Request for Qualifications (A/E)

State Architect's Office
4200 Surface Road
Columbus, Ohio 43228-1395

http://ohio.gov
Phone 614-644-7969

Administration of Project: State Architect's Office

Project Name	Emergency generator power back up to the York chillers	Response Deadline	Aug. 10, 2012 | 4:00 pm local time
Project Location	30 W. Spring Street	Project Number	BWC-130001
City / County	Columbus / Franklin	Project Manager	Nick Cassidy
Agency/Institution	State Architect's Office	Contracting Authority*	State Architect's Office

**The Contracting Authority for SAO-administered projects is the State Architect's Office. The Contracting Authority for locally administered projects is the state agency or institution of higher education.*

No. of paper copies requested (stapled, not bound) **0** No. of electronic copies requested on CD (PDF) **4**

Submit the requested number of Statements of Qualifications (SAO Form F110-330) directly to the following address: State Architect's Office, Attention: Program Services, 4200 Surface Road, Columbus, Ohio 43228.

See Section H for additional submittal instructions.

Project Overview

A. Project Description

This project is for the installation of an emergency power supply to two (2) of the William Green Building York chillers and related support equipment. This work is to be accomplished in accordance with the concepts presented in DLZ's Emergency Power Study (dated April 18, 2012), which is included and incorporated as an attachment to this request. In addition to addressing the installation of an emergency power supply to the York chillers, the study also made recommendations regarding the existing Chiller 5 and Chiller 6 plants.

Per the study's recommendations, both chiller plants are to be abandoned upon completion of the primary project scope. Furthermore, it should be noted that the piping reconfigurations required to abandon the Chiller 6 plant are currently in progress, and as such, are to be specifically excluded from this project scope.

However, the scope to disassemble and remove the Chiller 5 and Chiller 6 plants from the William Green Building should be included and addressed as two separate bid alternates for the Owner's consideration.

The William Green Building is a 33 story high rise that houses the Ohio Bureau of Workers' Compensation and several other state agencies. The 15th floor is a data center that runs 24 hours per day 365 days per year. Under no circumstances may power or chilled water be cut off from this floor during the design or installation of this emergency power circuit.

B. Scope of Services

For projects advertised with an appropriately developed Program of Requirements (POR), upon award of the Agreement, commence with Design. For projects without such POR, upon award of the Agreement, commence by developing the Program of Requirements.

The selected firm shall perform the necessary site investigations, surveys and assessments to complete the design of the changes to the building's emergency power system. This information shall be used to prepare the project design, cost estimates, the preparation of bidding documents for construction and construction administration services.

As required by the Agreement, and as properly authorized, provide the following categories of services: Schematic Design, Design Development, Construction Document Preparation, Bid and Award Support, Permits, Construction Phase, Project Schedule, Testing and Inspection, Punchlist and Post Construction Phase.

Refer to the SAO Manual for additional information about the type and extent of services required for each. During the construction phase provide not less than four (4) hours on site each week, including attendance at progress meetings and brief summation reports of each visit.

For purposes of completing the Relevant Project Experience Matrix in Section F of the Statement of Qualifications (SAO Form #F110-330), below is a list of relevant scope of work requirements for this RFQ:

1. Electrical distribution systems
2. Emergency power systems design and installation
3. Electrical and cooling requirements for data centers
4. Renovation of occupied buildings
5. State of Ohio capital improvement projects
6. OAKS CI experience

C. Funding / Estimated Budget

Total Project Cost	$978,000	State Funding	$978,000
Construction Cost	$760,000	Other Funding	$0
Estimated A/E Fee	8.3% to 8.3%		

NOTE: The A/E fee percentage for this project includes all professional design services, and consultant services necessary for proper completion of the Basic Services for the successful completion of the project, including but not limited to: review and verification of the Program of Requirements provided by the Owner, validation of existing site conditions (but not subsurface or hidden conditions), preparation of cost estimates and design schedules for the project. Fees may be negotiated and allocated for Additional Services (e.g., creation of a Program of Requirements, extensive evaluation or validation of site conditions, extensive pre-design investigations, code-required special inspection and testing, Quality Assurance testing during the construction period, and testing due to unforeseen conditions).

D. Services Required (see note below)

Primary	Electrical Engineering
Secondary	
Other(s)	

E. Anticipated Schedule

Professional Services Start (mm/yy)	09/12
Construction Contracts Start (mm/yy)	12/12
Construction Contracts Completed (mm/yy)	06/13
Professional Services Completed (mm/yy)	06/13

F. EDGE Participation Goal

Percent of *initial* TOTAL A/E Fee	5.0%

NOTE: The primary A/E shall be (1) a registered architect holding a license and certificate of authorization issued by the Ohio Architects Board pursuant to O.R.C. Chapter 4703, (2) a landscape architect holding a license and certificate of authorization issued by the Ohio Landscape Architects Board pursuant to O.R.C. Chapter 4703, or (3) a professional engineer or professional surveyor holding a license and certificate of authorization issued by the Ohio Engineers and Surveyors Board pursuant to O.R.C. Chapter 4733.

G. Evaluation Criteria for Selection

Demonstrated ability to meet Owner's programmed project vision, scope, budget, and schedule on previous projects. Previous experience compatible with the proposed project (e.g., type, size). Relevant past work of prospective firm's proposed consultants. Past performance of prospective firm and its proposed consultants. Qualifications and experience of individuals directly involved with the project. Proposer's previous experience (numbers of projects, sizes of projects) when working with its proposed consultants. Specification writing credentials and experience. Experience and capabilities of creating or using Critical Path Method (CPM) schedules and of using CPM schedules as a project management resource. Approach to and success of using partnering and Alternative Dispute Resolution. Proximity of prospective firms to the project site. Proposer's apparent resources and capacity to meet the needs of this project. The selected A/E and all its consultants must have the capability to use the Internet within their normal business location(s) during normal business hours.

Interested A/E firms are required to submit the Commitment to Participate in the EDGE Business Assistance Program form in its Statement of Qualifications (SAO Form #F110-330) submitted in response to the RFQ, to indicate its intent to contract with and use EDGE-certified Business Enterprise(s), as a part of the A/E's team. The Intent to Contract and to Perform and / or waiver request letter and Demonstration of Good Faith Effort form(s) with complete documentation must be attached to the A/E's Technical Proposal. Both forms can be accessed via the SAO website at http://ohio.gov/sao (click on Forms). The Intent to Contract and to Perform form is again required at the Fee Proposal stage.

For all Statements of Qualifications, please identify the EDGE-certified Business Enterprises, by name, which will participate in the delivery of the proposed professional services solicited in the RFQ.

Prior to executing the Architect/Engineer Agreement, the selected A/E must represent and warrant that it has not provided any material assistance, as that term is defined in O.R.C. Section 2909.33(C), to an organization that is identified by, and included on, the United States Department of State Terrorist Exclusion List and that it has truthfully answered "no" to every question on the Declaration Regarding Material Assistance/Non-Assistance to a Terrorist Organization, and that it has provided or shall provide such to the Contracting Authority and/or the Ohio Business Gateway (https://ohiobusinessgateway.ohio.gov/OBG/Membership/Security.mvc).

H. Submittal Instructions

Firms are required to submit the current version of Statement of Qualifications (SAO Form F110-330) available via the SAO website at http://ohio.gov/sao (click on Forms).

Paper copies of the Statement of Qualifications are not required. Cover letters and transmittals are not necessary. Electronic submittals should be combined into one PDF file named with the project number listed on the RFQ and your firm's name. Use the "print" feature of Adobe Acrobat Professional or similar software for creating a PDF rather than using a scanner. If possible, please reduce the file size of the PDF. In Adobe Acrobat Professional, go to Advanced, then PDF Optimizer. Also, please label the CD and the CD cover with the project number and firm name.

Submit all questions regarding this RFQ in writing to StateArchOff@das.state.oh.us with the project number included in the subject line (no phone calls please). Questions will be answered and posted to the OAKS Capital Improvements (OAKS CI) website at http://ci.oaks.ohio.gov on a regular basis until approximately one week before the response deadline. The Question & Answer (Q&A) document can be found by downloading a new version of the RFQ or by clicking on the Q&A link to the right of the project listing. The name of the party submitting a question will not be included on the Q&A document.

Architect/Engineer Selection Rating

State Architect's Office
4200 Surface Road,
Columbus, Ohio 43228-1395

http://ohio.gov
Phone 614-644-7969

Project Name: Emergency generator power back up to the York chillers

Proposer Firm: _____

Project Number: BWC-130001

City, State, Zip: _____

Selection Criteria		Value	Score
1. A/E Firm Location (5 points)			
Proximity of primary A/E firm office where majority of work is to be performed in relationship to project site	Less than 10 miles	4 - 5	
	10 to 50 miles	2 - 3	
	More than 50 miles	0 - 1	
2. A/E Firm Size (5 points)			
Number of relevant licensed professionals within primary A/E firm available to perform the work.	Small = Less than 5 licensed professionals	1 - 5	
	Medium = 5 to 10 licensed professionals	5 - 5	
	Large = More than 10 licensed professionals	5 - 5	
3. Current Workload (5 points)			
Amount of fees awarded by the Contracting Authority to the primary A/E Firm in the previous 24 months (exclude projects on hold)	Less than $100,000.00	4 - 5	
	$100,000.00 to $250,000.00	2 - 3	
	More than $250,000.00	0 - 1	
4. Primary A/E Qualifications (30 points)			
a. Project Management Lead	Experience / ability of A/E project manager to manage scope / budget / schedule / quality	0 - 10	
b. Project Design Lead	Experience / creativity of lead designer to meet needs of owner	0 - 5	
c. Technical Staff	Experience / ability of technical staff to develop quality construction documents	0 - 5	
d. Construction Administration	Experience / ability of field representative to identify / solve issues during construction	0 - 10	
5. A/E Consultant Qualifications (10 points)			
Key Discipline Leads	Experience / ability of all key discipline leads to effectively perform the work	0 - 10	
6. Project Team Qualifications (15 points)			
a. Previous Team Collaboration Number of projects that a majority of the team members have worked together	Less than 5 projects (Low)	0 - 1	
	5 to 10 projects (Average)	2 - 3	
	More than 10 projects (High)	4 - 5	
b. LEED* Experience within Team	LEED AP(s)** on Team	0 - 1	
	LEED Registered Project(s)	0 - 2	
	LEED Certified Project(s)	0 - 2	
	Satisfies ALL above Criteria	Sum = 0 - 5	
c. Team Organization	Clarity of responsibility / communication demonstrated by table of organization	0 - 5	
7. Overall Project Team Experience (30 points)			
a. Budget and Schedule Management	Performance in completing projects within original budget and schedule limitations	0 - 5	
b. Experience with Similar Project Type	Less than 3 projects (Low)	0 - 3	
	3 to 6 projects (Average)	4 - 6	
	More than 6 projects (High)	7 - 10	
c. Past Performance	Level of performance as indicated by past A/E evaluations / letters of reference	0 - 5	
d. Knowledge of State of Ohio Capital Project Administration Process	Less than 3 projects (Low)	0 - 3	
	3 to 6 projects (Average)	4 - 6	
	More than 6 projects (High)	7 - 10	
* LEED = Leadership in Energy & Environmental Design developed by the U.S. Green Building Council ** LEED AP = LEED Accredited Professional credential by the Green Building Certification Institute		**Subtotal**	

Notes:

Evaluator:

Name _____

Signature _____ Date _____

DLZ

ENGINEERS ! ARCHITECTS ! SCIENTISTS
PLANNERS ! SURVEYORS

April 18, 2012

BWC Purchasing, L24
30 W. Spring Street
Columbus, Ohio 43215

Subject: Emergency Power Study for the William Green Building Chiller Plant
KM-RFQ12-24

We are pleased to submit our Emergency Power Study for the William Green Building Chiller Plant. Our assessment is based on our meeting and site visit conducted February 13th and the BWC Chiller/Ice Tank Replacement study report dated March 01, 2010.

SCOPE OF WORK

The primary focus of this study is to:

1. Study existing electrical systems associated with the backup power generation (such as capacities, wiring diagrams, etc).
2. Determine the ability of the existing backup system to power one new chiller and associated equipment. Note that the intention is to have two (2) of the four (4) new chillers wired for backup power (for the purpose of redundancy), but to operate only one chiller to cool the building's data center in the event of a building power failure.
3. Define possible methods to accomplish this goal.
4. Evaluate the need (or lack thereof) for replacing Chiller 5.
5. If Chiller 5 is not required, develop the requirements for abandoning this system in place.
6. Determine the initial and life cycle cost(s) for the above options.

The secondary requirements:

The secondary focus of this study is to evaluate the feasibility of combining the Chiller 6 package cooling loop with the main building cooling loop supplied by the four (4) new chillers, and potentially abandoning the Chiller 6 package.

1. Study the piping systems for both the building chilled water system and the Chiller 6 package chilled water system.
2. Determine if the building system is capable of supplying the requirements of the Chiller 6 system (both temperature and volume).
3. Define possible methods to accomplish this goal.
4. If the Chiller 6 package is no longer required, develop the requirements for abandoning this system in place.
5. Determine the initial and life cycle cost(s) for the above.

SUMMARY

The following discussion and life cycle cost analysis indicates that it will be beneficial to the Bureau of Workers Compensation to place two of the four Main Building's chillers on the backup generator power system. This will allow the Data Center chilled water system to take advantage of the N + 1 redundancy. Abandoning chiller 6 allows the electrical closets to take advantage of the free cooling and operate at a higher efficiency. The estimated cost for the Main Building's chilled water system electrical work is $880,000 with an immediate cost savings. The initial cost for piping the electrical closets onto the Main Building's chilled water system is $16,250 with a payback period of 4.1 years.

GENERAL

Presently, the building's electrical system is backed up with three (3) generator sets. The new chiller plant, which is located on Level 13, is only served by normal building power. Chiller 5, which is located on Level 31, is the only chiller currently designed to run on generator power in the event of a power loss to the building.

Providing emergency power for Chiller #1 or Chiller #2 and the associated chilled water pumps, condenser water pumps, and cooling tower, fans will require the changes listed below.

Second Basement: The Existing Automatic Synchronizing Generator Switchgear,feeds all the emergency power in the building to the existing Transfer Switches. A 1000 amp Bolted Fused Pressure Switch will be removed, and replaced with a 1200 amp Bolted Fused Pressure Switch to feed the existing 1200 amp 480 volt 3 phase 3 wire Bus Duct to the 31st floor. The existing 1200 amp Bus duct would be tapped on the 13th floor and connected to the EMERGENCY connection of the New 2000 Delayed Automatic Transfer Switch on the 13th or 14th floor for the chillers. The New Automatic Transfer Switch is sized at 2000 amps to carry the combined load of Chiller #1 and #2 on the normal feeder.

Generator Switchgear

14th Floor: The two 1200 amp Bolted Fused Pressure Switches for Chiller #1 and Chiller #2 in the existing Motor Control Center Switch #3 would be relocated and reconnected to chillers #1 and #2 A new2000 amp Bolted Pressure Switch, fused at 2000 amps would be installed in existing Motor Control Center #3 to feed the NORMAL connection of the new 2000 amp Transfer Switch.

13th Floor: A new 2000 amp 480 volt New Motor Control Center (NMCC) would be installed, to feed from the New 2000 amp Automatic Transfer Switch, with the two relocated 1200 amp Bolted Pressure Switches fused at 1000 amps in the (NMCC) for existing Chillers #1 and #2.

32nd Floor: The existing Computer Control Center #1 would remain, but the existing equipment for Chiller System #6 would remain, and two new 60 amp fused disconnect switches would be installed to feed the existing starters in Motor Control Center #5 for Cooling Towers Fans #1 and #2.

The existing 1200 amp Emergency Bus Duct only has capacity for one Chiller, and one Cooling Tower Fan. Therefore the remaining pumps for Chiller System #1 and #2 will have to be connected to another Emergency Bus Duct

13th Floor: The existing 1350 amp Bus Duct for Life Safety is only loaded to 500 amps The 1350 amp Bus Duct would be tapped and extended to a New Delayed Automatic Transfer Switch on the 13th floor for Chilled Water Pumps #1 and #2, Condenser Water Pumps #1 and #2, and Chiller Oil Sump Pumps #1 and #2 for an additional load of 216 amps. The National Electric Code does not allow mechanical equipment to be connected to a Life Safety Transfer Switch, it must be connected to a delayed transfer switch.

With the arrangement of the above mentioned electrical distribution, Chiller #1 and #2 will be connected to emergency power, but only one Chiller will run on Emergency Power. The same for the Cooling Tower Fans #1 and #2, Chilled Water Pumps #1 and #2, and Condenser Water Pumps, #1 and #2 are connected to Emergency Power, but the Building Automation System will be programmed to allow only one Chiller, one Chilled Water Pump, one Condenser Water Pump, and one Cooling Tower Fan to run on Emergency Power.

The above changes can be made without interruption to Normal Power and Lighting in the Building, with temporary connections to the Pumps for chiller systems #3 and #4.

The operation of Chillers #1 or #2 on Emergency Power will require an additional load of 578 amps above what Chiller #5 required on Emergency Power. The new Emergency Electrical Load will be 2320 Amps, which will require the 3 Existing Emergency Generators to run to provide addition capacity for the one Chiller System to run on Emergency Power
See the following electrical load summary.

The total estimated cost for the above described electrical work is $750,000.00. This includes utilizing the existing star-delta starters for the 700 HP Chillers #1 and #2. Changing the starters for Chillers #1 and #2 to Soft Start Electronic Starters, would reduce the current inrush and reduce the voltage drop when the chiller starts. The costs of the2 Soft Start Starters is estimated at additional $130,000.00, with a total of $880,000.00.

Electrical Load Summary

BWC CHILLER #1 OR #2 EMERGENCY ELECTRICAL LOADS

Chiller 700 HP	830 amps
Chilled Water Pump 100 HP	124 amps
Condenser Water Pump 75 HP	96 amps
Chiller Oil Sump Pump 7.5 HP	11 amps
Cooling Tower Fan 25 HP	34 amps

Total Amps for One 700 HP Chiller System	1095 amps

EXISTING CHILLER #5 EMERGENCY ELECTRICAL LOADS
Computer Control Center #1

Chiller #5 345KW	415 amps
Chilled Water Pump #5 25 HP	34 amps
Condenser Water Pump #5 25 HP	34 amps
Cooling Tower Fan #5 25 HP	34 amps

Total amps for existing Chiller #5 System	517 amps

Additional Loads on Normal and Emergency

Cooling Tower Fan #1	34 amps
Cooling Tower Fan #2	34 amps

Total Electrical load for Computer Control Center #1	585 amps

BWC CHILLER #1 and #2 NORMAL ELECTRICAL LOADS

Chiller #1 700 HP	830 amps
Chiller #2 700 HP	830 amps
	_____
Total Load on 2000 amp Normal Bus Duct	1660 amps

BWC CHILLER #1 OR #2 EMERGENCY ELECTRICAL LOAD
1200 AMP EMERGENCY Bus Duct

Chiller 700 HP	830 amps
Cooling Tower Fan #1	34 amps
Total Emergency Load on 1200 amp Bus Duct	864 amps

1350 amp EMERGENCY BUS DUCT LOADS

Existing Load on Automatic Transfer Switch #2 and Emergency Switchboard #2	500 amps
Chilled Water Pump 100 HP	124 amps
Condenser Water Pump 75 HP	96 amps
Chiller Oil Sump Pump #2 7.5 HP	11 amps
Total Emergency Amps for 1350 Bus Duct	731 amps

1350 amp NORMAL BUS DUCT LOADS

Existing Load on Automatic Transfer Switch #2 and Emergency Switchboard #2	500 amps
Chilled Water Pump #1 100 HP	124 amps
Chilled Water Pump #2 100 HP	124 amps
Condenser Water Pump #1 75 HP	96 amps
Condenser Water Pump #2 75 HP	96 amps
Chiller Oil Sump Pump #1 7.5 HP	11 amps
Chiller Oil Sump Pump #2 7.5 HP	11 amps
Total Normal Amps for 1350 Bus Duct	962 amps

EMERGENCY GENERATOR LOADS	480 volt 3 phase 3 wire	
Existing Automatic Transfer Switch #1 2nd Basement	(Emergency Switchboard #1)	110 Amps
Existing Automatic Transfer Switch #2 14th Floor	(Emergency Switchboard #2)	500 Amps
Existing Automatic Transfer Switch #3 31st Floor	(Emergency Switchboard #3)	250 Amps
Existing Manual Transfer Switch #1 16th Floor	(Computer Switchboard #1)	140 Amps
Existing Manual Transfer Switch #2 31st floor	(Computer Control Switch #1)	68 Amps
New 2000 amp Transfer Switch #3 for 750 HP Chiller		830 Amps
New 400 amp Transfer Switch		462 amps
New Total Emergency Load		2360 Amps

Chiller 5

This Dunham-Bush water-cooled centrifugal chiller is located on level 31 and serves as a backup chiller for cooling the Data Center. This chiller has a manual electrical transfer switch to allow operation on the backup generators. As discussed above, the backup generators are to be configured for operating one of the main buildings's cooling chillers and not this chiller 5 unit.

The Data Center chilled water piping is served off of the secondary chilled water loop which originates on level 14 and is distributed to the computer room air handling units on level 15. This area is currently served by the Main Building's cooling system. No additional piping is required if chiller 5 is abandoned. The free-cooling heat exchanger located on level 31 would remain operational. The piping arrangement currently allows the chiller to be bypassed during the free cooling mode. No piping changes are required to abandon the chiller in place.

Chiller 5

Free Cooling Heat Exchanger

The existing chilled water capacity (3 of 4 chillers operating) of the Main Building's cooling loop is designed for 1,950 tons of cooling. The estimated building load is reported at 1,526 tons. The future anticipated load for the Data Center (chiller 5) is 340 tons. This load has been included in the recent chiller upgrade project. The Main Building's chilled water plant has been designed with an N + 1 redundancy.

The alternate to configuring the Main Building's chiller plant to the existing backup generator would be to replace the Data Centers chiller plant. The current Data Center chilled water plant does not include an N + 1 redundancy. There is only one chiller system available. Chiller 5 is at the end of the normal life expectancy for a water cooled centrifugal chiller. To achieve the desired N + 1 system redundancy; two chillers, two cooling towers and duplicate pumping would be required. The floor space available for this does not exist. Additional space would need to be created. This may mean that a couple of the abandoned ice tank structures would need to be removed. Piping would have to be routed from level 15 to the roof. The estimated cost for the N + 1 Data Center chilled water system on level 13 would approach the $1,185,000 expended for the electrical revisions.

Life Cycle Cost Analysis

Abandoning Chiller 5 and placing two of the four Main Building chillers on the existing backup generator system is the recommended approach. The benefits include;

1. Chiller water would be available during a power outage.
2. An N + 1 redundancy would be provided.
3. Operational cost would be based on the new chillers with a 0.395 kW/Ton rating.
4. Additional floor space is not required.
5. The Main Building's chilled water plant has been sized for this load.
6. No additional chiller, tower and pump maintenance cost.

The alternate approach would include developing an N + 1 Data Center chilled water plant. The disadvantages include:

1. Two additional chillers and towers, six additional pumps to maintain
2. Floor and roof space in not readily available
3. No operational savings, new chiller would match the Main Building's chillers
4. Construction for piping from level 13 to the roof would be required.

The operating and installation cost are equal in this analysis. The difference is in the maintenance cost. A life cycle cost analysis is not applicable. For each year the alternate Data Center chiller water plant is operated, additional cost are incurred in maintenance.

It is recommended to abandoned chiller 5 and place two of the four Main Building's chillers on the existing generators.

<u>Chiller 6</u>

Evaluation

The secondary focus of this study is to evaluate the feasibility of combining the Chiller 6 package cooling loop with the main building cooling loop supplied by the four (4) new chillers, and potentially abandoning the Chiller 6 package.

Chiller 6 system

Chilled Water Pumps

Currently there is no chilled water piping connections to the main building cooling loop. The Chiller 6 package, which is located on Level 33, is a set of four (4) 30 ton chillers that serve the chilled water loop dedicated to the building's electrical closets. The chilled water loop is a 3-inch main from the 30th floor to the 1st floor. Typically chiller 6 will operate one unit at full capacity and a second unit at half capacity. The estimated peak load from the building's electrical closets is currently 45 tons. This chiller 6 system has an N + 2 redundancy in the chillers and an N + 1 redundancy in the chilled water pumps.

The existing chilled water capacity (3 of 4 chillers operating) of the Main Building's cooling loop is designed for 1,950 tons of cooling. The estimated building load is reported at 1,526 tons. The future anticipated load for the Data Center (chiller 5) is 340 tons. The existing Main Building's cooling loop can absorb the 45 tons from the building's electrical closets.

The existing Main Building's chilled water system utilizes 10" mains to serve the Air Handling Units (AHU-1a, b, c and d) on level 31 and 10" mains to serve the Air Handling Units (AHU-2a and b) on level 13. Six inch chilled water mains serve Air Handling Unit (AHU-3) at the basement level. The three secondary chilled water pumps each have a capacity of 2,520 gpm at 120 feet of head. The secondary chilled water pumping system is designed to operate two

pumps as a lead/lag operation with the third pump as a standby. A total flow of 5,040 gpm is available with two pumps operating. The Main Building's cooling loop has a capacity of 1,950 tons. The equivalent flow rate utilizing a 12 degree temperature drop is 3,900 gpm. The secondary pumping system has the capacity to serve the building's electrical closets.

The 3" chilled water mains serving the building's electrical closets crosses the 10" mains near the 13th floor. The piping is located in the air shaft of AHU-2. A 3" branch from the 10" mains could be made at this location and connected to the existing 3" risers. There are isolation valves on the 3" main that isolate the lower 12 floors. Piping connections to the 10" mains will require wet tapping in this air shaft of AHU-2. Connections to the existing 3" electrical clost mains would be made just below the two shut off valves. The piping would not need to be drained above or below this cut-in point. Two balancing and shut off valves would be required on the 3" chilled water return piping. The supply connection to the 3" chilled water supply main would only require a shut off valve. The 3" mains would be capped at level 33.

3" Shut-Off Valves

10" Mains

The alternate to abandoning the chiller 6 system would be to retain the system as is.

Life Cycle Cost Analysis

Abandoning the chiller 6 system and placing the electrical closet loop on to the Main Building's chilled water system is the recommended approach. The benefits include;

1. Operating cost would be based on the new chillers with a 0.395 kW/Ton rating.
2. Lower maintenance cost by removing four chillers and pumps.
3. The cooling load can take advantage of the free cooling heat exchanger
4. Chilled water would be available during a power outage
5. The Main Building's chiller plant has the capacity for this load.

The alternate approach of leaving the system as is includes the following advantages;

1. There would be no initial or first cost associated with leaving the system as is.

The cost analysis has assumed that the chiller 6 package would be abandoned in place. Initial costs have been determined for the piping work and re-balancing the 3" mains. The chiller 6 package includes four Carrier 30HWA040 split system units. These units have an operating input of 1.35 kW/Ton. The Main Building's cooling chillers have an operating input of 0.395 kW/Ton. The electric closets have a peak load of 45 tons. Maintenance cost for the chiller 6 system has been running around $1,500 per year.

A 20 year life cycle cost analysis indicates that the payback period on a $16,250 dollar investment would 4.1 years by placing the electrical closet load onto the Main Building's chilled water system.

Summary

This study has indicated that it will be beneficial to the Bureau of Workers Compensation to place two of the four Main Building's chillers on the backup generator power system. The benefits include;

1. Chiller water would be available during a power outage.
2. An N + 1 redundancy would be provided.
3. Operational cost would be based on the new chillers with a 0.395 kW/Ton rating.
4. Additional floor space is not required.
5. The Main Building's chilled water plant has been sized for this load.
6. No additional chiller, tower and pump maintenance cost.

Abandoning chiller 6 allows the electrical closets to take advantage of the following benefits:

1. Operating cost would be based on the new chillers with a 0.395 kW/Ton rating.
2. Lower maintenance cost by removing four chillers and pumps.
3. The cooling load can take advantage of the free cooling heat exchanger
4. Chilled water would be available during a power outage
5. The Main Building's chiller plant has the capacity for this load.

The estimated cost for the Main Building's chilled water system electrical work is $880,000 with an immediate cost savings. The initial cost for piping the electrical closets onto the Main Building's chilled water system is $16,250 with a payback period of 4.1 years.

Respectfully Submitted,

DLZ OHIO, INC.

Marvin L. VanMeter, P.E., LEED AP, CxA
Senior Project Manager

\\cols1\proj\proj\1221\7009\docs\reports\chiller-2012-04-18.docx

BWC Emergency Power and Chiller Study

Electrical Power

	Quanity	Material/unit	Material	Labor	sub total	OvHd 15%	total
14th Floor							
Remove 1000 amp BPS	2		$0.00	$1,400.00	$2,800.00	$420.00	$3,220.00
Install 2000 amp BPS	1	$38,000.00	$38,000.00	$3,000.00	$44,000.00	$6,600.00	$50,600.00
Bus Duct Connection	2	$3,700.00	$7,400.00	$1,100.00	$4,800.00	$720.00	$5,520.00
13th floor							
4000 amp switchgear	1	$36,600.00	$36,600.00	$3,050.00	$39,650.00	$5,947.50	$45,597.50
4000 AMP bps	1	$45,000.00	$45,000.00	$4,500.00	$49,500.00	$7,425.00	$56,925.00
ground faul trips	3	$8,600.00	$25,800.00	$185.00	$26,355.00	$3,953.25	$30,308.25
Bus Duct Connection	1	$3,700.00	$3,700.00	$900.00	$4,600.00	$690.00	$5,290.00
1000 amp BPS	2	$17,000.00	$34,000.00	$1,500.00	$37,000.00	$5,550.00	$42,550.00
400 amp fused switch	2	$4,900.00	$9,800.00	$800.00	$11,400.00	$1,710.00	$13,110.00
100 amp fused switch	1	$3,100.00	$3,100.00	$730.00	$3,830.00	$574.50	$4,404.50
60 amp fused switch	1	$2,500.00	$2,500.00	$670.00	$3,170.00	$475.50	$3,645.50
Relocate 1000 amp BPS	2		$0.00	$2,000.00	$4,000.00	$600.00	$4,600.00
Reconnect Chilloers	2		$0.00	$1,200.00	$2,400.00	$360.00	$2,760.00
4000 amp bus duct	60	$1,950.00	$117,000.00	$1,500.00	$207,000.00	$31,050.00	$238,050.00
400 amp fused switch	1	$1,000.00	$1,000.00	$610.00	$1,610.00	$241.50	$1,851.50
1600 amp bus duct	60	$850.00	$51,000.00	$92.00	$56,520.00	$8,478.00	$64,998.00
Disconnect existing Chiller	1		$0.00	$12,200.00	$12,200.00	$1,830.00	$14,030.00
2000 amp Transfer Switch	1	$67,100.00	$67,100.00	$7,000.00	$74,100.00	$11,115.00	$85,215.00
400 amp Transfer Switch	1	$18,300.00	$18,300.00	$4,300.00	$22,600.00	$3,390.00	$25,990.00
wiring to 31st floor	1	$6,100.00	$6,100.00	$4,900.00	$11,000.00	$1,650.00	$12,650.00
Temperature program update	1	$2,000.00	$2,000.00	$15,000.00	$17,000.00	$2,550.00	$19,550.00
Sub Totals			$468,400.00		$468,400.00		$730,865.25
							$750,000.00
700 HP soft start starters	2	$50,000.00	$100,000.00	$6,000.00	$112,000.00	$16,800.00	$128,800.00
							$130,000.00
Totals							$880,000.00

BWC Emergency Power and Chiller Study
Replace Chiller 5 with N + 1 System

	Quanity	Material/unit	Material	Labor/unit	Labor	sub total	OvHd (15%)	total
Remove ice tank structures	2		$0.00	$25,000.00	$50,000.00	$50,000.00	$7,500.00	$57,500.00
400 Ton chiller system	2	$160,000.00	$320,000.00	$60,000.00	$120,000.00	$440,000.00	$66,000.00	$506,000.00
Pump systems	6	$7,500.00	$45,000.00	$2,500.00	$15,000.00	$60,000.00	$9,000.00	$69,000.00
Hydronic componants	6	$11,500.00	$69,000.00	$9,500.00	$57,000.00	$126,000.00	$18,900.00	$144,900.00
Cooling tower	1	$40,000.00	$40,000.00	$7,200.00	$7,200.00	$47,200.00	$7,080.00	$54,280.00
Piping risers 6"	4	$8,400.00	$33,600.00	$12,000.00	$48,000.00	$81,600.00	$12,240.00	$93,840.00
Totals								$925,520.00

BWC Emergency Power and Chiller Study

Chiller 6 connection to Main

	Quanity	Material/unit	Material	Labor/unit	Labor	sub total	OvHd 15%	total
Wet Tapping 10" line	2	$500.00	$1,000.00	$3,000.00	$6,000.00	$7,000.00	$1,050.00	$8,050.00
3" piping	50	$21.00	$1,050.00	$30.00	$1,500.00	$2,550.00	$382.50	$2,932.50
Valves 3"	2	$1,000.00	$2,000.00	$200.00	$400.00	$2,400.00	$360.00	$2,760.00
Balancing Valves 3"	2	$700.00	$1,400.00	$80.00	$160.00	$1,560.00	$234.00	$1,794.00
Balancing system	1	$100.00	$100.00	$500.00	$500.00	$600.00	$90.00	$690.00
Total								$16,226.50

TRACE® 700 Chiller Plant Analyzer

By DLZ

Project Information

Weather file	Columbus, Ohio
Project Name	
Region	North Central
Building Type	hospital no economizer
User	
Company	
Comments	

Alternative 1 - - Existing HWA
Alternative 2 - - Main Building Chiller

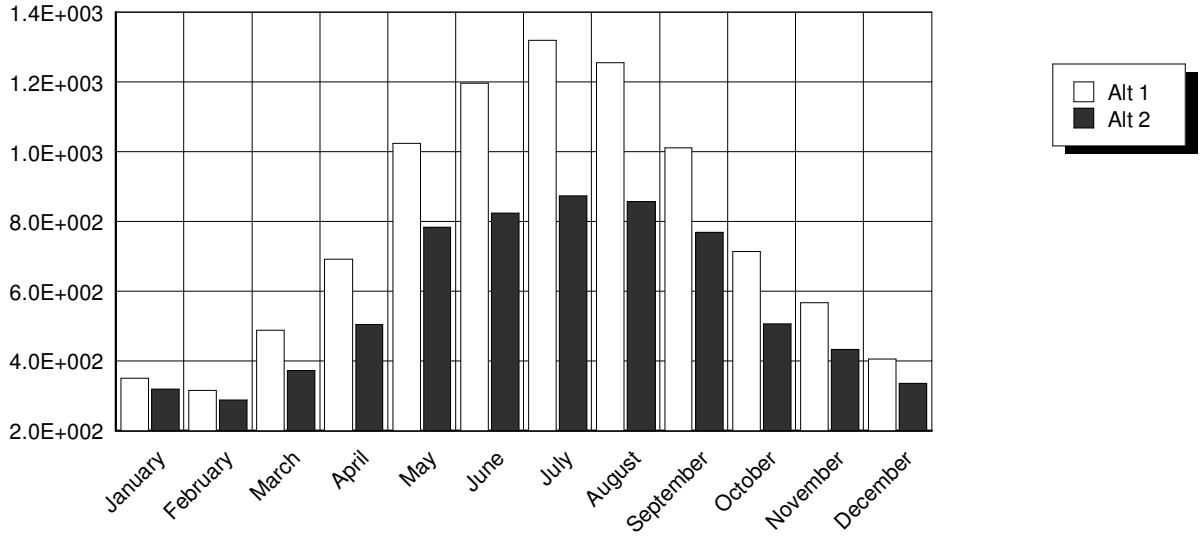
Economic Summary

Alternative Number	Installed Cost	First Year Util.Cost	Final Year Util. Cost	First Year Maint. Cost	Final Year Maint. Cost	Life Cycle Cost
1	0.00	9,337.57	9,337.57	1,500.00	1,500.00	92,266.33
2	16,250.00	6,859.76	6,859.76	0.00	0.00	74,650.98

Economic Comparison of the Alternatives

Alt. - Alt.	First Cost Difference	Simple Payback	Net Present Value	Life Cycle Payback	Internal Rate of Return
2 - 1	16,250.00	4.1 yrs	17,615.35	5.5 yrs	24.2 %

Monthly Utility Costs



Equipment Energy Consumption by Alternative

	Elect Cons. (kWh)	Water Cons. (1000 gals)	Percent of Total Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative: 1 - Existing HWA					
Primary heating	1,002		1.0%	3,420	10,261
Cooling Compressor	73,821		71.4%	251,949	755,924
Tower/Cond Fans	6,468		6.3%	22,075	66,232
Other Clg Accessories	1,913		1.9%	6,530	19,593
Pumps	20,198		19.5%	68,937	206,831
Totals**	**103,402**		**100.0%**	**352,912**	**1,058,841**
Alternative: 2 - Main Building Chiller					
Primary heating	1,002		1.3%	3,420	10,261
Cooling Compressor	21,881		28.8%	74,679	224,059
Tower/Cond Fans	17,398	171	22.9%	59,378	178,152
Condenser Pump	15,567		20.5%	53,132	159,411
Pumps	20,198		26.6%	68,937	206,831
Totals**	**76,046**	**171**	**100.0%**	**259,545**	**778,714**

** Note: Resource Utilization factors are included in the Total Source Energy value.*