RDG PA

University of Oregon
Student Recreation Center
Project Overview and System Narratives

UO Capital Construction and Operations Review
2/28/2012

The intent of this document is to provide an overview of the UO Student Recreation Center (SRC) expansion project and the various systems that support this expansion. The attached information has been developed by and with our consultant team and describes our design intentions as we near the end of the Schematic Design phase of the work.

This document includes the following:

1. General Information - RSA
2. Energy Goals - RDG
3. Sustainability Goals - RDG
4. LEED Checklist - RDG
5. Civil Narrative - KPFF
6. Landscape Narrative – Cameron McCarthy
7. Structural Narrative – M.R. Richards
8. HVAC, Plumbing, Electrical, and Technology Narrative – Interface Engineers
9. Lighting Narrative – RDG
10. Fire Suppression and Alarm Narratives.- S.O. Creighton
11. Pool Systems Narrative. - Aquatics Design Group
12. Code Narrative - S.O. Creighton
13. Outline Specifications – RSA/RDG
14. Drawings. Note that drawings are sent as a separate attachment and include architectural plans, sections and elevations, Utility plans, Landscape plans, Mechanical and Electrical diagrams.

Previously we distributed the survey, geotechnical information, and program information. This is not repeated in this document.

General Information

The work included herein has been developed with the Project User Group (PUG) during the course of six workshops that have been held over the past several months. In addition there have been three Integrated Design Workshops attended by the design consultant and UO facilities teams.

Location:
The project area is located to the east of Esslinger Hall and south of the 1999 SRC in the area now occupied by the outdoor covered tennis courts. These courts will be removed and the north end of the addition will attached to the existing 1999 SRC. It will be bounded on the east by the existing bike path/playing fields and to the south by an existing access drive. The existing parking area between Esslinger Hall and the west edge of the proposed addition will be repurposed as an open space containing sand volley ball courts. Most if not all of the parking will be relocated elsewhere. If Esslinger is ever removed in the future it is likely that the SRC would

expand into this open area to replace spaces in Esslinger that they currently occupy. Our intention is that the current plans do not hinder this likely future scenario.

Plans:

There are three levels to this addition.

Lower Level: The lowest level is at 5" above the adjacent east field level and contains the east entry, a natatorium with a lap pool, leisure pool and two spas, a fitness area, wet classrooms, offices, a lower level of lockers and storage and pool mechanical rooms. Along the new east entry will be toilet rooms serving the fields, a secure bike storage area, lockers, a lounge and an egress point for the natatorium and the exit stairs. This level has an outdoor south facing patio off the end of the natatorium.

The construction of this level will require significant excavation, some of which will be into the rock noted in the geotechnical report. For the most part the new construction is held away from the existing foundations of Esslinger and the 1999 Student Recreation Center. It is assumed that the new north, west and portions of the south wall of this level will be concrete retaining walls with a perimeter drainage system. Additional excavation will be required for the pools and surge tanks (refer to pool systems narrative). There will be an electrical transformer vault located by the southwest corner of the building that will be accessible from the mechanical room and through a lid to the exterior (refer to the electrical narrative). A new two stop elevator with opposing doors will connect this with the free zone on the main level and another 3-stop elevator will connect this level with the two levels above.

Main Level: The main level aligns with the existing 1999 SRC main floor level (about 14'-5" above the fields) and includes the main control area along with locker rooms and fitness areas. A portion of the floor of the new fitness area will align with the existing 1999 SRC gyms (4'-0" below the main level). New exit stairs from this level to the east will be added to aid in exiting from the existing gyms. The existing Leighton pool tank will be covered and repurposed as a storm water retention facility (refer to the structural and mechanical narratives). The existing Leighton pool natatorium structure will be modified and portions of it will be used for an extended entry area and for expanded fitness areas. There will be significant changes to the existing Esslinger locker room area and minor changes elsewhere in Esslinger Hall and the 1999 SRC.

The construction of this level will be mostly trusses and joists supporting a steel deck and concrete floor built to 2-hour fire rated standards. There will be a floor opening inter-connecting this level with the lower level. This opening will have an automatic horizontal smoke shutter. The east edge of this level will be cantilevered out over the east bike path and be supported by lines of wall and exterior columns.

Upper Level: The upper level is about 14'-6" above the main level and has a three-court gym, group-exercise room, open fitness areas, maintenance room, toilet rooms, mechanical and storage rooms. There is also an outdoor south and east facing outdoor patio with an outdoor basketball court at this level. The west edge along with the toilet and mechanical rooms will be at the existing indoor track level (12'-0" above the main level) and there will be a sloped walk and steps up to the main new gym and fitness level 2'-6" above. There will be a long linear sky light along the east wall of the gym to bring light down into the natatorium below.

The construction of this level will be mostly trusses and joists supporting a steel deck and concrete floor built to 2-hour fire rated standards. There will be a floor opening in the fitness area between the new and existing gyms that will line up with the opening in the main level floor below. No horizontal smoke shutter will be required at this level. The east wall of the new gym will act as a very deep truss supported on columns in the natatorium below. From this deep north/south wall-truss will hang the east/west trusses supporting portions of the gym floor and outdoor patio floors. These trusses will be exposed in the natatorium below and will be made of steel pipe and tubes covered by 2-hour rated intumescent paint. A portion of outdoor patio will reuse the existing resilient court flooring now located at the north end of covered tennis courts. All of the patio will have concrete pavers set on pedestals set on a membrane roof over rigid insulation that is sloped to drain.

Roof: There are no program areas on the roof. For the most part the new roofs are flat and will have a membrane roof over rigid insulation sloping to roof drains and edges. There will be skylights in the roof in the area between the new and existing gyms and monitors with skylights and ventilation openings in the roof over the new gym. Solar water heating panels will be located on the roof.

Materials:
The building will be constructed to follow the UO Campus Construction Standards. The list below is a general outline of systems. A more detailed list of materials is included in the attached outline specifications. Based on code requirement the building will be of non-combustible construction with two hour fire rated structural systems. The type and use of individual spaces will determine the type of interior finishes based on concerns for durability, maintenance, acoustics or aesthetics. The Recreation and Wellness Center on Western Oregon University campus is a good example of the level of quality expected for this project. .

Floors:

- Concrete slab on grade or on pan system on steel structural framing members
- Stained and polished concrete in most public areas, ceramic tile at toilet and shower rooms, rubber or vinyl tiles/sheet goods at limited areas, resilient safety flooring at custodial rooms and carpet finishes at offices.
- Wood flooring on resilient pads at gyms and new group-exercise rooms
- Concrete pavers on pedestals over sloped membrane roof at upper patio.
- Resilient court surface at upper patio basket ball court – reused from covered tennis court area.

Exterior Walls:

- Concrete or steel stud substrates.
- Brick masonry to match existing, exposed concrete, plaster/cemetitious materials, metal panel finishes.
- Aluminum storefront or curtain-wall, insulated glazing window systems with some operable windows
- Hollow metal doors and steel frames at service and mechanical entries and roll-up door at field storage room.

Interior Walls:

- Steel stud typical, concrete masonry units at natatorium and locker rooms and painted exposed concrete retaining walls at lower level mechanical and storage rooms.
- Veneer plaster, ceramic tile, or wood paneling wall finishes.
- Wood doors and relites in painted steel frames typical.

Ceiling Systems:

- Exposed painted structural systems at Natatorium and Gym
- Acoustic panels and veneer plaster soffits at most fitness areas.
- Suspended wood slat / veneer plaster at public circulation areas.
- Metal soffit panels at exterior ceiling along east edge over bike path.

Roof Systems:

- Concrete slab over trusses at patio, light weight steel framing at Gym, and possible reuse of covered tennis courts glu-laminated beams at upper level roof areas (except gym).
- Membrane roof finish over tapered rigid insulation, possible green roof, solar thermal panels or photovoltaic panels.
- Multi-layer sloped skylights with switched internal louvers for day light control.

Code Considerations:
The building is primarily considered an A Occupancy with some B Occupancy spaces. The construction will be Type 1-B (non-combustible with 2-hour protected structural elements). There are open steel trusses supporting the natatorium ceiling and the outdoor patio above. These members will be covered by intumescent paint in order to meet 2-hour construction requirements.

Design Objectives:
Ultimately the intent of the new construction is to create a durable and attractive, well day lit and energy efficient structure that could serve the campus community recreation needs for at least 100 years. The facility will be designed to meet LEED Gold certification levels although the UO has not yet decided whether to actually seek certification.

Energy Goals Associated with LEED

Using the Oregon Model for Sustainable Development as a guideline, the project team has focused on designing a high performance building with the intent of reducing energy consumption by 35% compared to code compliant facilities. To accomplish this goal, a variety of strategies have been tested and refined during the team's integrated design sessions. Focusing on "value", the project team has identified and prioritized systems and technologies that can produce a positive return on investment, including: solar thermal technology, intelligent building controls & sensors, and the reuse of waste energy. Additionally, our integrated design sessions, with the assistance of the Energy Studies in Building Laboratory (ESBL), have also refined concepts to optimize passive strategies, such as natural ventilation, thermal mass, and natural lighting.

Sustainability Plan

While not yet fully defined, this project holds great promise that construction waste management (CWM) strategies will be mandated for the construction trades. This includes the separation of construction and demolition debris, as well as waste distribution to recycling and reclaims centers. CWM goals include:

- Divert a minimum of 75% of the projects Construction & Demolition debris from the landfill
- Identify opportunities to reuse construction waste – for example, crushing concrete debris for use as sub-basis or clean backfill

In addition to CWM, the project hopes to promote sustainable construction practices. Practices will include: Third Party Commissioning of the buildings energy using systems, and may also include: Photographic documentation of the BMP's implemented on the project, and Outdoor Air Flush of the entire facility – Pre Occupancy. Additionally, it will be desirable to select materials that conform to the following principals:

- Locally sourced and sustainably harvested materials
- Materials manufactured with recycled and renewable content
- Healthy materials with low and/or no VOC content

Solar Technologies will be utilized on the project. This includes: Solar Thermal Collectors and Photovoltaic Array Panels. The project has earmarked 1.5% ($xxx,xxx) of the construction budget to pay for solar technologies in compliance with the Oregon Model for Sustainable Development. An energy model will be initiated during Design Development, and will help to identify the size / capacity of the solar technologies. At this time, we assume a majority of the earmarked funds will be allocated to solar thermal technologies. Solar Thermal technologies are a fundamental energy conservation strategy for the project, and will yield a very favorable return on investment (ROI) for the University. Remaining funds will be allocated to additional solar technologies, and will be evaluated based on an informed decision making process - considering simple payback (ROI), environmental impact, as well as a technologies value as a demonstration/teaching tool.

The projects bio-climatic design is intended to harmonize with site natural environmental forces, such as: thermal changes, solar capacity, and local wind patterns. As such, the project has planned for thermal mass and operable fenestration to allow spaces to take advantage of natural ventilation. A CFD analysis (computational thermal dynamics) will be initiated during Design Development. The CFD analysis will allow the design team to "tune" the buildings fenestration and massing to optimize its potential for natural ventilation strategies – thus reducing the facilities energy consumption and carbon footprint. While not yet fully defined, operable wall louvers, operable windows, and roof top ventilators will be fundamental to the success of a natural ventilation strategy. It should be anticipated that these technologies will be implemented in large volume spaces, such as the new three-court gymnasium.

The project will be generously day lit with louver controlled skylights planned for over the large natatorium and 3-court sym spaces. Lighting controls will make efficient use of artificial lighting. The existing Leighton Pool shell will be repurposed for use as a storm water collection basin for gray water flushing and as energy sink for mechanical equipment use. These along with energy efficient mechanical systems are outlined later in this report in the HVAC section.

LEED 2009 for New Construction and Major Renovations

Project Checklist

University of Oregon

Sustainable Sites — Possible Points: 26

Y	?	N			
12	14			**Sustainable Sites**	**26**
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
	1		Credit 3	Brownfield Redevelopment	1
	6		Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
	3		Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
	1		Credit 5.1	Site Development—Protect or Restore Habitat	1
	1		Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
	1		Credit 6.2	Stormwater Design—Quality Control	1
1			Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
	1		Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

Y	?	N			
8	2			**Water Efficiency**	**10**
Y			Prereq 1	Water Use Reduction—20% Reduction	
2	2		Credit 1	Water Efficient Landscaping	2 to 4
2			Credit 2	Innovative Wastewater Technologies	2
4			Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 35

Y	?	N			
19	10	6		**Energy and Atmosphere**	**35**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
12	7		Credit 1	Optimize Energy Performance	1 to 19
	1	6	Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
3			Credit 5	Measurement and Verification	3
	2		Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

Y	?	N			
4	7	3		**Materials and Resources**	**14**
Y			Prereq 1	Storage and Collection of Recyclables	
	3		Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
	1		Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
1	1		Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

Y	?	N			
1	1		Credit 4	Recycled Content	1 to 2
1	1		Credit 5	Regional Materials	1 to 2
		1	Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1

Indoor Environmental Quality — Possible Points: 15

Y	?	N			
12	3			**Indoor Environmental Quality**	**15**
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
	1		Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
	1		Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
	1		Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
1			Credit 8.1	Daylight and Views—Daylight	1
1			Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

Y	?	N			
4	2			**Innovation and Design Process**	**6**
1			Credit 1.1	Innovation in Design: Green Education	1
1			Credit 1.2	Innovation in Design: Exemplary Performance	1
	1		Credit 1.3	Innovation in Design: Exemplary Performance	1
	1		Credit 1.4	Innovation in Design: Green Cleaning	1
1			Credit 1.5	Innovation in Design: Pool?	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

Y	?	N			
1	2	1		**Regional Priority Credits**	**4**
1			Credit 1.1	Regional Priority: MRc7	1
	1		Credit 1.2	Regional Priority: WEc2	1
	1		Credit 1.3	Regional Priority: MRc1.1 (75%)	1
		1	Credit 1.4	Regional Priority: SSc5.1	1

Total — Possible Points: 110

Y	?	N	
60	40	10	**Total** — Possible Points: 110

Certified 40 to 49 points   Silver 50 to 59 points   Gold 60 to 79 points   Platinum 80 to 110

kpff
Consulting Engineers

University of Oregon Student Recreation Center

Civil Narrative

February 24, 2012

Existing Conditions:

The existing topography at the Student Recreation Center (SRC) site ranges in elevation from approximately 441' at the northeast corner of the existing recreation center at 15th Avenue to 462' at the western edge of the proposed buildings, along the east side of McArthur court. The site sheds from west to east, with slopes up to 1:1.5.

There are covered tennis courts in the proposed building location. The tennis courts will be demolished, and any underground utilities within the proposed footprint will be re-routed. The existing building sits on a hill of very rocky soil at elevation 455'. This hill will be excavated to field level at 444', at a minimum, and in some places the excavation will reach 14' below field level for the pool and surge tank.

The east side of the site consists of existing turf fields. The fields will be preserved to the extent that is possible.

Site Soils:

Based on the soil map, the site consists mostly of Urban land-Hazelair-Dixonville complex, which consists of approximately 8 feet of silty clay over bedrock. The existing bedrock is thought to be generally located at elevation 445', just above the existing fields to the east. Much of the excavation below field level, especially the excavation for the pool, will be rock excavation.

Site Improvements:

The proposed project includes a new building for the student rec center and possibly some improvements to the existing turf field for fire access. This facility will require re-routing existing water, storm drainage, sanitary sewer, power, data, and telephone. Connections for those underground utilities will be provided, as well as water quality treatment for the new roof area and possibly a rainwater harvesting system. See the Electrical Narrative for the power, data, and telephone demolition, re-routing and proposed improvements.

Demolition:

The existing covered tennis courts building will be demolished, and the hill underneath will be completely excavated. This demolition work will require that the utilities within the proposed development area will be relocated prior to excavation. See the Electrical Narrative for demolition of the existing power, data, and telephone systems.

Any utility relocations and removals will likely require rock excavation because the elevations required for the utilities are within the existing bedrock layer. See geotechnical investigation for existing bedrock location and depth.

Sustainability:

The LEED requirements for stormwater quality (Credit 6.2) will be met through the City of Eugene's Stormwater Management requirements. Stormwater treatment can be achieved through pre-engineered mechanical systems, such as water quality manholes, or through vegetative infiltration / filtration, such as planters or rain gardens. If there is space on site, water quality treatment will take place in vegetated facilities.

Opportunities to achieve LEED Credit 6.1 for stormwater quantity could come from the use of the existing Leighton pool for rainwater harvesting. If this option is pursued, overflow storm piping will be installed. See Storm Drainage for more information.

Site Utilities:

Domestic Water and Fire Protection:

The proposed SRC development area has an existing looped 8-inch water and fire service line that runs around the area on the north, east, and west sides, as well as directly through portions of the development area. Portions of this existing 8-inch line will need to be relocated, including approximately 400 feet of piping because it is under the proposed footprint on the west side and serves the buildings to the north and west . Any laterals that are needed will require minimal new piping because the existing service lines are directly adjacent to the proposed building. The system is already metered and has backflow prevention at 15th Avenue.

Before proposed water line sizes can be fully evaluated, the program needs for water and the anticipated flow rates and volumes will need to be more clearly defined. The building's plumbing system demands will need to be determined as well as expected flow rates and volumes for pools, restrooms, kitchens, drinker facilities, laundry, etc. The domestic water system must also anticipate water reuse from rainwater harvesting, as discussed in the rainwater harvesting section of this report. For the purposes of this report, it is assumed that the existing water distribution system is adequate to serve the proposed SRC.

One existing fire hydrant will be required to be moved. Depending on the building's final construction type and size, additional fire hydrants may be required to meet Oregon Fire Code. Based on the current building size and footprint, it is assumed that one additional fire hydrant will be required.

Sanitary Sewer:

There is an existing 8-inch sanitary sewer line running from west to east along the south side of the proposed development area. Approximately 400 feet of this line will need to be relocated further to the south so that it is not within the building footprint.

The existing line varies between 3' and 5' deep, related to the field elevation, which may be problematic for any waste lines that are needed from the lowest level of the proposed building, especially the pool. A pumping system will most likely be required to drain the pool to the existing sanitary sewer line.

Storm Drainage:

The existing storm system runs along all four sides of the development area. Existing roof drains are picked up by 8" lines run from south to north along McArthur court, then from west to east along the south side of the existing recreation center. A 10" mainline flows from west to east along the south side of the development area. All of these existing pipes flow into a 12" storm pipe that runs from south to north, along the edge of the turf field towards 15th Ave. The 8" storm drain that is picking up existing roof drains may need to be incorporated into the proposed building's plumbing system and piped within the building footprint. The 12" storm drain line on the east side of the site will need to be relocated as well.

About 750' of storm pipes will need to be removed. Up to 300' of that pipe may be replaced within the building footprint, but approximately 500' of storm pipe will need to be re-installed outside of the building's extents.

If Leighton pool is used for rainwater harvesting, up to 300' of 10" storm pipe will need to be installed within 15th Ave. The current storm mains within 15th Ave are insufficient to handle the overflow from a large storm, so they will need to be supplemented by the proposed pipe.

There are currently no water quality facilities for this site. All new impervious areas, including roof areas, are required to be treated. Treatment for portions of the roof will be achieved through planters, then runoff will flow to the existing conveyance pipes. No infiltration will be available for these planters, as they will most likely be on the roof patio area.

For areas not treated by the planters, a water quality manhole will be required.

Subdrainage:

The pool may be below the groundwater level for this area during the winter. If that is the case, subdrainage will be required. Although the storm drainage system is 7-9 feet below field level, it may not be low enough for the pool's subdrainage to gravity drain. A pump system may be required.

Tunnel System:

The existing tunnel system provides connections to several utilities through a spur from the main tunnel system that enters the existing SRC on the north side at 15th Avenue. See the mechanical narrative for the details on a possible connection to the tunnel system for utilizing waste heat for the proposed development. No other improvements or connections are anticipated for the tunnel system.

Landscape Narrative

Existing Site Framework

The University of Oregon's Campus Plan states, "The University of Oregon campus is organized as a system of quadrangles, malls, pathways, and other open spaces and their landscapes. This organizational framework not only functions well, but also serves as a physical representation of the university's heritage." The Student Recreation Center site is located to the immediate south of the 15th Avenue Axis and to the east of University Street Axis. Although the turf fields to the east of the building site are not designated open space they do act as outdoor classroom space. Students, faculty, and other users accessing the campus from the neighborhood south of campus heavily use the existing bike/pedestrian path that runs north-south between the turf fields and the building site. This has created a sense of community and connection within this area that the new site improvements will help identify and enhance.

Site Design

The site design will incorporate all requirements and recommendations from the current University of Oregon Campus Plan, Selected Standards for Campus Construction Projects, ADA Accessibility Guidelines, Bicycle Plan, Sustainable Development Initiatives and all other applicable planning documents. The goal for the outdoor spaces surrounding the new Student Recreation Center (SRC) building is to follow a structure and framework that is synonymous with the current campus design. The outdoor rooms will reflect the design excellence from within the building and will encourage all users to gather, move, recreate, relax, and enjoy their surroundings. A new secondary entry plaza will be created on the east side of the new addition that will connect users from the existing bike/pedestrian path to the recreation center. This plaza will also help connect the existing building and new addition while providing users easier access to the adjacent outdoor facilities. Site furnishings (benches, trash receptacles, etc.) that adhere to campus standards will be located at all plazas and other suitable locations throughout the site.

The existing synthetic turf fields located to the immediate east of the building will remain while the bike/pedestrian path will be enhanced to encourage movement in both an east-west and north-south direction. Terraced seating is proposed to be located between the path and the new building area to allow new space for field spectators and outdoor classroom use. The proposed path improvements extend to the southern edge of Field 2 while also extending north into the 15th Avenue Axis (designated open space). The vision for the improvements at 15th Avenue is to improve the interaction between pedestrian/bike movements and vehicular traffic. The goal is to also improve the connection between the path and the Emerald Axis to provide users a clear line of movement from the southern edge of campus to the heart of campus. Infiltration planters will be provided to help treat the stormwater runoff from 15th Avenue that is currently untreated.

A smaller, more private outdoor space that is accessible only from the SRC will be provided at the southeast corner of the new building that will allow pool users access to the outdoors. This space may be slightly elevated (5"-6") above field grade and will be fenced and buffered with plant bed to allow users to sunbathe and relax without being directly viewed from the adjacent bike/pedestrian path. A physical connection between this outdoor space and a new upper level patio will also be provided.

The upper level patio will provide both active and passive opportunities. It is anticipated that at least one outdoor basketball court will be provided along with gathering/social space for outdoor events, meetings, classes, etc. Stormwater planters will help capture roof water and provide a visual of sustainable design for the users while providing a buffer from the roof edge. These planters are anticipated to be part of a wall system that will act as a guard wall at the edge of the patio. Additional aesthetic landscape elements, such as potted plants and trees, may also be provided.

Parking

Additional vehicle parking is not anticipated for this project. However, existing parking (adjacent to the existing building and at 15th Avenue) will be displaced as a result of the expansion and improvements.

Additional bicycle parking (both covered and non-covered spaces) will be provided as part of the expansion project. Bicycle parking will be conveniently located near, but not directly adjacent to, the main building entries and outdoor activity spaces. Bicycle racks will adhere to campus standards. Existing bicycle hoops located on 15th Avenue (near the existing main building entrance) are not spaced according to current campus standards and there may be an opportunity to provide additional spaces at these locations.

Grading

The existing site topography is dramatic with nearly 20' of elevation change from one end of the project limits to the other (east to west direction). It is anticipated that berming or embankments will be needed. Retaining walls may also be necessary. Aesthetic grading will occur to soften the dramatic grade changes and create visual interest.

Sustainability

The design of the project site will include energy saving and sustainability measures to minimize long term operating costs, maintenance requirements, and environmental impact while providing a safe, healthy, and comfortable environment for University of Oregon students, employees, and visitors. The design will incorporate native plantings, stormwater quality measures, and a water-conserving irrigation system.

Landscape

The landscape areas will be planted with combinations of trees, shrubs, and accent plantings. The majority of the plants will be species native to Oregon or will be native "analogue" plants: plants that are adapted to similar climatic and growing conditions to native plants. Native and native analogue plants are acclimated to the unique Willamette Valley climate patterns and adapted to its unique soils leading them to be a lower maintenance alternative to non-natives. The design will accommodate the mature size of the plants and trees selected and will also allow for low ongoing maintenance requirements and reduced life cycle costs.

Site irrigation will be accomplished with an automatically controlled, underground system. It will be designed and constructed to be as efficient in terms of water usage as possible. The irrigation system will be centrally controlled using components compatible with Toro Sentinel.

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DRAFT SCHEMATIC DESIGN STRUCTURAL NARRATIVE

University of Oregon
Student Recreation Center Expansion

The proposed expansion of the Student Recreation Center will include new construction in the general area of the existing outdoor tennis courts. The new space will include a gymnasium, exercise spaces, a new pool area, an expanded rock climbing area, locker rooms, mechanical spaces and other associated rooms.

The purpose of this report is to describe the project structural requirements and outline the materials and structural systems selected.

The new construction will be closely adjacent to the existing Esslinger Hall and connected to the existing Leighton Pool building and existing Student Recreation Center. The structural design for the new project will need to be coordinated with the existing buildings. The foundations for the existing buildings extend past the face of the structures and may be at a depth that will interfere with new construction. Where old and new construction is connected, there will either be a solid structural connection or a joint that will allow relative movement between the two sections.

The structural systems and materials for the new construction were selected based on architectural considerations, structural requirements and cost effectiveness. Because of the size and use of the project, non-combustible materials are generally required. The open spaces required for basketball courts and swimming pools make trussed spans favorable. Steel construction has an advantage in being geometrically adaptable. Concrete's mass can contribute to thermal stability and blocking sound transmission. A full range of construction materials were considered for this project.

The following is a description of the structural systems for the different areas of the project:

Leighton Pool

The existing Leighton Pool building is planned to be used as an entry lobby and expanded fitness area. The existing swimming pool will be covered over and used as a water storage tank.

This building was constructed with concrete walls and a concrete beam and joist roof system. The prior 1998 remodel and addition of the Student Recreation Center removed some of the building walls and added other shear wall elements to restore the loss of strength.

The structural schematic drawings show one potential arrangement of the north and south building walls that will allow the proposed entry lobby function and provide for adequate lateral force resistance. Coordination of these walls with the architectural function is recommended prior to moving beyond the schematic design phase.

The existing pool tank will be covered by precast concrete planks and topped with a concrete slab. The planks will be supported by a concrete beam and column system with foundations placed on top of the existing pool floor to maintain the integrity of the pool tank.

South Of Leighton Area

This area is bounded by Leighton Pool on the north, Esslinger Hall on the south and west, and other new construction to the east. A single level structure is anticipated.

The roof structure will consist of steel joists spanning approximately 60 feet in a north/south direction between Leighton and Esslinger. It will be necessary to construct walls for bearing and lateral resistance alongside of the existing walls of Esslinger. A portion of the Esslinger wall foundation is at an elevation higher than the new floor level. This will require that the wall and footing be slightly offset from the existing wall.

The roof structure for this area will have a concrete topping slab to provide a fire separation. The roof structure will have a seismic separation joint to isolate it from Esslinger. This structural separation will facilitate the planned future demolition of Esslinger Hall.

South of Existing Recreation Center Gym Area

This area of the project will contain an entryway to the upper level, a mechanical room, fitness space and open areas to allow natural lighting. The space is somewhat irregular in form with stairs and open spaces, lending itself to structural steel framing. A suggestion has been made to use recycled glulaminated beams at roof level in this part of the structure; this is potentially possible as well.

The structural system for the adjacent gymnasium is relatively flexible. A separation joint will be required between the new construction and the wall of the existing gymnasium. Columns for the new construction may be supported on the existing gymnasium foundations because they are oversized for wind resistance.

New Gymnasium

A new three court gymnasium will be built on the upper level of new construction. It is anticipated that the roof structure will be steel joists with a metal deck. North facing light monitors will be part of the roof structure, formed by framed walls and a sloping roof over the main roof plane. The east wall of the gymnasium will be a truss-like structure that serves to support the gym floor and roof over the natatorium. The west wall will have steel columns and metal framing.

Outdoor Court

An open outdoor activity area will be provided over the eastern portion of the natatorium. A paver system and insulation will be installed over the structural deck. A strip skylight will penetrate the structural deck, necessitating horizontal bracing for structural continuity in the diaphragm.

Locker Rooms

Two levels of locker rooms will exist in the area below the new gymnasium. The elevated floor structures will be precast concrete planks with a concrete topping. The interior walls will be concrete masonry for durability and the exterior walls concrete.

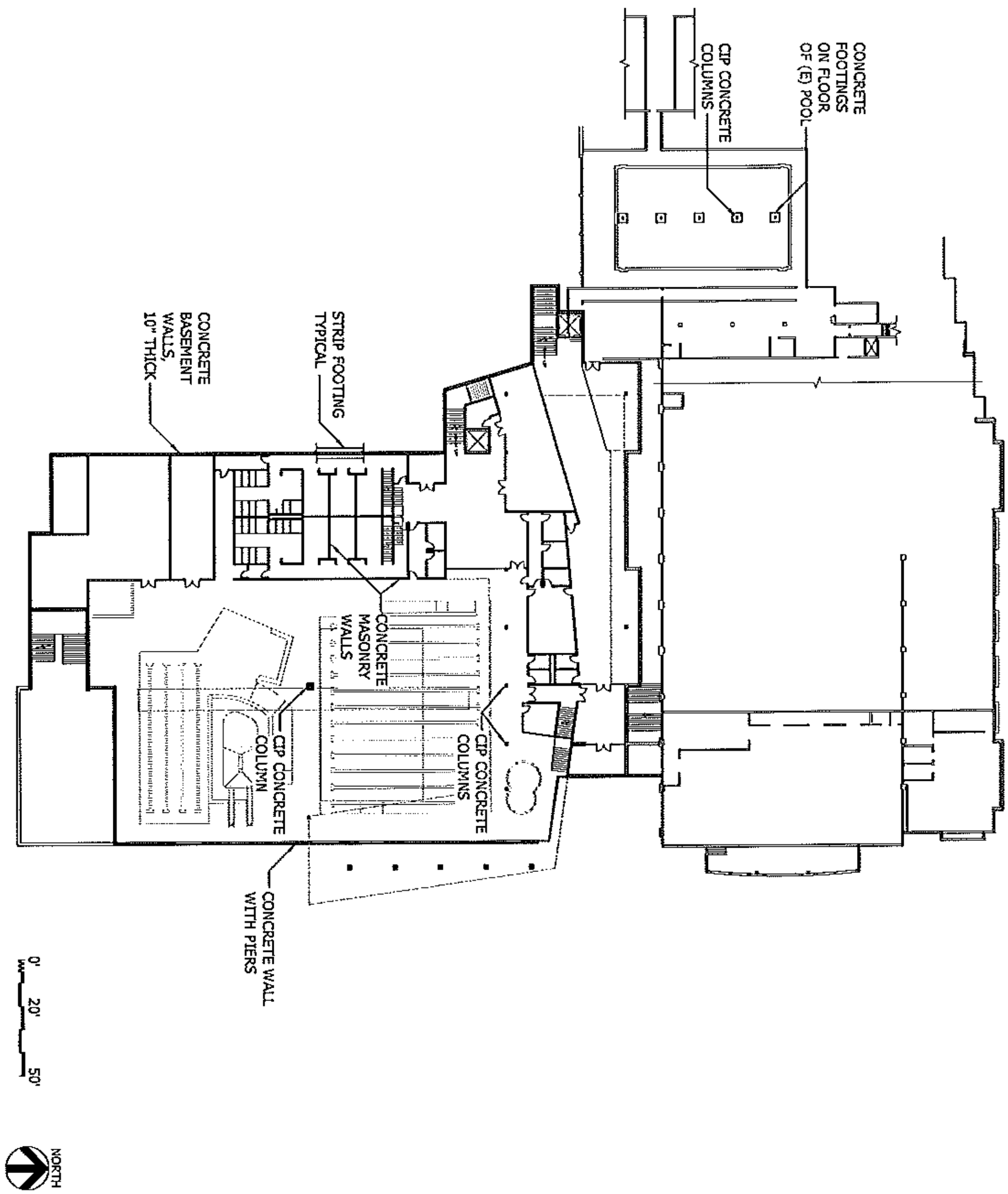
Natatorium and Swimming Pools

The new pools will be located on the lowest level of the new construction with the pool deck approximately five inches above the existing field level. The natatorium will be a large, relatively column-free volume, made possible by steel trusses framing the overhead structure. The exterior walls will be concrete with openings for windows and doors. Concrete has the strength and stiffness required to provide vertical support and lateral restraint.

The structural design of the Student Recreation Center Expansion will be in conformance with applicable building codes and University of Oregon Standards. Special consideration will be given to the minimization of floor vibration and sound transmission. The following is a summary of the project design criteria:

Building code	2010 Oregon Structural Specialty Code
Design Loads	ASCE-7
Occupancy Category	III
Wind	95 MPH Exposure C I = 1.15
Seismic	Design Category D I = 1.25
	S_S = 0.67 S_l = .33
Soil Bearing	To Be Determined

The attached diagrams identify the structured systems selected for the project schematic design. Further development of the design is necessary, but it is shown that the project is feasible and constructible.

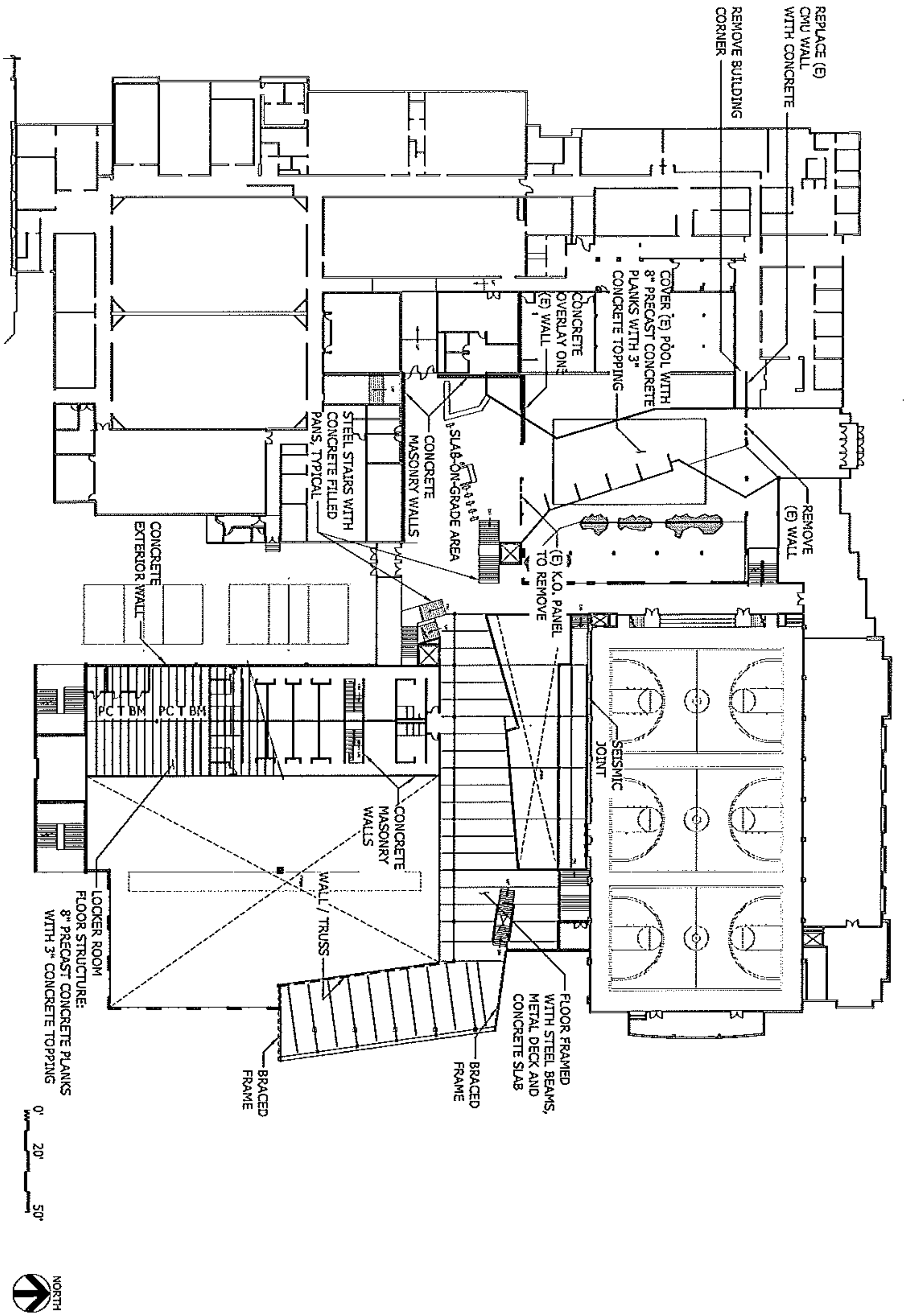


Sheet 1

Lower Level Floor Plan
Phase 1
Scale: 1"=50'-0"

University of Oregon Student Recreation Center
Addition and Expansion
Early Schematic Design Drawings
February 24, 2012

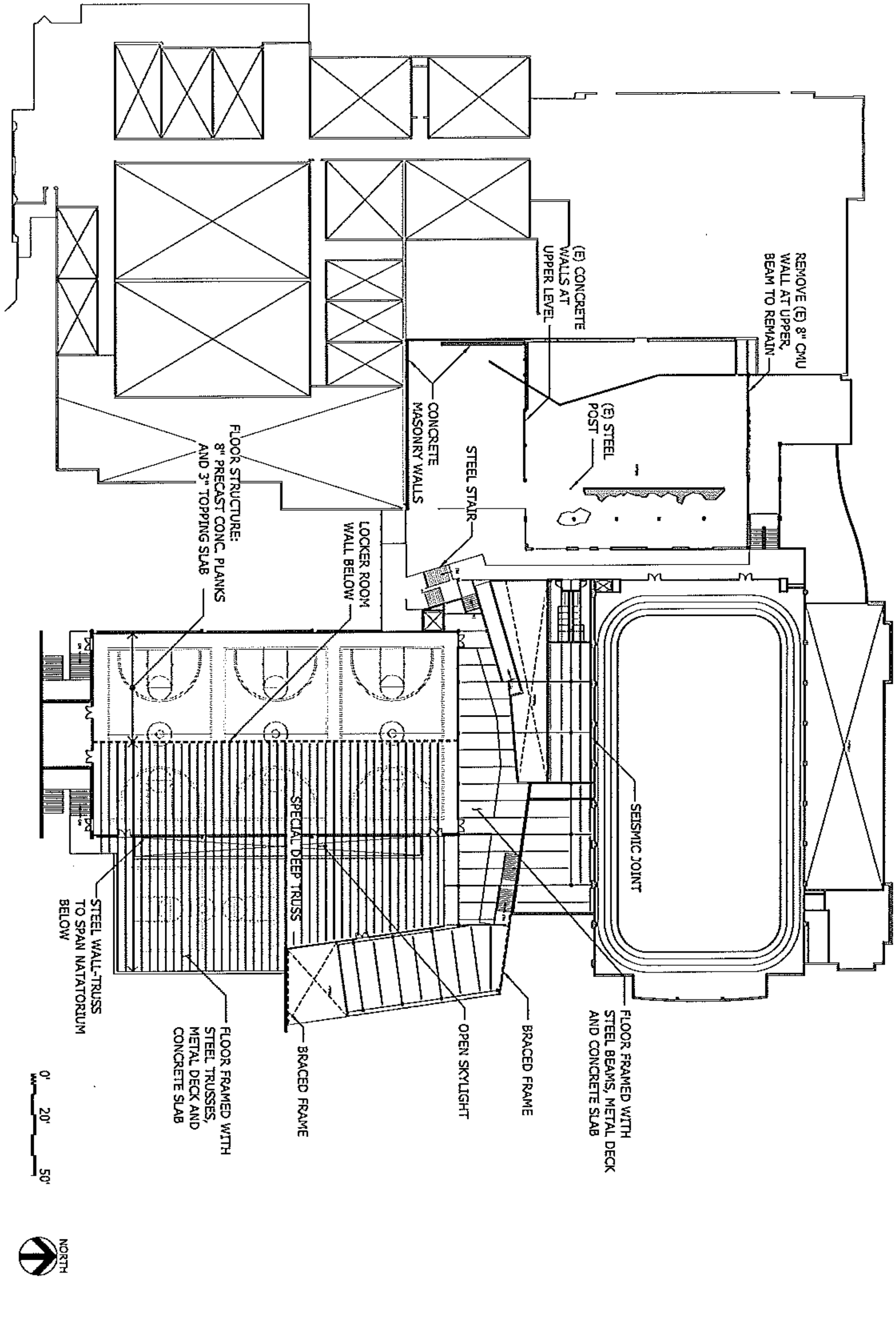
RDG PA



Sheet 2

Main Level Floor Plan
Phase 1
Scale: 1"=50'-0"

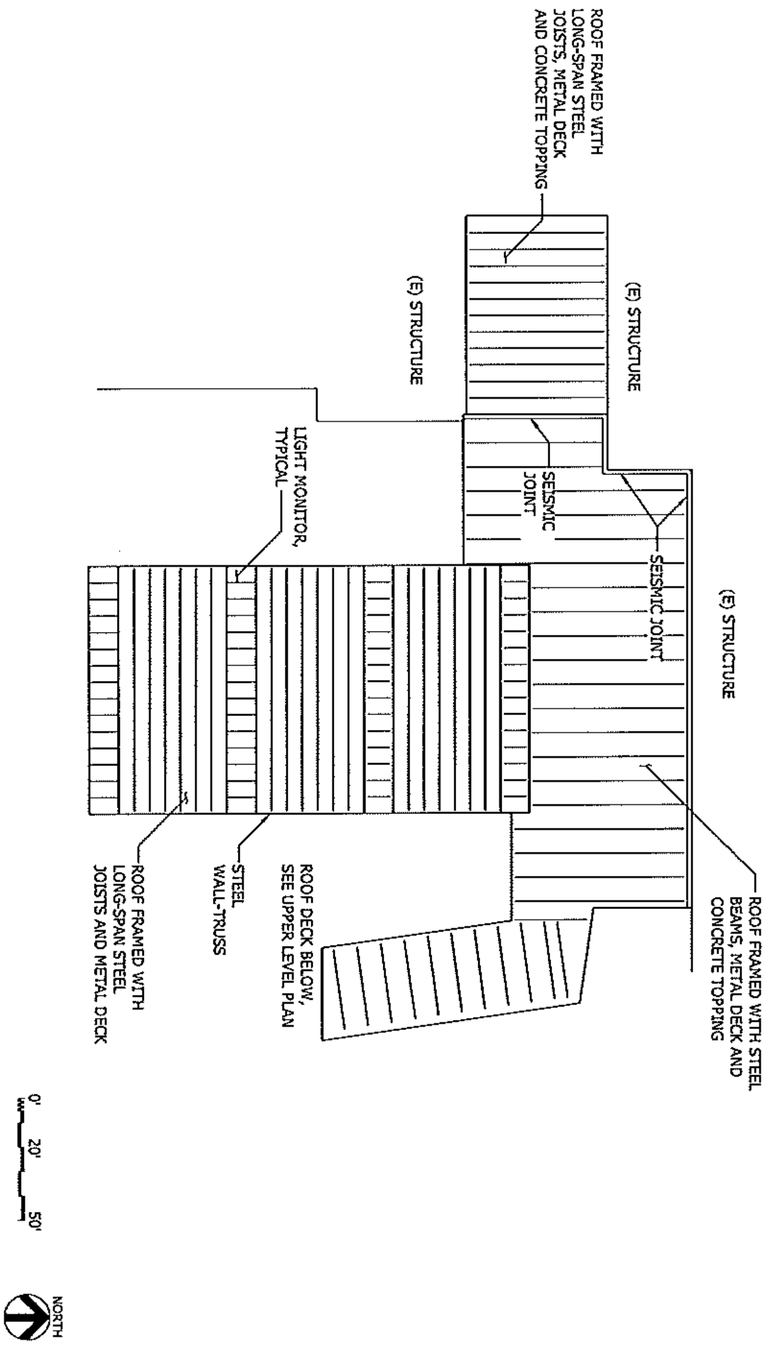
University of Oregon Student Recreation Center
Addition and Expansion
Early Schematic Design Drawings
February 24, 2012



Upper Level Floor Plan
Phase 1
Scale: 1"=50'-0"

University of Oregon Student Recreation Center
Addition and Expansion
Early Schematic Design Drawings
February 24, 2012

RDG PA


ROOF FRAMED WITH LONG-SPAN STEEL JOISTS, METAL DECK AND CONCRETE TOPPING
(E) STRUCTURE
(E) STRUCTURE
LIGHT MONITOR, TYPICAL
SEISMIC JOINT
SEISMIC JOINT
(E) STRUCTURE
ROOF FRAMED WITH STEEL BEAMS, METAL DECK AND CONCRETE TOPPING
ROOF DECK BELOW, SEE UPPER LEVEL PLAN
STEEL WALL-TRUSS
ROOF FRAMED WITH LONG-SPAN STEEL JOISTS AND METAL DECK
0'
20'
50'
NORTH

Basis of Design

University of Oregon Student Recreation Center
Expansion and Renovation
2011-0527.01
prepared for:
Robertson Sherwood Architects PC

prepared by:
Steve Dacus, PE, LEED AP
Christopher Larson, PE, LEED AP

February 24, 2012

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Design Criteria

Outdoor Design Conditions

System load calculations shall be based on the following outdoor design conditions:

» Summer: 92 degrees F DB / 67 degrees F WB (2009 ASHRAE Handbook of Fundamentals; Eugene, Oregon).

» Winter: 22 degrees F DB (2009 ASHRAE Handbook of Fundamentals; Eugene, Oregon).

Indoor Design Conditions

System will be designed to maintain the following temperature and humidity conditions, in compliance with ASHRAE Std. 55-2004:

Space	Fall/Spring (°F)	Summer (°F)	Winter (°F)	Relative Humidity (%)
Pool	86 2	86 2	86 2	40 to 60
Fitness Rooms	73 ± 2	78 2	70 ± 2	No control
Entry, Halls	78 ± 2	80 2	70 ± 2	No control
Gym	No cooling	No cooling	70 ± 2	No control

Internal Air Conditioning Loads Assumptions

Lighting: 1.2 watts per square foot. Utilize actual lighting load upon completion of lighting design.

People: 250 BTUH sensible/200 BTUH latent for people at rest. 635 BTUH sensible/1165 BTUH latent for athletic activity (base number of people on ASHRAE standards, Oregon Mechanical Specialty Code, and the Oregon Structural Specialty Code).

Ventilation Rate: ASHRAE Std. 62-2007/Oregon Mechanical Specialty Code.

Acceptable Noise Levels (ASHRAE 2007 Applications Handbook, Chapter 47, Table 42)

Room Type	Maximum RC(N)
Corridors	45
Fitness Rooms, Gym, Pool	45

Code References

Systems shall be designed in accordance with the latest edition of the following codes:

» Energy Policy Act of 2005 (EPACT).

» Energy Star.

» NFPA Standards (most recent adopted edition).

» Oregon Electrical Specialty Code (most recent adopted edition).

» Oregon Energy Code (most recent adopted edition).

» Oregon Mechanical Specialty Code.

» Uniform Plumbing Code (most recent adopted edition).

The following reference standards shall be used for the design:

» AMCA: Air Movement and Control Association International, Inc.
» ANSI: American National Standards Institute.
» ARI: Air Conditioning and Refrigeration Institute.
» ASHRAE: American Society of Heating, Refrigeration, and Air Conditioning Engineers.
» EPA: Environmental Protection Agency.
» NEMA: National Electrical Manufacturer's Association.
» NFPA: National Fire Protection Association:
  - NFPA 90A: Air Conditioning and Ventilating Systems.
  - NFPA 101: Life Safety Code.
» SMACNA: Fire and Smoke Damper Installation Guide.
» SMACNA: Guidelines for Seismic Restraints of Mechanical Systems.
» SMACNA: Standards for Duct Construction.
» UL: Underwriters' Laboratories.
» University of Oregon Campus Construction Standards, May 2011.

Heating, Ventilating and Air Conditioning

Sustainable Strategies

The project will be designed to achieve Leadership in Energy and Environmental Design (LEED) certification with a goal of attaining enough credits for LEED Gold. As part of the LEED process, an Owner's Project Requirements (OPR) documents will have to be provided by an owner's representative, separate from the design team. The project will go through the State SEED process. Metering of electrical and steam energy of the existing and new building will be required. It is desired by the University to save 30-percent energy beyond current Oregon State Energy Code.

» Natural ventilation will be incorporated into new gyms using wall louvers and roof or wall openings.
» New gyms will be heated using radiant floors.
» The existing pool will be used for water storage. It will be used for radiant cooling of entries or hallways and used to store heating water for radiant floors.
» The tunnel system will be cooled with water source heat pumps whose heat will be transferred to the existing pool's heating water storage section.
» Solar thermal heating can be used to heat the existing pool's heating water storage section or the new pool's water.
» Heat recovery from the new natatorium's heated air will be used to pre-heat incoming outside air or provide heated water to the pool.
» Pools will be covered when not in use.
» Displacement ventilation will be used in the new gym and fitness areas to deliver pre-cooled and pre-heated ventilation air directly to occupied zones.
» A night flush cycle will be used to pre-cool large volume spaces, excluding the natatorium.
» Irrigation water may be used to cool radiant slabs.

Hydronic Systems

The proposed University of Oregon Student Recreation Center Addition will be served by new mechanical systems. The existing campus central steam plant will serve the building's heating needs. Heating water for the addition will be generated by a steam to hot water heat exchanger that takes steam from the campus system. Condensate will be metered and returned to the campus system. The heating water will be distributed to hydronic radiant slabs in the new gymnasium, fitness rooms, and lobby. Air handlers with heating water coils serving the new natatorium, gym, and fitness areas will also be served by this heat exchanger. Heating water is distributed throughout the building using pumps with variable speed drives and premium efficiency motors. Existing portions of the building including Esslinger Hall, existing gyms, and fitness rooms will continue to be served by existing steam and heating water coils. Existing steam and condensate piping serving the existing building will be back-fed by new piping. No further modifications to the existing steam system are anticipated.

Cooling will be provided to portions of the addition from the existing campus chilled water system and recovered rainwater. Chilled water is expected to be provided at 48 degrees F with a 15 degree F temperature difference between supply and return water. Irrigation water may also be used for cooling. No modifications to the existing chilled water system serving the existing building are anticipated.

New heating and chilled water equipment will be installed in the existing pool mechanical room. Pumps will be provided with variable frequency drives (VFDs) and premium efficiency motors. The campus chilled water system will be separated from the new building chilled water system using a Delta-P automatic flow control valve.

Airside Systems

An indoor heat recovery unit (HRU) will provide ventilation air, heating, cooling, and exhaust for the new natatorium and locker rooms. The HRU will incorporate a heat pipe heat exchanger, VFD's on supply and exhaust fans, and stainless steel construction. Supply ductwork will be exposed in the natatorium and distributed along perimeter walls to reduce condensation. Return will be ducted as low as possible from the pool deck.

The new fitness areas will be served from an indoor HRU with chilled water and heating water coils. Air will be distributed to the fitness areas using displacement ventilation grilles or active chilled beams. Open fitness areas off of paths of egress will be supplemented by ceiling fans. The gym will be served by a single HRU with heating coil that delivers only ventilation air to the space. Air in the gym and fitness areas will be distributed as low as possible to the occupied zones. Gym and fitness area ductwork and distribution will be sized for ventilation loads only in order to keep ductwork sizes small and decrease the amount of architectural work to hide them. Mechanical ventilation will be used for times when the outside air conditions are not acceptable for use of natural ventilation in the gym. Enclosed fitness areas, such as Mind/Body, will be mechanically cooled using active chilled beams with supplemental ceiling fans.

Large paddle wheel fans will circulate air above the three basketball courts. Turbine roof vents will be used to enhance natural ventilation through the gym.

No modifications to the existing air handling systems in the existing building are anticipated.

Pool Mechanical Room

The pool mechanical room will be provided with code-required exhaust and make-up air to prevent the build-up of hazardous or obnoxious odors and gases.

Air Distribution

Air will be distributed and exhausted using sheet metal ductwork constructed according to the Oregon Mechanical Specialty Code (OMSC). Displacement ventilation will be used in the new gym and fitness areas. 306 stainless steel ductwork will be used for supply and exhaust to and from the natatorium. Supply ducts will be located to allow even distribution of air and to "wash" perimeter walls. Return inlets will be located as low as possible to the pool deck.

Equipment will be provided with unique tags and labels.

Transfer air and exhaust will be added to the climbing wall area to reduce the amount of chalk dust in the air which affects indoor air quality and filter life.

Air Distribution Equipment

Ductwork:

» Ductwork sheet metal will be galvanized, except in the natatorium

» Return air duct, supply duct, and general exhaust ducts: SMACNA low pressure duct standards (zero to 2 inches).

» Flexible Ducts: Pre-insulated with vapor barrier, used for diffuser connection and in concealed ceiling spaces only. Flexible "Alumaduct" is allowed in exposed areas, maximum of five feet.

» Insulation for Ductwork:
  - Outside air ducts: R-3.5, 1-inch-thick fiberglass blanket duct wrap with foil facing.
  - Supply ducts: R-6, 1-1/2-inch-thick fiberglass blanket duct wrap with foil facing. Not required while exposed in fully conditioned spaces.
  - Internal duct liner: 1 inch thick.
  - Exhaust ducts: Not insulated except for acoustic liner where required.

» Balancing Dampers: Adjustable balancing dampers in each branch take-off for proper control of balancing of the air distribution system will be provided. All operating levers will be readily accessible and be of extended type so as to not be in contact with insulation. Where dampers are inaccessible for adjustment, ceiling flush mounted concealed damper regulators with rod extension to damper, and die cast gears, as manufactured by Ventlock and Young Regulator, or equal will be provided. Dampers will be Ruskin, Johnson, or equal.

» Seismic Restraints: Piping, ductwork, and equipment will be provided with adequate restraints conforming to the Oregon Structural Specialty Code.

» Testing, Adjusting, and Balancing:
  - An independent testing and balancing contractor will be required (contracted by the University), NEBB or AABC certified to balance all air and water systems and heating and cooling equipment to the required quantities; and to verify the capacity and operating conditions of each piece of equipment.
  - They will submit detailed test procedures, forms, etc. for approval prior to beginning the work.
  - After balancing is complete and all airflows have been balanced to within +/- 5 percent of design airflow, the contractor shall submit three complete balance reports.

HVAC Controls

The system shall consist of series of direct digital controllers interconnected by a local area network. BMS system must offer trending, scheduling, downloading memory to field devices, real-time "live" graphic programs, parameter changes of properties, set point adjustments, alarm/event information, confirmation of operators, and execution of global commands. Fire alarm systems, security systems and elevator systems shall not be controlled by the BMS. The system will be connected to the campus Siemens BMS.

Heating and cooling in each zone shall be controlled by a temperature sensor located in that zone. Radiant heating zones will be controlled by slab temperature sensors.

Occupancy sensors will signal BMS when a zone becomes unoccupied and set back temperature control setpoints. These will also be used to activate HVAC systems after hours during periods of cleaning to improve air quality during occupied hours. Systems will operate at reduced airflows during this time.

Air Systems: Systems supplying heated or cooled air to multiple zones include controls that automatically reset supply air temperature required by building loads or by outdoor air temperature.

Hydronic Systems: Systems supplying heated water to comfort conditioning systems include controls that automatically reset supply water temperatures required by temperature changes responding to changes in outdoor air temperature.

Energy Management and Conservation: HVAC control algorithms include optimized start/stop for air-handling units and all associated equipment. Lighting control shall be accomplished by use of separate control equipment. Optimal start/stop calculates the earliest time systems can be shut down prior to the end of occupancy hours and the latest time systems can start up in the morning with the aim of minimizing equipment run time without letting space conditions drift too far outside of the comfort setpoints.

Maintenance Scheduling: The BMS includes programs for control that switch pumps from operating equipment to stand-by on a scheduled basis.

System Design Considerations: System ability includes logs of data created by user selectable features. The system provides for stand-alone operation of subordinate components. The primary operator workstation shall have a graphical user interface. Standalone control panels and terminal unit controllers can have text-based user interface panels which are handheld or fixed. Ethernet data connections will be provided at all indoor air handler locations from the private network.

Existing HVAC Systems

Existing steam and condensate piping, heat exchangers, and air handlers are to remain active. Piping that is being demolished will be removed back to finished surfaces.

Plumbing

Sustainable Strategies

The project will be designed to achieve Leadership in Energy and Environmental Design (LEED) certification with a goal of attaining enough credits for LEED Gold.

- » Low flow plumbing fixtures.
- » Solar thermal systems for heating pool water or radiant floor heating.
- » Use of rainwater collected in existing pool for flushing water closets and urinals with heat exchanger.

Scope of Work

Work Included:

- » Sanitary waste and vent system.
- » Domestic cold water system.
- » Domestic hot water system.
- » Plumbing fixtures and equipment.
- » Seismic bracing of piping and equipment.

Systems shall be designed in accordance with most recent adopted edition of the following codes:

- » Oregon Electrical Specialty Code.
- » Oregon Mechanical Specialty Code.
- » Oregon Plumbing Specialty Code.
- » Oregon Structural Specialty Code.

The following reference standards shall be used for the design:

- » ANSI: American National Standards Institute.
- » ASME: American Society of Mechanical Engineers.
- » ASSE: American Society of Sanitary Engineering.
- » ASTM: American Society for Testing and Materials.
- » AWS: American Welding Society.
- » AWWA: American Water Work Association.
- » CISPI: Cast Iron Soil Pipe Institute.
- » CS: Commercial Standards.
- » EPA: Environmental Protection Agency.
- » NEMA: National Electrical Manufacturer's Association.
- » NFPA: National Fire Protection Association.
- » NSF: National Sanitation Foundation.
- » PDI: Plumbing and Drainage Institute.
- » UL: Underwriters' Laboratory.
- » University of Oregon Campus Construction Standards, May 2011.

Plumbing systems

Sanitary Waste and Vent System

The domestic waste system will convey waste from the new plumbing fixtures by gravity through soil, waste, and vent piping connected to the building waste line.

Floor drains and floor sinks will be provided with automatic trap primers. Access panels shall be provided for the trap primers. Access panels shall be consistent with the architectural specifications.

Piping provided for both waste and vents shall be no-hub cast iron, service weight. Standard-duty couplings will be provided above grade.

Trap insulation shall be provided at ADA accessible sinks and lavatories. Installation shall be in a neat, workmanlike manner, and shall be approved by the Owner.

Domestic Cold Water System

The domestic cold water system will be distributed through branch piping connected to the new building mains. Each branch pipe shall be provided with a branch shut-off valve (ball valve).

System will be designed to maintain a maximum velocity of 6 fps at design flow conditions. Backflow protection will be provided to protect the water supply, as well as isolate potential areas for contamination within the building.

Piping will be designed so that no fixture has a pressure lower than 35 psi or higher than 75 psi. Booster pump systems are not anticipated.

System will be designed to prevent water hammer conditions by providing shock arrestors for fixtures and quick closing valves. Shock arrestors shall be maintained accessible.

Piping services above grade shall be Type L, hard-drawn copper, 125 psi maximum service pressure, 250 degrees F maximum service temperature. The piping will be provided with fiberglass insulation and molded fitting covers.

Domestic Hot Water System

Hot water will be provided via steam to hot water heat exchanger. Steam will be provided from the campus system. The hot water will be circulated within the system and distributed to all fixtures at 120 degrees F. The recirculation pump will be connected to the BMS for scheduling. A return water sensor will cycle the pump during occupied hours. Point-of-use mechanical mixing valves will be provided to reduce the temperature to a maximum of 110 degrees F at sinks and lavatories.

System will be designed to maintain a maximum velocity of 5 fps at design flow conditions. The hot water circulation piping will be designed to maintain a maximum velocity of 4 fps at design flow conditions.

Piping service shall be Type L, hard-drawn copper pipe, 125 psi maximum service pressure, 250 degrees F maximum service temperature. The piping will be provided with fiberglass insulation and molded fitting covers.

Plumbing Fixtures and Equipment

New, water-conserving plumbing fixtures, equipment, rough-in, and trim will be provided. Wall-mounted fixtures will be provided.

Water closets will be provided with dual-flush flushometer valves with 1.6/1.1 gpf rating. The urinals provided will be rated for 0.125 gpf. The lavatories will be rated at 0.5 gpm. Other sinks will be rated at 1.5 gpm. Shock arrestors will be provided as required by code in readily accessible areas.

Seismic Bracing

Waste, water, gas, storm drain services, and equipment located within the building will be provided with seismic bracing designed specific to the site conditions, location, and building construction. Seismic compensation will be provided for new and existing piping crossing seismic joints.

Rainwater Harvesting / Storage

New roof area will be used for collection to be stored in the existing pool tank. Water will be used for flushing water closets and urinals. The existing surge tank may be reused to treat this water prior to being distributed to plumbing fixtures. An automatic switchover to the potable domestic water system will occur if the rainwater storage tank is inadequate to handle demand. The potable system will be protected by a double-check backflow preventer.

Natatorium

Drainage piping for the natatorium will be provided in polyvinyl chloride (PVC) piping. Storm drain piping exposed to the natatorium environment will also be PVC. Stainless steel hangers and attachments will be used for piping within the natatorium.

Electrical

Design Criteria

Codes and Standards

» Oregon Electrical Specialty Code.
» Oregon Structural Specialty Code.
» ANSI: American National Standards Institute.
» Energy Policy Act (EPACT).
» Energy Star.
» EPA: Environmental Protection Agency.
» NEMA: National Electrical Manufacturer's Association.
» NFPA: National Fire Protection Association (most recent adopted edition).
» Oregon Energy Code.
» UL: Underwriters' Laboratories.
» University of Oregon Campus Construction Standards.

Electrical Systems

Sustainable Strategies

The project will be designed to meet Leadership in Energy and Environmental Design (LEED) Gold standard LEED certification.

The design will incorporate high-efficiency lighting, automated daylighting controls, enhanced energy monitoring and interactive kiosk.

Demolition

All items slated for demolition must be removed complete; no item will be allowed to be abandoned in place.

Power Distribution

The existing service consists of a padmounted 150kVA dry type transformer installed on the south side of the building, this vault and transformer will be removed and replaced. The transformer feeds an existing 800 amp 120/208V service is located in the basement next to the pool equipment room. A primary feeder routed in the west side of the existing tunnel exits the building below grade to the south to feed the 150kVA transformer. Existing secondary conductors travel below grade north/south from the transformer to the 800 amp service. The existing service will remain operational during construction to be demolished when the new service becomes operational. The transformer and below grade feeders will need to be demolished to accommodate the new structural work for the expansion. A temporary 150kVA transformer will need be installed on the eastside of the project with temporary feeders to backfeed the existing Student Recreation Center service.

An existing 600A, 277/480V exterior service is located at the bottom of an exterior stair landing in the southeast corner leading to the recreational soccer fields. This serves existing panels 'F', 'T' and 'T1' which serve field lighting, there is also 400 amp switch for special events. This service will be maintained until a temporary service for the field lighting can be installed. The new service in the expansion will backfeed the field lighting and a new 400 amp switch for special events will be installed on the eastside of the building.

A new oil filled 750kVA, 12.47kV/480V transformer for the normal power distribution will be installed in a new electrical vault on the southeast corner of the new building directly connected to a new electrical room in that location. The primary feeder will be extended from the tunnel. A second oil filled 150kVA, 12.47kV/480V transformer for the standby power distribution will be installed in the same location (see Emergency Systems narrative below).

A new 1200 amp, 277/480V, 3 phase service will be installed in the new Electrical Room in the southeast corner. A 300kVA, 120/208V dry-type transformer will be installed to backfeed the existing 800 amp 120/208V service in the existing building. Advanced electronic metering will be installed to monitor building energy performance as compared to energy design targets. Each breaker in the main distribution panel will be electronically monitored and will report to the Campus monitoring system. Branch panel loads will be separated between lighting, receptacle and HVAC loads for monitoring purposes. The existing loads in Esslinger Hall and the Student Recreation Center will have loads separated in branch panels to allow for separate metering.

All switchboards and panelboards will have copper buses. Provide separate panelboards for all receptacle, HVAC and lighting loads equipped with sub-metering at the main breaker for Campus load monitoring.

Electrical connections to new HVAC units will be provided as required by mechanical design. Duplex receptacles will be replaced in walls where renovations occur. New receptacles will be provided as required by floor and furniture plans; dedicated neutrals will be provided for every circuit. Provide additional duplex receptacles as follows:

- Provide a duplex receptacle on every wall of each office.
- Provide duplex receptacle 12 feet on center in public areas such as lobbies, lounges, exercise, main street and Healthy Oregon.
- Provide a duplex receptacle at each piece of fitness equipment, install receptacle in floor or adjacent wall. Assume a receptacle will be installed 6 feet on center in Fitness areas. Provide provision for data outlet at each location.
- Provide duplex receptacle for digital signage, assume one location for each public gathering space
- Provide duplex receptacle for an interactive Kiosk showing the building energy use may be installed in the lobby area.
- Provide duplex receptacles 30 feet on center in weights, wet classroom, multipurpose, Mind Body Yoga, storage spaces, locker rooms, corridors and similar spaces.

Emergency Systems

An 80kW generator is located next to the transformer on the south side of the building which serves an existing 400 amp emergency distribution. This generator is to remain operational during construction to be demolished when the new standby service becomes operational.

A new 150kVA oil filled utility transformer for standby distribution will be installed in a new vault located on the southwest corner, primary power will be supplied from the existing campus emergency 12.47kV distribution. A 600 amp emergency distribution board will serve (2) automatic transfer switches (ATS's) located in the new electrical room. The ATS's will serve life safety and standby distribution panelboards. Emergency egress lighting will be provided by fixtures identified as emergency on the drawings. Emergency lighting will be provided to meet IBC illumination requirements of 1.0 footcandle average maintained throughout exit pathway.

Standby power is anticipated to serve, HVAC DDC controls, HVAC systems for IDF room, telecommunication active equipment and Owner provided rack mounted UPS's for IT servers.

Lighting

Provide lighting fixtures as specified by RDG. Lutron H-series ballasts are required for all dimming applications. Provide circuiting to all fixture locations. Intercept circuiting affected by remodel in existing areas to remain and re-terminate on new panelboards. Remove existing Hi-mast sports field lighting on the east sports field to accommodate new building footprint and construction staging and access. Install new Hi-mast sports field lighting coordinated with new pathways and field revisions.

Lighting Controls

Public areas such as lobbies and workout areas will have ceiling-mount, combination-type infrared/ultrasonic-type occupancy sensors intertied into a programmable lighting controlled. Gyms will be controlled from occupancy sensors only with night light. Provide daylight controls (within 15 feet of the exterior perimeter window walls) via photocell daylight sensors connected to fluorescent electronic dimmable ballasts in all areas with sufficient daylight. Public corridors, install occupancy sensors designed for hallways will be intertied into a building wide programmable lighting controller. In stairwells and restrooms, install ultrasonic-type occupancy sensors. Lutron Grafik Eye 3000 series control in all classrooms and conference rooms.

Natatorium will be controlled via a programmable lighting controller with daylight dimming (or switched if HID or Induction lamp is used) photocell to automatically dim the fixtures when sufficient daylight is present.

Exterior lighting will be controlled via a programmable lighting controller. Extend existing controls to the sports field lighting on the east field that is to be installed to replace the field lighting that is demolished for construction. Re-install and extend existing controls to new fixtures.

Provide switching in each of the following rooms:

» Occupancy sensor in janitor rooms.
» Wall switch in electrical rooms.
» Occupancy sensors in open office areas.
» Switched occupancy sensors in private office areas.
» Occupancy sensors in all storage rooms.
» Dimmable controls in all conference rooms.

Renewable Energy

Solar thermal water heating is the preferred method to meet the Oregon Renewable Energy Act 1.5% budget expenditure requirements; however a photovoltaic array may also be required to make up a cost deficit to reach the 1.5% target. The size of this array is undetermined at this stage of the design.

Technology

Voice, Data, and CATV Horizontal Cabling Infrastructure

This facility will be cabled with 4-pair unshielded twisted pair (UTP) Category 5e voice and data network cabling. The design will be based on University of Oregon approved manufacturers and will require that the successful bidder submit at least a 20-year, end-to-end solution warranty for the completed installation of these products.

Each telecommunications outlet (TO) will consist of four 8-pin connector modules. Each outlet will be capable of delivering voice or data as selected by the Owner. Each TO will also be capable of accepting an RG-6 outlet. These TO locations will be coordinated with the Owner to ensure exact placement as needed.

Voice, Data, and Video Backbone Infrastructure

A new fiber and copper entrance will be extended via the existing tunnel system to a new MDF room located in the lower level of the addition. The existing fiber and copper service entrances in room 87B will be used for redundant backup. This will allow room 87B to be demolished in a future Esslinger Hall remodel. Three (3) four inch conduits will be routed from the new MDF room to the existing room 87B which will now become and IDF with a fiber and copper backbone.

Copper Backbone

A new IDF closet will be installed in upper level of the expansion. The voice backbone will consist of 100 ohm Category 3, 24 awg, multipair copper cable. These multipair cables originate from the MDF. Pair count will be determined at a later time when the final horizontal cabling counts are agreed upon. All voice risers will terminate on wall mounted 110 blocks with overlays to rj-11 patch panels in the equipment racks.

The data backbone will consist of the following: Twenty four (24), Cat6 Augmented cables terminated in the equipment racks in the MDF and upper floor IDF.

A fiber optic cable consisting of 12 single-mode and 12 multi-mode fibers will be installed from the MDF to the IDF and terminated in fiber distribution cabinets. The single-mode terminations shall be fusion spliced to factory pre-connectorized modules utilizing SCUPC connectors. The multi-mode terminations shall be hand polished utilizing either anaerobic or hot-melt ST connectors and mounted in ST panels in the fiber distribution cabinets.

Racks and Rack Wire Management

Rack will be provided to meet Campus Design Standards and the needs of the facility, quantity of racks to be determined by the final horizontal cable count.

Access Control and Intrusion Detection

The access control system will consist of door monitoring, electric latches and card readers on doors reusing the existing system and expanding to new secure doors where necessary.

CCTV Surveillance System

The CCTV Surveillance System will consist of pan, tilt, zoom and fixed cameras in Owner designated public areas to be determined. This will include indoor and outdoor areas to monitor reception desk and front entrance. Digital data storage will be provided. The CCTV System will be integrated with the Access Control System.

CATV System

The CATV System will consist of a combination of 0.5 inch hardline and RG-11 coaxial distribution cables installed within the existing tunnel system to a CATV service entrance in the MDF. Horizontal RG-6 Quadshield cable will be used from the taps to the outlets.

Each TO described above will be capable of accepting a CATV insert and cable. The CATV insert with be modular and designed to be used in the modular faceplate. The CATV outlet will utilize RG-6 Quadshield coaxial cable. Provide amplifiers and splitters as required to maintain video signal integrity at each TO.

Wireless Access

Provide full wireless coverage for all public areas. Provide wireless access point with telecommunications outlet (TO) with two 8-pin connector modules and wireless transmitter conforming to IEEE 802.11n standards.

Digital Signage

Owner designated public areas to be determined will have connections for future digital signage. A telecommunications outlet (TO) with four 8-pin connector modules and CATV outlet will be required at each location. Assume every public gathering area will have one screen. The University will provide digital integration with Department of Public Safety and campus network.

Distributed Antenna Network

Size pathway to accept future distributed Antenna Network.

lighting narrative

University of Oregon **Student Recreation Center**

The University of Oregon Student Recreation Center project, an expansive renovation and addition to the existing facilities to adapt a modern, energetic design, strives to capture the attention of students and make the accessibility to wellness and life style changes available to the entire university campus community. Lighting will be creatively used to accentuate the architectural design and enhance the overall experience within the Recreation Center facilities.

Some of the lighting issues considered when developing the lighting design:

- Light levels will be designed to meet the recommended guidelines for all occupants as stated in the new, 10th Edition of the IESNA Handbook. Light levels shall also comply with local codes and ordinances.
- The luminaire style shall correspond with the architectural design and finishes.
- Indirect lighting will be used in many spaces to enhance the volume of the spaces and eliminate potential glare issues.
- Luminaires shall be energy efficient and easily maintained/relamped.
- Light sources shall have a long lamp life and good color rendition.
    - LED or fluorescent lamping sources, unless otherwise noted below
    - Minimize lamp types
- Daylighting will be used in many spaces throughout the facility based upon ongoing work by the ESBL.
- Daylight and occupancy sensors will be used whenever possible to assist with sustainable design.
- Attention to the design of the dimming system and luminaire zone groupings will allow for flexible lighting levels appropriate to the corresponding activities held in the area.
- Dimmable luminaires shall have Lutron H–Series or Hi–Lume ballasts and shall be compatible with the Lutron Grafik Eye system, as specified by the Electrical Engineer.
- The architectural program statement fully defines the lighting solution for each program space, while the following narrative describes the overall common objectives:

<u>**Gymnasium**</u>

Provide indirect/direct luminaires to achieve a minimum light level of 50 FC at the floor. Light source may include fluorescent, LED, or HID lamping. Areas shall be controlled through a Building Automation System / Dimmable or Multi–Switched / Manual Override. Additional Daylight Sensor may be used in areas with sufficient daylighting contribution to conserve energy. Floor finish, aiming angles, and damage resistant luminaire construction shall also be addressed in the design.

<u>**Fitness / Cardio / Weight Rooms**</u>

Provide indirect/direct luminaires to achieve a minimum light level of 30 FC at the floor. Areas shall be controlled through a Manual Switch / Occupancy Sensor. Additional Daylight Sensor may be used in areas with sufficient daylighting contribution to conserve energy. Additional task lighting as desired. Direct lighting will be avoided in free weight areas, where users are prone to exercise while looking up into light fixtures.

Natatorium (Pool)

Provide indirect or remote source luminaires to achieve a minimum light level of 50 FC at the floor level. Light source may include fluorescent, LED, or HID lamping. Areas shall be controlled through a Building Automation System / Time Clock / Photocell. Additional Daylight Sensor may be used in areas with sufficient daylighting contribution to conserve energy. Aiming angles (particularly with relation to glare on the water surface) / pool basin / underwater lighting shall also be addressed in the design. Luminaires shall be UL rated for natatorium installations, with no luminaire sources located directly above the pool water.

Multi–Purpose / Group Ex Rooms

Provide direct / indirect / cove luminaires to achieve a minimum light level of 30 FC at the floor. Areas shall be controlled through a Building Automation System / Occupancy Sensor / multi–switched. Additional Daylight Sensor may be used in areas with sufficient daylighting contribution to conserve energy. Additional considerations shall be floor finish / aiming angles / use of mirrors on the walls / and damage resistant design related to the activities to be held in the space. Color changing RGB luminaires may also be considered to enhance the design and participants' experience.

Lockers / Restrooms

Provide direct / lensed / cove luminaires to achieve a minimum light level of 10 FC at the floor. Areas shall be controlled through a Building Automation System / Occupancy Sensor. Luminaires located in wet and / or humid environments shall be sealed and UL rated for wet–location installation.

Circulation / Lobby Areas

Provide direct decorative luminaires and indirect ambient luminaires to achieve a minimum light level of 10 FC at the floor. Additional task lighting at the control desk shall also be used to achieve 30 FC at 2'–6" a.f.f. Areas shall be controlled through a Building Automation System / Preset Dimming System / Occupancy Sensor / Manual Override as appropriate to the space. Additional Daylight Sensor may be used in areas with sufficient daylighting contribution to conserve energy. Color changing RGB luminaires may also be considered to enhance the design and participants' experience.

Back of House (BOH) – Administration, offices, marketing, duplication, mail room, and technology / server room areas, etc.

Provide indirect/direct recessed luminaires to achieve a minimum light level of 30 FC at 2'–6" a.f.f. Additional task lighting as desired. BOH areas shall be controlled through a Building Automation System / Occupancy Sensor / Dual–Level Switching as appropriate to the space. Additional Daylight Sensor may be used in areas with sufficient daylighting contribution to conserve energy.

Exterior

Provide direct luminaires to achieve a minimum light level of 1FC at the ground at night to illuminate the pathway. In–grade fixtures to highlight the building façade. Building mounted lights will only be considered with the Owner's approval. Light sources may include fluorescent, LED, or HID lamping. Areas will be controlled through a Building Automation System / Photocell.

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24 February 2012

Robertson Sherwood Architects
132 E Broadway, Suite 540
Eugene OR 97401
Att: Dave Guadagni, Carl Sherwood

RE: UO Student Recreation Center
SD Fire Protection Systems Narrative
Interface With Existing Bldg/Systems - Esslinger

Fire Sprinklers Overview:

Project scope is for wet type life safety fire sprinkler system(s) throughout.

The existing UG fire service serving Esslinger will remain in service. The FIRE WALL separating Esslinger from the balance of the existing recreation center building will serve as a sprinkler system boundary until AS - BUILT research deems another choice.

A new UG fire service will be brought into the new construction. Two locations are being considered 0 one at the NE corner of the existing SRC and one location at the south end of the project – entering the pool mechanical room. The NE option is a stronger supply point.

New area sprinklers will be zoned per floor with the likelihood of 2 zones for the two upper floor levels (north and south zones).

Existing sprinklers in Esslinger will be modified (relocated) where demolition or renovation occurs. New sprinklers will be quick response. *Interface boundaries* with existing standard response sprinklers will be established.

Sprinkler Design Criteria will include areas requiring Light though Ordinary Hazard protection densities.

The project does not include insurance design criteria.

System to comply with university standards for fire risk objectives which includes specific elements to reduce long term inspection and maintenance costs.

Recent changes on the state level has added new requirements for fire sprinklers due to SEISMIC zone "D" status. Coordination with ceilings and ceiling bracing concept is required. Fire sprinkler systems to comply with Zone "D" seismic requirements which include flexible pipe for certain ceilings or expansion (slip) rings around sprinklers.

New fire department pumper connection to be located per discussions with the Eugene Fire Department fire plan analyst.

Fire sprinklers will include 7 types+/- throughout the installation:

1. Recessed Quick Response Pendents.
2. Recessed Quick Response Sidewalls.
3. Quick Response Uprights.
4. Concealor Quick Response Pendents.
5. Recessed Quick Response Extended Coverage Pendents.
6. Recessed or Flush Quick Response Extended Coverage Sidewalls.
7. Quick Response Extended Coverage Uprights.

Extended Coverage sprinklers will be utilized where pressures and conditions permit.

Design at this point is considering only steel pipe.

A special note of concern is "floating acoustical or decorative ceilings". These require multiple levels of sprinklers and high flow rate hydraulic calculations.

We anticipate that the water supply is adequate for fire sprinkler systems without the need for a fire pump.

Sprinkler piping to be concealed above ceilings where ceilings occur. Exposed structure areas to have exposed painted pipe located as aesthetically feasible.

The east side fitness center is cantilevered. The space below is primarily a circulation path and cantilever construction is non combustible – sprinklers will not be provided underneath the structure due to non combustible construction – non combustible occupancy.

Activities areas where sprinklers could receive impact will require sprinkler head guards. Sprinklers over the pool will require chlorine protection (wax coating).

Standpipe Systems Overview:

The building does not have a standpipe requirement per OSSC Section 905.

Fire Alarm System Overview:

A new fire alarm system will be orchestrated that meets code and the university protection philosophy and standards.

The new fire alarm control panel (FACP) will be located at the north entry. The new FACP will be provided to serve new areas and selected existing areas.

This facility will have an occupant load exceeding 1,000. Per OSSC 907.2.1.1 this facility requires an emergency voice/alarm communication fire alarm system - a very different system in terms of number of devices (typically 2X - 4X times the number of devices needed in a standard horn notification system) than standard fire alarm systems. Occupant notification will utilize speakers and combo speaker-strobes.

Current design concept is to use same type/style fire alarm devices for remodel areas west of the FIRE WALL.

New construction and renovation work will interrupt existing building fire systems therefore requiring temporary or interim equipment in the project or fire watch services.

The new system to serve new and existing areas east of the FIRE WALL.

Acoustics in this building will require special attention due to large volumes and high ceilings. Some areas may have high ambient noise levels to overcome or high echo factors.

ADA compliance is required for applicable devices.

The fire alarm control panel will supervise fire alarm, sprinkler and smoke control activation devices along with required smoke detection for door release service, elevator equipment, HVAC and Fire Smoke Dampers (FSD's). Shafts will require FSD's.

Redundant equipment is to be avoided if possible. Placement of long term equipment needs consideration for maintenance issues - high ceiling spaces are maintenance problems due to frequent testing/inspection requirements. Device selection must consider device effective lives (many fire alarm devices have 15 year or less effective lives).

As designed, 3 levels open to each other make this building an atrium requiring engineered smoke control.

Options are being reviewed to provide automatic closing horizontal fire shutters to close off the lowest level from the main level therefore changing this structure to a "2 levels open to each other" building. Per the OSSC Section 402.10 Exception 1 this deletes the requirement for Section 909 engineered smoke control.

It is beyond the fire alarm scope to estimate the requirements of an engineered smoke control system (OSSC Section 909). Engineered smoke control systems are mechanical smoke exhaust systems which operate from a Fire Fighters Smoke Control Panel (not the fire alarm control panel). The extent of smoke detection (beam detectors, spot detectors) needed for an engineered smoke control system is an unknown until an engineered smoke control system is designed. Fire modeling is typically required for engineered smoke control systems. (OSSC 909). Fire Fighters Smoke Control Panels are called FFSCP's in the code.

Engineered smoke control systems are independent of fire alarm systems. Engineered smoke control systems are not fire alarm systems.

Mass notification is not a required system and is not proposed.

Esslinger Interface/Integration/Modifications. Mac Court Interface:

It is the intent of this project to limit sprinkler and alarm work to "project scope" areas and fringe rooms around the remodel areas. Wholesale modifications in Esslinger are not planned.

No work is proposed in Mac Court.

Specialty 'Non Water" Protection Systems:

Specialty water failsafe suppression (pre action) or gaseous suppression systems for high value/water vulnerable spaces are not proposed.

CEI

Pool Systems Narrative

A. Design Criteria:

Competition / Lap Pool

• Pool Water Surface Area-	Approximately 6,852 SF
• Pool Perimeter-	345 linear feet
• Pool Depths-	0'-0" to 6'-7"
• Desired Water Temperature-	80-82 degrees

Recreation / Leisure / Diving Pool

• Pool Water Surface Area-	Approximately 4,963 SF
• Pool Perimeter-	309 linear feet
• Pool Depths-	0'-0" to 12'-6"
• Desired Water Temperature-	84-86 degrees

North Hydrotherapy Spa / Social Pool

• Pool Water Surface Area-	Approximately 240 SF
• Pool Perimeter-	60 linear feet
• Pool Depths-	3'-6"
• Desired Water Temperature-	102-104 degrees

South Hydrotherapy Spa / Social Pool

• Pool Water Surface Area-	Approximately 208 SF
• Pool Perimeter-	58 linear feet
• Pool Depths-	3'-6"
• Desired Water Temperature-	102-104 degrees

B. Water Collection and Circulation:

Both larger pools will feature rim flow, deck level gutter water surface collection which facilitate lounging at the edge of the pool as well as provide ingress and egress for those who do not choose the ladders, stairs, or zero depth areas. Both smaller pools will feature skimmer water surface collection. There will be dual non-entrapment VGB approved main drains in all four bodies of water. Surge chambers will be required for both of the larger pools.

C. Pool Deck Equipment:

Pool deck equipment shall be installed in strict accordance with pertinent codes and regulations and the manufacturer's published recommendations, anchoring firmly and securely for long life under hard use. Contractor shall furnish and install the following deck equipment: handrails at entry ramps; grab rails at in the lap swim area of the pools; two (2) self-directed, hydraulically-powered disabled access lifts. All rail goods shall be manufactured from 316 stainless steel tubing, 1.50" outside diameter, 0.145 wall thickness, with clear powder coat finish. The pool shall also have underwater lights, and rope anchors for swimming lanes. Required competitive equipment shall include ten (10) starting blocks with associated deck anchors, two fixed cage water polo goals, and two floating cage water polo goals. Two (2) one-meter diving boards will be installed in the dive tank portion of the leisure pool. Required recreation equipment shall include two (2) water basketball goals with deck anchors and two (2) water volleyball nets with associated deck anchors.

D. **Water Treatment (Each Body of Water Shall Have a Separate System):**

Permanent media hi-rate silica sand filters have been requested by maintenance staff as the preferred media for the filtering of foreign substances (dirt, debris, etc.) from the pool water. The approximate filtration system flow rate shall be 15 GPM per square foot of filter area.

Filtration system shall be furnished complete with influent piping manifold, effluent piping manifold, and all necessary valves and fittings as required for normal filter operations. Influent and effluent pressure gauges shall also be provided as part of a fully integrated system.

The Chemical treatment system shall utilize calcium hypochlorite (tablet chlorine) as the primary oxidant. The oxidant feed system shall be capable of providing a constant in-pool chlorine residual of 1 - 15 PPM. The pH shall be controlled through the utilization of muriatic acid. Both chemical feed systems shall be automatically controlled by a single chemical controller with the capacity of monitoring and continually adjusting ORP, PPM, and pH. At the request of maintenance staff to simplify processes between their pools, Pulsar and a Stantrol chemical controller will be used. LMI or approved equal shall be used for muriatic acid feed.

U/V (Ultra Violet sterilization) will also be used. The addition of a UV system will further reduce the risk of pathogens in the water as well as help control chloramines, which can irritate eyes, skin, and throats.

E. **Pool Mechanical:**

Pool mechanical piping shall consist of Schedule 40 PVC for all below grade piping and Schedule 80 PVC for all above grade piping. Piping shall be sized for velocities not to exceed 6 feet per second for suction piping and 8 feet per second for discharge (return) piping. All underground piping shall have a minimum of 18" of earth cover. Provisions shall be made for automated filling of the pool to compensate for water loss due to splash-out and evaporation.

F. <u>Pool heating analysis</u>:

For this project assuming that pool covers will be used every day. As a way of further reducing energy costs and dependence on fossil fuels thermal solar heating will be used to heat the pool. While thermal solar heating will not be sufficient to heat the pool year round without relying on another means of pool heating, it, along with the use of pool blankets, will result in a significant reduction in energy use and associated costs. The option of utilizing a heat recovery system integrated into the dehumidification system is also being explored.

The primary means of heating the pools shall be natural gas fired vertical, modulating condensing commercial pool heaters. These heaters are selected due to their ability to achieve up to 99% efficiency. The option of utilizing the existing campus steam loop in conjunction with heat exchangers is also being considered

END SECTION

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