2010

Jensen
Yorba
Lott
Inc

UAS SITKA CAMPUS CONDITION SURVEY

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EXECUTIVE SUMMARY

This report presents the findings of a conditions survey conducted at the campus of the University of Alaska Southeast Sitka Campus. The purpose of the conditions survey is to identify major maintenance, code, program, obsolescence and other deficiencies that we found on the campus, including buildings, site features, and utilities. The conditions survey team includes:

Tony Yorba, Architect and Team Leader, Jensen Yorba Lott, Inc.,

Chris Mertl, Landscape Architect, Corvus Design, LLC.

Chris Gianotti, Civil and Structural Engineer, PND, Inc.

Doug Murray, Mechanical Engineer, Murray and Associates

Ben Haight, Electrical Engineer, Haight and Associates

The team members reviewed the history of the building, referenced construction drawings from previous projects where available, observed existing conditions of the site and facilities, and met with UAS Sitka staff to obtain anecdotal and other oral comments on the operation and functionality of the facilities. The suite of 2006 International Codes were consulted and inconsistencies or violations were noted.

The report includes individual sections by each of the primary disciplines: Architecture, Landscape Architecture, Structural, Civil, Mechanical and Electrical Engineering. Where deficiencies were found due to life cycle, maintenance or obsolescence requiring renewal or replacement we recommend options and costs for corrective work.

It is important to note that existing conditions inconsistent with current codes do not necessarily need to be modified. If an existing condition was compliant with code at the time it was originally constructed, with few exceptions it need not be modified unless a change in occupancy occurs or if the building is altered significantly. Therefore, if a condition was code compliant at the time it was installed, we temper our comments to reflect deficiencies that are of immediate concern to the university- either civil liabilities (such as ADAG issues), life safety or operational deficiencies that pose a risk to facility or occupants, or conditions that arise due to renovation or reconfiguration.

The report includes an appendix that contains overall floor plans of the building, an energy audit prepared by Alaska Energy Engineering, LLC, and a building code analysis based on the 2006 IBC. Where appropriate, the recommendations from the appendix items are included in the report.

The team prepared a summary spread sheet of the deficiencies and costs for corrective work. The deficiencies are presented in order of the following priority:

High: work items that should be corrected as soon as practicable owing to either potential liability or operational cost savings.

Medium: Work items that could potentially provide operational/maintenance cost savings or improvements in program/appearance of the building that further the mission of the University and improve its marketability.

Low: Optional improvements to physical plant that could be made if funds permit.

The costs for corrective work items are shown several ways. First, the costs for all individual items are shown in current dollars escalated to 2011. For the purpose of planning, the costs of high priority items are assumed to be grouped as a potential project and illustrated as near term projects for a 2011 project. Medium priority projects are grouped as mid term projects and escalated out to 2014. Low priority work items are shown as future projects and escalated to 2019. This was done to illustrate a possible funding request scenario.

The following is the summary spread sheet of deficiencies and corrective work.

UAS SITKA CAMPUS
Conditions Survey
Corrective Work and Budgets

Note: all prices include labor and material, general conditions and mark-ups

Element	Item	Quantity	Unit	Unit Cost	Subtotal to 2011	Escalation to 2014 16%	Escalation to 2019 35%	High Priority (to 2011)	Medium Priority (to 2014)	Low Priority (to 2019)
ARCHITECTURAL DEFICIENCIES										
	Code Deficiencies									
	1. Provide 2nd exit from Commons 102-extend new corridor link to door 100C5-C	600	sf	$200	$120,000	$139,200	$162,000		$139,200	
	2. Separate carpentry class area and project area w/ full height wall	2,000	sf	$25	$50,000	$58,000	$67,280		$58,000	
	3. Provide dust collection devices		(in mechanical comments)							
	4. Separate mezzanine storage areas from adjacent shop areas	2,500	sf	$25	$62,500	$72,500	$84,100		$72,500	
	5. Reconfigure existing, non compliant stairs. (budget with future renovation)	2	ea	$50,000	$100,000	$116,000	$134,560			$134,560
	6. Reconfigure Art Rooom 109		(in interior comments)							
	Subtotal							**$0**	**$269,700**	**$134,560**
	Roof Deficiencies									
	1. Install self adhering membrane to prevent further boiler exhaust corrosion	2,200	sf	$8	$17,600	$20,416	$23,683	$17,600		
	2. Snow retaining clips at low roofs		(in 2010 improvents)							
	3. Skylite maintenance	1	ls	$5,000	$5,000	$5,800	$6,728	$5,000		
	4. Repair ridge vents	1	ls	$5,000	$5,000	$5,800	$6,728	$5,000		
	5. Repair vent pipes	1	ls	$5,000	$5,000	$5,800	$6,728	$5,000		
	6. Improve roof to wall flashing at low roof, north elevation	240	lf	$50	$12,000	$13,920	$16,147	$12,000		
	7. Repair gutters and downspouts	1	ls	$8,000	$8,000	$9,280	$10,765	$8,000		
	Replace gutters and downspouts	720	lf	$40	$28,800	$33,408	$38,753			$38,753
	Connect downspouts to retention gallery and storm drains		(in civil comments)							
	Subtotal							**$52,600**	**$0**	**$38,753**
	Exterior Wall Deficiencies									
	1. Repaint exisitng metal wall panels	37,000	sf	$6	$222,000	$257,520	$298,723		$257,520	
	2. Fastener replacement, flashing repair and sealant replacement	1	ls	$10,000	$10,000	$11,600	$13,456	$10,000		
	3. Wall base flashing repair	1	ls	$10,000	$10,000	$11,600	$13,456	$10,000		
	4. Window sealant and dry glazing strip repair/replacement	65	ea	$250	$16,250	$18,850	$21,866	$16,250		
	5. Aluminum entrance door corrosion correction and joint repair at sidewalk	1	ls	$5,000	$5,000	$5,800	$6,728	$5,000		
	Replace main aluminum entrance doors (exterior and interior vestibule)	4	ea	$2,000	$8,000	$9,280	$10,765		$9,280	
	6. Repaint two entry canopies	2	ea	$3,000	$6,000	$6,960	$8,074	$6,000		
	7. Repaint all steel doors and frames	3	ea	$500	$1,500			$1,500		
	8. Replace building signage mounting	1	ls	$5,000	$5,000	$5,800	$6,728	$5,000		
	Subtotal							**$53,750**	**$266,800**	**$0**
	Building Interiors									
	1. Replace carpet and base in public corridors and commons	900	sy	$45	$40,500	$46,980	$54,497	$40,500		
	2. Replace carpet and base in program spaces where in replaced recently	600 ls	sy	$45	$27,000	$31,320	$36,331	$27,000		
	3. Replace flooring, skirtboards and re-paint railings, walls @ stair 100S1,100S2	2	ea	$5,000	$10,000	$11,600	$13,456	$10,000		
	4. Repair suspended ceilings where damaged or dirty	1	ls	$10,000	$10,000	$11,600	$13,456	$10,000		
	5. Replace plastic laminate doors and door hardware with wood doors and new door hardware	50	ea	$1,500	$75,000	$87,000	$100,920		$ 87,000	
	6. Paint walls and door frames	40,000	sf	$2	$60,000	$69,600	$80,736	$60,000		
	7. Replace toilet partitions in toilet rooms 100M1, 100W1, 200M1, 200W1	12	ea	$500	$6,000	$6,960	$8,074		$ 6,960	
	8. Replace admissions area casework	20	lf	$500	$10,000	$11,600	$13,456		$ 11,600	
	9. Reconfigure Art/Multi-Purpose 123	2,730	sf	$250	$682,500	$791,700	$918,372		$ 791,700	
	Subtotal							**$147,500**	**$ 897,260**	**$0**
	Total Architectural							**$253,850**	**$1,433,760**	**$173,313**
LANDSCAPE DEFICIENCIES										
	1. Improve ADA stall configuration and demarcation	1	ls	$5,000	$5,000	$5,800	$6,728	$5,000		
	2. Repave accessible route, improve	1	ls	$10,000	$10,000	$11,600	$13,456		$ 11,600	

existing sidwalk ramp									
3. Repair gaps, seal concrete	1 ls		$10,000						
4. Provide tactile warning strips at the bottom of sidewalk ramp	1	ls	$500	$500	$580	$673			
5. Replace damaged concrete in recently constructed canopy	(in warranty work of existing contract)								
6. improve ADA stalls	(in item 1 of landscape comments)								
7. Resurface parking lot	(in civil comments)								
8. Parking lot repair	(in civil comments)								
9. Improve fencing at satellite dish	1	ls	$500	$500	$580	$673	$500		
10. Retaining wall at existing fire hydrant	1	ls	$3,000	$3,000	$3,480	$4,037	$3,000		
11. Secure water vault	1	ls	$250	$250	$290	$336	$250		
12. Provide security fencing at utilities on south side of building	1	ls	$10,000	$10,000	$11,600	$13,456		$ 11,600	
13. Secure gas cylinder area	(in item 12 of landscape comments)								
14. Drainage improvements at north elevation of building	(in civil comments)								
15. Drainage improvements at south elevation of building	(in civil comments)								
16. Secondary drainage improvements	(in civil comments)								
17. Provide drip zone below eaves at canopies	1	ls	$1,000	$1,000	$1,160	$1,346	$1,000		
18. Recondition soil at turf areas	1	ls	$5,000	$5,000	$5,800	$6,728	$5,000		
19. Develope landscape masterplan	1 ls		$5,000						
20. Create improved campus entrance	1	ls	$500,000	$500,000	$580,000	$672,800			$ 672,800
21. Improve driveway	(in item 20 of landscape comments)								
22. Improve pedestrian access on site	(in item 20 of landscape comments)								
Total Landscape Architecture							**$14,750**	**$23,200**	**$672,800**

STRUCTURAL DEFICIENCIES

No Cost Item Identified

CIVIL DEFICIENCIES

1a. Create water retention system at north elevation similar to south elevation	1	ls	$30,000	$30,000	$34,800	$40,368	$30,000		
1b. Create stormwater main drainage system with oil water separator and discharge to salt water	1	ls	$125,000	$125,000	$145,000	$168,200		$145,000	
2. Repair entry walkway	(in architectural comments)								
3. Repair and repave existing tarmac with aspalt overlay	77,000	sf	$3.50	$269,500	$312,620	$362,639		$312,620	
4. upgrade access road	(in landscape comments)								
5. Remove debris from beach area	1	ls	$500	$500	$580	$673	$500		
6. improve pedestrian access	(in landscape comments)								
7. Negotiate public sewer easement	1	ls	$5,000	$5,000	$5,800	$6,728		$5,800	
8. Develop as-built water service plans	1	ls	$8,000	$8,000	$9,280	$10,765		$9,280	
9. Demolish derelict stairs and install security fencing at south side elevation	1	ls	$25,000	$25,000	$29,000	$33,640	$25,000		
Total Civil Deficiencies							**$55,500**	**$472,700**	**$0**

MECHANICAL DEFICIENCIES

Ventilation Deficiencies

1. AHU-1 VAV replacement	1	ls	$80,000	$80,000	$92,800	$107,648	$80,000		
2. Dust collection system	1	ls	$85,000	$85,000	$98,600	$114,376	$85,000		
3. AHU-1 damper improvements	1	ls	$4,000	$4,000	$4,640	$5,382		$4,640	
4. Replace AHU-1	1	ls	$30,000	$30,000	$34,800	$40,368			$40,368
5,6. AHU-2 damper refurbishment	1	ls	$4,000	$4,000	$4,640	$5,382		$4,640	
7. Replace ventilation fan motors	1	ls	$50,000	$50,000	$58,000	$67,280		$58,000	
8. Computer, electrical and mechanical room cooling	1	ls	$45,000	$45,000	$52,200	$60,552		$52,200	
9. Damper impovements	1	ls	$50,000	$50,000	$58,000	$67,280		$58,000	
10. EF-4 Replacement	1	ls	$15,000	$15,000	$17,400	$20,184		$17,400	
11. Art room dust collection system	1	ls	$40,000	$40,000	$46,400	$53,824		$46,400	
12. Exhaust system consolidation	1	ls	$45,000	$45,000	$52,200	$60,552		$52,200	
13. Exhaust fan cleaning (EF-3)	1	ls	$6,000	$6,000	$6,960	$8,074		$6,960	
Subtotal							**$165,000**	**$300,440**	**$40,368**

Heating Deficiencies

1. Reconfigure heating plant circulation	1	ls	$45,000	$45,000	$52,200	$60,552		$52,200	
2. DDC additions/modifications	1	ls	$100,000	$100,000	$116,000	$134,560		$116,000	
Subtotal							**$0**	**$168,200**	**$0**
Plumbing Deficiencies									
1. repair plumbing vent above 1988 CR	1	ls	$400	$400	$464	$538		$464	
2. replace flush valves with auto sensing valves at toilets and urinals	1	ls	$20,000	$20,000	$23,200	$26,912		$23,200	
3. Replace lavatory faucets with low volume types	1	ls	$2,000	$2,000	$2,320	$2,691		$2,320	
4. Replace/refurbish 100lb tanks and piping	1	ls	$3,000	$3,000	$3,480	$4,037			$ 4,037
Subtotal							**$0**	**$25,984**	**$4,037**
Fire Supression System									
1. Flush fire sprinkler piping system	1	ls	$3,000	$3,000	$3,480	$4,037			
2. Replace sprinkler heads 20 yrs of age and older	1	ls	$15,000	$15,000	$17,400	$20,184			
Subtotal							**$0**	**$0**	**$0**
Building Automation Controls									
1. Convert existing pneumatic controls to full DDC.	1	ls	$200,000	$200,000	$232,000	$269,120	$200,000		
2. Reconfigure heating plant circulation using variable speed pumps and DDC	1	ls	$50,000	$50,000	$58,000	$67,280		$58,000	
3. Reconfigure air handling units using variable speed motors and DDC	1	ls	$104,000	$104,000	$120,640	$139,942		$120,640	
Subtotal							**$200,000**	**$178,640**	**$0**
Total Mechanical							**$365,000**	**$673,264**	**$44,405**
ELECTRICAL DEFICIENCIES									
Power Distribution									
1. Replace selected circuit breakers	1	ls	$3,000	$3,000	$3,480	$4,037		$3,480	
2. Ground system improvements	1	ls	$5,000	$5,000	$5,800	$6,728		$5,800	
3. Replace branch circuit breakers	1	ls	$25,000	$25,000	$29,000	$33,640		$29,000	
4. Provide surge supression	1	ls	$20,000	$20,000	$23,200	$26,912		$23,200	
5. Clean electrical equipment	1	ls	$5,000	$5,000	$5,800	$6,728		$5,800	
6. Improve step down transformers	1	ls	$30,000	$30,000	$34,800	$40,368			$40,368
Subtotal							**$0**	**$67,280**	**$40,368**
Branch Circuits									
1. Replace 1989 era devices	1	ls	$15,000	$15,000	$17,400	$20,184			$20,184
2. Replace 1989 era motor controls	1	ls	$15,000	$15,000	$17,400	$20,184			$20,184
Subtotal							**$0**	**$0**	**$40,368**
Lighting									
1. Replace 1989 era luminaires	1	ls	$50,000	$50,000	$58,000	$67,280		$58,000	
2. Replace parabolic troffers	1	ls	$50,000	$50,000	$58,000	$67,280		$58,000	
3. Replace Commons lighting	1	ls	$10,000	$10,000	$11,600	$13,456		$11,600	
4. Replace battery inverter	1	ls	$5,000	$5,000	$5,800	$6,728		$5,800	
5. Replace 1989 era exit signs	1	ls	$2,000	$2,000	$2,320	$2,691			$2,691
6. Replace exit signs with LED lights	1	ls	$2,000	$2,000	$2,320	$2,691			$2,691
7. Provide occupancy sensors in program spaces connected to DDC system	1	ls	$30,000	$30,000	$34,800	$40,368	$30,000		
8. Provide occupancy sensors for public areas connected to light control	1	ls	$10,000	$10,000	$11,600	$13,456	$10,000		
9. Replace luminaires in shop/hangar bay	1	ls	$20,000	$20,000	$23,200	$26,912	$20,000		
10. Upgrade exterior lights and controls	1	ls	$10,000	$10,000	$11,600	$13,456		$11,600	
Subtotal							**$60,000**	**$145,000**	**$5,382**
Network and Communications									
1. Replace 1989 era cable tray system	1	ls	$50,000	$50,000	$58,000	$67,280	$50,000		
2. Provide ground in 1997 era cable tray	1	ls	$5,000	$5,000	$5,800	$6,728		$5,800	
3. Replace 1989 era cables	1	ls	$45,000	$45,000	$52,200	$60,552	$45,000		
4. Upgrade and expand server racks	1	ls	$20,000	$20,000	$23,200	$26,912	$20,000		
5. Upgrade Cables	1	ls	$20,000	$20,000	$23,200	$26,912			
Subtotal							**$115,000**	**$5,800**	**$0**
Fire Alarm									
1. Adjust pull stations	1	ls	$5,000	$5,000	$5,800	$6,728	$5,000		
2. Adjust smoke detectors	1	ls	$5,000	$5,000	$5,800	$6,728	$5,000		
3. Install additional horn strobes	1	ls	$15,000	$15,000	$17,400	$20,184	$15,000		
Subtotal							**$25,000**	**$0**	**$0**
Total Electrical							**$200,000**	**$218,080**	**$86,118**
Total Project Construction Budgets							**Near Term**	**Mid Term**	**Future**
							$889,100	**$2,821,004**	**$976,636**

Existing Building Description


Figure 1

The UAS Sitka Campus is housed in a former amphibious aircraft hangar, one of two similar structures built in WWII (the other currently serves as the Fieldhouse for Mt. Edgecumbe High School) and now a part of the Sitka Naval Air Base National Historic Landmark *(fig 1)*. The original drawings for the Sitka Campus building are no longer available. Partial drawings for the Fieldhouse are available and were used for the structural portions of this report.


Figure 2


Figure 3


Figure 4

The original building, constructed in 1941, has a footprint of 240 ft x 186 feet. The building consisted of a 240 x 160 hangar bay with a clear ceiling height of over 30 feet to the underside of structure (*fig 2*), and an attached two story office bay approximately 26 feet deep along the north side of the building. The original building remained largely unchanged until approximately 1987 when an exterior and interior renovation took place, under drawings prepared by Alaskan architects ECI Hyer. The original wall cladding was either removed or in some areas overlaid with insulated metal wall panels (*fig 3*), a new EPDM membrane roof assembly installed, new windows installed and a canopy entry feature added at the main entry. The two story office bay was expanded into the hangar bay. A two story atrium area capped with an aluminum skylight structure was also added. Between 1994 and 1997 a two story multi phase infill addition was accomplished under drawings prepared by Jensen Douglas Architects, Inc. This project had a footprint of 117 x 55 feet and included a two story academic block topped by a mechanical mezzanine (*fig 4*). In 2006 a welding lab hangar infill addition was accomplished under drawings prepared by architects Jensen Yorba Lott, Inc. The 80 x 75 feet addition consisted of new metal shop space, storage, office and classroom areas, topped by a mezzanine mechanical space. An unfinished portion of this project was completed as a campus maintenance area in a 2008 follow-on project by the same firm. Also completed in 2008-2009 was a renovation of surplus welding space into a multi-purpose technical classroom, a canopy addition and conversion of the last remaining hangar bay door into an overhead sectional door. Other miscellaneous improvements include 2007 construction of a small kiln shed on the west end of the building and replacement of the EPDM roof membrane assembly with site formed metal roofing in 1996. The metal roofing project was notable because it corrected one of the first EPDM roof failures attributable almost exclusively to bird activity. Significant changes to EPDM membrane techniques resulted throughout Southeast Alaska.


Figure 5

Description of the building roof, floor and wall structure is included in the structural section of this report. Roof architectural assembly includes 3” of expanded polystyrene insulation with an insulation value of about R-12. Total thermal value of the roof assembly, including the wood structural decking, is about R-15. Exterior wall assemblies vary. The hangar bay is essentially unfinished, with the wall panels exposed to the hangar interior *(fig 5)*. The wall panels are similar to a Robertson sandwich panel- two steel sheets filled with foamed in place insulation. The panels are assumed to have an overall thermal value of approximately R-20. Portions of the improved classroom areas have additional layers of insulation that increase overall r values. An energy audit further describing thermal performance was prepared by Alaska Energy Engineering and is included in the appendix to this report.


Figure 6

The open hangar bay continues to be one of the key features of the building. While infill projects have converted much of it into conventionally configured space, the open hangar bay allows for a variety of special projects and uses as well as break out space for ongoing programs. It is this combination of high bay and conventional space all within a single building that makes the UAS Sitka campus unique *(fig 6)*. While program evaluation is beyond this report, the building appears to be large enough to serve campus needs for the foreseeable future.

Code Analysis

The life safety code currently adopted in Sitka is the International Building Code, (IBC) 2006 suite of codes. This section deals with architectural related issues- additional mechanical and electrical code issues are described later in this report.


Figure 7

Code and occupancy requirements of the building have changed dramatically over the years and with them requirements for construction. One of the most significant changes in recent years was the alternative high school program included in phase I of the two story classroom addition constructed in 1994. The inclusion of the high school program, as an E occupancy, required a 2 hour fire rated area separation wall between the addition and the rest of the school. This made the classroom addition essentially a separate building. The E occupancy alternative high school program was never actually implemented. However, the separation wall would still be required if an E occupancy is desired in the future. The separation wall should be considered a resource and maintained so that it can be utilized if program needs change in the future.

The present building uses are classified by the IBC as B or S occupancies and may be of unlimited area in its present configuration. In this classification there are fewer restrictions on development of the unfinished hangar bay and none related to size. The primary code deficiencies and methods for addressing them are as follows:

1. Lack of code compliant exits from the first floor commons area: The offices and the art room suite presently exit through Commons 102 area *(fig 7)*. The tributary occupant loads of these spaces are as follows: offices, 2207/100 sf per occupant or 22 occupants; art room, 2692/20 sf per

occupant divided by two exits or 67 occupants; commons, 385/15 sf per occupant or 25 occupants for a total load in Commons 102 of 114 occupants. Two exits are required from Commons 102, and two are provided. However one of the exits discharges directly into the undeveloped hangar area, which is not permitted. (IBC 2006 Table 1015.1) To be compliant, an additional exit must be provided to this area.

Figure 8

Cost: $120,000

2. Exiting from the undeveloped hangar area *(fig 8)*: There are several programs taught in the undeveloped hangar area, including carpentry, small engine repair, construction etc. In addition, welding activities have occasionally taken place in the open hangar area. These areas should be separated by one hour wall, or a combination of sprinklers and smoke barrier wall (IBC 2006 Table 508.2). In addition, exiting is defined only by walkways painted on the floor. The painted exit pathway solution is a temporary agreement with the local building official with the understanding that code compliant exits will be provided as the spaces are developed. The Health Sciences addition includes an exit to the south side of the building and provides a dedicated exit for the existing construction lab area. The dedicated construction lab exit can be extended in the future to provide an additional dedicated exit to the open project area of the hangar as well as serve as the exit required for Commons 102 mentioned in item 1 above. However, the lack of separation between the carpentry area and the undeveloped hangar area continues to be a problem. A wall should be established to separate the two. A wall in this location has been discussed in the past, is consistent with the overall campus masterplan and would also serve to resolve dust and noise issues between the spaces. Figure 8 illustrates the condition- the open projects area in the foreground is open to the technology classroom beyond.

Figure 9

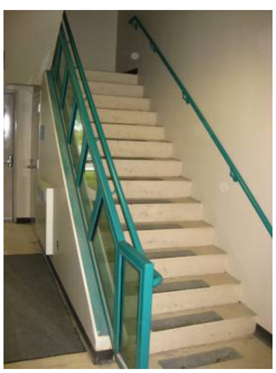


Figure 10

Cost: $50,000

3. Dust collection in the Construction area: There is not an effective method in place to contain construction area wood dust. Additional dust collection equipment should be provided, and is discussed in the mechanical section.

Cost: In Mechanical

4. Storage open to other occupancies *(fig 9)*: The undeveloped hangar area includes mezzanine areas developed in recent years and now being used as storage that are open to other occupancies. These areas must be separated by a one hour rated wall or a combination of smoke barrier wall and sprinklers (IBC 2006 Table 508.2) if they are not within an S-2 occupancy. The second floor of the health sciences addition planned for 2010 will remain unfinished pending a follow on construction project, and has been accepted by the local code official. In the future open storage areas will

need to be closed from the rest of the building with gypsum drywall sheathed wall framing or a similar assembly.

Cost: $62,000

5. The original stairs (stair 100S1 and 100S2) do not meet current requirements for rise/run, head height or width *(fig 10)*. They were compliant with code at the time of construction and need not be corrected unless they are modified as part of some other renovation project.

   Cost: 50,000 (in future project)

Figure 11

6. Art/ Multipurpose Room 123 is significantly contaminated with dust generated by ceramics activities. This type of dust has been identified in the past as potentially containing hazardous materials. Completely open ceramics studios such as this are generally no longer used. While individual pieces of equipment in the art area can be replaced (see mechanical report) the preferred solution is to reconfigure the room and isolate the dust producing activities from other functions *(fig 11)*. It is described further in the description of interior deficiencies to follow.

   Cost: In interior projects

A full code analysis is included in the appendix for this report.

Exterior Roof Conditions

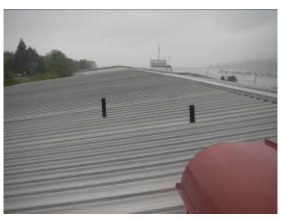


Figure 12

Roof: The roof includes a high roof over the hangar bay, with a lower roof over the original two story office bay. There are smaller roof sections over the old hangar bay doors as well as a narrow sloping roof over the original door tracks. There are gutters and downspouts along the eaves of both the low and high roof. No eaves are present.

The existing roof was installed in 1997 and consists of a 22 gage zinc-alum panel, site formed and then machine seamed in place to clips installed on wood sleepers placed over the 1980's era EPDM membrane *(fig 12)*. There is 3 inch rigid insulation between the EPDM membrane and the original 2" wood decking. The metal roofing is generally in good condition, with a life of at least an additional 10 to 15 years, possibly more depending on the continued ability of the zinc aluminum alloy coating to resist erosion. The following are conditions that should be considered for correction:

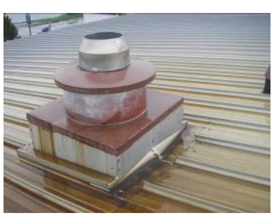


Figure 13

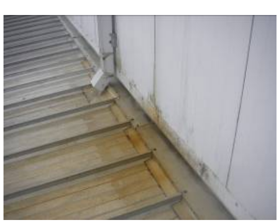


Figure 14

1. ***Boiler Exhaust Corrosion***: The roof panels in the area around the boiler stack through the high main roof is subject to significant, premature corrosion due to boiler exhaust fume compounds *(fig 13).* The panels in this area are presently discolored. Corrosion is occurring around the stack and the roof panels to each side. The entire area, from the ridge to the eave, should be wrapped with a self adhering membrane applied directly to the metal roofing. This would prevent the acid exhaust from reacting with the zinc clad metal. The low roof below the boiler exhaust is also subject to corrosion *(fig 14)*. A liner should also be

installed where the acid boiler flue gasses are corroding the panels below. As long as it is continuous through the area, it is not likely that sliding snow will not damage the membrane.

Cost: $18,000

Figure 15

2. ***Snow shedding***: The high roof sheds snow to the lower roof and to grade. The falling snow damages the canopy roofs below, (fig 15) as well as wall mounted light fixtures. Snow retention structures would prevent sliding snow and resulting damage. However, sufficient as-built information is not available to determine if the high roof areas could support potential drift loads. However, it appears that the low roof has sufficient load bearing capacity to support a tributary snow load from the high roof. Snow retention structures could be considered there. The roof to wall connection (fig 14) should be improved to ensure the retained snow doesn't cause leaks through the flashing in the area. Damaged wall lights should be replaced and shielded from high roof snow drifting. Cost of this work is in 2010 project.

Figure 16

3. ***Skylights***: A large skylight was installed over the commons 102 area as part of a 1980's era renovation *(fig 16)*. The skylights are wet-glazed, and portions appear to have been re-glazed in the past. The skylights do not presently appear to be leaking. However, it is suggested that the skylight sealant be monitored. If leaks or deterioration appears again, all existing wet glazing materials should be stripped, the surfaces cleaned and wet-glazed with a silicone sealant.

   Cost: $5,000

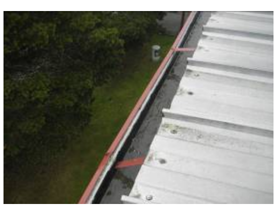


Figure 17

4. ***Ridge Vents***: Ridge vent fasteners are occasionally backing out and are no longer completely seated. The fasteners, with EPDM washers, should be re-seated if possible, or replaced with a larger fastener if backing threads are damaged.

   Cost: $5,000

5. ***Vent Pipes***: There are 5 vent pipes on the roof *(fig 12)*. Several are deformed due to the impact of sliding snow. At least one appears to be actively leaking. Snow deflectors should be installed and the pipe vents re-sealed where necessary.

   Cost: $5,000

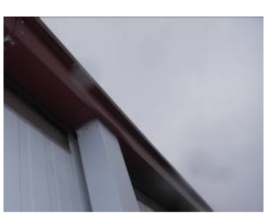


Figure 18

6. ***Low roof flashing***: The roof to wall flashing where the north side low intersects the wall panels has experienced leaks in the past *(fig 14)*. Self adhering membrane flashing was installed at each of the downspouts, but has failed to stop the leak. The full length of the roof to wall joint should be lined with a membrane flashing to prevent recurrence of leaks in this area. It should be installed so that it laps under the wall panels at least 18 inches to prevent wind

blown rain, ice dams, or retained snow from backing water up and defeating the flashing.

Cost: $12,000

Figure 19

7. ***Gutters***: Gutters have been installed at the eaves of the primary roof planes. The gutter/downspout system is not performing very well *(fig 17)*. There are leaks in the gutter seams despite an adhesive waterproof membrane installed inside the gutter. Ice has damaged the hangers, and while most of the fasteners are stainless steel, corrosion is occurring between non-stainless steel fasteners and the metal roof and gutter panels. Ice has crushed the gutter into the vertical downspouts, deforming the gutters and promoting leaks *(fig 18)*. The hanger straps could be augmented with a rigid bracket supporting the gutter both from above and below to strengthen the gutters, but it is likely that damage to the gutter will continue unless the sliding snow and ice are addressed. As discussed in the preceding ***Snow Shedding*** section ***,*** snow retention structures should not be used on the high roof. However they are feasible on the low roof, which would protect low roof gutters from sliding ice. Since it does not appear feasible to install snow retention on the high roof, consideration should be given to reconfiguring the high roof gutters so that sliding snow does not damage them. In addition, all non-stainless steel fasteners in the gutters/downspouts should be removed and replaced. An underdrain system should be installed to reduce the saturation that presently occurs around the building due to the lack of a drainage system *(fig 19)*.

   Cost: $8,000 (repair gutters)

   Cost: $28,000 (replace gutters)

   Cost: In civil comments (Connect downspouts to underdrain system)

Exterior Wall Conditions


Figure 20

Exterior walls consist of insulated metal wall panels installed over horizontal metal zee purlins that were installed as part of a 1980's era renovation of the building. The purlins are supported from original steel framing, generally 3" vertical steel angles installed at 48" on center. Aluminum framed windows and doors are cut through the insulated panels and supported by additional light gage metal framing secured to the steel framing. The following are conditions we noted:


Figure 21

1. ***Wall Panel Finish*** *(fig 20)*: The wall panel finish will be in fair condition after power washing, which is a part of normal building maintenance. The flouropolymer paint finish is white, which has the greatest fade resistance. In addition, the exterior finish color matches the primer color, so the appearance is less affected by surface erosion. However, the wall panels should be scheduled for re-finishing within 5 years to prevent corrosion. Corrosion will be much more difficult to correct than to avoid.

   Cost: $222,000


Figure 22

2. ***Fastener Corrosion*** *(fig 21)*: The panels, flashings, downspouts and windows were installed using both exposed stainless and non stainless ferrous steel fasteners. All non stainless steel fasteners, approximately 20% of the total fasteners, should be replaced to prevent additional corrosion.

   Cost: $10,000

3. ***Wall Base Flashing*** *(fig 22)*: In certain areas the base flashing is corroding, such as around the east canopy and at locations along the wall base at the north elevation. In addition, flashing is missing at some of the overhead door openings on the west elevation. The corroded or missing flashing should be replaced. The algae build up in the space between the base flash and the wall panel needs to be cleaned out to reduce the deformation occurring as the algae retains water that in winder freezes and expands, deforming the base flashing. The concrete walk at the east entry was poured directly against the steel wall panels. The wall panels are rusting and will continue to quickly corrode if the condition is not corrected. The concrete could be cut back from the wall at this point, the rusted panels could be sawn off above the rusted area and new flashing installed.


Figure 23

   Cost: $10,000

4. ***Window Sealant*** *(fig 23)*: The window glazing appears to be a combination of wet and dry glazing and appears to generally be in good condition. The wet glaze sealant appears to be a silicone type with many years of useful life. The dry glazing appears to be a mix of EPDM and neoprene. The neoprene appears dry, cracked and no longer flexible and needs to be replaced. The sealant used at window flashing (possibly a butyl type) is oxidizing. It is cracked and dry in some locations and loosing its adhesive qualities. All the existing flashing sealant should be removed and the metal flashing cleaned. The exposed joints


Figure 24

should be re-sealed with a clear or color matched silicone sealant installed in a simple fillet configuration.

Cost: $16,000

5. ***Aluminum Storefront glazing and entrances***: Entrances are in fair condition. Automatic openers have been retrofitted to the frames. They appear to operate satisfactorily, but are unsightly and should be scheduled for replacement. It appears that there is some corrosion occurring at the main entry vestibule doors, due to de-icer residue left on the floor and on the aluminum. All the de-icer should be removed, the corroded aluminum ground off, and the area re-painted *(fig 24)*. There are expansion joints in the concrete walkway at the entry that are deteriorated and need to be replaced with a pourable walk sealant. The concrete should be treated with a weather proof sealer to prevent further deterioration from de-icing chemicals. This is discussed in further detail in the site comments.

   Cost: $5,000 (Repair corrosion and walks)

   Cost: $8,000 (replace aluminum entrance doors)

Figure 25

6. ***Canopy Framing*** *(fig 25)*: The steel canopy frames at the east and north elevation (exclusive of the new, westernmost canopy) should be repainted. The light fixtures in the canopies are corroded and also need to be painted or replaced.

   Cost: $6,000

Figure 26

7. ***Exterior steel doors***: All exterior steel doors and frames should be repainted.

   Cost: $1,500

8. ***Wall Mounted Building Signage*** *(fig 26)*: Leaks and corrosion are occurring where sign fasteners penetrate the exterior wall panels. The signage mounting system should be replaced with a more corrosion resistant installation.

   Cost: $5,000

Building Interiors Conditions

The following is a room by room list of conditions observed, and where appropriate, corrective work recommended. Rather than show costs on a room by room basis, costs for similar work items have been consolidated by type and shown as line items on the spread sheet included in the executive summary

First Floor:

Stair 100S1 *(fig 10)*: Stair railing, ceiling, treads and risers are not compliant with current code. They were compliant when first installed and may remain. IBC 2006 Chapter 34 describes alterations, additions or repairs that could require the stairs to be brought into compliance with current code, generally limited to a major change in occupancy or building configuration. However, stair tread and riser finishes should be replaced.

Corridor 100C1: Replace carpet, rubber entry tile and base material. Replace ceiling panels with new matching ceiling panels


Figure 27

Vestibule 100V1: Replace flooring at entry hall outside vestibule. Patch and paint walls.

Corridor 100C2: Replace carpet and base. Patch and paint walls.

Corridor 100C3: Replace carpet and base. Patch and paint walls.

Janitor Closet: Replace flooring, paint all walls, install new FRP wainscot. Replace door and hardware.

Room 101A: Replace carpet and base. Patch and paint walls and frames.

Room 101B: Replace carpet and base. Patch and paint walls and frames.

Room 101C: Replace carpet and base. Patch and paint walls and frames.

Faculty Workroom 101: Replace carpet and base. Patch and paint walls and frames.

Room 101D: Replace carpet and base. Patch and paint walls and frames, replace ceiling tiles.


Figure 28

Room 101F: Replace carpet and base. Patch and paint walls and frames.

Commons 102: Replace carpet and base.

Admissions 103 *(fig 27)*: Transaction counter lacks an ADA compliant section, counter door is chipped and was designed prior to the use of computers so it does not support the typical needs of users. The casework in the admissions area should be reconfigured to match current needs. Replace carpet and base, patch and paint walls, repair ceiling tiles.

Office 103C: Patch and paint walls.

Office 103B: Install carpet over the existing floor finish, patch and paint walls, replace ceiling tiles.


Figure 29

Office 103A: Replace floor stop.

Office 104: Replace door and hardware, replace carpet.

Office 104B: Replace door and hardware, replace carpet, patch and paint doors.

Business Office 105: Replace existing carpet, Replace door and hardware.

Room 106: Replace doors and hardware with panic devices, add exit lights, repair ceiling.

Classroom 107: Replace carpet and base.

Art/Multi Purpose Room 123 *(fig 28)*: The art room is primarily a ceramics room. As presently configured, the art room is a significant liability. Dust is the single biggest concern in this area. Ceramics dust normally contains silicas, quartz, mica, talc and other materials that can damage the lungs, especially with long term exposure.

There are very few dust control measures presently in the art room. Some of the measures helpful in reducing the amount of dust exposure include the following: The air handling system should be upgraded to HEPA standards to eliminate more of the dust, possibly configured with a laminar flow to direct contaminated air away from students, similar to techniques used to control lead containing air in shooting ranges; Separation walls should be built to divide the spaces into dusty and less dusty areas *(fig 29)*; Casework should be replaced with ventilated casework that draws dust out of the storage areas; A designated clay mixing room should be provided; Rolling storage enclosures should be provided to facilitate cleaning *(fig 30)*; Concrete floor should be re-sealed with epoxy or some other hard sealed floor finish to help control dust; A vestibule should be provided at the art room entry to control dust contamination *(fig 31)*; A floor mat to prevent dust and potential hazardous materials from being tracked elsewhere in the building should be provided at the main entry.


Figure 30

In addition to the dust issues, the room has seen significant hard use and many surfaces should be replaced. Plastic laminate doors are chipped and should be replaced. Plastic laminate countertops should be replaced with stainless steel with integral stainless sinks (equipped with clay traps) to facilitate wipe down measures *(fig 32)*. The textured ceiling should be replaced with a smooth surface.


Figure 32

The sandblaster should be replaced and located in a separate environment to prevent it from contaminating other areas *(fig 33)*. The existing fume hood doubles as a spray booth, and should be replaced with a proper fume hood and a separate spray booth located in a separate environment.


Figure 33

While individual items can be identified for correction, the art room area should be considered for re-programming based on current UA educational and risk management policies. Re-programmng would also be beneficial to adapt the program to changes in technology that have occurred over the years, such as the use of digital projection and photography of student work for documenting, archiving and display.

MES Storage 110B: NA

UAS Stor 110A: NA

Physical Science/Nursing Lab 110: Patch and paint walls and sills at windows.

Computer Lab 112: NA

Prep 114: Repair ceiling, patch and paint walls.

Seminar 116: Replace carpet and base, patch and paint walls, replace door and hardware.

Seminar 118: Replace carpet and base, patch and paint walls, replace door and hardware.

Biochemistry Lab 122: Patch and paint walls, perform miscellaneous repair to casework. Replace exit light. Provide traffic bumper to prevent vehicles from blocking exit door.

Vestibule 100V3: Replace walk off mat, replace interior and exterior aluminum doors.

Men 114, Women 113: Replace toilet stall partitions and doors. Replace sinks.

Vestibule 100V2: Replace door and hardware, patch and paint walls and door frames, clean and refinish stairs and rails.

Mens Room 100M2: Replace door and hardware, modify trash receptacles to meet minimum 4” obstruction requirement.

Women Room 100M2: Replace door and hardware, modify trash receptacles to meet minimum 4” obstruction requirement.

Stair 100S3: Patch and paint walls, handrail. Paint sprinkler pipe, replace flooring.

Second Floor:
Corridor 200C1: Plan for carpet replacement. Repair damaged vinyl base. Adjust the 1.5 hour rated door between original classroom area and the 1994 classroom addition.

Corridor 200C2: Plan for carpet replacement.

Elevator 200E1: Replace floor finishes in elevator car.

Toilet room 200M1 and 200W1: replace or repair stained urinal.

Stair 200S1: Stair railing, ceiling, treads and risers are not compliant with current code, and should be revised if renovations are planned in the stair in the future. If doors are modified in the future, the wire glass should be replaced, as wire glass is no longer allowed in doors.

Stair 200S2: Stair railing, ceiling, treads and risers are not compliant with current code, and should be revised if renovations are planned in the stair in the future. If doors are modified in the future, the wire glass should be replaced as wire glass is no longer allowed in doors.

202: Replace door and door hardware.

Office suite 203: Repair water damaged ceiling, and repair water damage at plastic laminate window sills and adjacent drywall surfaces. Paint room 203D.

204: No comments

Room 205: Replace carpet. Replace vinyl weather seals on the north facing windows, both inside and outside, and repair water damage caused by leaking windows. Poor acoustical separation between 211 and 205. If renovation occurs in the area, acoustical rated walls should be projected up to the underside of the roof deck above. A cable management system should be considered to help manage conductors for the over 20 computer stations in this room.

206: Replace chipped plastic laminate door and hardware.

Room 211: If doors are modified in the future, the wire glass should be replaced.

Office suite 213: Repair water damaged ceiling tiles. Replace vinyl weather seals on the north facing windows, both inside and outside.

214: Replace plastic laminate doors with steel doors or wood doors to avoid chipping of plastic laminate. Provide additional cable management to reduce dependence on extension cords to the floor.

Classroom 215: Replace vinyl weather seals on the north facing windows, both inside and outside. If doors are modified in the future, the wire glass should be replaced.

216: No comments

218: No comments

200W2, 200M2: No comments

226: Replace chipped plastic laminate door and hardware. Replace vinyl weather stripping at window sashes at exterior windows.

SITE

The University of Alaska Southeast's Sitka campus is part of a larger decommissioned military base that now houses a variety of users and activities including Mount Edgecumbe School, the US Coast Guard and SEARHC clinic. The UAS campus building is located on the former concrete airfield tarmac. The tarmac serves as the campus parking as well as a driveway to Mt Edgecumbe administration and science facilities. Formal landscaping is limited to a strip between the building plan north elevation and the parking area. A smaller parking area to the south of the building contains the accessible parking and bicycle parking facilities. A total of 93 parking stalls are designated for the campus. The plan west side of the building is surrounded by more tarmac and is used as outdoor workshop and storage space for various departments. The plan south side of the building is comprised of an extremely steep naturally revegetated slope rising twenty-five feet. Toe of slope is separated from the face of the building by an approximately 11 foot wide level area containing water, electrical, fuel storm and possibly other underground utilities . The following are issues of concern with recommendations for corrective action where appropriate. The key notes are illustrated on the site plan at the end of the Site and Landscape comments.

Accessibility

1. The campus has two accessible parking areas. One at the southeast corner of the building and another at the south entrance to the building providing a total of five designated accessible stalls, one more than required by Americans with Disabilities Act Guidelines (ADAG). The aisles for the accessible stalls have a variety of widths of less than 5 feet. To be compliant with ADAG, accessible aisles are to be five feet wide. The accessible van parking aisles are compliant. However, there is no consistency in the accessible parking and aisle configurations. This is inefficient and creates confusion. Additionally, wheel stops are missing and signage is incomplete.

Recommendations: Develop an ADAG compliant accessible parking and striping configuration with curbs or wheel stops and complete signage.

Cost: $5,000

2. The accessible walking route from the accessible parking to the main entry of the campus runs along the concrete tarmac parking lot, up a concrete ramp and sidewalk that parallels the building and then to the covered main entry. The slopes of these areas meet ADA requirements however the tarmac surfacing is not appropriate for an accessible route. Numerous large cracks, concrete expansion joints and former aircraft tie downs exceed the allowable ¼" gap. The

age of the concrete tarmac has resulted in the surface of the concrete being spalled and uneven. The ramp from the parking to the sidewalk also contains numerous large cracks and expansion joints. The bottom of the ramp has a significant lip that exceeds the allowable ¼” change in elevation. There is no tactile warning strip at the bottom of the ramp.

Recommendations: Repave accessible route.
Cost: $10,000

3. The main entry sidewalk under the canopy requires maintenance to eliminate gaps greater than ¼” to meet ADA requirements.

Recommendations: Resurface sidewalks to remove gaps greater than ¼”. Reinstall expansion joint material and repair spalled joints. Spray concrete with a weather seal to protect concrete from de-icing chemicals and freeze thaw damage.
Cost: $10,000

4. A second accessible sidewalk ramp is found just to the north of the covered main entry and serves as an accessible drop off/pick-up location near the front door. The ramp is ADA compliant but lacks a tactile warning strip. The concrete sidewalk from the ramp to the covered main entry also has several large gaps greater than ¼”.

Recommendations: Install a tactile warning strip at the bottom of the ramp and resurface the concrete sidewalk between the ramp and the canopy covered sidewalk.
Cost: $500

5. A third accessible ramp is found in front of the second covered entry to the school. This is a secondary entry to the building. The ramp, covered sidewalk and canopy were recently installed and repaired by the contractor.

Cost: $0

6. The fourth accessible entrance at the plan east side of the building meets ADA requirements. However the parking and access aisles need to be resurfaced, accessible aisles widened to five feet, and wheel stops and signs installed, as discussed earlier.

Cost: In item 1 above

Parking

Portions of this discussion are likely to overlap with the civil portion of the condition survey. Recommendations from this and the civil discussion should be noted.

7. The parking lot for the UAS Sitka campus is located on the old airfield tarmac. The concrete is well worn and nearing the end of its lifespan. The surface is spalling and uneven with small potholes starting to form. The area of heaviest wear is near the front entry of the building where both vehicular and pedestrian traffic is the heaviest.

Cost: In Civil

8. There are numerous utility access covers for electrical, sewer, clean out points, and abandoned airfield fueling lines. Many of the concrete frames around these utility covers are degraded or heaved above the surrounding grade and pose a tripping hazard. A large metal frame structure protrudes above the concrete paving adjacent to the sidewalk between the two front entries to the building. The concrete within the metal frame is badly spalling. A concrete lip of greater than ¼" and spalling concrete within the concrete paving runs parallel to the sidewalk and creates a tripping hazard.

<u>Recommendations</u>: Resurface the existing concrete tarmac paving. The highest priority areas should be the accessible parking areas, the main parking lot to the plan north of the building, its driveway and pedestrian routes from the parking to the sidewalk and main entries of the building. The second priority for resurfacing should be the plan east parking area. Lowest priority would be the area to the plan west used for outdoor workshop space. Remove abandon utility access covers, fill and pave. Ensure the elevations of the remaining utility covers are flush with the final resurfacing of the parking lot and replace failed concrete frames around utilities where needed.

Cost: In Civil

Utilities

Portions of this discussion are likely to overlap with the civil, electrical and mechanical portions of the condition survey. Recommendations from this and the other discussions should be noted.

The site contains a wide array of utilities on site including above grade and below grade facilities. Some of these utilities are remnants of the old airfield and no longer used. The below grade utilities located in the parking area are covered in the parking portion of this report.

9. A satellite dish is found at the southeast corner of the building and is surrounded by a chain link fence. The gate is not locked. Access could also be gained by small children between the fence post and building. This gap between the post and building creates a possible head entrapment hazard.

<u>Recommendations</u>: Although the securing of satellite dishes is not required there is electrical and communication equipment present and with the fence already

installed the gate should be locked. Close off openings greater than four inches between fence posts and the building to eliminate head entrapment dangers. Openings should be four inches or less. **Cost: $500**

10. A fire hydrant is located near the southwest corner of the building at the bottom of the steep hillside. Earth debris has slid down the hillside and is partially obscuring the hydrant.

Recommendations: Remove debris around fire hydrant including plant material. Install concrete retaining blocks as required to maintain grade of slope around the hydrant.
Cost: $3,000

11. A large water vault is found at the back of the building and is accessed by two large metal doors just above grade. The doors are not secure. The vault is full of water and poses a drowning hazard.

Recommendations: Install locks on the doors.
Cost: $250

12. The rear of the building contains numerous utilities including electrical transformers, utility vault, a water vault, and above grade fuel tank. The area behind the building is not secure.

Recommendations: Security fencing should be installed to secure this area.
Cost: $10,000

13. On the north side of the building is a fenced gas cylinder storage area. The cylinders are held in place with a chain restraint system. The gate is not locked and provides access to the cylinders. Additionally there is an eight inch gap between the building and the fence post. Again, given the adjacent schools this area should be secured.

Recommendations: Lock the gate to prevent unauthorized access. Close off openings greater than four inches between fence posts and the building.
Cost: In item 12

Drainage

Portions of this discussion are likely to overlap with the civil portion of the condition survey. Recommendations from this and the civil discussion should be noted.

14. Along the front of the building roof drainage is discharged via six large downspouts and into dry wells below each. During low flow activities the water discharge misses the dry well of several downspouts and spills onto the

surrounding turf. During high flow activities the dry wells are inundated. Percolation is less than inflow and water spills onto the surrounding turf. During the periods of high flow the water spills across the turf and across the sidewalk between the building and the parking lot. The downspout adjacent to the covered sidewalk at the main entrance creates the greatest flooding, spilling across the covered sidewalk and exacerbates sidewalk deterioration.

Recommendations: Increase the holding capacity of the dry wells to absorb more water volume by converting them to a horizontal drainage gallery.
Cost: In Civil

15. The roof drainage system along the back of the building has downspouts that flow onto turf behind the building and creates saturated soils conditions that are affecting the foundation drain. Water is then drained to the surrounding parking lot and treated as surface run off. Recent temporary modifications have included digging a ditch and adding pipe length to the downspouts to move water away from the building and foundation.

Recommendations: Install a horizontal drainage gallery.
Cost: In Civil

16. The remaining sides of the building have downspouts that flow onto the surrounding parking lots. While this is an acceptable method of moving roof drainage it does create icing problems in the winter months.

Recommendations: These downspouts could be piped into a future storm drain system, if such a system is installed for other reasons.
Cost: In Civil

17. The secondary covered sidewalk along the front of the building has roof run off coming from the canopy above and dripping onto the soil below. This is creating soil erosion and prevents turf from growing in the splash zone.

Recommendations: Place a strip of rounded gravel along both sides of the sidewalk to allow the canopy runoff to land on the gravel and prevent further erosion. The strips should be nine inches wide and six to nine inches deep with edging between the gravel and turf.
Cost: $1,000

Landscaping

18. Landscaping is limited to the front of the building and includes a wide grassy strip with six very large mature shore pines (*Pinus contorta*). The turf is in fair condition and soils tend to be well drained and compacted in some locations. The shore pines are all in good condition with the most northerly tree showing signs of winter desiccation from drying winter winds. New growth is emerging at the tips of the twigs of this tree. The second most southern tree is missing its leader. Old unused holiday lights remain in the most southerly tree.

Recommendations: The soil should be thatched and aerated with a one to two inch layer of organics/compost applied to the top of the turf area to restore soil vitality. Apply fertilizers to turf areas as directed by manufacturer. Do not apply fertilizers after July 1 to prevent absorption of nutrients at the end of the growing season by the trees and preventing new growth from hardening off for the winter. Monitor the tree missing its leader to ensure that a new one is established. If more than one leader is established remove all but one. Remove holiday lights.
Cost: $5,000

19. Some general aesthetic improvements could be made by adding minimal maintenance landscaping. Additional large scale plantings could add color, flowers and create a more positive environment. The small new plantings in the concrete raised planters surrounding the building are nice additions but too small for the massive scale of the building and existing trees.

Recommendations: Create a landscape master plan and implement as funding becomes available.
Cost: $5,000

Site Improvements

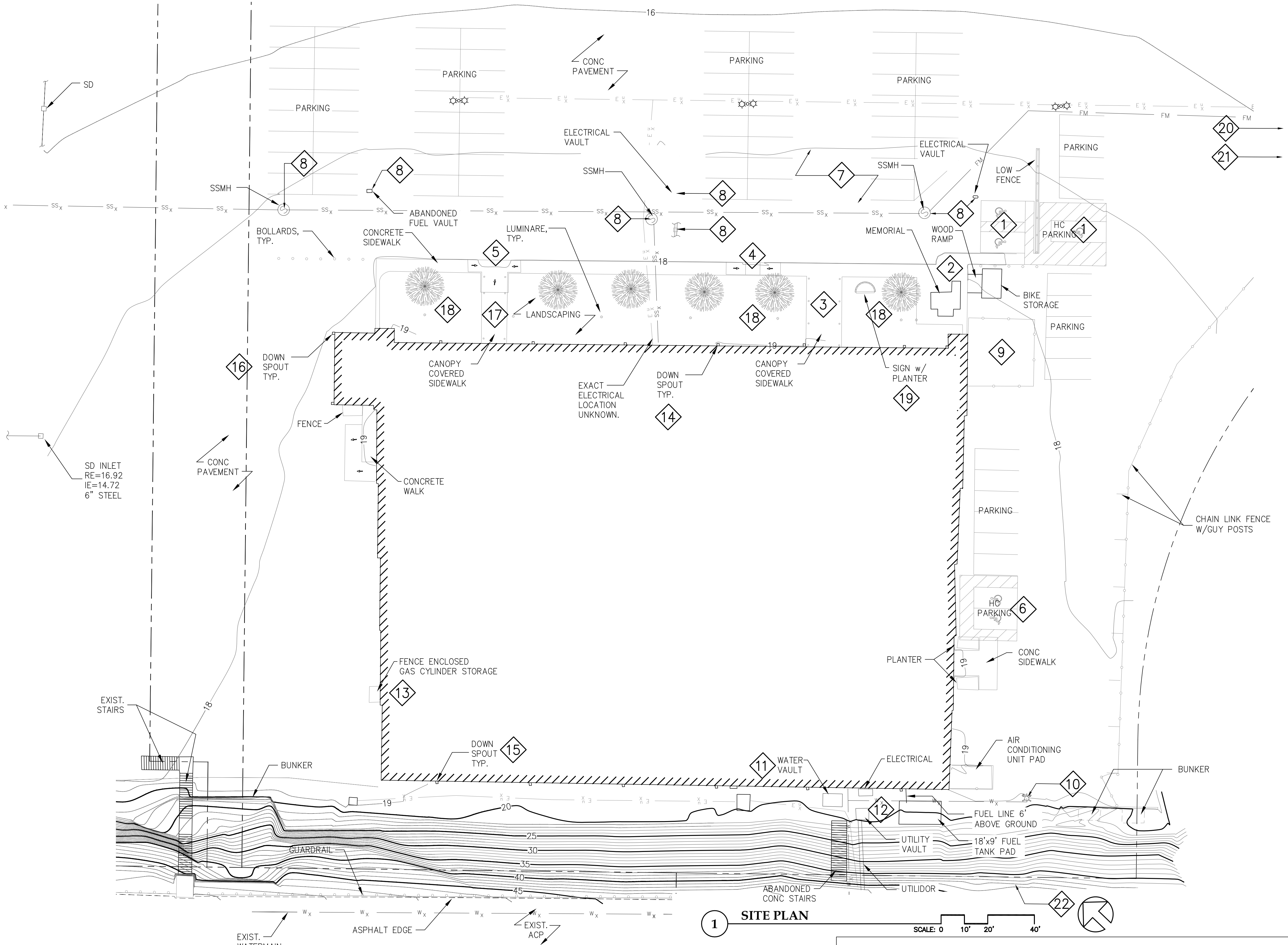
20. There are several areas of the site which could be enhanced and make significant improvements to the facility. The first is the entry to the site off Harbor Drive. There is no clear gateway to the campus and only with limited identification. Creating a gateway would benefit the University, Mount Edgecumbe and the US Coast Guard.
Cost: $500,000

21. The second area of concern is the driveway from Seward Avenue onto the airfield tarmac adjacent to the baseball field. This entry is difficult to maneuver and easy to miss. Once a visitor is on the property there is little definition of the driveway and parking lot on the old airfield tarmac. Creating a secondary gateway to the University and Mount Edgecumbe would benefit both.

Recommendations: Update and refine the Mount Edgecumbe Master Plan that creates the aforementioned gateways and makes accessing the site easier, more efficient and makes aesthetic improvements. Construct gateways and driveway improvements through partnerships with Mount Edgecumbe and the US Coast Guard. If the concrete tarmac is replaced include street trees to separate the driveway from the parking areas. Install a pedestrian route along the water and road's edge for safe movement of pedestrians.
Cost: In Item 20

22. The students at the neighboring uphill Mount Edgecumbe School have created a path down the hillside from the school to the University property near the fire hydrant and baseball field. Despite the "No Access" signs, guardrail at the top of the hill and dangerous slope students are still regularly using this route.

Recommendations: Work with Mount Edgecumbe School to understand why the students are using this unauthorized route and find ways to eliminate access or provide facilities to improve the safe passage of students at this location or in the vicinity.
Cost: In Item 20



LANDSCAPE AND SITE CONDITION SURVEY

Jensen Yorba Lott Inc.
522 West 10th Street
Juneau, Alaska 99801
phone 907-586-1070
fax 907-586-3959
jensenyorbalott.com

PND ENGINEERS, INC.
9360 Glacier Highway, Ste. 100
JUNEAU, ALASKA 99801
PHONE (907) 586-2093
FAX (907) 586-2099

UNIVERSITY OF ALASKA SOUTHEAST
CONDITION SURVEY
xxx
SITKA, ALASKA

REVISIONS

SHEET TITLE
SITE PLAN

DATE: MAY, 2009
FILE: 092038.01

C101

CIVIL/STRUCTURAL CONDITION SURVEY

Hanger bay east side

North Side Mezzanine

North Side Mezzanine

Roof truss connection

Typical roof deck, purlin and roof truss

Structural System

The original 1941 building structural system consists of steel-framed roof and walls, second floor framing consisting of steel beams supporting a concrete floor deck, and a reinforced concrete foundation supported by shallow bedrock. Steel roof purlins support a straight sheathed timber tongue and groove deck. The purlins span across roof trusses spaced at 20 feet on center. The roof trusses span 160 feet.

The north and south, exterior steel-framed walls consist of steel columns supporting the roof trusses and horizontal wind girts. At the south wall, between two pairs of girts there is cross bracing that creates a frame that resists in-plane lateral loads. The north exterior wall is cross braced to resist lateral loads.

The east and west end walls were once rolling hanger doors. These doors nested in end pocket structures. The doors are no longer operable. The end pocket walls are braced to resist lateral loads from the roof and original second floor in the north-south direction.

The original second floor was 26 feet wide by the length of the building at the north side of the building.

No structural plans of the building are available.

It is likely that the structural steel in this building conformed to ASTM A7 with a 33,000 psi yield strength. Many connections are riveted while some are bolted.

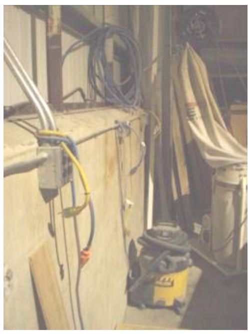
At some point in time a concrete wall was cast along the south and east perimeter wall. This wall extends to approximately 6 feet above the interior ground floor slab.

1984 inspection and evaluation reports indicate that an inventory report was performed by CH2M-Hill in 1979. A floor plan from that inventory study showed an open hanger bay used as shops over approximately 160 feet by 240 feet and a two-story office/classroom structure along the north edge of the building that had a footprint of approximately 26 feet by 240 feet. There was a mezzanine in the south east corner of the open hangar bay that was a classroom and storage room accessed by a single flight of stairs.

South side wall bracing

An inspection and evaluation of the building was performed in 1984 by Tongass Engineers of Juneau as part of an evaluation of most of the buildings at the Mount Edgecumbe High School complex, of which this building was once part of. The following is from that report:

Description
Unlike the concrete-rigid frame buildings, the seaplane hangers are framed with simply supported structural steel members.



Concrete wall at base of south wall

Purlins (steel wide-flanged beams) spaced at 6'-8" carry roof loads to the steel roof trusses of the hanger areas. These trusses are spaced at 20' and span 160'. Roof trusses are supported by steel wide-flanged columns.

Steel cross-bracing along the top and bottom of trusses together with sway bracing (vertical) between trusses and cross bracing along the side walls stabilize the steel-structure and transmit longitudinal wind and earthquake loads to foundation. The 2 story office areas at the front of each hanger have concrete floors, steel beams, steel columns and steel cross bracing. The bracing together with the concrete shear walls at the centers of the buildings and each side of the stairway transmit transverse wind and earthquake loads from the hangers to foundations.

Overhead door west wall

Load Capacity Check

Existing design drawings 141-438 and 141-439 show "(hanger) doors designed for 50 psf and 30 psf wind load." Design drawing 138-881 for control tower framing notes: "live loads-Roof 70 psf, supported floors 100 psf" Design drawings for roof, floor and wall framing were not found. Shop drawings for the steel framing provided sufficient information for us to calculate live load stresses imposed on the members.

A 40 psf snow load stresses the 10B11.5 purlins to 15,200 psf. The current roof dead load is approximately 10 psf. The combination dead plus snow load thus stresses the purlins to 19,000 psi. This stress is very near the maximum allowable bending stress for the non-compact purlins of ASTM A-7 Steel.

If the existing built-up roofing material is removed a new roofing system weighing up to 5 psf can be installed without endangering the structure.

The roof trusses as well as the purlins have very little reserve capacity. Without removing any portions of the existing roofing the roof dead load can be safely increased about 6 psf without reducing the 40 psf allowable snow load. For this increase, however, purlins would have to be strengthened.


2006 Canopy

With cross bracing repaired the primary frame will safely handle 30 psf wind loads. Some local elements, however, may not comply with 1982 UBC requirements for 100 mph winds.

The cross bracing that required repair was in the adjacent hanger and not in this building.


Welding Lab Structure

In 1987, an interior addition was constructed. This addition consisted of steel columns, light gage steel studs, and concrete masonry unit (CMU) walls supporting light gage steel joists, a plywood floor deck and lightweight concrete topping slab. A topping slab was added on the ground floor slab to create a level surface. The addition is a free-standing structure within the original structure.

Structural design criteria for the 1987 addition includes the following:


Weld Lab
(2006 Construction)

Code: 1985 UBC
Live Loads:

Classrooms:	40 psf uniform with 1000 pound concentrated
Corridor and Stairs:	100 psf uniform
Mechanical Rooms:	150 psf
Seismic Criteria:	Zone 3, I =1.0
Exterior Wind Loads:	43 psf
Interior Lateral Load on Walls	5 psf

Materials for this addition include the following:


Overhead Door Weld Lab

Concrete	28 day strength = 3,000 psi
Rebar:	ASTM A615, Grade 60
Steel W shapes, angles, channels, plates and bars:	ASTM A36 (Yield strength = 36,000 psi)
Structural Steel Tubes:	ASTM A500, Grade B (Yield strength = 46,000 psi)
Anchor Bolts	ASTM A307
Structural Bolts	ASTM A325
Masonry	fm' = 1500 psi

In 1994, a second addition was constructed within the building. The structural system consists of plywood floor decks supported by plywood I joists which, in-turn are supported on light-gage steel stud walls or glued laminated timber beams supported on tube steel columns. The lateral load resisting system consists of light gage sheathed walls supporting the plywood diaphragms. This addition is also a free-standing structure within the original building.

Structural design criteria for the 1994 addition is listed on the structural general notes as follows:

Code: 1991 Uniform Building Code
Design Soil Pressure: 3000 psf (assumed)
Design Live Loads:
- Floors 50 psf
- Partitions 20 psf
- Corridors and Stairs 100 psf
- Mechanical Floors 100 psf
- Seismic Zone 3, Z=0.30, I = 1.0, S = 1.5
  C = 2.75, Rw = 8, V =0.103 W

Structural steel and concrete was specified to be the same as in the 1987 addition. Glued laminated timber beams were specified to be Grade 24F-V4 grade.


Exterior Canopy

An entry canopy was constructed with this addition. The entry canopy consists of transverse rigid frames made of hollow, tubular steel supporting tube steel purlins which in-turn support a corrugated metal deck.

The 1997 project to finish the second floor spaces framed in 1994 included adding a cementitious underlayment over the plywood floor deck.

In 2006 the welding classroom, lofts, maintenance garage and storage mezzanine were constructed. The structural system consists of light gage steel stud walls supporting timber joist, loft floor framing and at the storage mezzanine parallel timber chord open web floor trusses. Trusses and loft floor joists support a plywood deck. Sheathed stud walls serve as shear walls to support the diaphragms at the loft and storage mezzanine. This project also included fixing several leaves of the west rolling hanger doors and constructing overhead garage doors in those hanger door leaves. The construction of openings for overhead doors involved constructing new framing at the door edges and stiffening the vertical framing adjacent to the door opening.

Structural design criteria for the 2006 project included:

Code: 2003 International Building Code
Design Soil Pressure: 12,000 psf (assumed bedrock)
Design Live Loads:
- Shop Loft Floors 500 psf
- Corridors and Stairs 100 psf
- Mechanical Floors 100 psf
- Wind: 120 mph (3 second gust),
  Exposure C, Iw = 1.0

Seismic Site Class B, Ie = 1.0
Ss = 1.0g, Fa = 1.0, Sds = 0.67g
S1 = 0.51g, Fv = 1.0, Sd1 = 0.34g
Rw = 6, Cs = 0.134g

Structural materials were specified to be:
Steel Plates: ASTM A572, Grade 50
(Yield strength = 50,000 psi)
Steel W Shapes ASTM A992 (Yield strength = 50,000 psi)
Tube Steel ASTM A 500, Grade B
(Yield strength = 46,000 psi)
Steel Bolts ASTM A325
Glued Laminated Timber Beams: Grade 24F-V4
Engineered Timber: E = 2.0E6 psi, Fb = 2900 psi

A second entry canopy was constructed at this time. This canopy matches the main entry canopy constructed earlier in 1994.

In 2007 an additional overhead door was constructed in a hanger door leaf. This was designed and constructed similarly to the overhead door openings in 2006.

In 2008 a loft was constructed in the garage adjacent to the welding shop. The garage walls were framed in 2006. The loft construction consisted of a 1.125" thick plywood floor deck supported by engineered timber joists, supported by a light-gage steel stud wall against the existing wall and a row of glued laminated timber beams supported on tube steel columns. Materials were the same as were specified in the 2006 construction.

Structural Deficiencies

The condition of the structural system appears to be fair to good. The following discrepancies were observed:

1) Steel roof purlins and steel wall framing in the original hanger bay exhibit minor rust. Painted coatings appear to be beyond their life. The corrosion is likely to be minimal as the members are exposed only to interior atmosphere which is generally dry.

2) Between Rooms 110 and 112 gypsum wall sheathing between windows is damaged. This is likely due to gaps left between studs and headers and then compression loads reducing the gaps after the wall was sheathed.

Structural Recommendations:

1) Monitor painted surfaces.

2) Remove damaged sheathing at the wall between Rooms 110 and 112 and investigate the cause of cracking.

Site Civil

Main Entry

Pavement with patch for sewer

Pitted/uneven pavement

Undefined access road

Site civil systems include:

- Underground water and fire suppression piping,
- Underground piped sewer systems,
- Underground electrical cables serving luminaires in the parking lot,
- Drainage and storm drain systems,
- Sidewalks,
- Concrete paving at the parking lot and the east and west sides of the building
- Concrete launch ramps,
- A concrete pad with windsock,
- An access road,
- A fenced enclosure for welding gas storage,
- A fenced enclosure for propane tank storage,
- A fenced enclosure of air conditioning units,
- A fenced enclosure of the communications satellite dish,
- A timber framed bike storage shelter,
- A fuel tank pad and double walled fuel tank,
- Bollards, and
- A low fence that directs traffic and landscaping.

The water system consists of a line that originates at the main in Seward Street south of the building and runs north to the building. A spur lines runs to a hydrant southeast of the building. The age of this waterline likely dates to the 1980s when the waterlines for the Mount Edgecumbe High School complex were renovated. The waterline supplies not only potable water for consumption but also supplies water for the building sprinkler system.

There is a derelict water vault that appears to be remaining from a deluge fire suppression system from the 1940s. This system is no longer used. The vault is on the south side of the building and has an aluminum lid that is not locked. There is standing water in the vault.

The sewer system consists of an east-west running main that crosses the site north of the building through the parking area. A lift station at the east edge of university property serves the US Coast Guard Dock and Cutter Support Team Building east of this site. The lift station charges a force main that leads to a manhole north of the northeast corner of the building. A gravity sewer line running west from this manhole delivers sewage to a main west of the site. The building sewer service line leaves the north side of the building near its mid point. The service line is a gravity line that runs north to the sewer main. There is no defined easement for the sewer main running east to west but this main serves facilities in addition to the university. The sewer line is thought to be relatively new as concrete pavement patches above the line are in good condition.

Embedded steel in pavement and lid of derelict fuel vault

See the electrical narrative for a description of the site electrical system.

The drainage on the site primarily depends on sheet drainage across the parking lot and ground absorption of water from roof drain leaders. Makeshift drywells are at drain leader outlets on the north side of the building. At the south side of the building rail leaders empty onto splash blocks which deliver the water to the gravel surfacing.

Rain leader outlet

Sidewalks include the walks from the north side of the building and the sidewalk along the south edge of the parking lot.

There is a baseball field east of the building and a parking lot on the adjacent property. The field encroaches onto UAS property as the outfield fence is on UAS property.

Bollards at NE Corner

Access to the site is via a poorly defined, two-lane road that is northeast of the ball field. The road is all within UAS property. The road is not well defined as there are no centerline striping, no fog lines, and no traffic signs.   The surface is very uneven with pot holes and fractured concrete at an abandoned utilidor. There is a guard rail on the north side of the access that protects the lift station and a transformer from vehicle traffic.

Propane Tank Storage

Fenced enclosures consist of chain link fencing.

A low fence separates two rows of parking spaces. It is made of 8 inch diameter x 3 foot high pipe bollards spaced at 8 feet on center and connected with 4 inch diameter pipe struts and 4x12 timbers on each side.

Concrete filled pipe bollards define some traffic patterns at the west side of the building and protect the bike storage shelter from vehicles.

The fuel tank is south of the southeast corner of the building.   The tank is a double-walled, skid-mounted tank resting on an 18 foot long by 9 foot wide concrete pad.

There is one concrete launch ramp on the north side of the property. This dates from the early 1940’s. The surface is pitted but appears to be useable.

Site-Civil Deficiencies

Observed deficiencies in site civil systems include:


Rain leader & derelict vault


Derelict stairs at South Side of building

1) Roof drain leaders and dry wells are ineffective as the ground is typically saturated and water from the leaders saturates the surface and flows over sidewalks.
2) The walk at the main entry has many expansion joints in it. The material in these joints has failed, leaving large gaps between concrete. The gaps exceed the allowable amounts prescribed by the ADA.
3) Paving is pitted and many joints have spalled. The surface is rough and does not meet ADA requirements. There are embedded pieces of steel in the pavement that resist wear. There are abandoned vaults from the fueling system. One is partially covered with a steel plate.
4) The access road is poor and undefined.
5) There is debris from an abandoned fuel hose reel and steel enclosure on the beach. This should be removed.
6) The access easement across the north edge of the parking lot is poorly defined.
7) A public sewer system crosses the property but it is not defined by an easement agreement.
8) The age of the water service is unknown.
9) The derelict stairs south of the building are an attractive hazard.

Site Civil Recommendations:


Fuel Reel Debris on Beach


Standing water at building

1) Construct a storm drain system that collects water from drain leaders and delivers it to the unpaved area between the north edge of the parking lot and Sitka harbor. The system should extend to the south side of the building and collect drain leaders there. This system will require cutting existing pavement and patching the pavement.
   Cost: $30,000 storm water retention gallery
   Cost: $125,000 storm drain to tidewater
2) Repair or replace pavement at the main entry with large gaps.
   Cost: In Architectural
3) Pavement should be overlain with asphalt paving and restriped.
   Cost: $270,000
4) The access road should be repaved and defined by striping and signage.
   Cost: In Landscape
5) Remove the debris on the beach
   Cost: $500

6) Access across the property should be well defined physically with a corresponding legal description. The access should be along a smooth, well-paved surface that is defined by proper striping and signage.
   Cost: In Landscape
7) An easement for the public sewer across the property should be established.
   Cost: $5,000
8) Develop as-built plans for the water service.
   Cost: $8,000
9) Demolish the derelict stairs south of the building.
   Cost: $25,000

Mechanical Systems

Existing mechanical systems were originally installed in 1988 during the classroom and administration offices renovation of the hangar facility. These mechanical systems included domestic plumbing and sanitary drainage, ventilation systems AHU-1, AHU-2, AHU-3 and related exhaust systems, pneumatic controls, wet and dry sprinkler systems, and the oil-fired boiler hydronic heating systems.

Direct digital controls for new major mechanical components were initially installed in the early 1990's.

During the phased two story computer lab and science classroom addition in 1995 and 1996 additional mechanical systems were added including ventilation system AHU-4, related exhaust air systems, extension of plumbing systems with oil-fired domestic water heater, sewage ejector and dilution tank for sanitary sewer for additional science classrooms, direct digital controls, and an extension of the wet sprinkler systems.

In 2006 a welding lab addition was added to hanger facility with AHU-5 ventilation system supplying the heating and ventilation air, multiple welding exhaust fans, and extensions to the wet sprinkler system and direct digital controls.

In 2008 AHU-3 ventilation unit was replaced during the multi-technical classroom conversion of the former welding lab.

Generally all occupied areas of the facility are ventilated with mechanical ventilation and heated except the interior open space currently used for storage and carpentry projects. The interior open space does receive heat from the occupied areas as well as any heat rejected into the open space from air-conditioning unit condensers AC's, exhaust fans, etc.

The sanitary system in the western half of the facility must drain into a sewage ejector and thus any modifications need to consider drainage requirements carefully.

A 52 gallon heat pump style hot water tank with electric elements was installed in 2009 to heat the domestic water from excess boiler room heat. The tank has back up electric elements for additional capacity.

In 2009 the oil supply pump was moved to the interior of the building with a spill tank located below the pump.

An energy audit was conducted in 2009 under a separate contract, the salient comments of which have been incorporated into this report.

Ventilation/Exhaust Systems

AHU-1

AHU-1

Ventilation Unit AHU-1 is located in a fan room off of the mezzanine and serves the original 1988 classroom and administration portion of the facility. AHU-1 was manufactured by BOHN. The single fan unit takes in outside air from a louver on the north side of the facility through a mixing box with outside air and return air dampers then through 2-inch filters, then through a heating coil into the fan section. The outside air return air mixing dampers are original, and are in poor condition The outside damper does not appear to close completely. A variable speed drive was installed a few years ago, and the existing fan inlet vanes were fixed open to accommodate.

Inside AHU-1 looking at mixing box. Note corrosion of dampers and deteriorating insulation liner.

The AHU-1 fan delivers the tempered and filtered air through ductwork out to first generation zoned variable air volume VAV boxes which are controlled by room thermostats. The VAV boxes located throughout the ceiling plenum space then distribute the air to their respective ventilation zone through ceiling slot diffusers.

AHU-1 Relief Fan RF-2; Note access through hatch to fan. RF discharges to hanger space through grille on right side of rated enclosure. RF-1 the same about 6 feet behind.

Return air from the space is drawn into the ceiling space return air plenum through ceiling grilles and then back to the AHU-1 fan room where it is either mixed with outside air in the AHU-1 mixing box or where two staged relief fans exhaust/relieve the air into the hangar space. Two duct silencers are located at the fan room walls of the second floor and allow return air into the fan room.

AHU-1 Relief Fan RF-2.

The two relief fans RF-1 and RF-2, are PENN Breezeway BF24 units. They are a propeller type and are located above the fan room in separate rated enclosures, accessible from the upper mezzanine space,(see left pictures). The relief air fans are dirty and apparently do not operate very much.

The AHU-1 fan was a medium quality fan when it was installed over 20 years ago and has an estimated 5-10 years of service life remaining before major maintenance will be required; i.e. replacing the fan assembly or heating coil. AHU-1 is undersized for area served.

Toilet Exhaust Fan EF-4

The two story building area that the AHU-1 fan system serves contains several rooms that are not supplied ventilation. Any area that is occupied and does not have mechanical or natural ventilation is in violation of building codes.

Toilet exhaust fan EF-4, is a TRANE utility fan, and is located above the AHU-1 Fan Room and exhausts air from both the first floor and second floor toilet rooms of the 1988 classroom renovation area.

AHU-1 SUPPLY DUCT WITH MODIFICATIONS – NOTE SMALL DUCT ADDED

Several modifications have been made to AHU-1 duct system.   Variable air volume terminal boxes are first generation air valve type. They should be replaced.

AHU-2 SYSTEM

Ventilation Unit AHU-2 is a single fan system located on the second floor mezzanine viewable from inside the hangar. AHU-2 supplies ventilation air to the Art/Multi Purpose classroom on the first floor only. Relief air is routed from the classroom out through the mezzanine into the open hanger space. The outside air return air mixing dampers are original, and are in poor condition   The outside damper does not appear to close completely.

Exhaust Fan **EF-3**, is a TRANE utility set and located on the mezzanine. It exhausts air from the Art/Multi Purpose Room fume hood and the AHU-2 ventilation area.

AHU-2

A Fume Hood and Sand Blaster Cabinet are located in the Art/Multi Purpose class room. The equipment is connected to the AHU-2 ventilation system. The fume hood sucks in dust from the adjacent sand blaster and exhausts it out through EF-3 system.

AHU-3 SYSTEM

Ventilation Unit AHU-3 is a single fan system located on the second floor mezzanine and is viewable from inside the hangar.   AHU-3 supplies ventilation air to the Multi Tech classroom on the first floor only. AHU-3 was recently downsized and replaced in 2008. Relief air is routed from the classroom out through a separate duct to the mezzanine with an automatic relief air damper that controls the relief air exhausted into the open space of the hangar.

EF-3 DISCHARGE, NOTE DUST ESCAPING DUCT SEAMS

Exhaust Fan **EF-2,** a TRANE unit located on the mezzanine, is an intermittent general duty exhaust fan for the Multi Purpose Technical Classroom and is controllable from a wall mounted switch in the classroom.

Original **EF-1** exhaust fan was removed during the AHU-3 replacement.

AHU-4

Ventilation unit AHU-4, located on the mezzanine above the second story of the addition, supplies heated and mixed air to zone dual duct terminal boxes for the 1995-96 classroom addition. Wall thermostats control the terminal boxes, several of which have cooling coils. Outside air is taken in through a louver located on the south side of the building. AHU-4 fan motor has been modified with a variable speed drive controlled by duct static pressure sensors.

EF-3, NOTE DUST AROUND FAN

Return Fan **RF-4** is located adjacent to AHU-4 on the mezzanine above the second story of the addition and returns air from the classroom addition or exhaust it out the building through the roof top exhaust cap. RF-4 fan motor has been modified with a variable speed drive controlled by duct static pressure sensors.

Exhaust **fans EF-4, EF-5, EF-6, EF-7, and EF-**8, located on the mezzanine above the second story of the addition, serve a variety of exhaust air systems in the classroom addition. The exhaust fans are Twin Cities utility sets and are in good condition. EF-4 and EF-5 serve the 1995-95 Toilet room exhaust. EF-6 serves the BIO/CHEM Lab exhaust air. EF-7 & EF-8 serve separate BIO/CHEM hoods.

FUME HOOD, SAND BLAST ABRASION CENTER

AHU-5

Ventilation unit AHU-5, is located on the mezzanine above the Welding Shop Area on the second story of that addition, and supplies make-up air and supply air heating and ventilation air for the Welding Shop area. Outside air is taken in through a louver located on the south side of the building. AHU-5 Heating Coil has Face & Bypass dampers useful for full outside air operation when in make-up air mode, as occurs when welding shop exhaust fans are operating. AHU-5 is a recent addition (2005) and in good condition.


AHU-3

WELDING SHOP EXHAUST FANS EF-10, EF-11, EF-12, EF-13, and EF-13, located on the mezzanine above the second story of the welding shop addition, serve multiple welding stations in the welding shop below. The exhaust fans are Nederman utility sets and are in good condition.

WOODSHOP DUST COLLECTION SYSTEM
A portion of the open unheated work space in the hanger facility contains wood shop and carpentry equipment. The Wood Shop classroom is sprawled about in the open western space part of the Hangar space. The dust collection system is comprised of a self contained portable system with two portable dust collection canisters and flexible duct connections. However, this type of dust collection is not acceptable for meeting code requirements for wood shop classroom settings.

AHU-4

MISCELLANEOUS EXHAUST SYSTEMS

Multi-Tech Classroom Storage Cabinet Exhaust Fan: A small inline fan located in the narrow Storage Room behind the classroom continually exhausts air for the cabinets.

Maintenance Garage General Duty Exhaust Fan: Wall mounted exhaust fan is located in the garage for general duty and is controlled by a variable speed switch on the wall.

Boiler Room Exhaust Fan: A sidewall exhaust fan controlled by a room thermostat is located in the wall of the Boiler Room. Fan is in fair condition but is undersized for the room and could be interfering with combustion air flow.


EF-7

Mechanical Cooling Systems

Chiller WCU-1
An air cooled chiller was installed in the 1996 two story classroom addition. A glycol tank and circulating pump, CP-11 is located at the southwest corner of the building in the utility space. The circulating pump circulates chilled water to the zoned dual duct terminal box cooling coils located in the ceiling space in the 1995-96 two story classroom addition.

The chiller has not been used recently and has reportedly

AHU-5

WELDING EXHAUST FAN

WELDING BOOTHS EXHAUST AIR MANIFOLD, ARM

been idle since shortly after the original installation. Originally there was anticipated to be heavy cooling loads required for the programs intended but these programs did not materialize and the cooling ability of the chiller was not needed.

AC-1 & AC-2:
The Network Server Room and Electrical Rooms on the second floor of the original classroom addition are cooled with split cooling ductless systems, Mitsubishi Mr. Slim units, with the evaporator located on the mezzanine above the two story addition. The evaporators reject the heat to the open space interior of the Hangar. Both of the cooling units are in fair condition, estimated to be at least 10 years old, and with approxmaitly3-8 years of service life left.

VENTILATION AND COOLING SYSTEM

Corrective Measures, options and costs

Category: Code Compliance, Repairs/Renovation Needed, Energy Efficiency, Occupant Comfort

Item 1: AHU-1 System VAV Box Replacement. Replace the first generation variable air volume pneumatic terminal boxes (20) with modern DDC boxes for better control and energy savings, connect to DDC system. RR, EE.

Cost: $80,000.
Priority: High

Item 2: Woodshop Dust Collection System. The dust collection system does not meet current code requirements. Existing system is a recirculation system tied to barrel collection. Since the wood shop area is transient and spread out in the Hanger it is probably not practical to install a dust collection system at this time until a more permanent home for the Wood shop is planned. Recommend eventually to install a fixed dust collection system with recirculation with system connected to each dust producing device. CC
Cost: 85,000.
Priority: High
Item 3: AHU-1 Damper Section Refurbishment. Damper

Dust Collection System

section has corrosion and insulation is deteriorating. Recommend replacing the outside and return air mixing dampers and refurbish metal framing and interior insulation. RR, EE.

Cost: $4,000.
Priority: Medium

WOOD SHOP EQUIPMENT

Item 4: AHU-1 Replacement. The fan system is old, undersized, and will probably require major maintenance in 5-10 years. Recommend to schedule replacement of the fan in next 10 years. RR, EE.
Cost: $30,000.
Priority: Low

Item 5: AHU-2 Damper Section Refurbishment. Damper section has corrosion and insulation is deteriorating. Recommend replacing the outside and return air mixing dampers and refurbish metal framing and interior insulation. RR.

Cost: 4,000.
Priority: Medium

WATER CHILLER

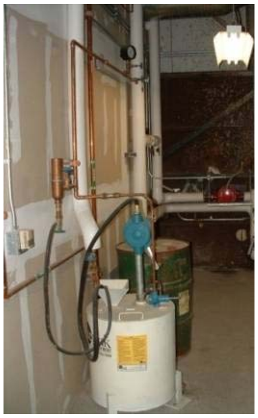
Item 6: AHU-2 Damper Section Refurbishment. Damper section has corrosion and insulation is deteriorating. Recommend replacing the outside and return air mixing dampers and refurbish metal framing and interior insulation. RR.

Cost: 4,000.
Priority: Medium

Item 7: Ventilation Fan Motors not Efficient: In general all fan motors for supply, return, and exhaust fans are not a high efficiency type. Recommend replacing most fan motors with highest efficiency available; premium efficient motors. EE
Cost: 50,000.
Priority: Medium

Item 8: Computer, Electrical, and Mechanical Rooms

Cooling Ventilation. Rooms are excessively hot, with some served by Mechanical Cooling AC units and others with exhaust fans.
Recommend life cycle cost analysis be done of different exhaust air heat recovery systems for the entire facility to determine energy conservation opportunities.
Life Cycle Analysis Cost: $5,000.
Potential Construction Cost: $40,000.
Priority: Medium



Chiller Circulation Pump and Glycol Fill Station.

Item 9: Exhaust Fans Open to Outside, No Dampers: In many cases exhaust fans discharge air without automatic dampers or gravity backdraft dampers to prevent airflow when not in operation. Most of the exhaust fan system exhaust dampers are not sufficient to prevent airflow. Recommend installing gravity backdraft dampers or automatic dampers in all exhaust fan systems, replace fan motors with highest efficiency available; premium efficient motors. EE
Cost: 50,000.
Priority: Medium

AC-1 & AC-2 Condenser Units rejecting heat to Hangar open space.

Item 10: Exhaust Fan EF-4 Replacement. The utility exhaust fan serves the 1988 toilet rooms and is over 20 years old with no filtration. Fan is old; motor is not energy efficient, and capacity of fan undersized for areas nearby. Recommend to replace fan unit and consider heat recovery. RR, EE
Cost: 15,000.
Priority: Medium

INTERIOR AC-1 FAN

Item 11: Art Room Sand Blaster Collection System. The sand blaster recirculates air back into the classroom though the drum filter.

Recommend eventually to install a fixed dust collection system with recirculation with system connected to each dust producing device. CC
Cost: 40,000.
Priority: Medium

Item 12: Exhaust Fan Systems Consolidation System with

Heat Recovery, Variable Speed. Various exhaust fan systems are constant speed and exhaust directly to outside with no heat recovery.

Recommend consolidation of the exhaust system be considered, possible variable speed fans, and a heat recovery system with life cycle cost analysis to determine energy conservation opportunities.

Recommend life cycle cost analysis be done of different exhaust air heat recovery systems for the entire facility to determine energy conservation opportunities.

Life Cycle Analysis Cost: $5,000.
Potential Construction Cost: $40,000.

Item 13: Exhaust Fan EF-3 Cleaning. This fan serves the Art Room fume hood. There is evidence of dust coming out of the EF discharge duct due to lack of sealing of duct joints. Fan is old; motor is not energy efficient, and capacity of fan undersized for areas nearby.
Recommend to replace fan unit and clean ductwork. RR, EE
Cost: 6,000.
Priority: Medium

Electrical


Fig. 2: Utility Transformer

Power Distribution:
The power distribution system incorporates a dedicated utility transformer with service metering, a main switchboard, and numerous branch circuit appliance panels to form a distribution system.

- The service power is rated at 480Y/277 volts, three phase served from a padmounted utility transformer behind the building with a capacity of 750 KVA.

- The main switchboard is rated with a capacity of 1000 amperes. This panel is located inside the building against the wall and adjacent to the utility transformer (Figure 1). It is fed directly from the transformer with three sets of 3 inch conduit enclosing 4 No. 400 MC copper conductors also providing 1000 amperes of capacity.


Fig. 2: Main Switchboard

- The main switchboard was installed with the initial building renovation in 1989. It was manufactured by Siemens, Model FC-I, Series 6.

- The service metering transformers are enclosed inside the main distribution switchboard and circuited to a meter on the building exterior near the utility transformer.

- The main service circuit breakers are shunt trip operated to open by a pushbutton on the building exterior near the utility meter.


Fig. 3: Main Switchboard Service Entrance

- The main switchboard (Figures 2 & 3) is composed of two distribution sections, each with a main service circuit breaker/disconnect. An additional small circuit breaker is also service rated and feeds power to a small life safety panel. The distribution feeder circuit breakers are rated from 45 amperes to 250 amperes.

- From billing records of 2005, 2006, 2007, and 2008, the greatest demand occurred in December of 2008 with a load of 189 KW. The power factor is not recorded on the billing, but with a typical power factor of 88%, the real load is 215 KVA (259 amperes). This is a continuous load maintained for a period of time exceeding 15 minutes. With a projected non-continuous load of 25 percent, the anticipated load to the service and distribution system is 269 KVA (324 amperes).

Fig. 4: Panelboards & Step Down Transformer

- Feeders extend from the main switchboard to nine 480Y/277 volt appliance branch circuit panels, and to the elevator. There is one spare 125 ampere circuit breaker and space for two more circuit breakers (225 ampere, maximum) in the second section.

- The 480 volt panels installed with the 1989 construction are manufactured by Siemens, type CDP-7, Series 7. Those installed with more recent construction are manufactured by Square D, type These panels provide branch circuits primarily for lighting and large equipment.

- Two 75 KVA and two 30 KVA transformers fed from 480 volt panels, step the voltages to 208Y/120 volts, three phase for additional appliance branch circuit panels. All are naturally ventilated dry type, rated with a 150 degree C temperature rise and impedances of 5.10 to 6.35 percent. All are located inside the building.

- There are several 208 volt panels installed with the 1989 construction as well as following construction projects since 1997 (Figure 4). The original panels were manufactured by Siemens, type CDP-7, Series 7. The subsequent panels were manufactured by Square D, type NQOB and NQOD. Most of these panels obtain their power directly from the above mentioned step-down transformers, while some panels are sub fed from the initial panels. These panels provide circuits for receptacles and small equipment.

- All circuits for the 480 volt and 208 volt feeders are single conductors in conduit. Most of the conduit is EMT. The conductor insulation is predominantly THW and THWN.

- The system grounded conductor (neutral) is bonded to ground inside the main switchboard. A No. 3/0 AWG grounding conductor exits from the switchboard to an electrode. The type and configuration of the electrode is unknown and could not be determined in the field.

<u>Branch Circuits:</u>

The branch circuits involve devices and equipment for the building user for equipment, lighting, and heating/ventilation equipment. All are fed from the 480 and 208 appliance branch circuit panels.

- All branch circuits include single conductors installed in conduit. The conduit is predominantly EMT and the conductors utilize THWN and THHN insulation. Metal boxes are used for devices.

- The receptacles include both NEMA 5-15R (15 ampere rated) and 5-20R (20 ampere rated) devices. Most are specification grade. Some of the devices installed with the original construction are hard plastic type while the more recent ones utilize nylon bodies.

- Light switches are predominantly 20 ampere, 277 volt rated. Most are ivory colored, specification grade with traits similar to the receptacles.

- The device plates in the original construction are metallic while those installed since 1997 appear to be non-breakable polycarbonate or nylon type. Most are colored similar to the devices.

- A variety of manual and full voltage magnetic starters are included in the facility to control motors for the heating and ventilation system. The original starters were manufactured by Siemens with those most recently manufactured by Square D.

Lighting:

The building lighting includes primarily troffers in the interior grid ceilings, high bay HID in the main hangar bay, low bay HID and linear fluorescent in the shops, wall mounted HID on the exterior, and pole mounted HID in the parking area. Most of the interior lighting is manually controlled, while the exterior lighting is controlled by a scheduling controller.


Fig. 5: Troffers with Parabolic Louvers

- Most of the office, classroom, laboratory, and common spaces utilize luminaires with linear fluorescent sources. The luminaires installed in 1989 utilize T12 lamps with electromagnetic ballasts, while the more recent installations utilize luminaires with T8 lamps and electronic ballasts.

- The more recently constructed multipurpose classroom utilizes a troffer with a perforated reflector providing a type of direct/indirect illumination. The lamps are the new T5 type powered with electronic ballasts.

- Most of the grid mounted troffers include two or three lamps and utilize parabolic baffles (Figure 5).

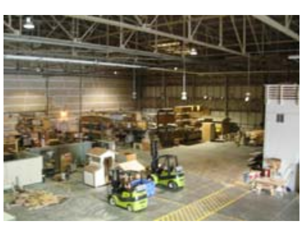


Fig. 6: Hangar High Bay Lighting

- Until recent installations in the shop and multipurpose classroom areas were constructed, the exit signs utilized compact fluorescent lamps. The more recently installed exit signs utilize LED lamps. The signs for the original area are not illuminated.

Fig. 7:Exterior Wall-mounted Luminaires

Fig 8: Entrance Canopy Lighting

Fig 9: Exterior Entrance Floodlight

Fig 10: Exterior Lighting

- Surface mounted luminaires with wrap around acrylic lenses are installed in some of the utility spaces. Other spaces include industrial strips and medium base incandescent type with fluorescent lamps.

- The high bay luminaires in the hangar area utilize metal halide lamps (Figure 6).

- The low bay luminaires in the shops also utilize metal halide lamps.

- The decorative high bay luminaires in the commons atrium focus illumination directly to the floor with no illumination of the walls or ceilings. They utilize HID lamps with electromagnetic ballasts.

- The luminaires mounted to the exterior of the building (Figure 10) and on the parking area light poles are rectangular box type with controlled and cutoff type distributions. The lamps are high pressure sodium presenting a golden color (Figure 7).

- The luminaires under the sidewalk canopy at the entrance present indirect illumination of the ceiling with a metal halide type lamp (Figure 8).

- Floodlights are mounted to the ground inside canisters with windows along the front of the building, aimed to illuminate the building. The lamps appear to be metal halide (Figure 9).

- The luminaires designated to comply with life safety requirements in the originally constructed area are separately powered from a 3KVA, 277 volt, inverter/battery system located in the maintenance shop. The circuits for these designated luminaires are separated from the normally powered luminaires. The luminaires in the areas constructed since 1997 include designated luminaires with battery packs providing the required compliance to life safety regulations for emergency power. Dedicated wall mounted units are scattered around the hangar as well as some of the shop spaces.

- The lighting in most of the rooms is controlled by manual switch. The exterior luminaires are controlled by relays with scheduling controls.

Network/Communications:

Figure 11 - Telephone Terminal Board and Switch

Communications technology has changed dramatically since the original system was installed in 1989. Correspondingly, the telephone system for this facility has also changed dramatically. With the 1989 construction, network computer systems were not common. Since that time, they have become the standard for most facilities. The installations since 1997 include infrastructure for the network and communications systems.

- The telephone and TV service cables enter the building to demarcation boxes and distribution blocks in a dedicated utility room behind the maintenance office on the second floor. These cables are all terminated on mounting boards on the walls (Figure 11).

Fig 12: Network Rack and Distribution System

- The telephone circuits are routed to a switch also mounted on the wall. The switch serves the communications instruments scattered throughout the building with individual cables. This is an analog type system.

- The original building utilized two pair uncategorized cables with RJ11 terminals at the communications instruments. Some remain in use, but most have been converted to more recent installations.

- Newer communications installations utilize cables routed through patch panels in the telephone utility room to instrument terminals utilizing Category 5 or 5e, four pair cables. These cables are terminated to RJ45 jacks for the instruments.

- The network system (Figure 12) incorporates Category 5 and 5e cables routed from an array of patch panels mounted to a plywood board on the wall of the telephone utility room to terminals scattered around the building. The terminals are patched into network switches located in an adjacent rack with patch cables. The terminals at the computer work stations utilize RJ45 jacks.

- The servers are located in a separate room on the second floor. They are interconnected to the network system with cables to the rack mounted switches in the telephone utility room.

- The telephone and network cables in the originally constructed area are routed in the ceiling cavities with no supporting structures. Some of the original telephone cables utilize conduits from the ceiling cavities to boxes in the walls for their terminals. Most of the telephone and network cables are installed in surface mounted raceways on the walls, or “fished” into the walls.

- In most of the areas constructed since 1997, the telephone and network cables are routed in cable tray in the ceiling cavities and through conduit from the ceilings to boxes in the walls. There are some portions of cables routed through ceiling cavities without support in larger rooms.

Fire Alarm

The fire alarm system includes manual pull stations, some detection, sprinkler system monitoring, alarm notifications, and annunciation. The original zoned type control system was replaced in 2003 with an addressable type control system.

- The control panel is located in the main entry. It includes all detection and control modules as well as annunciator and display. The system is supported with an emergency, battery supported power supply.
- Smoke detectors are installed in many of the rooms and spaces open to the students, faculty, and public.
- The hangar is monitored with beam type detectors viewing at equally spaced intervals across the ceiling.
- Thermal detectors are located in the mechanical spaces.
- The ventilation systems include duct mounted smoke detectors.
- Manual pull stations are strategically located in the corridors, at stair landings, and at exits in conformance with the codes.
- Horns with strobes and strobes are located in the corridors and common areas. No devices are located in most of the classrooms constructed in 1989, but are included with the classrooms constructed after 1997. Devices are also installed in the restrooms. No devices are installed in the larger, multi-occupant offices.
- The circuits utilize fire alarm cable and single conductors installed in conduit.

FINDINGS

Power Distribution:

- The service and distribution system are in good condition. The system has an excess capacity of approximately 395 KVA (476 amperes). Its remaining service life exceeds 20 years.

- The feeder circuit breakers have provided 20 years of service, and do not appear to have been exercised. Characteristically, they may not respond to fault conditions as originally designed. Thus, they may not protect their circuits accordingly.

- The step-down transformers are all in good condition. Their impedances are high, characteristic of those manufactured twenty years ago. The higher impedances cause higher transient voltages with load surges.

- The appliance branch circuit panelboards are in good condition. The original panels have a remaining service life in excess of 10 years; however, the circuit breakers are near the end of their service life. The panels installed since 1997 are in good condition with a remaining service life in excess of 20 years. Their circuit breakers have at least 10 years of service life remaining.

- All feeder and branch circuits are in good condition with an excess of 20 years service life remaining.

- There is no surge protection equipment on the system.

- The grounding system appears to comply with the minimum requirements of the code. It does not appear to have been tested since its original installation.

Branch Circuits:

- The devices installed with the original construction in 1989 are in fair condition, but have reached the extent of their service life. Those installed since 1997 are in good condition with 10 years of service life remaining.

- The motor controls installed with the original construction in 1989 are in fair condition with approximately five years of service life remaining. Those installed since 1997 retain in excess of 10 years of service life.

Lighting:

- The luminaires and controls installed with the original construction in 1989 are in fair condition with approximately five years of remaining service life. The fluorescent lamps (T12) for these luminaires are destined for extinction in the near future.

- The luminaires and controls installed with construction after 1997 are in good condition with 10 years or more of life expectancy remaining.

- The parabolic type troffers have a low efficiency rating, delivering less than 50 percent of the lamp luminance to the space below. Those with T12 lamps have even less efficiency. These troffers are most applicable where task type lighting is desired. They are generally not appropriate for general, ambient type illumination.

- The indirect/direct type troffers in the new multipurpose classroom have a high efficiency, exceeding 80 percent. These are applicable for general, ambient type lighting, but do not always perform well where task lighting is necessary.

- The decorative HID luminaires in the commons area are quite inefficient in delivering illumination to the walls. As a result, the room seems small with a ceiling appearing much higher than it is.

- Although occupancy sensors are installed in some of the rooms, it appears that they only control the heating and ventilation system.

- The HID luminaires in the hangar and shop areas appear to be left off most of the time due to the slow turn on time, or left on for the same reason. This creates either inadequate lighting, or excess use of lighting.

- The exterior lighting is in good condition with 5 to 10 years of remaining service life. The illumination of the parking area appears to be appropriate for times of darkness when the facility is quite active. It may be excessive for times with little or no activity. The illumination of the areas at the ends of the facility seems appropriate. There is no illumination of the back side.

- The emergency battery/inverter for the life safety lighting in the original area has reached the end of its service life, although it is functional and seems to be in fair condition.

Network/Communications:

- The telephone and network closet is quite crowded. The extent of the network system greatly exceeds its space.

- The infrastructure for cables and terminals in the original facility is essentially nonexistent. Many cables are routed on top of the ceiling tiles contrary to industry standards and codes, allowing mechanical abuse as well as potential cross noise from power sources and luminaires.

- The cable trays, raceways, and terminals in the additions since 1997 are in good condition and meet most of the facility needs. Some cables need additional support to minimize the possibility of mechanical abuse and cross noise.

- The cables installed prior to 1997 are in poor condition and not usable for the current network and communications technology. Much of it still resides in the ceiling spaces and telephone utility room, although not in use.

- The cables installed since 1997 are in good condition, and most are in use.

- The patch panels and terminal boards are in poor condition.

- The telephone systems appear to be in good condition. Communications technology is rapidly progressing with digital equipment utilizing Voice over IP systems. The current infrastructure does not appear to have capacity or features for such an upgrade at this time.

- The UAS IT department now has a standard requiring a minimum of three network drops in each work space. This facility does not meet this standard.

Fire Alarm

- The current fire alarm system is in good condition with 10 to 15 years of remaining service life.

- Many of the manual pull stations are mounted above the code allowed elevation of 48 inches.

- Some of the smoke detectors do not appear to comply with current code requirements for spacing.

- Some multi-occupant rooms do not include strobes or horn/strobes as now required by the codes.

RECOMMENDATIONS

Categories: Code Compliance (CC), Maintenance/Renovation (M/R), Energy Efficiency (EE), System Upgrade (SU)

Power Distribution:

1. M/R: Test the circuit breakers, 100 ampere and greater, in the main switchboard and appliance panels. Replace the smaller feeder circuit breakers.

Cost: $30,000.
Priority: Medium.

2. M/R: Test the system earth ground. Supplement with a new ground grid to achieve a true earth ground of less than 5 ohms as tested with "Drop of Potential" equipment.

Cost: $5,000.
Priority: Medium.

3. M/R: Replace the branch circuit breakers in the older appliance branch circuit panelboards.

Cost: $25,000.
Priority: Medium

4. SU: Provide a surge suppression system with devices connected to the main switchboard and the appliance panels supporting more sensitive equipment.

Cost 20,000.
Priority: Medium

5. M/R: Clean the main switchboard, the transformers, and all of the appliance branch circuit panels.

Cost: $5,000.
Priority: Medium

6. EE: The step-down transformers may be replaced with more efficient units at a later date. However, an evaluation of the payback should be performed first. In this evaluation, consideration should be included for the heating system energy displaced by the heat dissipated from the transformers, where appropriate. The electrical system utilizes primarily energy from a renewable resource while the heating system utilizes nonrenewable energy.

Cost: $30,000.

Priority: Low

Branch Circuits:

1. M/R: Replace the receptacles and switches installed with the original 1989 facility.
   Cost: $15,000.
   Priority: Low

2. M/R: Replace the motor controls also installed with the original 1989 facility within five years.
   Cost: $15,000.
   Priority: Low

Lighting:

1. EE, M/R: In lieu of replacing lamps, sockets, and ballasts in the troffers in the 1989 area, replace the luminaires in their entirety to achieve better efficiency and space illumination.
   Cost: $50,000.
   Priority: Medium

2. EE: Replace the parabolic troffers with T8 lamps in the near future only when the spaces are renovated.
   Cost: $50,000.
   Priority: Medium

3. EE, M/R: Replace the lighting in the commons area.
   Cost: $10,000.
   Priority: Medium

4. M/R: Replace battery inverter system in the next five years.
   Cost: $5,000.
   Priority: Medium

5. EE, M/R: Provide new exit signs with LED lamps in the 1989 area when the other luminaires are replaced.
   Cost: $2,000.
   Priority: Low

6. EE: Replace the exit signs utilizing fluorescent lamps with LED type when those spaces are renovated.
   Cost: $2,000.
   Priority: Low

7. EE: Provide occupancy sensor controls for as many spaces as possible. Integrate them with the DDC system to facilitate heating and ventilation controls where reasonable.
   Cost: $30,000.
   Priority: High

8. EE: Provide occupancy sensors for the common spaces and corridors, integrated into a lighting control system. Program the system to reduce illumination levels when the areas are less active, or not active.
   Cost: $10,000.
   Priority: High

9. EE, Safety: Provide luminaires with fluorescent and/or LED lamps in the shop and hangar areas that are currently illuminated with high or low bay metal halide luminaires. Locate and control these luminaires to provide nominal access illumination through these areas, minimizing the necessity of the HID luminaires for times when more illumination is necessary for longer periods of time. Segregate the HID controls from the smaller luminaires. Segregate the HID sources into smaller groups such that only the lamps needed are active.
   Cost: $20,000.
   Priority: High

10. EE: Upgrade the controls for the exterior lighting to operate only when darkness prevails. Additionally, secure some illumination when the area is less active where reasonable.
    Cost: $10,000.
    Priority: Medium

<u>Network/Communications:</u>

1. SU, M/R: Provide new infrastructure in the 1989 facility when it is renovated. Provide cable tray in the ceiling, integrated with conduits routed

to terminal boxes in the walls. Provide a ground conductor in the cable tray with taps to the conduits.

Cost: $50,000.

Priority: High

2. SU: Provide a ground conductor with the existing cable tray in the classroom areas constructed since 1997.

Cost: $5,000.

Priority: Medium

3. SU, M/R: Replace cables in the 1989 portion of the facility when it is renovated. Upgrade the cable infrastructure to comply with the UAS IT standards.

Cost: $45,000.

Priority: High

4. SU, M/R: Provide additional space for network racks with patch panels with future renovations. Renovate the existing telephone closet with new network racks incorporating patch panels. Segregate some of the circuits to the new space when appropriate.

Cost: $20,000.

Priority: High

5. SU: Provide infrastructure for cables and equipment supporting a videoconferencing facility and distance delivery technology. This includes cable tray, trench duct, wall duct, power receptacles, and data terminals.

Cost: $20,000

Priority: High

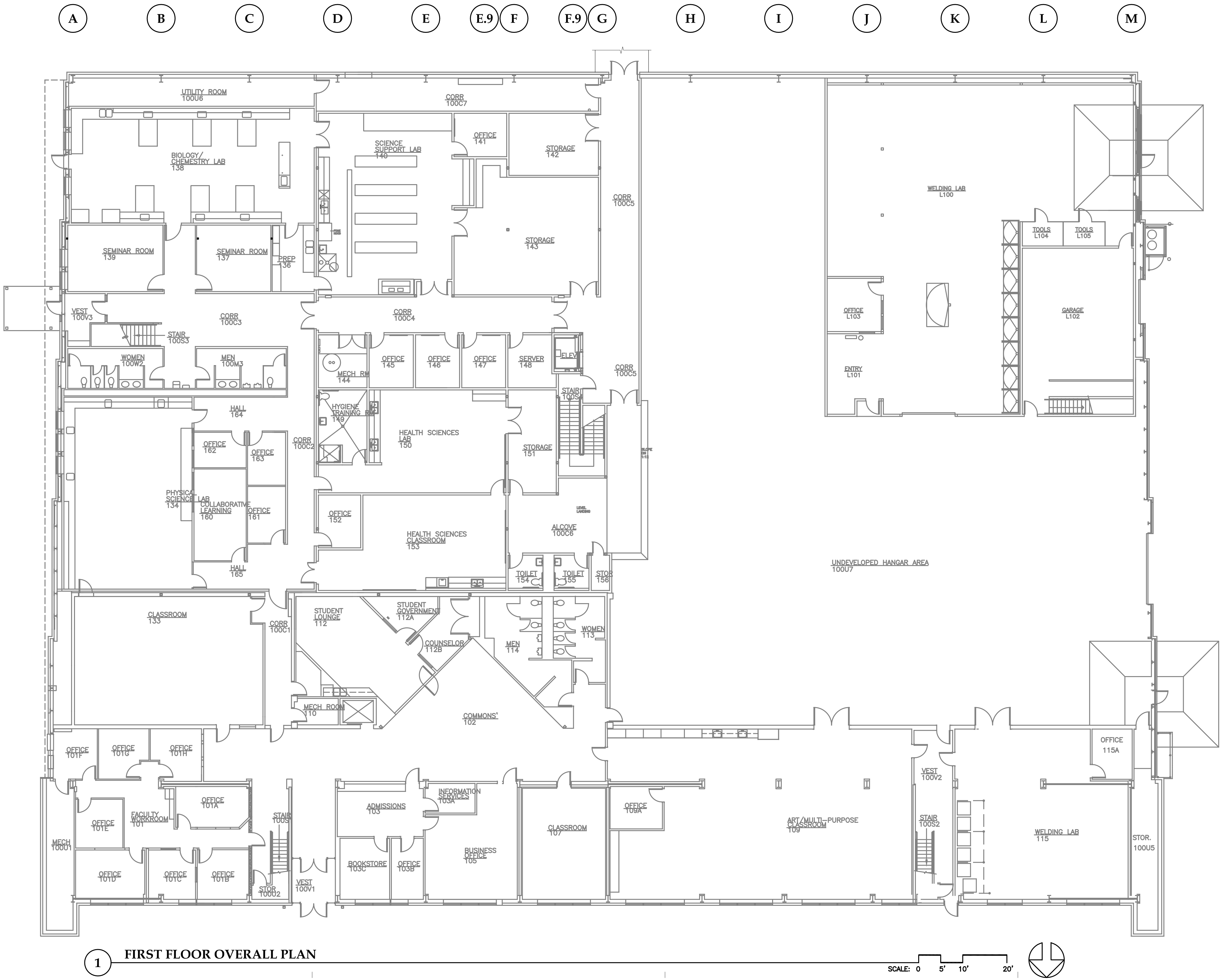
<u>Fire Alarm</u>

1. CC: Adjust the manual pull stations elevations to comply with the codes.
   Cost: $5,000.
   Priority: High

2. CC: Adjust smoke detector positions, and supplement when necessary, to achieve compliance with the code requirements for spacing.
   Cost: $5,000.
   Priority: High

3. CC: Install additional strobes and horn/strobes to achieve code compliance in rooms lacking such devices.
   Cost: $15,000.
   Priority: High

APPENDIX



1 FIRST FLOOR OVERALL PLAN

Jensen
Yorba
Lott
Inc.

522 West 10th Street
Juneau, Alaska 99801
phone 907-586-1070
fax 907-586-3959
jensenyorbalott.com

UNIVERSITY OF ALASKA SOUTHEAST
SITKA CAMPUS
MASTER PLAN

REVISIONS
△ CONFORMED
△ .
△ .

SHEET TITLE
FIRST FLOOR
OVERALL PLAN
.
.

DATE: JUNE 2010
FILE: X

A201

1 SECOND FLOOR PLAN

SCALE: 0 5' 10' 20'

Jensen Yorba Lott Inc.

522 West 10th Street
Juneau, Alaska 99801
phone 907-586-1070
fax 907-586-3959
jensenyorbalott.com

UNIVERSITY OF ALASKA SOUTHEAST
SITKA CAMPUS
MASTER PLAN

REVISIONS
△ CONFORMED
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SHEET TITLE
SECOND FLOOR PLAN
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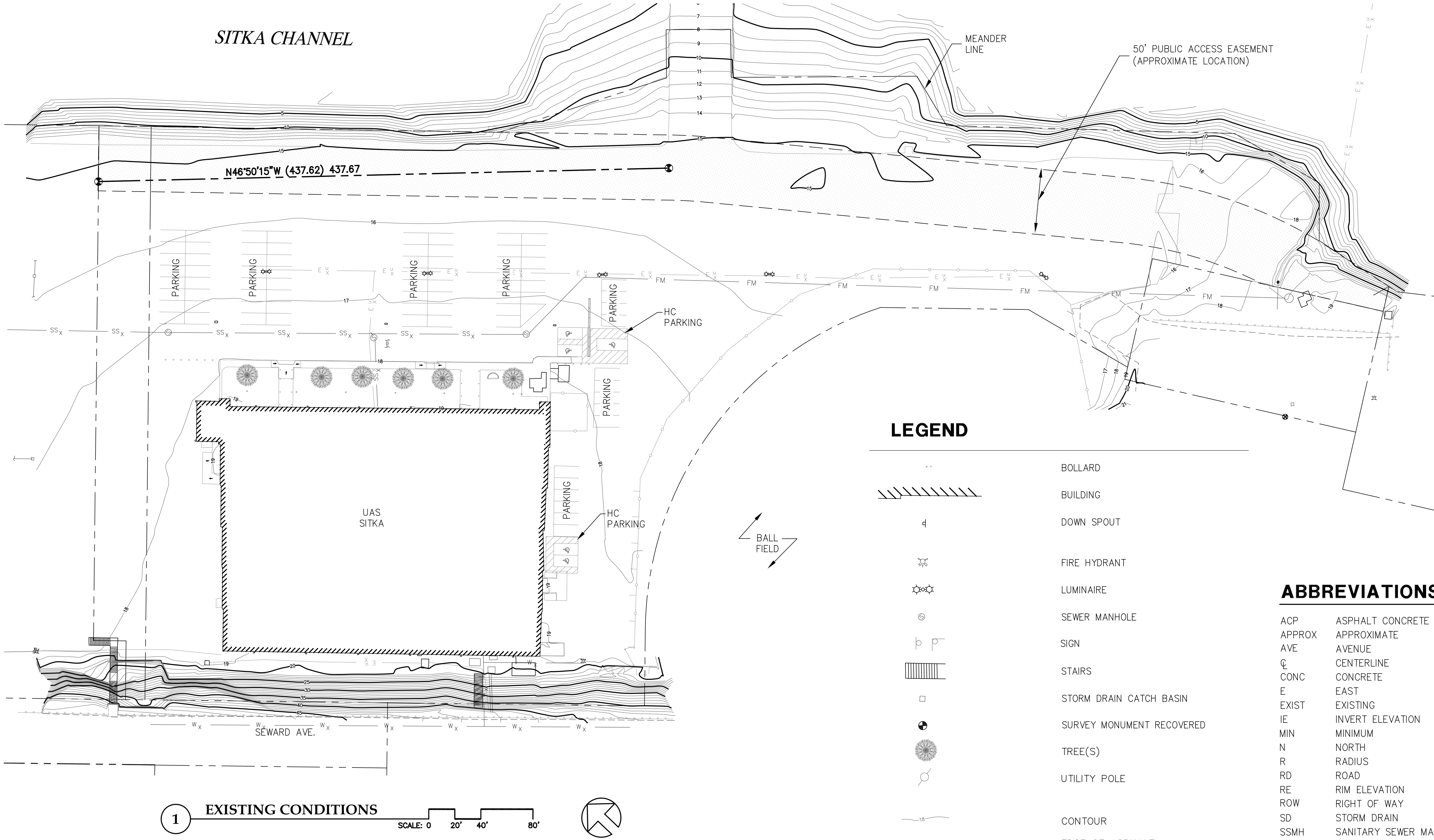
DATE: JUNE 2010
FILE: X

A202



1 EXISTING CONDITIONS SCALE: 0 20' 40' 80'

LEGEND

	BOLLARD
	BUILDING
	DOWN SPOUT
	FIRE HYDRANT
	LUMINAIRE
	SEWER MANHOLE
	SIGN
	STAIRS
	STORM DRAIN CATCH BASIN
	SURVEY MONUMENT RECOVERED
	TREE(S)
	UTILITY POLE
18	CONTOUR
	EDGE OF ASPHALT
	EDGE OF CONCRETE
	FENCE w/ GUY POSTS
	GUARDRAIL
	PROPERTY LINE
E X	UNDERGROUND ELECTRIC LINE
SS X	UNDERGROUND SEWER
FM	UNDERGROUND SEWER (PRESSURE)
SD X	UNDERGROUND STORM DRAIN PIPE
W X	UNDERGROUND WATER LINE

ABBREVIATIONS

ACP	ASPHALT CONCRETE PAVEMENT
APPROX	APPROXIMATE
AVE	AVENUE
℄	CENTERLINE
CONC	CONCRETE
E	EAST
EXIST	EXISTING
IE	INVERT ELEVATION
MIN	MINIMUM
N	NORTH
R	RADIUS
RD	ROAD
RE	RIM ELEVATION
ROW	RIGHT OF WAY
SD	STORM DRAIN
SSMH	SANITARY SEWER MANHOLE
ST	STREET
TYP	TYPICAL
W	WEST

NOTES:
1. BASED ON SURVEY BY PND ENGINEERS INC., MAY 2009.
2. BASIS OF VERTICAL ELEVATION IS MEAN LOWER LOW WATER (MLLW)=0.00 FT.

LANDSCAPE AND SITE CONDITION SURVEY

Jensen Yorba Lott Inc.
522 West 10th Street
Juneau, Alaska 99801
phone 907-586-1070
fax 907-586-3959
jensenyorbalott.com

P N D ENGINEERS, INC.
9360 Glacier Highway, Ste. 100
JUNEAU, ALASKA 99801
PHONE (907) 586-2093
FAX (907) 586-2099

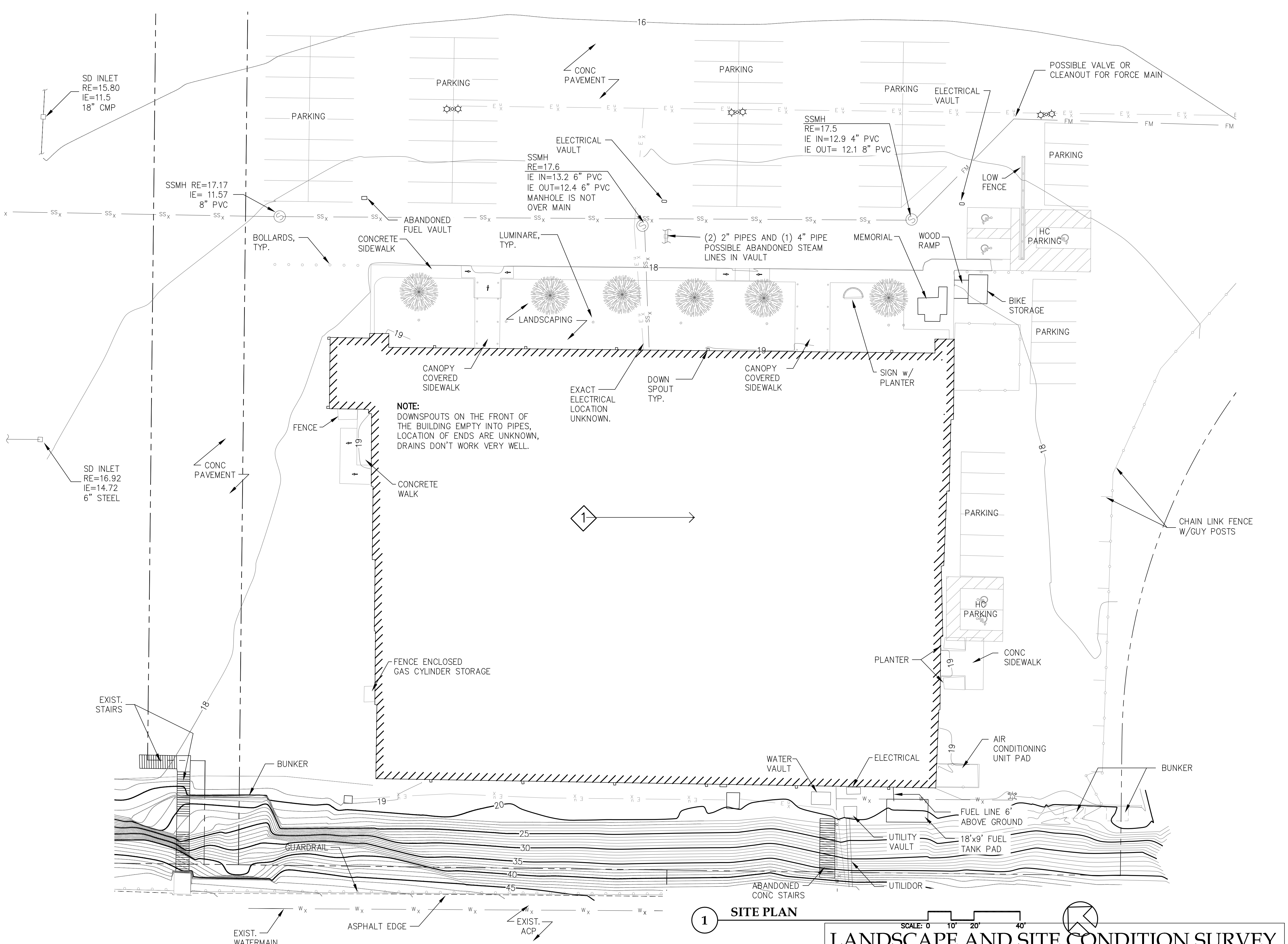
UNIVERSITY OF ALASKA SOUTHEAST
CONDITION SURVEY
xxx
SITKA, ALASKA

REVISIONS

SHEET TITLE
EXISTING CONDITIONS

DATE: MAY, 2009
FILE: 092038.01

C100



1 SITE PLAN

LANDSCAPE AND SITE CONDITION SURVEY

Jensen Yorba Lott Inc.
522 West 10th Street
Juneau, Alaska 99801
phone 907-586-1070
fax 907-586-3959
jensenyorbalott.com

P N D ENGINEERS, INC.
9360 Glacier Highway, Ste. 100
JUNEAU, ALASKA 99801
PHONE (907) 586-2093
FAX (907) 586-2099

UNIVERSITY OF ALASKA SOUTHEAST

CONDITION SURVEY

XXX

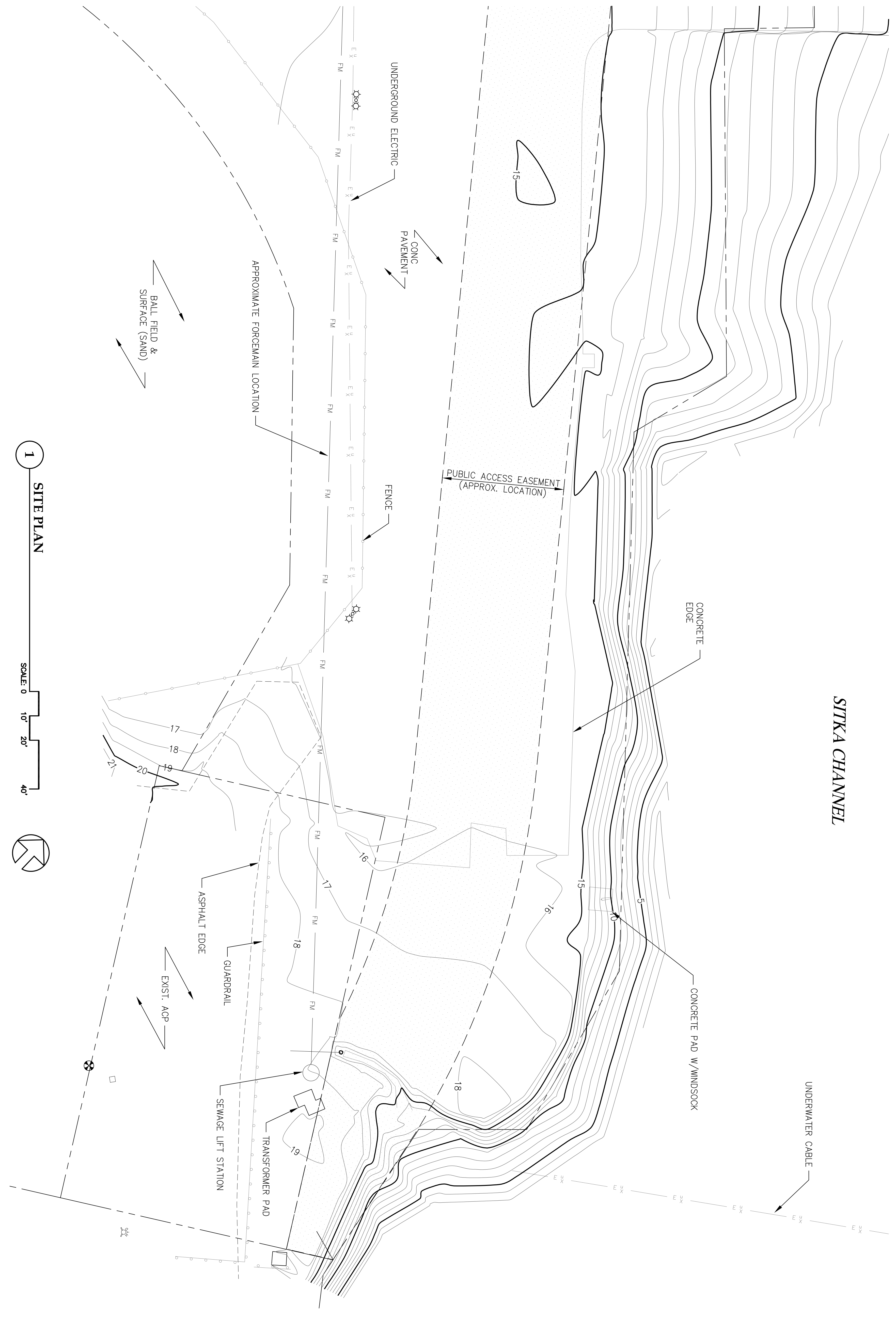
SITKA, ALASKA

REVISIONS

SHEET TITLE
SITE
PLAN

DATE: MAY, 2009
FILE: 092038.01

C101



LANDSCAPE AND SITE CONDITION SURVEY

UNIVERSITY OF ALASKA SOUTHEAST

CONDITION SURVEY

XXX

SITKA, ALASKA

Jensen Yorba Lott Inc.
522 West 10th Street
Juneau, Alaska 99801
phone 907-586-1070
fax 907-586-3959
jensenyorbalott.com

P N D ENGINEERS, INC.
9360 Glacier Highway, Ste. 100
JUNEAU, ALASKA 99801
PHONE (907) 586-2093
FAX (907) 586-2099

REVISIONS

SHEET TITLE
SITE PLAN

DATE: MAY, 2009
FILE: 092038.01

C102

Jensen Yorba Lott, Inc.
522 West 10th Street
Juneau, AK
ph 907-586-1070 fax 907-586-3959

Plan analysis based on
the 2006 International Building Code

Project Number: 0670 Date: June 26, 2010
Project Name: UAS Sitka Campus Conditions Survey Repor
Address:
Contractor:
Occupancy: B,S-2 Architect:
Construction: V-B Engineer:
Report By: Tony Yorba

NOTE: The code items listed in this report are not intended to be a complete listing of all possible code requirements in the 2006 IBC. It is a guide to selected sections of the code.

Report created using Plan Analyst software by IHS Global 800-854-7179

SPRINKLER SYSTEM:
NFPA 13 sprinkler system throughout the building
Sprinkler system used to increase the allowable area and height.
-- Sec. 504.2 and 506.3

FRONTAGE INCREASE:
Perimeter of the entire building = 830 feet.
Perimeter which fronts a public way or accessible open space = 830 feet.
Minimum width of public way or accessible open space = 70

FL	NAME	OCC	MAX FLR	AREA	ALLOWED	RATIO	STATUS
2	Office	B	ok	20000	UNLIMITED	AREA	OK
TOTAL FOR FLOOR				20000	UNLIMITED	AREA	OK
1	Office	B	ok	45710	UNLIMITED	AREA	OK
1	Parking Garage	S-2	ok	840	UNLIMITED	AREA	OK
TOTAL FOR FLOOR				46550	UNLIMITED	AREA	OK
BUILDING TOTAL				66550	UNLIMITED	AREA	OK

-- Sec. 503, 504, 506 and Table 503

Allowable area and height calculations are based on the most restrictive use. Different uses are not separated by fire barriers.
-- Sec. 508.3.2.2

The actual height of this building is 45.0 feet.
The maximum height of this building is 60.0 feet. -- Table 503 and Sec. 504.2

Code review for:
Project Id.: UAS Sitka Campus Conditions Survey Repor
Address:

PROPERTY DESCRIPTION:
North Side has a public way. - Distance to public way = 40.0 ,width = 60.0
Exterior wall rating based on distance to center line of public way.
-- Sec. 702.1 FIRE SEPARATION DISTANCE
East Side has building. - To building = 300.0 ,assumed property line 150.0
Exterior wall rating based on distance to assumed property line.
-- Sec. 704.3 and 702.1 FIRE SEPARATION DISTANCE
South Side has a property line. - Distance to property line = 500.0
West Side has a property line. - Distance to property line = 500.0

EXTERIOR WALL FIRE RATINGS AND OPENING PROTECTION
Sec. 602, Tables 601 and 602, and Sec. 704

	NORTH			EAST			SOUTH			WEST		
OCC	BRG WALL	NON BRG	OPNG% UP/PR	BRG WALL	NON BRG	OPNG% UP/PR	BRG WALL	NON BRG	OPNG% UP/PR	BRG WALL	NON BRG	OPNG% UP/PR
B	0-hr	0-hr	NL/NL	0-hr	0-hr	NL/NL	0-hr	0-hr	NL/NL	0-hr	0-hr	NL/NL
S-2	0-hr	0-hr	NL/NL	0-hr	0-hr	NL/NL	0-hr	0-hr	NL/NL	0-hr	0-hr	NL/NL

The exterior walls may be of COMBUSTIBLE material. -- Sec. 602.5
Exterior walls are required to be fire-rated for exposure to fire:
1. From Both sides when fire separation is 5 feet or less.
2. On the interior side only when separation is greater than 5 feet.
   -- Sec. 704.5

Then maximum percent of area of unprotected opening has been adjusted for an automatic sprinkler system. -- Sec. 704.8.1

up/pr = Maximum percent of openings in the exterior wall.
-- Table 704.8
up - The maximum percent if all openings are unprotected.
pr - The maximum percent if all openings are protected.
If some are protected and some are not, then use formula in Sec. 704.8
Openings in 1hr walls are required to be protected with 3/4 hour assemblies. -- Sec. 704.12 and Sec. 715.5
Openings in walls required to be greater than 1hr are required protected with 1 1/2 hour assemblies. -- Sec. 715.5
NL = No fire protection requirements for openings.
NP = Openings are not permitted in this wall.

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Note: Unlimited unprotected openings are allowed in walls not required to fire-resistant. -- Table 704.8, Note: i.

* = These walls may be required to have a parapet wall 30 inches above the roofing. The parapet wall is required to have the same fire rating as the wall and shall have noncombustible faces for the uppermost 18 inches. -- Sec. 704.11
Exception 1: A parapet wall is not required when the wall is not required to be fire-resistive.

FIRE RESISTANCE RATINGS FOR BUILDING ELEMENTS -- Table 601

ELEMENT	MATERIAL	RATING	NOTES
Structural Frame	Any	0 hour	
Interior Bearing wall	Any	0 hour	
Interior nonbrg wall	Any	0 hour	
Shaft Enclosure	Any	1 hour	Note 1
Floor/Ceiling Assembly	Any	0 hour	Note 9
Roof/Ceiling Assembly	Any	0 hour	
Stairs	Any	None	

NOTES:
1. Fire resistance rating for shafts based on Section 707.4
   NOTE: See Section 707.2 for shaft enclosure exceptions.
9. Parking surfaces shall be of concrete or similar noncombustible and nonabsorbent materials. Asphalt parking surfaces are permitted at ground level. -- Sec. 406.2.6

SHAFT REQUIREMENTS:
Openings other than those necessary for the purpose of the shaft shall not be permitted. -- Sec. 707.7.1
Penetrations other than those necessary for the purpose of the shaft shall not be permitted. -- Sec. 707.8.1
Shafts that do not extend to the bottom of the building shall:
1. Be enclosed at the lowest level with the same fire-resistance rating as the lowest floor but not less than the rating of the shaft enclosure; or
2. Terminate in a room having a use related to the purpose of the shaft. The room and openings shall have a fire-resistance rating at least equal to the shaft enclosure; or
3. Be protected by approved fire dampers installed at the lowest floor level within the shaft enclosure.
   -- Sec. 707.11

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DRAFTSTOPPING:
Draftstopping is not required in buildings equipped throughout with an automatic sprinkler system in accordance with NFPA 13. -- Sec. 717.3.3 Exception (floor) and Sec. 717.4.3, Exception (attic)
Opening in the partitions shall be protected by self-closing doors with automatic latches constructed as required for the partitions.
-- Sec. 717.4.1.1

OCCUPANCY SEPARATIONS -- Sec. 508.3.3 and Table 508.3.3
Uses are not separated by fire barriers. The construction of the building is based on the most restrictive use. -- Sec. 508.3.2

SEPARATION OF INCIDENTAL USE AREAS -- Table 508.2
Furnace rooms where any piece of equipment is over 400,000 BTU per hour input -- Smoke barrier -- Sec. 508.2.2.1
Rooms with any boiler over 15 psi and 10 horsepower -- Smoke barrier -- Sec. 508.2.2.1
Refrigerant machinery rooms -- Smoke barrier -- Sec. 508.2.2.1
Parking garages -- 1 hour and an automatic sprinkler system
Hydrogen cut-off rooms not classified as Group H -- 1 hour
Incinerator rooms -- 2 hours and an automatic sprinkler system
Storage rooms over 100 square feet -- Smoke barrier -- Sec. 508.2.2.1
Stationary lead-acid battery systems having a liquid capacity of more than 100 gallons used for facility standby power, emergency power or uninterrupted power supplies -- 1 hour

EXIT REQUIREMENTS:

FL	NAME	NUMB OCC	MIN EXITS	MIN WIDTH	PANIC HDWR	CORRIDOR RATING	DOOR SWING	NOTES
2	Office	200	2	30.0	No	N/A	Out	1
TOTAL FOR FLOOR		200	2	40.0	No	N/A	Out	
1	Office	457	2	68.6	No	N/A	Out	1 2
1	Parking Garage	4	1	0.6	No	N/A	N/R	
TOTAL FOR FLOOR		461	2	69.2	No	N/A	Out	

FOOTNOTES:
1. Two exits are required from this area since the occupant load exceeds allowable in Table 1015.1
2. Two exits are required from this area since the common path of egress limits in Section 1014.3

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NOTES FOR EXIT TABLE
Door swing is based on Section 1008.1.2
Occupant load is based on Section 1004 and Table 1004.1.1
Exit width is in inches and based on Section 1005.1 & Table 1005.1
  Width shown for all areas is based on other egress components.
  Width shown for 1st floor is based on other egress components.
  Width shown for other floors & basements is based on stairways.
  For the minimum width of doors, see Section 1008.1.1.
  For the minimum width of stairways, see Section 1009.1.
Exits shall be continuous from the point of entry into the exit to the exit discharge. -- Sec. 1003.6

EXIT SEPARATION
In areas where 2 exits are required, the minimum separation is 1/3 of the maximum diagonal of the area or floor measured in a straight line between exits or exit access doorways.-- Sec. 1015.2.1, Exception 2
Multiple means of egress shall be sized such that the loss of any one means of egress shall not reduce the available capacity by more than 50 percent. -- Sec. 1005.1

EXIT SIGNS
Exits and exit access doors shall be marked by an approved exit sign readily visible from any direction of egress travel. Access to exits shall be marked by readily visible exit signs in cases where the exit or the path of egress travel is not immediately visible. Exit sign placement shall be such that no point in a corridor is more than 100 feet or the listed viewing distance for the sign, whichever is less. -- Sec. 1011.1
Exception 1: Exit signs are not required in rooms or areas which require only one exit.
Exception 2: Main exterior exit doors which obviously and clearly are identifiable as exits need not be signed when approved.
Exit signs shall be internally or externally illuminated.
-- Sec. 1011.2
Exit sign shall be illuminated at all times including during loss of primary power. -- Sec. 1011.4 & Sec. 1011.5.3

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BOLT LOCKS:

Manually operated flush bolts and surface bolts are not permitted. -- Sec. 1008.1.8.4

Exception 2: Where a pair of doors serves a storage or equipment room, manually operated edge- or surface-mounted bolts are permitted on the inactive leaf.

The unlatching of any door or leaf shall not require more than one operation. -- Sec. 1008.1.8.5

Exception 2: Where manually operated bolt locks are permitted.

Exception 3: Doors with automatic flush bolts as permitted.

LOCKS AND LATCHES:

Egress doors shall be readily openable from the egress side without the use of a key or any special knowledge or effort. -- Sec. 1008.1.8

Locks and latches shall be permitted to prevent operation where any of the following exists:

Exception 2: The main door or doors in Group B, F, M and S areas are permitted to be equipped with key operating locking devices from the egress side provided:

2.1 The locking device is readily distinguishable as locked.

2.2 A readily visible durable sign is posted on the egress side stating: THIS DOOR TO REMAIN UNLOCKED WHEN BUILDING IS OCCUPIED

Exception 3: Where egress doors are used in pairs, automatic flush bolts shall be permitted to be used, provided the door leaf having the automatic flush bolts has no doorknob or surface-mounted hardware.

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ADDITIONAL DOORS:
Where additional doors are provided for egress purposes, they shall conform to the requirements in Section 1008.1
LANDINGS AT DOORS:
1. There shall be a floor or landing on each side of a door. -- Sec. 1008.1.4
2. Such floor or landing shall be at the same elevation on each side of the door. -- Sec. 1008.1.4
3. The floor or landing shall not be more than 1/2 inch lower than the threshold. -- Sec. 1008.1.6
4. Landings shall have a width not less than the width of the stairway or width of the doorway, whichever is the greater. Where a landing serves an occupant load of 50 or more, doors in any position shall not reduce the landing dimension to less than one half it required width. The minimum length in the direction of exit travel is 44 inches. -- Sec. 1008.1.5
5. The space between two doors in series shall be 48 inches plus the width of door swinging into the space. -- Sec. 1008.1.7

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ELEVATION CHANGE:
Where changes in elevation of less than 12 inches exists in the means of egress, sloped surfaces hall be used. -- Sec. 1003.5
Exception 2: A stair with a single riser or with two risers and a tread is permitted at locations not required to be accessible. The minimum depth of the tread is 13 inches. A handrail is required within 30 inches of the centerline of the path of egress travel.
STAIR REQUIREMENTS:
Stairways:
1. The riser heights shall not be less than 4 inches or greater than 7 inches. The minimum tread depth is 11 inches. -- Sec. 1009.3 The maximum variation is 3/8 inch between the largest and the smallest in a stairway flight. -- Sec. 1009.3.2
2. The minimum width of a stairway is 36 inches, 44 inches if the occupant load is more than 49. -- Sec. 1009.1
   Also, check exit table above to see if minimum width is greater than 44 inches.
   When a stairway is part of an accessible means of egress, the stairway shall have a clear wdith of 48 inches. -- Sec. 1007.3
3. Provide a handrail on each side of stairways. -- Sec. 1009.10
   Handrail height, measured above stair tread nosing, shall be not less than 34 inches and not more than 38 inches. -- Sec. 1012.2
   Handrails with a circular cross section shall have an outside diameter of at least 1 1/4 inches and not greater than 2 inches or shall provide equivalent graspability. -- Sec. 1012.3
   Handrail-gripping surfaces shall be continuous without interruption by newel post or other obstructions. -- Sec. 1012.4
   Handrails shall return to a wall, guard or the walking surface or shall be continuous to the handrail of an adjacent stair flight. Where handrails are not continuous between flights, the handrails shall extend horizontally at least 12 inches beyond the top riser top riser and continue to slope for the depth of one tread beyond the bottom riser. -- Sec. 1012.5
4. Open sides of walking surfaces which are located more than 30 inches above the floor or grade below are required to have a guard. -- Sec. 1013.1
5. The minimum height of guard is 42 inches. -- Sec. 1013.2
6. Open guards shall have balusters or ornamental pattern such that a 4-inches diameter sphere cannot pass through any opening up to a height of 34 inches. From a height of 34 inches above the adjacent walking surface to 42 inches above the walking surface, a sphere 8 inches in diameter shall not pass. -- Sec. 1013.3
   Exception 1. The triangular opening formed at the riser, tread and guardrail may be 6 inches.
   Exception 3. Areas which are not open to the public within I-3, F, H, or S occupancies, balusters, horizontal intermediate rails, or other construction shall not permit a sphere with a diameter of 21 inches to pass through.
7. The minimum headroom clearance is 80 inches (6 ft.- 8 inches.) measured vertically from a line connecting the edge of the nosing.

Headroom shall be continuous to the point where the line intersects the landing below. The minimum clearance shall be maintained the full width of the stairway and landing. -- Sec. 1009.2

8. Enclosed usable space under the stairs is required to be protected on by 1-hour fire-resistive construction or the fire-resistance rating of the stairway enclosure, whichever is greater. -- Sec. 1009.5.3
9. A flight of stairs shall not have a vertical rise greater than 12 feet between floor levels or landings. -- Sec. 1009.6

STAIRWAY ENCLOSURES:

1. Stairways are required to be in 1 hour fire resistive exit enclosures. -- Sec. 1020.1

   Exception 4: Stairways that are not a required means of egress element only need to comply with shaft enclosure requirements in Section 707.2
   See Exception 2 to shaft enclosures in Section 707.2

   Exception 8: 50 percent of egress stairways serving one adjacent floor are not required to be enclosed, provided at least two means of egress are provided from both floors.

   Exception 9: Stairways serving on the first and second stories are not required to be enclosed, provided at least two means of egress are provided from both floors served by the unenclosed stairways.

2. The openings into the exit enclosure are required to be 1 hour fire assemblies. -- Table 715.4
   Openings into enclosure are limited to those necessary for exit access to the enclosure from normally occupied spaces and for egress from the enclosure. -- Sec. 1020.1.1
   Doors shall be self-closing or automatic closing. -- Sec. 715.4.7

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3. Exit enclosure must discharge directly to the exterior of the building.
   -- Sec. 1024.1
   Exception 1: 50 percent of the number and capacity may exit through
                areas on the level of discharge provided all of the
                following are met:
     1.1 There is a free and unobstructed way to the exterior that is
         readily visible and identifiable form the exit enclosure.
   Exception 2: 50 percent of the number and capacity may exit through
                a vestibule provided all of the following are met:
     2.2 The depth from the exterior of the building is not greater than
         10 feet and the length is not greater than 30 feet.
     2.3 The vestibule is separated from the remainder of the level of exit
         discharge by construction providing at least the equivalent of
         approved wired glass in steel frames.
     2.4 The vestibule is used only for means of egress and exits directly
         to the outside.

4. The walls and soffits within enclosed usable spaces under stairways
   shall be protected by 1 hour fire resistant construction. Access to
   the enclosed usable space shall not be directly from within the
   stair enclosure. -- Sec. 1019.1.5
   -- Sec. 1019.5

ELEVATOR REQUIREMENTS:
1. An approved pictorial sign of a standardized design shall be posted
   adjacent to each elevator call station on all floors instructing
   occupants to use the exit stairways and not to use the elevators
   in case of fire. -- Sec. 3002.3

EXIT ACCESS TRAVEL DISTANCE:
The maximum travel distance in Group B  is 300 feet. -- Table 1016.1
The maximum travel distance in Group S2 is 400 feet. -- Table 1016.1
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BUILDING ACCESSIBILITY

1. In addition to accessible entrances required by Sections 1105.1.1 through 1105.1.6, at least 60 percent of all public entrances shall be accessible. -- Sec. 1105.1
2. At least one accessible entrance shall be provided to each tenant, dwelling unit and sleeping unit in a facility. -- Sec. 1105.1.6
3. Where parking is provided, accessible parking spaces hall be provided in compliance with Table 1106.1 -- Sec. 1106.1
   See additional requirements for outpatient and rehabilitation facilities. -- Sec. 1106.3 and 1106.4
4. At least one accessible route shall connect each accessible level. -- Sec. 1104.4 See exceptions.
5. Accessible routes shall coincide with or be located in the same area as a general circulation path. Where the circulation path is interior, the accessible route shall also be interior. -- Sec. 1104.5
6. On floors where drinking fountains are provided, no fewer than two drinking fountains shall be provided. One drinking fountain shall comply with the requirements for people who use a wheelchair and one drinking fountain shall comply with the requirements for standing persons. -- Sec. 1109.5.1
   Exception: A single drinking fountain that complies with both requirements shall be permitted.
   Where more than 2 drinking fountains are provided, at least 50% shall be accessible. -- Sec. 1109.5.2
   Exception: Where 50% yields a fraction, the number may be rounded up or down. Total must be equal to 100% or required.

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LIGHT AND VENTILATION

1. Every space intended for human occupancy shall be provided with natural light by means of exterior glazed openings or shall be provided with artificial light. -- Sec. 1205.1
   When natural light is provided, the minimum net glazed area shall not be less than 8% of the floor area. -- Sec. 1205.2
   Any room is permitted to be considered as a portion of an adjoining room where one half of the area of the common wall is open and unobstructed and provided not less than one tenth of the floor area or 25 square feet, whichever is greater. -- Sec. 1205.2.1
   When artificial light is used, it must provide an average illumination of 10 foot candles over the area of the room at a height of 30 inches above the floor. -- Sec. 1205.3
2. Buildings shall be provided with natural ventilation or mechanical ventilation per the International Mechanical Code. -- Sec. 1203.1
   Natural ventilation of an occupied space shall be through windows, doors, louvers or other openings to the outdoors. -- Sec. 1203.4
   The minimum openable area to the outdoors shall be 4 percent of the floor area. -- Sec. 1203.4.1
   Any room is permitted to be considered as a portion of an adjoining room where unobstructed openings are provided that have an area not less than 8% of the floor area of the interior room but no less than 25 square feet. -- Sec. 1202.3.1.1
   When openings are below grade, clear space measured perpendicular to the opening shall be one and one half times the depth of the opening. -- Sec. 1203.4.1.2
3. Rooms containing bathtubs, showers, spas and similar bathing fixtures shall be mechanically ventilated. -- Sec. 1203.4.2.1

CEILING HEIGHTS:

Occupiable spaces, habitable spaces and corridors shall have a ceiling height of not less than 7 feet 6 inches. Bathrooms, toilet rooms, kitchens, storage rooms and laundry rooms shall be permitted to have a ceiling height of not less than 7 feet. -- Sec. 1208.2

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ACCESSIBLE FACILITIES:

NOTE: Except as noted, section numbers listed below are from ICC/ANSI A117.1-2003

WATER FOUNTAINS AND WATER COOLERS:

Accessible units must comply with the following:

1. Spout outlets for wheelchair accessible fountains shall be 36 inches maximum above the floor. Spout outlets for standing persons shall be 38 inches minimum and 43 inches maximum. -- Sec. 602.4
2. The spout shall be located 15 inches minimum from the vertical support and 5 inches maximum from the front edge, including bumpers. Where only a parallel approach is provided, the spout shall be located 3 1/2 inches maximum from the front edge, including bumpers. -- Sec. 602.5
3. Spouts shall provide a flow of water 4 inches height minimum. -- Sec. 602.6

TOILET FACILITIES:

1. A 60 inch diameter turning space or T-shaped space is required in the toilet room. -- Sec. 603.2.1 and 304.3
   Doors shall not swing into the clear floor space for any fixture. 603.2.3 See exception for rooms used for individual use.
2. Water closet shall be mounted adjacent to a side wall or partition. The distance from the side wall or partition to the centerline of the water closet shall be 16 to 18 in. Sec. 604.2
3. When the accessible water closet is not in a compartment:
   Clearance around the water closet shall be 60 inches minimum, measured perpendicular to the side wall, and 56 inches minimum, measured perpendicular to the rear wall. -- Sec. 604.3.1
4. When the accessible water closet is in a compartment:
   Wheelchair accessible compartments shall be 60 inches wide minimum measured perpendicular to the side wall, and 56 inches deep minimum for wall hung water closets and 59 inches deep for floor mounted water closets, measured perpendicular to the rear wall. -- Sec. 604.8.2
   Compartment doors shall not swing into the minimum required compartment area. -- Sec. 604.8.3

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5. Grab bars shall have a circular cross section with a diameter of 1 1/4 inch minimum and 2 inches maximum, or shall provide equivalent graspability. -- Sec. 609.2
   The space between the wall and the grab bar shall be 1 1/2 inches. Sec. 609.3
   Grab bars shall be mounted in a horizontal position 33 inches minimum and 36 inches maximum above the floor. -- Sec. 609.4
   a. Side wall grab bars are required to start within 12 inches of the backwall and extend to 54 inches from the back wall. (The minimum length of the bar is 42 in) -- Sec. 604.5.1
   b. The rear bar shall be 24 in long minimum, centered on the water closet. Where space permits, the bar shall be 36 in long minimum, with the additional length provided on the transfer side. -- Sec. 604.5.2
6. The top of the water closet seats shall be 17 to 19 inches above the floor. -- Sec. 604.4
7. Accessible urinals shall be of the stall type or wall hung with the rim at 17 inches maximum above the floor. -- Sec. 605.2
8. Accessible lavatories shall be mounted with the rim 34 inches maximum above the floor. -- Sec. 606.3
9. Sinks shall be 6 1/2 inches deep maximum. -- Sec. 606.5
10. Water supply and drain pipes under lavatories shall be insulated or otherwise treated to protect against contact. -- Sec. 606.6
11. Mirrors located above lavatories, sinks or counters shall be mounted with the bottom edge of the reflecting surface 40 inches maximum above the floor. -- Sec. 603.3

FIXTURE COUNT TABLE:

NAME	NUMBER OCC	RATIO M/F	WATER CLOSETS MALE	FEMALE	LAVS M	F	TUB SHOWER	DRINKING FOUNTAIN
2nd. floor								
Office	200	50/50	3	3	3	3	0	2
Ratio = 1 per ____			50	50	80	80	--	100
TOTAL FOR FLOOR	200		2	2	2	2	0	2

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1st. floor

Office	457	50/50	6	6	4	4	0	5
Ratio = 1 per ____			50	50	80	80	--	100
Parking Garage	4	50/50	1	1	1	1	0	1
Ratio = 1 per ____			100	100	100	100	--	400
TOTAL FOR FLOOR	461		5	5	3	3	0	5
BUILDING TOTAL	661		7	7	4	4	0	7

International Plumbing Code Section 403 and Table 403.1

In each bathroom or toilet room, urinals shall not be substituted for more than 50 percent of the required water closets. -- IPC Sec. 419.2

NOTE: The number of fixtures for a floor may not match total number of fixtures per area. The number of fixtures for the building may not match the total for the floors. The number of fixtures for each area and floor are rounded up to the next whole number. Totals are not rounded up until the total is obtained. If the fixtures only serve an area, use number shown for each area. If the fixtures serve an entire floor or building, use number shown for totals.

Energy Audit

Final Report
October 14, 2009

Sitka Campus
University of Alaska Southeast

Prepared for:

University of Alaska Southeast

Prepared by:

Alaska Energy Engineering LLC

25200 Amalga Harbor Road
Juneau, Alaska 99801
Tel/Fax: 907.789.1226
alaskaenergy@earthlink.net

INTRODUCTION

This report presents the findings of a walk-through energy audit of the Sitka Campus of the University of Alaska Southeast. The purpose of the energy audit is to identify energy conservation opportunities (ECO). The audit is performed by Jim Rehfeldt, P.E., Mechanical and Energy Engineer for Alaska Energy Engineering LLC.

A walk-through energy audit represents the initial step toward improving the energy performance of the building. The process for identifying ECOs includes review of energy consumption data, on-site observations, review of construction documents, and interviews with UAS operations and maintenance personnel. The ECOs are identified and ranked in one of the following three categories:

- High Priority: These ECOs are likely to offer a life cycle savings or improve an undesirable condition.
- Medium Priority: These ECOs are believed to offer a life cycle savings. An energy and cost analysis or investigation is recommended to determine which ECOs are most worthy of investing limited funds.
- Low Priority: These ECOs are capable of reducing energy costs but are not likely to offer a life cycle savings.

BACKGROUND

The building for the UAS Sitka Campus has transformed over several construction projects from a former aircraft hanger to an educational facility. The following is a brief timeline:

- Renovation Phase I (1988): Build out of administrative and educational spaces along the north wall of the former hanger building.
- Renovation Phase II (1997): Build out of science laboratories, nursing lab, and a media center along the east wall of the building.
- Roof Replacement (1997): Replaced the roof insulation and membrane.
- Welding Lab (2007): Build out of a welding lab in the southwest corner of the building.
- Multi-purpose Technical Classroom (2008): Renovation of the northwest corner of the building into a Multi-purpose Classroom.

There is interior, open space within the building that is used as shop space. This area is unheated, except for local radiant heaters in the small engines shop, but is tempered by heat loss from the enclosed spaces.

Building Use and Occupancy

The Sitka Campus is a former hanger that has been converted into classrooms, shops, media center, administrative spaces, and other educational spaces. Building occupancy varies daily with class schedules according to the following schedule:

- Monday through Thursday: 8 am to 9 pm
- Friday: 8 am to 5 pm
- Saturday: 9 am to 1 pm

Energy Consumption

Electricity

Electricity is supplied by the City of Sitka Electric Department. Power generation facilities include Blue Lake Hydro, Green Lake Hydro, and the Jarvis Street diesel plant. In 2008, the hydroelectric plants generated 97.6% of the electricity with diesel supplementation of the remaining amount.

Each building is billed under the General Services rate, which charges for both electrical consumption (kWh) and peak electric demand (kW). Electrical consumption is the amount of energy consumed and electric demand is the rate of consumption. Electric demand is determined by averaging demand over a continuously sliding fifteen-minute window. The highest fifteen-minute average during the billing period determines the peak demand. The following table lists the current electric charges:

General Service Rate

Monthly Charge	Rate
Energy Charge per kWh	
First 500 kWh	14.17¢
501 to 10,000 kWh	9.03¢
10,001 to 100,000 kWh	8.50¢
Demand Charge per kW	
First 25 kW	No charge
Over 25 kW	$3.90

Electricity consumption averaged a consistent 590,000 kWh per year over the past four years. Energy demand has averaged 150 kW per month over the same period. Average monthly demand has increased by 12 kW over the past two years due to the addition of the Welding Shop. There may be opportunity to instruct occupants in electric demand control.

Electricity costs have averaged $57,000 per year, at an effective cost of 9.7¢ per kWh.

Fuel Oil

Fuel oil is used to heat the building and domestic hot water. Annual consumption averages 11,300 gallons at a cost of $24,000, based on the current price of $2.10 per gallon.

Annual Energy Consumption and Cost

Source	Consumption	Cost	Energy, MMBH
Fuel Oil	11,300 gals	$24,000	1,500 (43%)
Electricity	590,000 kWh	$57,000	2,000 (57%)
Totals	-	$102,000	3,500 (100%)

Consumption is the average from 2005-2008. Costs are based on 2009 prices.

It is uncommon for a building in Southeast Alaska to consume more non-heating BTUs than heating BTUs. This indicates that there are large electric loads in the building, likely associated with the shop equipment.

DESCRIPTION OF SYSTEMS

Building Envelope

Description

The building consists of an unheated, former hanger with conditioned spaces built out within the hanger enclosure. The outer envelope is insulated, as is the envelope between the interior spaces and the hanger. The following table describes the components of the building envelope:

Walls, Roof, and Floors

Component	Description, inside to outside	R-value
Walls		
Hanger	Metal frame; insulated panels	R-20
Interior walls	Gyp, bd; 6" metal studs w/batt insulation; gyp. bd	R-9
Roof		
Hanger	2" wood deck; 5-1/2" fiberglass insulation; membrane; metal roof	R-30
Interior (Phase I)	Gyp. bd (2); 6" metal studs w/ batt insulation, plywood	R-11
Interior (Phase II)	Gyp. bd (2); wood TJI joists w/batt insulation; plywood	R-34
Floor	Concrete slab-on-grade	R-1
Perimeter footing	Concrete, no insulation	R-2
Windows		
Phase I	Metal frame w/o thermal break; dbl pane glazing; good weather-stripping	R-1.4
Phase II	Metal frame w/ thermal break; dbl pane glazing; good weather-stripping	R-2.0
Storefront	Metal frame w/o thermal break; dbl pane glazing	R-1.6
Skylights		
Phase I	Metal frame w/o thermal break; triple pane glazing	R-2.2
Doors		
Entrance	Metal frame w/o thermal break; dbl pane glazing; poor weather-stripping	R-2.5
Overhead	Metal door/frame w/o thermal break; single pane; good weather-stripping	R-3.0

Analysis

An assessment of the walls and roofs must consider that the inner and outer thermal envelopes add complexity to the wall and roof assessment. The inner and outer R-values cannot be simply added to obtain an overall R-value because the outer area greatly exceeds the inner area and there is considerable open space between them.

Walls: The combined wall insulation is in the optimal range of R-25 to R-30.

Roof: The Phase I roof is below the optimal insulation level of R-50 to R-60. The roof is moderately insulated so that adding more insulation will not provide a life cycle savings. The Phase II roof is well insulated.

Floor Slab: The lack of floor slab insulation is typical of past practice and there is no economical way to add insulation to the slab.

Perimeter: The lack of perimeter insulation is below optimal level of 2”-3” rigid insulation. There is no economical way to add insulation to the perimeter.

Windows:

- None of the windows is optimally insulated.
- Typically, replacing double pane windows does not offer a life cycle savings.
- Metal frames without thermal breaks have a lifetime energy penalty due to direct conduction of heat from inside to outside. There is little incentive to replace non-thermally broken frames due to the high cost of replacement.
- Good weather-stripping that minimizes infiltration is essential to thermal performance.

Skylights: The skylight insulation meets current standards for R-value.

Doors:

- None of the doors is optimally insulated.
- Metal frames without thermal breaks have a lifetime energy penalty due to direct conduction of heat from inside to outside. There is little incentive to replace non-thermally broken frames due to the high cost of replacement.
- Good weather-stripping that minimizes infiltration is essential to thermal performance.
- Reducing the temperature within the arctic entrance will reduce heat loss.

Heating System

Description

The heating system consists of two oil-fired, hot water boilers and a hydronic distribution system. The distribution system consists of pumps that circulate water through the boiler and heating units. The pumps have constant energy use that does not vary with the heating load.

The heating units consist of heating coils in the ventilation systems, convectors, baseboard heaters, and cabinet unit heaters. The heating system has the following pumps:

- CP-1 and CP-2: Operate in lead/standby configuration serving the baseboard heaters.
- CP-3 and CP-4: Operate in lead/standby configuration serving air handling units AHU-1, AHU-2, and AHU-3 heating coils.
- CP-5 and CP-6: Operate in lead/standby configuration serving the unit heaters.
- CP-9 and CP-10: Operate in lead/standby configuration serving the air handling unit AHU-4 heating coil.
- CP-12 and CP-13: Operate in lead/standby configuration serving the air handling unit AHU-5 heating coil.

Analysis

The boilers are operated in a lead/lag configuration to supply year-round heating loads that are the result of Sitka’s temperate climate.

The boiler burners are capable of high-low firing, but operate on high fire due to failure of the low fire control.

The boilers do not have flue dampers to minimize the flow of heated air through the boiler and up the chimney when it is not operating.

Some of the pumps are manufactured by Grundfos. They are not as energy efficient as custom pumps with premium efficiency motors. Some of the three-speed pumps are not set at their design speed. It is not clear if the speed has been optimized.

The larger custom pumps do not have premium efficiency motors.

Converting the pumping system to a primary/secondary configuration with variable speed pumping will decrease pumping costs and provide thermal shock protection.

None of the unit heaters has an automatic valve to shut off the heating water flow when heat is not required.

Ventilation System

Description

Air Handling Unit AHU-1 and Relief Fans RF-1 and RF-2: AHU-1 is a variable flow air handling unit that supplies the Phase I administrative and educational spaces. The unit has a mixing box, filter section, heating coil, and supply fan with variable inlet blades. Return air flows back to the AHU-1 fan room via a ceiling plenum. RF-1 and RF-2 exhaust relief air from the building.

Air Handling Unit AHU-2: AHU-2 is a constant flow air handling unit that supplies the art room. The unit has a mixing box, filter section, heating coil, and supply fan.

Air Handling Unit AHU-3: AHU-3 is a constant flow air handling unit that supplies the multi-purpose classroom. The unit has a mixing box, filter section, heating coil, and supply fan.

Air Handling Unit AHU-4 and Return Fan RF-3: AHU-4 is a constant flow air handling unit that supplies the Phase II area. The unit has a mixing box, filter section, and supply fan. A dual duct distribution system supplies terminal mixing boxes. The hot deck contains a heating coil and the cold deck a cooling coil. Return air is drawn back to the fan room by RF-3 where it is recirculated or exhausted.

Air Handling Unit AHU-5: AHU-5 is a constant flow air handling unit that supplies the welding shop. The unit has a mixing box, filter section, heating coil, and supply fan.

Exhaust Fan EF-2: EF-2 is a utility fan that draws exhaust air from the multi-purpose room.

Exhaust Fan EF-3: EF-3 is a utility fan that draws exhaust air from the art room hood.

Exhaust Fan EF-4: EF-4 is a utility fan that draws exhaust air from the Phase I toilets.

Exhaust Fan EF-5: EF-5 is a utility fan that draws exhaust air from the Phase II toilets.

Exhaust Fan EF-6: EF-6 is a utility fan that draws exhaust air from the Bio/Chem lab.

Exhaust Fan EF-7: EF-7 is a utility fan that draws exhaust air from the Bio/Chem fume hood.

Exhaust Fan EF-8: EF-8 is a utility fan that draws exhaust air from the Bio/Chem fume hood.

Exhaust Fan EF-9: EF-9 is a utility fan that draws exhaust air from the welding shop.

Exhaust Fan EF-10: EF-10 is a utility fan that draws exhaust air from the welding demonstration table.

Exhaust Fan EF-11: EF-11 is a utility fan that draws exhaust air from the welding booths.

Exhaust Fan EF-12: EF-12 is a utility fan that draws exhaust air from the welding booths.

Exhaust Fan EF-13: EF-13 is a utility fan that draws exhaust air from the welding booths.

Exhaust Fan EF-14: EF-14 is a utility fan that draws exhaust air from the welding booths.

Boiler Room Fan: A wall fan that naturally cools the boiler room by drawing in outside air and exhausting heated air to the open space.

Analysis

Air Handling Unit AHU-1 and Relief Fans RF-1 and RF-2:

- The outside air damper on AHU-1 does not close tight when the unit is off.
- The inlet vanes on the supply fan are not functioning.
- The AHU-1 motor is not a premium efficiency motor.

Air Handling Unit AHU-2:

- The outside air damper on AHU-2 does not close tight when the unit is off.
- The AHU is located in a cool space but the unit and ductwork insulation is typical of warm spaces.
- The AHU-2 motor is not a premium efficiency motor.

Air Handling Unit AHU-3:

- The outside air damper on AHU-3 does not close tight when the unit is off.
- The relief air damper is an open duct to the cool open area of the building.
- The AHU is located in a cool space but the unit and ductwork insulation is typical of warm spaces.
- The motor is not a premium efficiency motor.

Air Handling Unit AHU-4 and Return Fan RF-3:

- The AHU is located in the cool open space but the unit and ductwork insulation is typical of warm spaces.
- The AHU-4 and RF-3 motors are not premium efficiency.

Air Handling Unit AHU-5: The AHU is located in a cool space but the unit and ductwork insulation is typical of warm spaces.

Exhaust Fan EF-2:

- There is no exhaust air or backdraft damper to prevent airflow when the fan is off.
- The motor is not a premium efficiency motor.

Exhaust Fan EF-3: There is no exhaust air or backdraft damper to prevent airflow when the fan is off.

Exhaust Fan EF-4: There is no heat recovery on the exhaust air.

Exhaust Fan EF-5: There is no heat recovery on the exhaust air.

Cooling System

Description

An air-cooled water chiller supplies chilled water to the cooling coil in AHU-4 and to cooling coils in the supply ductwork to several rooms. Cooling pump CP-11 circulates chilled water to cooling coils.

A split cooling system with evaporator and cooling fan is located in the network room. The unit rejects heat to the open space of the building.

A split cooling system with evaporator and cooling fan is located in the electrical room. The unit rejects heat to the open space of the building.

Analysis

The water chiller is not operated.

The network computer room and electrical room can be cooled with a natural cooling system for the majority of the year.

Domestic Hot Water System

Description

An oil-fired hot water heater supplies domestic hot water to the building. Pump CP-8 recirculates hot water in the piping system.

The lavatory faucet aerators have a flow rate of 2.5 gpm. The faucets are not auto-sensing.

Analysis

Ultra-low aerators of 0.5 gpm are available for lavatory faucets. Auto-sensing faucets reduce the water flow time three seconds during each use.

Automatic Control System

Description

The building has a pneumatic/electric control system with a computer terminal in the maintenance office for monitoring.

Boilers B-1 and B-2:

- Operate in lead/lag configuration with 30 day changeover.
- Lead boiler is continuously enabled. Lag boiler is enabled when the heating supply temperature is 20°F less than setpoint.
- When a boiler is enabled, an automatic valve in the heating return piping is open and the boiler operating thermostat turns the burner on at 160°F and off at 180°F.
- Three-way valve in the heating supply modulates to maintain the heating supply setpoint, which is reset with outside temperature.

Pumps CP-1 and CP-2, CP-3 and CP-4, CP-5 and CP-6, CP-9 and CP-10, and CP-12 and CP-13:

- Each pair is operated in a lead/standby configuration with monthly switchover.
- Lead pump operates continuously when outside temperature is below 60°F.

Air Handling Unit AHU-1 and Relief Fans RF-1 and RF-2:

- Operates according to an occupied/unoccupied schedule.
- Inlet vanes modulate to maintain supply duct pressure setpoint.
- Mixing dampers modulate to maintain a minimum of 10% outside air and the mixed air temperature setpoint.
- Heating coil automatic valve modulates to maintain supply air temperature setpoint.
- RF-1 and RF-2 operate to maintain building pressure setpoint.
- Terminal boxes modulate airflow to the rooms to maintain the room thermostat setpoint.

Air Handling Unit AHU-2:

- Operates according to an occupied/unoccupied schedule.
- Mixing dampers modulate to maintain a minimum of 10% outside air and the mixed air temperature setpoint.
- When EF-3 operates, the mixing dampers modulate open to maintain the room pressure setpoint.

- Heating coil automatic valve modulates to maintain room temperature setpoint.

Air Handling Unit AHU-3:

- Operates according to an occupied/unoccupied schedule.
- Mixing dampers modulate to maintain a minimum of 10% outside air and the mixed air temperature setpoint.
- When EF-2 operates, the mixing dampers modulate open to maintain the room pressure setpoint.
- Heating coil automatic valve modulates to maintain room temperature setpoint.

Air Handling Unit AHU-4 and Return Fan RF-3:

- AHU-1 and RF-3 operate according to an occupied/unoccupied schedule.
- Mixing dampers modulate to maintain the mixed air temperature setpoint.
- Heating coil automatic valve modulates to maintain the hot deck supply air temperature.
- Terminal boxes modulate hot and cold deck air flow to maintain the setpoint.

Air Handling Unit AHU-5:

- Operates according to an occupied/unoccupied schedule.
- Mixing dampers modulate to maintain the mixed air temperature setpoint, which is reset with outside temperature.
- When EF-3, EF-4, EF-5, and/or EF-6 operate, the mixing dampers modulate to increase outside airflow for makeup.
- Heating coil automatic valve modulates to maintain room temperature.

Exhaust Fan EF-2: EF-2 is manually controlled.

Exhaust Fan EF-3: EF-3 is manually controlled.

Exhaust Fan EF-4: EF-4 is interlocked to operate with AHU-1.

Exhaust Fan EF-5: EF-5 is interlocked to operate with AHU-4.

Exhaust Fan EF-6: EF-6 is manually controlled.

Exhaust Fan EF-7: EF-7 is manually controlled.

Exhaust Fan EF-8: EF-8 is manually controlled.

Exhaust Fan EF-9: EF-9 is manually controlled.

Exhaust Fan EF-10: EF-10 is manually controlled.

Exhaust Fan EF-11: EF-11 is manually controlled.

Exhaust Fan EF-12: EF-12 is manually controlled.

Exhaust Fan EF-13: EF-13 is manually controlled.

Exhaust Fan EF-14: EF-14 is manually controlled.

Boiler Room Fan: Fan is manually controlled.

Computer Network Cooling: Unit operates to maintain room setpoint.

Hot Water Heater: Immersion thermostat operates the burner to maintain the setpoint.

Analysis

Boilers B-1 and B-2:

- Their operating thermostats have an on-off temperature differential of 20°F. A larger differential will decrease cycling losses and improve seasonal efficiency.
- The burners are capable of low-high firing, but are only operated on high fire. Restoring low-high firing will improve seasonal efficiency.

Air Handling Unit AHU-1 and Relief Fans RF-1 and RF-2:

- The supply duct pressure setpoint of 1.8" water gage may be higher than necessary.
- The inlet vanes are not modulating.
- The mixing dampers bring in 45% outside air, which exceeds the minimum of 10% outside air.
- Supply air reset control should be added.
- Occupancy sensors should be used to control the airflow into classrooms and meeting rooms.
- RF-1 and RF-2 rarely operate.

Air Handling Unit AHU-2:

- The mixing dampers bring in 21% outside air, which exceeds the minimum of 10% outside air.
- Demand controlled ventilation should be incorporated into the control scheme.

Air Handling Unit AHU-3:

- The mixing dampers bring in outside air that exceeds the minimum of 10% outside air.
- Demand controlled ventilation control should be incorporated into the control scheme.

Air Handling Unit AHU-4 and Return Fan RF-3:

- A cold deck reset control should be incorporated into the control scheme to reset the mixed air temperature with cooling loads.
- A hot deck reset control should be incorporated into the control scheme to reset the hot deck temperature with heating loads.

Air Handling Unit AHU-5:

- When no exhaust fans are operating, the mixing dampers bring in 25% outside air, which exceeds the minimum of 10% outside air.

Boiler Room Fan: Thermostat control that maintains the boiler temperature as high a practical will improve boiler efficiency.

Lighting

Description

The lighting in the Phase I, Phase II, and open area of the building is fluorescent lighting with inefficient T12 lamps.

The open space (hanger) has metal halide lighting.

Controls:

- Occupancy sensor control of lighting is used in several rooms. Other rooms would benefit from occupancy sensor control.
- The exterior lighting is controlled from a program clock. Photocell control is also installed but no longer functions.

Analysis

Fluorescent lighting with T8 or T5 lamps is more efficient than the T12 lighting.

High bay fluorescent lighting with T5 lamps is more efficient than the metal halide lighting in the open space.

Occupancy sensor control in classrooms, offices, meeting rooms, and toilet rooms will ensure lighting is off when the room is unoccupied.

Repairing the exterior lighting photocell will reduce hours of operation.

Some of the exterior lighting, such as the parking lot lighting, can be turned off from 11:00 pm to 6:00 am when the building is unoccupied.

Electric Equipment

Description

The building has numerous computers that are left on continuously.

The computer lab computers receive minimal use.

There are several 480v:208/120v transformers.

Analysis

Computers consume energy even when they are not in use, even if they enter sleep mode. Turning them off overnight reduces their energy consumption and conserves hydroelectric power resources.

The transformers are less efficient than modern transformers.

ENERGY CONSERVATION OPPORTUNITIES

The energy audit identified a number of ECOs for the building. For the most part, the ECOs are due to one of the following reasons:

- Construction of the various phases goes back 21 years and used standards that reflect the energy costs and awareness of that time.
- Improvements in technologies such as lighting, motors, and variable speed drives have improved the energy efficiency of modern buildings.
- Improvements in systems such as boiler burner control and energy recovery have improved the energy efficiency of modern buildings.
- DDC control systems allow the use of more sophisticated control sequences.

High Priority

The following ECOs are recommended for implementation. Some are behavioral or operational in nature, require minimal investment, and/or offer immediate savings. These ECOs are not easily justified by economic analysis because behavioral or operation changes cannot be accurately predicted. They are recommended because there is a high likelihood they will offer a life cycle savings, represent good practice, and are accepted features of high performance buildings.

Behavioral or Operational

ECO-1: Electric Demand Control

Electricity costs will be reduced if the building operates in a manner that minimizes electric demand charges.

Building users should be aware of how demand charges are incurred. Billing demand is the maximum average load over any fifteen consecutive minutes during the billing period. The most effective demand control strategies are:

- Minimize the size of electric equipment.
- Schedule operations so large electric loads operate for long periods.
- Sequence the operation of large loads rather than operate them concurrently.

ECO-2: Reduce Entrance Temperatures

Heat will be saved by reducing the entrance temperatures.

Heaters are located near building entrances to minimize the thermal comfort impacts of cold air entering the building and to dry the floor. The higher the temperature at the entrance the greater the amount of heat loss to the outdoors, whether the doors are open or closed. Reducing the temperature setpoint to the minimum needed for thermal comfort and moisture control will reduce heat loss.

Recommend turning the entrance setpoints down to 55°F and adjust as needed for adequate thermal comfort and moisture control. Mark the desired setpoint on the thermostat.

ECO-3: Turn Off Computers

Electricity will be saved if the computer and monitor power settings are set to sleep mode and they are turned off during non-work or unoccupied hours.

The computers and peripheral equipment is left on overnight and on weekends. The amount of energy used when the computer is not in use varies with the power settings of the machine. If the computer stays active and the monitor switches to screen saver, the power use does not drop. If the computer and monitor enter sleep mode or are turned off, the power use drops significantly.

Limited hydroelectric power and increasing electricity costs necessitate a review of the policy to keep computers on continuously. At a minimum, computers and monitors should enter sleep mode after 15 minutes of inactivity. This will reduce energy use from an average of 150 watts to 25 watts. Turing both off will reduce energy use and additional to 15-25 watts.

People routinely turn off computers at home and will adapt the same behavior at work or school if the policy changes. Turning them off is most energy efficient. he IT Department should evaluate methods of performing software updates and networking functions during normal hours or through software the turns a computer on, performs the task and turns it back off.

ECO-4: Turn Off Lighting

Electricity will be saved if lighting is turned off when rooms are unoccupied. Lighting was left on in unoccupied rooms.

Turning off lighting is an ECO with immediate payback. As long as the occupancy does not change every 15 minutes, the lighting can be turned off and on with minimal degradation of lamp life. This ECO requires behavior changes where occupants regularly turn off lighting when they leave the room.

ECO-5: Turn Off Equipment

Electricity will be saved if equipment is turned off when it is not in use. Occupants will often habitually leave equipment on because of long-standing practices. Turning off unused equipment is an ECO with immediate payback. This ECO requires behavior changes where occupants regularly turn off equipment when they are finished with it.

<u>Envelope</u>

ECO-6: Weather-Strip Doors

Heat will be saved if doors are properly weather-stripped to reduce infiltration. Many of the exterior doors do not have adequate exterior weather-stripping.

<u>Mechanical</u>

ECO-7: Seal AHU-3 Relief Air Opening

Heat will be saved by installing an automatic damper to seal the AHU-3 relief air opening. The opening is needed to relieve air from the Multipurpose Classroom. The damper will modulate and close the opening when the fan is not operating so warm air does not continually flow to the open space.

ECO-8: Install Water-Conserving Aerators

Heat will be saved by using water-conserving aerators on sinks and lavatories. A water-conserving aerator will reduce nominal flow from 2.5 gpm down to ultra low flow models of 0.5 gpm.

ECO-9: Minimize Boiler Short Cycling

Heat will be saved if the setpoints on the boiler operating thermostat are changed so the boiler operates for a longer time during each cycle.

Currently, the operating thermostats have a fixed 20°F differential between on and off setpoints. A new controller that allows a larger differential of 25°F-40°Fwill increase the amount of time the boiler operates each cycle, which improves seasonal efficiency. As a starting point, use typical differentials of 30°F in the winter and 40°F in the summer.

ECO-10: Modulating Burners

Heat will be saved if burner low-high fire operation is restored. This will enable burner operation to closely match the heating load, increasing burner run time and decreases cycling losses. The existing burners are capable of low-high operation but the controls have not worked in years.

ECO-11: Unit Heater Automatic Valves

Heat will be saved if each unit heater has an automatic valve that shuts off hydronic heating flow when heat is not needed. Currently, the heater coil is continuously hot which results in convective heat loss when the heater fan is not operating. While some of the heat loss may be useful, it is often not. Install an automatic valve on each unit heater to shut off the hydronic heating flow when heat is not needed.

ECO-12: Increase Boiler Room Temperature

Heat will be saved if the boiler room is kept warmer. A warm boiler room uses the heat loss from the boiler and piping to preheat the combustion air. This improves the seasonal efficiency of the boiler.

Currently the boiler room fan is controlled by a manual on-off switch. Changing to thermostat control will allow setting the boiler room temperature as high as practical.

ECO-13: Boiler Flue Damper

Heat will be saved by installing a flue damper in the boiler flue. When the boiler is off, warm air escapes up the flue. A flue damper automatically closes the flue, reducing this heat loss.

ECO-14: Computer Room Natural Cooling

Heat and electricity will be saved if the computer room is naturally cooled with outside air instead of mechanically cooling. The natural cooling potential should be optimized by using a ventilation scheme that supplies cooling air down low and exhaust it up high. Raised flooring and displacement ventilation are two options for improving the ventilation efficiency, which increases the natural cooling potential.

Mechanical cooling will still be needed to supplement the natural ventilation when outside temperatures are too warm. As an integration strategy, the warm exhaust air should be introduced into an air handling system. This warm air can provide ventilation rather than drawing in draw cold ventilation air.

ECO-15: Retro-commission Building

Heat and electricity will be saved if the building energy systems are optimized through a retro-commissioning process. The energy audit revealed that the building is over-ventilated and modern energy efficient control sequences are not utilized. The retro-commission process should include developing new control sequences and verification testing. Specific items to be incorporated include:

- Optimal operating strategies
- Reduce ventilation
- Demand controlled ventilation
- Scheduled ventilation
- Supply air reset control
- Occupancy sensor control
- Optimal burner control
- Temperature setback
- Rebalancing portions of the HVAC system

Lighting

ECO-16: Replace Exterior Lighting Photocell Control

Electricity will be saved if the photocell control for the exterior lighting is repaired. The lighting is currently controlled by a time clock. A photocell will more efficiently control the lighting with seasonal daylight changes.

ECO-17: Reduce Exterior Lighting

Electricity will be saved if the exterior lighting is turned off when the building is unoccupied. Unless security or safety issues dictate, the parking lot or perimeter lighting, or both, could be turned off from 11:00 pm to 6:00 am.

Electrical

ECO-18: Reduce Air Compressor Pressure

Electricity will be saved if the setpoints on the control air compressor are lowered closer to the distribution pressure. Compressing air is very energy intensive. Reducing the pressure to the minimum required will significantly reduce energy consumption.

Medium Priority

Medium priority ECOs require planning and investment, but warrant investment as funding allows because they offer a life cycle savings. The ECOs are listed from highest to lowest priority.

Mechanical

ECO-19: Replace AHU-1 Inlet Vanes with VFD

Electricity will be saved by replacing the inlet vanes on AHU-1 with a variable speed drive (VFD). The existing inlet vanes are not operating. A VFD will be a more efficient means of varying airflow.

ECO-20: Utilize NEMA Premium® Motors

Electricity will be saved if inefficient motors are upgraded to NEMA Premium® motors. The motors on CP-9, CP-10, CP-12, CP-13, AHU-1, AHU-2, AHU-3, AHU-4, and AHU-5 are potential upgrade candidates.

ECO-21: Variable Speed Hydronic Pumping

Electricity will be saved if the hydronic heating system is converted to variable flow pumping. The combined output of the lead hydronic heating pumps is 6.5 HP. Converting to two energy efficient pumps with VFDs is estimated to reduce the average horsepower to 2 HP.

ECO-22: Replace Inefficient Pumps

Electricity will be saved if pumps CP-1 through CP-6 are replaced. The pumps are unitized Grundfos pumps. The pumps are reliable, need less maintenance, and are quickly replaced when they fail. However, they are less energy efficient than custom pumps because they are not customized to the system operating condition and the integral motors on larger pumps are less efficient than NEMA Premium® motors. The result is that Grundfos pumps often have higher life cycle costs.

ECO-23: Add Exhaust Air Heat Recovery

Heat will be saved if heat recovery is incorporated into the exhaust airflow from EF-4 and EF-5. The exhaust heat from both exhaust fans has a life cycle cost of over $200,000. A heat recovery loop between the exhaust air and outdoor air entering AU-1 and AHU-4 will provide heat recovery. Space considerations and the ability of the fans to handle greater friction drop may limit the feasibility of this ECO.

ECO-24: Boiler Room Heat Recovery

Heat will be saved if heat from the boiler room is recovered and transferred to ceiling plenum and drawn into AHU-1. Boilers typically have jacket losses of 1%-2%. A heat recovery unit in the boiler room can extract heat from the boiler room air and transfer it to the ceiling plenum air.

ECO-25: Increase Duct Insulation

Heat will be saved by adding insulation to the ductwork in the cooler, open space of the building. The temperature in the open space is 10-25°F cooler than the enclosed spaces, but the insulation is the same thickness. Additional insulation is optimal for ductwork in the cooler, open space.

ECO-26: Increase Hydronic Pipe Insulation

Heat will be saved by adding insulation to the piping in the cooler, open space of the building. The temperature in the open space is 10-25°F cooler than the enclosed spaces, but the insulation is the same thickness. Additional insulation is optimal for piping in the cooler, open space.

ECO-27: Convert AHU-2, AHU-3. And AHU-4 to Variable Flow

Heat and electricity will be saved if AHU-2, AHU-3 and AHU-4 are converted to variable flow systems. Variable flow will reduce the airflow when cooling is not needed, which saves fan energy and reheat energy. The AHU-2 and AHU-3 conversion will require a VFD on the supply fan and control programming. The AHU-4 will require VFDs on the supply and return fan and reprogramming of the terminal mixing boxes.

Lighting

ECO-28: Lighting Occupancy Sensors

Some of the rooms have occupancy sensors to control the lighting so it is on only when the room is in use. Additional occupancy sensors are recommended for the remaining classrooms, meeting rooms, toilet rooms, offices, and other variable occupancy rooms.

ECO-29: Upgrade Lighting

Electricity will be saved if the lighting is upgraded to energy efficient fixtures and lamps. Much of the interior lighting in the Phase I and II portions of the building is inefficient T-12 fluorescent lighting. Options include retrofitting the fixtures with T8 lamps and electronic ballasts or replacing the fixtures with T5 fixtures and lamps.

The open space lighting is inefficient metal halide lighting. An energy efficient option is to replace the lighting with high-bay T5 lamps and fixtures. These fixtures would have to be suitable for the cooler temperatures of the open space.

The exterior lighting is energy efficient high pressure sodium lighting. An energy efficient option is to replace the lighting with LED lamps and fixtures.

Electrical

ECO-30: Install High Efficiency Transformers

Electricity will be saved if the older transformers are replaced with energy efficient transformers that comply with NEMA Standard TP 1-2001. This ECO applies to a 75 kVA and two 30 kVA transformers in the open space.

Low Priority

Low priority ECOs do not offer a life cycle energy savings and are not recommended.

Envelope

ECO-31: Replace Non-thermally Broken Metal Doors

Heat will be saved if non-thermally broken doors are replaced with thermally broken units. Most of the doors are non-thermally broken.

Thermally broken doors and frames have separators between the inside and outside surfaces so there is not a direct conductive path through the metal. The thermal break reduces heat loss and keeps inner surfaces warmer, which precludes the formation of condensation.

Previous analyses have shown that replacing the doors will not provide a life cycle savings.

ECO-32: Replace Windows

Heat will be saved by replacing double pane windows in aluminum frame systems with triple pane units in non-metal frames.

Metal frame have high edge effects that degrader the thermal performance of the glazing unit. IN new high performance buildings, triple pane glazing units in non-metal frames are optimal. However, the high cost of retrofitting a window into an existing building will not be offset by lower energy bills, so a life cycle savings does not occur.

ECO-33: Increase Wall Insulation

Heat will be saved if the insulation level of the walls is increased. However, the walls are moderately insulated so adding insulation will not provide sufficient energy savings to offset the cost.

ECO-34: Increase Perimeter Insulation

Heat will be saved by adding perimeter insulation. Perimeter insulation is an essential component of high performance buildings. The lack of insulation is difficult due to the high cost and disruption necessary to excavate the foundation and install the insulation. Previous analyses have shown that that adding insulation to the perimeter footings will not provide a life cycle savings.

<u>Mechanical</u>

ECO-35: Auto-sensing Lavatory Faucets

Heat will saved if auto-sensing faucets are installed on the lavatories. Auto-sensing faucets will reduce the water flow by 3 seconds each time the faucet is used. However, low-flow aerators go a long way toward reducing water use. The low flow rate results in less water running down the drain while turning the faucet on and off. As such, this ECO does not provide a life cycle savings.

From an economic basis, ultra-low flow aerators offer a higher life cycle savings than standard aerators with auto-sensing faucets.

ECO-36: Seal Ductwork

Heat and electricity will be saved if the ductwork is sealed against leaks. Unsealed ductwork typically has a leakage rate of 5-10% of the airflow. The leakage decreases the ventilation to the rooms and increases heat loss into the ceiling space. Sealing the ductwork will not provide a life cycle savings because of high costs due to the difficulty in accessing existing ducts above ceilings.

Conclusion

The energy audit revealed that there is significant opportunity for energy savings in the building. As a starting point, it is recommended that the high priority ECOs be corrected. Of the other worthy ECOs, a top priority should be given to lighting upgrades and motor replacements. These are proven ECOs that can be shown through analysis to offer substantial return on investment, especially if performed by in-house personnel.

The medium priority ECOs are listed in order of likely return on investment.

The author would like to express appreciation to Dave Barlow, maintenance specialists at the UAS Sitka campus, who assisted during the site investigation. His knowledge of the building systems and high level of energy awareness and dedication to energy efficiency was extremely valuable.

Alaska Energy Engineering LLC
25200 Amalga Harbor Road Tel/Fax: 907-789-1226
Juneau, Alaska 99801 alaskaenergy@earthlink.net

Electric Use Data
June 14, 2009

UAS Sitka Campus

ELECTRIC RATE

General Service

Customer Charge ($ / mo)

Electricity ($ / kWh)		Demand ($ / kW)	
1-500 kWh	$0.1417	First 25 kW	$0.00
501-10,000 kWh	$0.0903	Over 25 kW	$3.90
10,001-100,000 kWh	$0.0850		
>100,000 kWh	$0.0750		

ELECTRICAL CONSUMPTION AND DEMAND

Month	2005		2006		2007		2008		Average
	kWh	kW	kWh	kW	kWh	kW	kWh	kW	
Jan	53,120	146	45,040	149	44,160	162	47,760	162	190,080
Feb	55,440	146	55,760	154	55,040	168	55,920	180	222,160
Mar	52,720	148	49,920	156	48,480	172	53,440	169	204,560
Apr	49,040	143	55,520	141	59,360	165	57,280	166	221,200
May	53,680	150	48,160	155	46,400	142	40,960	156	189,200
Jun	44,720	118	41,360	116	41,680	122	41,760	113	169,520
Jul	38,720	122	44,160	118	39,600	147	36,240	106	158,720
Aug	40,320	114	44,240	123	45,200	138	39,040	107	168,800
Sep	49,680	160	43,600	145	53,520	154	52,320	156	199,120
Oct	55,120	140	54,560	144	52,880	159	47,920	168	210,480
Nov	55,760	150	50,960	149	54,320	163	59,040	182	220,080
Dec	52,320	160	55,120	174	51,840	169	51,440	189	210,720
Total	600,640		588,400		592,480		583,120		591,160
Average	50,053	141	49,033	144	49,373	155	48,593	154	49,263
Load Factor	48.5%		46.8%		43.6%		43.1%		149

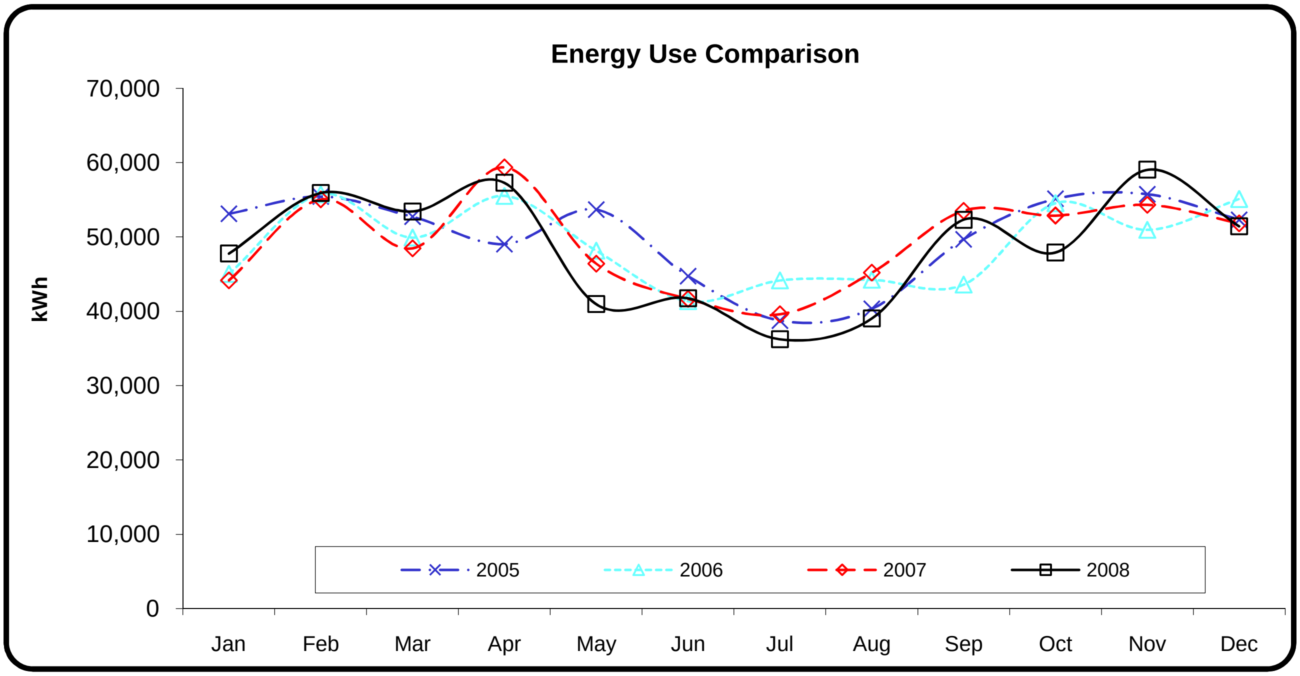
ELECTRIC BILLING DETAILS Electrical costs are based on the current electric rates.

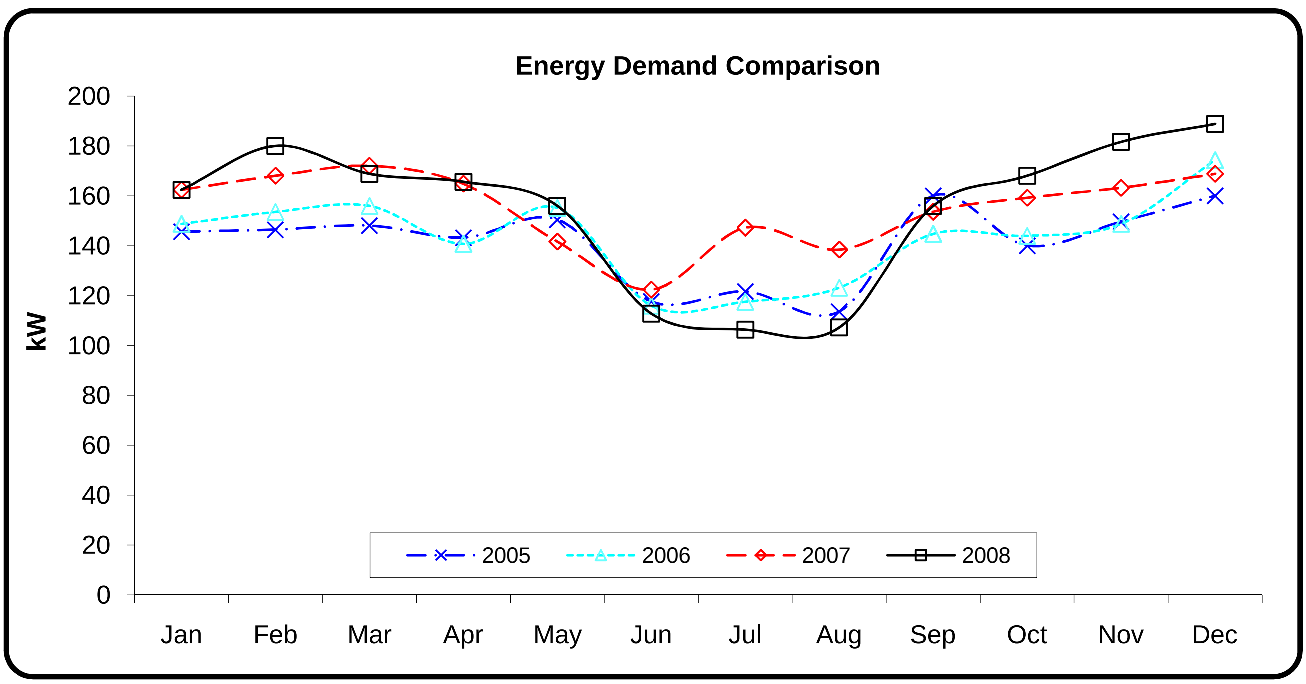
Month	2007 Energy	2007 Demand	2007 Total	2008 Energy	2008 Demand	2008 Total	% Change
Jan	3,832	536	4,368	4,138	536	4,674	7.0%
Feb	4,757	558	5,315	4,832	605	5,436	2.3%
Mar	4,200	573	4,773	4,621	561	5,182	8.6%
Apr	5,124	545	5,670	4,948	548	5,496	-3.1%
May	4,023	455	4,477	3,560	511	4,071	-9.1%
Jun	3,622	380	4,001	3,628	342	3,971	-0.8%
Jul	3,445	477	3,921	3,159	317	3,477	-11.3%
Aug	3,921	442	4,363	3,397	321	3,718	-14.8%
Sep	4,628	502	5,129	4,526	511	5,037	-1.8%
Oct	4,574	523	5,097	4,152	558	4,710	-7.6%
Nov	4,696	539	5,235	5,097	611	5,708	9.0%
Dec	4,485	561	5,046	4,451	639	5,090	0.9%
Total	$ 51,305	$ 6,090	$ 57,395	$ 50,510	$ 6,059	$ 56,569	-1.4%
Average	$ 4,275	$ 508	$ 4,783	$ 4,209	$ 505	$ 4,714	-1.4%
Cost ($/kWh)			0.0969	89%	11%	0.0970	0.1%

Alaska Energy Engineering LLC
25200 Amalga Harbor Road Tel/Fax: 907-789-1226
Juneau, Alaska 99801 alaskaenergy@earthlink.net

Yearly Comparison
June 14, 2009

UAS Sitka Campus





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