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Design Report

UNIVERSITY OF WISCONSIN – WHITEWATER: Athletic Complex Buildings (DFD #15J1P)

June 26, 2016

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PROJECT OVERVIEW

1. PROJECT BACKGROUND AND PURPOSE

In 2006, the campus undertook a multi-sport study, with the help of HGA and Rettler (DFD Project #06K1F) to help develop a strategic plan for improvement of athletic facilities and fields. This study was instrumental in justifying student seg fee requests for funding as well as a productive tool for fundraising efforts by the department and the UW-Whitewater Foundation. It also helped to inform capital budget planning over several biennia and laid some foundation information for the capital master plan. This multi-sport study was implemented over several phases with the final piece being the Softball Service Building completed in the fall of 2015.

As the Intercollegiate Athletics and Intramural Athletics programs experience continued success, the resulting growth to these programs have started to stress existing facilities. Of specific concern are the facilities for the Football and Baseball programs. Over the last couple of years, several larger planning efforts were happening concurrently: the Comprehensive Master Plan (DFD Project 12I1D) and the 2015-2017 Capital Budget Planning. Both were large in scale and with the changing dynamics of the athletic programs, it was determined that additional study was needed to help fill the gap. The Comprehensive Master Plan recommends a more detailed programmatic study of the Athletics programs to supplement the campus's long term planning efforts.

As part of the 2015-2017 Capital Budget Planning effort, UW-W Facilities staff, Athletics Administration, Coaches and UW-Whitewater Foundation continued to worked to develop solutions to the needs presented by these expanding programs and ever challenging financial climate.

This study summarizes these planning efforts and the preferred direction chosen by campus to address the needs for the Football and Baseball programs as well as the Athletics Grounds Maintenance Department. This information was used to develop the Major Project Request submitted as part of the Wisconsin 2015-2017 Capital Budget.

SPECIAL DESIGN AND PLANNING ISSUES

1. EXISTING BUILDINGS AND SITE CONDITIONS

A. Athletic Services Building

1) Existing Physical Conditions - The 9,887 ASF/12,975 GSF facility was constructed in 1970. It has an exterior cast-in-place concrete perimeter with interior columns and interior load bearing concrete masonry unit (CMU) walls. The roof structure is a pan concrete roof system with short spans, which creates long narrow divisions of the interior floor space. The columns are 12 inches square, the load bearing walls are 12-inch CMU, and the concrete beams are a depth of 2 feet 8 inches. Mechanical, plumbing and electrical systems are original to the building. The Athletic Services Building has primarily housed the football locker rooms (home and visiting teams) and training areas, the women's softball locker room, and the Athletics Grounds Maintenance Department. This building has never been renovated.

2) Issues - Finishes and fixtures within the locker rooms, shower rooms and restrooms (Football, Softball and visiting team rooms), although well maintained, are dated and beginning to show their age (45 years), making them difficult to clean and maintain. Mechanical systems and roof are also original to the building. Current layout of locker rooms and lack of team meeting areas does not support current teaching and coaching pedagogy. They are also too small to house the teams and lockers are not holding up to the intense use. The equipment storage room and ticket office is also not efficient for the volume of business handled in these areas. The existing therapy area is a small room and cannot handle multiple athletes. The training area is only set up to serve the football team, since it is accessed through the football locker room. There are no facilities for the referees – they currently change in a bathroom within the adjacent Student

Athletic Complex Building and do not have a dedicated area to secure their belongings. The Grounds Maintenance Department is also housed in the southeast corner of this building, with maintenance vehicles parked outside, which is the public face and entrance to Perkins Stadium. Also, with the development and improvement of the outdoor athletic fields over the past decade, the location of this department is not efficient or cost effective.

3) Other considerations or influencing factors - With the completion of the new Softball Services Building, the women's softball team will relocate to the new facility. This opens up an opportunity within the Athletic Services Building for backfill potential. It was this potential that started the planning process on campus to determine best use of this space, as well as the realization that the building was nearing 50 years old and had not undergone a major renovation. The Athletics Department has also had a desire to expand their therapy and training areas to incorporate hydrotherapy pools, but have not had sufficient space in which to do so. This area would serve both women's and men's varsity sports programs. The vacating of the women's softball locker room offers additional space, but it is on the opposite side of the building from the existing training and therapy area.

4) Solutions - The locker rooms need to be expanded and would function better if they were able to follow a more open plan, without structural restrictions. Several options were looked at to renovate the interior areas, including moving the location of shower and restrooms, all while maintaining the existing footprint of the building. However, the existing structural system of the building (interior bearing walls), essentially divided the building into thirds, making renovation expensive and difficult. Relocation of plumbing systems also proved to be extremely costly and with the Athletic Grounds Maintenance department still housed within the building, many of the desired program functions could not be accommodated. If this department were to be relocated to another location, however, this would free up additional space within the existing building footprint. Building a small addition to the north side of the SASB, would allow the existing shower and restroom facilities to remain, thus eliminating the need to relocate plumbing. The addition would allow for a longer clear-span structural system, and locker rooms could be expanded more efficiently and plumbing for a hydrotherapy area could more easily be incorporated under a new slab. The exterior access to locker rooms and physical therapy areas, including the hydro-therapy pools, provides new opportunities for the Athletic Department to serve other programs and events. The proposed improvements extend the life of the original building and will meet the current and anticipated future athletic program needs. The renovated and expanded facility would include larger locker rooms and new team meeting rooms for both home and visiting teams, a visiting coaches' locker room, an officials' locker room, an expanded physical therapy/training area (including a new hydro-therapy room), and improved equipment storage area, and a ticket office. Remaining areas would undergo upgrades to plumbing fixtures, lighting, ventilation systems and finishes.

B. Baseball Services Building

1) Existing physical conditions - The 1,627 ASF/2,274 GSF two-story facility was constructed in 2002 to provide minimal support for the varsity baseball team by providing a dugout, locker room with shower facilities, equipment storage, a small press box, and coaching office. The exterior is split face concrete block with awnings and a shed roof. The upper level of the facility is not ADA accessible, an interior staircase leads to the press box and coaching office. The facility does not provide public restrooms and concessions are provided by portable methods (truck and trailer, booths, grills, etc.).

2) Issues - The current facility does not provide locker room or shower areas for the visiting team, nor any locker room areas for umpire officials. The original building was intended to provide a concessions area, but that space has been utilized for team equipment storage and concessions storage. Concessions are

currently being provided via mobile trailers and small shacks. Currently the upper level, where the press box and coach's office are located, is not ADA accessible since the building does not have an elevator. The room is often used for observation of the game, but it does not have proper railings for this function. The facility also does not provide any public restrooms. Although a toilet room building was just recently completed a short distance away near the track and soccer fields, there still remains a need for accessible restroom facilities in the athletic field areas, especially when there are multiple events.

3) Other considerations or influencing factors - The Multi-Sport Planning study recommended the construction of a new building adjacent to this facility to provide space for the baseball program, public restrooms, and a concessions area that would serve multiple events. Because the campus is addressing multiple growth demands across athletics, financial resources are not available to accomplish all the 2006 study recommendations. The Multi-Sport Planning effort considered multiple alternatives prior to making solution recommendations. Addressing these issues through smaller projects is not feasible, nor cost effective. The new construction recommendation for the baseball operations has been determined to be unaffordable and estimated to have an unacceptable and extended schedule. The athletics space needs require timely and cost effective solutions and the proposed project has balanced these needs across campus and all athletic operations.

4) Solutions - The recommendations were reviewed by institution leadership and it was determined to accommodate the program needs through a small building addition and the renovation of the original building. UW-Whitewater Foundation worked with Angus Young to do a schematic planning exercise to help develop scope and renderings to be used for fundraising efforts. The renovated and expanded facility will include a larger team locker room with new accessible shower and toilet facilities, a training room, a large multi-purpose room, a larger press box, a spectator deck, and equipment storage areas. An administrative suite with three offices, a small conference room, a large multi-purpose workroom, a kitchenette, and two accessible single-occupant restrooms will be created. New spaces in the facility include an umpire locker room with accessible fixtures, accessible public restrooms for men and women, a team meeting room, a passenger elevator, and a concessions area. The critical issues of ADA accessibility, public service areas (concessions and restrooms), and expanded program support areas (team meeting, training, administrative support) will all be resolved by this project of the existing structure and outside of the utility corridor.

C. Athletic Grounds Maintenance Building

1) Program Justification - The athletic maintenance functions are currently located in the Athletic Services Building. The demand for support space corresponds to the growth of athletic programs. Relocating the Athletic Grounds Maintenance Department operations will allow the reallocation of 950 GSF of other support units within the Athletic Services Building, provide an additional GSF to the athletic maintenance operations for interior storage, and centrally locate the function for improved efficiency. It would also allow the relocation of the maintenance operations parking from the main entrance to Perkins Stadium and the Student Athletic Complex to improve safety for pedestrians and vehicular traffic.

2) Other considerations or influencing factors - Location of this new facility would be farther west near the recently completed Athletic Fields Restroom Building between soccer field/track and baseball services building. This location would also be near already existing utilities, the existing maintenance service road and the parking area for these fields.

3) Solutions - This new facility will house an office with two workstations and file storage, an ADA accessible single occupant restroom, a workshop and tool storage area, a utility sink with eyewash station, a parking

area for five grounds maintenance vehicles, and a vehicle maintenance area. Exterior building materials will coordinate with adjacent facilities and follow the design guidelines for the athletic zone as set forth in the Campus Comprehensive Master Plan. Schematic designs have been based on a simple gable style roof over a 30'x50' footprint.

2. ZONING

A. Each of the proposed building sites fall within the property boundaries of the University of Wisconsin – Whitewater (State of Wisconsin). This campus is zoned "I" for Institutional per the City of Whitewater's Zoning Map. No issues are anticipated.

3. UTILITY SERVICE

A. These buildings are not linked to campus central plant utilities (chilled water or steam). Please see "Design Concept / Basis of Design" sections 5 to 8 for more information on proposed systems.

4. HISTORIC PRESERVATION

A. Not Applicable

5. ENVIRONMENTAL IMPACT

A. An Environmental Impact Assessment process has begun with Ayres Associates.

6. OTHER LEGAL/ REGULATORY OR UNRESOLVED ISSUES

A. None reported to the A/E Team and/or known at the time of this report.

7. SCHEDULE ISSUES

A. Schedule

1)	Submission of Documents for Final Review:	August 2016
2)	Bid Opening:	October 2016
3)	Start of Construction:	January 2017
4)	Substantial Completion / Occupancy:	April 2018

8. SPACE TABULATION

A. See Appendix A for Space Tabulations.

B. Space Summary:

1) Athletic Services Building:
Gross Area: 3,998 GSF Assignable Area: 3,543 ASF Building Efficiency: 88.6%

2) Baseball Services Building:
Gross Area: 7,829 GSF Assignable Area: 5,470 ASF Building Efficiency: 69.9%

3) Press Box/Concessions Building:
Gross Area: 1,016 GSF Assignable Area: 595 ASF Building Efficiency: 58.6%

4) Athletic Grounds Maintenance Building:
Gross Area: 1,568 GSF Assignable Area: 1,330 ASF Building Efficiency: 84.

1. OVERALL/ ARCHITECTURAL DESIGN CONCEPT

A. **Athletic Services Building** – This building is one of the most prominent in the Athletic Department because of its position as a gateway building to Perkins Stadium. This project will build an addition on the north side which will be a new face for this building in the south end zone of the stadium. The current north façade is a large billboard highlighting the National Championships won and the Athletic Department wanted to maintain that large scale graphic effect. To accomplish this and give the campus maximum flexibility in the future, we are proposing that this elevation be constructed of a glass curtain wall system. This will allow UWW to install a graphic on the glass after installation and then have the flexibility to change it in the future. In addition to the large scale end zone graphic, the glass wall will also provide natural ambient lighting into the expanded football locker room and new hydrotherapy area.

B. **Baseball Services Building** – When challenged with an expansion concept for this existing building, we thought of the team's long term position related to the baseball field. Previous plans showed an expansion to the south only which moved more people away from the field. We discovered an opportunity to remove the second level, expand to the east and slightly to the south. This concept afforded the baseball program the most frontage on the field which opened up design and programmatic possibilities that didn't previously exist. The plan layout takes advantage of the existing first floor – renovating the existing baseball locker room into a team meeting room, expanding the team's storage room, and keeping the dugout and toilet/showers. A new prominent entrance is added to the southwest corner that will be for student-athletes, coaches, alumni and spectators. This will be a transparent entrance that is meant to highlight team branding and graphic elements in this two-story space. With the exception of the entrance lobby, the first level is dedicated to player/team spaces which includes a new team locker room, player lounge, nutrition area and a training room. The second level is anchored with a large multi-purpose Alumni Room which will act as a "suite" on game day for spectators and serve as a team multipurpose room during other days of the week. The coach's offices, locker room and recruiting lounge make up the rest of the second level.

C. **Concessions / Press Box Building** – This building will be located behind home plate for optimal viewing of the field from the press box. Although this building will not be heated/cooled at this time (three seasons building), the walls will be insulated so this could be added in the future if desired. The first level will house a concessions stand, storage area and an enclosed lift. The second level will have a two-tier press box area accessible from an exterior stair and a lift. The exterior will be concrete masonry units and metal panels to match the color of the Baseball Services Building.

D. **Athletic Grounds Maintenance Building** – This building has 3 components: an office, breakroom and restroom area; a heated/cooled garage and workshop; and an unheated garage. The concept for this is to "keep it simple" and match a recently completed restroom building in the area. The exterior will be split-faced concrete masonry units with a standing seam metal roof. This building is centrally positioned for athletics near the existing track grandstands just off of an existing parking lot.

1. SITE DESIGN

A. **Athletic Services Building**

1) General

- Site work will occur primarily on the north side of the existing athletic services buildings. Site demolition will involve site security, site preparation, hard surface removals, specifically the walkway along the north side of the existing facility, ornamental metal fence and gate removal for reuse, utility demolition, and tree protection fencing.

- Site grading and drainage are anticipated to follow the existing drainage pattern on the site. Drainage structures will tie into the existing storm sewer network, located on the north side of the site.
- Site access will be constructed to accommodate normal campus activity of pedestrian, maintenance vehicle, and emergency vehicle traffic. ADA access will be maintained. A new drive will be constructed on the west side to accommodate ingress and egress to the football field. Walkways will be added to the north to tie into existing walkway system.
- Erosion control will include silt fencing, inlet protection, and site topsoil restoration and seeding will occur at the conclusion of construction.

B. Baseball Services Building

1) General

- Site work will occur primarily on the south and east side of the existing baseball buildings. Site demolition will involve site security, site preparation, hard surface removals, utility demolition, and tree protection fencing. The existing storage shed, including irrigation control, will be relocated. The existing water utility lateral, south of the existing building, will be relocated. An existing sanitary manhole southwest of the building will remain. The sanitary lateral running east of the manhole will be removed. The existing gas utility lateral, east of the existing building, will need to terminate at the new addition wall, and enter the east side of the addition.
- New site sewer and water utility construction is anticipated. A new approximately 35', 4" water service will run from the existing mainline south of the building, to the east side of the new addition into mechanical room. A new approximately 6" sanitary lateral will run from the existing manhole to the edge of the new building addition foundation. Site grading and drainage are anticipated to follow the existing drainage pattern on the site. Drainage structures will tie into the existing storm sewer network, located to the west of the site.
- Site access will be constructed to accommodate normal campus activity of pedestrian, maintenance vehicle, and emergency vehicle traffic. A new drive will be constructed on the southeast side to accommodate ingress and egress. Walkways will be added to the south and east side to tie into existing walkway from doorway stoops.
- Erosion control will include silt fencing, inlet protection, and site topsoil restoration and seeding will occur at the conclusion of construction.

C. Athletic Grounds Maintenance Building

1) General

- Site work will occur primarily on the west side of the existing track and field facility bleachers. Site demolition will involve site security, site preparation.
- New site sewer and water utility construction is anticipated. A new approximately 8', 2" water lateral will run from the existing water mainline to the edge of the new building addition foundation. A new approximately 23', 4" sanitary lateral will run from a new manhole located on the existing sanitary mainline, west of the buildings to the edge of the new building addition foundation. Site grading and drainage are anticipated to follow the existing drainage pattern on the site. Sheet flow drainage is anticipated and will tie into the existing storm sewer network, with an inlet located approximately 150' north of the site.
- A new approximately 34' x 40' concrete pad will be constructed east of the building and tie into the existing asphalt bleacher pad and driveway.
- Erosion control will include silt fencing, inlet protection, and site topsoil restoration and seeding will occur at the conclusion of construction.

2. ARCHITECTURAL/ GENERAL CONSTRUCTION SYSTEMS

A. Design Standards

1) The proposed building renovation will comply with the 2009 Wisconsin Administrative Code including Chapters 60 to 66 – Wisconsin Commercial Building Code which adopts the 2009 International Building Code (IBC), the 2009 International Energy Conservation Code, the 2009 International Mechanical Code, and the 2009 International Fuel Gas Code.

   The project will follow the State of Wisconsin – Division of Facilities Development Master Specifications/Design guidelines. Although the project will not be LEED certified, sustainable design strategies will be evaluated. The project will follow the DFD sustainable facilities standards and will use the Sustainable Facilities Checklist to identify, record and track sustainable strategies.

   The project will comply with all accessibility requirements. The project scope does not include but will have access to accessible parking spaces, and will be located on an accessible route

B. Architectural Interiors

1) Interior Circulation - All spaces within the buildings will have access to separate means of egress.
2) Exterior Windows and Interior Glazing - Where possible, program spaces will be located along the exterior windows. Blinds or shades shall be installed at all exterior windows to control glare and maintain privacy.
3) Interior Partitions - Partition construction will be evaluated during the Preliminary Design Phase for compliance with applicable building codes and DFD standards. Partitions should provide adequate sound control between rooms with a minimum STC rating of 42. Partitions should be sealed along their entire perimeter. All partitions will be constructed with metal studs and gypsum board. All exposed wall surfaces will be painted with a gloss or semi-gloss latex paint.

   Stud partitions at wet areas should be constructed of water resistant gypsum board. Such areas include:
   - Toilet rooms
   - Custodial closets
   - Drinking fountain alcoves

   Protect stud partitions at areas subjected to splashing with ceramic tile or similar impervious finish. Such areas include:
   - Toilet room walls
   - Custodial closets
   - Drinking fountain alcoves

4) Ceilings - 9'-0" ceiling heights will be maintained to the extent possible in all public areas. Portions of each floor may have ceilings lower than 9'-0" to accommodate main duct distribution. Ceiling heights will be evaluated during the Preliminary Design Phase and options will be studied to allow for portions of the building with larger sized rooms to have higher ceilings.

C. Building Exterior

1) It is the design teams intention to use similar exterior materials on all four of these buildings. Some of those materials are:
   - Buff-colored brick (to match others on campus)
   - Aluminum horizontal panel system on CMU rainscreen wall
   - Curtain wall system w/ ½" tempered glass

- Sitecast concrete
- Buff-colored, split-faced CMU

3. STRUCTURAL SYSTEMS

A. Athletic Services Building

This facility will be remodeled and expanded with an addition to the north side. Remodeling contemplates very little, if any structural modifications. The north addition will extend the building approximately 25', the full east-west dimension of the building. The existing building uses cast-in-place concrete bearing walls at the exterior and interior concrete masonry bearing walls, to support precast concrete hollow core plank. The foundation consists of cast-in-place concrete foundation walls of frost depth at the exterior and interior concrete strip footings at bearing walls.

The addition will utilize open web steel joists, spanning north-south, supporting steel roof deck. These joists will bear on exterior masonry bearing walls or a steel beam and column support line at the new north edge. At the interface of the existing building, the joists will bear on a short masonry bearing wall built off the edge of the existing roof construction. Access to the new hydro-therapy area will be by an opening saw-cut in the existing concrete exterior wall, to a height of approximately 8'-4" above floor level. A cut of this type will leave adequate wall and reinforcing above to support existing and new roof construction. At the new team locker room area, a large length of the existing north exterior bearing wall will be removed (approximately 72 feet) and a steel beam and column line will be installed below the edge of the existing precast roof plank, to support both existing and new construction.

At the new north wall, a significant portion will include a ribbon window, with a high sill. This sill condition will require steel support, spanning lateral to columns, to brace the top of the masonry wall and window.

Lateral resistance for the addition will be provided by a partial north side masonry bearing/shear wall, as well as east and west side masonry shear walls.

Foundations will be concrete walls to frost depth, supported on concrete strip footings, with spread footings and concrete piers at column locations. Slab-on-grade will be 4-inch concrete on a vapor retarder and compacted granular fill. There will be a crawl-space provided at the hydro-therapy pools. First floor level structure at this location will be coordinated with the requirements of the hydro pools and the durability requirements of the area and may be of cast-in-place concrete slab construction.

B. Baseball Services Building

There are two components to the baseball facility, remodeling and addition to the existing baseball locker/coaching offices building and a new concessions/press box building.

The existing baseball building is a two-story structure with masonry bearing and foundation walls on concrete strip footings. These masonry bearing walls support precast concrete plank used for second floor and low roofs and wood framed second floor walls and roof structure. The existing second floor will be removed and the existing structure prepared for vertical expansion over all except the present dug-out area. An addition will be constructed to the east and south of the present building.

New second floor elevation is desired to be at 12 feet, which is 1'-10" to 2'-8" higher than existing floor/low roof elevations. The existing plank structure has adequate capacity to support require live loads for the new second floor levels as well as a build-over of new floor structure at the higher elevation. This build-over will use light gage steel

stub walls at regular intervals, supporting a concrete slab on form deck. Existing concrete masonry walls will be built up around the perimeter (and interior as required) to support the new floor and roof structure. The existing stair will be removed and the opening infilled with precast concrete plank and topping at the new floor elevation. Second floor framing for the new construction will be precast concrete plank and topping, primarily supported by concrete masonry bearing walls, both interior and exterior. In the case of the floor area over the new locker room, this plank will be sized (12" depth) to support the step-back wall of the coaches' offices above. A new elevator/shaft will serve the building, incorporated along with a steel stair, at the southwest corner.

Roof framing over the entire building will be open-web steel joists spanning north-south, support steel roof deck. These joists will be supported by either exterior concrete masonry bearing walls or steel beam and column lines. In the case of the north and northwest beam lines, these columns will be based on the concrete masonry wall extensions at the second floor level.

Lateral resistance is provided by exterior masonry walls and the masonry elevator shaft.

Foundations for the addition will use concrete walls to frost depth with strip footings at the exterior and strip footings at interior bearing wall locations. Slab-on-grade will be 4-inch concrete on a vapor retarder and compacted granular fill.

The concessions/press box building is a two-story structure using concrete masonry bearing walls. These walls will support a precast concrete plank second floor and a steel-framed roof. Concrete plank at the second floor will cantilever at the north side to create a canopy over the concession window. Also at the second floor, a raised seating area will be provided with light gauge steel stub walls supporting a concrete slab on form deck. An exterior steel-framed stair will provide access to the second floor, along with a small mechanical lift in a masonry shaft, located in the south corner of the facility. Foundations will be concrete walls to frost depth, supported on concrete strip footings. Slab-on-grade will be 4-inch concrete on a vapor retarder and compacted granular fill.

C. Grounds/Maintenance

The grounds/maintenance building will be a one story facility using concrete masonry bearing walls at exterior. About two-thirds of the building will be of heated cavity-wall construction, while the north third will be an un-heated garage. The exterior masonry bearing walls will support wood, gang-nail trusses with a gabled profile. The exterior end walls may be masonry up to the top of the gabled ends or may stop at eave height with gable-end trusses provided. Lateral resistance is provided by the ample masonry walls. If the end walls do not extend to gable as masonry, wood sheathing will provide shear transfer from roof edge down to masonry shear resistance level.

Foundations for this building will be concrete walls to frost depth, supported on concrete strip footings. Slabs-on-grade will be 5-inch concrete on a vapor retarder and compacted granular fill.

5. HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

A. General

1) Project Description

The project includes construction work in the following four athletic buildings on the UW-Whitewater campus:

- Football Building
  - Remodeling and Building Addition
  - One story building with existing penthouse mechanical equipment room
  - Total floor area of 15,300 square feet
  - Drawings Volume A
  - Operations: Year Round – Athletic Training in use through all seasons.
- Baseball Building
  - Remodeling and Building Addition
  - Two story building
  - Total floor area of 8,600 square feet
  - Drawings Volume B
  - Operations: Year Round – offices in use through all seasons.
- Concession/Press Box Building
  - New Two Story Building
  - Total floor area of 700 square feet
  - Drawings Volume B
  - Fully Insulated Building
  - No HVAC Scope of Work
  - Operations: Three Seasons - Spring, Summer and Fall.
- Athletic Grounds Building
  - New One Story Building
  - Total floor area of 1,560 square feet
  - Drawings Volume C
  - Operations: Year Round - Spring, Summer, Fall and Winter.

B. Project Goals

1) Sustainable Design

- The project will be designed to Version 2.0 of Division of Facilities Development Sustainable Facilities Standard and will not seek LEED certification.

2) Redundancy

- In general, redundancy of equipment will only consist of spare standby hydronic heating pumps. The remainder of HVAC systems will not have redundancy.

3) Reserve Capacity

- All HVAC systems for this project are sized to meet current heating, cooling and ventilation loads. None of the systems are sized for future expansion capabilities.

C. Applicable Codes, Guidelines, and Standards

- The codes and standards listed below are considered to provide the minimum design requirements necessary. Actual design parameters may exceed these requirements where appropriate.
- Wisconsin Administrative Code
- International Building Codes
  - International Mechanical Code – 2009
  - International Fuel Gas Code – 2009

- International Energy Conservation Code – 2009
- DFD – HVAC Design Guidelines

D. Base Design Criteria

1) Design Conditions

Outdoor Design Conditions		
	Dry-Bulb Temperature	Wet-Bulb Temperature
Outdoor Air Temperature	89ºF	77ºF
Outdoor Air Winter	-10ºF	-
Ambient on Roof	105ºF	78ºF

Interior Design Conditions - Occupied spaces which do not have specific space condition requirements		
	Summer	Winter
Dry-Bulb Temperature	76ºF ± 2ºF	68ºF ± 2ºF
Relative Humidity	50% max ± 5%	Not Controlled
Interior Design Conditions – Mechanical Rooms		
	Summer	Winter
Dry-Bulb Temperature	95ºF max	60ºF min
Relative Humidity	Not Controlled	
Interior Design Conditions – Electrical Rooms		
	Summer	Winter
Dry-Bulb Temperature	80ºF max	65ºF min
Relative Humidity	Not Controlled	
Interior Design Conditions – General Office		
	Summer	Winter
Dry-Bulb Temperature	76ºF ± 2ºF	68ºF ± 2ºF
Relative Humidity	50% max ± 5%	Not Controlled
Interior Design Conditions – Unoccupied Spaces		
	Summer	Winter
Dry-Bulb Temperature	65ºF - 95ºF	
Relative Humidity	Not Controlled	

2) Heating and Cooling Loads

Heating and Cooling Loads - Electrical		
	Lighting	Equipment
General Office	Per Division 26	1.0 watts per sq. ft.
Common Areas	Per Division 26	0.5 watts per sq. ft.
Corridor	Per Division 26	0.0 watts per sq. ft.
Storage Rooms	Per Division 26	0.0 watts per sq. ft.

** To be determined by actual equipment load, but not less than that indicated.*

- Rooms with large equipment shall be calculated for actual equipment load, per space program and equipment data. This includes Elevator Equipment, Electrical and Telecom rooms.
- Where specific lighting load information is not available, an average of 1.5 watts per square foot will be used until actual lighting load information is confirmed.
- Equipment Diversity: 80%

Heating and Cooling Loads - Occupants		
	Sensible	Latent
Building Occupants	250 Btuh/person	201 uh/person

- Occupant heat rejection will be adjusted as appropriate for physical activity at individual spaces.
- The number of occupants in each space will be based on the actual occupant density listed in the facility program.
- Occupant Diversity: 80%

3) Acoustical Criteria
- Indoors
  - Conference Rooms: 30 NC
  - Common Areas: 40 NC
  - Office/Work Areas: 40 NC
  - Service/Support Areas: 40 NC
  - Corridors and Public Areas 40 NC
- Exterior mechanical equipment will be evaluated for anticipated sound levels and attenuation provided as appropriate to comply with all applicable local noise requirements.
- Diffusers and grilles will be selected at performance criteria of 5 NC lower than the levels indicated above.

4) Filtration Rates:
- Prefilters (MERV-7) and final filters (MERV-14) will be provided on air handling systems serving all conditioned spaces.

5) Infiltration:
- The building heat loss calculations will include an infiltration load based on 0.10 cfm of infiltration air per square foot of exterior wall area.

- Infiltration rates of 200 cfm per door or up to 10 air changes/hour will be used for main entrances. Infiltration rates of 200 cfm per door will be used for secondary entrances and exits.

6) Building Envelope:
   - Performance criteria for building envelope construction materials shall be as provided by the Architect.
   - Construction material coefficients will comply with the State of Wisconsin and International Energy Conservation Code requirements.

7) Vibration Elimination Criteria:
   - All HVAC equipment shall be isolated per Chapter 48 of the ASHRAE - HVAC Applications handbook.

8) Ventilation Rates:
   - Outdoor Air and Exhaust:
     - Table 364.0403 of the Wisconsin Administrative code will be used for determining outside air and exhaust ventilation rates.

E. Building Issues

1) High Rise: The buildings are not considered high rise.
2) Atrium: The facilities do not contain an atrium.
3) Humidification: Humidification systems are not provided for any of the buildings.
4) Campus Utilities: Campus steam and chilled water are not available in this portion of the campus. Standalone heating and cooling systems are included for each building.
5) Rated Shafts: No rated shafts are included on the project since the maximum number of stories for the four buildings is only 2 stories. Rated shafts are not required by code.

F. Natural Gas Service

1) Existing Gas Meters: The existing football and baseball buildings both have existing natural gas services provided by the local utility company.
2) New Gas Service: A new gas service will be brought to the Athletic Grounds Building by the local utility company.
3) Natural gas service will not be provided for the new Concessions/Press Box Building.
4) The mechanical contractor will extend schedule 40 black steel gas piping from the gas meters to the following types of equipment within the buildings and provide associated pressure regulators and gas valves:
   - Hot Water Heating Boilers.
   - Domestic Water Heaters.
   - Gas Fireplaces.
   - Gas Unit Heaters
   - Cooking appliances.

G. Central Hot Water Heating Systems

1) New central hot water heating systems are included for the football building and baseball building. Each heating system is piped in a primary secondary arrangement.
2) The football building has two equal size boilers piped in parallel.
3) The baseball building has only one boiler
4) Distribution System Design Flow Rates:
   - Football Building: 60 GPM
   - Baseball Building: 30 GPM
5) Each system consists of the following features:

- Boilers: Condensing sealed combustion boilers with 500 MBH input capacity, and 470 MBH output capacity. Full modulation with infinite proportional firing capacity control.
- Boiler Pumps: Each boiler has a constant speed inline primary circulation pump sized for 30 GPM. One standby boiler pump is included for each building.
- Distribution Pumps: Two variable speed inline pumps piped in parallel. One pump is standby.

6) Accessories:
   - Air Separator.
   - Expansion Tank.
   - 250 Gallon Storage Tank for Primary Piping Loop.
   - Water Filter.
   - Flue Vents and Combustion Air Ducting.

H. Central Air Handling Systems

1) Air Handling Units
   - Design Criteria
     - Air Handling Unit Component Sizing
       - Maximum allowable nominal face velocities for air handling unit components are as follows:
         - Air Intake Louvers (free area) - 500 fpm.
         - Hot Water Heating Coils - 500 fpm.
         - Cooling Coils - 450 fpm.
         - Pre-filters and Final-filters - 450 fpm.
         - Sound Attenuating Devices - 1200 fpm.
     - Common features:
       - Casings: Foam filled or fiberglass insulated double wall units.
       - Leakage Rates: 1% of rated CFM at 150% of design pressure.
       - Drain Pans: Double wall, pitched, stainless steel. Provide drain pans in the following sections:
         - Downstream of cooling coils.
       - Access sections: 24" minimum width provided between each component.
       - Access Doors
         - Gasketed,double wall, positive latching.
         - Doors shall open up against pressure.
         - Minimum door width of 20".
       - Lights: Waterproof marine LED lights in each access section and fan section. Lights shall be prewired to switches outside each door.
       - Vibration isolation: All fans shall be internally isolated.
       - Base Rails: 8" high.
       - Concrete Housekeeping Pads: 4" high.

   - All systems will be a single duct, variable air or constant air volume reheat system providing heating, cooling, and dehumidification to the spaces. The systems for all areas will utilize a fully ducted exhaust air system.
   - Refer to the individual air handling unit descriptions for intended hours of operation.

2) Air Handling Unit AHU-1A:
   - Serves: Football Building
   - Location: Penthouse Mechanical Room.

- Hours of Operation: Varies up to 50 hours per week for year round for select access
- Unoccupied Periods: Unit remains off. Night heating provided by room heating terminals; Unit cycles on if hydro area humidity exceeds 60% RH.
- CFM/SP: 9,000 cfm each @ 5.7" TSP.
- Fan Type: Draw through direct drive plenum fan with 13.7 BHP motor
- System Type: Variable Air Volume using supply air VAV terminals with hot water reheat coils and VAV exhaust air terminals;100% outside air with enthalpy type fix plate energy recovery
- Reserve Capacity: None.
- Redundancy: None.
    - Packaged unit consisting of the following:
        - Direct drive plenum supply fan with VFD.
        - Access section.
        - 6-row intertwined direct expansion cooling coil.
        - Access section.
        - Pumped hot water coil with dual circulating pumps (one standby).
        - MERV-14 bag filters
        - MERV-7 pleated pre-filters.
        - Inlet plenum with face and bypass dampers serving the energy recovery ventilator.
        - Remote ducted enthalpy type fixed plate energy recovery ventilator with MERV-8 filters in outside air and exhaust air streams.
        - Two position outside air and exhaust air control dampers.
        - Direct drive mixed flow inline exhaust fan with VFD sized for 9,000 CFM.
        - Outside air and exhaust air wall louvers.
        - Duct mounted sound attenuation in supply air and exhaust air streams.
        - Two 20-ton air cooled condensing units with dual manifold compressors mounted on roof. Each unit will have hot gas bypass. Two total refrigerant piping circuits providing four stages of cooling. Air cooled condensing units will be selected for 105°F outdoor ambient conditions.

3) Air Handling Unit AHU-2A:
    - Serves: Ticket Office in Football Building
    - Location: Storage next to Ticket Office.
    - Hours of Operation: Infrequent use during football season.
    - Unoccupied Periods: Unit remains off unless there is a call for unoccupied heating.
    - CFM/SP: 800 cfm each @ 1.5" TSP.
    - Fan Type: Draw through direct drive fan with ECM motor
    - System Type: Single zone VAV with mixed air.
    - Reserve Capacity: None.
    - Redundancy: None.
    - Packaged unit consisting of the following:
        - Blower coil fan coil unit.
        - Direct drive supply fan with ECM motor.
        - Direct expansion cooling coil.
        - Pumped hot water coil with dual circulating pumps (one standby).
        - MERV-7 pleated filters.
        - Outside air and return air modulating control dampers.
        - Economizer cooling with gravity relief air.

- Outside air wall louvers.
- 2-ton air cooled condensing unit mounted on the roof with one stage of cooling. Air cooled condensing units will be selected for 105°F outdoor ambient conditions.
- Small inline exhaust fan sized for 100 CFM serving the small toilet room serving the Ticket Office.

4) Air Handling Unit AHU-1B:
   - Serves: Baseball Building
   - Location: 2nd Floor Mechanical Room.
   - Hours of Operation: Varies up to 60 hours per week for three seasons
   - Unoccupied Periods: Unit remains off. Night heating provided by room heating terminals
   - CFM/SP: 8,000 cfm each @ 5.4" TSP.
   - Fan Type: Draw through direct drive plenum fan with 10.9 BHP motor
   - System Type: Mixed air VAV reheat air terminals
   - Reserve Capacity: None.
   - Redundancy: None.
   - Packaged unit consisting of the following:
     - Direct drive plenum supply fan with VFD Vertical configuration (Stacked).
     - Access section.
     - 6-row intertwined direct expansion cooling coil.
     - Access section.
     - Pumped hot water coil with dual circulating pumps (one standby).
     - MERV-14 bag filters
     - MERV-7 pleated pre-filters.
     - Inlet plenum with air blenders upstream of inlet connection.
     - Return air control dampers.
     - Outside air control dampers sized for economizer cooling.
     - Outside air flow measuring station
     - Outside air wall louver.
     - Roof mounted relief fan with VFD and duct mounted air flow measuring station.
     - Two position relief air control damper.
     - Two roof mounted exhaust fans sized for a total of 2100 CFM. One fan serving the first floor exhaust system, the other fan serving the second floor exhaust system. Each fan has a two position control damper in the roof curb.
     - Duct mounted sound attenuation in supply air and return air streams.
     - Two 15-ton air cooled condensing units with dual manifold compressors mounted on roof. Each unit will have hot gas bypass. Two total refrigerant piping circuits providing four stages of cooling. Air cooled condensing units will be selected for 105°F outdoor ambient conditions.

I. Exhaust Systems

1) Football Building
   - All rooms except the Ticket Office Area, Equipment Storage, Mechanical and Electrical Rooms will be served by the central exhaust heat recovery system connected to air handling unit AHU-1A.

2) Baseball Building
   - Since there will be many time periods when the first floor is unoccupied and the second floor is occupied, two independent exhaust systems are provided so that the first floor exhaust system can be turned off when unoccupied. Anticipated exhaust rates are 1400 CFM for the first floor and 700 CFM for the second floor.
   - General exhaust is provided for the following types of rooms:

- Toilet Rooms.
- Janitor's Closets.
- Shower Rooms.
- Kitchenettes.
- Locker Rooms.

J. Ventilation Systems

1) General:
   - Heat removal mechanical ventilation systems are provided for mechanical, electrical and transformer spaces. Ventilation systems are activated when the space temperature is 4°F warmer than the outdoor air temperature.

K. Common Equipment and Materials

1) Piping Systems
   - Hot Water Systems
     - Material:
       - Type L copper piping with soldered fittings or brazed with silver solder, or carbon steel pipe with threaded fittings for pipes 2" and smaller.
       - Carbon steel piping with welded fittings for pipes 2-1/2" and larger.
     - Insulation: Rigid Fiberglass.
     - Sizing
       - Maximum pressure drop of 4 ft. of water/100 ft. of piping for piping 1" and larger.
       - 2 fps minimum velocity to 10 fps maximum velocity.
   - Natural Gas Piping
     - Material:
       - Schedule 40 Black steel.
       - Sizes 2" and smaller, threaded fittings.
       - Sizes 2-1/2" and larger, welded fittings.
   - Refrigerant Piping
     - Material:
       - Type L copper ACR piping with soldered fittings.
2) Ductwork
   - Material:
     - Galvanized sheet metal except for moisture laden exhaust.
     - Moisture Laden Exhaust
       - Aluminum or 304 Stainless Steel with soldered joints.
       - Exposed: 304 Stainless Steel, ground and polished.
   - Ductwork will not be lined. Sound attenuating flexible duct up to 6 ft. in total length will be provided at the grilles and diffusers to help control noise.
   - Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class.
   - Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not exceeding 1% of the design flow rate for high pressure ductwork and 2% for low pressure ductwork.
   - All Supply and Exhaust ductwork will be leak tested per SMACNA Standards.
   - Supply and exhaust ductwork will be designed in a looped system where appropriate, to allow greater flexibility for future changes.
   - Insulation

- Supply Ductwork
  - Exposed above 8 feet: Flexible Fiberglass Wrap.
  - Exposed below 8 feet: Rigid Fiberglass Board with Canvas covering.
- Concealed: Flexible Fiberglass Wrap.
- Return ductwork: Not required.
- General Exhaust from damper to outlet (roof or wall):
  - Exposed above 8 feet: Flexible Fiberglass Wrap.
  - Exposed below 8 feet: Rigid Fiberglass Board with Canvas covering.
  - Concealed: Flexible Fiberglass Wrap.

- Duct System Distribution Criteria
  - Supply Ductwork Sizing
    - From Air Handling Unit to Air Terminal Units (ATU) Device:
      - 0.10"/100 ft. when $<$ 10,000 cfm.
      - 1,800 fpm when $>$ 10,000 cfm.
      - Duct size to ATU device = ATU inlet size (within 10 ft. of ATU).
  - Air Terminal Unit to Supply Diffuser
    - 0.08"/100 ft. when $<$ 8,000 cfm.
    - 1,600 fpm when $>$ 8,000 cfm.
- Return Ductwork Sizing
  - From Return Grille to Return Air Terminal Units:
    - 0.05"/100 ft. when $<$ 8,000 cfm.
    - 1,200 fpm when $>$ 8,000 cfm.
- From Return Air Terminal Units to Return Fan:
  - 0.10"/100 ft. when $<$ 10,000 cfm.
  - 1,800 fpm when $>$ 10,000 cfm.
- Exhaust Ductwork Sizing
  - From Exhaust Grille to exhaust main:
    - 0.08"/100 ft. when $<$ 8,000 cfm.
    - 1,600 fpm when $>$ 8,000 cfm.
  - Exhaust mains in shafts and in Mechanical Rooms:
    - 0.10"/100 ft. when $<$ 10,000 cfm.
    - 1,800 fpm when $>$ 10,000 cfm.

3) Grilles and Diffusers
   - Supply Ceiling Diffusers: Aluminum flat plate plaque.
   - Supply Linear Diffusers: Extruded Aluminum, adjustable blades, insulated plenums.
   - Supply Sidewall Diffusers: Aluminum, double deflection, ¾" blade spacing.
   - Return and Exhaust Ceiling & Sidewall grilles:
     - Aluminum, ¾" blades fixed at 30^0 deflection.
4) Air Terminal Units
   - Supply:
     - Single duct, dual wall with a solid sheet metal interior liner, with flow measuring station and low leakage dampers.
     - Galvanized sheet metal construction with round inlet and square outlet.
     - Hot water coil 18" from damper with double wall, cam locking access panel upstream of reheat coil.

- Exhaust:
  - All exhaust branch ducts in the football building will have exhaust air terminals in order to turn off local ventilation systems during periods when selected spaces are unoccupied.
  - Single duct, dual wall with a solid sheet metal interior liner, with flow measuring station and low leakage dampers.
  - Exhaust air terminals will track air flow with the supply air terminals.
  - Exhaust minimum air flow rates will meet code minimum ventilation requirements.
- Zoning:
  - In general, each room will have an independent supply air terminal unit for zone temperature control.
  - Offices and other miscellaneous spaces may be combined onto a single zone provided the rooms have similar functions, occupancy and exterior exposures.
    - No more than three (3) rooms will be combined on any one single temperature control zone.
- Controls:
  - Each supply air terminal unit and hot water booster coil will have DDC control.
  - Occupancy sensors provided under the Division 26 scope of work will be used for occupancy control of the HVAC terminal zone units.
- Hot Water Terminal Units
  - Space heating shall be accomplished by the VAV box reheat coils, CAV hot water booster coils and terminal hot water heating units.
  - Terminal hot water heating units shall consist of the following:
    - Unit Heaters.
    - Cabinet Heaters.
    - Convectors.
    - Finned Pipe Radiation.
  - Unit heaters shall be used in unfinished areas such as mechanical rooms, electrical rooms, loading dock, storage rooms, etc.
  - Cabinet Unit heaters shall be used in finished areas such as vestibules, stairways and lobbies.
  - Finned pipe radiation shall be used for all rooms where the glass area exceeds 30% of the gross wall area.
  - Convectors may be used in toilet rooms which have a heat loss.
  - Sizing:
    - All terminal equipment, except perimeter radiation and ceiling panels, shall be sized for a 20 ^{o}F temperature drop or a minimum flow rate of 0.5 gpm.
    - All radiation shall be sized for a 20^{o}F temperature drop or a minimum flow rate of 0.5 gpm.
    - Equipment will be selected to provide capacity for 125% of the calculated load, except equipment for entry areas will be selected for 200% of the calculated load.
    - Hot water equipment shall be selected for a 180 ^{o}F entering water temperature.

L. Athletic Grounds Building

General: The Athletic Grounds Building consists of the following spaces:

1) Uninsulated, unheated, non-ventilated spaces:
   - One vehicle garage with 460 square foot floor area.
2) Fully insulated and heated spaces:
   - Work area with 570 square foot floor area.

- Break room office with 220 square foot floor area.
- Toilet room with 60 square foot floor area.
- Mechanical room with 35 square foot floor area.

3) Work Area HVAC:
   - Heating System:
     - Gas unit heater with separated combustion sized for 40 MBH input, 83 % efficiency and one stage of heating control.
   - Ventilation:
     - Code ventilation requirements will be provided by natural ventilation since the overhead door size exceeds 4% of the floor area.
4) Break Room/Office/HVAC:
   - Heating and Cooling System:
     - Cooling: Ductless split air conditioning system (heat pump) with indoor evaporator ceiling cassette. Total cooling capacity modulates from 8,000 BTU/hour to 18,000 BTU/hour. Outdoor condensing unit located on a concrete housekeeping pad at grade.
     - Heating: Primary heating is 8,000 BTU/Hour to 18,000 BTU/Hour from heat pump unit. Supplemental heating is from 3 KW electric wall heater.
   - Ventilation System:
     - An energy recovery ventilator sized for 75 CFM will provide fresh outside air ventilation to the break room/office and 75 CFM exhaust air for the toilet room during the occupied mode. The unit will be off during the unoccupied mode. The energy recovery ventilator consists of an enthalpy type fixed plate heat exchanger, constant volume outside air supply fan, constant volume exhaust air fan, motor starters, filters, and motorized control dampers for both air streams. Both airstreams will be ducted to wall louvers. Fresh outside air will be ducted directly to the split AC system indoor evaporator ceiling cassette.
5) Toilet Room:
   - Heating System:
     - Primary heating is by a 3 KW electric wall heater.
   - Ventilation System:
   - Exhaust ventilation is provided by the energy recovery ventilator.
6) Mechanical Room:
   - Heating System:
   - Primary heating is by a 3 KW electric wall heater.

M. Temperature Controls

1) The UW-Whitewater campus is equipped with a JCI direct digital control (DDC) system. The temperature control systems for the project will use BACnet open communication protocol type direct digital controls (DDC). All new equipment and systems will be equipped with compatible devices and fully integrated into the existing campus JCI building automation system (BAS).
2) Field control devices (valve and damper actuators, etc.) shall be direct digital control with electric actuation.
3) Standalone terminal units (cabinet unit heaters, unit heaters) shall have electric control.
4) The following systems and equipment will be integrated into the Building Automation System:
   - Automatic Transfer Switches
   - Power Monitoring.
   - Site Lighting.
   - Variable Frequency Drives.

N. Life Safety
1) Smoke detectors will be provided at air handling units for unit shutdown upon signal from fire alarm system. Smoke detectors will be provided by the Electrical Contractor.

O. Dedicated Mechanical Cooling:
1) For rooms with high internal heat gains such as server rooms, electrical rooms, IDF and telecom rooms, provide ductless split cooling systems with indoor evaporator units and outdoor air cooled condensing units.

P. Miscellaneous Ventilation Systems:
1) For equipment rooms which require heat removal during winter, ventilation systems will be provided consisting of the following equipment:
    - Inline ventilation fan sized to remove the heat with pleated filter section, outside air and return air modulating control dampers, intake outside air louver and gravity relief louver with modulating relief air control damper. Space temperature control of ventilation system is included.
    - For the football building hydro area piping pit, an inline heat removal fan will transfer heat from the pit to other portions of the building via transfer ductwork. The fan will be thermostatically controlled.

Q. Heat Rejection Equipment for Football Building Hydro Chillers:
1) The pool equipment room will contain two water cooled chillers provided by the pool equipment manufacturer serving the two plunge pools. Each chiller condenser load is 48,000 BTU/Hour. The mechanical contractor will provide a heat rejection system consisting of the following equipment:
    - Roof mounted glycol fluid cooler sized for 96,000 BTU/Hour heat rejection.
    - Heat rejection piping system.
    - Packaged pumping system located in the penthouse mechanical room consisting of the following equipment:
        - Inline circulating pump.
        - Air Separator and Expansion tank.
        - Glycol maintenance pumping package.
        - 40% propylene glycol system fluid.
        - 3-way control valve preventing supply temperature from dropping below 45°F.

R. Emergency/Standby Power Provisions
1) The Athletic Complex Buildings will not be served by permanent standby emergency generators. Each building will have a plug-in connection on the outside exterior wall to allow connection to a temporary emergency generator brought to the site in the event of a power failure.
2) The electrical contractor will provide a contact closure at each building's transfer switch which will be monitored by the DDC building automation system. When the contact closure indicates an emergency power condition, the building automation system will lockout all mechanical cooling within the building during the normal power failure period. All other remaining HVAC equipment will be served by emergency power during this condition.

S. Commissioning
1) All HVAC systems will be commissioned.
2) The appropriate contractor will be expected to verify the equipment installed meets all performance requirements, as well as to address and remedy any issues discovered during the commissioning process.
3) Commissioning work to be performed by the Mechanical Contractor and Temperature Control Contractor shall include, but not be limited to:
    - Start-up and testing of equipment.

- Performing commissioning tests, including seasonal tests.
- Providing appropriate commissioning documentation.
- Attendance at Commissioning meetings.

6. PLUMBING SYSTEMS

A. General

1) Project Description

The project includes construction work in the following four athletic buildings on the UW-Whitewater campus:

- Football Building
  - Remodeling and Building Addition
  - One story building with existing penthouse mechanical equipment room
  - Total floor area of 15,300 square feet
  - Drawings Volume A
  - Operations: Year Round – Athletic Training in use through all seasons.
- Baseball Building
  - Remodeling and Building Addition
  - Two story building
  - Total floor area of 8,600 square feet
  - Drawings Volume B
  - Operations: Year Round – Offices in use through all seasons.
- Concession/Press Box Building
  - New Two Story Building
  - Total floor area of 700 square feet
  - Drawings Volume B
  - Fully Insulated Building
  - No Plumbing/Fire Suppression Scope of Work
  - Operations: Three Seasons - Spring, Summer and Fall.
- Athletic Grounds Building
  - New One Story Building
  - Total floor area of 1,560 square feet
  - Drawings Volume C
  - Operations: Year Round - Spring, Summer, Fall and Winter.

B. Project Goals

1) Sustainable Design

The project will be designed to Version 2.0 of Division of Facilities Development Sustainable Facilities Standard and will not seek LEED certification.

C. Applicable Codes, Guidelines, and Standards

The codes and standards listed below are considered to provide the minimum design requirements necessary. Actual design parameters may exceed these requirements where appropriate.

- Wisconsin Department of Safety and Professional Services
- DFD – Plumbing/Fire Protection Design Guidelines
- UW Whitewater Facilities Requirements

D. Base Design Criteria
1) Design Conditions
2) Sustainable Design
- This project is attaining to DFD Sustainability Standards. Water consumption shall be reduced by 20% from the baseline calculated for the building after meeting the Energy Policy Act of 1992 fixture performance requirements.
- Provide low flow plumbing fixtures:
  - Lavatories: Flow restrictors and aerators.
  - Showerheads flow of 2.2 gpm or less (based on inlet pressure of 80 p.s.i.)
  - Urinals: Provide 0.125 gpf flush valves.
  - Water Closets: Provide dual type flush valve.

E. Sanitary Waste and Vent:
1) Sanitary Waste and Vent
- System Description
  - A sanitary waste and vent system will be provided for all plumbing fixtures and other devices requiring drainage. Plumbing fixtures will be drained by gravity through conventional soil, waste and vent stacks, and building drains, which will discharge to the sanitary sewer.
  - All fixtures will be trapped and vented through the roof.
  - Existing sanitary sewer lateral shall remain and a new one be provided to serve the addition.
- Design Criteria
  - The sanitary drains will be sloped to maintain a minimum velocity of 2 fps.
  - Sufficient elevation is available for gravity flow to the municipal system. All areas of the building shall drain to the sanitary sewer by gravity.
- Equipment and Material
  - Waste and vent piping:
    - Under-floor piping shall be PVC DWV piping with solvent cement joints.
    - Above-ground waste and vent piping shall be type DWV copper tube with soldered joints and wrought copper or cast bronze drainage pattern fittings, or PVC DWV piping with solvent cement joints.
    - Floor drains, floor sinks, and indirect waste receptors shall be provided at HVAC, fire protection and plumbing equipment. Provide trap seal protection when subject to loss of trap seal due to evaporation.
- Distribution
  - Football: a second sanitary building sewer lateral will be extended to the building by the site utility contractor for the addition.
  - Baseball: Existing sanitary building sewer lateral to the building will be modified for use.
  - Athletic Grounds: Sanitary building sewer lateral will be extended to the building by the site utility contractor.

F. Storm and Clearwater Drainage
1) Storm and Clearwater Drainage
- System Description
  - Roof drains will be provided on all flat roofs to convey rainwater from the roof to the site storm sewers.
  - Overflow drainage will be accomplished through roof scuppers where provided. Refer to Architectural roof plans and building elevations for scuppers and overflows.

- Clearwater waste from air handling units and other devices will be conveyed through a separate clearwater drain and vent piping system. This system will connect to the building storm drain.
  - All above grade horizontal storm and clearwater waste piping will be insulated.

- Equipment and Material
  - Storm and Clearwater drainage piping:
    - Under-floor piping shall be PVC DWV piping with solvent cement joints.
    - Above-ground waste and vent piping will be PVC DWV piping with solvent cement joints.
    - Clearwater indirect waste receptors shall be provided at HVAC, and plumbing equipment. Provide trap protection when subject to loss of trap seal due to evaporation.
- Distribution
  - Roof conductors shall be located throughout the building (at columns where possible) to minimize long runs of piping across the ceiling at each floor.
  - Football: a second storm building sewer lateral will be extended to the building by the site utility contractor for the addition.
  - Baseball: Existing storm building sewer lateral to the building will be modified for use.
  - Athletic Grounds: Will have gutters and downspouts no connection to the site storm.
  -

G. Domestic Water

1) System Description
   - Domestic water is supplied from the municipal water system with a 4" line. This will handle new addition and fire suppression.
     - Domestic cold water piping and valves shall be insulated.
   - Design Criteria
     - The piping will be sized to limit the velocity in any section of the system to a maximum of 6 fps for cold water systems and 4 fps for hot water systems.
     - Water piping shall not be run under any slab on grade inside the building.
     - Existing water softener will remain.
     - Water will be supplied to a connection at the hydro pools for pool equipment contractor
   - Equipment and Material
     - Domestic water piping shall be type L copper with soldered or roll grooved joints.
     - Valves shall be 2-piece, full port ball type with stainless steel trim or butterfly type with aluminum bronze discs.
   - Distribution
     - Generally, water piping mains shall be run in the ceiling space of the floor where the fixtures served are located.
     - Football: Existing water service will remain.
     - Baseball: Existing water service will be modified for use.
     - Athletic Grounds: Water service will be supplied to the building be the site utilities contractor.

H. Domestic Hot Water Systems

1) System Description
   - Hot water shall be supplied at the appropriate temperature to all fixtures requiring hot water.
   - Design Criteria

- The hot water return system shall be designed for a 5-degree temperature difference between the supply and return.
- Hot water piping supply and return mains shall be sized to minimize velocity to 4 fps.

- Distribution
  - Generally hot water piping mains shall be run in the ceiling space of the floor where the fixtures served are located.
  - Football: New gas fired modulating water heaters will replace the existing water heaters. Storage tank to remain.
  - Baseball: New gas fired modulating water heater will replace the existing electric water heater.
  - Athletic Grounds: Gas fired modulating water heater will be used.

9) Non-Potable Water Systems

1) Non-Potable Water Systems

- Non-potable water system will provide make-up water to mechanical (HVAC) systems such as heating hot water, chilled water, cooling towers and other devices that require water makeup or fill. A reduced pressure backflow preventer will protect the domestic water supply and will be sized for 100% of the design load.
- The piping will be sized to limit the velocity in any section of the system to a maximum of 6 fps.
- Materials shall be the same as for domestic water.

10) Plumbing Fixtures

1) Plumbing Fixtures

- Provide plumbing fixtures and other devices where indicated on the Architectural plans.
- Water Closets: Wall hung water closets with manual dual-flush flush valve, solid plastic heavy duty open front seat less cover, heavy duty floor mounted carrier rated at 500 pounds.
- Lavatories: Countertop or wall mounted china lavatory and faucet with wrist blade handles and low flow, laminar flow gooseneck spout and temperature limit stop. Wall mounted china lavatories shall be provided with floor mounted carrier.
- Sinks: Single or double compartment, 18-gauge stainless steel with sound deadening, faucet with wrist blade handles and low flow, laminar flow gooseneck spout and temperature limit stop.
- Stops and Supplies: Heavy duty chrome plated brass.
- Traps: Chrome plated 17-gauge brass.
- Urinals: Wall hung with hard wired low flow sensor operated flush valve.
- Mop Basins: Floor set molded stone basin with 3" outlet, service sink fitting with hose thread vacuum breaker.

7. FIRE PROTECTION SYSTEMS

1) System Designs

- Base Design Criteria
  - Applicable Codes, Guidelines and Standards
    - Wisconsin Department of Safety and Professional Services Code
    - NFPA 13, Installation of Sprinkler Systems
    - Owner's Insurance Underwriter
    - DFD Requirements
    - UW Whitewater Facilities Requirements
- Infrastructure
    - Fire Service
    - System Description

- The existing water service will handle fire suppression.

- Design Criteria
  - Football Building: A new 4" double detector check assembly shall be provided on the water service to protect the municipal water system from backflow.
  - Other buildings will not get fire suppression
  - Wet Pipe Sprinkler System
    - System Description
    - The entire building shall be protected throughout with hydraulically calculated wet pipe sprinkler systems unless other types of systems or protection are specifically called out.
    - Main Electrical rooms shall not be provided with an automatic wet sprinkler system but shall be constructed in accordance with code requirements for un-sprinklered electrical rooms.
  - Design Criteria
    - The sprinkler system for the building will be designed and installed in accordance with NFPA 13 and the insurance underwriter's requirements. All systems will be hydraulically calculated with a computer calculation program using the Hazen-Williams method. Areas designated, as Light Hazard Occupancy will be designed for a minimum sprinkler flow of 0.10 gpm per sq ft. Areas designated as Ordinary Hazard, Group 1 will be designed for a minimum sprinkler flow of 0.15 gpm per sq ft. Areas designated as Ordinary Hazard, Group 2 will be designed for a minimum sprinkler flow of 0.20 gpm per sq ft. The system demand will be based upon the most remote 1500 sq ft. The pipe sizing for the systems will be as required to satisfy the hydraulic demand.
  - Equipment and Material
    - The piping for the wet pipe sprinkler system will be black steel. Piping 2" and smaller in size will be Schedule 40 with threaded joints. Piping larger than 2" will be Schedule 10 with welded or roll groove couplings or Schedule 40 with welded, threaded, or cut groove couplings.
    - Complete and unobstructed sprinkler protection shall be provided throughout in accordance with NFPA 13 and the sprinkler manufacturer's UL Listing and installation instructions.
  - Sprinklers
    - Sprinklers shall be quick response type.
    - Sprinklers shall be concealed type, located in the center quadrant of the ceiling tile.
    - Sprinklers in mechanical and spaces with exposed structure shall be brass upright or pendent type.
  - Site Specific Requirements
    - Coordinate storm and sanitary connections with the site utility contractor.
    - Siamese connections shall be located on the building per fire marshal requirements.

- Commissioning
  - All Plumbing and Fire Suppression systems will be commissioned.
  - The appropriate contractor will be expected to verify the equipment installed meets all performance requirements, as well as to address and remedy any issues discovered during the commissioning process.

8. ELECTRICAL SYSTEMS

UNIVERSITY OF WISCONSIN – WHITEWATER: Athletic Complex Building

A. General

1) Project Description

The project includes construction work in the following four athletic buildings on the UW-Whitewater campus:

- Football Building
  - Remodeling and Building Addition
  - One story building with existing penthouse mechanical equipment room
  - Total floor area of 15,300 square feet
  - Drawings Volume A
- Baseball Building
  - Remodeling and Building Addition
  - Two story building
  - Total floor area of 8,600 square feet
  - Drawings Volume B
- Concession/Press Box Building
  - New Two Story Building
  - Total floor area of 700 square feet
  - Drawings Volume B
- Athletic Grounds Building
  - New One Story Building
  - Total floor area of 1,560 square feet
  - Drawings Volume C

B. Codes and Standards:

At a minimum, the following published codes and standards would be applied for any system upgrades:

- DSPS - Wisconsin Department of Safety and Professional Services
- IEEE - Institute of Electrical and Electronics Engineers
- IESNA - Illuminating Engineering Society of North America
- NEC - National Electrical Code as adopted in Wisconsin
- NECA - National Electrical Contractors Association
- NEMA - National Electrical Manufacturers Association
- UL - Underwriters Laboratories
- NFPA - 1, 70, 72, 99, 101, 780
- ADAAG - Americans with Disabilities Act Accessibility Guidelines
- ADA - Americans with Disabilities Act
- DFD - Department of Facilities Development Guidelines
- DFD - Guidelines/Standards for Design and Sustainability
- TIA - Telecommunications Industry Association
- BICSI - Building Industry Consulting Services International
- ICC - International Code Council (ICC)
  - International Building Code, Occupancy Classification: "B" Business
  - International Energy Conservation Code
  - International Electrical Code
  - International Fire Code

C. Load Calculation Criteria:

Maximum Design Connected Watts Per Square Foot

Room Type	Lighting	Receptacle
Active Storage	.7	.5
Conference/Meeting	.86	4.0
Corridor	.46	.5
Electrical/Mechanical Rooms	.67	Actual Equipment Loads
Locker Rooms	.53	4.0
Office, Enclosed	.78	4.0
Lounges	.51	4.0
Reception Area/Lobby	.63	1.0
Training Rooms	.87	
Garage/Workshop	1.11	
Concessions	.56	
Press box	.86	
Outdoor Balcony	.56W / lineal foot	
Restrooms	.69	.5
Stairway	.48	.5
Egress Lighting	.20	

D. Equipment Sizing Criteria:

Item	Description
Secondary Design Voltages	
Motors	480V, 3 phase, 3 wire
General Lighting	277V, 1 phase, 2 wire
Receptacles Motors less than ½ hp Specialty Lighting	120V, 1 phase, 2 wire
Equipment Sizing Criteria	
Branch Circuit Load Calculations	
Lighting	Actual Installed VA
General Purpose Receptacles	180VA per outlet
Multiple Outlet Assemblies	180VA per 2'-0"
Special Outlets	Actual Installed VA of Equipment Served
Motors	100% of Motor Full Load Amps
Demand Factors – Commercial Areas	
Lighting	100% of Installed VA
Receptacles	100% of First 10 kVa Installed plus 50% of Balance
Motors	100% of Total Motor Full Load Amps
Dedicated Receptacles	100% of Total VA and Fixed Equipment Installed

Demand Factors – Residential Areas	
Calculate load for residential areas as indicated in the National Electric Code	
Minimum Bus Sizes	
480Y/277V Equipment/Lighting Panels	100A
208Y/120V Equipment Panels	100A
208Y/120V General Receptacle Panels	100A

E. System Description

1) Medium Voltage – Football Building
   - Existing medium voltage service entrance conductors, switch and 750kVA dry type transformer shall remain.

F. 480V & 208V - Football Building

1) Existing Challenger/Cutler Hammer 1000A, 480Y/277V, 3φ, 4W switchgear shall remain to serve existing 480V distribution throughout Football Building.
2) Utilize existing 600A, 480Y/277V, 3φ, 4W distribution panelboard BD to serve new 208Y/120V, 3φ, 4W panelboard.
3) Provide a new 75kVA 480V, 3φ, 3W - 208Y/120V, 3φ, 4W transformer to serve new 208V panelboard. New Panelboard shall be a 225A 208Y/120V 3φ, 4W double tub 42 circuit branch panel for new addition. Existing branch panels shall be utilized to serve the existing spaces.
4) Provide New Generator Connection on outside of building. Connection shall be an interlocked receptacle with Circuit Breaker in a 4x NEMA enclosure. Equal to Russelstow MaxGard 200A, 480Y/277V, 3φ, 4W. Provide with control contacts to BAS for generator status indication.

G. 480V & 208V - Baseball Building

1) Remove existing outdoor transformer on East side of building, and associated feeders. Provide new 480Y/277V, 200A 3φ, 4 Wire feeder from substation building (POP) to Baseball Building. New feeder shall utilize the same route as the existing 100A feeder. Provide a new 75kVA, 480V, 3φ, 3W - 208Y/120V, 3φ, 4W transformer to serve new panelboards. Provide (1) new 225A 208Y/120V, 3φ 4W double tub 42 circuit branch panel to serve 1st floor. Provide (1) new 225A 208/120V 3 phase 4-wire double tub 42 circuit branch panel to serve 2nd floor. New branch panels shall have main circuit breakers, and shall be fed by new 75kVA transformer. All existing panels shall be removed.
2) Provide New Generator Connection on outside of building. Connection shall be an interlocked receptacle with Circuit Breaker in a 4x NEMA enclosure. Equal to Russelstow MaxGard 200A, 480Y/277V, 3φ, 4W. Provide with control contacts to BAS for generator status indication.

H. 480V & 208V – Concession/Press Box Building

1) Provide new 100A, 480Y/277V 3φ, 4-wire feeder, in direct buried PVC Conduit, from Baseball Building to new Concession/Press Box Building. Provide a new 75kVA 480V, 3φ, 3W - 208Y/120V, 3φ, 4W transformer to serve (1) new 225A 208/120V 3φ, 4W double tub 42 circuit branch panelboard. New panelboard shall be furnished with a main circuit breaker.

I. 480V & 208V – Athletic Grounds Building

1) Provide 100A 480/277v 3-phase 4-wire feeder, in direct buried PVC Conduit, from substation building (POP) to new Athletic Grounds Building. Provide handholds as needed. Provide new 100A 480v/277 3 phase 4-wire panelboard in electrical room. Provide (1) new 30kVA 480V, 3φ, 3W - 208Y/120V, 3φ, 4W transformer and (1) new 100A 208/120V 3φ 4W single tub 42 circuit branch panel to serve new building. New panel shall have a main circuit breaker.

J. Equipment and Material

1) Branch circuit and lighting panelboards shall be dead front construction utilizing thermal magnetic circuit breakers and copper bus bars. All panels shall be fully rated for the available short circuit current. All trims shall be door-in-door type. The panelboard connected load shall be limited to provide an additional 10% future connected load. The panelboards shall contain 10% spare 20A branch circuit breakers, and space for the addition of 10% future circuit breakers.
2) Step down transformers shall be metal enclosed, energy efficient, dry-type with aluminum windings and 150°C rise.
3) Point-of-use power connection devices shall include power receptacles, furniture connections, and other equipment connections as required.

K. Distribution

1) Raceway for feeders and branch circuits less than 600V shall be metallic, electrical metallic tubing (EMT) subject to the restrictions of the National Electrical Code, minimum size 1/2". EMT shall not be used in concrete construction or where subjected to mechanical damage.
2) 600-volt feeders shall be single-conductor, aluminum or copper 600-volt rated with XHHW, XHHW-2, or THHW insulation, feeders shall be color coded using color type at all connections and in all pull and junction boxes.
3) Aluminum feeder conductors shall be allowed per DFD Guidelines. Only where compression termination can be used. No mechanical lugs shall be accepted. All distribution equipment enclosures shall be sized to accommodate these compression lugs. If compression lugs cannot be used, then copper conductors are only allowed.
4) All feeders shall be installed in conduit.
5) Branch circuit conductors shall be single-conductor copper 600-volt rated with THWN or THHN insulation with continuous color-coding. Branch circuits shall utilize dedicated neutrals.

L. Emergency Service and Distribution:

1) System Description
   - The emergency service shall consist of battery backup light fixtures and exit lights for proper path of egress illumination. An inverter shall be used for exterior emergency egress lighting.

M. Grounding System:

1) System Description
   - A complete equipment grounding system shall be provided such that all metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and all other conductive items operate continuously at ground potential and provide a low impedance path to ground for possible fault currents. All grounding system connections shall be made using compression, mechanical or exothermic welds.
   - Bonding jumpers shall be provided as required across pipe connections to water meters, dielectric couplings in a metallic cold water system, and across expansion/deflection couplings in conduit and piping systems.

- A separate insulated green grounding conductor shall be provided for each single and 3-phase feeder and branch circuit. Grounding conductor shall be run with the related phase and neutral conductors. Panel feeders installed in more than (1) raceway shall have individual, full sized, green grounding conductor in each raceway. The equipment grounding system shall not rely on the metallic raceways for grounding continuity.
- Additional telecommunications grounding requirements as discussed in "Voice / Data Systems" section (below).

2) Equipment and Material
   - Provide a wall-mounted copper ground bar around perimeter of Main Electrical Room. Connect bus to the exterior ground ring in two locations.
   - Provide 5/8" x 10' driven copper ground rods within the Main Electrical Room. Connect to the ground bar with a #4/0 AWG bare copper conductor.

3) Distribution
   - Provide a 24" ground bar in each new electrical room. A separate, insulated #4/0 AWG ground wire shall be provided from the main electrical room ground bus to each floor's electrical room ground bus.
   - The main service entrance neutral shall be bonded to the system ground bar within the switchboard by a removable bus bar link.
   - A code-sized, unbroken bond leader shall connect the electrical room ground bar to the XO terminal of local transformers.
   - A bare copper, grounding electrode conductor shall be extended to all voice/data room ground bars.

N. Lighting Systems:

1) System Description
   - All new lighting shall be hung from the building structure independently of ceiling support system including all grid mounted fixtures. All lighting fixtures shall be complete with LEDs, drivers, hangers, lenses, etc.
   - Lighting shall be 277V LED. Fluorescent and incandescent lighting shall not be used.

O. General space types shared between buildings:

1) Examples of light fixtures to establish quality shall be as follows:
   - Vestibule
     - Square downlights for general illumination. Equal to USAi Lighting – 1010 Series
   - Restrooms (if update is deemed necessary)
     - Sinks - Wall mounted linear sconces above the mirrors. Equal to ALW – Ladder 2
     - Stalls - Recessed narrow slot fixture against wall, length of stalls. Equal to Focal Point - Seem 4.
     - Square downlights for general illumination. Equal to USAi Lighting – 1010 Series
   - Toilet Rooms (if update is deemed necessary)
     - Sinks - Wall mounted linear sconces above the mirrors. Equal to ALW – Ladder 2
     - Square downlights for general illumination. Equal to USAi Lighting – 1010 Series
   - Showers
     - Surface mounted, vandal resistant, wet-listed linear fixture. Equal to Kenall – Millenium Stretch
   - Stairs
     - Wall Mounted linear direct / indirect LED fixtures. Equal to Focal Point Seem 4.

- Utility Spaces
    - Lensed type LED recessed fixtures where a ceiling is present and industrial type LED suspended fixtures where a ceiling is not present.

P. Football Building – specific room types:

1) Examples of light fixtures to establish quality shall be as follows:
    - Training Rooms
        - Recessed linear LED fixture. Equal to Focal Point – Seem 4.
    - Corridor
        - 2' x 2' recessed LED fixture for general illumination. Equal to Focal Point – Equation
        - Wall wash recessed linear fixture to highlight trophy walls. Equal to Focal point – Seem 4 ASY
    - Offices
        - 2'x4' or 2'x2' recessed LED fixture. Equal to Focal Point – Equation.
    - Lounge/Nutrition
        - Recessed linear LED fixture. Equal to Focal Point – Seem 4.
    - Hydro Room
        - Wall Mounted indirect style LED fixture with natatorium finish. Equal to Eaton/Cooper – Ametrix.
        - Perimeter LED linear style fixture for wall washing. Equal to Focal Point – Seem 4
    - Visiting Locker Room
        - Lighting is existing to remain. Some readjustment may be required.
    - Home Locker Room
        - Recessed direct linear LED fixture placed between rows of lockers. Equal to Focal Point – Seem 4.
        - Indirect fixture mounted above North Lockers for general illumination of higher ceiling. Equal to Ecosense - TROV
        - Supplemental recessed downlights in higher ceiling for general illumination. Equal to USAi – 1010 Series
        - Integral mini LED downlights to highlight Lockers. Equal to Contech – RA2LRM. If not integral to Locker design. To be coordinated with Gear Boss.
    - Exterior
        - Ground mounted, color-changing LED uplights to highlight stadium side of building. Equal to LumenPulse – Lumen Façade.

Q. Baseball Building – specific room types:

1) Examples of light fixtures to establish quality shall be as follows:
    - Stairwell
        - Recessed LED downlights in ceiling to highlight feature art. Mimicked with ingrade LED uplights at bottom of stairs.
        - Vertically mounted linear LED fixtures along stairwell walls. Equal to Visa Lighting – Shine.
    - Lobby / Corridor
        - Square downlights for general illumination. Equal to USAi Lighting – 1010 Series
        - Suspended accent pendant over seating at top of stairs. Initial consideration – Impact Lighting – Sq.Air LED pendant.

  - Low-profile linear LED fixtures to highlight custom wall displays. Suggested application would be internal mounting around each wall cut-out to evenly illuminate display surfaces. Initial consideration – Lumini.
- Conference Rooms, Private Offices/Coaches Locker Room
  - Recessed linear LED fixture. Equal to Focal Point – Seem 4.
- Training Rooms
  - 2' x 2' recessed LED fixture for general illumination. Equal to Focal Point – Equation
- Video/Film Review Room
  - 2' x 2' recessed LED fixture for general illumination. Equal to Focal Point – Equation
  - Dimmable, multiple zone control interfaced with A/V system.
- Outdoor Seating / Staircase
  - Wall mounted LED sconces. Equal to Visa Lighting - Scope
  - Railing light concealed within structure to illuminate travel path on balcony and stairwell. Equal to Cole – Lightrail.

- Lounge Areas
  - Collection of recessed 2x2 fixtures with varying lens depths. Equal to Focal Point – Nivo collection.
  - Recessed adjustable LED downlight to highlight fireplace wall. Equal to USAi Lighting – 2431 Series
- First Floor Lounge/Kitchen
  - Accent pendants over island and table. Equal to Tech Lighting – Moxy Pendant.
  - Perimeter fixture to graze mural wall. Equal to Focal Point – Seem 2
  - Square downlights for general illumination. Equal to USAi Lighting – 1010 Series
  - Wall to Ceiling corner. Linear recessed LED fixture over seating area. Equal to Focal Point – Seem 4
- Offices
  - 2'x4' or 2'x2' recessed LED fixture. Equal to Focal Point – Equation.
- Locker Room
  - Recessed LED downlights in Wood ceiling to height floor Logo. Equal to USAi Lighting – 1010 Series.
  - Cove fixture in soffit to highlight wood ceiling and general illumination. Equal to Focal Point – Covert.
- Recessed accent downlights in soffit to highlight front of Lockers. Equal to Contech – RA2LRM.
  - Narrow beam spread to create defined pools of light for each locker.
- Recruiting Lounge
  - Cove fixture above seating area for general illumination. Equal to Focal Point – covert.
  - Recessed LED downlights for general illumination of corridor area. Equal to USAi Lighting – 1010 Series.
  - Recessed adjustable LED downlight to highlight fireplace wall. Equal to USAi Lighting – 2431 Series\

R. Press Box and Concessions Building – specific room types:

1) Examples of light fixtures to establish quality shall be as follows:
   - Concessions
     - Suspended, lensed industrial type LED fixture
   - Press Box
     - Suspended or recessed. linear LED direct fixture. Equal to Focal Point – Seem 4.
   - Exterior
     - Exterior wall mounted fixture to wall wash logo. Equal to McGraw-Edison – Impact Elite.
     - Recessed linear LED fixture in soffit to light stairwell. Equal to Axis - Wet Beam.
     - Surface mount, wet listed LED fixture under stair landing.

S. Grounds Building – specific room types:

1) Examples of light fixtures to establish quality shall be as follows:
   - Break Room / Office
     - 2'x4' recessed LED linear fixtures. Equal to Focal Point - Equation
   - Garage / Work Space
     - Suspended, lensed, industrial type 8 foot LED fixture
   - Exterior
     - Exterior wall mounted fixture to wall wash logo and signage. Equal to McGraw-Edison – Impact Elite.
     - Egress lighting and exit signs will be provided along the entire path of egress. Egress lighting and exit signs shall utilize integral batteries fed from local normal circuit. If power is lost, battery will illuminate fixture to full output for 30 minutes.
     - All lighting levels shall conform with the Illuminating Engineering Society's recommendations and in general, shall be as follows in footcandles (FC). Actual ambient levels may be adjusted due to power density considerations and supplemented with task lighting. This shall be determined as the project progresses and surface finishes are selected.
     - Support areas (toilet, restrooms, corridor, stair, storage, mechanical / electrical room): 15 to 20 FC
     - Office/Break Rooms: 30 FC with task lighting
     - Meeting / Conference / Training rooms: 35 FC
     - Lobby / Foyer: 10 FC
     - Locker Rooms: 5 to 10 FC
     - Lounges: 5 to 15 FC
     - Garage / Workshop: 10 to 20 FC
     - Concessions: 50 FC
     - Press Box: 30 FC with task lighting
     - Exterior Pedestrian Walkways: 0.5 to 1.0 FC
     - Egress lighting: 1.0 FC average per code

   - Controls shall be provided as follows:
     - All areas shall be provided with ceiling-mounted occupancy sensors to automatically control lighting. Sensor shall be provided as follows:
       - Janitor's closets, small storage rooms, single occupant toilet rooms: Wall mounted infrared.
       - Multi-occupant restrooms: Ceiling mounted dual technology infrared / ultrasonic.

- Large storage rooms: Ceiling mounted infrared.
- Individual office, corridors, lobbies: Ceiling or Corner-mounted dual technology infrared / ultrasonic.
- All ceiling mounted occupancy sensors shall be provided with auxiliary relay packs capable of interfacing with the HVAC for system setback.
- All rooms with occupancy sensors shall have manual override to positively shutoff light fixtures as needed.

- Perimeter areas, fifteen feet from windows, shall be switched separately and controlled via dimming daylight sensing devices. Continuous dimming of fixtures in daylight areas shall be used where possible.
- Local dimming shall be provided in all spaces except support spaces (restrooms, storage, equipment, garage, corridors and concessions).
- Locker Rooms and Lounge spaces shall have multiple zones of dimming control for the various lighting applications: general, accent, indirect, etc.
- Where accepted, color-changing RGB LED fixtures will be provided with manual control station for users to select color and sequences.
- Mechanical and electrical rooms shall be controlled via line voltage switches for safety.

- Sustainability
  - Lighting densities will be a minimum of 30% lower than required by ASHRAE 2010.
  - Daylighting controls will be utilized where possible to reduce operating costs.

T. Site Electrical Requirements:

1) Exterior Lighting
   - Walkways shall be illuminated by LED fixtures to provide IES recommended light levels. The fixtures shall be classified as cut-off luminaries, and shall be mounted at or below heights allowable by local codes.
   - Canopies and Balconies. Lighting under entrance canopies shall consist of LED downlight or wall sconce fixtures.
   - Exterior Architectural Building Lighting. Some exterior LED lighting fixtures shall be used to highlight as yet undetermined architectural features.
   - All exterior lighting shall be controlled via a discrete relay system. All lighting shall be turned on and off by the campus central system signal.
   - LED fixtures defined as Egress luminaires illuminating the code required path between the exit discharge and the public way shall be sourced from a mini inverter located on the interior of the building(s), either above the ceiling or in the electrical room.
2) Exterior Power
   - Building mounted exterior, weatherproof, GFCI receptacles shall be mounted around the perimeter of the building at each exit door, and no more than 100' on center.
   - Provide power to any internally lit signage and / or exterior illuminated building signage.
   - Provide power general power and illumination to serve outdoor mechanical equipment.

U. Fire Alarm System:

1) Football Building
   - Existing Fire alarm system, Simplex 4010, shall be expanded as needed for new addition.
2) Baseball Building
   - A new fire alarm panel shall serve the Baseball Building.

3) Concessions/Press Box Building
   - Provide Remote transponder served by Baseball Building Fire alarm system for Concessions/Press Box Building.
4) Athletic Grounds Building
   - A new Fire Alarm Panel shall serve the Athletic Grounds Building.
5) System Description
   - New Fire Alarm Panels and systems shall be monitored, multiplexed, fully addressable one-way voice fire alarm system. The fire alarm system shall be composed of smoke detectors, heat detectors, magnetic door holders, duct smoke detectors, manual pull stations, water flow monitors, tamper switches, and audio/visual signaling devices. The installation of new devices shall comply with DFD standards.
   - System shall be integrated into UW Whitewater Campus Mass Notification system. Cross connect to system shall occur in Wing Hall.
6) Design Criteria
   - The fire alarm system shall comply with requirements of NFPA 72, Life Safety Codes and State Building Code.
   - A fire alarm annunciator panel shall be mounted at the entrance as designated by the local fire department.
   - Audio/visual devices shall be installed in all areas of the building in accordance with the NFPA and ADA guidelines. All areas of the building shall be covered by audible device coverage as required by NFPA 72 and the International Building Code as adopted in Wisconsin. Visual devices shall be installed in those public and common areas as recognized by ADA such as corridors, bathrooms, kitchen, serveries, dining rooms, conference rooms, waiting rooms, break areas and lobbies. Visual devices shall also be provided in mechanical areas as a supplement to the audible devices.
   - Smoke detectors shall be installed as required by the National Fire Protection Association and the International Building Code. Smoke detectors shall be installed in, but not limited to, the following locations: air handling units, elevator shafts, elevator lobbies, elevator machine rooms, and electrical equipment rooms.
   - Heat detectors shall be installed in areas that are not suitable for smoke detectors.
   - Dual-action manual pull stations shall be installed adjacent to all exit doors, each elevator lobby, and at floor exit stairwells. Pull stations shall have covers.
   - Fire fighter phones shall be installed in each elevator lobby.
7) Equipment and Material
   - Remote transponder panels shall be used to provide supervised amplifiers and signal circuits for audio/visual devices and magnetic door holders.
   - The system shall utilize individual addressable, photoelectric smoke detectors, heat detectors, addressable manual pull stations, and addressable monitor and control modules. The system shall monitor all sprinkler supervisory and water flow switches - where applicable, HVAC smoke control, and smoke fire dampers.

V. Telecommunications Systems

1) Definitions
   - Backbone Cabling – A facility (e.g., pathway, cable, conductors) between any of the following spaces: Telecommunications Rooms (TR), Telecommunications Enclosures (TE), common Telecommunications Rooms, floor serving terminals, Entrance Facilities (EF), Equipment Rooms (ER) and, common equipment rooms.
   - Cable – An assembly of one or more insulated conductors or optical fibers, within an enveloping sheath.

- Cable Channel – The end to end transmission path connecting interfaces on any two pieces of application specific equipment. Equipment cords and work area cords are included in the channel.
- Cable Link – A transmission path between two points no including terminal equipment, work area cables, and equipment cables. Can be up to 90m (295ft.) in length for horizontal cabling.
- Consolidation Point (CP) – A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- Cross-Connection – A connection scheme between cabling runs, subsystems, and equipment using patch cords, or jumpers that attach to connecting hardware on each end.
- Entrance Facility (EF) – An entrance to a building for both public and private network service cables (Including wireless) including the entrance point at the building wall and continuing to the entrance room or space.
- Faceplate – A protective plate surrounding a communications outlet that is used to hold telecommunications outlets/connectors or transition devices.
- Horizontal Cabling – Distribution media that connect the telecommunications outlet/connector at the work area and the first piece of the connection hardware in the horizontal cross connect (floor distributor).
- Horizontal Cross-connect (HC – usually located in the telecommunications rooms (TR), or Main Equipment Room (MER)). Termination blocks and patch panels for backbone and horizontal voice and data workstation cabling.
- Inter-Building – Connections between more than one building.
- Intra-Building – Connections within a single building, can be multiple floors
- Jack – A common term for telecommunications outlet/connector. Referred to as a modular jack and a Standard Information Outlet (SIO).
- Local Area Network (LAN) – The standard industry term for a network installation that serves a relatively small area (e.g., structured cabling installation serving a building).
- Main Equipment Room (MER), The central telecommunications space in a building, which connects to the TR(s) and to the EF. The MC is housed in this space, and the room may also serve as the HC for the floor or area in which it is located.
- Main Cross-connect (MC). The cross-connect normally located in the (Main) equipment room for cross-connection and interconnection of entrance cables, first level backbone cables, and equipment cables. Campus distributor is the international equivalent term for the Main Cross-Connect.
- Outlet Box – A metallic or nonmetallic box mounted with a floor, wall or ceiling and used to hold telecommunications outlets/connectors or transition device.
- Telecommunications – Any transmission, emission and reception of signs, signals, writings, images, and sounds; that is, information of any nature by cable, radio, optical, or other electromagnetic systems.
- Telecomm Outlet (TO) – an outlet jack device located in the work area on which horizontal cabling terminates. This device is typically mounted into a faceplate.
- Telecommunications Room (TR), An enclosed architectural space for housing telecommunications equipment, cable terminations, and cross-connect cabling.
- Telecommunications Cabinet (TC), an enclosed cabinet, typically wall mounted, to serve smaller buildings with modest quantities of data connections.
- Unshielded Twisted Pair (UTP) – Balance, 4-pair cable used for copper horizontal cabling and multi-pair copper backbone cables.
- Voice over Internet Protocol (VoIP) – A system in which voice signals are converted to packets and transmitted over a network using Transmission Control Protocol/Internet Protocol (TCP/IP)
- Wide Area Network (WAN) – A data communications system that uses telecommunications circuits to link LANs that are distributed over large geographic distances. Typically includes client-owned and service provider-owned cabling and equipment.

W. Applicable Codes, Guidelines, and Standards

1) The technology systems shall be designed in accordance with the following codes, guidelines, and standards:
   - Wisconsin Enrolled Commercial Building Code, which consists of the International Building Code (IBC) with the State of Wisconsin amendments.
   - National Fire Protection Association (NFPA) guidelines and standards including the following:
     - NFPA 70 – National Electrical Code, with the State or Wisconsin amendments
     - NFPA 72 – National Fire Alarm Code
     - NFPA 101 – Life Safety Code
   - ANSI/TIA-568-C.0 Generic Telecommunications Cabling for CustoMC Premises
   - ANSI/TIA-568-C.1 Commercial Building Telecommunications Cabling
   - ANSI/TIA-568-C.2 Balance Twisted-Pair Telecommunications Cabling and Components
   - ANSI/TIA-568-C.3 Optical Fiber Cabling Components
   - ANSI/TIA-568-C.4 Broadband Coaxial Cabling and Components
   - ANSI/TIA-569-C Commercial Building Standard for Telecommunications Pathways and Spaces
   - ANSI/TIA-606-B Administration Standard for Commercial Telecommunications Infrastructure
   - ANSI-J-STD-607-B Commercial Building Grounding and Bonding Requirements for Telecommunications.
   - ANSI/TIA/EIA 526-14-B – OFSTP-14 Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.
   - IEEE/ANSI 142-1982 Recommended Practice for Grounding of Industrial and Commercial Power Systems.
   - UL 910 – Test for Flame Propagation and Smoke Density Values for Electrical and Optical Fiber Cables used in Spaces Transporting Environmental Air
   - UL 1660 Test for Flame Propagation Height of Electrical and Optical Fiber Cables Installed Vertically in Shafts.
   - ICEA Publication S-80-576-2002.
   - BICSI TDMM Telecommunications Distribution Methods Manual (Current Edition).
   - Department of Facilities Development Guidelines
   - DFD Guidelines/Standards for Design and Sustainability

X. Low Voltage Raceway Systems

1) System Description
   - Inter-building fiber optic and/or copper telecommunications cabling shall be installed in buried PVC conduit with Quazite (or equal) handholes placed as required to facilitate cable installation. This conduit shall be 4"OD, and include a metallic conductor for tracing/locating.
   - Horizontal Distribution: Provide basket type cable tray routed above all major corridors. This cable tray is intended to route all low voltage systems not installed completely in conduit. These systems may include:
     - Voice/Data Horizontal Category 6 Cabling
     - Wireless Access Point (WLAN) Cabling
     - Copper Backbone Cabling
     - Optical Fiber Backbone Cabling
     - Security CCTV, Access Control, Intrusion Detection, and Duress System Cabling
     - Distributed Antenna Cabling (DAS)
     - Building Automation Systems
   - Low Voltage Cable Distribution – Special Systems: Provide a recessed junction box sized to accommodate device within the wall at the outlet location and a 1" conduit routed from the junction box

stubbed to the nearest accessible ceiling space. For exposed ceiling areas, extend this conduit to the basket tray. In drop ceiling areas, J-hooks shall be utilized above the accessible ceiling from the 1" conduit every 4' or less to support cabling to the cable tray.

- Low Voltage Cable Distribution – Horizontal Voice/Data: Provide a flush two-gang box with a single-gang plaster ring within the wall at outlet location and a 1" conduit routed from the box stubbed above the accessible ceiling. For exposed ceiling areas, extend this conduit to the basket tray. In drop ceiling areas, J-hooks shall be utilized above the accessible ceiling from the 1" conduit every 4' or less to support cabling to the cable tray.
- J-Hook cable support shall be utilized to transition cabling from the stubbed up outlet locations as well as between sections of cable tray in the ceiling where MEP congestion in the ceiling does not allow for the installation of a continuous length of cable tray. This latter option shall only be used as a last resort when no other option exists.
- Equipment and Material
  - Conduit Stubs: 1" EMT Conduit shall be used with plastic end bushings to protect cabling.
  - Conduit Sleeves: 4" EMT Conduit shall be used with plastic end bushings to protect cabling.
  - J-Hooks: Equivalent to Caddy or B-Line, Minimum ¾" (CAT12) and Maximum 4" (CAT64).
  - Cable Tray: Equivalent to Cablofil, B-Line or Chatsworth clear finish.
    - Cable tray in corridors: Combination of 24"W x 4"D and 18"W x 4"D.
    - Cable tray within Telecommunications Equipment Rooms: 12"Wx4"D and 18"W x 4"D

Y. Telecommunications Structured Cabling System

1) Main Equipment Room (MER) / Entrance Facility (EF):
   a. Due to the size of the buildings, the MER will contain the MC and also include the incoming telecommunications services – or EF – and may be housed in a TC. Dedicated rooms will not be required.
      - The MC for each building shall be located in the electrical, Audio Visual room, or mechanical room as space allows.
   b. MC/EF Design Requirements
      - The MC should be located as necessary to limit the longest network cable run to 295ft.
      - 6ft wide by 8ft high wall space should be reserved for the placement of the MC.
      - The wall space shall be lined with AC grade ¾" Plywood, painted with two coats of fire retardant paint on all 6 sides, leaving at least one plywood fire rating stamp visible on each sheet for future reference.
      - Each room in which the MC is housed shall have a doorway with a minimum of 3'-0" in width x 6'8" in height. All doors should swing out if possible to maximize usable room space. Each room shall be provided with card access control with keyed override.
      - A wall mounted telephone outlet shall be provided in each room. Phone to be provided by the Owner.
      - Specified distances should be maintained from possible sources of electromagnetic interference (EMI) exceeding 5 kilovolt-amperes (kVA)
        - 24in. - From unshielded power lines or electrical equipment in proximity to open or non-metal pathways.
        - 12in. - From unshielded power lines or electrical equipment in proximity to grounded metal conduit pathway.
        - 6in. - From power lines enclosed in a grounded metal conduit in proximity to a grounded metal conduit pathway
        - 48in. - From motors and transformers.

  - 2in. - From branch circuits of 5kVA or less
- HVAC shall be designed to maintain:
  - Control 24hrs a day, 365 days a year.
  - A positive pressure with a minimum of one air change per hour.
  - A temperature between 64 and 80 degrees Fahrenheit, and a relative humidity range of 30 to 60%.
- Floors within the rooms should be sealed to minimize static electricity and dust.
  - Each room should have a minimum 500 lux (50 foot candles) measured at the point of cable termination (36" AFF). Fixtures shall not be placed directly over data racks or cabinets.
- Data Cabinets
  - Wall mounted 4'H x 24"W cabinets shall be installed as the MC for each building for termination of horizontal cabling, optical fiber backbone cabling, and copper backbone cabling as well as the installation of owner furnished network data equipment and associated patching. Each rack has 26 useable Rack Units (1 RU = 1.75").
  - A 2-RU Horizontal cable management with hinged covers shall be installed for each patch panel.
- Overhead Cable Raceway
  - Overhead basket type cable tray shall be provided in each room to transition all horizontal and backbone cabling from the ceiling to the wall field or data cabinets within the MC. This cable tray shall be a minimum 12"W x 4"D. All tray shall be supported by a combination of support hardware off of walls, racks, and building structure. Center hung cable trays and center hung support hardware shall not be allowed.
- Grounding
  - A Telecommunication Ground Busbar (TGB) shall be provided in each room as part of the Telecommunication Grounding System. Each TGB shall be bonded to the Telecommunications Bonding Backbone (TBB) which in turn shall be connected to the Telecommunications Main Ground Busbar (TMGB) located in the main electrical service entrance. Minimum grounding backbone conductor in the grounding system shall be #3/0.
  - The TMGB shall be ¼" thick by 4" tall by the length needed for all terminations plus 30% future growth (>/=20").
  - The TGB shall be ¼" thick by 2" tall by the length needed for all terminations plus 50% future growth (>/=12").
  - All data cabinets, cable trays, lightning protection, metal cable jackets, and equipment per manufacturer's recommendation shall be grounded to the TMGB within the MC using approved two-hole ground lugs.
- Cable Pathway & Firestopping
  - STI EZ-path sleeves or an equal solution for cable pathway from the MC to the main corridor shall be used on all rated walls. UL listed systems shall be chosen based on the rating of the wall the cable pathway need to penetrate. Appropriate UL Firestop System labeling shall be required for each penetration installed.
- Additional Systems Space Requirements
  - Space shall be allotted in each room for the following other systems as required:
    - Fire Alarm
    - CATV/MATV
    - Security CCTV and Access Control
    - Future Distributed Antenna System (DAS)

Z. Service Entrance Cabling

- A new service entrance of (1) 4" Duct shall be provided from the campus ductbank system to the building to support the technology infrastructure. All technology services for the building shall enter through this duct bank and manhole/handhole system.
- 48 strands of OS2 singlemode in a dielectric cable will need to be installed between the "Point of Presence" building and Goodhue Hall via underground ductbank system.
- 6-strands of OS2 singlemode in a dielectric cable will need to be installed from the Point of Presence building to the Baseball Building, Concession/Press Box Building, and Athletic Grounds Building.
- A 25 pair PE-39 copper telephone cable shall service each building.
- All incoming copper cable shall terminate on wall-mounted surge protection in the MC/EF, then onto adjacent 110 style termination blocks for future cross-connection.
- All incoming optical fiber strands shall terminate on LC connectors in rack mounted fiber termination panels in the MC/EF.

AA. Horizontal Category 6 Cabling

- Work Area Locations
  - All cabling shall be UTP Category 6 cabling and shall be capable of be used for voice or data.
  - All four pairs shall be terminated on the telecommunications outlet and in the MC/TR upon rack mounted 48-port jack panels.
  - At outlet locations Faceplates shall be flush wall mounted or flush furniture mounted type faceplates.
  - All horizontal cable shall be terminated at the jack and on patch panels using the TIA-568B wiring standard.
  - Minimum compliant category 6 cabling shall not be considered. Cabling shall exceed category 6 standards.
  - The structured cabling system shall be provided as a certified cabling system. The manufacturer or manufacturers of the cable and termination components shall qualify and warranty the performance of the entire system for minimum of (20) years.

- Wireless Access Point (AP) Outlets
  - All data cabling for AP's shall be F/UTP Category 6A and shall be capable of being used for wireless data and voice and be PoE IEEE 802.11ac compliant.
  - Each WAP location will receive (2) Cat 6A data drops.
  - All four pairs shall be terminated on the MC/TR upon rack mounted 24 port patch panel.
  - At the Wireless Access Point outlet locations, the cable shall be field terminated with an 8P8C modular plug for connection directly into the AP.
  - These workstations shall be installed with 15ft. of slack placed at the last J-hook before the AP to enable minor relocations based on coverage needs.
  - It is the assumption that predictive RF surveys shall be accomplished prior to installation of the cabling. Then cabling shall be installed based on these predictive surveys. A sound preliminary wireless layout for the facility would have each Wireless Access Point located on a grid pattern with a separation of approximately 10m between AP's on each floor throughout the entire facility.
  - A post-deployment RF surveys should be performed once the access points are installed and the system is energized.
  - The contractor should include preliminary surveys; post surveys (and re-deployment time as needed), as well as installing the owner furnished Access Point Radios and patch cords at each WAP location.

- It is assumed Owner furnished network equipment, wireless controllers, etc. shall be installed by the owner or an owner representative.

BB. Access Control Security Systems:

1) System Description
   - Provide all hardware, devices, wiring, and equipment necessary to connect to the owner's current Andover security system as follows:
     - Division 8, shall provide all devices that mount to the door or door-frame.
     - Division 28 shall provide all wiring to those devices, connections to those devices, the security panel in each building, and connections of all field devices to that panel. This contractor shall also provide all Card Readers and motion request to exit (REX) devices at each door, with all necessary wiring and connections to the security panel in each building.
   - Contractor (Division 26) shall provide rough-in for security systems as follows:
     - Contractor shall provide all raceways and back boxes for the security equipment along with power to door locking hardware as required.

CC. Synchronized Clock System

1) System Description
   - All synchronized clocks within the football facility shall be time corrected via existing Primex wireless signal. A wireless signal extender shall be located in the football stadium press-box level mechanical space.
   - All clocks shall be battery clocks, and either digital or analog as desired by the Owner.
   - Quantity and location of clocks throughout the buildings shall be discussed further with the Owner.

2) Equipment and Materials – Wireless System
   - Clocks: Class 1 Notice to utilize Primex.

DD. Audio-Visual Systems

1) System Description:
   - Data connections shall be installed based on location and Owner requirements for network connections with conference rooms for Owner provided video conferencing and Polycom type voice only conferencing.
   - Conduits and flush mounted outlet boxes shall be designed for specialized Owner or AV contractor cabling between AV and/or network devices.

9. AUDIO VISUAL SYSTEMS

A. Athletic Services Building

1) Football Locker Room
   - Space shall include surface/ceiling mounted speakers for background music. Inputs for portable music device shall be provided with volume knob and source selector. Space shall include a large format display connected to building cable TV with a local input for a laptop. Audio can be routed to locker room audio system.

2) Lounge/Nutrition Area
   - Space shall include a large format display connected to building cable TV with a local input for a laptop. Display shall include additional speakers (sound bar) for better program audio. Connections

shall be included for various gaming systems. A button panel or touch screen shall be mounted next to display to select various video sources, adjust audio, and change channels.
- Ceiling mounted speakers shall be included for background music. Inputs for portable music device shall be provided with volume knob and source selector.

3) Lounge/Nutrition Huddle Space
   - Space shall include a large format display connected to building cable TV with a local input for a laptop.
   - Display shall also include a wireless presentation device. Audio shall be through display.
4) Training Room
   - Space shall include several medium format displays connected to building cable TV. Connections for headphones shall be provided for individuals to locally listen to audio.
5) Hydrotherapy Area
   - System shall include two large format displays that are rated for outdoors to prevent failure in a wet environment. Audio shall be from displays and control of displays shall be at entry.

B. Baseball Services Building

1) Baseball Audio System
   - System shall include new outdoor speakers positioned to direct audio at field and audience, reducing noise "spillage" in the surrounding residential area. Audio signal for main system shall be routable to other locations, such as lounge area, first floor spaces, etc., as directed by owner. The main sound system equipment (DSP, amps, rack, etc.) shall be located in the Baseball Services Building, and shall provide support for all other spaces.
   - Video input connection shall be mounted outside the press box and camera location. Video signal shall be routable to displays located in the Baseball Services Building.
2) Press Box
   - Space shall include headsets and microphones for announcers. Connections for the portable touch screen for the main audio system and inputs for portable music devices shall be located in this space. Special attention shall be given to isolate the sound at the announcers' positions to prevent interference and interruption from other individuals in the shared space.
3) Baseball Locker Room System
   - Space shall include surface/ceiling mounted speakers for background music. Inputs for portable music device shall be provided with volume knob and source selector.
4) First Floor Classroom System
   - System shall include a large format display or projector screen, sized so that the furthest seat can see a presentation clearly. System may require two large displays as an alternative configuration based on seating layout and ceiling height. Inputs for laptop or other video sources shall be located in the room as well as a wireless presentation device. Ceiling/surface mounted speakers shall be included for program audio. A touch screen or button panel shall also be included to control the system.
5) First Floor Lounge Area
   - Space shall include a large format display connected to building cable TV with a local input for a laptop. Display shall also be tied to camera feed and include a wireless presentation device. Audio shall be through display.
6) Entryway Feature Wall
   - Space shall include a technology feature wall with either an interactive display or architectural displays. Content shall be designed to showcase UW-Whitewater baseball program. Audio may be included.

7) Coaches Locker Room
   - Space shall include a medium format display connected to building cable TV with a local input for a laptop. Display shall also be tied to camera feed.
8) Alumni Lounge Area
   - Space shall include several large format displays tied to building cable TV with a local input for a laptop. Displays shall also be tied to camera feed and wireless presentation device. System shall also include surface/ceiling mounted speakers for program audio. Audio shall be zoned for three main areas in space. A control system with a touch screen will control each zone.
9) Recruiting Lounge Area
   - Space shall include a large format display connected to building cable TV with a local input for a laptop. Display shall also be tied to camera feed and include a wireless presentation device. Audio shall be through display.

J. Office Spaces (3 Total)
   - Spaces shall include a medium format display connect to building cable TV with a local input for a laptop. Display shall also be tied to camera feed.
   -

10. BUILDING ENERGY MODELING

Not applicable as a substantial portion of project work consists of existing building renovations. All new systems will be designed in accordance with current energy standards.

11. LIFE CYCLE COST PLAN AND REPORT

Not applicable as a substantial portion of project work consists of existing building renovations. All new systems will be designed in accordance with current energy standards.

12. BUDGET DETAIL

The budget recommendations in Appendix C are based on the following:

1) Drawings and programmatic information included in this document.
2) Project construction start date in January 2017 and completion in April 2018.

13. PROJECT SCHEDULE

The project schedule was developed with both the Football and Baseball athletic seasons in mind. All three buildings will be part of a single prime contract and therefore the General Contractor will have some flexibility in the delivery of the buildings based on campus input. The schedule assumes a start of construction in January of 2017 with a completion of the Athletic Services Building in August 2017 for the start of the football season. The Baseball Services Buildings will start after the 2017 season (approximately early June) and be completed for the 2018 baseball season in April 2018. The Athletic Grounds Maintenance Building can be completed by the end of summer 2017.

See Appendix D for Project Schedule detail.

14. EQUIPMENT

A. Athletic Services Building

1) Hydroworx Pools are to be purchased separately by UW-Whitewater. They have requested the design team plan for three pools:
   - Thermal Plunge
   - Polar Plunge
   - 750i Therapy Pool (with technology package)

2) Gear Boss Football Lockers are to be purchased separately by UW-Whitewater. They have shared preliminary design information and requested the design team plan for (110) 30" wide lockers.

B. Baseball Services Building
   1) Wood Baseball Lockers are to be purchased separately by UW-Whitewater. They have requested the design team plan for (33) 30" wide lockers

C. Athletic Grounds Maintenance Building
   1) UW-Whitewater Grounds Maintenance staff has stated that they will build custom shelving and other items for their workshop

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APPENDICES

Appendix A: Space Tabulation Sheet

University of Wisconsin Whitewater

Athletic Services Building

February 15, 2016

DSF # 15J1P

KS # 215125.00

Space Tabulation

Kahler Slater experience design

UNIVERSITY OF WISCONSIN WHITEWATER

Component		RENOVATED AREA No. of Units	Area	Total Area SF	NEW CONSTRUCTION No. of Units	Area	Total Area SF	Notes
1.00	**ATHLETIC TRAINING**							
1.01	Training Room	1 area	965 SF	965 SF				
1.02	Hydrotherapy Room				1 area	915 SF	915 SF	Excludes costs of (3) Hydroworx pools
1.03	Office -Trainer	2 room	113 SF	226 SF				
1.04	Training Supplies Storage	1 room	155 SF	155 SF				
1.05	Ice Machine / Water Room				1 room	172 SF	172 SF	
#REF!	Unisex Toilet / Changing Room	1 room	137 SF	137 SF				
1.00	**ATHLETIC TRAINING**			**1,483 SF**			**1,087 SF**	
2.00	**LOCKER ROOMS**							
2.01	Home Team - Locker Room	1 room	1,500 SF	1,500 SF	1 area	1,557 SF	1,557 SF	(110) team lockers to be purchased and installed separately (outside of this cost)
2.02	Home Team - Shower Room	0 room	357 SF	0 SF				
2.03	Home Team - Toilets	0 room	249 SF	0 SF				
2.04	Home Team - Player Lounge	1 room	763 SF	763 SF				
2.05	Home Team - Player Lounge Toilets	1 room	152 SF	152 SF				
2.06	Visiting Team - Locker Room	0 room	1,082 SF	0 SF				
2.07	Visiting Team - Shower Room	1 room	282 SF	282 SF				
2.08	Visiting Team - Toilets	0 room	305 SF	0 SF				
2.09	Shoe Dryer Alcove	1 room	60 SF	60 SF				
2.00	**LOCKER ROOMS**			**2,757 SF**			**1,557 SF**	
3.00	**TICKETING**							
3.01	Ticket Office	0 room	367 SF	0 SF				
3.02	Ticket Storage	0 room	143 SF	0 SF				
3.03	Ticket Toilet	0 room	25 SF	0 SF				
3.00	**TICKETING**			**0 SF**			**0 SF**	
4.00	**BUILDING SUPPORT**							
4.01	Equipment Storage	0 room	1,239 SF	0 SF				
4.02	Equipment Sink	0 room	32 SF	0 SF				
4.03	Mechanical Room	0 room	301 SF	0 SF				
4.04	Transformer Room	0 room	255 SF	0 SF				
4.05	Electrical Room	0 room	124 SF	0 SF				
4.06	Mechanical Penthouse	0 room	1,373 SF	0 SF				
4.07	Hydrotherapy Pit				1 room	764 SF	764 SF	
4.08	Pool Mechanical Room				1 room	135 SF	135 SF	
4.09	Football Game Day Storage	0 room	821 SF	0 SF				
4.00	**BUILDING SUPPORT**			**0 SF**			**899 SF**	
1.00	**ATHLETIC TRAINING**			**1,483 SF**			**1,087 SF**	
2.00	**LOCKER ROOMS**			**2,757 SF**			**1,557 SF**	
3.00	**TICKETING**			**0 SF**			**0 SF**	
4.00	**BUILDING SUPPORT**			**0 SF**			**899 SF**	
	Net Building Area	83%		**4,240 SF**	89%		**3,543 SF**	
	Circulation and Walls	17%		**860 SF**	11%		**455 SF**	
	Gross Building Area/Building Constr. Cost	100%		**5,100 SF**	100%		**3,998 SF**	

University of Wisconsin Whitewater

Baseball Services Building

February 15, 2016

DSF # 15J1P

KS # 215125.01

Space Tabulation

Component		RENOVATED AREA No. of Units	Area	Total Area SF	NEW CONSTRUCTION No. of Units	Area	Total Area SF	Notes
1.00	**SHARED SPACE**							
1.01	Entry Lobby				1 area	320 SF	320 SF	
1.02	Elevator Lobby				1 area	90 SF	90 SF	
1.03	Entry Vestibule				1 area	80 SF	80 SF	
1.00	**SHARED SPACE**			**0 SF**			**490 SF**	
2.00	**LOCKER ROOM/TRAINING**							
2.01	Locker Room				1 area	900 SF	900 SF	(33) team lockers to be purchased and installed separately (outside of this cost)
2.02	Team Meeting Room	1 room	465 SF	465 SF				
2.03	Shower Room	1 room	160 SF	160 SF				
2.04	Toilets	0 room	150 SF	0 SF				
2.05	Team Lounge				1 area	500 SF	500 SF	
2.06	Nutrition Area				1 area	130 SF	130 SF	
2.07	Athletic Training				1 room	450 SF	450 SF	
2.08	Equipment Storage	1 room	300 SF	300 SF				
2.09	Mud Room / Team Bag Storage	1 room	75 SF	75 SF				
2.10	Dugout	1 room	310 SF	310 SF				
2.11	Coach's Locker Room				1 room	225 SF	225 SF	
2.00	**LOCKER ROOM/TRAINING**			**1,310 SF**			**2,205 SF**	
3.00	**ALUMNI SUITE/OFFICES**							
3.01	Head Coach Office				1 room	210 SF	210 SF	
3.02	Assistant Coach's Office				2 room	170 SF	340 SF	
3.03	Volunteer Area				1 room	100 SF	100 SF	
3.04	Work Room				1 room	100 SF	100 SF	
3.05	Recruiting Lounge				1 room	275 SF	275 SF	
3.06	Alumni Suite				1 room	1,350 SF	1,350 SF	
3.07	Kitchen				1 room	120 SF	120 SF	
3.08	Spectator / Staff Toilet Rooms				2 room	140 SF	280 SF	Allowance
3.09	Spectator Deck				0 area	500 SF	0 SF	
3.00	**ALUMNI SUITE/OFFICES**			**0 SF**			**2,775 SF**	
1.00	**SHARED SPACE**			**0 SF**			**490 SF**	
2.00	**LOCKER ROOM/TRAINING**			**1,310 SF**			**2,205 SF**	
3.00	**ALUMNI SUITE/OFFICES**			**0 SF**			**2,775 SF**	
	Net Building Area	84%		**1,310 SF**	70%		**5,470 SF**	
	Circulation and Walls	16%		**245 SF**	30%		**2,359 SF**	
	Gross Building Area/Building Constr. Cost	100%		**1,555 SF**	100%		**7,829 SF**	

University of Wisconsin Whitewater

Concessions / Press Box Building

February 15, 2016

DSF # 15J1P

KS # 215125.01

Space Tabulation

Component		RENOVATED AREA No. of Units	Area	Total Area SF	NEW CONSTRUCTION No. of Units	Area	Total Area SF	Notes
1.00	**CONCESSIONS/PRESS BOX**							
1.01	Concessions				1 area	160 SF	160 SF	
1.02	Concessions Storage				1 area	110 SF	110 SF	
1.03	Press Box				1 area	325 SF	325 SF	
1.00	**CONCESSIONS/PRESS BOX**			**0 SF**			**595 SF**	
1.00	**CONCESSIONS/PRESS BOX**			**0 SF**			**595 SF**	
	Net Building Area			**0 SF**	59%		**595 SF**	
	Circulation and Walls			**0 SF**	41%		**421 SF**	
	Gross Building Area/Building Constr. Cost	0%		**0 SF**	100%		**1,016 SF**	

University of Wisconsin Whitewater

Athletic Grounds Maintenance Building

February 15, 2016

DSF # 15J1P

KS # 215125.01

Space Tabulation

Component		RENOVATED AREA No. of Units	Area	Total Area SF	NEW CONSTRUCTION No. of Units	Area	Total Area SF	Notes
1.00	**TEMPERED SPACE**							
1.01	Work Area				1 area	560 SF	560 SF	
1.02	Office				1 area	120 SF	120 SF	Space for (2) staff
1.03	Toilet				1 area	50 SF	50 SF	
1.04	Kitchenette / Break Area				1 area	65 SF	65 SF	
1.00	**TEMPERED SPACE**			**0 SF**			**795 SF**	
2.00	**GARAGE/STORAGE**							
2.01	Garage				1 area	460 SF	460 SF	
2.00	**GARAGE/STORAGE**			**0 SF**			**460 SF**	
1.00	**TEMPERED SPACE**			**0 SF**			**795 SF**	
2.00	**GARAGE/STORAGE**			**0 SF**			**460 SF**	
	Net Building Area			**0 SF**	80%		**1,255 SF**	
	Circulation and Walls			**0 SF**	20%		**305 SF**	
	Gross Building Area/Building Constr. Cost			**0 SF**	100%		**1,560 SF**	

APPENDICES

Appendix B: Preliminary Design Drawings

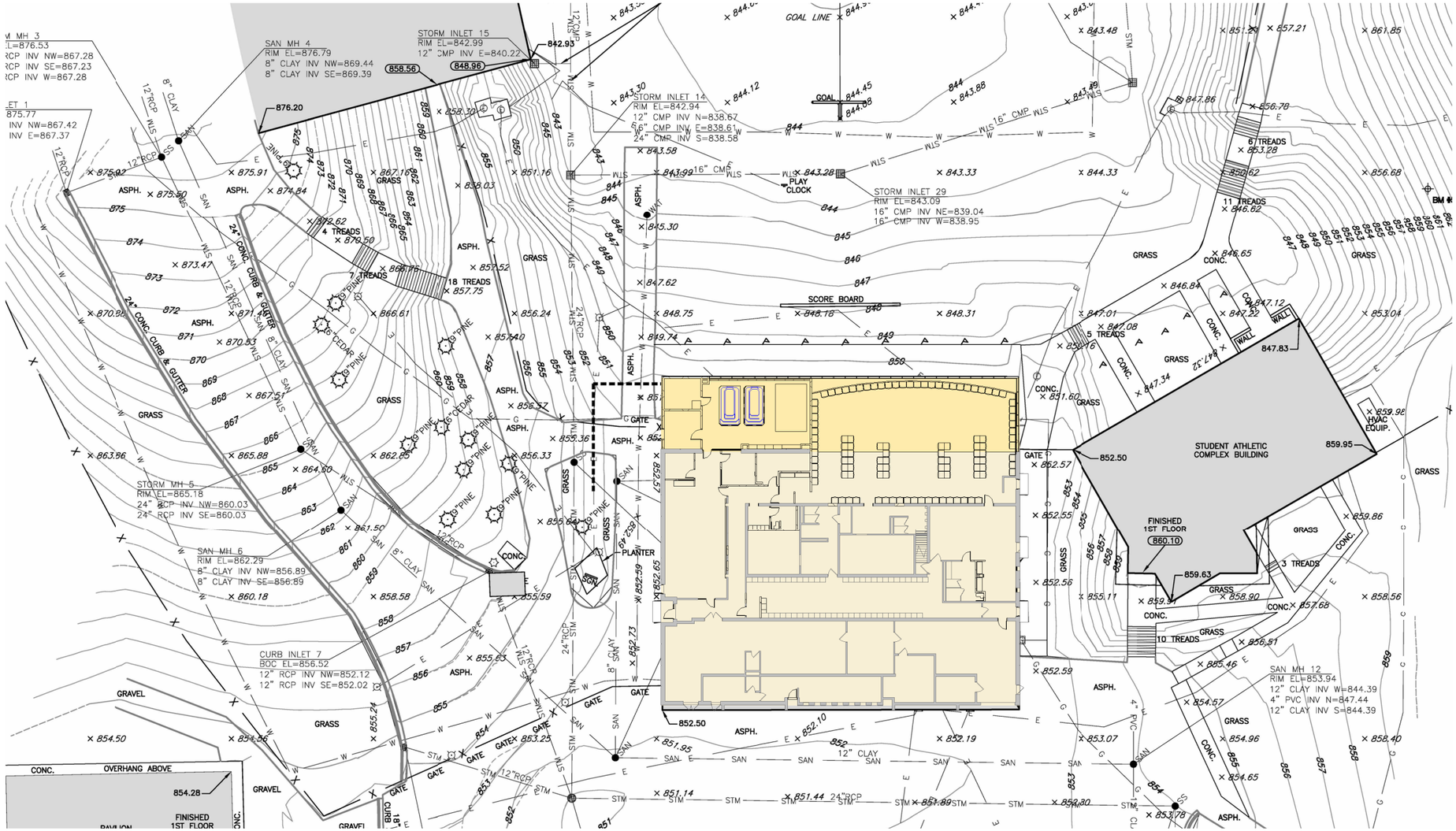
ATHLETIC COMPLEX BUILDINGS

UNIVERSITY OF WISCONSIN - WHITEWATER

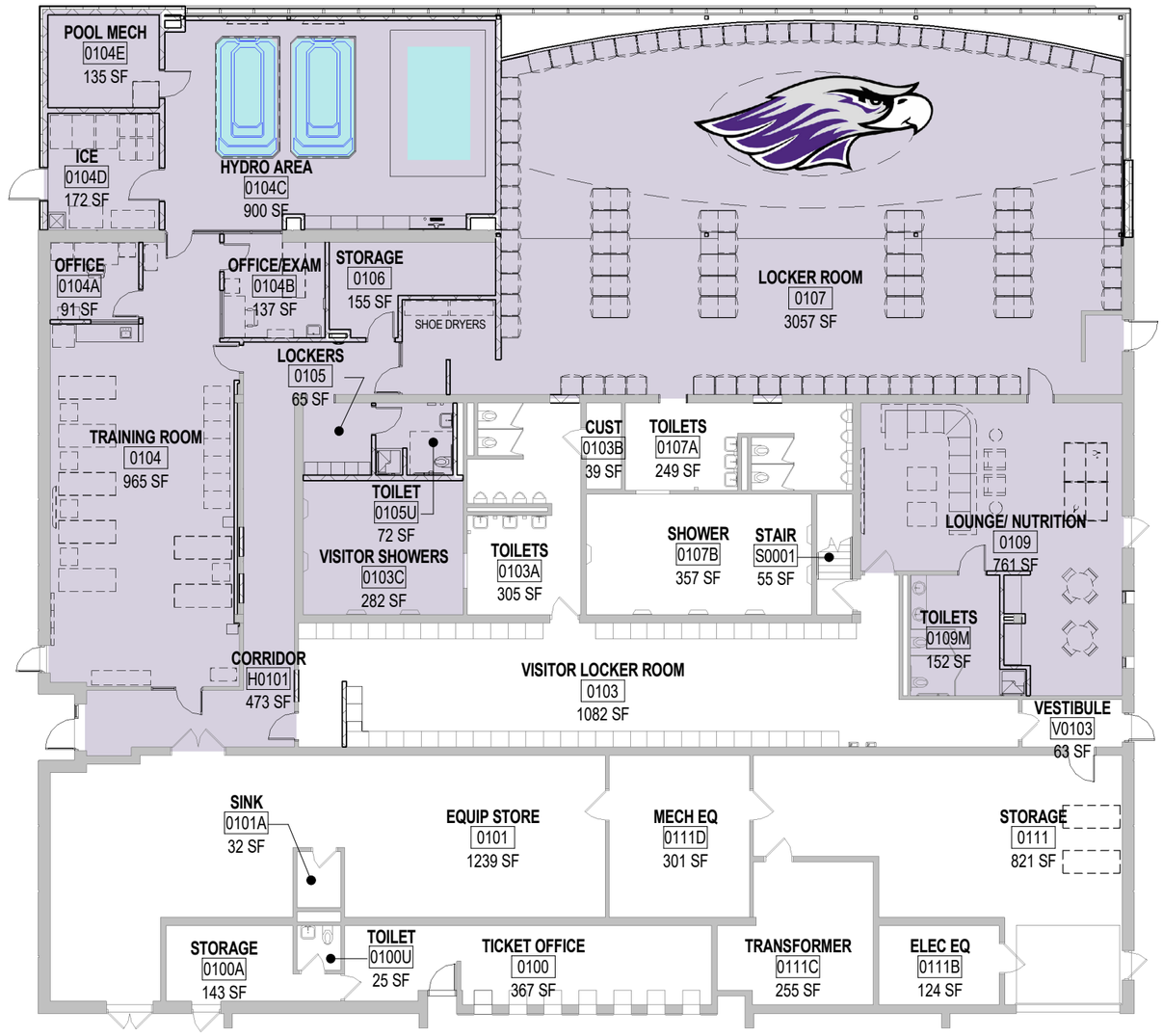
35% Plans, Images
JUNE 28, 2016

Kahler Slater
experience design

UNIVERSITY OF WISCONSIN
WHITEWATER



ATHLETIC SERVICES SITE PLAN



ATHLETIC SERVICES FIRST FLOOR

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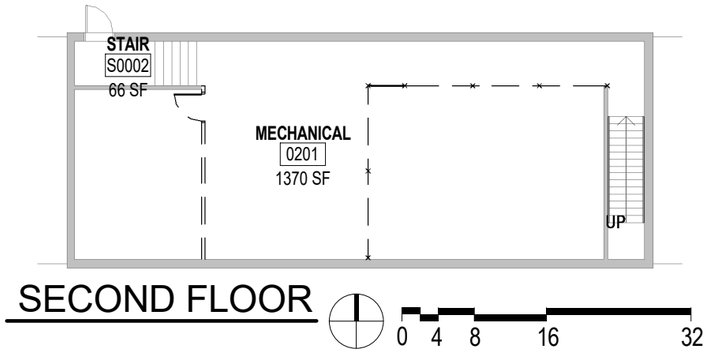


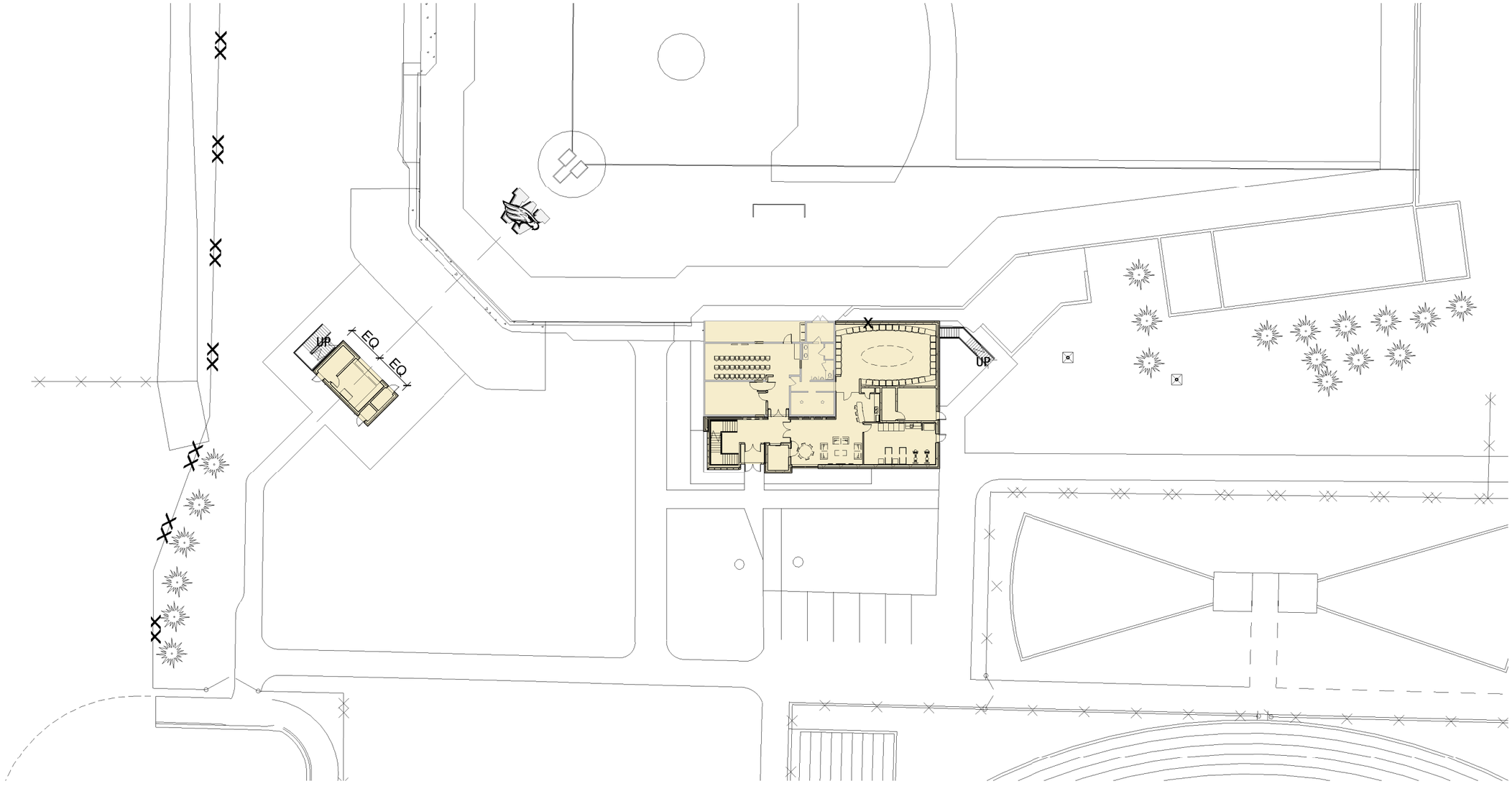
SECOND FLOOR

0 4 8 16 32


NATIONAL CHAMPIONS
2007
2009
2010
2011
2013
2014


NATIONAL CHAMPIONS


POWERED BY TRADITION
WARHAWKS



BASEBALL SERVICES SITE PLAN

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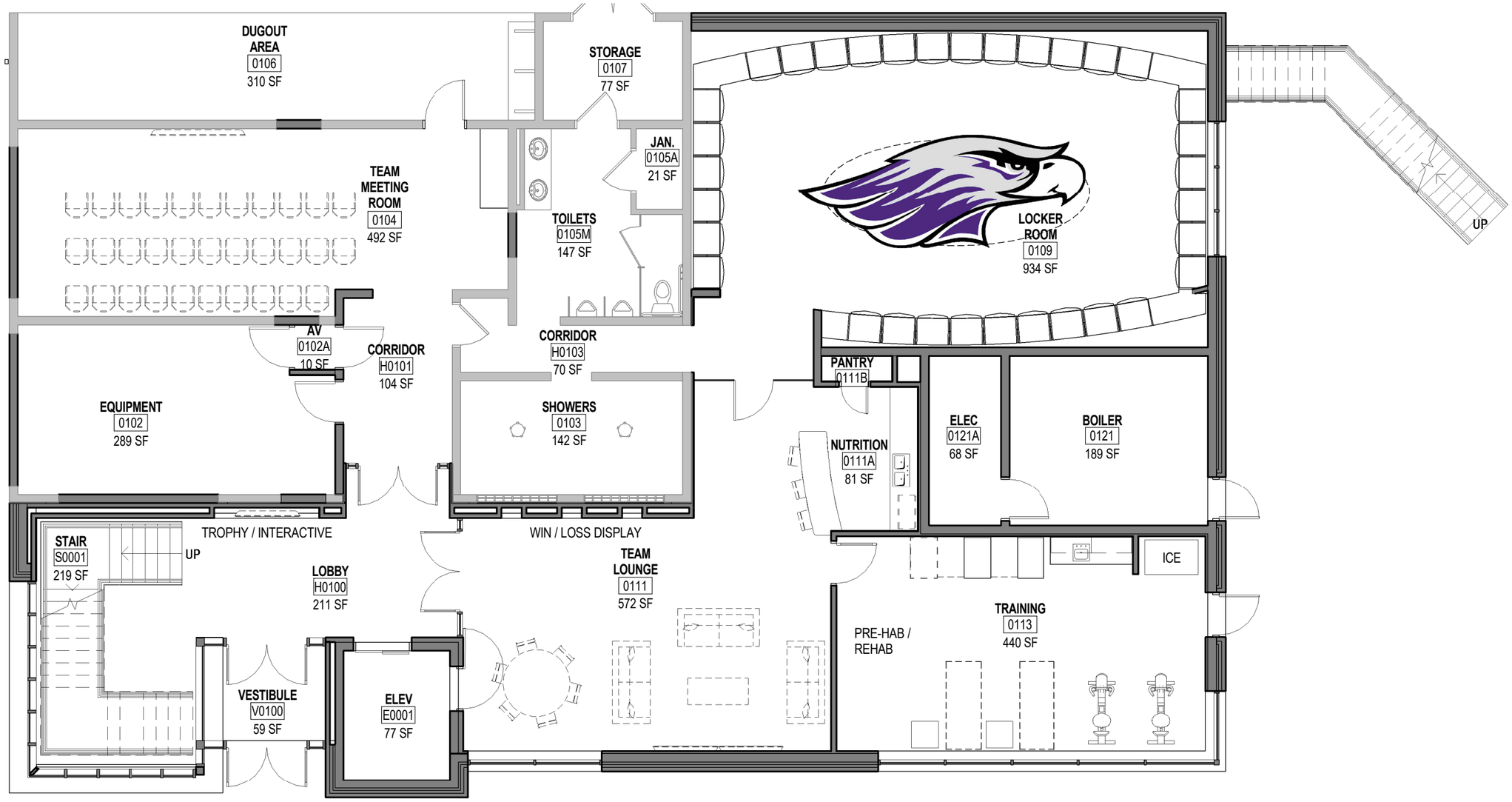

BASEBALL SERVICES FIRST FLOOR

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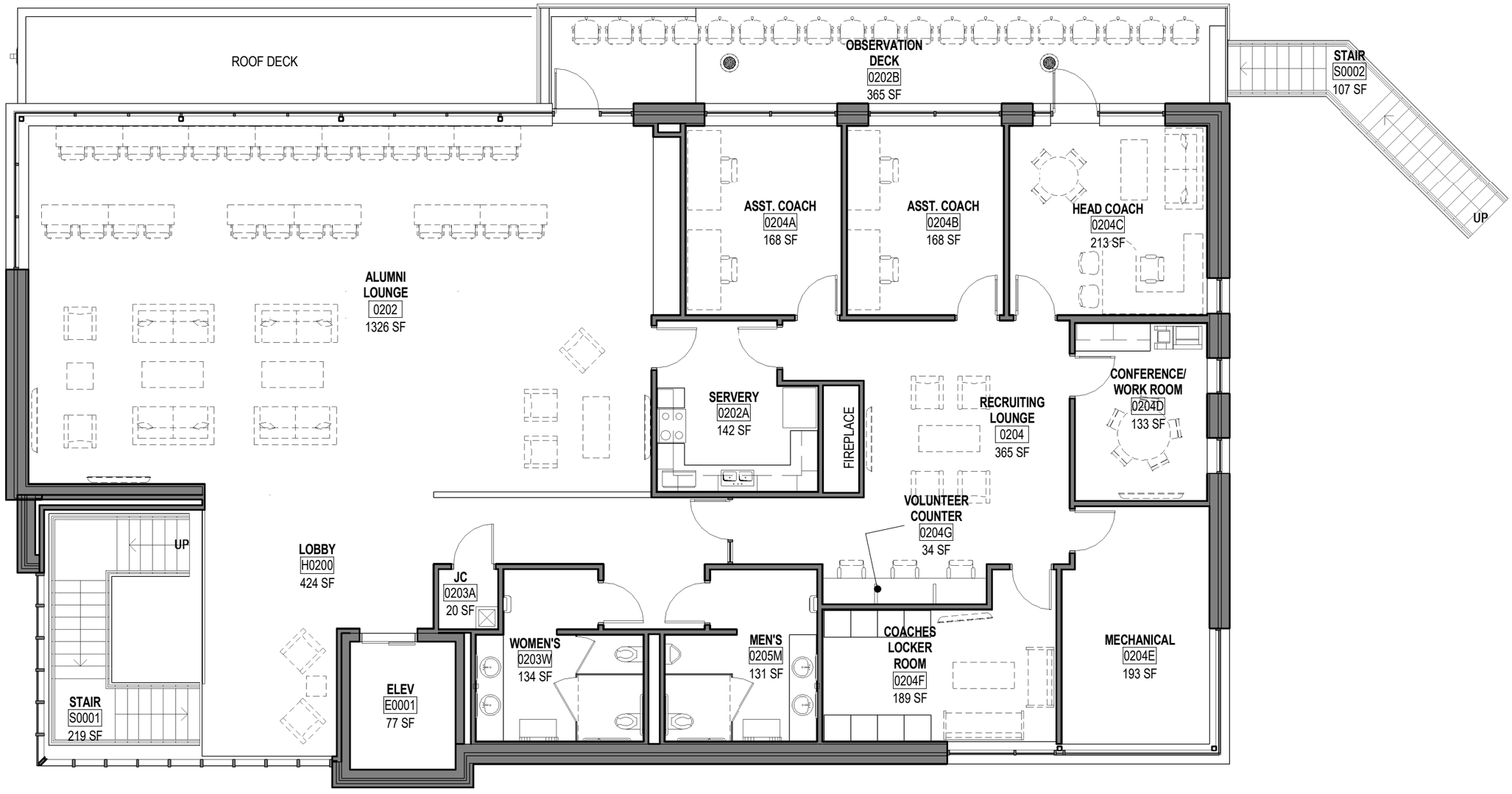
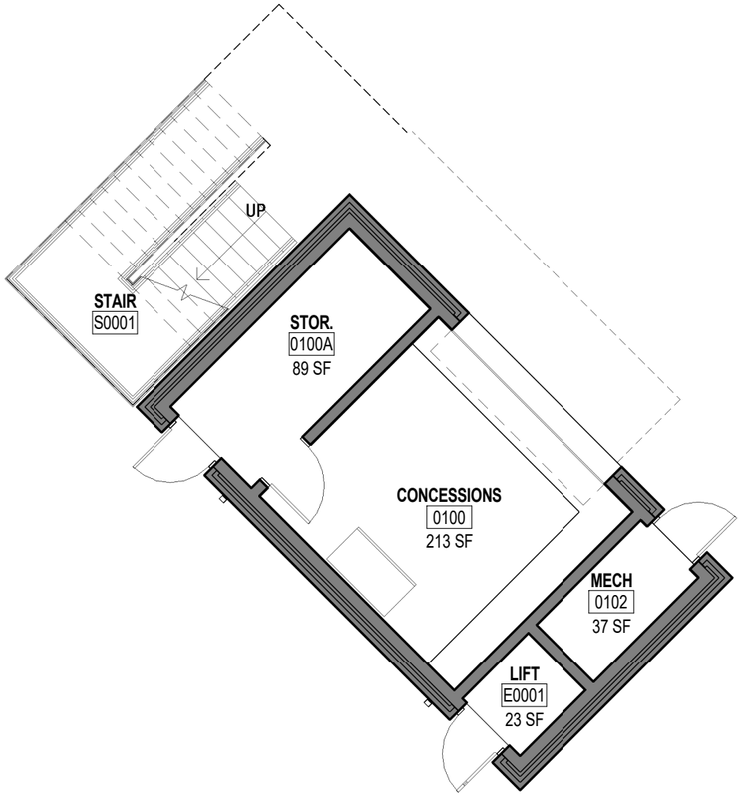


BASEBALL SERVICES SECOND FLOOR

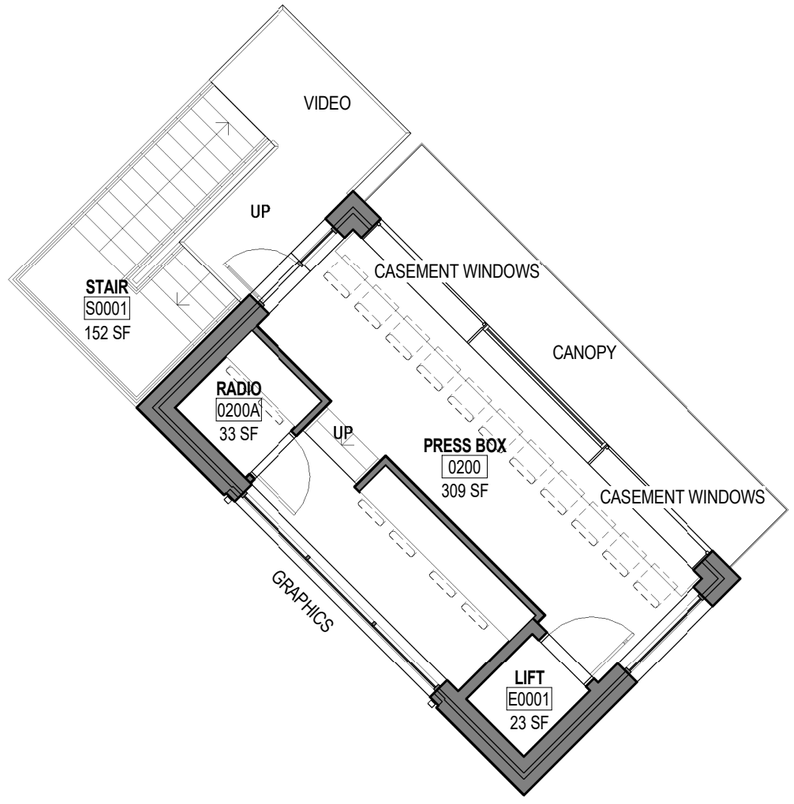
0 2 4 8 16


WARHAWKS



CONCESSION/PRESS BOX - 1ST

0 2 4 8 16



CONCESSION/PRESS BOX - 2ND

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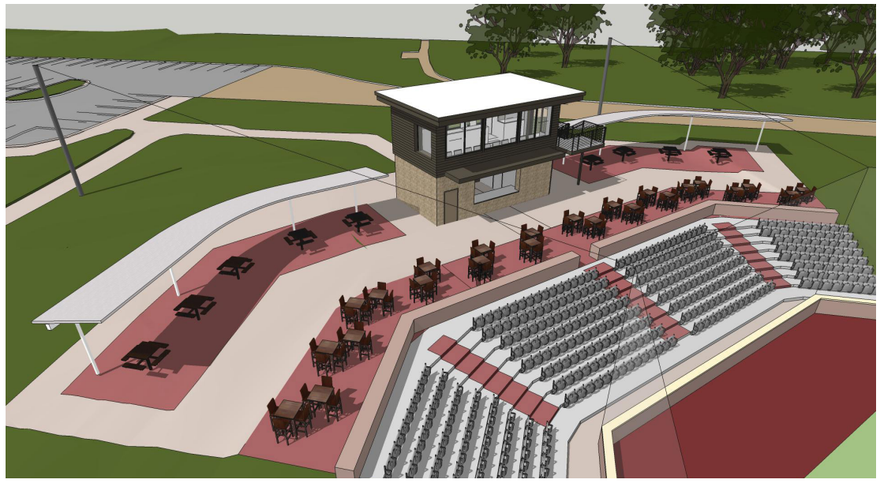
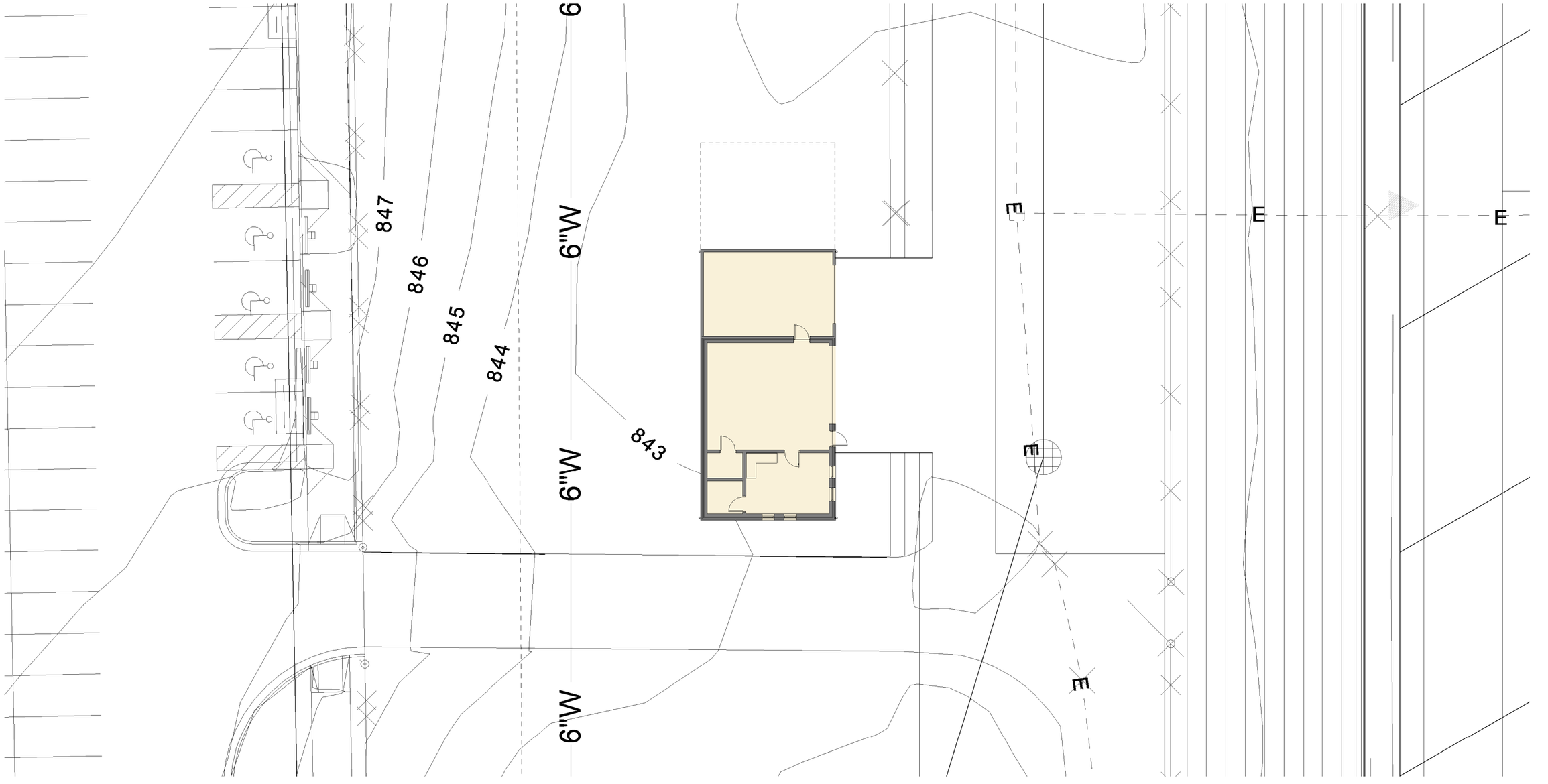
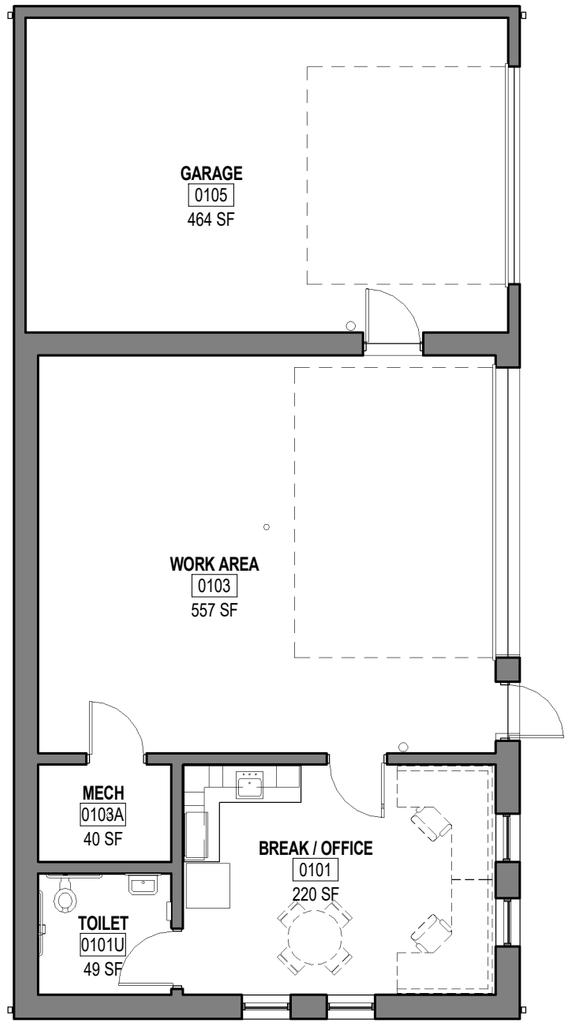




GROUNDS MAINTENANCE SITE PLAN

0 5 10 20 40



GROUNDS MAINTENANCE FLOOR PLAN

0 2 4 8 16

APPENDICES

Appendix C: Project Budget

MIRON CONSTRUCTION CO., INC.
1471 McMahon Drive, Neenah, WI 54956-6305
PH 920.969.7000 FX 920.751.8150
MIRON-CONSTRUCTION.COM

Work Section	Sub Total
Athletic Services Building	
310000 - Earthwork	**$60,083**
31 00 00 - Earthwork	$49,456
31 05 13 - Soil Testing	$4,500
31 10 00 - Site Clearing	$2,832
31 23 23 - Fill	$2,508
31 25 00 - Erosion and Sedimentation Controls	$788
320000 - Exterior Improvements	**$5,750**
32 12 16 - Asphalt Paving	$750
32 13 13 - Concrete Paving	$5,000
32 17 00 - Paving Specialties	$0
32 90 00 - Planting	$0
330000 - Utilities	**$4,750**
33 10 00 - Water Utilities	$4,750
33 30 00 - Sanitary Sewerage Utilities	$0
33 40 00 - Storm Drainage Utilities	$0
020000 - Existing Conditions	**$72,765**
02 05 00 - Common Work Results for Existing Conditions	$5,517
02 41 19.13 - Selective Building Demolition	$67,248
030000 - Concrete	**$88,951**
03 00 00.00 - Concrete Testing	$1,177
03 11 00 - Concrete Forming	$37,708
03 15 00 - Concrete Accessories	$6,964
03 20 00 - Concrete Reinforcing	$11,566
03 22 00 - Welded Wire Fabric Reinforcing	$2,328
03 30 00 - Cast-in-Place Concrete	$21,753
03 35 00 - Concrete Finishing	$5,062
03 60 00 - Grouting	$2,394
040000 - Masonry	**$111,585**
04 00 00 - Masonry	$7,500
04 22 00 - Concrete Unit Masonry	$104,085
050000 - Metals	**$72,300**
05 12 00 - Structural Steel Framing	$55,050
05 50 00 - Metal Fabrications	$1,000
05 52 00 - Metal Railings	$16,250
060000 - Wood, Plastics, and Composites	**$40,765**
06 10 00 - Rough Carpentry	$17,951
06 40 00 - Architectural Woodwork	$12,829
06 61 16 - Solid Surfacing Fabrications	$9,985

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Work Section	Sub Total
070000 - Thermal and Moisture Protection	**$105,368**
07 21 13 - Board Insulation	$2,462
07 27 00 - Air Barriers	$6,840
07 46 16 - Metal Wall Panel	$59,827
07 53 23 - EPDM Roofing	$27,975
07 60 00 - Flashing and Sheet Metal	$4,515
07 92 00 - Joint Sealants	$3,750
080000 - Openings	**$145,018**
08 11 13 - Hollow Metal Doors and Frames	$8,775
08 13 15 - Install HM Doors, Frames, & Hardware	$3,806
08 14 00 - Wood Doors	$1,904
08 33 13 - Coiling Counter Doors	$2,900
08 41 13 - Aluminum-Framed Entrances and Storefronts	$26,280
08 44 00 - Curtain Wall and Glazed Assemblies	$100,775
08 81 00 - Glass Glazing	$578
090000 - Finishes	**$165,861**
09 21 16 - Gypsum Board Assemblies	$42,809
09 30 13 - Ceramic Tiling	$35,447
09 51 00 - Acoustical Ceilings	$11,557
09 65 00 - Resilient Flooring	$9,174
09 68 00 - Carpeting	$31,750
09 72 00 - Wall Coverings - Specialty Logos**N.I.C.**	$0
09 90 00 - Painting and Coating	$10,124
09 99 01 - Improve South Side of Building**Allowance**	$25,000
100000 - Specialties	**$0**
10 00 00 - TV's, Monitors, Sound**N.I.C.**	$0
10 11 16 - Markerboards	$0
10 14 00 - Signage - Room Identification Only	$0
10 28 13 - Toilet Accessories	$0
10 44 00 - Fire Protection Specialties	$0
10 51 00 - Lockers	$0
10 51 16 - Wood Athletic Lockers**N.I.C.**	$0
10 75 00 - Flagpoles**N.I.C.**	$0
110000 - Equipment	**$0**
11 52 13 - Projection Screens	$0
120000 - Furnishings	**$0**
12 21 00 - Window Blinds	$0
12 50 00 - Furniture**N.I.C.**	$0
130000 - Special Construction	**$0**
13 14 13 - Pools**N.I.C.**	$0

MIRON CONSTRUCTION CO., INC.
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Work Section	Sub Total
210000 - Fire Suppression	**$45,900**
21 00 00 - Fire Suppression	$45,900
220000 - Plumbing	**$99,450**
22 00 00 - Plumbing	$99,450
230000 - Heating, Ventilating and Air-Conditioning (HVAC)	**$428,400**
23 00 00 - Heating, Ventilating, and Air-Conditioning (HVAC)	$428,400
260000 - Electrical	**$214,200**
26 00 00 - Electrical	$214,200
26 05 19 - Electrical - Audio / Visual	$0
Athletic Services Building Total	**$1,661,147**

Description	Percent	Amount
Building Permit - By Owner		
Insurance Requirements		
Builders Risk Insurance	0.08 %	1,329
General Conditions	3.25 %	53,987
General Requirements	1.75 %	29,070
Project Contingency		
Subtotal		1,745,533
Construction Fee	4.00 %	69,821
Project Construction Total		1,815,354
Performance and Payment Bond		18,909
Owner FFE		
Total Estimate		**1,834,263**

MIRON CONSTRUCTION CO., INC.
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Baseball Services Building

Work Section	Sub Total
310000 - Earthwork	**$39,536**
31 00 00 - Earthwork	$28,966
31 05 13 - Soil Testing	$3,000
31 10 00 - Site Clearing	$2,549
31 23 23 - Fill	$4,146
31 25 00 - Erosion and Sedimentation Controls	$875
320000 - Exterior Improvements	**$8,564**
32 12 16 - Asphalt Paving	$2,889
32 13 13 - Concrete Paving	$5,675
32 17 00 - Paving Specialties	$0
32 90 00 - Planting	$0
330000 - Utilities	**$4,040**
33 10 00 - Water Utilities	$4,040
33 30 00 - Sanitary Sewerage Utilities	$0
33 40 00 - Storm Drainage Utilities	$0
020000 - Existing Conditions	**$47,605**
02 05 00 - Common Work Results for Existing Conditions	$1,724
02 41 19.13 - Selective Building Demolition	$45,881
030000 - Concrete	**$203,584**
03 00 00.00 - Concrete Testing	$1,893
03 11 00 - Concrete Forming	$48,241
03 15 00 - Concrete Accessories	$4,258
03 20 00 - Concrete Reinforcing	$16,892
03 22 00 - Welded Wire Fabric Reinforcing	$5,756
03 30 00 - Cast-in-Place Concrete	$37,921
03 35 00 - Concrete Finishing	$9,075
03 41 13 - Precast Concrete Hollow Core Planks	$78,700
03 60 00 - Grouting	$848
040000 - Masonry	**$199,131**
04 05 23 - Masonry Accessories	$5,170
04 05 23.16 - Masonry Embedded Flashing	$9,700
04 21 00 - Clay Unit Masonry	$60,545
04 22 00 - Concrete Unit Masonry	$121,154
04 72 00 - Cast Stone Masonry	$2,562
050000 - Metals	**$111,681**
05 12 00 - Structural Steel Framing	$61,331
05 50 00 - Metal Fabrications	$0
05 51 00 - Metal Stairs	$20,000
05 52 00 - Metal Railings	$30,350

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Work Section	Sub Total
060000 - Wood, Plastics, and Composites	**$83,040**
06 10 00 - Rough Carpentry	$30,386
06 20 00 - Finish Carpentry	$432
06 40 00 - Architectural Woodwork	$27,689
06 61 16 - Solid Surfacing Fabrications	$23,927
06 80 00 - Composite Fabrications	$607
070000 - Thermal and Moisture Protection	**$238,455**
07 13 00 - Sheet Waterproofing	$0
07 21 13 - Board Insulation	$2,052
07 27 00 - Air Barriers	$26,151
07 46 16 - Metal Wall Panel	$119,700
07 53 23 - EPDM Roofing	$69,247
07 60 00 - Flashing and Sheet Metal	$10,710
07 84 00 - Firestopping	$6,000
07 92 00 - Joint Sealants	$4,595
080000 - Openings	**$188,854**
08 11 13 - Hollow Metal Doors and Frames	$16,800
08 13 15 - Install HM Doors, Frames, & Hardware	$7,255
08 14 00 - Wood Doors	$1,950
08 41 13 - Aluminum-Framed Entrances and Storefronts	$107,916
08 44 00 - Curtain Wall and Glazed Assemblies	$54,933
08 81 00 - Glass Glazing	$0
090000 - Finishes	**$221,468**
09 21 16 - Gypsum Board Assemblies	$97,474
09 30 13 - Ceramic Tiling	$11,694
09 51 00 - Acoustical Ceilings	$32,745
09 65 00 - Resilient Flooring	$9,066
09 68 00 - Carpeting	$46,041
09 72 00 - Wall Coverings - Specialty Logos **N.I.C.**	$0
09 90 00 - Painting and Coating	$24,449
100000 - Specialties	**$0**
10 00 00 - TV's, Monitors, Sound **N.I.C.**	$0
10 11 16 - Markerboards	$0
10 14 00 - Signage - Room Identification Only	$0
10 21 13 - Toilet Compartments	$0
10 26 00 - Wall and Door Protection	$0
10 28 13 - Toilet Accessories	$0
10 44 00 - Fire Protection Specialties	$0
10 51 00 - Lockers	$0
10 51 16 - Wood Athletic Lockers **N.I.C.**	$0
110000 - Equipment	**$0**
11 40 00 - Foodservice Equipment **N.I.C.**	$0

MIRON CONSTRUCTION CO., INC.
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Work Section	Sub Total
11 52 13 - Projection Screens	$0
120000 - Furnishings	**$0**
12 21 00 - Window Blinds	$0
140000 - Conveying Equipment	**$48,000**
14 20 00 - Elevators	$48,000
210000 - Fire Suppression	**$35,742**
21 00 00 - Fire Suppression	$35,742
220000 - Plumbing	**$66,378**
22 00 00 - Plumbing	$66,378
230000 - Heating, Ventilating and Air-Conditioning (HVAC)	**$183,816**
23 00 00 - Heating, Ventilating, and Air-Conditioning (HVAC)	$183,816
260000 - Electrical	**$153,180**
26 00 00 - Electrical	$153,180
26 05 19 - Electrical - Audio / Visual	$0
Baseball Services Building Total	**$1,833,074**

Description	Percent	Amount
Building Permit - By Owner		
Insurance Requirements		
Builders Risk Insurance	0.08 %	1,466
General Conditions	3.25 %	59,575
General Requirements	1.75 %	32,079
Project Contingency		
Subtotal		1,926,194
Construction Fee	4.00 %	77,048
Project Construction Total		2,003,242
Performance and Payment Bond		20,701
Owner FFE		
Total Estimate		**2,023,943**

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Baseball Pressbox

Work Section	Sub Total
310000 - Earthwork	**$13,998**
31 00 00 - Earthwork	$9,964
31 05 13 - Soil Testing	$1,500
31 10 00 - Site Clearing	$1,558
31 23 23 - Fill	$713
31 25 00 - Erosion and Sedimentation Controls	$263
320000 - Exterior Improvements	**$2,000**
32 13 13 - Concrete Paving	$2,000
32 90 00 - Planting	$0
330000 - Utilities	**$0**
33 10 00 - Water Utilities	$0
33 30 00 - Sanitary Sewerage Utilities	$0
33 40 00 - Storm Drainage Utilities	$0
030000 - Concrete	**$35,728**
03 00 00.00 - Concrete Testing	$410
03 11 00 - Concrete Forming	$11,965
03 15 00 - Concrete Accessories	$3,309
03 20 00 - Concrete Reinforcing	$3,918
03 22 00 - Welded Wire Fabric Reinforcing	$851
03 30 00 - Cast-in-Place Concrete	$6,507
03 35 00 - Concrete Finishing	$2,453
03 41 13 - Precast Concrete Hollow Core Planks	$5,869
03 60 00 - Grouting	$445
040000 - Masonry	**$72,897**
04 05 23 - Masonry Accessories	$2,098
04 05 23.16 - Masonry Embedded Flashing	$3,680
04 21 00 - Clay Unit Masonry	$24,564
04 22 00 - Concrete Unit Masonry	$41,589
04 72 00 - Cast Stone Masonry	$966
050000 - Metals	**$42,988**
05 12 00 - Structural Steel Framing	$12,805
05 50 00 - Metal Fabrications	$633
05 51 00 - Metal Stairs	$12,500
05 52 00 - Metal Railings	$17,050
060000 - Wood, Plastics, and Composites	**$20,852**
06 10 00 - Rough Carpentry	$7,964
06 40 00 - Architectural Woodwork	$304
06 61 16 - Solid Surfacing Fabrications	$12,583

MIRON CONSTRUCTION CO., INC.
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Work Section	Sub Total
070000 - Thermal and Moisture Protection	**$46,844**
07 21 13 - Board Insulation	$923
07 27 00 - Air Barriers	$3,312
07 46 16 - Metal Wall Panel	$30,138
07 53 23 - EPDM Roofing	$7,163
07 60 00 - Flashing and Sheet Metal	$4,408
07 92 00 - Joint Sealants	$900
080000 - Openings	**$35,973**
08 11 13 - Hollow Metal Doors and Frames	$7,735
08 13 15 - Install HM Doors, Frames, & Hardware	$2,923
08 14 00 - Wood Doors	$272
08 33 13 - Coiling Counter Doors	$2,750
08 41 13 - Aluminum-Framed Entrances and Storefronts	$20,886
08 81 00 - Glass Glazing	$1,408
090000 - Finishes	**$17,858**
09 21 16 - Gypsum Board Assemblies	$11,231
09 65 00 - Resilient Flooring	$226
09 68 00 - Carpeting	$2,400
09 90 00 - Painting and Coating	$2,250
09 97 00 - Moisture Mitigation	$1,750
100000 - Specialties	**$0**
10 14 00 - Signage - Room Identification Only	$0
10 44 00 - Fire Protection Specialties	$0
120000 - Furnishings	**$0**
12 21 00 - Window Blinds	$0
12 50 00 - Furniture **N.I.C.**	$0
140000 - Conveying Equipment	**$16,000**
14 10 00 - Lifts	$16,000
210000 - Fire Suppression	**$0**
21 00 00 - Fire Suppression	$0
220000 - Plumbing	**$0**
22 00 00 - Plumbing	$0
230000 - Heating, Ventilating and Air-Conditioning (HVAC)	**$0**
23 00 00 - Heating, Ventilating, and Air-Conditioning (HVAC)	$0
260000 - Electrical	**$20,000**
26 00 00 - Electrical	$20,000
26 05 19 - Electrical - Audio / Visual	$0
Baseball Pressbox Total	**$325,136**

MIRON CONSTRUCTION CO., INC.
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Description	Percent	Amount
Building Permit - By Owner		
Insurance Requirements		
Builders Risk Insurance	0.08 %	260
General Conditions	3.25 %	10,567
General Requirements	1.75 %	5,690
Project Contingency		
Subtotal		341,653
Construction Fee	4.00 %	13,666
Project Construction Total		355,319
Performance and Payment Bond		4,534
Owner FFE		
Total Estimate		**359,853**

MIRON CONSTRUCTION CO., INC.
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Work Section	Sub Total
Athletic Grounds Building	
310000 - Earthwork	**$12,524**
31 00 00 - Earthwork	$9,231
31 05 13 - Soil Testing	$895
31 10 00 - Site Clearing	$1,014
31 23 23 - Fill	$1,226
31 25 00 - Erosion and Sedimentation Controls	$157
320000 - Exterior Improvements	**$11,520**
32 13 13 - Concrete Paving	$9,520
32 90 00 - Planting	$2,000
330000 - Utilities	**$33,500**
33 10 00 - Water Utilities	$9,500
33 30 00 - Sanitary Sewerage Utilities	$10,000
33 40 00 - Storm Drainage Utilities	$14,000
030000 - Concrete	**$39,495**
03 00 00.00 - Concrete Testing	$689
03 11 00 - Concrete Forming	$17,629
03 15 00 - Concrete Accessories	$4,920
03 20 00 - Concrete Reinforcing	$6,045
03 22 00 - Welded Wire Fabric Reinforcing	$1,080
03 30 00 - Cast-in-Place Concrete	$7,528
03 35 00 - Concrete Finishing	$1,605
040000 - Masonry	**$91,579**
04 05 23 - Masonry Accessories	$2,987
04 05 23.16 - Masonry Embedded Flashing	$5,240
04 21 00 - Clay Unit Masonry	$29,845
04 22 00 - Concrete Unit Masonry	$52,132
04 72 00 - Cast Stone Masonry	$1,376
050000 - Metals	**$9,766**
05 12 00 - Structural Steel Framing	$6,000
05 50 00 - Metal Fabrications	$3,766
060000 - Wood, Plastics, and Composites	**$26,732**
06 10 00 - Rough Carpentry	$10,197
06 17 00 - Shop-Fabricated Structural Wood	$12,374
06 40 00 - Architectural Woodwork	$2,100
06 61 16 - Solid Surfacing Fabrications	$2,061
070000 - Thermal and Moisture Protection	**$48,692**
07 21 00 - Thermal Insulation	$2,730
07 21 13 - Board Insulation	$1,949

MIRON CONSTRUCTION CO., INC.
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Work Section	Sub Total
07 27 00 - Air Barriers	$4,716
07 31 16 - Metal Roofing	$31,828
07 60 00 - Flashing and Sheet Metal	$3,933
07 71 23 - Manufactured Gutters and Downspouts	$2,096
07 92 00 - Joint Sealants	$1,440
080000 - Openings	**$23,068**
08 11 13 - Hollow Metal Doors and Frames	$5,875
08 13 15 - Install HM Doors, Frames, & Hardware	$2,169
08 36 13 - Sectional Doors	$11,782
08 41 13 - Aluminum-Framed Entrances and Storefronts	$3,242
090000 - Finishes	**$18,998**
09 21 16 - Gypsum Board Assemblies	$9,360
09 30 13 - Ceramic Tiling	$4,882
09 51 00 - Acoustical Ceilings	$660
09 90 00 - Painting and Coating	$4,096
100000 - Specialties	**$965**
10 14 00 - Signage - Room Identification Only	$176
10 44 00 - Fire Protection Specialties	$790
110000 - Equipment	**$0**
11 40 00 - Foodservice Equipment **N.I.C.**	$0
120000 - Furnishings	**$0**
12 50 00 - Furniture **N.I.C.**	$0
210000 - Fire Suppression	**$0**
21 00 00 - Fire Suppression	$0
220000 - Plumbing	**$14,500**
22 00 00 - Plumbing	$14,500
230000 - Heating, Ventilating and Air-Conditioning (HVAC)	**$15,680**
23 00 00 - Heating, Ventilating, and Air-Conditioning (HVAC)	$15,680
260000 - Electrical	**$50,000**
26 00 00 - Electrical	$50,000
26 05 19 - Electrical - Audio / Visual	$0
Athletic Grounds Building Total	**$397,020**

Description	Percent	Amount
Building Permit - By Owner		
Insurance Requirements		
Builders Risk Insurance	0.08 %	318

MIRON CONSTRUCTION CO., INC.
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Description	Percent	Amount
General Conditions	3.25 %	12,903
General Requirements	1.75 %	6,948
Project Contingency		
Subtotal		417,188
Construction Fee	4.00 %	16,688
Project Construction Total		433,876
Performance and Payment Bond		5,537
Owner FFE		
Total Estimate		**439,412**

Project Budget
UWW Athletic Complex Buildings
#15J1P
June 21, 2016

Appendix C

		Project Budget Option (No omits but 10% reduction on all bldgs)	Notes
Building Estimates (Miron Estimate)			
Athletic Services Building		$1,834,263	
Baseball Services Building		$2,023,943	
Concessions / Press Box Building		$359,853	
Athletic Grounds Maintenance Building		$439,412	
TOTAL		$4,657,471	(a)
10% Scope Reductions			
Athletic Service Bldg.		($183,426)	
Baseball Services Bldg.		($202,394)	
Concessions / Press Box Bldg.		($35,985)	
Grounds Maintenance Bldg.		($43,941)	
Reduction Total		($465,747)	(b)
Construction (Total from Above)		$4,657,471	
Scrub Items removed from scope (Total from Above)		($465,747)	
Design & Bidding Contingency		$0	
TOTAL CONSTRUCTION COST		$4,191,724	
		$4,192,000	
Construction Contingency	10%	400,000	
A/E Design Fees		415,000	
DFD Management Fees (construction + contingency)	4%	184,000	
Other Fees (Includes Survey, EIA, Branding Design)		45,000	
Moveable and Special Equipment (FF&E)		0	
SOFT COST TOTAL		$1,044,000	
TOTAL PROJECT COST		$5,236,000	
Budget per Program Statement		$4,236,000	
Budget Difference		($1,000,000)	
Add Comb. Of Gift & Agency Cash Funds to Project		$1,000,000	(c)
Adjusted Project Budget Total		$5,236,000	
Adjusted Budget Difference		$0	

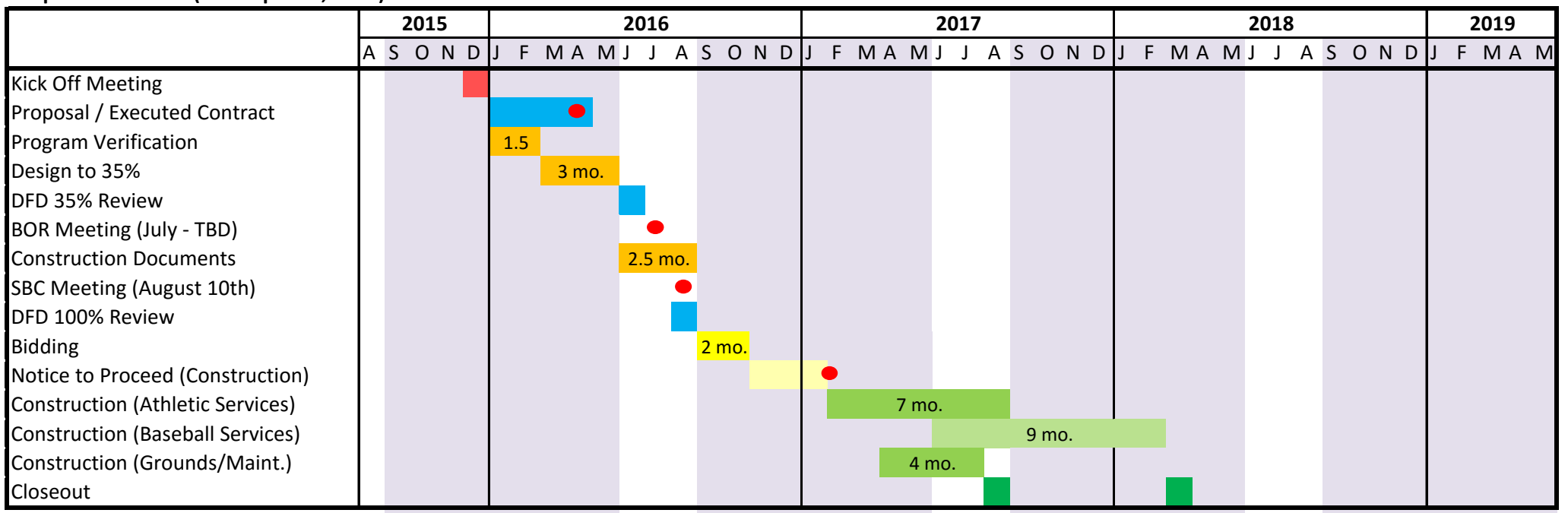
(a) Miron Estimates minus Ken Kramer (UWW) Scrub Items
(b) Beyond 35% - KS/UWW will look to execute strategies to reduce scope by 10%
(c) Internal UWW Note: Additional Gift funds are for Baseball and Football only

APPENDICES

Appendix D: Project Schedule

Appendix D - Schedule

Proposed Schedule (as of April 27, 2016)



APPENDICES

Appendix E: Geothermal Analysis

RING & DUCHATEAU

HVAC ♦ Plumbing ♦ Fire Protection ♦ Electrical ♦ Commissioning

Geothermal Study

June 23, 2016

Mr. Jeff Piette, AIA
Principal
Kahler Slater
111 W. Wisconsin Ave.
Milwaukee, WI 53203

Subject: Geothermal Study for DFD Project 15J1P UW-Whitewater Athletic Complex Buildings

Dear Jeff:

We have completed our Geothermal Study for the Football and Baseball building remodeling projects at UW-Whitewater. Attached is detailed energy model data indicating that installing geothermal systems for this project does not have a life cycle payback and is not a cost effective approach. For both buildings, the energy model compared two types of systems:

Alternative 1: Conventional VAV air handling systems with direct expansion air cooled condensing units

Alternative 2: Water source heat pump units with ground loop geothermal well field.

A summary of the findings is listed below:

Football Athletic Services Building: The premium first cost for alternative 2 geothermal system is $124,500 and has $5,220 annual operating savings yielding a 23.9 year simple payback. On a life cycle cost basis, the geothermal system does not payback.

Baseball Services Building: The premium first cost for alternative 2 geothermal system is $125,300 and has $2,333 annual operating savings yielding a 53.7 year simple payback. On a life cycle cost basis, the geothermal system does not payback.

Sincerely,

RING & DuCHATEAU, LLP
Consulting Engineers

Edward Gill

Edward T. Gill, P.E.
Senior Project Manager

Copies to: Wendy von Below, DOA/DFD
Doug Schorr, DOA/DFD

Ring & DuChateau, LLP
17400 West Capitol Drive
Brookfield, WI 53045

UW Whitewater Football Athletic Services

Location	**UW-Whitewater**
Building owner	**DFD**
Program user	**Ring and DuChateau**
Company	
Comments	

By	**Ring & DuChateau**
Dataset name	**E:\215JOBS\215165.00\HVAC\CALCS\TRACE\ENERGY ANALYSIS\FOOTBALL\215165-FOOTBALL.TRC**

Calculation time	**03:49 PM on 06/09/2016**	
TRACE® 700 version	**6.3.1**	
Location	**Milwaukee, Wisconsin**	
Latitude	**43.0**	**deg**
Longitude	**87.0**	**deg**
Time Zone	**6**	
Elevation	**672**	**ft**
Barometric pressure	**29.2**	**in. Hg**
Air density	**0.0741**	**lb/cu ft**
Air specific heat	**0.2444**	**Btu/lb·°F**
Density-specific heat product	**1.0867**	**Btu/h·cfm·°F**
Latent heat factor	**4,783.5**	**Btu·min/h·cu ft**
Enthalpy factor	**4.4457**	**lb·min/hr·cu ft**
Summer design dry bulb	**95.0**	**°F**
Summer design wet bulb	**77.0**	**°F**
Winter design dry bulb	**-10.0**	**°F**
Summer clearness number	**0.85**	
Winter clearness number	**0.85**	
Summer ground reflectance	**0.20**	
Winter ground reflectance	**0.20**	
Carbon Dioxide Level	**400**	**ppm**
Design simulation period	**January - December**	
Cooling load methodology	**TETD-TA1**	
Heating load methodology	**UATD**	

Energy Cost Budget / PRM Summary

By Ring & DuChateau

Project Name: UW Whitewater Football Athletic Services	Date: June 09, 2016
City: UW-Whitewater	Weather Data: Milwaukee, Wisconsin

Note: The percentage displayed for the "Proposed/ Base %" column of the base case is actually the percentage of the total energy consumption.

* Denotes the base alternative for the ECB study.

		* Alt-1 DX Cooling w/Condesing			Alt-2 Geothermal		
		Energy 10^6 Btu/yr	Proposed / Base %	Peak kBtuh	Energy 10^6 Btu/yr	Proposed / Base %	Peak kBtuh
Lighting - Conditioned	Electricity	94.8	8	38	94.8	100	38
Space Heating	Electricity	30.3	3	5	61.8	204	215
	Gas	350.3	30	201	0.0	0	0
Space Cooling	Electricity	138.8	12	206	41.7	30	88
Pumps	Electricity	34.7	3	5	109.7	316	18
Heat Rejection	Electricity	13.9	1	19	0.0	0	0
Fans - Conditioned	Electricity	255.0	21	73	248.7	98	73
Receptacles - Conditioned	Electricity	52.2	4	21	52.2	100	21
Stand-alone Base Utilities	Electricity	216.3	18	76	216.3	100	76
Total Building Consumption		**1,186.4**			**825.2**		

		* Alt-1 DX Cooling w/Condesing	Alt-2 Geothermal
Total	**Number of hours heating load not met**	0	0
	Number of hours cooling load not met	0	0

	* Alt-1 DX Cooling w/Condesing		Alt-2 Geothermal	
	Energy 10^6 Btu/yr	Cost/yr $/yr	Energy 10^6 Btu/yr	Cost/yr $/yr
Electricity	836.1	31,125	825.2	28,883
Gas	350.3	2,977	0.0	0
Total	**1,186**	**34,103**	**825**	**28,883**

Economic Summary

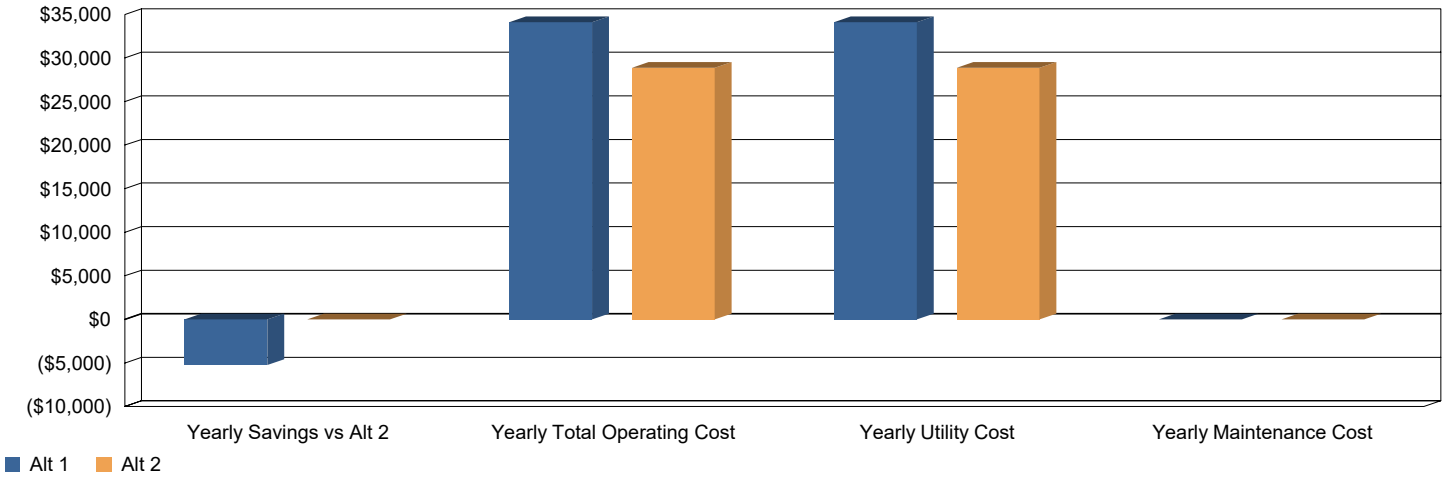
Project Information

Location	UW-Whitewater	Study Life:	30 years
Project Name	UW Whitewater Football Athletic Services	Cost of Capital:	4.5 %
User	Ring and DuChateau	Alternative 1:	DX Cooling w/Condesing Boiler
Company		Alternative 2:	Geothermal
Comments			

Economic Comparison of Alternatives

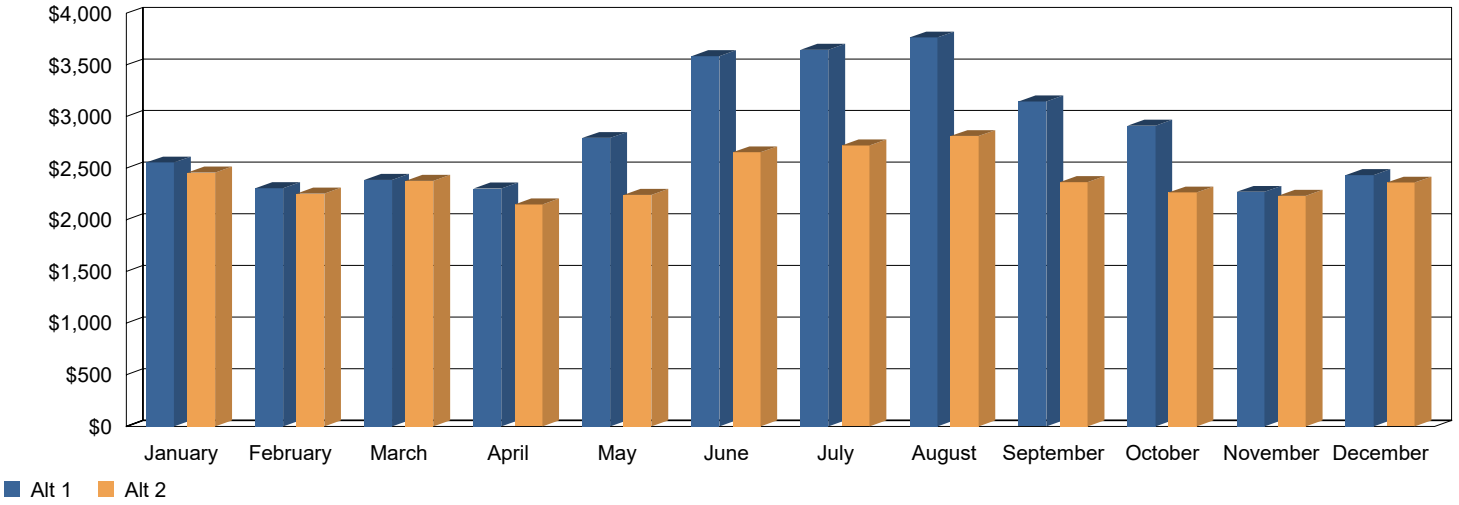
	Yearly Savings ($)	First Cost Difference ($)	Cumulative Cash Flow Difference ($)	Simple Payback (yrs.)	Net Present Value ($)	Life Cycle Payback (yrs.)	Internal Rate of Return (%)	Life Cycle Cost
Alt 2 vs Alt 1	5,220	124,500	48,536	23.9	-7,485	No Payback	3.4	-7,485.29

Annual Operating Costs



	Yearly Savings vs Alt 2	Yearly Total Operating Cost ($)	Yearly Utility Cost ($)	Yearly Maintenance Cost ($)	Plant kWh/ton-hr
Alt 1	-5,220	34,103	34,103	0	1.321
Alt 2	0	28,883	28,883	0	1.937

Monthly Utility Costs



System Checksums

By Ring & DuChateau

100% OA DX Cooling — **Terminal Reheat**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 16
Outside Air: OADB/WB/HR: 94 / 77 / 114

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	41,981	41,981	7
Glass Solar	1,035	0	1,035	0
Glass/Door Cond	1,627	0	1,627	0
Wall Cond	13,084	2,002	15,086	3
Partition/Door	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	30,991		30,991	5
Sub Total ==>	46,738	43,984	90,721	15
Internal Loads				
Lights	30,352	7,588	37,941	6
People	156,638	0	156,638	26
Misc	21,049	0	21,049	4
Sub Total ==>	208,040	7,588	215,628	36
Ceiling Load	14,035	-14,035	0	0
Ventilation Load	0	0	396,204	67
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	-99,266		-99,266	-17
Exhaust Heat		-37,526	-37,526	-6
Sup. Fan Heat			29,873	5
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	169,547	10	595,634	100.00

CLG SPACE PEAK

Mo/Hr: Sum of
OADB: Peaks

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	1,222	1
Glass/Door Cond	1,592	1
Wall Cond	14,543	9
Partition/Door	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	13,502	8
Sub Total ==>	30,858	18
Internal Loads		
Lights	30,689	18
People	71,856	43
Misc	20,645	12
Sub Total ==>	123,190	73
Ceiling Load	13,828	8
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Ov/Undr Sizing	0	0
Exhaust Heat		
OA Preheat Diff.		
RA Preheat Diff.		
Additional Reheat		
Underflr Sup Ht Pkup		
Supply Air Leakage		
Grand Total ==>	167,876	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: -10

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-44,061	5.34
Glass Solar	0	0	0.00
Glass/Door Cond	-6,680	-6,680	0.81
Wall Cond	-24,289	-28,145	3.41
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-56,298	-56,298	6.83
Sub Total ==>	-87,268	-135,186	16.39
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-13,051	0	0.00
Ventilation Load	0	-724,521	87.84
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		34,867	-4.23
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-100,319	-824,840	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	83.4
Ra Plenum	77.9	68.3
Return	77.9	68.3
Ret/OA	94.4	-10.0
Fn MtrTD	0.3	0.0
Fn BldTD	0.8	0.0
Fn Frict	2.3	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	8,131	8,131
Terminal	8,131	8,131
Main Fan	8,131	8,131
Sec Fan	0	0
Nom Vent	8,131	8,131
AHU Vent	8,131	8,131
Infil	632	632
MinStop/Rh	8,131	8,131
Return	8,763	8,763
Exhaust	8,763	8,763
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	100.0	100.0
cfm/ft²	0.72	0.72
cfm/ton	163.81	
ft²/ton	226.63	
Btu/hr·ft²	52.95	-73.33
No. People	218	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	49.6	595.6	277.0	8,131	83.0	72.0	103.8	51.6	48.6	47.5
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	49.6	595.6								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	11,249		
Part	0		
Int Door	0		
ExFlr	0		
Roof	11,249	0	0
Wall	5,779	22	0
Ext Door	374	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-280.4	8,131	51.6	83.4
Aux Htg	0.0	0	0.0	0.0
Preheat	-544.4	8,131	-10.0	51.6
Reheat	-180.1	8,131	51.6	72.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-824.8			

System Checksums

By Ring & DuChateau

Geothermal — **Water Source Heat Pump**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 16
Outside Air: OADB/WB/HR: 94 / 77 / 114

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	41,981	41,981	6
Glass Solar	1,035	0	1,035	0
Glass/Door Cond	1,627	0	1,627	0
Wall Cond	13,084	2,002	15,086	2
Partition/Door	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	28,730		28,730	4
Sub Total ==>	44,476	43,984	88,460	14
Internal Loads				
Lights	30,352	7,588	37,941	6
People	156,638	0	156,638	24
Misc	21,049	0	21,049	3
Sub Total ==>	208,040	7,588	215,628	33
Ceiling Load	14,035	-14,035	0	0
Ventilation Load	0	0	351,931	54
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	5		5	0
Exhaust Heat		-37,527	-37,527	-6
Sup. Fan Heat			29,874	5
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	266,556	10	648,371	100.00

CLG SPACE PEAK

Mo/Hr: Sum of
OADB: Peaks

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	1,222	1
Glass/Door Cond	1,592	1
Wall Cond	14,543	9
Partition/Door	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	13,502	8
Sub Total ==>	30,858	18
Internal Loads		
Lights	30,689	18
People	71,856	43
Misc	20,645	12
Sub Total ==>	123,190	73
Ceiling Load	13,828	8
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Ov/Undr Sizing	5	0
Grand Total ==>	167,881	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: -10

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-44,061	5.34
Glass Solar	0	0	0.00
Glass/Door Cond	-6,680	-6,680	0.81
Wall Cond	-24,289	-28,145	3.41
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-56,298	-56,298	6.83
Sub Total ==>	-87,268	-135,186	16.39
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-13,051	0	0.00
Ventilation Load	0	-724,543	87.84
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		34,867	-4.23
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-100,319	-824,861	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	83.4
Ra Plenum	77.9	68.3
Return	77.9	68.3
Ret/OA	94.4	-10.0
Fn MtrTD	0.3	0.0
Fn BldTD	0.8	0.0
Fn Frict	2.3	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	8,131	8,131
Terminal	8,131	8,131
Main Fan	8,131	8,131
Sec Fan	0	0
Nom Vent	8,131	8,131
AHU Vent	8,131	8,131
Infil	632	632
MinStop/Rh	0	0
Return	8,763	8,763
Exhaust	8,763	8,763
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	100.0	100.0
cfm/ft²	0.72	0.72
cfm/ton	188.42	
ft²/ton	260.67	
Btu/hr·ft²	46.03	-73.33
No. People	218	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB °F	Enter WB °F	Enter HR gr/lb	Leave DB °F	Leave WB °F	Leave HR gr/lb
Main Clg	43.2	517.8	246.7	8,131	84.1	72.7	105.9	55.0	53.4	59.8
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	43.2	517.8								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	11,249		
Part	0		
Int Door	0		
ExFlr	0		
Roof	11,249	0	0
Wall	5,779	22	0
Ext Door	374	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-824.9	8,131	-10.0	83.4
Aux Htg	0.0	0	0.0	0.0
Preheat	-544.5	8,131	-10.0	51.6
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-824.9			

Geothermal Energy Transfer Summary

By Ring & DuChateau

Geothermal Plant - Ground-Source Heat Transfer

Alternative: 2 - Geothermal

Plant: Cooling plant - 001

Year: 1

	QExtracted from Geothermal Loop			QRejected to Geothermal Loop			Heat Rejected to Auxiliary Cooling				Heat Supplied from Supplemental Boiler				Compressor	
Month	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh	peak tons	ton-hrs	kBtu	kWh	peak MBH	ton-hrs	kBtu	kWh	Energy	kWh
Jan	4,039	48,465	14,200	0	0	0	0	0	0	0	113	93	1,119	328		3,769
Feb	3,284	39,411	11,547	0	0	0	0	0	0	0	65	48	572	168		3,057
Mar	2,659	31,909	9,349	0	0	0	0	0	0	0	0	0	0	0		2,463
Apr	1,444	17,324	5,076	0	0	0	0	0	0	0	0	0	0	0		1,346
May	213	2,558	749	-1,446	-17,351	-5,084	0	0	0	0	0	0	0	0		1,021
Jun	43	514	151	-5,965	-71,583	-20,974	0	0	0	0	0	0	0	0		2,832
Jul	89	1,073	314	-6,906	-82,875	-24,282	0	0	0	0	0	0	0	0		3,335
Aug	68	819	240	-6,925	-83,097	-24,347	0	0	0	0	0	0	0	0		3,402
Sep	52	629	184	-3,555	-42,663	-12,500	0	0	0	0	0	0	0	0		1,753
Oct	306	3,670	1,075	-1,280	-15,365	-4,502	0	0	0	0	0	0	0	0		1,046
Nov	2,210	26,514	7,769	0	0	0	0	0	0	0	0	0	0	0		2,018
Dec	3,665	43,980	12,886	0	0	0	0	0	0	0	71	64	772	226		3,381
Annual	18,072	216,866	63,541	-26,078	-312,934	-91,689	0	0	0	0	113	205	2,463	722		29,422

Geothermal Earth Temperature Summary

By Ring & DuChateau

Geothermal Plant - Ground Heat Exchanger Temperatures

Alternative: 2 - Geothermal

Cooling plant - 001

Year 1					
Month	Average Earth Temp.°F	Average Fluid Leaving Temp. °F	Average Fluid Entering Temp. °F	Minimum Fluid Entering Temp. °F	Maximum Fluid Entering Temp. °F
Jan	53.80	51.60	50.60	47.50	55.40
Feb	53.30	51.40	50.50	47.20	53.30
Mar	53.40	52.00	51.30	48.50	53.50
Apr	53.60	52.80	52.50	49.90	53.90
May	54.70	55.40	55.70	52.60	62.30
Jun	56.90	60.20	61.70	55.80	77.10
Jul	58.20	61.90	63.60	58.00	82.40
Aug	59.00	62.60	64.40	57.80	81.90
Sep	58.50	60.40	61.30	57.60	77.40
Oct	57.60	58.10	58.40	55.50	67.50
Nov	56.20	55.00	54.40	52.20	58.60
Dec	55.20	53.30	52.30	49.10	55.20
Annual	55.90	56.20	56.40	47.20	82.40

Geothermal Plant Peak Load Summary

By Ring & DuChateau

Monthly Peak Heating/Cooling Loads

Alternative: 2 - Geothermal

Plant: Cooling plant - 001

	Time of Peak Plant Cooling Load					Time of Peak Plant Heating Load					Time of Peak Coincident Cooling/Heating Load				
	Peak Cooling Load tons	Coincident Heating Load mbh	Available Condenser Heat mbh	Outside Air DB/WB (°F)	Date-Time	Peak Heating Load mbh	Available Condenser Heat mbh	Net Available Heat mbh	Coincident Cooling Load tons	Date-Time	--- Coincident Peak --- Cooling Load tons	Heating Load mbh	Available Condenser Heat mbh	Outside Air DB/WB (°F)	Date-Time
Jan	0	0	0			582	0	-582	0	Sun - 6 am	0	0	0		
Feb	0	0	0			534	0	-534	0	Sun - 6 am	0	0	0		
Mar	0	0	0			383	0	-383	0	Sun - 6 am	0	0	0		
Apr	3	0	40	55/47	Dsn - 7 pm	291	0	-291	0	Sun - 6 am	0	0	0		
May	18	0	247	75/62	Dsn - 4 pm	90	0	-90	0	Mon - 8 am	0	0	0		
Jun	39	0	540	90/74	Dsn - 4 pm	32	0	-32	0	Mon - 3 am	11	11	147	67/59	Wkdy - 1 am
Jul	42	0	590	94/76	Dsn - 4 pm	30	0	-30	0	Mon - 2 am	5	8	65	75/66	Dsn - 4 am
Aug	41	0	574	88/75	Dsn - 4 pm	31	0	-31	0	Wkdy - 2 am	5	5	75	67/60	Wkdy - 5 am
Sep	33	0	460	83/71	Dsn - 4 pm	31	0	-31	0	Mon - 1 am	7	11	89	60/55	Mon - 5 am
Oct	21	0	285	74/65	Dsn - 4 pm	158	0	-158	0	Sun - 6 am	1	24	12	48/44	Wkdy - 5 am
Nov	0	0	0			325	0	-325	0	Sun - 6 am	0	0	0		
Dec	0	0	0			540	0	-540	0	Sun - 6 am	0	0	0		
Annual	42	0	590	94/76	Jul/Dsn - 4 pm	582	0	-582	0	Jan/Sun - 6 am	28	59	388	67/59	Jun/Wkdy - 1 am

Geothermal Plant Cumulative Load Summary

By Ring & DuChateau

Monthly Cumulative Heating/Cooling Load

Alternative: 2 - Geothermal

Plant: Cooling plant - 001

	Plant Cooling Loads			Plant Heating Loads			Coincident Cooling/Heating Loads			Net Plant Load (+ cooling / - heating)		
	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh
Jan	0	0	0	5,307	63,686	18,660	0	0	0	-5,307	-63,686	-18,660
Feb	0	0	0	4,272	51,266	15,021	0	0	0	-4,272	-51,266	-15,021
Mar	0	0	0	3,412	40,945	11,997	0	0	0	-3,412	-40,945	-11,997
Apr	0	0	0	1,873	22,481	6,587	0	0	0	-1,873	-22,481	-6,587
May	1,284	15,406	4,514	605	7,257	2,126	0	0	0	679	8,149	2,388
Jun	5,191	62,297	18,253	160	1,922	563	994	11,931	3,496	5,031	60,375	17,690
Jul	5,980	71,755	21,024	111	1,335	391	634	7,604	2,228	5,868	70,420	20,633
Aug	5,988	71,861	21,055	147	1,764	517	557	6,681	1,957	5,841	70,097	20,538
Sep	3,115	37,383	10,953	169	2,026	594	393	4,718	1,382	2,946	35,357	10,360
Oct	1,124	13,482	3,950	711	8,531	2,500	96	1,157	339	413	4,951	1,451
Nov	0	0	0	2,839	34,071	9,983	0	0	0	-2,839	-34,071	-9,983
Dec	0	0	0	4,780	57,358	16,806	0	0	0	-4,780	-57,358	-16,806
Annual	22,682	272,185	79,749	24,387	292,641	85,743	2,674	32,091	9,403	-1,705	-20,456	-5,994

MONTHLY UTILITY COSTS

By Ring & DuChateau

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Utility Costs -------												
Alternative 1													
Electric													
On-Pk Cons. ($)	875	779	913	839	1,111	1,485	1,473	1,594	1,255	1,151	835	829	13,139
Off-Pk Cons. ($)	362	325	357	322	333	408	435	463	337	329	329	351	4,350
On-Pk Demand ($)	767	767	767	903	1,202	1,616	1,686	1,631	1,460	1,256	815	767	13,637
Total ($):	2,004	1,871	2,037	2,064	2,645	3,510	3,594	3,688	3,051	2,736	1,979	1,946	31,125
Gas													
On-Pk Cons. ($)	246	192	160	102	72	40	28	43	52	80	131	216	1,361
Off-Pk Cons. ($)	305	243	191	138	75	36	25	34	43	95	161	271	1,617
Total ($):	551	435	351	240	148	75	53	77	94	175	291	487	2,977
Monthly Total ($):	2,555	2,306	2,387	2,304	2,793	3,585	3,647	3,765	3,146	2,911	2,270	2,433	34,103

Building Area = 15,300 ft²

Utility Cost Per Area = 2.23 $/ft²

Alternative 2													
Electric													
On-Pk Cons. ($)	1,097	966	1,088	924	974	1,175	1,173	1,259	977	969	986	1,035	12,623
Off-Pk Cons. ($)	462	398	423	363	331	354	370	386	305	335	382	431	4,540
On-Pk Demand ($)	898	889	866	862	937	1,125	1,176	1,166	1,084	960	862	894	11,720
Total ($):	2,457	2,253	2,377	2,148	2,243	2,653	2,719	2,811	2,365	2,264	2,231	2,361	28,883
Monthly Total ($):	2,457	2,253	2,377	2,148	2,243	2,653	2,719	2,811	2,365	2,264	2,231	2,361	28,883

Building Area = 15,300 ft²

Utility Cost Per Area = 1.89 $/ft²

ECONOMIC PARAMETERS

By Ring & DuChateau

Project Name: UW Whitewater Football Athletic Services
Location: UW-Whitewater
Building Owner: DFD
Program User: Ring and DuChateau
Company:
Comments:

Study Life:	30 Yrs	Income Tax Rate:	0.000 %
Mortgage Life:	20 Yrs	Cost of Capital:	4.500 %
Depreciation Life:	20 Yrs	Property tax rate:	0.000 %
Mortgage Interest Rate:	5.000 %	Insurance Expense rate:	0.000 %
Percent Financed:	100.0 %		
Depreciation Method:	None	Annual Inflation Rate Of	
Declining Balance Taxes:	100.0 %	Maintenance Expense	3.000 %
		Replacement Expense	0.000 %
		Property Taxes	0.000 %
		Insurance Expense	0.000 %

Alt #	First Cost ($/ton)	First Cost ($/ft²)	Additional First Cost	Total First Cost	Maintenance Cost ($/ton)	Maintenance Cost ($/ft²)	Total Maint. Cost	Total Alt. Cost
2	12,812.38	36.14	0.00	552,900.00	0.00	0.00	0.00	552,900.00
1	8,630.80	28.00	0.00	428,400.00	0.00	0.00	0.00	428,400.00

ENERGY CONSUMPTION SUMMARY

By Ring & DuChateau

	Elect Cons. (kWh)	Gas Cons. (kBtu)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 1					
Primary heating					
Primary heating		350,283	29.5 %	350,283	368,719
Other Htg Accessories	8,880		2.6 %	30,309	90,936
Heating Subtotal	**8,880**	**350,283**	**32.1 %**	**380,591**	**459,654**
Primary cooling					
Cooling Compressor	40,443		11.6 %	138,032	414,138
Tower/Cond Fans	4,074		1.2 %	13,904	41,716
Condenser Pump			0.0 %	0	0
Other Clg Accessories	234		0.1 %	798	2,393
Cooling Subtotal....	**44,751**		**12.9 %**	**152,734**	**458,247**
Auxiliary					
Supply Fans	74,722		21.5 %	255,026	765,154
Pumps	10,173		2.9 %	34,721	104,174
Stand-alone Base Utilities	63,379		18.2 %	216,312	649,002
Aux Subtotal....	148,274		42.7 %	506,059	1,518,330
Lighting					
Lighting	27,785		8.0 %	94,829	284,514
Receptacle					
Receptacles	15,293		4.4 %	52,194	156,596
Cogeneration					
Cogeneration			0.0 %	0	0
Totals					
Totals**	**244,982**	**350,283**	**100.0 %**	**1,186,407**	**2,877,342**

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

** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

ENERGY CONSUMPTION SUMMARY

By Ring & DuChateau

	Elect Cons. (kWh)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 2				
Primary heating				
Primary heating	18,079	7.5 %	61,704	185,132
Other Htg Accessories	22	0.0 %	75	224
Heating Subtotal	**18,101**	**7.5 %**	**61,779**	**185,355**
Primary cooling				
Cooling Compressor	12,064	5.0 %	41,175	123,537
Tower/Cond Fans		0.0 %	0	0
Condenser Pump		0.0 %	0	0
Other Clg Accessories	140	0.1 %	478	1,435
Cooling Subtotal....	**12,204**	**5.1 %**	**41,653**	**124,972**
Auxiliary				
Supply Fans	72,873	30.1 %	248,717	746,224
Pumps	32,153	13.3 %	109,737	329,243
Stand-alone Base Utilities	63,379	26.2 %	216,312	649,002
Aux Subtotal....	168,405	69.7 %	574,766	1,724,469
Lighting				
Lighting	27,785	11.5 %	94,829	284,514
Receptacle				
Receptacles	15,293	6.3 %	52,194	156,596
Cogeneration				
Cogeneration		0.0 %	0	0
Totals				
Totals**	**241,787**	**100.0 %**	**825,220**	**2,475,907**

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

** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

MONTHLY ENERGY CONSUMPTION

By Ring & DuChateau

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**DX Cooling w/Condesing Boiler**												
Electric													
On-Pk Cons. (kWh)	11,157	9,932	11,643	10,707	14,165	18,943	18,783	20,338	16,008	14,684	10,654	10,570	167,583
Off-Pk Cons. (kWh)	6,441	5,785	6,349	5,727	5,919	7,265	7,743	8,232	5,993	5,851	5,854	6,240	77,399
On-Pk Demand (kW)	57	57	57	67	89	120	125	121	108	93	60	57	125
Off-Pk Demand (kW)	57	57	57	57	68	91	99	99	92	72	57	57	99
Gas													
On-Pk Cons. (therms)	290	226	188	120	85	47	33	50	61	94	154	254	1,601
Off-Pk Cons. (therms)	359	286	225	162	89	42	29	40	50	112	189	319	1,902
On-Pk Demand (therms/hr)	1	1	1	1	1	1	0	1	1	1	1	1	1
Off-Pk Demand (therms/hr)	2	2	2	2	1	1	1	1	1	1	2	2	2

Energy Consumption

Building	105,468	Btu/(ft2-year)
Source	255,786	Btu/(ft2-year)
Floor Area	11,249	ft2

Environmental Impact Analysis

CO2	389,943 lbm/year
SO2	1,159 gm/year
NOX	460 gm/year

MONTHLY ENERGY CONSUMPTION

By Ring & DuChateau

------- Monthly Energy Consumption -------

Utility		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2	**Geothermal**													
Electric														
	On-Pk Cons. (kWh)	13,989	12,325	13,873	11,781	12,426	14,984	14,962	16,061	12,456	12,360	12,582	13,205	161,006
	Off-Pk Cons. (kWh)	8,221	7,080	7,533	6,452	5,894	6,295	6,587	6,860	5,419	5,963	6,805	7,671	80,781
	On-Pk Demand (kW)	67	66	64	64	69	83	87	86	80	71	64	66	87
	Off-Pk Demand (kW)	79	67	65	65	57	68	71	71	67	56	65	67	79

Energy Consumption		
Building	73,359	Btu/(ft2-year)
Source	220,100	Btu/(ft2-year)
Floor Area	11,249	ft2

Environmental Impact Analysis	
CO2	384,858 lbm/year
SO2	1,144 gm/year
NOX	454 gm/year

YEARLY CASH FLOW

By Ring & DuChateau

Alternative: 1
Life Cycle Cost: $1,247,259.29

Year	Utility Cost ($)	Maint. Cost ($)	Interest Cost ($)	Principal Cost ($)	Property Taxes ($)	Insurance Cost ($)	Revenue Penalty ($)	Replace. Expenses ($)	Deprec. Tax ($)	Cash Flow Effect ($)	Present Value ($)
0	0	0	0	0	0	0	0	0	0	0	0
1	34,103	0	21,420	12,956	0	0	0	0	0	68,479	65,530
2	35,126	0	20,772	13,604	0	0	0	0	0	69,502	63,645
3	36,180	0	20,092	14,284	0	0	0	0	0	70,556	61,828
4	37,265	0	19,378	14,998	0	0	0	0	0	71,641	60,075
5	38,383	0	18,628	15,748	0	0	0	0	0	72,759	58,385
6	39,534	0	17,841	16,535	0	0	0	0	0	73,910	56,756
7	40,721	0	17,014	17,362	0	0	0	0	0	75,096	55,183
8	41,942	0	16,146	18,230	0	0	0	0	0	76,318	53,666
9	43,200	0	15,234	19,142	0	0	0	0	0	77,576	52,201
10	44,496	0	14,277	20,099	0	0	0	0	0	78,872	50,788
11	45,831	0	13,272	21,104	0	0	0	0	0	80,207	49,424
12	47,206	0	12,217	22,159	0	0	0	0	0	81,582	48,106
13	48,622	0	11,109	23,267	0	0	0	0	0	82,998	46,834
14	50,081	0	9,946	24,430	0	0	0	0	0	84,457	45,605
15	51,584	0	8,724	25,652	0	0	0	0	0	85,959	44,417
16	53,131	0	7,441	26,934	0	0	0	0	0	87,507	43,270
17	54,725	0	6,095	28,281	0	0	0	0	0	89,101	42,160
18	56,367	0	4,681	29,695	0	0	0	0	0	90,743	41,088
19	58,058	0	3,196	31,180	0	0	0	0	0	92,434	40,052
20	59,799	0	1,637	32,739	0	0	0	0	0	94,175	39,049
21	61,593	0	0	0	0	0	0	0	0	61,593	24,440
22	63,441	0	0	0	0	0	0	0	0	63,441	24,089
23	65,344	0	0	0	0	0	0	0	0	65,344	23,743
24	67,305	0	0	0	0	0	0	0	0	67,305	23,402
25	69,324	0	0	0	0	0	0	0	0	69,324	23,066
26	71,404	0	0	0	0	0	0	0	0	71,404	22,735
27	73,546	0	0	0	0	0	0	0	0	73,546	22,409
28	75,752	0	0	0	0	0	0	0	0	75,752	22,087
29	78,025	0	0	0	0	0	0	0	0	78,025	21,770
30	80,365	0	0	0	0	0	0	0	0	80,365	21,458

Alternative: 2
Life Cycle Cost: $1,254,744.58

Year	Utility Cost ($)	Maint. Cost ($)	Interest Cost ($)	Principal Cost ($)	Property Taxes ($)	Insurance Cost ($)	Revenue Penalty ($)	Replace. Expenses ($)	Deprec. Tax ($)	Cash Flow Effect ($)	Present Value ($)
0	0	0	0	0	0	0	0	0	0	0	0
1	28,883	0	27,645	16,721	0	0	0	0	0	73,249	70,095
2	29,749	0	26,809	17,557	0	0	0	0	0	74,116	67,870
3	30,642	0	25,931	18,435	0	0	0	0	0	75,008	65,729
4	31,561	0	25,009	19,357	0	0	0	0	0	75,927	63,670
5	32,508	0	24,041	20,325	0	0	0	0	0	76,874	61,688
6	33,483	0	23,025	21,341	0	0	0	0	0	77,849	59,780
7	34,488	0	21,958	22,408	0	0	0	0	0	78,854	57,944
8	35,522	0	20,838	23,528	0	0	0	0	0	79,888	56,176
9	36,588	0	19,661	24,705	0	0	0	0	0	80,954	54,474
10	37,686	0	18,426	25,940	0	0	0	0	0	82,052	52,835
11	38,816	0	17,129	27,237	0	0	0	0	0	83,182	51,257
12	39,981	0	15,767	28,599	0	0	0	0	0	84,347	49,736

YEARLY CASH FLOW

By Ring & DuChateau

13	41,180	0	14,337	30,029	0	0	0	0	0	85,546	48,271
14	42,415	0	12,836	31,530	0	0	0	0	0	86,782	46,860
15	43,688	0	11,259	33,107	0	0	0	0	0	88,054	45,499
16	44,999	0	9,604	34,762	0	0	0	0	0	89,365	44,188
17	46,349	0	7,866	36,500	0	0	0	0	0	90,715	42,924
18	47,739	0	6,041	38,325	0	0	0	0	0	92,105	41,705
19	49,171	0	4,125	40,241	0	0	0	0	0	93,537	40,530
20	50,646	0	2,113	42,254	0	0	0	0	0	95,012	39,396
21	52,166	0	0	0	0	0	0	0	0	52,166	20,699
22	53,731	0	0	0	0	0	0	0	0	53,731	20,402
23	55,343	0	0	0	0	0	0	0	0	55,343	20,109
24	57,003	0	0	0	0	0	0	0	0	57,003	19,820
25	58,713	0	0	0	0	0	0	0	0	58,713	19,536
26	60,474	0	0	0	0	0	0	0	0	60,474	19,255
27	62,289	0	0	0	0	0	0	0	0	62,289	18,979
28	64,157	0	0	0	0	0	0	0	0	64,157	18,706
29	66,082	0	0	0	0	0	0	0	0	66,082	18,438
30	68,064	0	0	0	0	0	0	0	0	68,064	18,173

Geothermal Well Field: - 15J1P UW-Whitewater Athletic Complex - Football

Water Source Heat Pump Units (Alternative 2)

Description:

Gross Floor Area (Sq. Ft.):	15,300
Gross Cooling Tons/S.F.:	450
Total Cooling Tons:	34 (with heat recovery)
Cooling Tons/Well Bore:	2.0
Depth per Well Bore:	400 Feet
Quantity of Well Bores:	17
Spacing of Well Bores:	20 ft. On Centers
Well Field Size:	8,000 Square Feet
Cost per Well Bore	$9,500
Total Well Field Cost:	$161,500
Equipment First Cost Savings:	($ 37,000)
Net Premium Cost:	$124,500

UW Whitewater Baseball Services

Location	**UW-Whitewater**
Building owner	**DFD**
Program user	**Ring and DuChateau**
Company	
Comments	

By	**R&D**
Dataset name	**E:\215JOBS\215165.00\HVAC\CALCS\TRACE\ENERGY ANALYSIS\BASEBALL\215165-BASEBALL.TRC**

Calculation time	**04:57 PM on 06/21/2016**	
TRACE® 700 version	**6.3.1**	
Location	**8760 Milwaukee, Wisconsin**	
Latitude	**43.0**	**deg**
Longitude	**87.9**	**deg**
Time Zone	**6**	
Elevation	**569**	**ft**
Barometric pressure	**29.3**	**in. Hg**
Air density	**0.0745**	**lb/cu ft**
Air specific heat	**0.2444**	**Btu/lb·°F**
Density-specific heat product	**1.0920**	**Btu/h·cfm·°F**
Latent heat factor	**4,806.9**	**Btu·min/h·cu ft**
Enthalpy factor	**4.4674**	**lb·min/hr·cu ft**
Summer design dry bulb	**95.0**	**°F**
Summer design wet bulb	**77.0**	**°F**
Winter design dry bulb	**-10.0**	**°F**
Summer clearness number	**1.00**	
Winter clearness number	**1.00**	
Summer ground reflectance	**0.20**	
Winter ground reflectance	**0.20**	
Carbon Dioxide Level	**400**	**ppm**
Design simulation period	**January - December**	
Cooling load methodology	**TETD-TA1**	
Heating load methodology	**UATD**	

Energy Cost Budget / PRM Summary

By R&D

Project Name: UW Whitewater Baseball Services	Date: June 21, 2016
City: UW-Whitewater	Weather Data: 8760 Milwaukee, Wisconsin

Note: The percentage displayed for the "Proposed/ Base %" column of the base case is actually the percentage of the total energy consumption.

* Denotes the base alternative for the ECB study.

		* Alt-1 VAV w/DX Cooling			Alt-2 Geothermal		
		Energy 10^6 Btu/yr	Proposed / Base %	Peak kBtuh	Energy 10^6 Btu/yr	Proposed / Base %	Peak kBtuh
Lighting - Conditioned	Electricity	58.5	11	24	58.5	100	24
Space Heating	Electricity	18.0	3	3	34.2	190	33
	Gas	177.8	33	161	0.0	0	0
Space Cooling	Electricity	89.1	16	150	40.9	46	73
Pumps	Electricity	13.2	2	2	89.9	682	14
Heat Rejection	Electricity	12.1	2	18	0.0	0	0
Fans - Conditioned	Electricity	52.7	10	40	52.3	99	42
Receptacles - Conditioned	Electricity	39.9	7	17	39.9	100	17
Stand-alone Base Utilities	Electricity	80.3	15	34	80.3	100	34
Total Building Consumption		**541.6**			**396.0**		

		* Alt-1 VAV w/DX Cooling	Alt-2 Geothermal
Total	**Number of hours heating load not met**	0	0
	Number of hours cooling load not met	0	0

	* Alt-1 VAV w/DX Cooling		Alt-2 Geothermal	
	Energy 10^6 Btu/yr	Cost/yr $/yr	Energy 10^6 Btu/yr	Cost/yr $/yr
Electricity	363.8	16,200	396.0	15,289
Gas	177.8	1,422	0.0	0
Total	**542**	**17,622**	**396**	**15,289**

Economic Summary

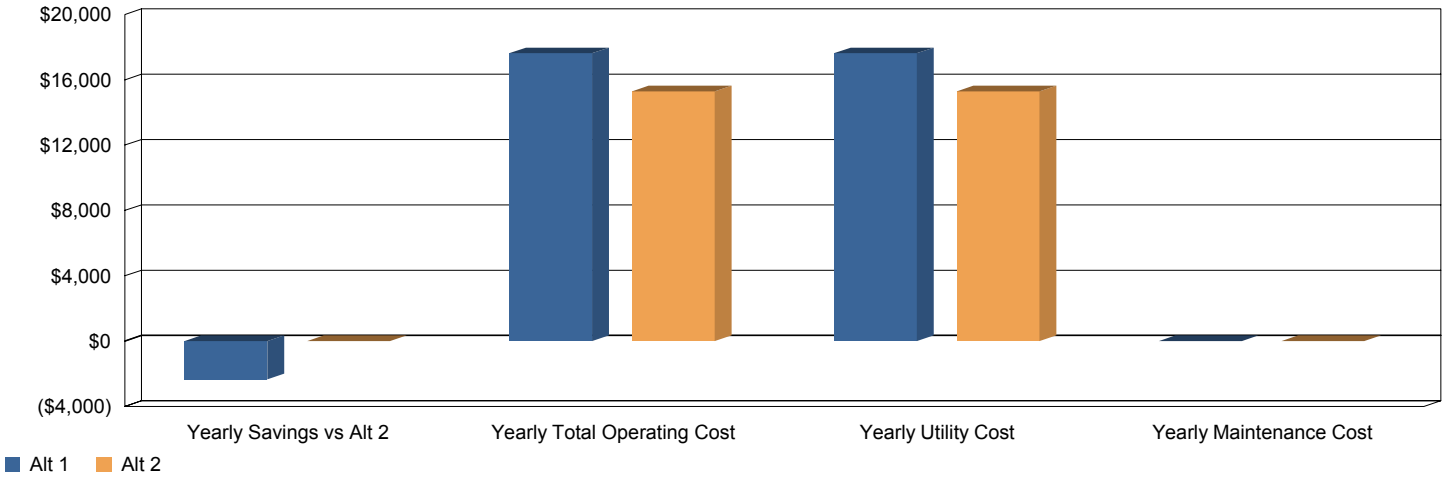
Project Information

Location	UW-Whitewater	Study Life:	30 years
Project Name	UW Whitewater Baseball Services	Cost of Capital:	4.5 %
User	Ring and DuChateau	Alternative 1:	VAV w/DX Cooling
Company		Alternative 2:	Geothermal
Comments			

Economic Comparison of Alternatives

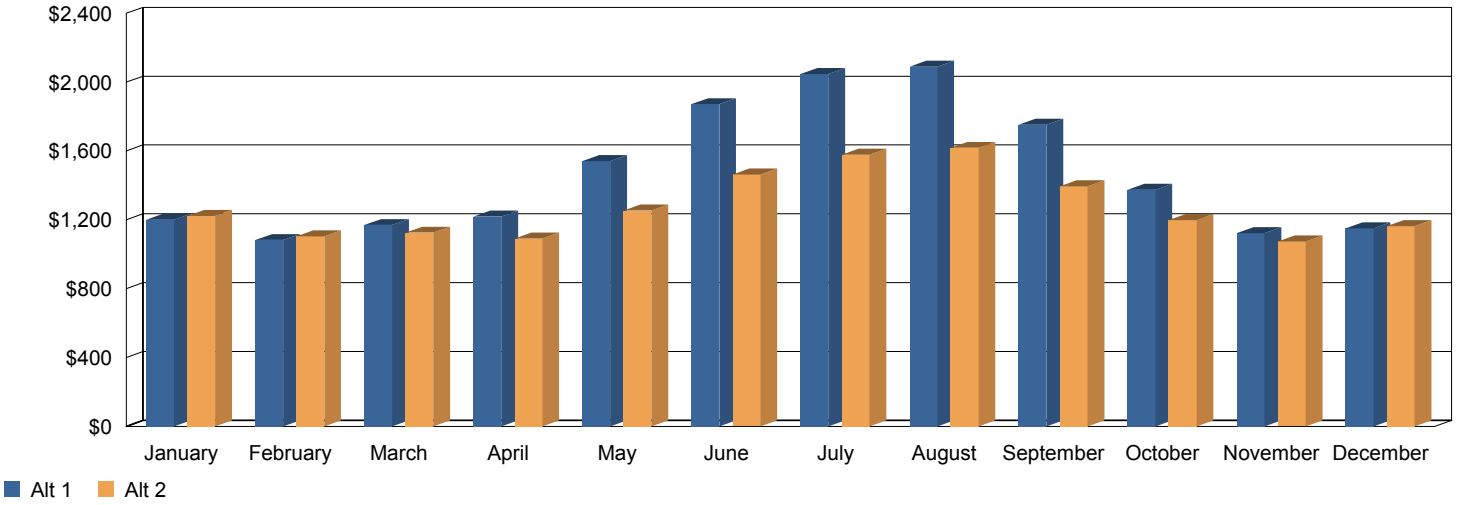
	Yearly Savings ($)	First Cost Difference ($)	Cumulative Cash Flow Difference ($)	Simple Payback (yrs.)	Net Present Value ($)	Life Cycle Payback (yrs.)	Internal Rate of Return (%)	Life Cycle Cost
Alt 2 vs Alt 1	2,333	125,300	-90,084	53.7	-76,046	No Payback	Does Not Payback	-76,046.48

Annual Operating Costs



	Yearly Savings vs Alt 2	Yearly Total Operating Cost ($)	Yearly Utility Cost ($)	Yearly Maintenance Cost ($)	Plant kWh/ton-hr
Alt 1	-2,333	17,622	17,622	0	1.331
Alt 2	0	15,289	15,289	0	1.501

Monthly Utility Costs



System Checksums

By R&D

VAV w/DX Cooling — **Variable Volume Reheat (30% Min Flow Default)**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 17
Outside Air: OADB/WB/HR: 93 / 76 / 112

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	6,563	6,563	2
Glass Solar	58,746	0	58,746	15
Glass/Door Cond	11,459	0	11,459	3
Wall Cond	7,649	1,888	9,537	2
Partition/Door	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	30,821		30,821	8
Sub Total ==>	108,675	8,451	117,126	31
Internal Loads				
Lights	17,225	4,306	21,531	6
People	94,940	0	94,940	25
Misc	15,181	0	15,181	4
Sub Total ==>	127,346	4,306	131,652	35
Ceiling Load	2,388	-2,388	0	0
Ventilation Load	0	0	109,044	29
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-3,193	-3,193	-1
Sup. Fan Heat			26,874	7
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	238,408	7,177	381,502	100.00

CLG SPACE PEAK

Mo/Hr: 7 / 17
OADB: 93

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	58,746	34
Glass/Door Cond	11,459	7
Wall Cond	7,649	4
Partition/Door	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	12,599	7
Sub Total ==>	90,453	53
Internal Loads		
Lights	17,225	10
People	46,656	27
Misc	14,353	8
Sub Total ==>	78,234	46
Ceiling Load	2,385	1
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Ov/Undr Sizing	0	0
Grand Total ==>	171,072	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: -10

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-12,721	3.92
Glass Solar	0	0	0.00
Glass/Door Cond	-47,954	-47,954	14.78
Wall Cond	-17,478	-21,773	6.71
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-53,810	-53,810	16.59
Sub Total ==>	-119,242	-136,258	42.01
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-6,435	0	0.00
Ventilation Load	0	0	0.00
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		1,897	-0.58
OA Preheat Diff.		-138,621	42.74
RA Preheat Diff.		-33,345	10.28
Additional Reheat		-18,027	5.56
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-125,677	-324,354	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	113.8
Ra Plenum	75.1	69.1
Return	75.1	69.1
Ret/OA	79.8	69.1
Fn MtrTD	0.3	0.0
Fn BldTD	0.7	0.0
Fn Frict	2.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	8,245	2,752
Terminal	8,245	2,752
Main Fan	8,245	2,752
Sec Fan	0	0
Nom Vent	2,126	0
AHU Vent	2,126	0
Infil	601	601
MinStop/Rh	2,752	2,752
Return	8,846	3,353
Exhaust	2,727	601
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	25.8	0.0
cfm/ft²	1.17	0.39
cfm/ton	259.35	
ft²/ton	221.03	
Btu/hr·ft²	54.29	-46.92
No. People	177	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR °F	Enter DB/WB/HR °F	Enter DB/WB/HR gr/lb	Leave DB/WB/HR °F	Leave DB/WB/HR °F	Leave DB/WB/HR gr/lb
Main Clg	31.8	381.5	249.7	8,245	79.8	66.6	78.9	52.0	51.2	55.9
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	31.8	381.5								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	7,027		
Part	0		
Int Door	0		
ExFlr	0		
Roof	3,216	0	0
Wall	5,914	1,957	33
Ext Door	95	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-185.7	2,752	52.0	113.8
Aux Htg	0.0	0	0.0	0.0
Preheat	-144.0	2,126	-10.0	52.0
Reheat	-60.1	2,752	52.0	72.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-329.7			

Project Name: UW Whitewater Baseball Services
Dataset Name: 215165-BASEBALL.TRC

System Checksums

By R&D

Geothermal — **Variable Volume Reheat (30% Min Flow Default)**

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 17
Outside Air: OADB/WB/HR: 93 / 76 / 112

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	6,564	6,564	2
Glass Solar	58,746	0	58,746	15
Glass/Door Cond	11,459	0	11,459	3
Wall Cond	7,649	1,888	9,537	2
Partition/Door	0		0	0
Floor	0		0	0
Adjacent Floor	0	0	0	0
Infiltration	30,710		30,710	8
Sub Total ==>	108,563	8,452	117,015	29
Internal Loads				
Lights	19,139	4,785	23,923	6
People	105,489	0	105,489	27
Misc	16,868	0	16,868	4
Sub Total ==>	141,496	4,785	146,280	37
Ceiling Load	2,385	-2,385	0	0
Ventilation Load	0	0	108,650	27
Adj Air Trans Heat	0		0	0
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	0		0	0
Exhaust Heat		-3,190	-3,190	-1
Sup. Fan Heat			28,239	7
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Underflr Sup Ht Pkup			0	0
Supply Air Leakage		0	0	0
Grand Total ==>	252,445	7,660	396,994	100.00

CLG SPACE PEAK

Mo/Hr: 7 / 17
OADB: 93

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	58,746	33
Glass/Door Cond	11,459	6
Wall Cond	7,649	4
Partition/Door	0	0
Floor	0	0
Adjacent Floor	0	0
Infiltration	12,599	7
Sub Total ==>	90,453	50
Internal Loads		
Lights	19,139	11
People	51,840	29
Misc	15,948	9
Sub Total ==>	86,927	48
Ceiling Load	2,385	1
Ventilation Load	0	0
Adj Air Trans Heat	0	0
Ov/Undr Sizing	0	0
Grand Total ==>	179,765	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: -10

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-12,721	3.92
Glass Solar	0	0	0.00
Glass/Door Cond	-47,954	-47,954	14.78
Wall Cond	-17,478	-21,773	6.71
Partition/Door	0	0	0.00
Floor	0	0	0.00
Adjacent Floor	0	0	0
Infiltration	-53,810	-53,810	16.59
Sub Total ==>	-119,242	-136,258	42.01
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-6,435	0	0.00
Ventilation Load	0	0	0.00
Adj Air Trans Heat	0	0	0
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		1,897	-0.58
OA Preheat Diff.		-138,621	42.74
RA Preheat Diff.		-33,345	10.28
Additional Reheat		-18,027	5.56
Underflr Sup Ht Pkup		0	0.00
Supply Air Leakage		0	0.00
Grand Total ==>	-125,677	-324,354	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	113.8
Ra Plenum	75.1	69.1
Return	75.1	69.1
Ret/OA	79.5	69.1
Fn MtrTD	0.3	0.0
Fn BldTD	0.7	0.0
Fn Frict	2.0	0.0

AIRFLOWS

	Cooling	Heating
Diffuser	8,664	2,752
Terminal	8,664	2,752
Main Fan	8,664	2,752
Sec Fan	0	0
Nom Vent	2,126	0
AHU Vent	2,126	0
Infil	601	601
MinStop/Rh	2,752	2,752
Return	9,265	3,353
Exhaust	2,727	601
Rm Exh	0	0
Auxiliary	0	0
Leakage Dwn	0	0
Leakage Ups	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	24.5	0.0
cfm/ft²	1.23	0.39
cfm/ton	261.89	
ft²/ton	212.41	
Btu/hr·ft²	56.50	-46.92
No. People	177	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR °F	Enter DB/WB/HR °F	Enter DB/WB/HR gr/lb	Leave DB/WB/HR °F	Leave DB/WB/HR °F	Leave DB/WB/HR gr/lb
Main Clg	33.1	397.0	260.2	8,664	79.5	66.4	78.5	52.0	51.2	55.8
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	33.1	397.0								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	7,027		
Part	0		
Int Door	0		
ExFlr	0		
Roof	3,216	0	0
Wall	5,914	1,957	33
Ext Door	95	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-185.7	2,752	52.0	113.8
Aux Htg	0.0	0	0.0	0.0
Preheat	-144.0	2,126	-10.0	52.0
Reheat	-60.1	2,752	52.0	72.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-329.7			

Geothermal Energy Transfer Summary

By R&D

Geothermal Plant - Ground-Source Heat Transfer

Alternative: 1 - VAV w/DX Cooling

Plant: Cooling plant - 001

Year: 1

	QExtracted from Geothermal Loop			QRejected to Geothermal Loop			Heat Rejected to Auxiliary Cooling				Heat Supplied from Supplemental Boiler				Compressor	
Month	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh	peak tons	ton-hrs	kBtu	kWh	peak MBH	ton-hrs	kBtu	kWh	Energy	kWh
Jan	2,560	30,725	9,002	-383	-4,599	-1,347	0	0	0	0	0	0	0	0		2,651
Feb	1,895	22,738	6,662	-462	-5,542	-1,624	0	0	0	0	0	0	0	0		2,037
Mar	770	9,235	2,706	-639	-7,664	-2,245	0	0	0	0	0	0	0	0		1,115
Apr	242	2,907	852	-784	-9,410	-2,757	0	0	0	0	0	0	0	0		561
May	0	0	0	-2,397	-28,759	-8,426	0	0	0	0	0	0	0	0		964
Jun	0	0	0	-3,954	-47,445	-13,901	0	0	0	0	0	0	0	0		1,657
Jul	0	0	0	-4,881	-58,576	-17,163	0	0	0	0	0	0	0	0		2,130
Aug	0	0	0	-5,003	-60,038	-17,591	0	0	0	0	0	0	0	0		2,211
Sep	0	0	0	-3,247	-38,959	-11,415	0	0	0	0	0	0	0	0		1,396
Oct	112	1,338	392	-1,089	-13,069	-3,829	0	0	0	0	0	0	0	0		610
Nov	508	6,100	1,787	-534	-6,413	-1,879	0	0	0	0	0	0	0	0		933
Dec	2,150	25,795	7,558	-363	-4,352	-1,275	0	0	0	0	0	0	0	0		2,240
Annual	8,236	98,837	28,959	-23,735	-284,824	-83,453	0	0	0	0	0	0	0	0		18,505

Geothermal Energy Transfer Summary

By R&D

Geothermal Plant - Ground-Source Heat Transfer

Alternative: 2 - Geothermal

Plant: Cooling plant - 001

Year: 1

	QExtracted from Geothermal Loop			QRejected to Geothermal Loop			Heat Rejected to Auxiliary Cooling				Heat Supplied from Supplemental Boiler				Compressor	
Month	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh	peak tons	ton-hrs	kBtu	kWh	peak MBH	ton-hrs	kBtu	kWh	Energy	kWh
Jan	2,758	33,092	9,696	-206	-2,473	-725	0	0	0	0	0	0	0	0		2,576
Feb	1,998	23,976	7,025	-212	-2,541	-745	0	0	0	0	0	0	0	0		1,889
Mar	1,181	14,167	4,151	-514	-6,164	-1,806	0	0	0	0	0	0	0	0		1,364
Apr	451	5,413	1,586	-1,038	-12,454	-3,649	0	0	0	0	0	0	0	0		1,030
May	55	665	195	-2,840	-34,083	-9,986	0	0	0	0	0	0	0	0		1,344
Jun	25	299	88	-4,307	-51,686	-15,144	0	0	0	0	0	0	0	0		2,013
Jul	17	198	58	-4,989	-59,867	-17,541	0	0	0	0	0	0	0	0		2,389
Aug	18	210	61	-5,317	-63,798	-18,693	0	0	0	0	0	0	0	0		2,584
Sep	18	213	63	-3,747	-44,964	-13,174	0	0	0	0	0	0	0	0		1,809
Oct	286	3,426	1,004	-1,686	-20,230	-5,927	0	0	0	0	0	0	0	0		1,271
Nov	997	11,964	3,506	-551	-6,606	-1,936	0	0	0	0	0	0	0	0		1,306
Dec	2,360	28,314	8,296	-210	-2,519	-738	0	0	0	0	0	0	0	0		2,235
Annual	10,161	121,937	35,727	-25,616	-307,386	-90,063	0	0	0	0	0	0	0	0		21,808

Geothermal Earth Temperature Summary

By R&D

Geothermal Plant - Ground Heat Exchanger Temperatures

Alternative: 1 - VAV w/DX Cooling

Cooling plant - 001

Year 1					
Month	Average Earth Temp. °F	Average Fluid Leaving Temp. °F	Average Fluid Entering Temp. °F	Minimum Fluid Entering Temp. °F	Maximum Fluid Entering Temp. °F
Jan	55.30	55.10	55.00	55.00	56.40
Feb	55.30	55.20	55.10	55.00	57.30
Mar	55.50	55.70	55.80	55.00	59.20
Apr	55.80	56.30	56.50	55.00	60.90
May	56.80	58.50	59.30	55.60	67.80
Jun	58.20	61.10	62.50	57.60	76.40
Jul	59.40	62.90	64.60	59.00	82.70
Aug	60.10	63.70	65.40	59.40	83.10
Sep	59.90	62.30	63.50	59.20	78.80
Oct	58.90	59.60	60.00	56.30	67.50
Nov	58.20	58.10	58.00	55.00	62.50
Dec	57.40	56.50	56.10	55.00	58.90
Annual	57.60	58.70	59.30	55.00	83.10

Geothermal Earth Temperature Summary

By R&D

Geothermal Plant - Ground Heat Exchanger Temperatures

Alternative: 2 - Geothermal

Cooling plant - 001

Year 1					
Month	Average Earth Temp. °F	Average Fluid Leaving Temp. °F	Average Fluid Entering Temp. °F	Minimum Fluid Entering Temp. °F	Maximum Fluid Entering Temp. °F
Jan	54.10	52.30	51.50	49.70	55.40
Feb	53.90	52.50	51.90	50.00	54.80
Mar	54.30	53.80	53.50	51.20	58.70
Apr	55.00	55.40	55.50	52.80	63.20
May	56.40	58.30	59.20	54.20	70.40
Jun	57.70	60.80	62.30	56.80	78.80
Jul	58.90	62.30	64.00	58.10	84.70
Aug	59.70	63.40	65.20	58.50	85.00
Sep	59.70	62.40	63.70	58.90	81.30
Oct	58.80	59.60	60.10	57.30	70.20
Nov	57.70	57.20	57.00	55.20	62.80
Dec	56.50	55.00	54.30	52.90	57.90
Annual	56.90	57.80	58.20	49.70	85.00

Geothermal Plant Peak Load Summary

By R&D

Monthly Peak Heating/Cooling Loads

Alternative: 1 - VAV w/DX Cooling

Plant: Cooling plant - 001

	Time of Peak Plant Cooling Load					Time of Peak Plant Heating Load					Time of Peak Coincident Cooling/Heating Load				
	Peak Cooling Load tons	Coincident Heating Load mbh	Available Condenser Heat mbh	Outside Air DB/WB (°F)	Date-Time	Peak Heating Load mbh	Available Condenser Heat mbh	Net Available Heat mbh	Coincident Cooling Load tons	Date-Time	--- Coincident Peak --- Cooling Load tons	Heating Load mbh	Available Condenser Heat mbh	Outside Air DB/WB (°F)	Date-Time
Jan	4	23	53	33/31	Dsn - 4 pm	309	0	-309	0	Sat - 6 am	0	167	3	14/13	Wkdy - 8 am
Feb	5	14	67	34/31	Dsn - 4 pm	304	0	-304	0	Sat - 6 am	0	146	3	19/17	Wkdy - 8 am
Mar	6	0	87	50/45	Dsn - 4 pm	275	0	-275	0	Sat - 6 am	0	66	3	37/37	Dsn - 8 am
Apr	9	0	127	60/53	Dsn - 5 pm	188	0	-188	0	Sun - 6 am	2	6	25	51/42	Sun - 4 pm
May	18	0	243	76/63	Dsn - 5 pm	13	0	-13	0	Sun - 6 am	0	3	2	56/49	Wkdy - 6 am
Jun	26	0	358	87/71	Dsn - 5 pm	0	0	0	0		0	0	0		
Jul	31	0	429	93/75	Dsn - 5 pm	0	0	0	0		0	0	0		
Aug	30	0	416	90/75	Dsn - 5 pm	0	0	0	0		0	0	0		
Sep	24	0	338	85/70	Dsn - 4 pm	3	0	-3	0	Sun - 6 am	0	0	0		
Oct	13	0	174	65/59	Dsn - 4 pm	150	0	-150	0	Sun - 6 am	2	5	29	55/49	Sun - 3 pm
Nov	6	0	83	52/47	Dsn - 3 pm	250	0	-250	0	Sat - 6 am	0	51	3	34/32	Wkdy - 8 am
Dec	4	14	53	37/34	Dsn - 3 pm	307	0	-307	0	Sat - 6 am	0	142	3	21/20	Wkdy - 8 am
Annual	31	23	429	93/75	Jul/Dsn - 5 pm	309	0	-309	0	Jan/Sat - 6 am	5	585	71	14/13	Jan/Wkdy - 8 am

Alternative: 2 - Geothermal

Plant: Cooling plant - 001

	Time of Peak Plant Cooling Load					Time of Peak Plant Heating Load					Time of Peak Coincident Cooling/Heating Load				
	Peak Cooling Load tons	Coincident Heating Load mbh	Available Condenser Heat mbh	Outside Air DB/WB (°F)	Date-Time	Peak Heating Load mbh	Available Condenser Heat mbh	Net Available Heat mbh	Coincident Cooling Load tons	Date-Time	--- Coincident Peak --- Cooling Load tons	Heating Load mbh	Available Condenser Heat mbh	Outside Air DB/WB (°F)	Date-Time
Jan	5	29	68	30/29	Dsn - 6 pm	153	38	-115	3	Dsn - 7 am	3	153	38	19/19	Dsn - 7 am
Feb	5	15	71	32/29	Dsn - 6 pm	146	39	-107	3	Dsn - 7 am	3	146	39	24/23	Dsn - 7 am
Mar	8	4	115	47/43	Dsn - 6 pm	128	42	-86	3	Dsn - 7 am	3	128	42	36/36	Dsn - 7 am
Apr	13	0	176	62/54	Dsn - 4 pm	108	41	-67	3	Mon - 7 am	13	0	176	62/54	Dsn - 4 pm
May	21	0	290	76/63	Dsn - 5 pm	44	47	3	3	Mon - 7 am	13	0	180	71/62	Dsn - 11 am
Jun	29	0	403	87/71	Dsn - 5 pm	8	117	108	9	Mon - 8 am	16	2	214	75/66	Dsn - 9 am
Jul	33	0	470	93/75	Dsn - 5 pm	7	124	118	9	Wkdy - 8 am	17	1	229	80/65	Wkdy - 10 am
Aug	32	0	459	90/75	Dsn - 5 pm	6	123	117	9	Mon - 8 am	20	0	280	81/72	Dsn - 9 am
Sep	27	0	386	85/70	Dsn - 4 pm	13	65	51	5	Mon - 7 am	14	1	198	74/66	Dsn - 9 am
Oct	16	0	223	65/59	Dsn - 4 pm	105	43	-62	3	Mon - 7 am	16	0	223	65/59	Dsn - 4 pm
Nov	7	14	96	50/45	Dsn - 6 pm	119	43	-76	3	Dsn - 7 am	3	119	43	40/39	Dsn - 7 am
Dec	5	30	71	35/32	Dsn - 6 pm	142	40	-103	3	Dsn - 7 am	3	142	40	27/27	Dsn - 7 am
Annual	33	30	470	93/75	Jul/Dsn - 5 pm	153	124	-28	9	Jan/Dsn - 7 am	124	692	1,700	81/72	Aug/Dsn - 9 am

Geothermal Plant Cumulative Load Summary

By R&D

Monthly Cumulative Heating/Cooling Load

Alternative: 1 - VAV w/DX Cooling

Plant: Cooling plant - 001

	Plant Cooling Loads			Plant Heating Loads			Coincident Cooling/Heating Loads			Net Plant Load (+ cooling / - heating)		
	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh
Jan	344	4,126	1,209	3,289	39,468	11,564	3,719	44,630	13,077	-2,945	-35,342	-10,355
Feb	414	4,972	1,457	2,449	29,386	8,610	2,994	35,929	10,527	-2,034	-24,414	-7,153
Mar	572	6,865	2,011	1,156	13,875	4,065	1,897	22,761	6,669	-584	-7,010	-2,054
Apr	701	8,410	2,464	352	4,223	1,237	282	3,384	992	349	4,187	1,227
May	2,126	25,513	7,475	17	208	61	15	183	54	2,109	25,305	7,414
Jun	3,482	41,789	12,244	0	0	0	0	0	0	3,482	41,789	12,244
Jul	4,276	51,307	15,033	0	0	0	0	0	0	4,276	51,307	15,033
Aug	4,374	52,491	15,380	0	0	0	0	0	0	4,374	52,491	15,380
Sep	2,850	34,198	10,020	2	26	8	0	0	0	2,848	34,172	10,012
Oct	965	11,575	3,392	230	2,760	809	241	2,886	846	735	8,815	2,583
Nov	476	5,708	1,672	964	11,569	3,390	921	11,049	3,237	-488	-5,861	-1,717
Dec	324	3,894	1,141	2,776	33,313	9,760	2,905	34,861	10,214	-2,452	-29,419	-8,620
Annual	20,904	250,848	73,498	11,236	134,828	39,504	12,974	155,685	45,615	9,668	116,020	33,994

Alternative: 2 - Geothermal

Plant: Cooling plant - 001

	Plant Cooling Loads			Plant Heating Loads			Coincident Cooling/Heating Loads			Net Plant Load (+ cooling / - heating)		
	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh	ton-hrs	kBtu	kWh
Jan	184	2,207	647	3,468	41,618	12,194	1,464	17,564	5,146	-3,284	-39,411	-11,547
Feb	189	2,267	664	2,512	30,147	8,833	1,275	15,304	4,484	-2,323	-27,880	-8,169
Mar	457	5,479	1,605	1,626	19,514	5,717	1,950	23,403	6,857	-1,170	-14,034	-4,112
Apr	918	11,012	3,227	858	10,294	3,016	2,717	32,605	9,553	60	718	210
May	2,493	29,918	8,766	144	1,723	505	5,074	60,885	17,839	2,350	28,195	8,261
Jun	3,744	44,927	13,164	47	561	164	1,852	22,220	6,510	3,697	44,366	12,999
Jul	4,314	51,774	15,170	25	302	88	2,053	24,636	7,218	4,289	51,472	15,081
Aug	4,587	55,045	16,128	28	336	99	2,320	27,838	8,156	4,559	54,708	16,029
Sep	3,243	38,910	11,401	52	620	182	1,090	13,085	3,834	3,191	38,290	11,219
Oct	1,472	17,669	5,177	755	9,061	2,655	3,798	45,577	13,354	717	8,608	2,522
Nov	485	5,818	1,705	1,531	18,366	5,381	1,941	23,288	6,823	-1,046	-12,548	-3,676
Dec	186	2,232	654	3,028	36,331	10,645	1,311	15,736	4,611	-2,842	-34,099	-9,991
Annual	22,272	267,259	78,306	14,073	168,872	49,479	26,845	322,140	94,386	8,199	98,386	28,827

MONTHLY UTILITY COSTS

By R&D

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
	------- Monthly Utility Costs -------												
Alternative 1													
Electric													
On-Pk Cons. ($)	367	335	418	423	626	737	790	840	654	513	391	353	6,446
Off-Pk Cons. ($)	108	95	106	97	116	133	139	149	116	107	99	104	1,370
On-Pk Demand ($)	375	399	481	612	784	997	1,117	1,098	977	678	479	388	8,384
Total ($):	850	829	1,006	1,132	1,526	1,867	2,045	2,087	1,747	1,298	969	845	16,200
Gas													
On-Pk Cons. ($)	138	85	36	15	1	0	0	0	0	12	39	115	443
Off-Pk Cons. ($)	212	169	128	72	13	4	2	3	5	64	115	191	979
Total ($):	351	254	164	87	15	5	3	3	5	76	155	306	1,422
Monthly Total ($):	1,200	1,083	1,170	1,218	1,541	1,872	2,047	2,089	1,753	1,374	1,123	1,151	17,622

Building Area = 8,600 ft²

Utility Cost Per Area = 2.05 $/ft²

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative 2													
Electric													
On-Pk Cons. ($)	516	446	481	446	558	647	663	709	580	509	454	489	6,497
Off-Pk Cons. ($)	245	210	195	133	93	109	129	126	93	133	170	228	1,863
On-Pk Demand ($)	462	449	449	513	603	708	786	783	722	556	451	447	6,929
Total ($):	1,223	1,105	1,125	1,092	1,254	1,464	1,578	1,618	1,395	1,199	1,075	1,163	15,289
Monthly Total ($):	1,223	1,105	1,125	1,092	1,254	1,464	1,578	1,618	1,395	1,199	1,075	1,163	15,289

Building Area = 8,600 ft²

Utility Cost Per Area = 1.78 $/ft²

ECONOMIC PARAMETERS

By R&D

Project Name: UW Whitewater Baseball Services
Location: UW-Whitewater
Building Owner: DFD
Program User: Ring and DuChateau
Company:
Comments:

Study Life:	30 Yrs	Income Tax Rate:	0.000 %
Mortgage Life:	20 Yrs	Cost of Capital:	4.500 %
Depreciation Life:	20 Yrs	Property tax rate:	0.000 %
Mortgage Interest Rate:	5.000 %	Insurance Expense rate:	0.000 %
Percent Financed:	100.0 %		
Depreciation Method:	None	Annual Inflation Rate Of	
Declining Balance Taxes:	100.0 %	Maintenance Expense	3.000 %
		Replacement Expense	0.000 %
		Property Taxes	0.000 %
		Insurance Expense	0.000 %

Alt #	First Cost ($/ton)	First Cost ($/ft²)	Additional First Cost	Total First Cost	Maintenance Cost ($/ton)	Maintenance Cost ($/ft²)	Total Maint. Cost	Total Alt. Cost
2	11,326.13	43.57	0.00	374,700.00	0.00	0.00	0.00	374,700.00
1	7,844.77	29.00	0.00	249,400.00	0.00	0.00	0.00	249,400.00

ENERGY CONSUMPTION SUMMARY

By R&D

	Elect Cons. (kWh)	Gas Cons. (kBtu)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 1					
Primary heating					
Primary heating		177,778	32.8 %	177,778	187,135
Other Htg Accessories	5,280		3.3 %	18,022	54,070
Heating Subtotal	**5,280**	**177,778**	**36.2 %**	**195,800**	**241,205**
Primary cooling					
Cooling Compressor	25,753		16.2 %	87,896	263,713
Tower/Cond Fans	3,552		2.2 %	12,122	36,369
Condenser Pump			0.0 %	0	0
Other Clg Accessories	349		0.2 %	1,189	3,569
Cooling Subtotal....	**29,653**		**18.7 %**	**101,207**	**303,651**
Auxiliary					
Supply Fans	15,432		9.7 %	52,670	158,025
Pumps	3,861		2.4 %	13,177	39,535
Stand-alone Base Utilities	23,514		14.8 %	80,253	240,782
Aux Subtotal....	42,807		27.0 %	146,100	438,343
Lighting					
Lighting	17,146		10.8 %	58,521	175,580
Receptacle					
Receptacles	11,701		7.4 %	39,935	119,816
Cogeneration					
Cogeneration			0.0 %	0	0
Totals					
Totals**	**106,588**	**177,778**	**100.0 %**	**541,562**	**1,278,595**

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

** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

ENERGY CONSUMPTION SUMMARY

By R&D

	Elect Cons. (kWh)	% of Total Building Energy	Total Building Energy (kBtu/yr)	Total Source Energy* (kBtu/yr)
Alternative 2				
Primary heating				
Primary heating	10,028	8.6 %	34,226	102,688
Other Htg Accessories		0.0 %	0	0
Heating Subtotal	**10,028**	**8.6 %**	**34,226**	**102,688**
Primary cooling				
Cooling Compressor	11,780	10.2 %	40,206	120,630
Tower/Cond Fans		0.0 %	0	0
Condenser Pump		0.0 %	0	0
Other Clg Accessories	196	0.2 %	667	2,002
Cooling Subtotal....	**11,976**	**10.3 %**	**40,873**	**122,632**
Auxiliary				
Supply Fans	15,314	13.2 %	52,267	156,815
Pumps	26,335	22.7 %	89,883	269,676
Stand-alone Base Utilities	23,514	20.3 %	80,253	240,782
Aux Subtotal....	65,163	56.2 %	222,402	667,273
Lighting				
Lighting	17,146	14.8 %	58,521	175,580
Receptacle				
Receptacles	11,701	10.1 %	39,935	119,816
Cogeneration				
Cogeneration		0.0 %	0	0
Totals				
Totals**	**116,014**	**100.0 %**	**395,957**	**1,187,989**

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

** Note: This report can display a maximum of 7 utilities. If additional utilities are used, they will be included in the total.

MONTHLY ENERGY CONSUMPTION

By R&D

------- Monthly Energy Consumption -------

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1	**VAV w/DX Cooling**												
Electric													
On-Pk Cons. (kWh)	4,681	4,267	5,337	5,397	7,987	9,398	10,071	10,712	8,345	6,543	4,983	4,497	82,218
Off-Pk Cons. (kWh)	1,915	1,696	1,892	1,723	2,069	2,375	2,465	2,645	2,061	1,912	1,764	1,852	24,370
On-Pk Demand (kW)	28	30	36	45	58	74	83	81	72	50	35	29	83
Off-Pk Demand (kW)	25	25	25	28	35	49	56	56	46	31	25	25	56
Gas													
On-Pk Cons. (therms)	173	106	46	19	2	1	0	0	0	15	49	144	554
Off-Pk Cons. (therms)	265	212	160	90	16	5	3	3	7	80	144	239	1,223
On-Pk Demand (therms/hr)	1	1	0	0	0	0	0	0	0	0	0	1	1
Off-Pk Demand (therms/hr)	2	2	1	1	0	0	0	0	0	1	1	2	2

Energy Consumption

Building	77,069	Btu/(ft2-year)
Source	181,955	Btu/(ft2-year)
Floor Area	7,027	ft2

Environmental Impact Analysis

CO2	169,658 lbm/year
SO2	504 gm/year
NOX	200 gm/year

MONTHLY ENERGY CONSUMPTION

By R&D

------- Monthly Energy Consumption -------

Utility		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 2	**Geothermal**													
Electric														
	On-Pk Cons. (kWh)	6,586	5,685	6,136	5,684	7,115	8,252	8,456	9,043	7,395	6,495	5,786	6,232	82,864
	Off-Pk Cons. (kWh)	4,356	3,735	3,462	2,359	1,652	1,940	2,304	2,248	1,653	2,365	3,023	4,051	33,150
	On-Pk Demand (kW)	34	33	33	38	45	52	58	58	53	41	33	33	58
	Off-Pk Demand (kW)	35	34	31	30	33	38	41	41	37	31	31	34	41

Energy Consumption		
Building	56,348	Btu/(ft2-year)
Source	169,061	Btu/(ft2-year)
Floor Area	7,027	ft2

Environmental Impact Analysis	
CO2	184,662 lbm/year
SO2	549 gm/year
NOX	218 gm/year

YEARLY CASH FLOW

By R&D

Alternative: 1
Life Cycle Cost: $673,762.78

Year	Utility Cost ($)	Maint. Cost ($)	Interest Cost ($)	Principal Cost ($)	Property Taxes ($)	Insurance Cost ($)	Revenue Penalty ($)	Replace. Expenses ($)	Deprec. Tax ($)	Cash Flow Effect ($)	Present Value ($)
0	0	0	0	0	0	0	0	0	0	0	0
1	17,622	0	12,470	7,543	0	0	0	0	0	37,635	36,014
2	18,151	0	12,093	7,920	0	0	0	0	0	38,163	34,947
3	18,695	0	11,697	8,316	0	0	0	0	0	38,708	33,920
4	19,256	0	11,281	8,731	0	0	0	0	0	39,269	32,929
5	19,834	0	10,845	9,168	0	0	0	0	0	39,846	31,975
6	20,429	0	10,386	9,626	0	0	0	0	0	40,441	31,055
7	21,042	0	9,905	10,108	0	0	0	0	0	41,054	30,168
8	21,673	0	9,399	10,613	0	0	0	0	0	41,686	29,313
9	22,323	0	8,869	11,144	0	0	0	0	0	42,336	28,488
10	22,993	0	8,312	11,701	0	0	0	0	0	43,005	27,692
11	23,683	0	7,727	12,286	0	0	0	0	0	43,695	26,925
12	24,393	0	7,112	12,900	0	0	0	0	0	44,406	26,184
13	25,125	0	6,467	13,545	0	0	0	0	0	45,138	25,470
14	25,879	0	5,790	14,223	0	0	0	0	0	45,891	24,780
15	26,655	0	5,079	14,934	0	0	0	0	0	46,668	24,114
16	27,455	0	4,332	15,680	0	0	0	0	0	47,467	23,471
17	28,278	0	3,548	16,464	0	0	0	0	0	48,291	22,850
18	29,127	0	2,725	17,288	0	0	0	0	0	49,139	22,250
19	30,001	0	1,861	18,152	0	0	0	0	0	50,013	21,671
20	30,901	0	953	19,060	0	0	0	0	0	50,913	21,111
21	31,828	0	0	0	0	0	0	0	0	31,828	12,629
22	32,782	0	0	0	0	0	0	0	0	32,782	12,448
23	33,766	0	0	0	0	0	0	0	0	33,766	12,269
24	34,779	0	0	0	0	0	0	0	0	34,779	12,093
25	35,822	0	0	0	0	0	0	0	0	35,822	11,919
26	36,897	0	0	0	0	0	0	0	0	36,897	11,748
27	38,004	0	0	0	0	0	0	0	0	38,004	11,579
28	39,144	0	0	0	0	0	0	0	0	39,144	11,413
29	40,318	0	0	0	0	0	0	0	0	40,318	11,249
30	41,528	0	0	0	0	0	0	0	0	41,528	11,088

Alternative: 2
Life Cycle Cost: $749,809.26

Year	Utility Cost ($)	Maint. Cost ($)	Interest Cost ($)	Principal Cost ($)	Property Taxes ($)	Insurance Cost ($)	Revenue Penalty ($)	Replace. Expenses ($)	Deprec. Tax ($)	Cash Flow Effect ($)	Present Value ($)
0	0	0	0	0	0	0	0	0	0	0	0
1	15,289	0	18,735	11,332	0	0	0	0	0	45,356	43,403
2	15,748	0	18,168	11,899	0	0	0	0	0	45,815	41,954
3	16,220	0	17,573	12,493	0	0	0	0	0	46,287	40,561
4	16,707	0	16,949	13,118	0	0	0	0	0	46,774	39,223
5	17,208	0	16,293	13,774	0	0	0	0	0	47,275	37,936
6	17,724	0	15,604	14,463	0	0	0	0	0	47,791	36,699
7	18,256	0	14,881	15,186	0	0	0	0	0	48,323	35,509
8	18,804	0	14,122	15,945	0	0	0	0	0	48,870	34,365
9	19,368	0	13,325	16,742	0	0	0	0	0	49,435	33,265
10	19,949	0	12,487	17,580	0	0	0	0	0	50,016	32,206
11	20,547	0	11,608	18,459	0	0	0	0	0	50,614	31,188
12	21,164	0	10,685	19,381	0	0	0	0	0	51,230	30,209

YEARLY CASH FLOW

By R&D

13	21,798	0	9,716	20,350	0	0	0	0	0	51,865	29,266
14	22,452	0	8,699	21,368	0	0	0	0	0	52,519	28,359
15	23,126	0	7,630	22,436	0	0	0	0	0	53,193	27,486
16	23,820	0	6,509	23,558	0	0	0	0	0	53,887	26,645
17	24,534	0	5,331	24,736	0	0	0	0	0	54,601	25,836
18	25,270	0	4,094	25,973	0	0	0	0	0	55,337	25,057
19	26,028	0	2,795	27,272	0	0	0	0	0	56,095	24,306
20	26,809	0	1,432	28,635	0	0	0	0	0	56,876	23,583
21	27,614	0	0	0	0	0	0	0	0	27,614	10,957
22	28,442	0	0	0	0	0	0	0	0	28,442	10,799
23	29,295	0	0	0	0	0	0	0	0	29,295	10,644
24	30,174	0	0	0	0	0	0	0	0	30,174	10,492
25	31,079	0	0	0	0	0	0	0	0	31,079	10,341
26	32,012	0	0	0	0	0	0	0	0	32,012	10,193
27	32,972	0	0	0	0	0	0	0	0	32,972	10,046
28	33,961	0	0	0	0	0	0	0	0	33,961	9,902
29	34,980	0	0	0	0	0	0	0	0	34,980	9,760
30	36,029	0	0	0	0	0	0	0	0	36,029	9,620

Geothermal Well Field: - 15J1P UW-Whitewater Athletic Complex - Baseball

Water Source Heat Pump Units (Alternative 2)

Description:

Gross Floor Area (Sq. Ft.):	8,600
Gross Cooling Tons/S.F.:	287
Total Cooling Tons:	30
Cooling Tons/Well Bore:	2.0
Depth per Well Bore:	400 Feet
Quantity of Well Bores:	15
Spacing of Well Bores:	20 ft. On Centers
Well Field Size:	6,000 Square Feet
Cost per Well Bore	$9,500
Total Well Field Cost:	$142,500
Equipment First Cost Savings:	($ 17,200)
Net Premium Cost:	$125,300