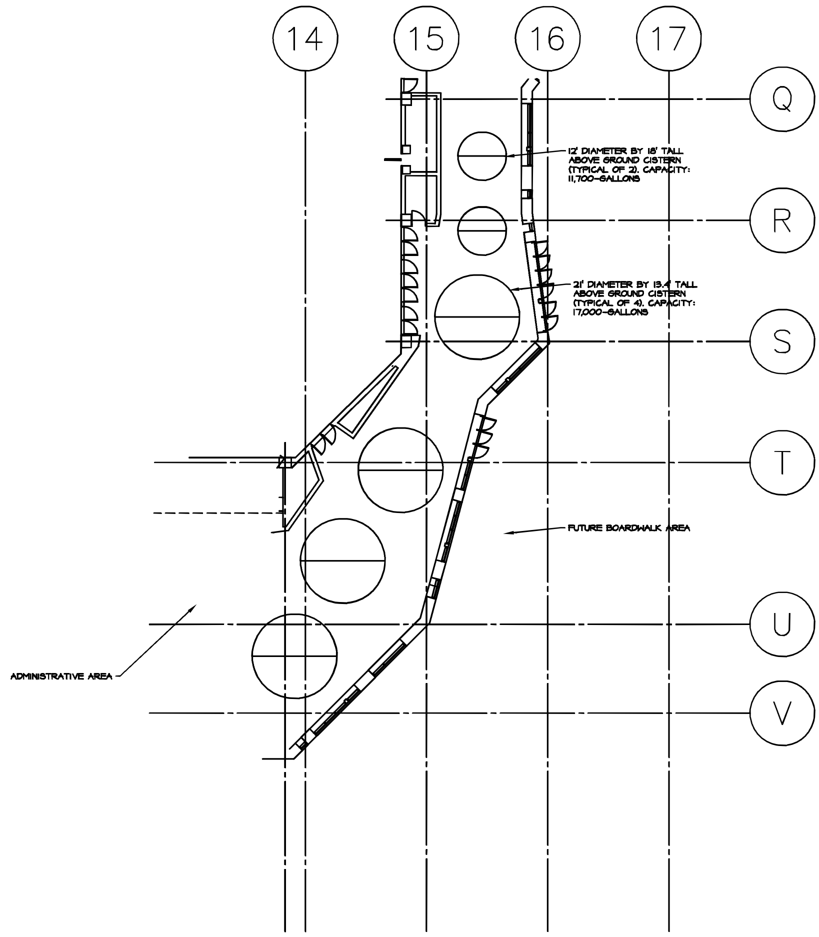
DRAWING TITLE:

SERVICE YARD
CISTERN

SCALE: NO SCALE

DATE: 4/2/2012

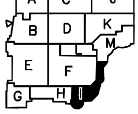
APP-3



AUSTIN CONVENTION CENTER

500 EAST 1st STREET
AUSTIN, TEXAS 78701

PROJECT NUMBER 493 827 1000
APITAL IMPROVEMENTS PROGRAM

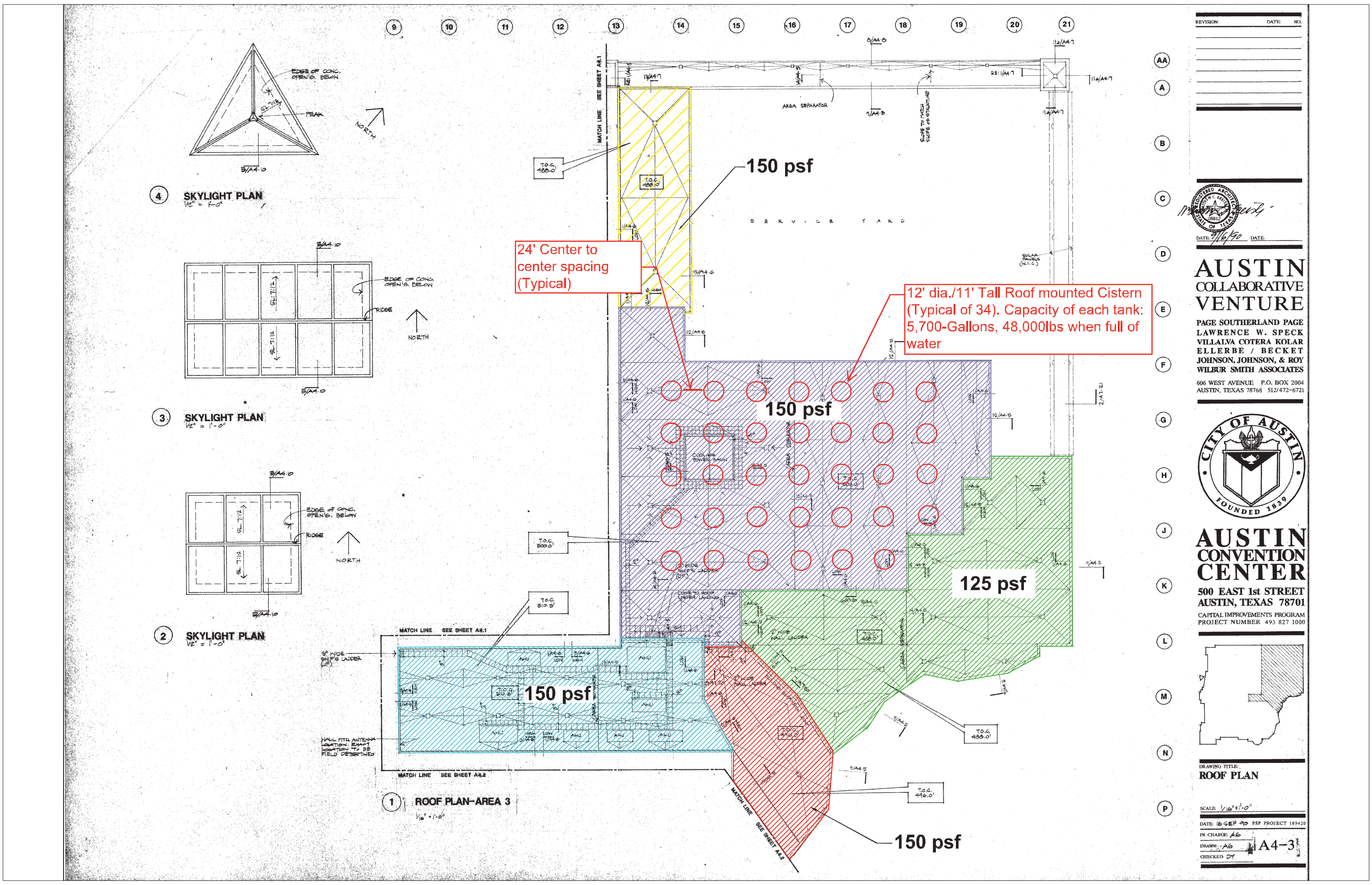


ADJACENT ADMIN AREA
CISTERNS

NO SCALE

4/2/2012

APP-4


150 psf
24' Center to center spacing (Typical)
12' dia./11' Tall Roof mounted Cistern (Typical of 34). Capacity of each tank: 5,700-Gallons, 48,000lbs when full of water
150 psf
125 psf
150 psf
150 psf
SERVICE YARD
4 SKYLIGHT PLAN
3 SKYLIGHT PLAN
2 SKYLIGHT PLAN
1 ROOF PLAN-AREA 3
MATCH LINE SEE SHEET A4.1
MATCH LINE SEE SHEET A4.2
AUSTIN COLLABORATIVE VENTURE
PAGE SOUTHERLAND PAGE
LAWRENCE W. SPECK
VILLALVA COTERA KOLAR
ELLERBE / BECKET
JOHNSON, JOHNSON, & ROY
WILBUR SMITH ASSOCIATES
606 WEST AVENUE P.O. BOX 2004
AUSTIN, TEXAS 78768 512/472-6721
CITY OF AUSTIN FOUNDED 1839
AUSTIN CONVENTION CENTER
500 EAST 1st STREET
AUSTIN, TEXAS 78701
CAPITAL IMPROVEMENTS PROGRAM
PROJECT NUMBER 493 827 1000
DRAWING TITLE:
ROOF PLAN
A4-3

SERIES BCG

CORGAL® ABOVE GROUND GALVANIZED STEEL TANKS

CorGal®, corrugated galvanized steel, water storage tanks are a unique and practical combination of corrugated galvanized, punched and rolled steel wall sheets, and a conical, flat or inverted galvanized steel roof structure.

CorGal® tanks are fitted with preliners and flexible membrane liners on the inside of the tanks for water containment. CorGal® tanks do not have a bottom structure and are constructed on a concrete foundation. They are available in a wide range of diameters and wall heights, with capacities up to 600,000 gallons per tank. Larger custom sizes are available by request.

Series BCG CorGal® Tanks

ADVANTAGES

- Designed to meet AWWA, NFPA and NSF standards for water storage
- Single source warranty
- Configurable design optimizes site specificity
- Water tight
- Quick field assembly onsite

FEATURES

- Extended warranty options
- Configurable design for controls, electrics and pump connections
- Individual tank capacities up to 600,000 gallons
- Range of diameters to meet architectural proportions
- Available with conical, flat or inverted roof designs
- Standard IBC Seismic Zone 2B
- IBC wind load 90 MPH
- Snow load 25 lbs per sq. foot

CorGal® is a registered trademark of Water Storage Tanks, Inc.

⚠ WARNING

Rainwater supplied by BRAE rainwater harvesting systems is not potable water and is not intended for potable water applications. Do Not Drink Water supplied from BRAE rainwater systems and related equipment. Users shall determine the suitability of the product for the intended application before using.

Job Name ______________	Contractor ______________
Job Location ______________	Approval ______________
Engineer ______________	Contractor's P.O. No. ______________
Approval ______________	Representative ______________

HOW TO ORDER

BCG	-		-		-		-		-		-		-		-		-		-	
		A		B		C		D		E		F		G		H		I		J

Sample: BCG-06-02-WT-FS-G04-00-F04-F02-04-00

BRAE CorGal® Tank (BCG)

Tank Diameter (Feet)

A
- (Choose from tank model chart)
- "06" for six foot diameter

Number of Rings High

B
- 1 (01)
- 2 (02)
- 3 (03)
- 4 (04)
- 5 (05)
- 6 (06)

C Water Tank (WT)

Roof Type/Style

D
- Flat Seamed Roof (FS)
- Corrugated High Ribbed Roof (CHR)
- Inverted Roof Design (INV)
- Flat Roof (FR)

Inlet Pipe (Position + Inches)

Includes calming inlet (Standard is Straight Pipe PVC)

E
- None (00)

"SWF" side wall flanged Inlet Pipe
- 2" (50mm) Sch. 80 PVC pipe (SWF02)
- 4" (100mm) Sch. 80 PVC pipe (SWF04)
- 6" (150mm) Sch. 80 PVC pipe (SWF06)
- 8" (200mm) Sch. 80 PVC pipe (SWF08)
- 10" (250mm) Sch. 80 PVC pipe (SWF10)
- 12" (300mm) Sch. 80 PVC pipe (SWF12)

"G" gasket sealed roof panel inlet
- 2" (50mm) Sch. 80 PVC pipe (G02)
- 4" (100mm) Sch. 80 PVC pipe (G04)
- 6" (150mm) Sch. 80 PVC pipe (G06)
- 8" (200mm) Sch. 80 PVC pipe (G08)
- 10" (250mm) Sch. 80 PVC pipe (G10)
- 12" (300mm) Sch. 80 PVC pipe (G12)

"SW" sidewall PVC
- 2" (50mm) Sch. 80 PVC pipe (SW02)
- 4" (100mm) Sch. 80 PVC pipe (SW04)
- 6" (150mm) Sch. 80 PVC pipe (SW06)
- 8" (200mm) Sch. 80 PVC pipe (SW08)
- 10" (250mm) Sch. 80 PVC pipe (SW10)
- 12" (300mm) Sch. 80 PVC pipe (SW12)

Vent Style

F
- None (00)
- Gooseneck (01)
- Low Profile (02)

Overflow Pipe (Position + Inches)

(Standard is Straight Pipe PVC)

G
- None (00)

"F" foundation installed overflow pipe + diameter of pipe
- 2" (50mm) Sch. 80 PVC pipe (F02)
- 4" (100mm) Sch. 80 PVC pipe (F04)
- 6" (150mm) Sch. 80 PVC pipe (F06)
- 8" (200mm) Sch. 80 PVC pipe (F08)
- 10" (250mm) Sch. 80 PVC pipe (F10)
- 12" (300mm) Sch. 80 PVC pipe (F12)

"SW" sidewall + diameter
- 2" (50mm) Sch. 80 PVC pipe (SW02)
- 4" (100mm) Sch. 80 PVC pipe (SW04)
- 6" (150mm) Sch. 80 PVC pipe (SW06)
- 8" (200mm) Sch. 80 PVC pipe (SW08)
- 10" (250mm) Sch. 80 PVC pipe (SW10)
- 12" (300mm) Sch. 80 PVC pipe (SW12)

Plumbing Connection (Inches)

H
- None (00)

"F" foundation installed plumbing pipe + diameter of pipe
- 1" (25mm) Sch. 80 PVC pipe (F01)
- 1-1/4" (32mm) Sch. 80 PVC pipe (F01.25)
- 1-1/2" (40mm) Sch. 80 PVC pipe (F01.50)
- 2" (50mm) Sch. 80 PVC pipe (F02)
- 4" (100mm) Sch. 80 PVC pipe (F04)
- 6" (150mm) Sch. 80 PVC pipe (F06)
- 8" (200mm) Sch. 80 PVC pipe (F08)
- 10" (250mm) Sch. 80 PVC pipe (F10)
- 12" (300mm) Sch. 80 PVC pipe (F12)

"SW" sidewall + diameter
- 2" (50mm) Sch. 80 PVC pipe (SW02)
- 4" (100mm) Sch. 80 PVC pipe (SW04)
- 6" (150mm) Sch. 80 PVC pipe (SW06)
- 8" (200mm) Sch. 80 PVC pipe (SW08)
- 10" (250mm) Sch. 80 PVC pipe (SW10)
- 12" (300mm) Sch. 80 PVC pipe (SW12)

Equalization Pipe Diameter (Position = Center of foundation)

(Standard is Straight Pipe PVC)

I
- None (00)
- 2" (50mm) Sch. 80 PVC pipe (02)
- 4" (100mm) Sch. 80 PVC pipe (04)
- 6" (150mm) Sch. 80 PVC pipe (06)
- 8" (200mm) Sch. 80 PVC pipe (08)
- 10" (250mm) Sch. 80 PVC pipe (10)
- 12" (300mm) Sch. 80 PVC pipe (12)

Ladder Package

J
- None (00)
- Interior ladder only (01)
- Exterior ladder only (02)
- Interior and Exterior ladder packages (03)

DIMENSIONS

Part Number	Diameter	Eave Height	Overall Height	Nominal Capacity US Gallons	FS Roof Type	INV Roof Type	FR Roof Type	CHR Roof Type
0601-WT	6'-0"	3'-8"	5'-8"	700	X	X	X	X
0602-WT	6'-0"	7'-3"	9'-3"	1,400	X	X	X	X
0603-WT	6'-0"	10'-9"	12'-9"	2,200	X	X	X	X
0604-WT	6'-0"	14'-4"	16'-4"	2,900	X	X	X	X
0605-WT	6'-0"	17'-11"	19'-11"	3,700	X	X	X	X
0606-WT	6'-0"	21'-5"	23'-5"	4,400	X	X	X	X
0801-WT	8'-0"	3'-8"	6'-2"	1,200	X	X	X	X
0802-WT	8'-0"	7'-3"	9'-9"	2,500	X	X	X	X
0803-WT	8'-0"	10'-9"	13'-3"	3,900	X	X	X	X
0804-WT	8'-0"	14'-4"	16'-10"	5,200	X	X	X	X
0805-WT	8'-0"	17'-11"	20'-5"	6,500	X	X	X	X
0806-WT	8'-0"	21'-5"	23'-11"	7,900	X	X	X	X
0901-WT	9'-0"	3'-8"	6'-6"	1,500	X	X	X	X
0902-WT	9'-0"	7'-3"	10'-1"	3,200	X	X	X	X
0903-WT	9'-0"	10'-9"	13'-7"	4,900	X	X	X	X
0904-WT	9'-0"	14'-4"	17'-2"	6,600	X	X	X	X
0905-WT	9'-0"	17'-11"	20'-9"	8,300	X	X	X	X
0906-WT	9'-0"	21'-5"	24'-3"	10,000	X	X	X	X
1201-WT	12'-0"	3'-8"	7'-3"	2,700	-	X	X	X
1202-WT	12'-0"	7'-3"	10'-9"	5,700	-	X	X	X
1203-WT	12'-0"	10'-9"	14'-4"	8,700	-	X	X	X
1204-WT	12'-0"	14'-4"	17'-11"	11,700	-	X	X	X
1205-WT	12'-0"	17'-11"	21'-5"	14,700	-	X	X	X
1206-WT	12'-0"	21'-5"	25'-0"	17,700	-	X	X	X
1501-WT	15'-0"	3'-8"	8'-1"	4,200	-	-	X	X
1502-WT	15'-0"	7'-3"	11'-8"	8,900	-	-	X	X
1503-WT	15'-0"	10'-9"	15'-2"	13,500	-	-	X	X
1504-WT	15'-0"	14'-4"	18'-9"	18,300	-	-	X	X
1505-WT	15'-0"	17'-11"	22'-4"	23,000	-	-	X	X
1506-WT	15'-0"	21'-5"	25'-10"	27,700	-	-	X	X
1801-WT	18'-0"	3'-8"	8'-11"	6,000	-	-	X	X
1802-WT	18'-0"	7'-3"	12'-6"	13,000	-	-	X	X
1803-WT	18'-0"	10'-9"	16'-1"	20,000	-	-	X	X
1804-WT	18'-0"	14'-4"	19'-7"	26,000	-	-	X	X
1805-WT	18'-0"	17'-11"	23'-2"	33,000	-	-	X	X
1806-WT	18'-0"	21'-5"	26'-9"	40,000	-	-	X	X
2101-WT	21'-0"	3'-8"	9'-10"	8,000	-	-	-	X
2102-WT	21'-0"	7'-3"	13'-4"	17,000	-	-	-	X

DIMENSIONS

Part Number	Diameter	Eave Height	Overall Height	Nominal Capacity US Gallons	FS Roof Type	INV Roof Type	FR Roof Type	CHR Roof Type
2103-WT	21'-0"	10'-9"	16'-11"	27,000	-	-	-	X
2104-WT	21'-0"	14'-4"	20'-6"	36,000	-	-	-	X
2105-WT	21'-0"	17'-11"	24'-0"	45,000	-	-	-	X
2106-WT	21'-0"	21'-5"	27'-7"	54,000	-	-	-	X
2401-WT	24'-0"	3'-8"	10'-8"	11,000	-	-	-	X
2402-WT	24'-0"	7'-3"	14'-3"	23,000	-	-	-	X
2403-WT	24'-0"	10'-9"	17'-9"	35,000	-	-	-	X
2404-WT	24'-0"	14'-4"	21'-4"	47,000	-	-	-	X
2405-WT	24'-0"	17'-11"	24'-10"	59,000	-	-	-	X
2406-WT	24'-0"	21'-5"	28'-5"	71,000	-	-	-	X
2701-WT	27'-0"	3'-8"	11'-0"	13,000	-	-	-	X
2702-WT	27'-0"	7'-3"	14'-6"	28,000	-	-	-	X
2703-WT	27'-0"	10'-9"	18'-1"	43,000	-	-	-	X
2704-WT	27'-0"	14'-4"	21'-8"	58,000	-	-	-	X
2705-WT	27'-0"	17'-11"	25'-2"	74,000	-	-	-	X
2706-WT	27'-0"	21'-5"	28'-9"	89,000	-	-	-	X
3001-WT	30'-0"	3'-8"	11'-10"	15,000	-	-	-	X
3002-WT	30'-0"	7'-3"	15'-5"	34,000	-	-	-	X
3003-WT	30'-0"	10'-9"	18'-11"	53,000	-	-	-	X
3004-WT	30'-0"	14'-4"	22'-6"	72,000	-	-	-	X
3005-WT	30'-0"	17'-11"	26'-1"	91,000	-	-	-	X
3006-WT	30'-0"	21'-5"	29'-7"	109,000	-	-	-	X
3301-WT	33'-0"	3'-8"	12'-8"	19,000	-	-	-	X
3302-WT	33'-0"	7'-3"	16'-3"	42,000	-	-	-	X
3303-WT	33'-0"	10'-9"	19'-10"	64,000	-	-	-	X
3304-WT	33'-0"	14'-4"	23'-4"	87,000	-	-	-	X
3305-WT	33'-0"	17'-11"	26'-11"	110,000	-	-	-	X
3306-WT	33'-0"	21'-5"	30'-6"	132,000	-	-	-	X
3601-WT	36'-0"	3'-8"	13'-7"	22,000	-	-	-	X
3602-WT	36'-0"	7'-3"	17'-1"	49,000	-	-	-	X
3603-WT	36'-0"	10'-9"	20'-8"	76,000	-	-	-	X
3604-WT	36'-0"	14'-4"	24'-3"	103,000	-	-	-	X
3605-WT	36'-0"	17'-11"	27'-9"	131,000	-	-	-	X
3606-WT	36'-0"	21'-5"	31'-4"	157,000	-	-	-	X
3901-WT	39'-0"	3'-8"	15'-1"	26,000	-	-	-	X
3902-WT	39'-0"	7'-3"	18'-8"	58,000	-	-	-	X
3903-WT	39'-0"	10'-9"	22'-2"	89,000	-	-	-	X
3904-WT	39'-0"	14'-4"	25'-9"	121,000	-	-	-	X

DIMENSIONS

Part Number	Diameter	Eave Height	Overall Height	Nominal Capacity US Gallons	FS Roof Type	INV Roof Type	FR Roof Type	CHR Roof Type
3905-WT	39'-0"	17'-11"	29'-4"	153,000	-	-	-	X
3906-WT	39'-0"	21'-5"	32'-10"	185,000	-	-	-	X
4201-WT	42'-0"	3'-8"	16'-0"	30,000	-	-	-	X
4202-WT	42'-0"	7'-3"	19'-7"	67,000	-	-	-	X
4203-WT	42'-0"	10'-9"	23'-1"	104,000	-	-	-	X
4204-WT	42'-0"	14'-4"	26'-8"	141,000	-	-	-	X
4205-WT	42'-0"	17'-11"	30'-3"	178,000	-	-	-	X
4206-WT	42'-0"	21'-5"	33'-9"	214,000	-	-	-	X
4801-WT	48'-0"	3'-8"	17'-8"	36,000	-	-	-	X
4802-WT	48'-0"	7'-3"	21'-3"	85,000	-	-	-	X
4803-WT	48'-0"	10'-9"	24'-9"	132,000	-	-	-	X
4804-WT	48'-0"	14'-4"	28'-4"	180,000	-	-	-	X
4805-WT	48'-0"	17'-11"	31'-11"	229,000	-	-	-	X
4806-WT	48'-0"	21'-5"	35'-5"	276,000	-	-	-	X

USA: Oakboro, NC • Tel: (800) 772-1958 • Fax: (704) 485-8032 • www.braewater.com
Canada: Burlington, ON • Tel: (905) 332-4090 • Fax: (905) 332-7068 • www.braewater.ca

SERIES BFRP

BELOW GROUND FIBERGLASS TANKS

Designed to meet AWWA D120, NFPA 22, NSF 61 and IAPMO standards for water storage tanks. These fiberglass tanks are lightweight and watertight making them the perfect vessel for any water application. BFRP tanks are manufactured at multiple locations to serve North America. Fiberglass tanks are significantly lighter in weight than both steel and concrete tanks which make them much easier to ship and install. Typical installation is one day. Our fiberglass tanks are designed to be the perfect solution for water tank projects, whether the site is in a rural community, a remote location or the middle of a major metropolitan city.

ADVANTAGES

- Designed to meet AWWA D120, NFPA 22, NSF 61 and IAPMO standards for water storage
- Single source warranty
- Prefabricated design means tanks are delivered install ready
- Configurable design optimizes site specificity
- Water tight
- Lighter weight than steel and concrete tanks

FEATURES

- Extended warranty options
- Tanks are constructed on a rotating steel mold during the automated manufacturing process results in a consistent tank wall thickness
- Single piece tank barrel construction
- Prefabbed for controls, electrics and pump connections
- Suitable for HS20 traffic loads (32,000 lbs/axle)*

WARNING

Rainwater supplied by BRAE rainwater harvesting systems is not potable water and is not intended for potable water applications. Do Not Drink Water supplied from BRAE rainwater systems and related equipment. Users shall determine the suitability of the product for the intended application before using.

*Refer to suitable tank burial depths and tank overburden requirements as calculated by the project design engineer.

Series FRP Fiberglass Tanks

Job Name ____________________

Job Location ____________________

Engineer ____________________

Approval ____________________

Contractor ____________________

Approval ____________________

Contractor's P.O. No. ____________________

Representative ____________________

HOW TO ORDER

BFRP - ___ - ___ - ___ - ___ - ___ - ___ - ___ - ___ - ___ - ___ - ___ - ___ - ___

A B C D E F G H I J K L M

BFRP (Tank)

A Capacity (Gallons x 1,000)

B Tank Diameter (Feet)

4 Feet (4)
6 Feet (6)
8 Feet (8)
10 Feet (10)
12 Feet (12)

C Riser Position (see diagram below)

MA
MB
M2

D Riser Diameter

24"
30"
36"

E Riser Material**

PVC
FRP
FRPF (Flanged)

F Inlet Pipe (Position + Inches) -Includes calming inlet (Standard is Straight Pipe PVC)

NOTE: add an "F" for flanged Inlet Pipe

G Overflow Pipe (Position + Inches) (Standard is Straight Pipe PVC)

NO langed Overflow Pipe

H Tank Anchoring System***

Not Supplied (00)
Factory Supplied, includes deadmen, straps, turnbuckles (01)
Factory Supplied, includes straps & turnbuckles ONLY, contractor to supply concrete deadmen (02)

I Vent Diameter (Inches) (notes size of NPT coupling for vent pipe connection in top of tank barrel)

J Conduit Connection(s) (Riser) (Inches)

None (00)
Single 1" (25mm) Electrical Conduit Connection (01)
Double 1" (25mm) Electrical and Controls Conduit Connections (02)

K Plumbing connection (Riser) (Inches)

None (00)
Single 1" (25mm) NPT Connection (01)
Double 1" (25mm) NPT Connection - when direct makeup supply enters the tank (02)
Single 1-1/4" (32mm) NPT Connection (03)
Double 1-1/4" (32mm) NPT Connection - when direct makeup supply enters the tank (04)
Single 2" (50mm) NPT Connection (05)
Double 2" (50mm) NPT Connection - when direct makeup supply enters the tank (06)

L Equalization Pipe (Position L or R + Inches) (Standard is Straight Pipe PVC)

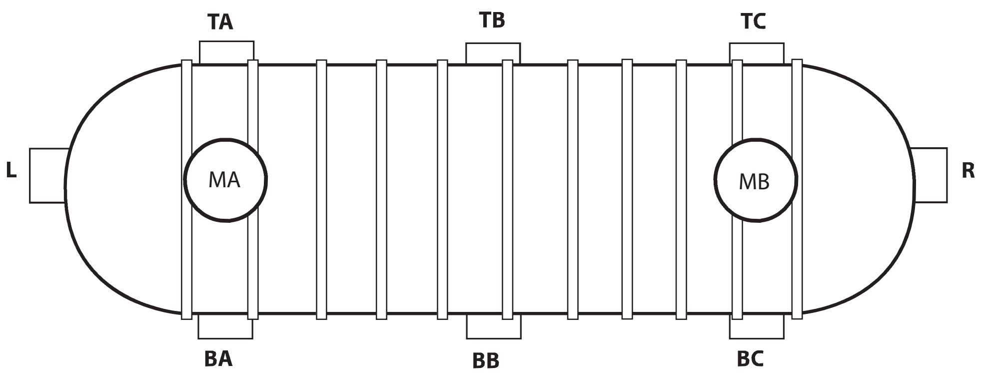
NOTE: add an "F" for flanged FRP Equalization Pipe

M NSF Liner

None (00)
Supply tank with NSF liner for potable water storage (01)

⚠ WARNING

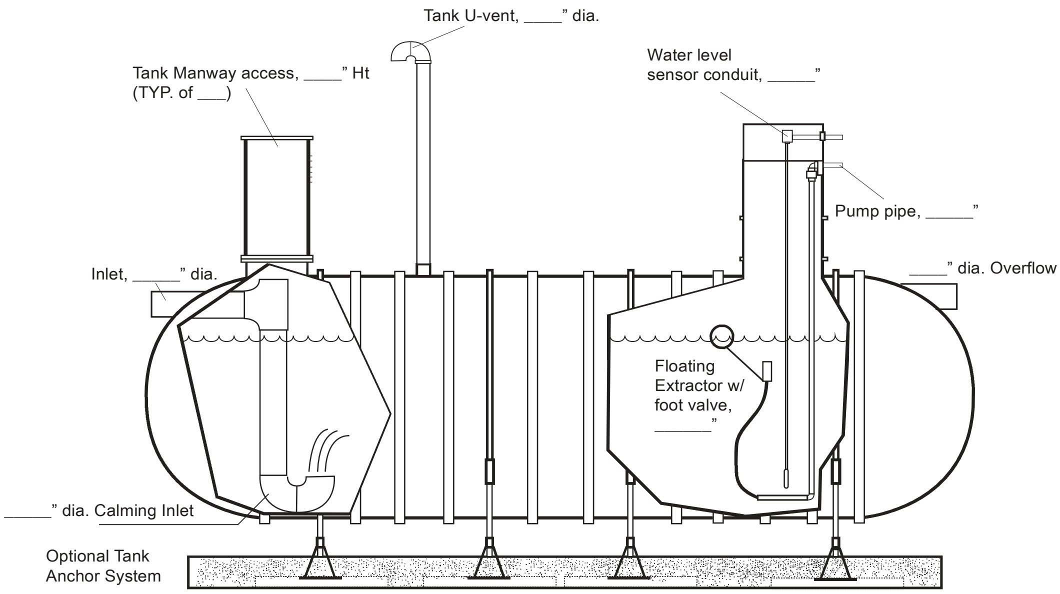
**Note: All BFRP tanks are shipped with a single riser constructed of FRP (no flange); second riser is standard PVC unless otherwise noted in design documents.
***CAUTION: It is the responsibility of the tank owner or tank owner's design engineer to determine the appropriate anchoring method and to design the anchoring system. Every site should be evaluated for buoyant conditions including but not limited to local water tables, flooding and trapped water. Failure to provide sufficient overburden and/or appropriate anchoring may result in tank failure and property damage may occur.



Tank Port locations

TANK DIMENSIONAL CHART

	Tank Capacity		Tank Length		Nominal Weight	
	Gallons	Liters	ft./in.	mm	lbs.	kg
4' Dia.	600	2294	7' 2"	2184	320	145
	1000	3657	11' 0"	3353	400	181
6' Diameter	2000	7976	11' 1-1/2"	3391	1050	476
	3000	12579	16' 1/2"	5029	1500	680
	4000	14983	19' 8-1/4"	6000	1650	748
	5000	18984	24' 7-1/4"	7500	2000	907
	6000	23390	29' 6-1/4"	8998	2300	1043
8' Diameter	4000	15135	13' 11"	4236	1550	703
	5000	18726	16' 8"	5080	1800	816
	6000	22322	19' 5"	5944	2050	930
	8000	29511	24' 11"	7595	2450	1111
	10000	36703	30' 5"	9296	2900	1315
	12000	43892	35' 11"	10947	3350	1520
	15000	55059	44' 5-1/2"	13564	4500	2041
10' Diameter	10000	38827	20' 5"	6248	3600	1633
	12000	44944	23' 4"	7112	4000	1814
	15000	57175	29' 1-1/2"	8871	4750	2155
	20000	75523	37' 4-1/2"	11386	6100	2767
	25000	94522	45' 11"	13995	7550	3425
	30000	112866	54' 2"	16510	8750	3969
	35000	131865	62' 8-1/2"	19114	10050	4559
	40000	150863	71' 3"	21717	11600	5262
	45000	169859	79' 10"	24333	12900	5875
	50000	188298	88' 1"	26848	14200	6450



Typical Tank Layout

BRAE™

ARCSA American Rainwater Catchment Systems Association

U.S. Green Building Council Member

Budgetary Estimate

Budget ID#: BR-R-41440_Austin Convention Center

Date: April 12, 2012
Blue Ridge Atlantic, Inc.
dba Blue Ridge Atlantic Enterprises
PO Box 643 Oakboro, NC 28129
www.braewater.com
800-772-1958 Tel
704-485-8032 Fax

To: ALL BIDDERS

Company:

Contact:

Project: Austin Convention Center

Scope: Rainwater System

X **Equipment** X **Supervised** [ ] **Turn Key** X **Please Reply**

This proposal is based upon review of the information emailed on 4-10-12. This estimate is based on an assumed GPM and all components will need to be confirmed as accurate prior to finalize design. The budgetary estimate does not represent an offer to sell.

Work not addressed in this specification section and not included in this quote is specifically excluded from this quotation. Please review the product-specific <u>SCOPE OF WORK NOTES</u> included in this document.

SCOPE OF WORK

It is the intention of this scope to provide a complete rain harvesting system designed to collect, filter, store and distribute rainwater of appropriate water quality for supplying pressurized non-potable water for irrigation and toilet flushing. Design, fabrication, testing and service shall be the sole responsibility of the rainwater control station manufacturer.

BRAE proposes two primary tasks for integrating systems specified in the Rainwater System Design for:
Austin Convention Center

Construction Coordination
Packaged System Delivery

I. Construction Coordination
-BRAE will coordinate with specialty trades to integrate rainwater system functional groups

II. Component Delivery
Contractor will be required to connect/pipe pump discharge piping from cistern to RCS and from RCS to points of use

A. Filtration

Three (3)	BRAE Model CDF-06 downspout inlet filter
Three (3)	BRAE Model TF-9-00-00 below grade inlet filter in a concrete vault

B. Cisterns

BRAE FRP below Ground Tank

Three (3) 50,000 Gallon below ground Fiberglass Tank (10' dia. x 88.1' long)

BRAE BCG above Ground Tanks:

Thirty-Four (34)	BRAE Model 1202-WT-CHR 5,700 Gallon Capacity
Two (2)	BRAE Model 1204-WT-CHR 11,700 Gallon Capacity
Four (4)	BRAE Model 2102-WT-CHR 17,000 Gallon Capacity

C. Rainset Control Station (RCS)
Four individual RCS, to pull from equalized tank fields

The Rainset Control Station (BRAE model: H2-ID2-FS-1-3-460-3-40-50-10) will include the following:

Water stored in cistern shall be pumped to the Rainset Control Station (RCS) prior to being sent to the end use. Pump shall have the following capacities and characteristics:

1. System capacity: 40 GPM
2. Number of Pumps: One
3. Each Pump:
    1. TDH: 150 feet
    2. Speed: 3450 RPM
    3. Horsepower: 3 hp
    4. Electrical: 460/3/60 Hz

To include:

Variable Speed pump system w/ Constant Pressure Controller. Controls and treatment will be mounted in an indoor enclosure. Water treatment includes a 25 micron strainer sediment screen w/ auto flush controller.

D. RCS Rainwater system accessories *Each RCS gets these accessories*

One (1)	BRAE Model BFE-02-BS-00-15 floating extractor, 2" dia. x 15' Long
One (1)	BRAE Model BPT-XX-00-20 Submersible pressure transmitter w/ 4-20 mA output
One (1)	BRAE Model WX-405-105 Hydro pneumatic Tank (Shipped Loose), 90 gallons
One (1)	BRAE Model BBC-150-5 sediment filter, 5 micron cartridge filer
One (1)	BRAE Model T1203-40 UV reactor with manual wiper

III. <u>Proposal Specifically excludes</u>: (Customer will be responsible for the following)

-Piping connections to rainset control station
-Piping connecting cistern pump discharge to control station location
-Electrical Service to rainset control station, cistern and grounding
-Foundation design and construction for rainwater system control station
-Roof Drain piping to cistern
-Sensor conduit/wiring connecting cistern with rainset control station
-Customer is responsible for any permits, waivers or Professional Engineering requirements
-Customer is responsible for unloading tank from delivery truck within 2 hours of trucks arrival to job site.
-Excavation, setting, backfill and associated installation requirements of cistern and related components
-Price does not include lifting equipment for basin inserts or tank or RSC
-Shall supply water for testing as required by BUYER

BUDGETARY ESTIMATE* $1,279,511.00** US dollars

Should onsite time be required, quote will increase at a rate of $600 per day plus Per Diem for commissioning, start-up and owner training

***TAXES & FREIGHT ARE APPLICAPABLE AND ARE SEPARATE FROM ABOVE QUOTED PRICE, WILL BE ADDED AT TIME OF INVOICING**

***PRICING INCLUDES LISTED EQUIPMENT**

***FOB SHIPPER/ PREPAY & ADD**

*We are pleased to price you on the above listed equipment and work subject to approval of the architect or engineer. Quantities listed are not guaranteed and should be verified. Prices will be adjusted accordingly. **This estimate is void after 30 days unless otherwise stated.** BRAE has based pricing upon all of the estimated (not guaranteed) quantities in this quotation. If buyer elects to purchase from seller only a portion of the quoted equipment, seller shall have the right to adjust its prices to reflect the impact of all resulting costs. Applicable taxes not listed above will be added. BRAE standard terms and conditions apply to this quote**. Lead times are calculated from time of order confirmation, account credit approval and receipt of signed/approved submittals. Lead time is 9-11 weeks.**

Submittals provided upon receipt of a purchase order. Please send PO to or contact your local Watts Drains agent

Submitted By:

BRAE Rainwater Technologies

Budget ID#: BR-R-4140_Austin Convention Center

Enclosures: BRAE Sales Terms and Conditions

ACCEPTED BY:

Accepted by: ___________________________

NAME/TITLE: ___________________________

Date: ___________________________

Company: ___________________________

Requested Delivery Date: ___________________________

Treatment Specific
Terms and Conditions of Sale

1.0 Price

1.1 Prices quoted are valid for 30 days from quote date
1.2 Prices are based on the purchase of all listed items
1.3 Prices are FOB origin with unloading by others
1.4 Final price is subject to change upon confirmation of system design parameters.
1.5 Price includes manway access for belo . PE tanks are shipped standard with a single 12" ht. Riser extension. Fiberglass below ground tanks do not include manway risers, manhole frames or covers unless otherwise noted in quote. Non-standard accessories may be provided at an additional cost.
1.6 Prices given do not include any Federal, State, local taxes, duties, tariffs or other expenses or assessments imposted on products and shipment of Seller. Any such taxes in effect at the time of shipment shall be paid by the Purchaser. Consequently, in addition to the quoted prices in effect at the time of sale, the amount of any such taxes will be paid by the Purchaser, or in lieu thereof, shall provide the Seller with the Tax Exemption Certificate and/or Resale Certificate acceptable to the taxing authorities.

2.0 Order Cancellation

2.1 Purchaser may cancel this order due to project cancellation. In the event of such cancellation, Purchaser will be liable for payment as follows: 15% of the quoted amount if the order is canceled prior to approval of submittals; 25% of the quoted amount if the order is canceled after the approval of submittals; 50% of the quoted amount if the order has been released to manufacture, plus any amounts Seller incurs from outside vendors (third party manufacturers, fabricators).
2.2 Orders canceled for reasons other than project cancellation may be billed at greater amounts at the sole discretion of Seller. Seller's security interest shall survive any cancellation or termination of this agreement.

3.0 Submittal Approval

3.1 Purchase acknowledges that Seller or his agent shall accomplish production of ordered products in accordance with approved submittals signed by Purchaser. Production of said products will commence only upon receipt of a signed purchase order and receipt by Seller of approved submittals.

4.0 Delivery and Installation

4.1 Purchaser agrees to provide suitable access for Seller's delivery trucks, traffic control and labor, and at least two people to assist in the unloading of the products.
4.2 Price includes one-hour waiting time and hour off-load time. Delays caused by the Purchaser, which are over and above the two-hour period, will be billed according to costs incurred.
4.3 Unit price does not include lifting equipment or unloading equipment of quoted products. Customer is responsible for supplying a crane or lifting equipment of sufficient lift and reach capacity and rigging for lifting system(s) and/or system components off delivery trucks, setting in place and all related construction and site activity to and from the system including bed preparation of crushed stone or other.
4.4 Seller will under no circumstances accept back-charges without prior written approval. Should problems arise during delivery/installation, Seller must be notified by Purchaser immediately. Failure to do so may result in additional costs to Purchaser that cannot be credited.
4.5 Purchaser agrees to provide a safe delivery site and comply with all Federal, State and local safety requirements. Purchaser further agrees to hold Seller harmless and to defend any and all actions, claims, suits, and proceedings that my subject Seller to liability due to Purchaser's failure to provide a safe delivery site.

5.0 Payment Terms

5.1 Payment terms are Net 30 days from date of invoice, subject to credit approval after receipt of acceptable credit references supplied by Purchaser.
5.2 Payment for purchase from Seller shall not be subject to retainage under any circumstances.

6.0 Notice Regarding Defective Materials

6.1 Should the products delivered hereunder not conform to the requirement s of this contract or be otherwise defective, Purchaser shall provide written notice to Seller within warranty period. If Purchaser fails to provide said written notice within this period, Purchaser shall have waived and relinquished all claims for replacement and repair of non-conforming or defective products. In the event that products fail to comply with the requirements of this contract, and Purchaser provides timely written notice, Seller will, at its discretion, repair, replace or refund the purchase prices, or portion thereof, of non-conforming or defective products within a reasonable amount of time.

7.0 Unqualified Acceptance

7.1 This agreement must be accepted on its exact terms. If Purchaser proposes additional or different terms, its response shall constitute a counter-offer and no contract shall come into existence without Seller's assent to the counter-offer terms.

8.0 Limitation of Liability

8.1 Seller's total liability for all losses and damages arising out of any and all causes whatsoever including, without limitation, defects in the goods, services or documentation supplied under this agreement, shall in no event exceed the purchase price of the applicable item(s).

Terms and Conditions of Sale

The following are the terms and conditions ("Terms and Conditions") for the sale of products ("Products") by Blue Ridge Atlantic, Inc. ("BRAE") to BRAE's customers ("Customers").

1. **ORDERS.** Orders will be initiated by Customer using a signed purchase order ("order") to BRAE. Purchase Orders will identify the Products, unit quantities, part numbers, descriptions, applicable prices and requested delivery dates. Orders are subject to BRAE's acceptance and to these Terms and Conditions. Customer may without charge, cancel an order for standard Products provided such order is scheduled for shipment by BRAE more than (sixty) 60 days after BRAE receives written notice of cancellation from Customer. Customer requests to cancel an order for standard Products scheduled for shipment by BRAE within sixty (60) days after BRAE receives written notice of cancellation may be accepted by BRAE in its sole discretion, which acceptance may be subject to Customer's accepting a charge determined in writing by BRAE. Customer requests to reschedule are subject to acceptance by BRAE in its sole discretion. Orders may not be canceled or rescheduled after delivery by BRAE to the carrier. Customer may not cancel orders for non-standard Products. Non-standard products, products which do not appear in the catalog or on BRAE's line card, products not customarily in stock, orders for value-added products, products to be assembled in kit form and products identified as "NCNR" or otherwise non-cancelable and non-returnable. Product specifications and availability are subject to change without prior notice. BRAE reserves the right to limit quantities.

2. **PRICES.** Orders are billed at the prices (in US dollars) in effect at the time of shipment. The catalog reflects the latest pricing information available at the time of printing. Prices shown in the catalog are subject to change without notice. If Customer does not purchase the quantity upon which quantity prices are based, customer will pay the non-discounted price for the quantity actually purchased and/or a cancellation or restocking fee. Prices for any rescheduled deliveries may be increased by BRAE in the event of an increase in BRAE's prices or costs or causes beyond BRAE's reasonable control.

3. **TERMS OF PAYMENT.** All purchase orders are subject to acceptance at company headquarters in Oakboro, North Carolina and are subject to credit approval by BRAE, which may in its sole discretion at any time change the terms of Customer's credit or require advance payment or payment by official bank check. Verification of acceptable credit and confirmation of order are required before production. A late fee of 1.5% of the unpaid balance will be charged per month on all accounts past due. If BRAE reasonably believes that Customer's ability to make payments is impaired, BRAE may cancel any order or remaining balance thereof, and Customer will remain liable to pay BRAE for Products already shipped. Customer will submit such financial information as BRAE may reasonably require for determination of credit terms. Checks are accepted subject to collection and the date of collection will be deemed the date of payment. Any check received from Customer may be applied by BRAE against any obligation owing by Customer to BRAE under this or any other contract, regardless of any statement appearing on or re to such check, without discharging Customer's liability for any additional amounts owing by Customer to BRAE. The acceptance by BRAE of such check will not constitute a waiver of each invoice fr E's right to pursue the collection of any remaining balance. Customer will pay the entire net amount of each invoice from BRAE pursuant to the terms of such invoice without offset or deduction. Invoices not paid when due will bear interest to date of payment at the annual rate of eighteen (18%) percent of such lower rate as may be the maximum permitted by law. If Customer fails to make payment when due BRAE may pursue any legal or equitable remedies, in which event BRAE will be entitled to reimbursement for costs of collection and reasonable attorney's fees. COD order minimum is $250.00. COD orders totaling $300.00 or more must be paid with certified funds (certified check, money order or cashier's check). Most carriers will not accept cash and require payment by check of some form regardless of the total. There is a $25.00 service charge on all returned checks.

4. **SALES TAX.** BRAE is required by la to collect all Federal, State and Local sale, use, excise and similar taxes that apply to a Customer's shipment. These taxes are in addition to the purchase price of the Products subject to an order. Since laws vary from state to state, please remit the correct tax for your area. If you are exempt from tax, an original signed tax exemption certificate must be sent to BRAE. Without a valid signed tax exemption certificate on file at BRAE, all applicable taxes will be charged to the Customer.

5. **DELIVERY AND TITLE.** BRAE will make reasonable efforts to initiate shipment and schedule delivery as close as possible to Customer's requested delivery date(s). Customer acknowledges that delivery dates provided by BRAE are estimated only and that BRAE will not be liable for failure to deliver on such dates. Selection of the carrier and delivery route will be made by BRAE unless specifically designated by Customer. All shipments by BRAE are FOB point of shipment from BRAE's facility and the amount of all transportation charges shall be paid to BRAE by the Customer in addition to the purchase price of the Products. Subject to BRAE's right of stoppage in tr t, delivery to a carrier will constitute delivery to Customer, and risk of loss will thereupon pass to Customer; however, title shall remain in BRAE until payment in full for the Products by Customer. Products invoiced and held by BRAE at Customer's request will be held at Customer's risk and expense. Delivery of any installment of Products within thirty (30) days after the date requested will constitute a timely delivery. Thereafter, delivery will be timely unless prior to shipment. BRAE has received written notice of cancellation valid under Section 1. Delivery of a quantity which does not vary by more than ten percent (10%) from the quantity specified therefore will constitute full performance of such delivery. Delay in delivery of one installment will not entitle Customer to cancel any other installment(s). APO and FPO Shipments will be routed Parcel Post. Insured, with a maximum size of 130 inches (length plus girth) and a maximum weight of 70 pounds. For faster delivery, specify Priority or Express Mail. Common Carrier Truck. Large items, heavy loads and special handling can be shipped economically via common carrier truck. Any shipment weighing less than 100 pounds will be charged at the minimum 100-pound rate as specified by truck carriers. Air Freight, including same-day, counter-to-counter, door-to-door, next day, 2nd day and 3rd day methods are available at the Customer's expense.

6. **LIMITED WARRANTY AND LIMITATION OF LIABILITIES.** BRAE warrants to Customer that Products purchased hereunder will conform to the applicable manufacturer's specifications for such Products and that any value-added work performed by BRAE on such Products will conform to applicable Customer's specifications relating to such work. BRAE makes no other warranty, express or implied, with respect to the Products. IN PARTICULAR, BRAE MAKES NO WARRANTY RESPECTING THE MERCHANTABILITY OF THE PRODUCTS OR THEIR SUITABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE OR RESPECTING INFRINGEMENT. However, BRAE will transfer to Customer whatever transferable warranties and indemnities BRAE receives from the manufacturer of the Products. With respect to Products which do not meet applicable manufacturer's specifications and with respect to value-added work by BRAE which dos not meet applicable Customer's specifications, BRAE's liability is limited (at BRAE's election) to (1) refund of Customer's purchase price for such Products (without interest), (2) repair of such Products, or (3) replacement of such Products; provided, however, that such Products must be returned to BRAE, along with acceptable evidence of purchase, within twenty (20) days from date of delivery, transportation charges prepaid. Further, no warranty will apply if the Product has been subject to misuse, static discharge, neglect, accident or modification, or has been soldered or altered in any way. CUSTOMER SHALL NOT IN ANY EVENT BE ENTITLED TO, AND BRAE SHALL NOT BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE INCLUDING, WITHOUT BEING LIMITED TO, LOSS OF PROFIT, PROMOTIONAL OR MANUFACTURING EXPENSES, OVERHEAD, BUSINESS INTERRUPTION COSTS, LOSS OF DATA, REMOVAL/REINSTALLATION COSTS, INJURY TO REPUTATION OR LOSS OF CUSTOMERS. CUSTOMER'S RECOVERY FROM BRAE FOR ANY CLAIM SHALL NOT EXCEED CUSTOMER'S PURCHASE PRICE FOR THE PRODUCTS IRRESPECTIVE OF THE NA E OF THE CLAIM WHETHER IN CONRACT, TORT, WARRANTY, OR OTHERWISE.

7. **DATA ERRORS AND OMISSIONS.** BRAE makes every effort to ensure the accuracy of the information published in our catalogs and on our Internet site. However, all Product specific information is provided to BRAE by the manufacturers, who are solely responsible for its content and accuracy. The

documents and graphics published may contain technical inaccuracies or typographical errors. BRAE makes no representations about the information and graphics presented. All such documents and graphics are provided "as-is" without warranty of any kind.

8. **PRODUCT RETURNS.** Customer is deemed to have accepted the Products unless written notice of rejection is received by BRAE within ten (10) days after delivery. Customer waives any right to reject or revoke acceptance thereafter. Authorization to return Products must be obtained from BRAE, which authorization may be granted by BRAE in its sole discretion. If granted, BRAE will issue Customer a return material authorization Number (RMA No.). No return of Products will be accepted without an RMA number. Returned Products must be in original shipping cartons and must be complete with all packing materials and in re-sellable condition. Return freight charges must be prepaid by Customer and, as BRAE is not responsible for returned Products lost in transit. BRAE strongly suggests the Customer insures their package. If returned Products are claimed to be defective, a complete written description of the nature of the defect must accompany all returned Products. Product returned due to Customer error may be subject to a restocking fee. All items not eligible for return will be returned to Customer, transportation collect. Non-standard Products may not be returned. Products returned due to Customer error may be subject to a restocking fee.

9. **SHIPMENT DAMAGE.** Product shipped from BRAE's distribution center is carefully packed in compliance with manufacturer and carrier requirements. Claims for loss or damage in transit must be made with the carrier by Customer. All shipments should be fully unpacked and inspected immediately upon receipt. It is important to keep the shipping carton, packing material and parts inta t for inspection by the carrier's agent. Visible Loss or Damage. Any external evidence of loss or damage must be noted on the freight bill or carrier's receipt and signed by the carrier's agent. Failure to do this will result in the carrier refusing to honor the claim. For your protection our billing includes insurance for damage or loss in transit. Concealed Loss or Damage. If damage is not discovered until the shipment is unpacked, make a request for inspection by the carrier's agent and file a claim with the carrier.

10. **STATEMENTS AND ADVICE.** If statements or advice, technical or otherwise, are offered or given to Customer, such statements or advice will be deemed to be given as an accommodation to Customer and without charge and BRAE will have no responsibilities or liabilities whatsoever for the content or use of such statements or advice.

11. **FORCE MAJEURE.** BRAE will not be liable for delays in delivery or for failure to perform its obligations due to causes beyond its reasonable control, including, but not limited to, product allocations, material shortages, labor disputes, transportations delays, unforeseen circumstances, acts of God, acts or omissions, riots, or war. BRAE's time for delivery or performance will be extended by the period of such delay or BRAE may, at its option, cancel any order or remaining part thereof without liability by giving notices to Customer.

12. **GENERAL.** The Terms and Conditions may not be modified or cancelled without BRAE's written agreement. The sale of Products hereunder will be governed by the Terms and Conditions, notwithstanding contrary or additional terms and conditions in any order purchase order, planning schedule, acknowledgment, confirmation or any other form or document issued by either party effecting the purchase and/or sale of Products. Nor rights, duties, agreements or obligations hereunder may be assigned or transferred by Customer without the prior written consent of BRAE. The obligations, rights, terms and conditions hereof will be binding upon and inure to the benefit or the parties hereto and their successors and permitted assigns. The waiver or any breach of any term, condition or covenant hereof or default under any provision hereof will not be deemed to constitute a waiver of any other term, condition, or covenant contained herein or of any subsequent breach or default of any kind or nature. Any provision hereof which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition or unenforceability without invalidating the remaining provisions hereof in that jurisdiction of affecting the validity or enforceability of such provision in any other jurisdictions. The Terms and Conditions will be governed by and construed in accordance with the laws of the state of North Carolina and the applicable laws of the United States. Customer will not directly or indirectly export, re-export, sell or transfer any Product to any country for which an export license or other governmental approval is required without first obtaining all licenses and other approvals. BRAE hereby disclaims any interest in the trademarks, trade names, service marks, logs, copyrights, patents, domain names and other intellectual property of third parties.