



Total Project Cost	\$ 248,000,000
Approval Level:	Full BoR

SCHEMATIC DESIGN APPROVAL REQUEST

TO: Pat Gamble
President

THROUGH: Kit Duke
AVP Facilities and Land Management

THROUGH: Brian Rogers
Chancellor

THROUGH: Pat Pitney
Vice Chancellor

THROUGH: Scott Bell
Associate Vice Chancellor *SB 5/6/14*

THROUGH: Jenny Campbell, P.E. *JC 5/5/2014*
Interim Director

FROM: Mike Ruckhaus, P.E. *MR for*
Sr. Project Manager

DATE: May 5, 2014

SUBJECT: Project Type: Deferred Maintenance, Renewal and Replacement
Project Name: UAF Heat and Power Plant Major Upgrade
Project No.: 2012031 CPHR

cc: CPHR (101)



SCHEMATIC DESIGN APPROVAL

Name of Project: UAF Heat and Power Plant Major Upgrade
Project Type: Deferred Maintenance, Renewal and Replacement
Location of Project: UAF, Fairbanks Campus, Atkinson Building-Power Plant # FS802
Project Number: 2012031 CPHR
Date of Request: May 5, 2014

Total Project Cost:	\$ 248,000,000	Phase Amount (Site Preparation and Major Equipment Purchase: \$ 53,000,000)
Approval Required:	Full Board	
Prior Approvals:	FPA Environmental Permitting (\$3,000,000)	December 8, 2011
	Preliminary Administrative Approval CPHR	August 8, 2013
	Formal Project Approval CPHR	December 13, 2013

A Schematic Design Approval (SDA) is required for all Capital Projects with a Total Project Cost in excess of \$250,000.

SDA represents approval of the location of the facility, its relationship to other facilities, the functional relationship of interior areas, the basic design including construction materials, mechanical, electrical, technology infrastructure and telecommunications systems, and any other changes to the project since formal project approval. Unless otherwise designated by the approval authority or a material change in the project is subsequently identified, SDA also represents approval of the proposed cost of the next phases of the project and authorization to complete the design development process, to bid and award a contract within the approved budget, and to proceed to completion of project construction. Provided however, if a material change in the project is subsequently identified, such change will be subject to the approval process.

Action Requested

The Facilities and Land Management Committee recommends that the Board of Regents approves the Schematic Design Approval request for the University of Alaska Fairbanks Heat and Power Plant Major Upgrade for site preparation and major equipment purchase as presented in compliance with the campus master plan, and authorizes the university administration to complete construction bid documents to bid and award a contract within the approved budget of \$248,000,000, and to proceed with project site construction and major equipment purchase not to exceed \$53,000,000. This motion is effective June 5, 2014.

Project Abstract

The two coal-fired boilers in Atkinson Combined Heat and Power Plant are at the end of their useful life and need to be replaced. A facility addition to the Atkinson Plant will house two coal/biomass-fired boilers (total capacity 280,000 lbs/hr steam) and a steam turbine with 17 MW of electrical output. This

facility will have an expected life of 50 years. The current Atkinson Plant will remain in place continuing to house the two backup boilers (one gas- and one oil-fired), water treatment, and machine shop. This phase includes site preparation (relocating buildings and utilities) and the purchase of major equipment (boilers, steam turbine, air cooled condenser and controls). Selection of the major equipment is required to finalize project engineering and design.

RATIONALE AND REASONING

Background

The Combined Heat and Power Plant Major Upgrade project has been UAF's most mission critical capital issue for the last five years. Significant planning has been accomplished and the Board of Regents has received regular progress updates since 2010. Although a Formal Project Approval was received December 8, 2011 for the environmental permitting at \$3,000,000 (referred to below as Initial Project Development Cost), for consistency within the facility policy requirements, UAF obtained Formal Project Approval for the entire Combined Heat and Power Plant Major Upgrade project for a total of \$248,000,000, inclusive of the \$3,000,000 funded permitting phase, in December 2013.

An Air Quality Permit was issued to UAF by ADEC on April 4, 2014. There are on-going informational discussions between ADEC and UAF about items in the permit; however, the only comments submitted during the public comment period were from UAF and EPA.

The Combined Heat and Power operation at UAF, housed at the Atkinson Power Plant, is reaching a crossroad. The plant was constructed in 1964 with additional capacity added in 1972, 1982, 1986, and 1998. It provides all of the heat and most of the electricity for the 3 million square feet of facilities on the UAF Fairbanks campus. Much of the infrastructure in the plant is nearing the end of its useful life, especially the two coal-fired boilers which are both almost 50 years old.

Engineering analyses have identified a number of critical upgrades necessary to the heat and power infrastructure at UAF. A 2006 study of the existing heat and power plant recommended the replacement of the oldest components of the existing plant and rehabilitation of the remaining equipment. It concluded UAF's best approach for the future would be to construct a 20MW combined coal/biofuel replacement plant. In 2010, an analysis was performed for additional options including natural gas. This study also concluded that the best options for UAF's future heat and power needs are new combined coal/biofuel boilers and a 17MW turbine, which is slightly smaller than the 2006 recommendations.

Programmatic Need

Heat and power are the foundation for operating UAF. The aging condition of the 50-year old facility represents the largest risk for UAF. The risk could manifest in two different forms, financial risk from high cost fuel (approximately \$10 million per year to \$26M per year to switch to oil) and physical risk from a catastrophic failure that would put over 3,000,000 square feet of buildings at risk of freezing and halting of academic programs. The attached Statement of Need provides more detail of the programmatic need.

Overall Project Scope

The proposed facility upgrade will provide a total of 280,000 lbs/hr of steam and 17MW of electricity with two coal/biomass-fueled boilers and a steam turbine with controlled extraction ports for providing low pressure steam for heating the campus. The size of the facility is based on projected campus growth for the next 20 years. There is known growth in the five years after the Murie Building construction, including the Wood Center Dining Addition and the new Engineering Building. Steady growth for the remaining 15 years is assumed. Projecting the rate of new facility construction, however, is uncertain in this fiscal environment.

The proposed boilers use Circulating Fluidized Bed (CFB) technology. This technology is more efficient and produces fewer emissions than the current stoker boilers. The permitting strategy is based on the new boilers producing fewer emissions than the existing coal boilers. The CFB boilers are also fuel flexible and will be able to burn approximately 85 percent coal and 15 percent biomass. If other solid fuels become available in the future, the CFB boilers would be able to burn them as well. The boilers can also be retrofitted to burn natural gas, should it become available at an attractive price.

The facility addition will be located immediately east of the Atkinson Heat and Power Plant and will connect to the current Atkinson Plant and the campus utilidor system. It will also connect to the campus electrical system at the Campus Switchgear Building. The facility will be approximately 100 feet tall. The existing Atkinson Heat and Power Plant will remain, but the two coal boilers, coal handling system, and ash handling equipment will be decommissioned. The existing Boilers 3 and 4 will be able to burn oil or natural gas and, when used with existing Turbine 3, will provide redundancy for the new CFB boilers and turbine. The existing facility water treatment, condensate collection and treatment and machine shop will remain in service.

Site Preparation Package Scope

The Site Preparation package performs tasks in advance of excavation and foundation construction in 2015. The specific work items are relocation of the steam lines to University Park and Hutchinson, relocation of the OIT cable storage building and demolition of the Facilities Services greenhouse.

Major Equipment Purchase

The major equipment that will be purchased by UAF and installed by the contractor are the Circulating Fluidized Bed (CFB) Boilers, steam turbine, air cooled condenser and the controls package. The design of the facility must be based on the actual equipment supplied, so it is essential that it is selected early in the overall project schedule. The support structure for the CFB boilers is also the building for the entire boiler bay.

Project Impacts for Site Preparation

The site preparation scope will affect parking for Utilities and Facilities services staff as well as require the FS greenhouse to be demolished. There currently are no plans to rebuild the greenhouse. No other impacts are anticipated.

Variances

N/A

Total Project Cost and Funding Sources

<u>Funding Title</u>	<u>Fund Account</u>	<u>Projected Estimate</u>
Series S Bond (UAF Debt DM)	514552-50216	\$800,000
Series Q Bond (UAF Debt DM)	514537-50216	\$1,547,000
FY14 Deferred Maintenance	571366-50216	653,000
Initial Project Development Cost		\$3,000,000
		(\$2,370,000 expended and encumbered)
FY15 state capital appropriation		\$74,500,000
FY15 and FY16 state operating appropriation		\$13,000,000
Municipal Bond Bank bond		\$87,500,000
UA revenue bond		\$70,000,000
Remaining Project Cost		\$245,000,000

Annual Program and Facility Cost Change Projections

	<u>Amount</u>
<u>Program Cost</u>	<u>Projected Estimate</u>
The new facility staffing needs are identical to the existing facility.	\$0
<u>Facilities Cost</u>	
<u>Operations (fuel cost savings)</u>	<u>(\$4,200,000)</u>
Annual O&M Cost Reductions	(\$4,200,000)
<u>Debt service obligation</u>	
Fuel savings committed to debt service	\$4,200,000
State operating funding to debt service (FY17 and beyond)	\$7,000,000
<u>Additional funding required for debt service</u>	<u>\$1,400,000</u>
Total annual debt service	\$12,600,000

The reference provides a summary showing the timing of encumbrances, expenditures, and debt service expectations to complete the project. The debt service expectations are based on a 20-year term and a 5% interest rate.

The new facility will require the same staffing as the existing facility, but in the early years there will be reduced repairs and maintenance due to the new equipment.

The reduction in fuel savings is due to reduced purchases of power from GVEA and reduced purchases of natural gas and oil. The cost of oil on a BTU basis is \$26.90/MMbtu and the cost of coal is \$4.41/MMbtu.

Project Schedule

DESIGN

Conceptual Design Development for Permitting	December 2011 – February 2013
Air Permit Issued	April 2014
Formal Project Approval	December 2013
Major Equipment Pre-Qualification (for Engineering)	January 2014
Partial Schematic Design Approval (for Site Work and major Equipment Purchase)	June 2014
Schematic Design Approval (for remainder of project)	February 2015

BID & AWARD – Site Preparation

Advertise and Bid	July 2014
Construction Contract Award	August 2014

CONSTRUCTION – Site Preparation

Start of Construction	August 2014
Construction Complete	April 2015
Warranty Period	1 year

MAJOR EQUIPMENT PURCHASE

Pre-Qualification and Pricing	January-August 2014
Purchase Order issued	August-December 2014
Warranty Period	1 year of operation

CONSTRUCTION

CM@R Selection and Award of Pre-Construction Services	June-July 2014
Start of Construction	April 2015
Start of Commissioning	May 2018
Commencement of Operation	November 2018

Project Delivery Method

This phase of the project, the site preparation contract, will use the traditional Design-Bid-Build method. The scope of work is small and well-defined so it is appropriate for this method.

Authorization to use Construction Manager at Risk (CM@R) method will be requested for the remainder of the project. The project is very complex and large, which is a good fit for CM@R. The pre-purchase of major equipment by UAF is an important factor in selecting CM@R. It is extremely difficult, and financially risky to manage and integrate owner purchased equipment into other project delivery methods. It is anticipated that some elements of construction will commence prior to having the design 100% complete. CM@R is ideally suited to smoothly integrate different work packages as the design is completed. CM@R selection will be both qualifications- and cost-based. The selected CM@R will be required to competitively bid subcontracts.

Project Design Team

The lead engineering firm is Stanley Consultants, Inc. (Denver, CO office). Major sub-consultants are Design Alaska, Inc. and Shannon and Wilson, Inc., both located in Fairbanks.

Supporting Documents

- One-page Project Budget
- Project Cash Flow Projection
- Statement of Need
- Design Narrative Document
- Drawings
 - Site Plan
 - Exterior Elevations
 - Floor Plans
 - Renderings

Affirmation

This project complies with Regents Policy and the campus master plan.

Approvals

The level of approval required for SDA shall be based upon the estimated TPC as follows:

- **TPC > \$4.0 million will require approval by the board based on the recommendations of the Facilities and Land Management Committee (FLMC).**
- TPC > \$2.0 million but not more than \$4.0 million will require approval by the FLMC.
- TPC > \$1.0 million but not more than \$2.0 million will require approval by the Chair of the FLMC.
- TPC ≤ \$1.0 million will require approval by the AVP of Facilities and Land Management.

UNIVERSITY OF ALASKA		
Project Name: UAF Heat and Power Plant Major Upgrade		
MAU: UAF		
Building:	Date:	5-May-14
Campus: Fairbanks	Prepared by:	Mike Ruckhaus
Project #: 2012031 CPHR	Acct #: 514552, 514537, 571366-50216	
Total GSF Affected by Project: N/A		
PROJECT BUDGET	FPA Budget	SDA Budget
A. Professional Services		
Advance Planning, Program Development, Permitting	\$3,000,000	\$3,000,000
Consultant: Design Services	\$14,600,000	\$14,600,000
Consultant: Construction Phase Services	\$2,000,000	\$2,000,000
Consultant:		
Site Survey (included above)		
Soils Testing & Engineering (Included above)		
Special Inspections	\$100,000	\$100,000
Plan Review Fees / Permits	\$200,000	\$200,000
Other		
Professional Services Subtotal	\$19,900,000	\$19,900,000
B. Construction		
General Construction Contract(s)	\$135,600,000	\$140,500,000
Site Preparation Contract	\$1,000,000	
Other Contractors (List:_____)		
Construction Contingency (includes 4 years escalation)	\$31,200,000	\$31,200,000
Construction Subtotal	\$167,800,000	\$171,700,000
Construction Cost per GSF	N/A	N/A
C. Building Completion Activity		
CFB Boilers (2)	\$35,000,000	\$35,000,000
Turbine	\$6,500,000	\$6,500,000
Air Cooled Condenser	\$3,800,000	\$3,800,000
Controls	\$4,000,000	
Move-Out Costs		
Move-In Costs	\$50,000	\$50,000
Art		
Other (Interim Space Needs or Temp Reloc. Costs)		
OIT Support	\$25,000	\$25,000
Maintenance Operation Support	\$100,000	\$100,000
Building Completion Activity Subtotal	\$49,475,000	\$45,475,000
D. Owner Activities & Administrative Costs		
Project Plng, Staff Support	\$7,350,000	\$7,350,000
Project Management	\$3,500,000	\$3,500,000
Misc. Expenses: Advertising, Printing, Supplies, Etc.	\$75,000	\$75,000
Owner Activities & Administrative Costs Subtotal	\$10,925,000	\$10,925,000
E. Total Project Cost	\$248,100,000	\$248,000,000
Total Project Cost per GSF	N/A	N/A
F. Total Appropriation(s)	\$248,000,000	\$248,000,000

UAF Combine Heat and Power Plant Upgrade Encumbrance and Spend Schedule

	FY15	FY16	FY17	FY18	FY19	Total
Encumbrance						
Fiscal Year	113,000.0	100,000.0	32,000.0			
Cumulative	113,000.0	213,000.0	245,000.0	245,000.0	245,000.0	
Expenditure						
FY Expenditure	22,000.0	87,000.0	79,000.0	50,000.0	7,000.0	
Cumulative Expenditure	22,000.0	109,000.0	188,000.0	238,000.0	245,000.0	
Funding Source Commitment						
FY15 Operating Fiscal Note	7,000.0	6,000.0				13,000.0
FY14 Capital Appropriation (SETS)	50,000.0					50,000.0
FY15 Capital Appropriation	24,500.0					24,500.0
Muni Bond Bank	31,500.0	56,000.0				87,500.0
UA Revenue Bond		44,000.0	26,000.0			70,000.0
Total	113,000.0	219,000.0	245,000.0			245,000.0
Funding Source Expended						
FY15 Operating Fiscal Note	7,000.0	6,000.0				
FY14 Capital Appropriation (SETS)		50,000.0				
FY15 Capital Appropriation	15,000.0	9,500.0				
Muni Bond Bank		21,500.0	66,000.0			
UA Revenue Bond			13,000.0	50,000.0	7,000.0	
Total	22,000.0	109,000.0	188,000.0	238,000.0	245,000.0	

Debt Service Payments*						FY20 and ongoing
Muni Bond Bank		(2,000.0)	(7,000.0)	(7,000.0)	(7,000.0)	(7,000.0)
UA Revenue Bonds			(1,000.0)	(5,100.0)	(5,600.0)	(5,600.0)
						(12,600.0)

*Exact timing of the bond issuance will depend on market conditions. Debt service funding available in advance of required payments will be used for project and/or to reduce future bonding costs

Debt service assumptions are based on bonding for 20 years at 5%.

The sequence of utilization by funding source may vary to maximize value.

Statement of Need for UAF Combined Heat and Power Plant

June 2013

The core mission of UAF depends on having reliable light and heat in all of the facilities. The existing Atkinson Combined Heat and Power facility has succeeded in reliably supporting the UAF mission since 1964. While the facility has seen some growth and very limited renewal over the years, the primary coal boilers are at the end of their useful life. These boilers are the heart of the plant and they are showing signs of age by increased outages and maintenance over the last 10 years. In addition to increased operating costs, the risk of a catastrophic failure that prevents the plant from providing heat and power to the campus is increasing every year. The campus experienced a 10-hour heat and power outage on December 11, 1998 when a boiler tube ruptured and filled the plant with steam. This was a serious event and some corrective action has been taken since that event to mitigate the effects if it should reoccur. The campus electrical distribution system is in the process of being removed from the Atkinson Plant to the new Campus Switchgear Facility. This will allow the campus to be powered from GVEA in the event of a similar outage, but most of the buildings would freeze with the lights on without the ability to deliver steam for heating.

In the 2012 update and all prior institutional risk evaluations, a failure of the Atkinson Combined Heat and power Plant is listed No. 1. The attached 2012 UAF Risk Evaluation provided to the Board of Regents' Audit Committee in February 2012 details those risks. The critical nature of providing reliable, reasonable cost heat and power to the UAF campus has led to this project being the top capital request priority.

The design and capacity of the Atkinson Plant has served the campus well for nearly 50 years. It is time to make the significant investment again to provide reliable heat and power for the future.



Office of the Chancellor

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MEMORANDUM

DATE: February 7, 2012

TO: Pat Gamble, President, UA *KG*
Nikki Pittman, Director, Internal Audit, UA

FROM: Brian Rogers, Chancellor, UAF *BR*

SUBJECT: Audit Committee Report on UAF CHP Risks

We must address the replacement funding in 2014 without fail... possibly even as early as 2013. PKG

The Board of Regents (BOR) audit committee requested a report on the risks related to the Atkinson Combined Heat and Power (CHP) Plant for its scheduled meeting on February 15, 2012. This memorandum and the attached updated Risk Management Plan for Risk # 01-2010 UAF provide that report.

Since the risk management plan was prepared in the summer of 2010, UAF has made significant progress on the replacement of the Atkinson CHP Plant. Concurrently, work has been occurring to limit the possibility/probability of a catastrophic failure at the plant endangering UAF. Outlined below is a summary of the work that has occurred, the work remaining, the risks to the University based on current status, and the mitigation strategies in place that result from those risks.

Since the initial risk management plan was prepared in 2010, UAF has selected the most viable replacement option for the Atkinson CHP Plant, selected a contractor to conduct the preliminary design and permitting work for that plant, and worked to minimize the risk to the existing plant. That work is presently underway, with completion of the permit application planned for the summer of 2012.

UAF has provided regular updates on the critical electrical project and Atkinson CHP Plant upgrades to the BOR since the Risk Management Plan was put in place in August 2010. A

Alaska's First University – America's Arctic University

UAF is an AA/EQ employer and educational institution



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MEMORANDUM

DATE: February 7, 2012

TO: Pat Gamble, President, UA
Nikki Pittman, Director, Internal Audit, UA

FROM: Brian Rogers, Chancellor, UAF 

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Since the initial risk management plan was prepared in 2010, UAF has selected the most viable replacement option for the Atkinson CHP Plant, selected a contractor to conduct the preliminary design and permitting work for that plant, and worked to minimize the risk to the existing plant. That work is presently underway, with completion of the permit application planned for the summer of 2012.

UAF has provided regular updates on the critical electrical project and Atkinson CHP Plant upgrades to the BOR since the Risk Management Plan was put in place in August 2010. A

significant amount of UAF major maintenance funding has been allocated to either the critical electrical project or major maintenance components of the CHP Plant for the past few years. This emphasis has minimized, but not eliminated, the risk of plant failure at UAF. Remaining work to be undertaken is focused on potential single point of failure items in the CHP Plant's electrical or heating infrastructure. The updated Risk Management Plan (attached) provides specific detail on the items that are outstanding. Those items will continue to present risks to the plant until the maintenance work is completed.

The current status of the Atkinson CHP plant is one where the risks to UAF, UA, and the State of Alaska are primarily financial risks. The risk of catastrophic failure of the heating system, the most significant risk in terms of both magnitude and lack alternatives, is minimized by the redundancy in boiler operations. Should UAF's aging coal boilers go down, sufficient capacity exists to run the main campus using the back-up oil and oil/gas boilers at the CHP Plant. However, the switch from coal to oil would dramatically increase costs for provision of heat and electricity. Annual fuel costs would rise from just under \$8 million per year to just over \$34 million per year. This increase of over \$2 million per month would rapidly drain all campus and system reserves, requiring either massive reallocations or emergency supplemental funding.

Risks at the Atkinson CHP Plant that could negatively impact the entire campus will remain until a replacement plant is completed and on-line. Actions taken by UAF and UA have worked to minimize those risks while simultaneously working on a replacement CHP plant. The fact that major components of the plant are 50+ years old increases the probability of a system failure as time passes. To that end, UAF continues to work with UA risk management and emergency services to plan for contingencies in the event of a catastrophic failure. The most recent emergency exercise, conducted February 7-8, 2012, contained a scenario with a failure at the CHP Plant.

The details provided in the attached Risk Management Plan provide the Audit Committee the opportunity to review in greater detail the status of UAF risks and mitigation efforts. I will be available at the Audit Committee meeting to respond to any question on this information.



RISK MANAGEMENT PLAN

Prepared: August 16, 2010 **Risk #** 01-2010 UAF
Updated February 15, 2012

Risk Owner: Brian Rogers/ Bob Shefchik **Risk Issue:** Inability to replace heat and power
Chancellor /Executive Officer plant with timely and cost-effective
907-474-7489 solution

Risk Statement: The UAF Atkinson Combined Heat and Power Plant is aging and needs replacement. Failure to plan for and successfully implement a replacement project places all facilities on the main UAF campus at risk of significant damage.

Summary of Risk:

The Combined Heat and Power operation at UAF, housed at the Atkinson Power Plant, is reaching a crossroads. The plant was constructed in 1964, with additional capacity added in 1972, 1982, 1986, and 1998. It provides all of the heat and most of the electricity for the 3 million square feet of facilities on the UAF main campus. Much of the infrastructure in the plant is nearing the end of its useful life, especially the two main boilers, which are both more than 45 years old. Engineering analyses have identified a number of critical upgrades necessary to the heat and power infrastructure at UAF.

Five major deficiencies of the UAF electrical distribution system were identified in a report prepared by PDC Inc. Engineers in 2001. Work is progressing on correcting those deficiencies through the UAF R&R project for "Critical Electrical Distribution Upgrades." This is a phased project; it is expected that the final phase of this work will be completed in 2012-2013. However, UAF will retain some risk until the project is fully funded and completed. *This work has been progressing as planned since the 2010 report. While some items remain unfinished on the critical electrical project, the majority of the work is completed or in progress with planned work in 2012.*

A 2006 study of the existing heat and power plant recommended replacement of the oldest components of the existing plant and rehabilitation of the remaining equipment. It concluded UAF's best approach for the future would be to construct a 20MW combined coal/biofuel replacement plant. That report is now six years old, and no work to begin design or permitting of a replacement plant has occurred. *Since 2010, significant movement on the replacement project has occurred. A project to undertake preliminary engineering and environmental permitting began in 2011. This project will result in a submitted permit application for a new plant with preliminary design and permit completion planned for the summer of 2012.*

The entire main campus physical plant is dependent on the heat and power provided by the Atkinson plant. A failure at the plant would put the 3 million square feet of facilities at risk. If an event occurred during the summer, current electrical infrastructure is insufficient to allow transmission of enough power from GVEA to meet campus demand. If an event occurred during temperatures below freezing, the physical infrastructure of UAF could suffer catastrophic damage. *Capacity to receive electricity for GVEA will improve with the completion of the switchgear installation. This project is well underway, with the new switchgear building constructed and the equipment purchased and delivered. Installation will occur during the summer of 2012 with the entire campus moving to the new switchgear during the next 2 ½ years. The risk of the entire main campus being solely dependent on heat from the Atkinson CHP plant still exists.*

Managing/Mitigating the Risk:

UAF consistently ranks the critical electrical project and the Atkinson replacement projects at the top of its major maintenance capital projects list. This has effectively positioned the critical electrical work to be designed, phased, and targeted for completion. The Atkinson Plant has lagged, partially because the critical electrical work needed to begin immediately and partially due to the high capital cost of a replacement combined heat and power plant.

At the direction of the Vice Chancellor for Administrative Services, a working group was established to re-evaluate the 2006 recommendations and consider new options. The circumstances and economics for coal, natural gas, and other alternative fuels had changed since 2006, and it was prudent to revisit our plan in light of current conditions. GLHN (the 2006 UDP consultant) was hired to evaluate multiple options in the order of magnitude level, and then to perform a detailed evaluation of two or three viable options. The process included solicitation of input from industry, the public, and interested stakeholders. Identifying alternatives, obtaining input, and analyzing options has led to the refinement of options to plants driven by two main fuel sources: coal/biofuel and natural gas. Work continues on those two options, with a recommendation targeted in time for the 2011 legislative session. *The decision to proceed with a solid fuel replacement system, focusing on Circulating Fluidized Bed Boiler technology, was made in the spring of 2011. The current preliminary design and permitting project is based upon that decision.*

The FY2012 and FY2013 R&R priorities will contain funding for permitting and the initial design necessary to prepare, submit, and defend permit applications. These amounts, while significant, are less than \$5 million annually and within amounts reasonably expected to be received in annual capital appropriations. *This funding has been used to proceed on the replacement work.*

Depending on the options selected, capital costs will range from \$50 million to \$200 million for the replacement plant. Due to the varying cost of fuel, operating costs run in inverse proportion to the capital costs; i.e. coal/biomass options are more costly to construct but less costly to operate while gas plants are less costly to construct but significantly more costly to operate. Without a reliable, cost-effective source of gas identified in the near future, planning will proceed on the coal/biomass options. *As noted above, the selected option is for a solid fuel boiler, which places the likely capital costs at approximately \$200 million.*

While design and permitting are being conducted, UAF will explore options for significant capital funding. These will include legislative appropriations, public-private partnerships, budget approaches that include capital amortization as part of utility base funding, and sell-back of excess capacity into the grid. A campaign for awareness of need amongst members of the legislature, the state administration, and the

leaders of local government will be a critical part of ensuring support for such a large capital investment. *This work continues.*

Based on the preliminary design and permitting timeline, there will not be a need for additional capital funding for the replacement plant until the summer of 2013, at the earliest. This led, in part, to the decision not to include a replacement plant funding request in the FY13 UA capital budget. It is expected that there will be a significant request for FY14 funding presented to the Board of Regents for the 2013 legislative session. The amount and type of the request from UAF will depend on the results of the preliminary engineering work. The amount and type of the request that goes to the state will be depend on the content of that request, the judgment of the UA system, and the determination of the Board of Regents.

Stakeholders:

Chancellor's Cabinet

Every member of the Chancellor's Cabinet has a stake in this risk. With the Chancellor, this group establishes UAF's capital and operating budget priorities and advocates for those priorities, both with internal (campus) and external constituencies. As evidenced by ranking this as UAF's top risk, the Cabinet understands the critical nature of the risk.

Executive Officer

The Chancellor and Vice Chancellor of Administrative Services tasked the Executive Officer to lead the team assigned to review options, receive input, and prepare recommendations on how to proceed in addressing this risk. The review team includes the head of the utilities division, the facilities services utilities project manager, the dean of the College of Engineering and Mines, representation from UAF marketing and communications, and a UAF student. It is the executive officer's responsibility to review progress, ensure that recommendations are delivered to the Chancellor and VCAS in a timely and useful manner, and that the project stays at the top of the campus priority list.

Vice Chancellor for Administrative Services (VCAS)

The VCAS is responsible for management of the facility services division, including allocating funding within that division to ensure that ongoing operations are maintained until a new plant is constructed. The VCAS will also pursue and advocate for funding options to meet the UAF's and the system's capital needs.

Facilities Services Project Manager and Director of UAF Utilities

These two individuals represent the front-line stakeholders in this risk. They are responsible for identifying near-term operational risks, maintaining operations, and analyzing the technical details presented by consultants on long-term options.

Deans, Institute Directors, all Campus Management

All of these individuals need to understand the critical nature of this risk, advocate for addressing the issue (even at the expense of their own capital needs), and promote funding for continued action on this project until successful.

Detailed Update on Known Plant Risks:**Equipment Failure Risks:**

Deaerator tank: The deaerator tank has not been out of service since 1964. Piping connections leak and the possibility exists that it is near failure. The plant cannot operate without this tank. The design of the replacement is at 50% and a new tank will be ordered for installation in late summer 2012.

Feedwater heater: This equipment has had several leaks over the last 3 years that required fixing when the plant is able to be operated at reduced capacity. If it fails, the plant can only run at 50% capacity. The replacement is on the same schedule as #1 above.

High pressure steam piping: The current configuration of HP steam piping does not allow bypassing and flexibility if a valve fails to open or a boiler needs to be isolated to fix it. New valves are currently being ordered and the most critical will be installed when the plant is down for items 1 and 2 in late summer 2012.

Condensate piping and hotwell: This piping is corroded and there are some partial fixes planned as part of the new utilidor project for West Ridge. These improvements should increase capacity and replace corroded sections as well as corroded connections to the hot well. Adding additional hot well capacity is best done when the new plant is constructed.

Variable Frequency Drives (VFD's): All of the VFD's in the plant are old and have problems. These are single points of failure for individual boilers, but they do not cause the entire plant to go down. They are scheduled for replacement summer 2013. Fixing the coal boiler VFD's is not planned based on the assumption the new plant will be built in a few years.

Rail repairs: 50% of the rail siding is in bad shape and could be unusable at any time (the AKRR red-flagged one section last year that did require an emergency repair). This will require a temporary switch to fuel oil until deliveries can be configured from the other direction or accommodations made to transport the coal by truck.

Coal boiler tubes: In the event a boiler tube fails, the boiler (but not the whole plant) would be out of service for at least a week. Oil boilers could supply the necessary steam to supply campus at a significant cost. A major repair of the coal boiler tubes is being deferred (~\$10M per boiler) because a new plant would result in decommissioning of the coal boilers. The high cost of retubing would be better spent on a replacement plant.

Main Turbine: This equipment is in good shape, but is a single point of failure. If it goes down, GVEA would supply most of the campus power. Heat could still be supplied to campus during turbine repairs.

Electrical Switchgear: The plant is still dependent on the existing switchgear in the Atkinson Plant. The new equipment will be energized this summer, but in the interim, a major electrical event would knock out the campus. It will be two years before all of the campus distribution is on the new switchgear.

Major Plant Failure: A catastrophic event caused by an earthquake, fire, or explosion that took down the entire plant could eliminate all campus heat and electricity. Many major plant components are in excess of 50 years old. A catastrophic system failure that takes down the all or part of plant, although

unlikely, will increase in probability as the plant ages until the replacement plant is constructed. No back-up system for heat will exist either, until the replacement plant is constructed.

Corrective / Mitigation Efforts for Equipment Failure Risk:

Corrective plans for all of the single point of failure issues and major equipment risks are underway and part of the multi-year major maintenance program. By the end of 2012, most of the equipment issues will be resolved or well on the way to being resolved. Some issues will remain until the 2013 and 2014 construction seasons. It is expected that the annual M&R capital funding from the legislature will be sufficient to meet these needs. This approach does, however, put pressure on the other needed M&R projects at UAF.

Repairs being conducted at the Atkinson Plant are those that are necessary to avoid single points of failure across the next several years while awaiting the replacement plant or will serve as part of the reconfigured system when the new plant is constructed. Some work is being deferred on the coal boilers to avoid huge capital expenses on equipment that could be decommissioned within a small number of years.

Cost, Permitting, and Aging Risks:

Cost Risk: Failure of one or both of the existing coal boilers, absent a catastrophic event that brings down the entire plant, represents primarily a financial risk to UAF/UA. The two coal boilers are backed up by the oil and oil/gas boilers in the plant. The oil boilers are presently used to provide supplemental heat when the steam from the coal boilers is insufficient to meet the heating demands of campus. These boilers are adequately sized to meet the entire heating demand of campus without reliance on the coal boilers. However, the switch from coal to oil would dramatically increase costs for provision of heat and electricity. Annual fuel costs would rise from just under \$8 million per year to just over \$34 million per year. This increase of over \$2 million per month would rapidly drain all campus and system reserves, requiring either massive reallocations or emergency supplemental funding.

UAF is working to mitigate operating cost risk in two ways. First, the efforts to mitigate the equipment risk reduce the likelihood that a switch to oil will be required. Secondly, UAF is actively working within the community on approaches to bring natural gas to Fairbanks. These efforts, through the Interior Delegation, the Chamber of Commerce, the FNSB, and GVEA/Flint Hills, offer the opportunity to reduce the cost risk by approximately 50%.

Permitting Risk: It is premature to assess permit risk until the work presently underway on preliminary design and permit preparation is complete or nearly completed. Known risks include permit delays, negative regulatory environment for coal, actions of external groups, and design/cost problems. A plan for assessment and mitigation of permit risks may be presented to the Board of Regents in the fall of 2012.

Aging Risk: Every year the Atkinson Plant ages and components grow another year older. The known equipment risks are identified in this plan. In addition, the annual aging of the plant increases the probability that some component will fail. The consequences of that failure on the plant will be unknown until the failure occurs. It could be a simple pump that stops working and is replaced in a day's time. It could also be as serious as the steam tube that ruptured in 1998 that shut down the entire plant. The balance of continuing preventative maintenance on a 50-year old boiler while working to replace that same boiler is one that contains risks. The fact that the back-up heating boilers are part of the same facility and infrastructure that serves the entire campus means the risk of heat loss from a failure in the

older part of the plant will continue to exist and will grow during the time that UAF/UA is working to construct the replacement CHP plant.

Risk Triggers/Metrics:

Warning Events:

- *Failure to complete initial design and permitting work in advance of the 2013 legislative session.*
- *Failure to complete switchgear project.*
- *Failure to complete or schedule single point of failure projects in FY13.*
- Episodic breakdowns – failures that interrupt heat/power to UAF's main campus

Tracking Mechanisms:

- Construction progress on the “Critical Electrical Infrastructure” project
- Funding received for permitting and initial design
- Reports to VCAS of activities of the combined heat and power
- *Existence of completed permit application by September 2012*

Communications Plan:

- Reports to the Board of Regents on the “Utilities Upgrade Plan” at regularly scheduled meetings by UAF facilities services
- Reports to the Board of Regents on the “Critical Electrical Infrastructure” at regularly scheduled meetings by UAF facilities services
- UA capital budget priorities presented to the Board of Regents annually

**University of Alaska Fairbanks
Combined Heat and Power Plant Replacement
UAF Project Number – 2012031 CPHR**



**Preliminary Design Criteria and
Capital Cost Estimate**

**Final
April 26, 2013**



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SECTION 6	INSTRUMENTATION AND CONTROLS REFERENCE DATA

I. INTRODUCTION

A. Project Description

1. This outline provides a general description of the basic design for the University of Alaska at Fairbanks Combined Heat and Power Plant Replacement. The project consists of the construction of two new coal / biomass fired circulating fluidized bed boilers to replace and augment existing steam generation capacity. Two existing coal fired, stoker-type boilers (Boilers #1 and #2) will be decommissioned upon startup of the new boilers. The replacement project also includes the installation of a new 17 MW (gross) steam turbine-generator (STG) and a hybrid heat rejection system consisting of both a traditional heat rejection system (surface condenser and wet cooling tower) and an air cooled condenser.

B. Project Schedule

1. It is not yet known what contracting strategy UAF will utilize to build the new power plant. UAF will be evaluating several different contracting strategies to determine what is best for this project. Two potential strategies include Engineer-Procure-Construct (EPC) and Construction Management at Risk (CMAR). Preliminary schedules for each of these contracting strategies are included in Appendix G. Both schedules make the following assumptions:
 - a. Phase 1 funding: July 2013
 - b. Phase 2 funding: July 2014
 - c. Submit environmental air permit application: February 2013 (completed)
 - d. Receive environmental air permit: November 2013

II. GENERAL DESIGN FACTORS

A. Facility Location

1. Existing Facility Address:
 - a. 802 Alumni Drive, Fairbanks, Alaska 99775
2. Approximately 3 miles northwest of Fairbanks International Airport on the campus of the University of Alaska - Fairbanks.
3. Approximate Coordinates: 64° 51.235'N, 147° 49.155'W

B. Site Conditions

1. Elevation: MSL +437.8 feet
2. Barometer, in. Hg. abs.: 29.4.

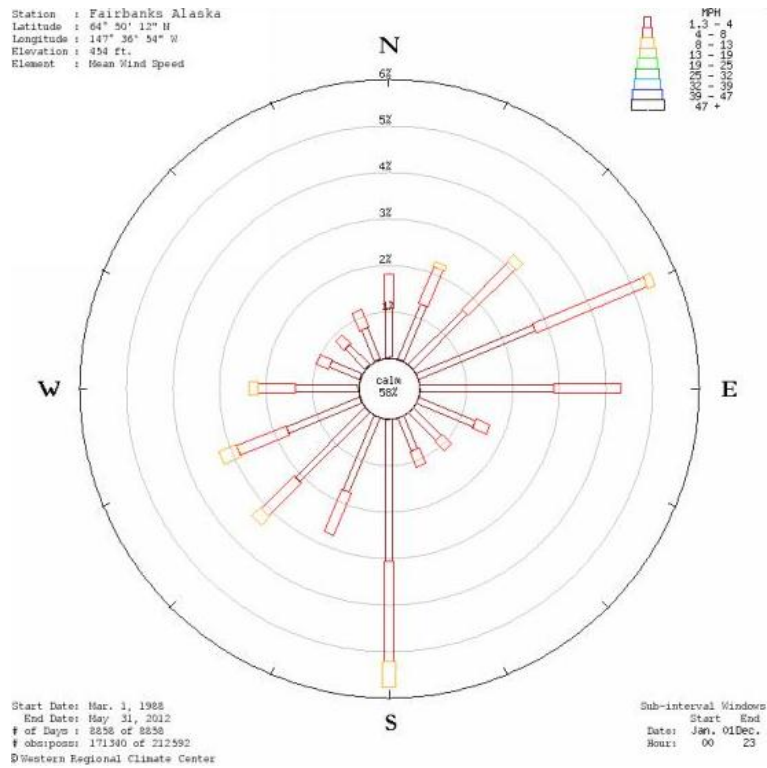
C. Ambient Temperatures

1. Extreme High: 93°F
2. Extreme Low: -66°F

D. Design Conditions

1. 0.4% Cooling Design Condition:
 - a. Ambient Dry Bulb Temperature: 82°F
 - b. Mean Coincident Wet Bulb Temperature: 62°F
2. 0.4% Evaporation Design Condition:
 - a. Wet Bulb Temperature: 63°F
 - b. Mean Coincident Dry Bulb Temperature: 77°F
3. 99.6% Heating Design Condition:
 - a. Dry Bulb Temperature: -47°F
4. ASHRAE Extreme Wind Speeds
 - (a) 1% Wind: 18 MPH
 - (b) 2.5% Wind: 15 MPH
 - (c) 5% Wind: 13 MPH

E. Wind Rose and Statistics



F. Facility Configuration

1. The project site currently consists of the Ben J. Atkinson Cogeneration Facility, associated ancillary structures, and adjacent open space. The cogeneration facility contains two 50,000 lb/hr stoker type boilers burning coal (Boilers #1 and #2), two 100,000 lb/hr package type boilers burning #2 Fuel Oil (Boilers #3 and #4). Boiler #4 is also capable of burning vaporized liquefied natural gas (a.k.a. natural gas). The steam generated by these boilers is throttled through one of three steam turbine generators before departing the cogeneration facility through utilidor tunnels for use on campus. In addition to the electricity generated by the steam turbines, the University also has the ability to generate additional electrical energy through the use of a liquid fueled reciprocating engine-generator set.
2. The Atkinson Plant also generates several other utilities required by various buildings on campus. Potable water, demineralized water, fire water, and compressed air are generated in ancillary facility buildings and distributed through the campus utilidor system.
3. Reference Appendix C for drawings illustrating the existing site conditions.
4. Existing Equipment to be Decommissioned-in-place:
 - a. Stoker Boiler #1
 - b. Stoker Boiler #2
5. Existing Equipment and Facilities to be Demolished
 - a. Several structures and pieces of existing equipment must be demolished in order to allow sufficient space for the construction of the new facility. Some equipment, however, must remain operational during the construction process to allow Boilers #1 and #2 to continue to function until the new facility is operational.
 - b. Demolition Prior to Construction
 - (1) Facility Services Greenhouse
 - (2) Telephone Cable Storage Building
 - (3) Utilities Materials Storage Building
 - (4) Water Treatment Building Parking
 - (5) Rail Car Mover Building
 - (6) Railroad tracks located east of the existing water treatment building
 - c. Demolition After Completion of New Facility
 - (1) Boiler #1 Baghouse

- (2) Boiler #2 Baghouse
- (3) Common exhaust stack
- (4) Coal unloading building
- (5) Existing coal handling equipment
- (6) Railroad tracks located west of the water treatment building
- (7) Existing ash handling equipment
- d. Associated Existing Equipment to Remain In Service:
 - (1) Boiler #3 – Liquid Fueled Package Boiler, 100,000 lb/hr steam generation
 - (2) Boiler #4 – Gas and Liquid Fueled Package Boiler, 100,000 lb/hr steam generation
 - (3) Turbine Generator #1 – 1.5 MW electrical generation capacity
 - (4) Steam Turbine-Generator #2 – 1.5 MW electrical generation capacity
 - (5) Steam Turbine-Generator #3 – 10 MW electrical generation capacity
 - (6) Air Cooled Condenser #3
 - (7) Air Cooled Condenser #4
 - (8) Condensate receiving, conditioning, and forwarding equipment
 - (9) Reciprocating engine, 9.6 MWe, and heat recovery steam generator
 - (10) Fuel oil storage and forwarding equipment
 - (11) Campus potable water facility
 - (12) Water treatment building
 - (13) Water storage tank
 - (14) Campus water demineralization equipment
 - (15) Campus compressed air system
 - (16) Existing auxiliary equipment to support equipment listed above
- e. New Buildings/Structures to be Constructed
 - (1) Main Facility
 - (2) Administration Area

- (3) Steam Turbine Area
 - (4) Boiler Building Area
 - (5) Baghouse Area
 - (6) Railcar Unloading Building
 - (7) Materials Handling Building
 - (8) Ash Storage and Loading Building
 - (9) Storage Building (approximately 10,000 ft²)
 - (10) Cooling Tower
- f. New Equipment to be Installed:
- (1) Boiler #5 - Circulating Fluidized Bed
 - (2) Boiler #6 - Circulating Fluidized Bed
 - (3) Boiler #5 Baghouse
 - (4) Boiler #6 Baghouse
 - (5) Common stack structure supporting two separate flues
 - (6) Turbine-Generator #4 – Steam Turbine Generator
 - (7) Air Cooled Condenser #5
 - (8) Surface Steam Condenser
 - (9) Evaporative Cooling Tower
 - (10) Materials Handling Systems (coal, limestone, sand and biomass)
 - (11) Materials Storage Silos
 - (12) Ash Handling and Storage System
 - (13) Auxiliary electrical system including transformers, switchgear, motor control centers (MCCs), batteries and uninterruptible power systems (UPS)
 - (14) Plant distributed control system (DCS)
 - (15) Wastewater Treatment Systems
 - (16) Solar Panel Array (located on the side of the boiler building)

G. General Design Provisions

1. The facility equipment shall be designed to operate for 8,000 equivalent full load hours per year and shall have a design working life of at least 25 years.
2. All equipment shall be designed to withstand the temperature, humidity, and other environmental conditions expected for each piece of equipment based on its location within the facility.

H. Facility Performance Design Criteria

1. Equipment in the facility shall be designed to meet the following performance requirements under all operating and ambient conditions. Reference Appendix A – Plant Sizing Methodology and Analysis, for further background sizing information.
2. Campus Steam Production: 190,000 lb/hr (total coincident peak of low and medium pressure steam).
 - a. Low Pressure Steam Production: 190,000 lb/hr at 30 psig
 - b. Medium Pressure Steam Production: 35,000 lb/hr at 125 psig
3. Campus Electricity Production: 17 Gross MWe
 - a. Coincident with peak total steam production
 - b. Sized to maintain valves-wide-open steam generating capability with station service electrical frequency of 60 Hz and a power factor of 0.85 lagging and 0.90 leading.

I. Heat Balances

1. Facility heat balances were generated using the SteamPro and SteamMaster heat balance calculation software by Thermoflow, Inc.
2. The heat balances were used to aid in the plant sizing process and to predict plant performance at several different operating conditions.
3. The following assumptions were used to complete these preliminary heat balances:
 - a. Ambient temperature was set at the minimum temperature supported by the heat balance software package (-40°F) to allow the software to approximate the size of the primary and secondary air preheater coils. Once the air heater size was determined, the ambient temperature was allowed to vary to simulate actual site conditions over the course of a year.
 - b. A wet cooling tower / surface condenser cooling system was selected because the software was not capable of simulating a hybrid ACC/wet tower/condenser system.
 - c. Condenser backpressure set to 2 inHg.

- d. The wet tower inlet air dry bulb temperature was set to the ASHRAE 0.4% Evaporation Design Conditions to allow the software to properly size the tower. This temperature is independent of the site ambient temperature noted previously. Once the tower was properly sized, site ambient conditions were used for all modeling runs.
- e. The configuration of the condensate and feedwater systems was set to represent a typical configuration for plants of this size and type. The system selected included the following:
 - (1) Condensate pumps
 - (2) Open feedwater heater (deaerator) operating at 45 psia.
 - (3) Boiler Feedwater pumps
 - (4) Closed feedwater heater operating at a shell (steam) side pressure of 140 psia
 - (5) Economizer
 - (6) Boiler drum
- f. The following characteristics were defined for the steam turbine:
 - (1) Turbine configuration: Single case, single-auto extraction, condensing
 - (2) Turbine extractions designed for the following process steam flows
 - (a) Medium Pressure Port: 35 kpph, 125 psig, uncontrolled.
 - (b) Low Pressure Port: 190 kpph, 30 psig, controlled.
- g. Software automatically adds additional steam flow to each port to account for steam demands internal to the plant including feedwater heaters, deaerators and heating coils.
- h. Inlet conditions: 620 psia and 750°F to match the steam conditions of the existing plant
- i. Heat balance output graphics are included in Appendix D. The following cases were analyzed:
 - (1) High Ambient – Full Load
 - (a) 73°F ambient temperature
 - (b) 100% of Maximum Continuous Rating (MCR)
 - (c) 100% of design extraction flows
 - (2) Average Ambient – Full Load

- (a) 40°F ambient temperature
 - (b) 100% of MCR
 - (c) 100% of design extraction flows
- (3) Average Ambient – 75% Load
 - (a) 40°F ambient temperature
 - (b) 75% of MCR
 - (c) 75% of design extraction flows
- (4) Average Ambient – 50% Load
 - (a) 40°F ambient temperature
 - (b) 50% of MCR
 - (c) 50% of design extraction flows
- (5) Low Ambient – Full Load
 - (a) -40°F ambient temperature
 - (b) 100% of MCR
 - (c) 100% of design extraction flows

J. Operating Modes and Basic Control Philosophy

1. The facility will serve the variable steam and electricity demands of the university campus, therefore operational flexibility is of paramount importance. The facility shall be capable of continuous operation over the following load ranges
 - a. Boiler load range of 40% to 100% of MCR
 - b. Steam turbine load range:
 - (1) Throttle flow from 10% to 100% of boiler MCR
 - (2) Medium and low pressure extraction flows from 0 to 100% of rated extraction flow
 - (3) Minimum exhaust flow 10% or less of throttle flow.
 - (4) Under no operational scenario will the mechanical output of the steam turbine exceed the generator nameplate rating.
 - c. Generator load range:
 - (1) Less than 1 MW upon closing the generator breaker

- (2) Manufacturers standard continuous operating minimum load
- (3) Maximum load to accommodate 105% of the mechanical power generated by the steam turbine with valves wide open (VWO)
- (4) The generator and control systems shall be capable of generating electricity for the campus while disconnected from the local electrical grid (isochronous operation)

K. Plant Layout and Access

1. The facility shall be laid out generally to accommodate the spaces required to service equipment as well as to maintain and operate the plant, (Refer to site drawing in Appendix C). Access aisles and clearance shall be provided for operation, maintenance, and equipment removal. Provisions shall also be made for personnel access to equipment and other access points, including, doors, stairs, ladders and other approved means. Elevated walkway platforms shall be interconnected with stairs or ladders to prevent personnel from having to return to grade level to access a different walkway, where practical. Single component access platforms may have ladder access.
2. Personnel and maintenance equipment access to plant piping and its related features shall include personnel access/egress relating to security and life-safety, within normally occupied spaces. In plant equipment areas, personnel access aisles for operation and light maintenance activities shall be 4'-0" wide and 6'-8" high, as a minimum.
3. Permanent direct access shall be provided for systems and equipment that require scheduled operation and maintenance. Devices and other components that do not require scheduled operation and maintenance are not required to be provided with permanent direct access from a platform, ladder, or stairs, but will be required to be accessed by a mobile work platform, man lift or ladder provided by Owner. Chain operators may be used for valve operation. Access requirements for instrumentation and equipment shall be subdivided into three levels:
 - a. Category I: Items in this category shall be provided with room to allow temporary access by way of an owner provided personnel lift, step ladder, scaffolding, scissor lift etc. No permanent platform or ladder will be provided. Level indicators and gauges will be located and displays sized so they can be read from a permanent access way. Category I items include the following:
 - (1) Analysis Probes/Sensors
 - (2) Small Bore Manual valves
 - (3) Flow Elements/Meters
 - (4) Gauges/Indicators
 - (5) Level Elements/Probes
 - (6) Process Switches
 - (7) Temperature Elements/Wells

- b. Category II: Items in this category have the ability to be routed to other platforms nearby and do not require a dedicated platform. Access is to be provided by platforms near the item. Category II items include the following:
 - (1) In-Line Analyzers
 - (2) Hand Switches
 - (3) Local Controllers
 - (4) Transmitters
 - c. Category III: Items in this category require a dedicated platform if the item is not accessible from grade. Category III items include the following:
 - (1) Rotating Equipment
 - (2) Equipment Manways and View Ports
 - (3) Control Panels
 - (4) Bag Filters
 - (5) Burner Elements
 - (6) Large Bore Manual Valves
 - (7) Regulator Valves
 - (8) Control Valves
 - (9) Large Bore Safety Relief Valves
 - (10) Motorized or Pneumatic Valve or Damper Actuators
 - d. Major equipment such as boilers, air-cooled condensers, cooling towers, and baghouses shall have platforms as recommended by the manufacturer.
- 4. Floor or platform openings around the STG, piping, and equipment necessitated by expansion and movement requirements shall be protected in accordance with OSHA standards, as applicable.
 - 5. The plant shall also be arranged to facilitate the performance of major maintenance activities with economic use of mobile cranes, overhead bridge cranes, forklifts, monorails, and temporary rigging beams as may be appropriate in certain cases. An area shall be indicated on the drawings for crane access to the STG for normal maintenance. Within plant buildings, adequate forklift access aisles, pull spaces, letdown areas, and lay-down areas shall be provided to facilitate equipment maintenance and removal. Where forklift access is not practical due to space limitations, or where provisions for temporary rigging beams or monorails are provided, adequate clear space shall be provided above equipment to ensure that foundation bolts or other devices do not obstruct removal.

6. Plant fire protection and life safety features shall be considered in the plant layout and be designed in accordance with local codes, permits and insurance requirements.
7. The plant should be subdivided into separate fire areas for the purpose of limiting the spread of fire, protecting personnel, and limiting the resultant consequential damage to the plant. Fire areas should be separated from each other by fire barriers, spatial separation, or other approved means.
8. Redundancy Requirements
 - a. Redundant mechanical and electrical equipment shall be provided to limit equipment failure that would result in lost steam or electrical generation capacity
 - b. Individual pieces of equipment may be exempted from the redundancy requirements based on an evaluation of the following characteristics:
 - (1) Probability of failure
 - (2) Predicted size of generation curtailment
 - (3) Predicted capital cost
 - c. Reference the Equipment List in Appendix F for the level of redundancy proposed for each piece of equipment.

L. Required Services

1. Domestic Water
 - a. Service water, firewater, and other plant uses will be provided from on-site wells.
 - b. Well water supply characteristics to be supplied prior to detailed design.
 - c. Reference the water balance in Appendix C for estimated flows.
2. Coal
 - a. Coal will be supplied from the Usibelli Coal Mine, Healy, AK
 - b. Reference Appendix E for typical coal characteristics
 - c. Reference the Heat Balances, Appendix D, for predicted coal flows
3. Woody Biomass
 - a. The exact source of woody biomass for the facility has not yet been identified. Potential sources for future consideration include university waste paper and cardboard streams, debarked and chipped wood waste from local forest, and wood pellets from a local manufacturer. Wood chip sizing will be provided by the selected boiler vendor.

- b. The locally supplied pelletized wood product is used to represent the entire range of potential woody biomass sources as it is composed of a mixture of many of the tree species that are common in the Fairbanks area. Results from a laboratory testing of the pelletized wood product are included in Appendix E.
- 4. Other Renewable Fuels
 - a. The University is continuing to seek out other potential sources of renewable fuels. These fuels will be considered for use in the boiler as they become available and as deemed practical by the University.
 - b. A general sizing criteria for wood chip biomass is as follows. This criteria is subject to revision based on the specific requirements of the selected boiler vendor.
 - (1) 100% no greater than $\approx 1/2$ " thick, by nominal 2" x 8",
 - (2) Less than 10% at nominal $1/2$ " diameter by 12" Long,
 - (3) Less than 33% as sawdust and shavings at less than $3/16$ ".
- 5. Startup Fuels:
 - a. Fuel Gas
 - (1) Type: Liquefied Natural Gas, Re-Vaporized
 - (2) Supplier: Fairbanks Natural Gas, LLC
 - (3) Fuel Composition: nearly 100% Methane, Odorized.
 - (4) Supply Pressure - The fuel gas shall be supplied to the facility at 25 psig or greater.
 - b. Fuel Oil
 - (1) Fuel oil used in the new facility shall meet the requirements for #2 Fuel Oil (+10 variant) in the latest version ASTM D396 - Standard Specification for Fuel Oils.
 - (2) Reference Appendix E for fuel specification sheets from local suppliers.
- 6. Water Treatment Chemicals
 - a. Specific water treatment chemicals will be specified once water quality requirements have been established.
- 7. Communications and Data
 - a. Internal Communications

- (1) The following communications methods will be provided for voice communications within the facility:
 - (2) Party-Line Communications System (Gai-Tronics or similar)
 - (3) University voice-over-IP (VOIP) telephone system
 - b. External Communications
 - (1) Voice communication between the facility and utility, the fuel supplier, and other university and outside parties will be via VOIP telephone links provided by the University.
 - c. Data
 - (1) The existing University network will be expanded as necessary to accommodate the needs of the new facility.
 - (2) Dedicated data links to outside parties will be provided, if required
- M. Products and Emissions
 - 1. Electrical Power Generation
 - a. University Electrical Distribution
 - b. Distribution Voltage and Allowable Variation: 12.47 kV +/-5%.
 - c. Voltage Levels
 - d. Medium Voltage Bus: 4160-volt.
 - e. Low Voltage Buses: 480-volt / 220-volt / 110-volt
 - f. Incoming Electric Transmission
 - g. Voltage: 69 kV
 - 2. Air Emission Limits
 - a. The anticipated emission limits as outlined in the Application for a Prevention of Significant Deterioration Air Quality Construction Permit (ADEC-DAQ Application #AQ0316CPT01A), submitted February 2, 2013. The information below summarizes the proposed limits presented in the permit application. Reference the application for additional information.
 - b. Energy Consumption Basis:
 - (1) Replacement Boiler MCR, MMBTU/hr: 185 each, 370 total
 - (2) Maximum Annual Operation (ORL), MMBTU/yr: 3,046,728 total for both units

- (a) Note: This is an Owner Requested Limit (ORL) equal to a 94% capacity factor.

c. Emission Factors (limits):

- (1) NO_x, lb/MMBTU: 0.2
- (2) CO, lb/MMBTU: 0.18 (220 ppmvd at 3% O₂)
- (3) PM, lb/MMBTU: 0.03
- (4) PM₁₀, lb/MMBTU: 0.012
- (5) PM_{2.5}, lb/MMBTU: 0.012
- (6) VOC, lb/ton: 0.05
- (7) SO₂, lb/MMBTU: 0.2
- (8) CH₄, kg/MMBTU: 1.10 E⁻²
- (9) N₂O, kg/MMBTU: 1.60 E⁻³
- (10) CO₂, kg/MMBTU: 97.02

3. Wastewater Discharge

- a. Wastewater from contact and process drains must meet the requirements in the following permit prior to entering the sanitary sewer discharge line.
 - (1) Golden Heart Utilities, Industrial Wastewater Discharge Permit No. UAF-03-2015
 - (2) Effective dates; November 12, 2010 to November 11, 2015
- b. Provisions for obtaining effluent samples will be provided as required by the permit referenced above.
- c. Contact the University office of Environmental Health, Safety, and Risk Management for a copy of the permit identified above.
- d. Outgoing wastewater does not require dechlorination.

4. Storm Water Discharge

- a. Facility storm water is subject to the conditions provided in the following documents:
 - (1) NPDES MS4 Permit No. AKS-053406, Effective June 1, 2005 (EXPIRED)

- (2) Atkinson Power Plant Spill Prevention, Control, and Countermeasures Plan (SPCC)
- (3) Atkinson Power Plant Storm Water Pollution Prevention Plan (SWPPP) (FUTURE)

- b. Storm water runoff after completion of construction will be sheet drained within the confines of the site to swales, or if necessary, to catch basins located adjacent to the site and routed to existing storm water outfall locations. Reference Section VIII of this design basis for additional information.
- c. Provisions for obtaining effluent samples will be provided as required by the permit referenced above.
- d. Provisions for storm water retention and discharge in unaffected areas of the existing facility will remain unchanged.

5. Noise Limits

- a. The near field noise requirement for equipment located in the facility is 85 dB at 3 feet horizontal distance from equipment and 5 feet above grade from platform.
- b. Equipment may exceed the 85 dB near field noise limit where the required sound attenuation measures are deemed to be impractical. In these cases, signage shall be used to indicate that hearing protection is required in that area.
- c. Existing background (ambient) noise levels will be established based on the results of an ambient noise study conducted by a third party firm specializing in noise measurement and control.
- d. Far field noise requirement:
 - (1) Will be based on the results of an ambient noise study conducted during the detailed design phase of the project.

6. Permitting

- a. Environmental, air and water permits by the University of Alaska Fairbanks
- b. Contractors will be required to obtain permits as required to perform their work.

N. Testing

- 1. Equipment acceptance tests will be performed in the field by a third party contractor on all major equipment.
- 2. Owner or Owner's Representative, in conjunction with the third party testing contractor, will simultaneously conduct performance tests on steam cycle and electric generating equipment including boilers, turbine-generator, condensers, feedwater heaters, and related components. Performance tests will be scheduled approximately 90 days after all equipment has been placed into service and proved capable of continuous normal operation.

3. Equipment and material suppliers will conduct shop tests on items including:
 - a. Certain electric motors.
 - b. Power transformers and switchgear.
 - c. Performance tests on certain pumps.
 - d. Pressure testing of certain code vessels.
 - e. Simulated performance testing of shop assembled components of the DCS
 - f. Inspection of shop painted structural steel.
 - g. Structural steel and reinforcing steel certified mill tests.
4. On-site construction testing and other services will be performed by independent testing agencies employed by the contractors for items including:
 - a. Excavation, grading, and backfill
 - b. Plant roads
 - c. Drilled piers
 - d. Concrete reinforcement
 - e. Concrete and concrete materials
 - f. Grouts
 - g. Masonry materials
 - h. Structural steel welding and bolted connections
 - i. Paint film thickness
 - j. Roofing system
 - k. HVAC system testing
 - l. Nondestructive testing for piping
 - m. Buried piping coating inspection
 - n. Sound level testing
 - o. Establishment of line and grade and other miscellaneous field survey work
5. Construction contractors will perform field tests on the following:
 - a. Insulation resistance tests on transformers, motors, power cables, and control systems

- b. Continuity checks on electrical and control circuits
- c. Grounding system checks
- d. Functional tests on electrical systems, switchgear, protective relaying, motors, heaters, batteries and UPS system
- e. Functional tests on control systems, logic and instruments.
- f. Other testing as required by applicable codes and standards

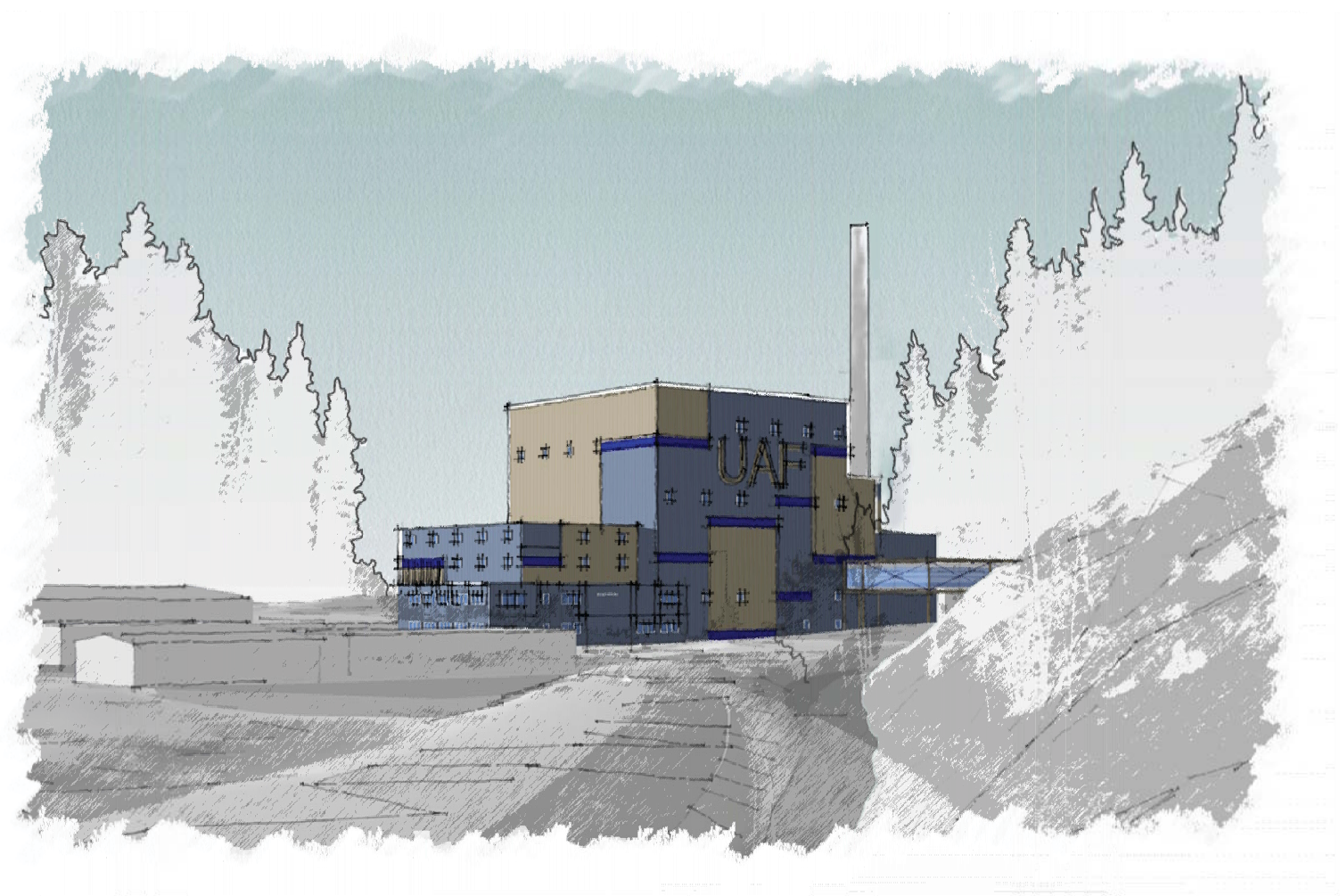
O. Governing Codes, Standards, Regulations, and Other Documents

- 1. All systems, equipment, materials, and their installation for the facility shall be designed in accordance with applicable law, good engineering practice, applicable codes, standards, and local, state, and federal regulations, as well as the design criteria, manufacturing process and procedures, material selection, testing, welding and finishing procedures, and quality control programs specified in this section. Engineer (or permitting consultants) will make reasonable efforts to identify, interpret, and determine applicability of the codes, standards, and regulations.
- 2. In the event conflicts arise between this document, referenced codes and standards and applicable law, the more stringent code shall apply. If conflicts arise between the BFB and STG manufacturer's scope of supply and the listed codes and standards, the BFB and STG documents shall govern.
- 3. In some cases, equipment may be purchased, with the Owners approval, which is based on other standards or codes that the Contractor or Engineer consider suitable.
- 4. Codes and Standards

AASHTO	American Association of State Highway and Transportation Official
ABMA	American Boiler Manufacturers Association
ABMA	Anti-friction Bearing Manufacturers Association
ACI	American Concrete Institute
AEIC	Association of Edison Illuminating Companies
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
API	American Petroleum Institute (where applicable)
ARI	Air Conditioning and Refrigeration Institute
ASA	Acoustical Society of America
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing

UAF COMBINED HEAT AND POWER PLANT

FAIRBANKS, ALASKA



UAF COMBINED
HEAT AND
POWER PLANT

ISSUE DATE 20 FEB 2013
COMM. NUMBER 191101
DESIGNED BY TEM
DRAWN BY ENT
SCALE 0" = 1"

COVER SHEET

G0.0

LIST OF DRAWINGS

GENERAL

G0.0 COVER SHEET

ARCHITECTURAL

A0.0 3D PERSPECTIVES
A0.1 3D PERSPECTIVES
A1.0 FIRST FLOOR PLAN
A1.1 SECOND FLOOR PLAN
A1.2 ADMINISTRATION AREA ENLARGED FLOOR PLANS
A2.0 EXTERIOR ELEVATIONS
A3.0 BRIDGE ELEVATIONS & DETAILS

CIVIL

C000 EXISTING CONDITIONS SITE PLAN KEY
C001 EXISTING CONDITIONS SITE PLAN - WEST
C002 EXISTING CONDITIONS SITE PLAN - CENTER
C003 EXISTING CONDITIONS SITE PLAN - EAST
C004 EXISTING CONDITIONS TOPOGRAPHIC KEY PLAN
C005 EXISTING CONDITIONS TOPOGRAPHIC PLAN - WEST
C006 EXISTING CONDITIONS TOPOGRAPHIC PLAN - CENTER
C007 EXISTING CONDITIONS TOPOGRAPHIC PLAN - EAST
C010 NEW WORK FENCING PLAN
C011 FIELD OFFICES, LAYDOWN YARD AND STAGING PLAN
C100 DEMOLITION SITE PLAN KEY
C101 DEMOLITION SITE PLAN - WEST
C102 DEMOLITION SITE PLAN - CENTER
C103 DEMOLITION SITE PLAN - EAST
C200 NEW WORK SITE PLAN KEY
C201 NEW WORK SITE PLAN - WEST
C202 NEW WORK ABOVE GROUND SITE PLAN - CENTER
C203 NEW WORK UNDERGROUND SITE PLAN - CENTER
C204 NEW WORK BRIDGE AND UTILIDOR PLAN
C205 NEW WORK SITE PLAN - EAST
C206 NEW WORK GRADING PLAN - KEY
C207 NEW WORK GRADING PLAN - WEST
C208 NEW WORK GRADING PLAN - CENTER
C209 NEW WORK GRADING PLAN - EAST
C210 TRAFFIC CIRCULATION SITE PLAN
C211 FIRE ENGINE TURNING SIMULATIONS

MECHANICAL

M1.0 PLANT VENTILATION CONCEPT ISOMETRIC
M2.0 SANITARY AND PROCESS WASTE SITE PLAN

PROCESS EQUIPMENT

GG02 GENERAL ARRANGEMENT EQUIPMENT LAYOUT BASEMENT
GG03 GENERAL ARRANGEMENT EQUIPMENT LAYOUT GROUND FLOOR
GG04 GENERAL ARRANGEMENT EQUIPMENT LAYOUT TURBINE FLOOR
GG05 GENERAL ARRANGEMENT EQUIPMENT LAYOUT FEEDER FLOOR
GG06 GENERAL ARRANGEMENT EQUIPMENT LAYOUT TRIPPER FLOOR
GG07 GENERAL ARRANGEMENT ELEVATION LOOKING SOUTH



1 3D PERSPECTIVE - UNIVERSITY AVENUE AT COLLEGE ROAD LOOKING WEST
A0.0 N.T.S.

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3D PERSPECTIVES
COAL OPTION

A0.0



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3D PERSPECTIVE
COAL OPTION

A0.1



1 3D PERSPECTIVE - ALUMNI DRIVE LOOKING SOUTHWEST
A0.1 N.T.S



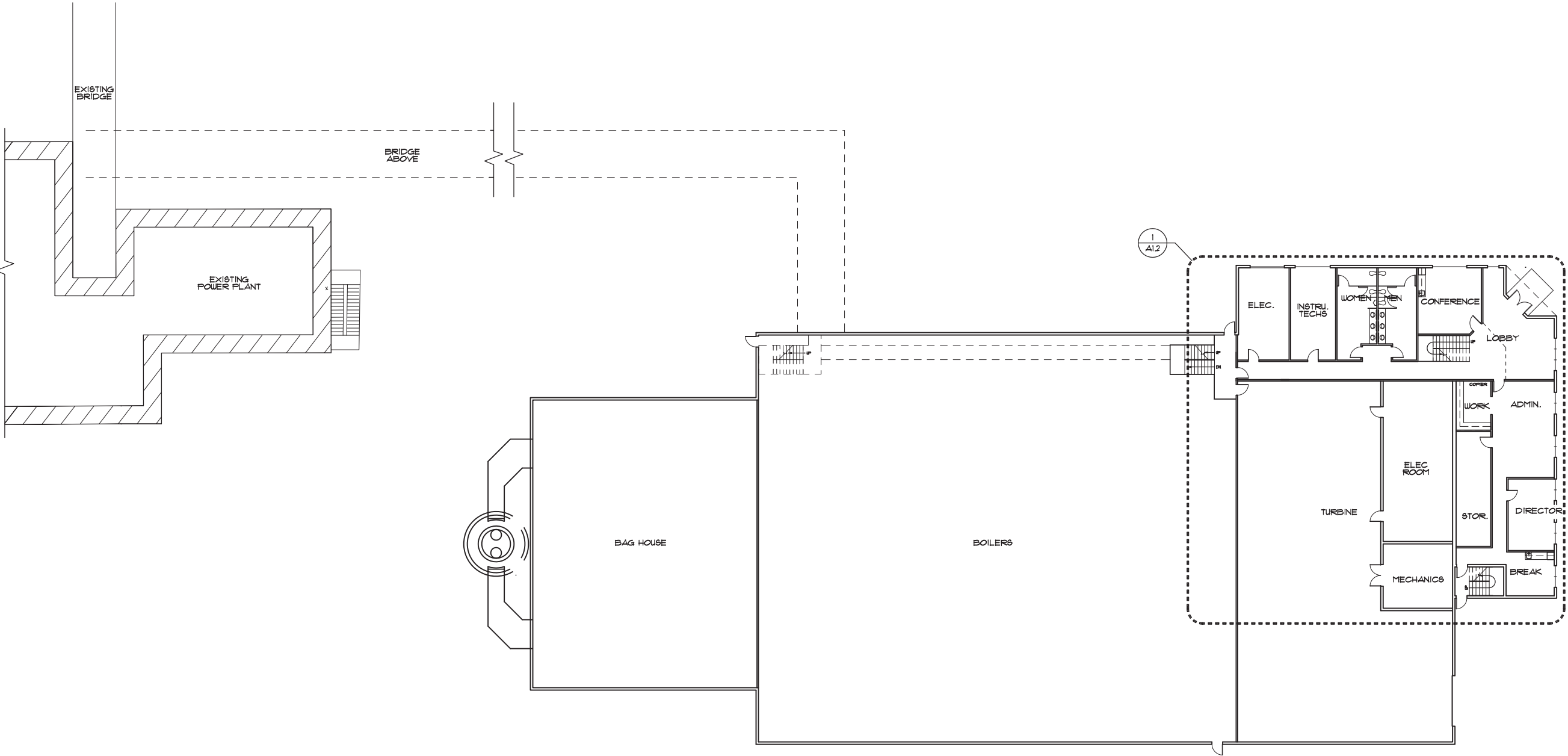
2 3D PERSPECTIVE - ALUMNI DRIVE LOOKING EAST
A0.1 N.T.S



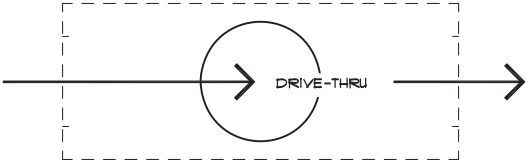
3 3D PERSPECTIVE - YUKON DRIVE LOOKING SOUTHEAST
A0.1 N.T.S



4 3D PERSPECTIVE - TANANA LOOP LOOKING SOUTHEAST
A0.1 N.T.S



1 FIRST FLOOR PLAN
A1.0 1/8" = 1'-0"
PLAN NORTH

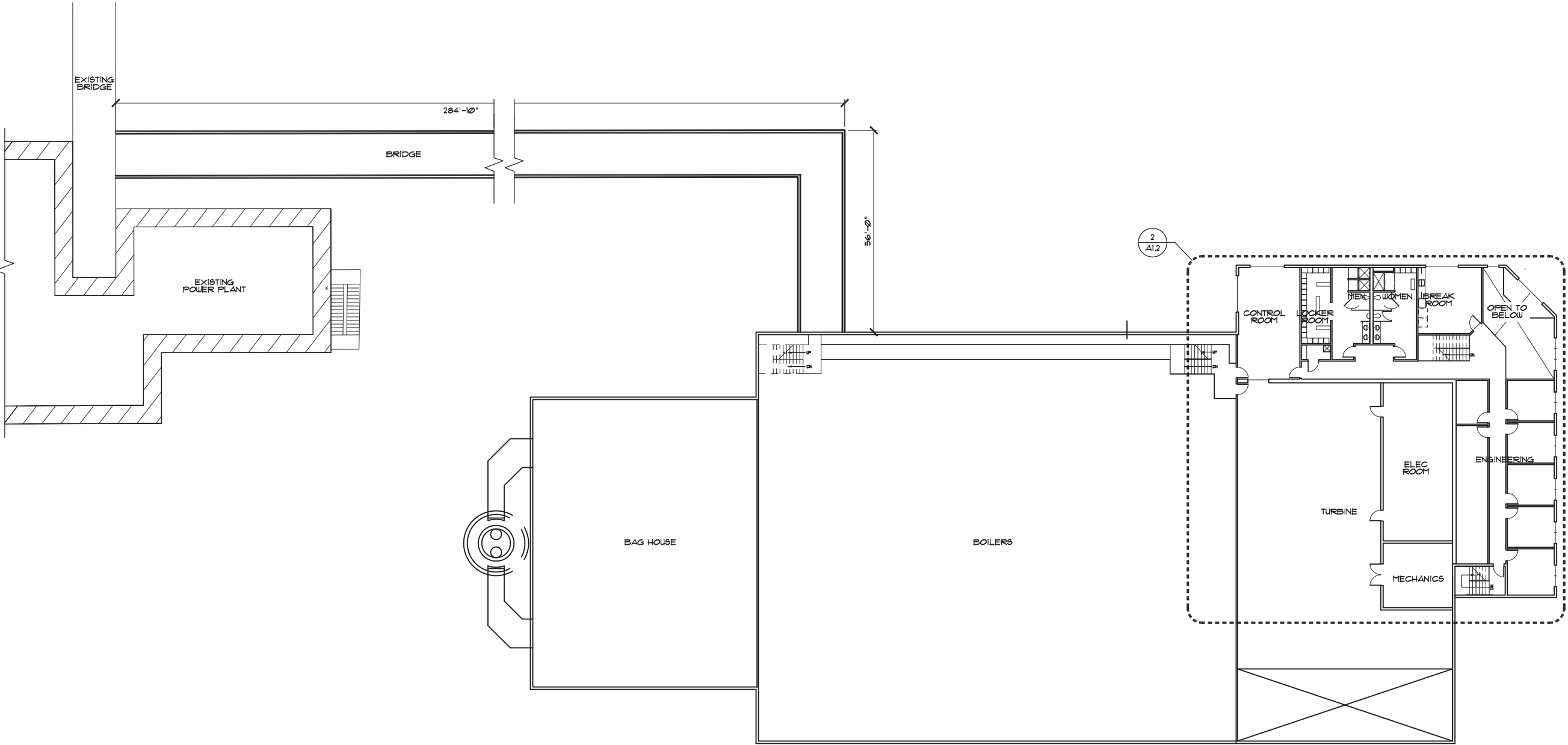


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POWER PLANT

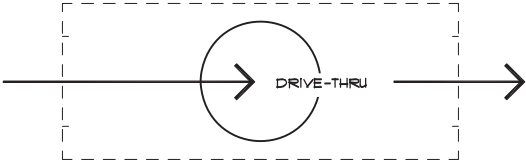
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FIRST FLOOR PLAN

A1.0



1 SECOND FLOOR PLAN
A1.1 1/8" = 1'-0"
PLAN NORTH

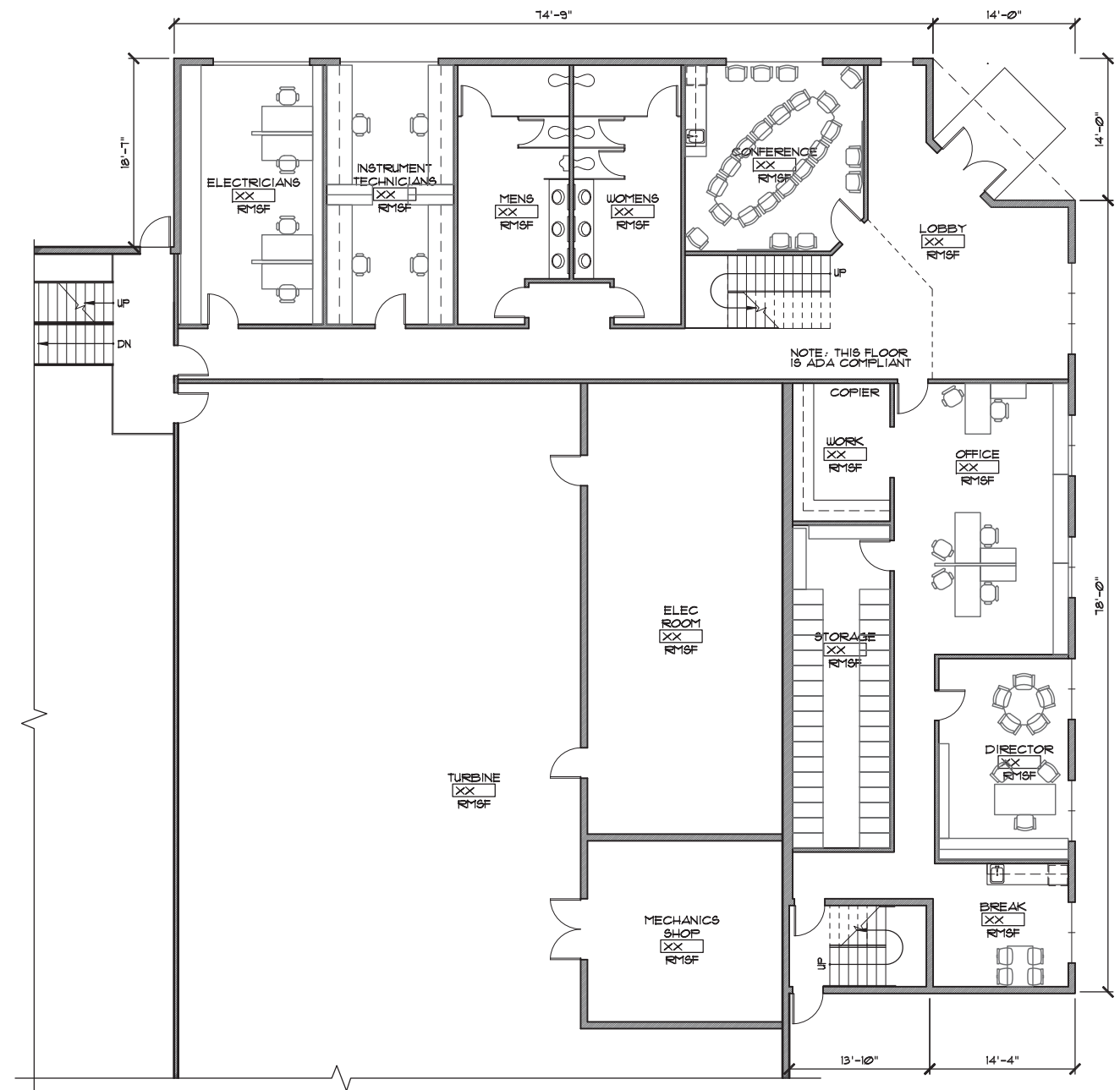


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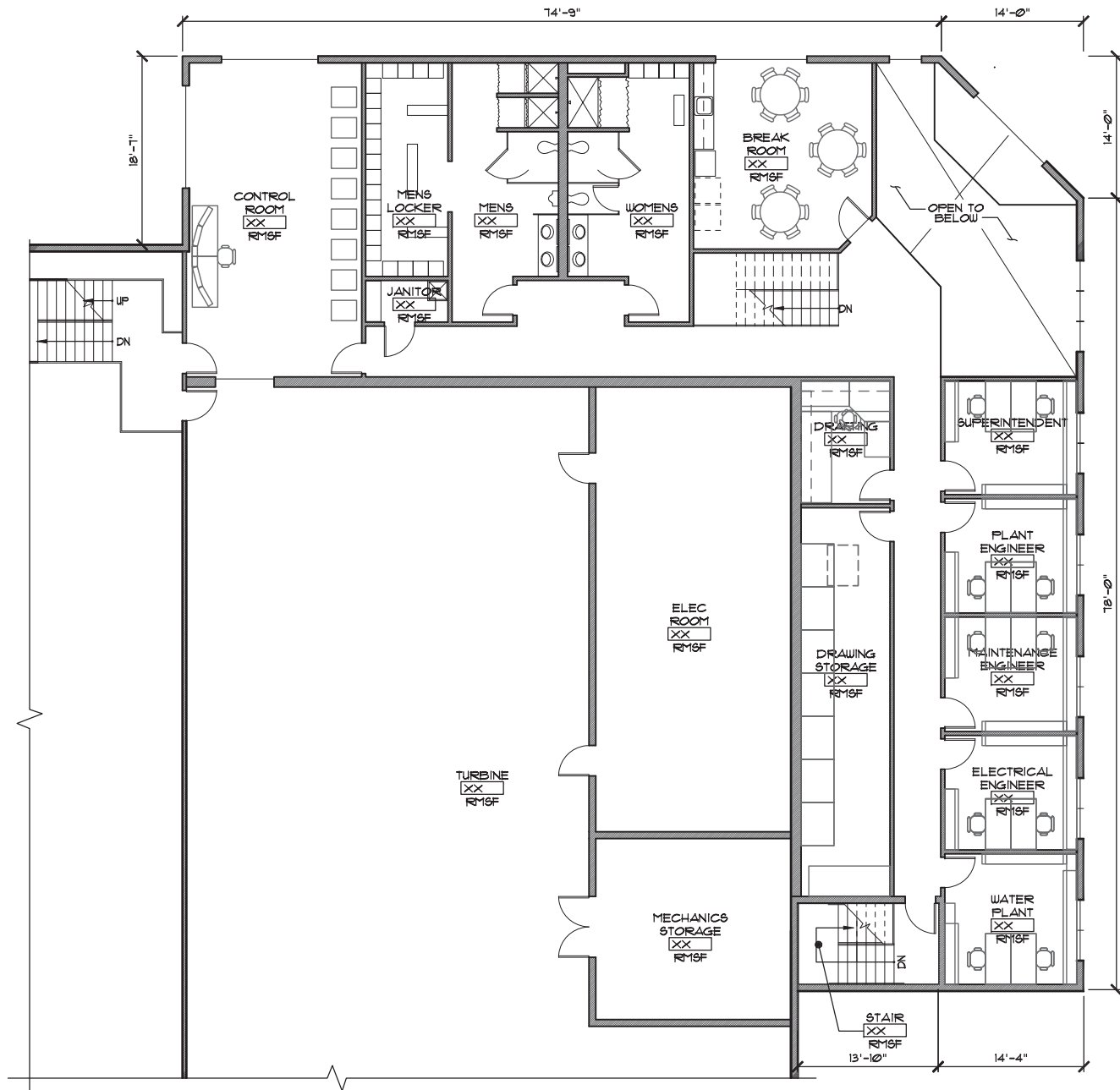
SECOND FLOOR
PLAN

A1.1



1 ADMINISTRATION AREA - ENLARGED PLAN - FIRST FLOOR
A1.2 1/8"=1'-0"

PLAN NORTH



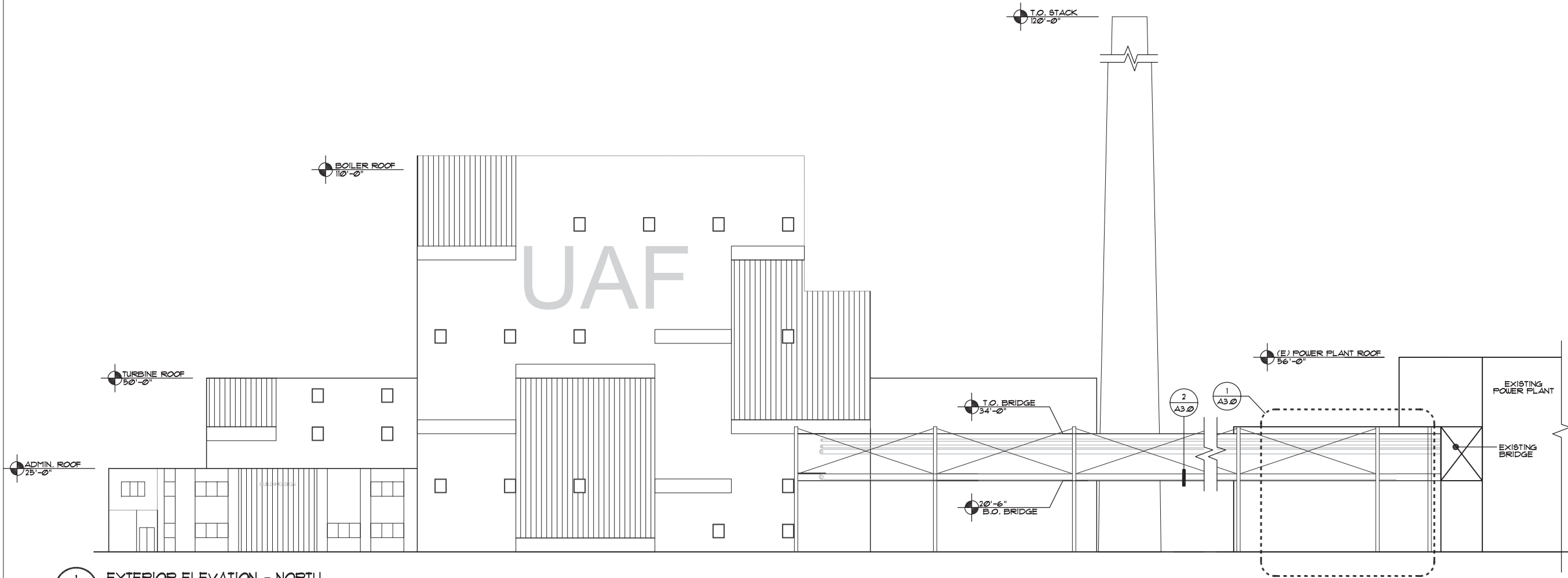
2 ADMINISTRATION AREA - ENLARGED PLAN - SECOND FLOOR
A1.2 1/8"=1'-0"

PLAN NORTH

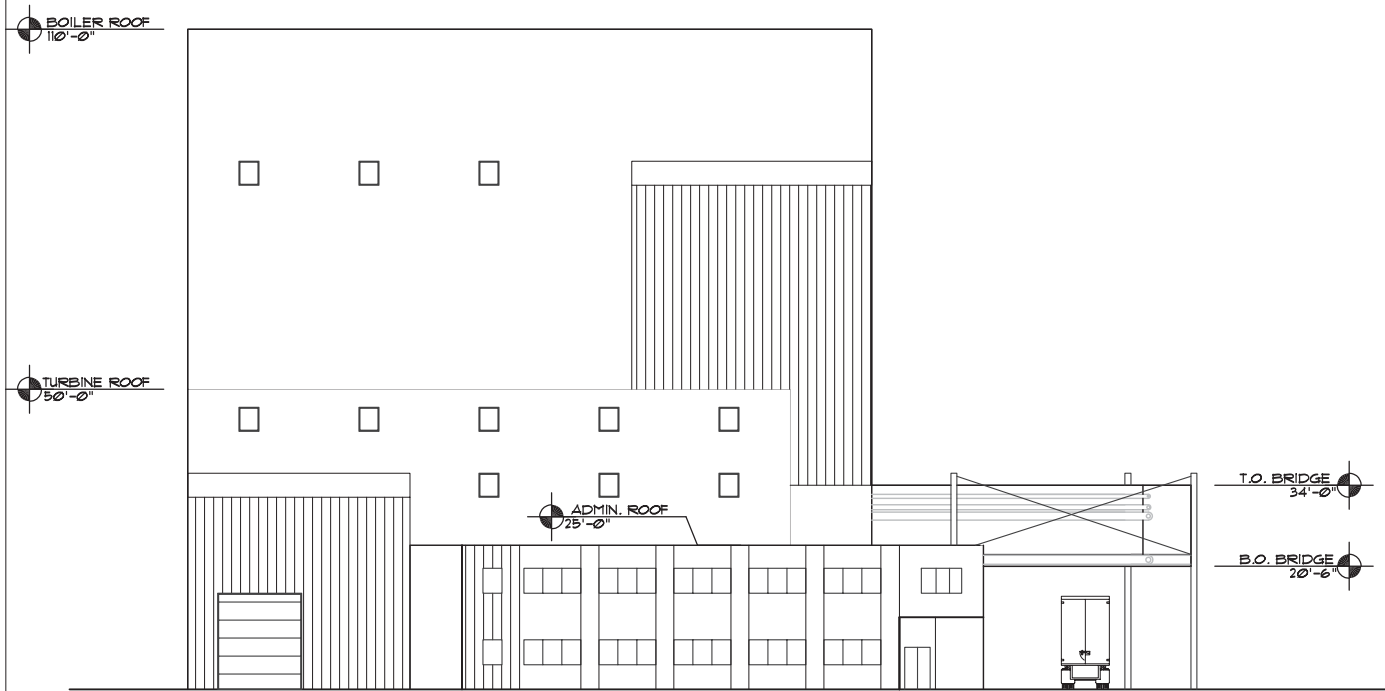
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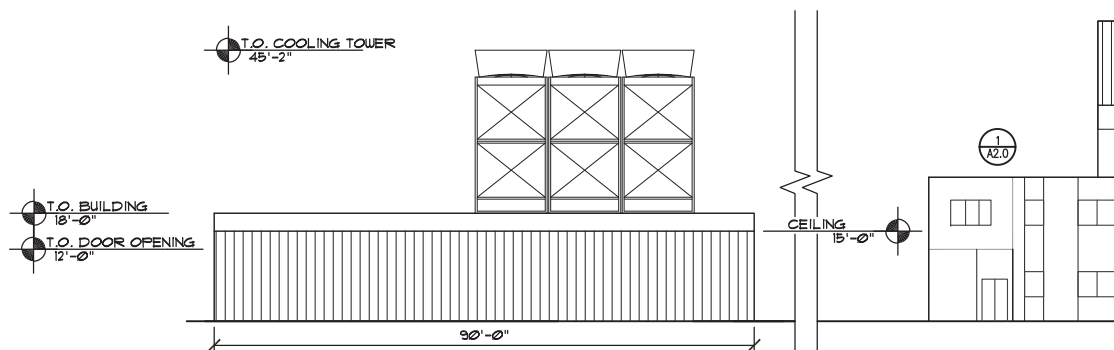
ADMINISTRATION
AREA ENLARGED
FLOOR PLANS



1 EXTERIOR ELEVATION - NORTH
A2.0 1/16"=1'-0"



2 EXTERIOR ELEVATION - EAST
A2.0 1/16"=1'-0"



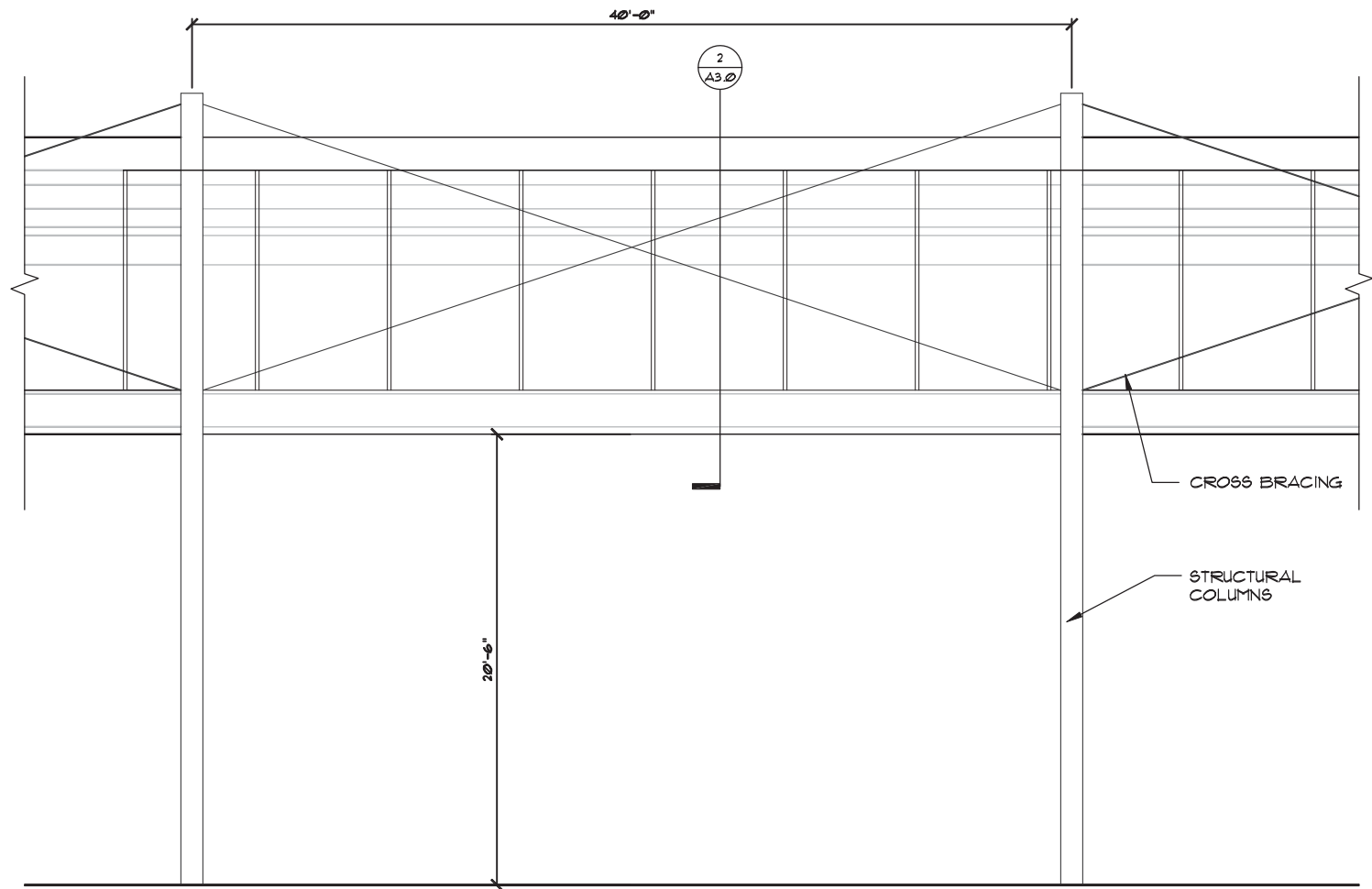
3 PARTS BUILDING/COOLING TOWER ELEVATION - NORTH
A2.0 1/16"=1'-0"

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POWER PLANT

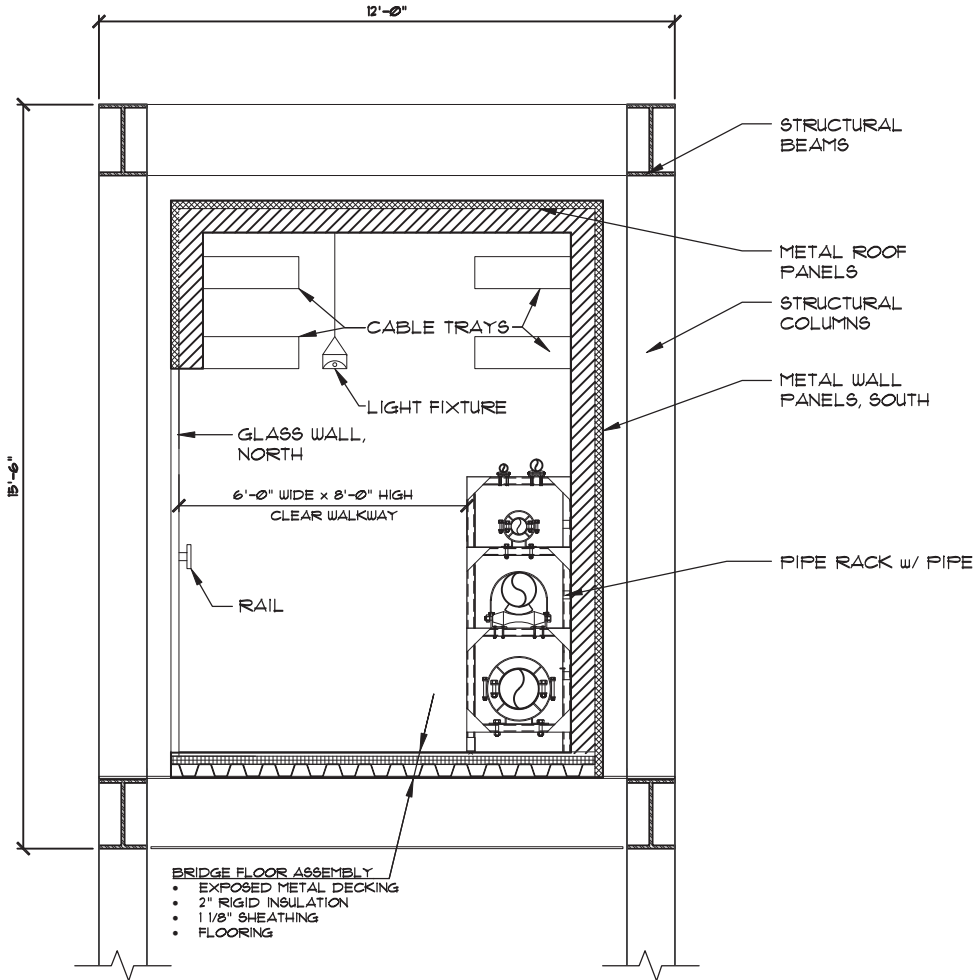
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SCALE 0"=1'

EXTERIOR
ELEVATIONS

A2.0



1 BRIDGE EXTERIOR ELEVATION - NORTH
A3.0 1/4"=1'-0"



2 BRIDGE SECTION
A3.0 1/2"=1'-0"

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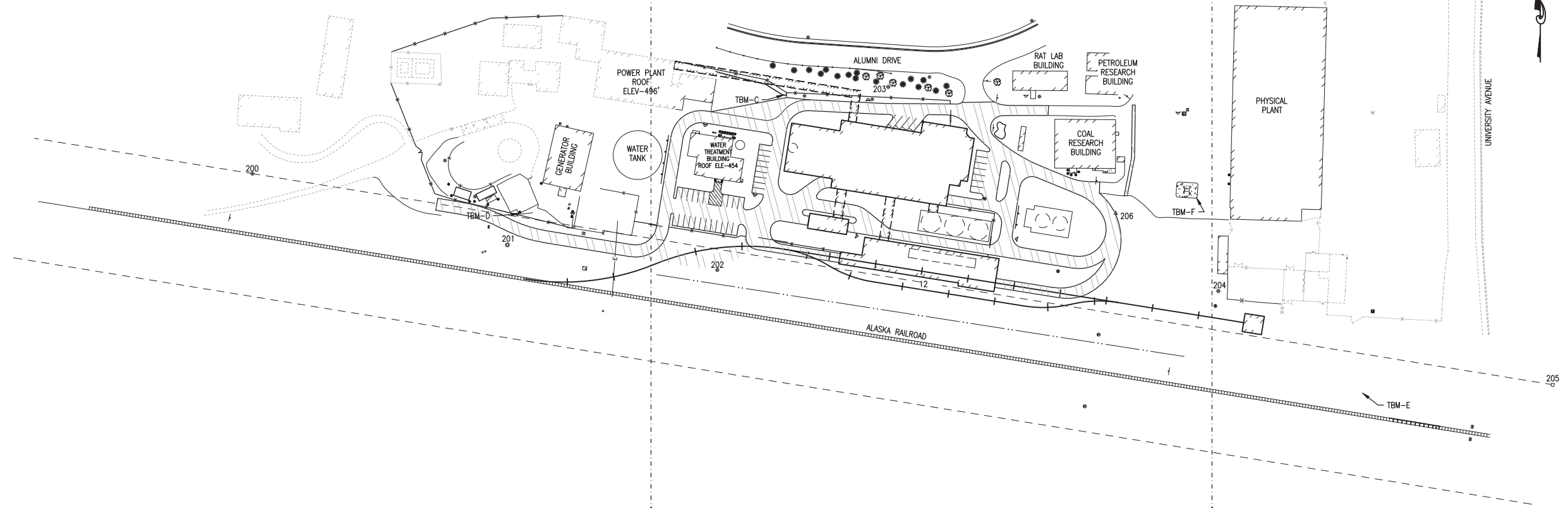
BRIDGE ELEVATIONS
& DETAILS

A3.0

SHEET C201

SHEETS C202-4

SHEET C205



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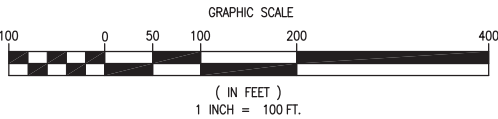
NEW WORK
SITE PLAN
KEY

C200

1 NEW WORK SITE PLAN KEY
C200 1" = 100'

LEGEND

---x---	UNDERGROUND UTILIDOR	⊠	TELEPHONE PEDESTAL
---E---	OVERHEAD POWER LINE	⚡	LIGHT POLE W/ UNDERGROUND POWER
---E---	BURIED POWER LINE	⚡	FIRE HYDRANT
---T---	BURIED TELEPHONE LINE	⚡	WALL HYDRANT
---U---	BURIED TELEPHONE, POWER & WATER	○	SEWER CLEANOUT
---NG---	BURIED NATURAL GAS LINE	⊠	ABOVE GROUND OIL TANK
---S---	BURIED STEAM LINE	⊠	ELECTRIC PEDESTAL
---C---	BURIED CONDENSATE LINE	⊠	ELECTRIC VAULT
---SS---	BURIED SANITARY SEWER LINE	⊠	STEAM MANHOLE
---FM---	BURIED FORCE MAIN SEWER LINE	⊠	RAILROAD LOCKOUT
---D---	BURIED STORM SEWER LINE	⊠	RAILROAD SIGNAL SENSOR
---W---	BURIED WATER LINE	⊠	RAILROAD SWITCH
---X---	CHAIN LINK FENCE	⊠	RAILROAD CROSSING SIGNAL ON CONCRETE BASE W/ UNDERGROUND POWER
---X---	UNSURVEYED CHAIN LINK FENCE	⊠	SIGN
---O---	HEAD BOLT OUTLET RAIL	⊠	RAILROAD CROSSING
---O---	GUARD RAIL	⊠	SOIL BORING
---O---	CULVERT	⊠	MONITOR WELL
---O---	DRAINAGE DITCH/SWALE	⊠	DECIDUOUS TREE
---O---	RAILROAD RIGHT-OF-WAY	⊠	CONIFEROUS TREE
---O---	BUILDING	⊠	ASPHALT PAVEMENT
---O---	UNSURVEYED BUILDING	⊠	CONCRETE PAD
---O---	UNSURVEYED STRUCTURE	⊠	STORM SEWER JUNCTION BOX
●	BOLLARD	⊠	SANITARY SEWER MANHOLE
⊕	PRIMARY ALUMINUM MONUMENT RECOVERED (AK RR R.O.W.)	⊠	SANITARY SEWER LIFT STATION
⊠	CONCRETE R.O.W. MONUMENT	⊠	DEMOLITION AREA
⊠	5/8" REBAR W/ ALUMINUM CAP	⊠	AREA FOR DEMOLITION AFTER START-UP OF NEW FACILITY
⊠	8" SPIKE SET THIS SURVEY		
FF	FINISHED FLOOR ELEVATION		
C.M.P.	CORRUGATED METAL PIPE		



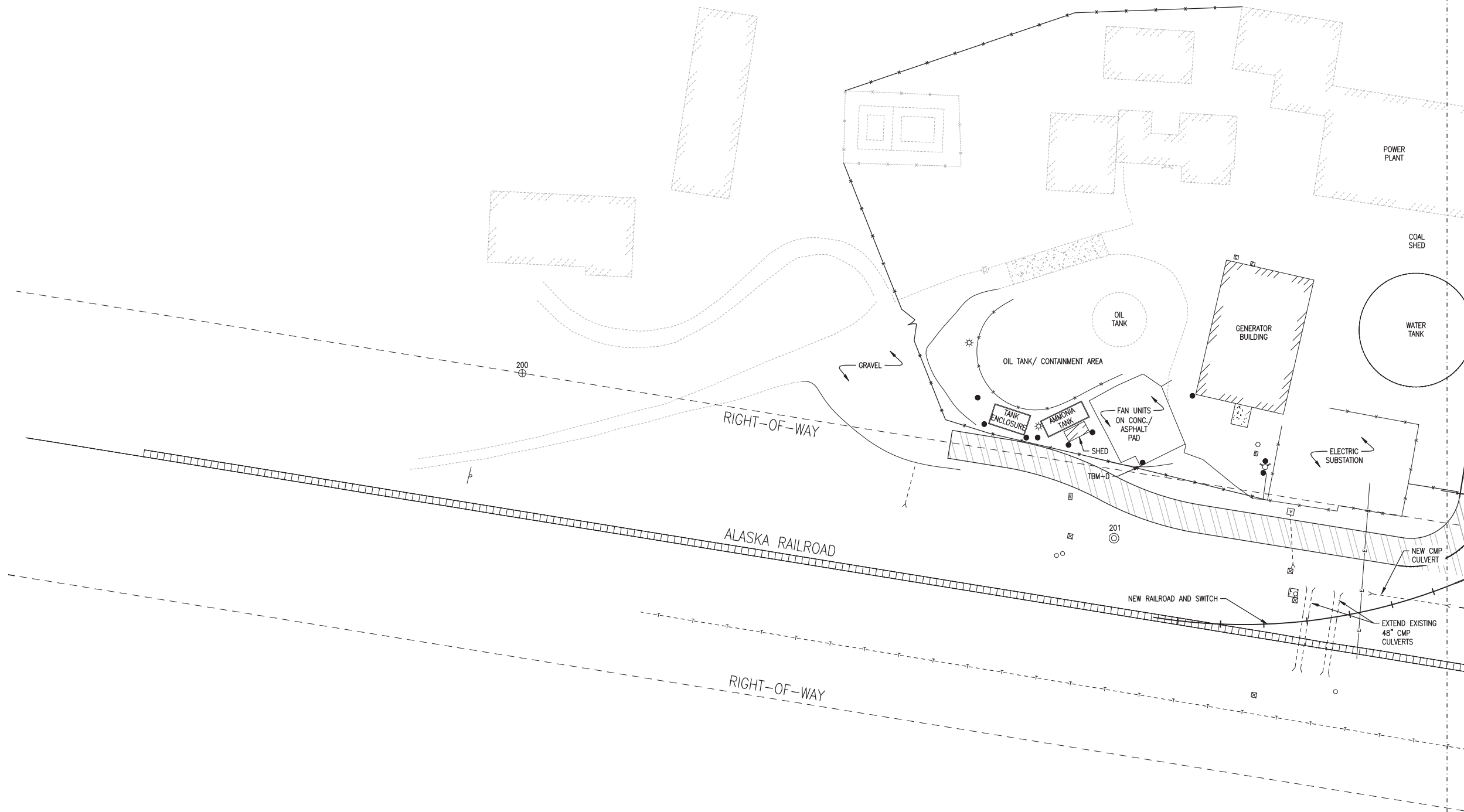


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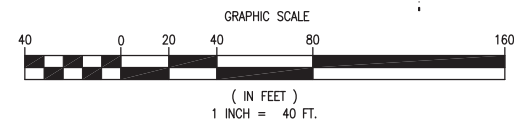
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NEW WORK
SITE PLAN
WEST

C201



1 NEW WORK SITE PLAN - WEST
C201 1" = 40'



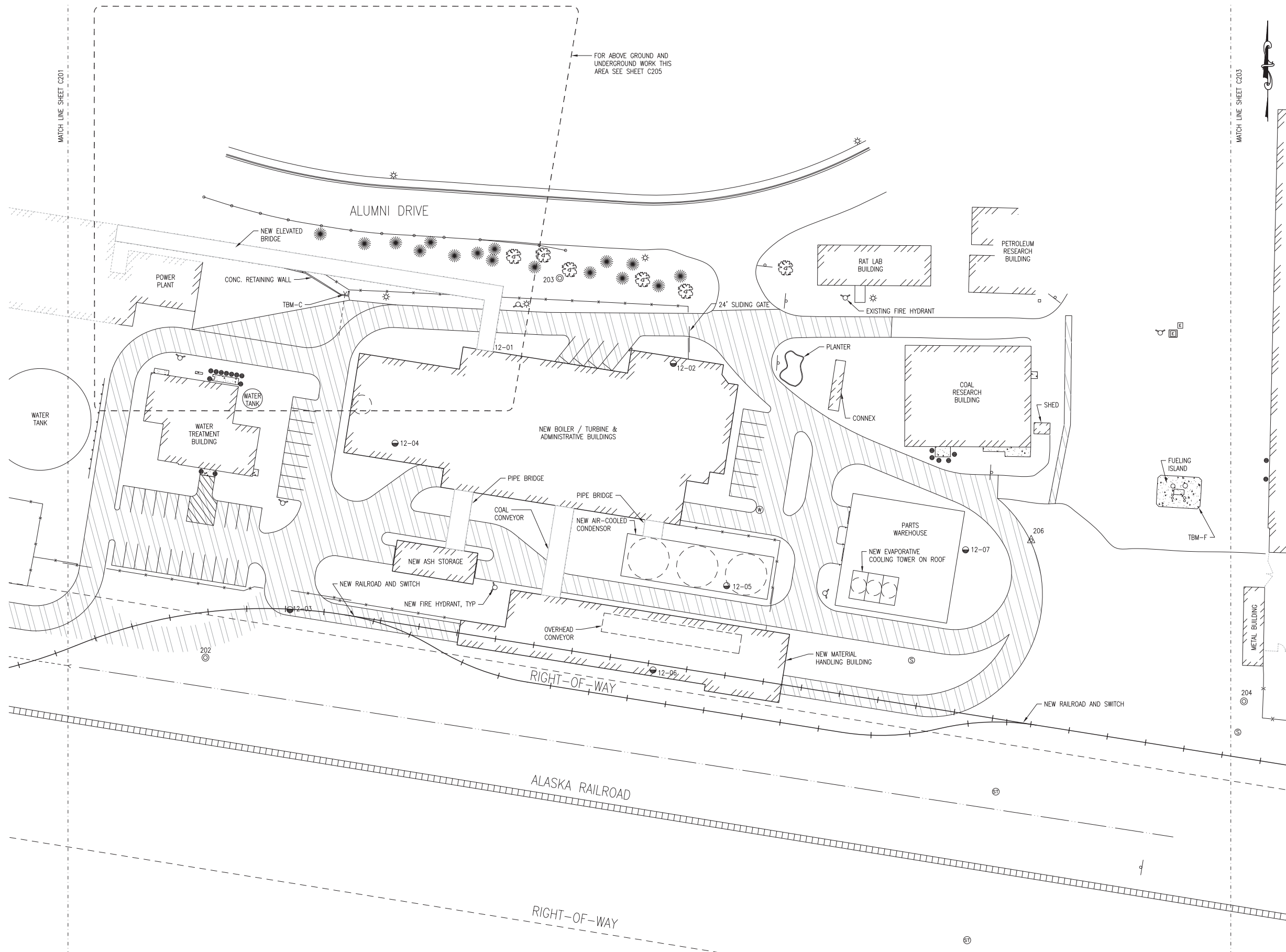


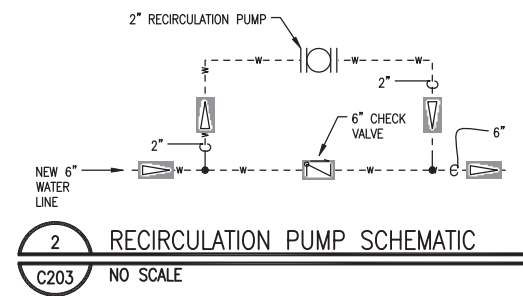
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NEW WORK
ABOVE GROUND
SITE PLAN
CENTER

C202





SPECIFIC NOTES

1 PROVIDE 2" RECIRCULATION PUMP IN PARALLEL WITH NEW 6" WATER LINE. SEE 2/C203.

NEW WORK UNDERGROUND SITE PLAN – CENTER

C203 $1'' = 40$

GRAPHIC SCALE

(IN FEET)
1 INCH = 40 FT.

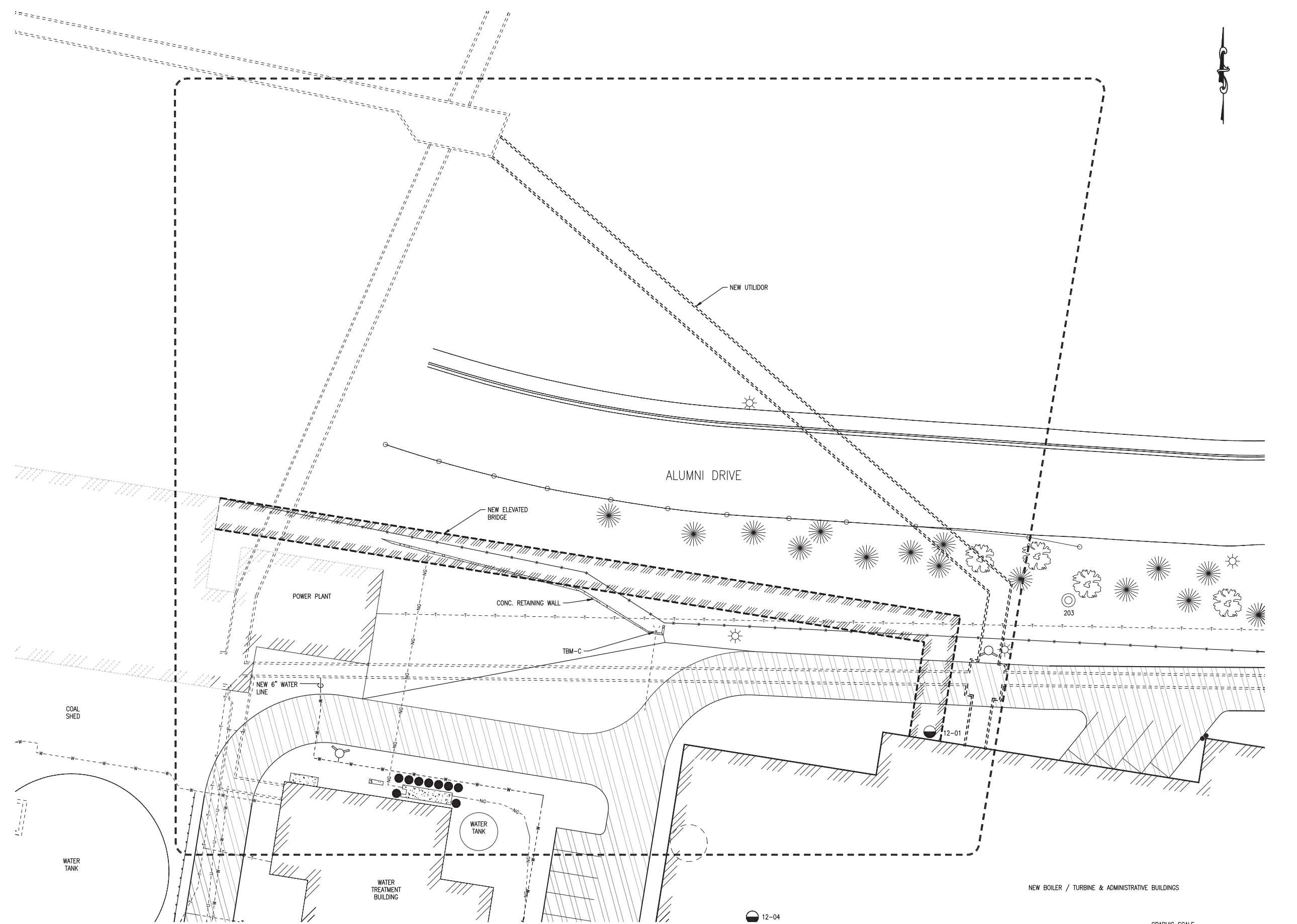


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NEW WORK
BRIDGE AND
UTILIDOR PLAN

C204



1 NEW WORK BRIDGE AND UTILIDOR PLAN
C204 1" = 20'

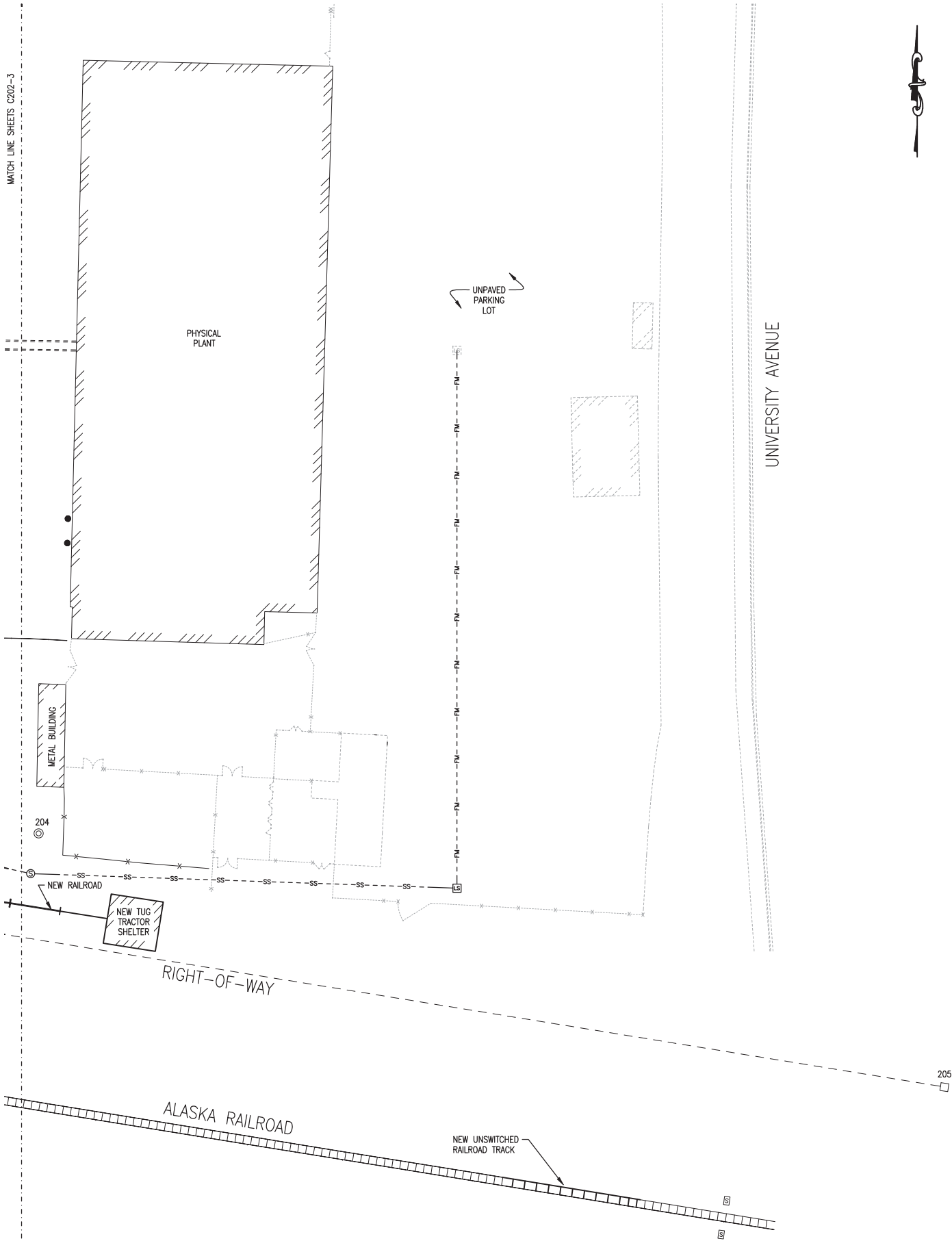


UAF COMBINED
HEAT AND
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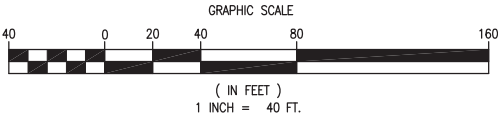
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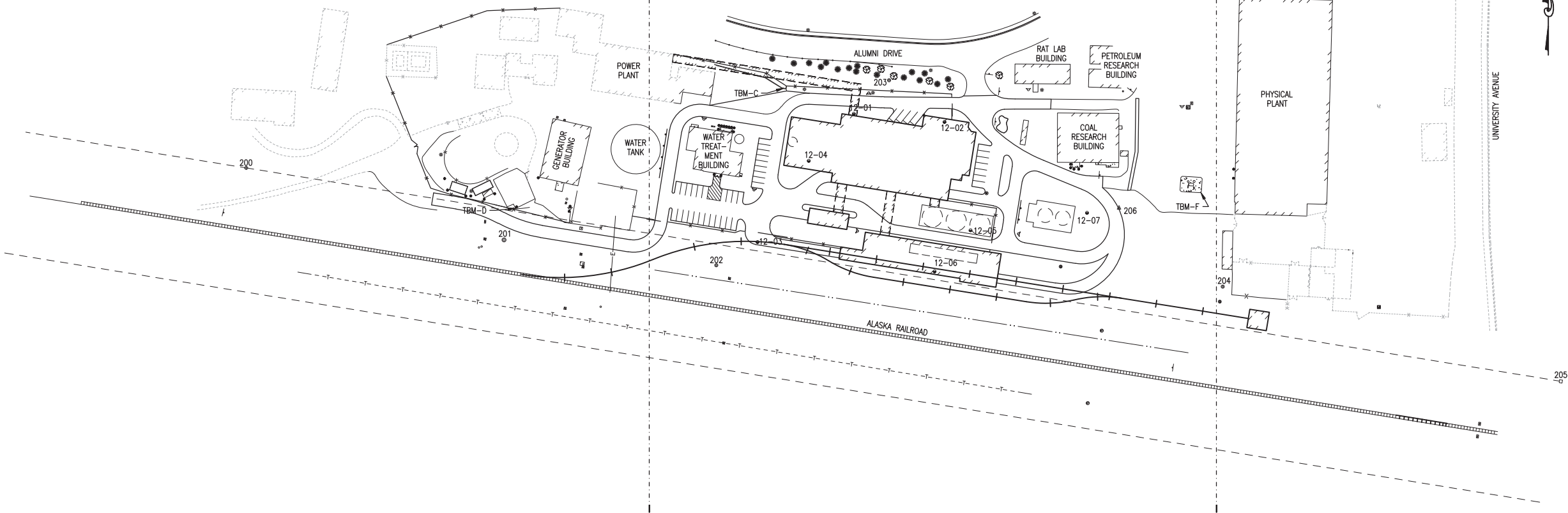
NEW WORK
SITE PLAN
EAST

C205



1 NEW WORK SITE PLAN – EAST
C205 1" = 40'





1 NEW WORK GRADING PLAN KEY
C206 1" = 100'

LEGEND

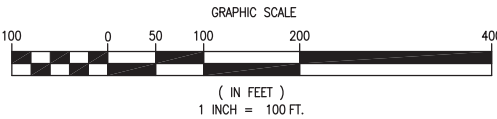
---x---	UNDERGROUND UTILIDOR	⊠	TELEPHONE PEDESTAL
---E---	OVERHEAD POWER LINE	⚡	LIGHT POLE W/ UNDERGROUND POWER
---E---	BURIED POWER LINE	⚡	FIRE HYDRANT
---T---	BURIED TELEPHONE LINE	⚡	WALL HYDRANT
---U---	BURIED TELEPHONE, POWER & WATER	○	SEWER CLEANOUT
---NG---	BURIED NATURAL GAS LINE	⊠	ABOVE GROUND OIL TANK
---S---	BURIED STEAM LINE	⊠	ELECTRIC PEDESTAL
---C---	BURIED CONDENSATE LINE	⊠	ELECTRIC VAULT
---SS---	BURIED SANITARY SEWER LINE	⊠	STEAM MANHOLE
---FM---	BURIED FORCE MAIN SEWER LINE	⊠	RAILROAD LOCKOUT
---D---	BURIED STORM SEWER LINE	⊠	RAILROAD SIGNAL SENSOR
---W---	BURIED WATER LINE	⊠	RAILROAD SWITCH
---X---	CHAIN LINK FENCE	⊠	RAILROAD CROSSING SIGNAL ON CONCRETE BASE W/ UNDERGROUND POWER
---X---	UNSURVEYED CHAIN LINK FENCE	⊠	SIGN
---O---	HEAD BOLT OUTLET RAIL	⊠	RAILROAD CROSSING
---O---	GUARD RAIL	⊠	SOIL BORING
---O---	CULVERT	⊠	MONITOR WELL
---O---	DRAINAGE DITCH/SWALE	⊠	DECIDUOUS TREE
---O---	RAILROAD RIGHT-OF-WAY BUILDING	⊠	CONIFEROUS TREE
---O---	UNSURVEYED BUILDING	⊠	ASPHALT PAVEMENT
---O---	UNSURVEYED STRUCTURE	⊠	CONCRETE PAD
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⊠	CONCRETE R.O.W. MONUMENT	⊠	SANITARY SEWER LIFT STATION
⊠	5/8" REBAR W/ ALUMINUM CAP	⊠	DEMOLITION AREA
⊠	8" SPIKE SET THIS SURVEY	⊠	AREA FOR DEMOLITION AFTER START-UP OF NEW FACILITY
FF	FINISHED FLOOR ELEVATION		
C.M.P.	CORRUGATED METAL PIPE		

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NEW WORK
GRADING PLAN
KEY

C206



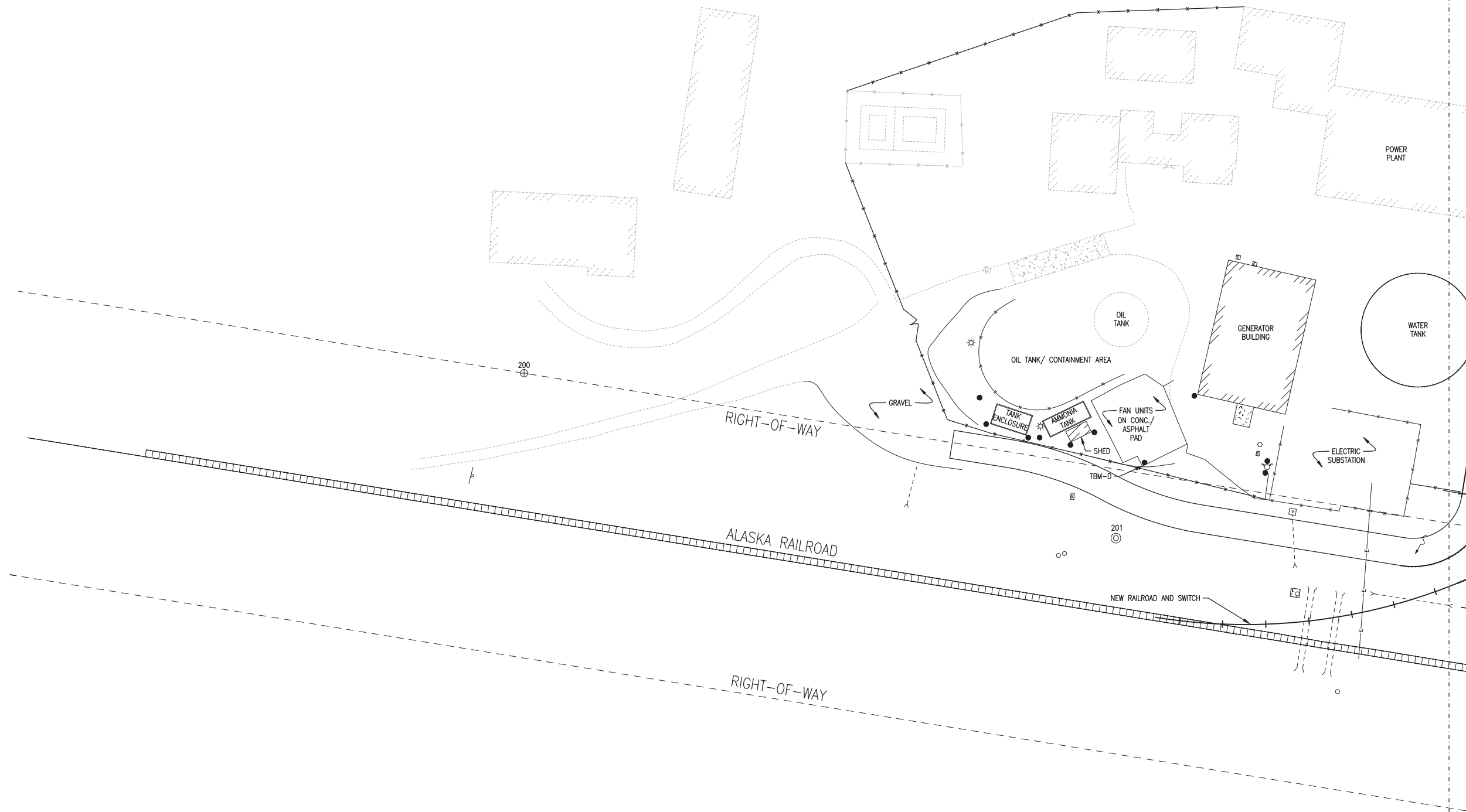


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NEW WORK
GRADING PLAN
WEST

C207



1 NEW WORK GRADING PLAN - WEST
C207 1" = 40'

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 INCH = 40 FT.

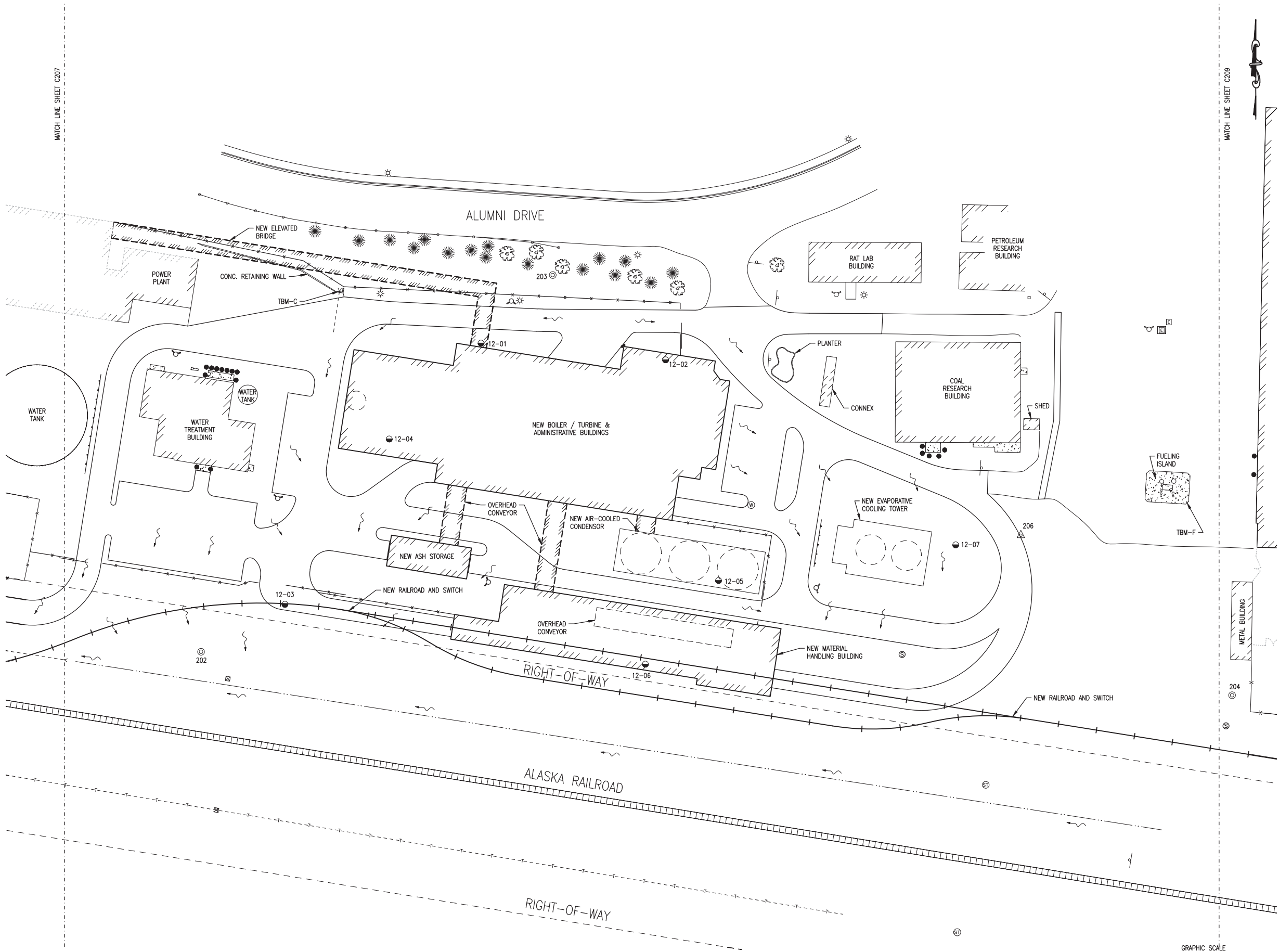


UAF COMBINED
HEAT AND
POWER PLANT

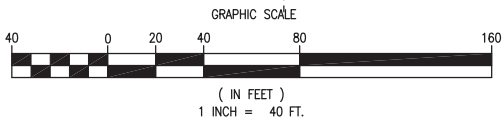
ISSUE DATE 20 FEB 2013
COMM. NUMBER 191101
DESIGNED BY VJA
DRAWN BY JAR
SCALE 0" = 1"

NEW WORK
GRADING PLAN
CENTER

C208



1 NEW WORK GRADING PLAN - CENTER
C208 1" = 40'



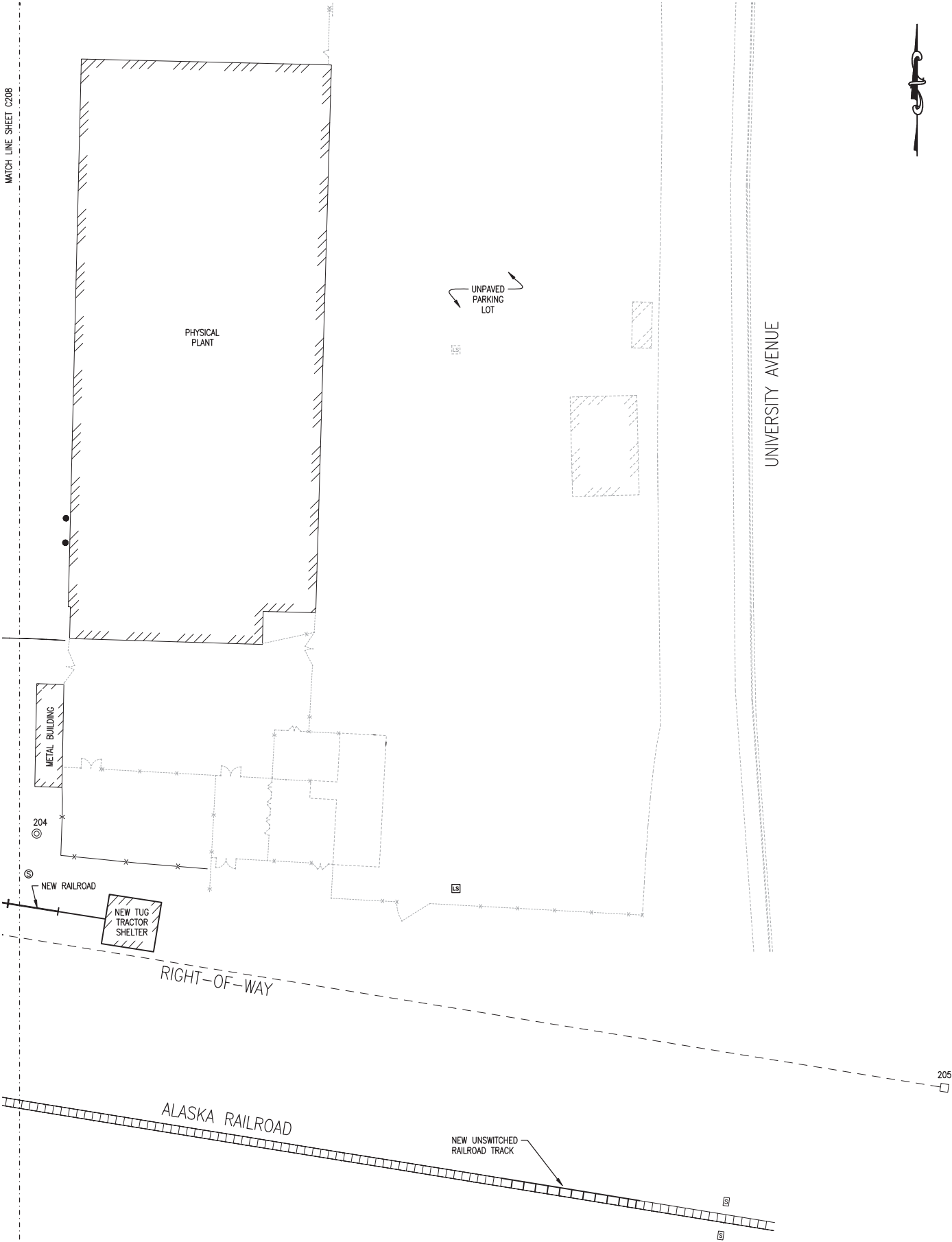


UAF COMBINED
HEAT AND
POWER PLANT

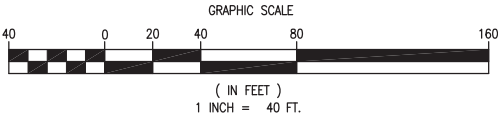
ISSUE DATE 20 FEB 2013
COMM. NUMBER 191101
DESIGNED BY VJA
DRAWN BY JAR
SCALE 0" = 1"

NEW WORK
GRADING PLAN
EAST

C209



1 NEW WORK GRADING PLAN - EAST
C209 1" = 40'



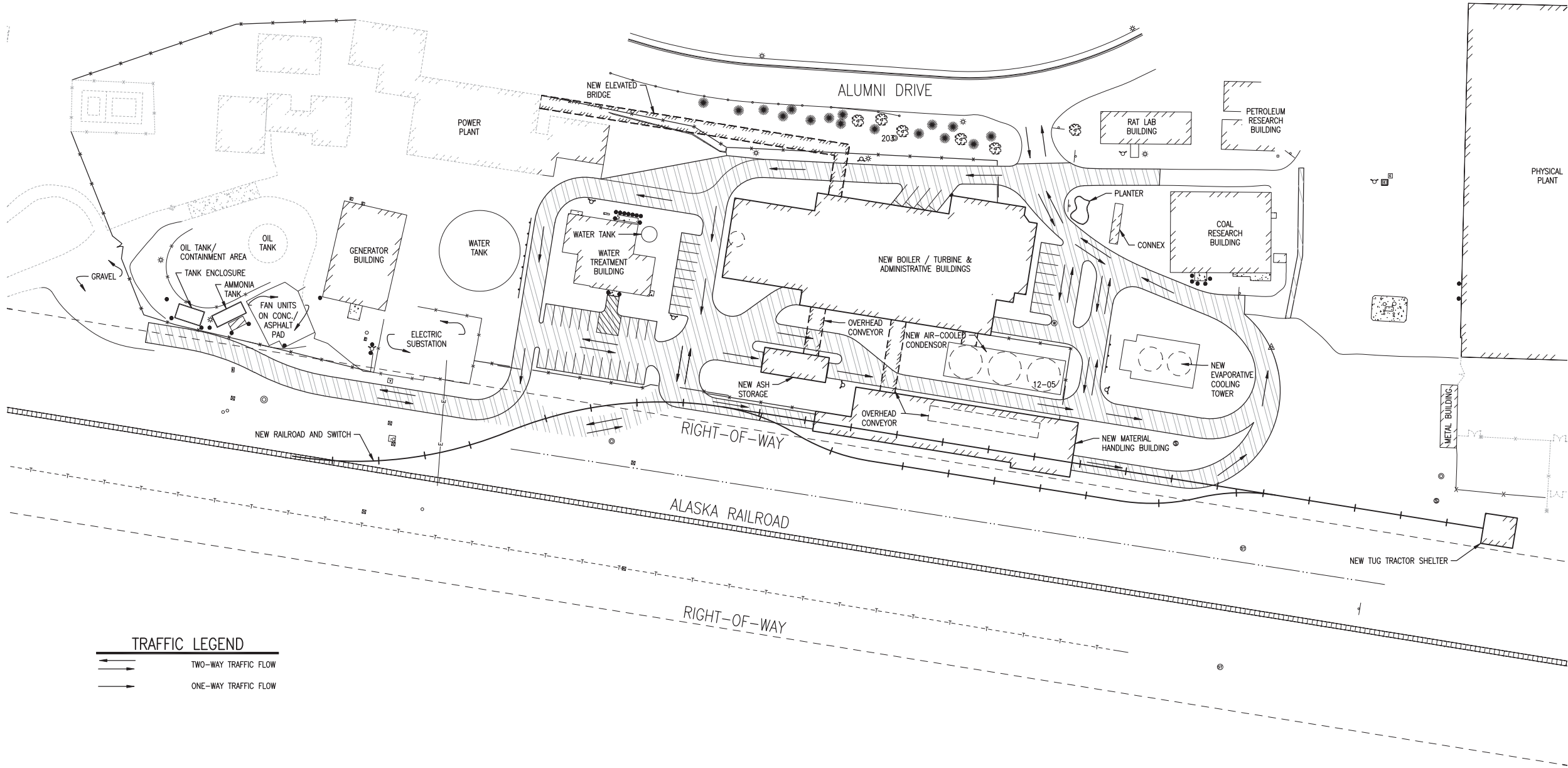


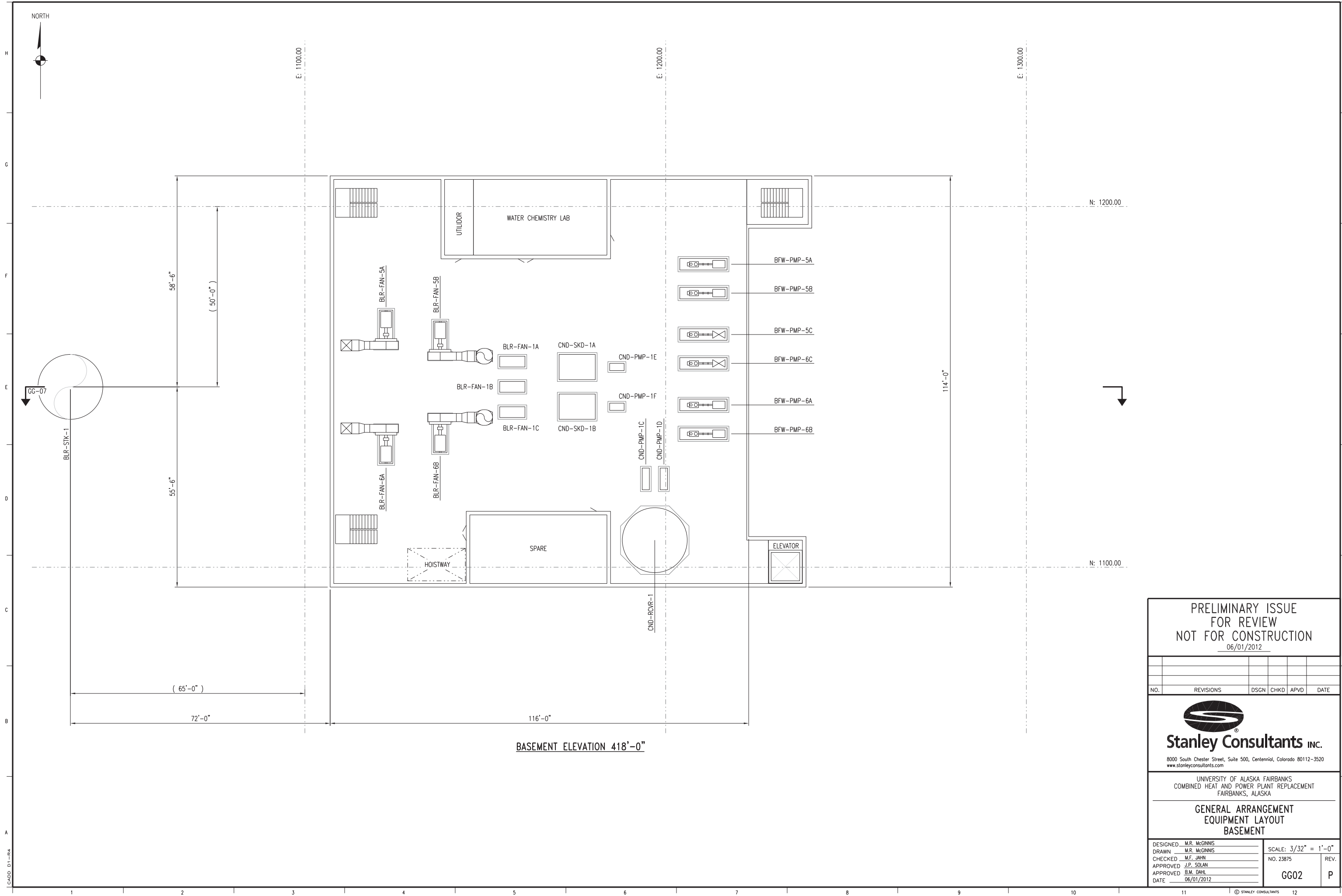
UAF COMBINED
HEAT AND
POWER PLANT

ISSUE DATE 20 FEB 2013
COMM. NUMBER 191101
DESIGNED BY VJA
DRAWN BY JAR
SCALE 0" = 1"

TRAFFIC
CIRCULATION
SITE PLAN


C210





PRELIMINARY ISSUE
FOR REVIEW
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06/01/2012

NO.	REVISIONS	DSGN	CHKD	APVD	DATE

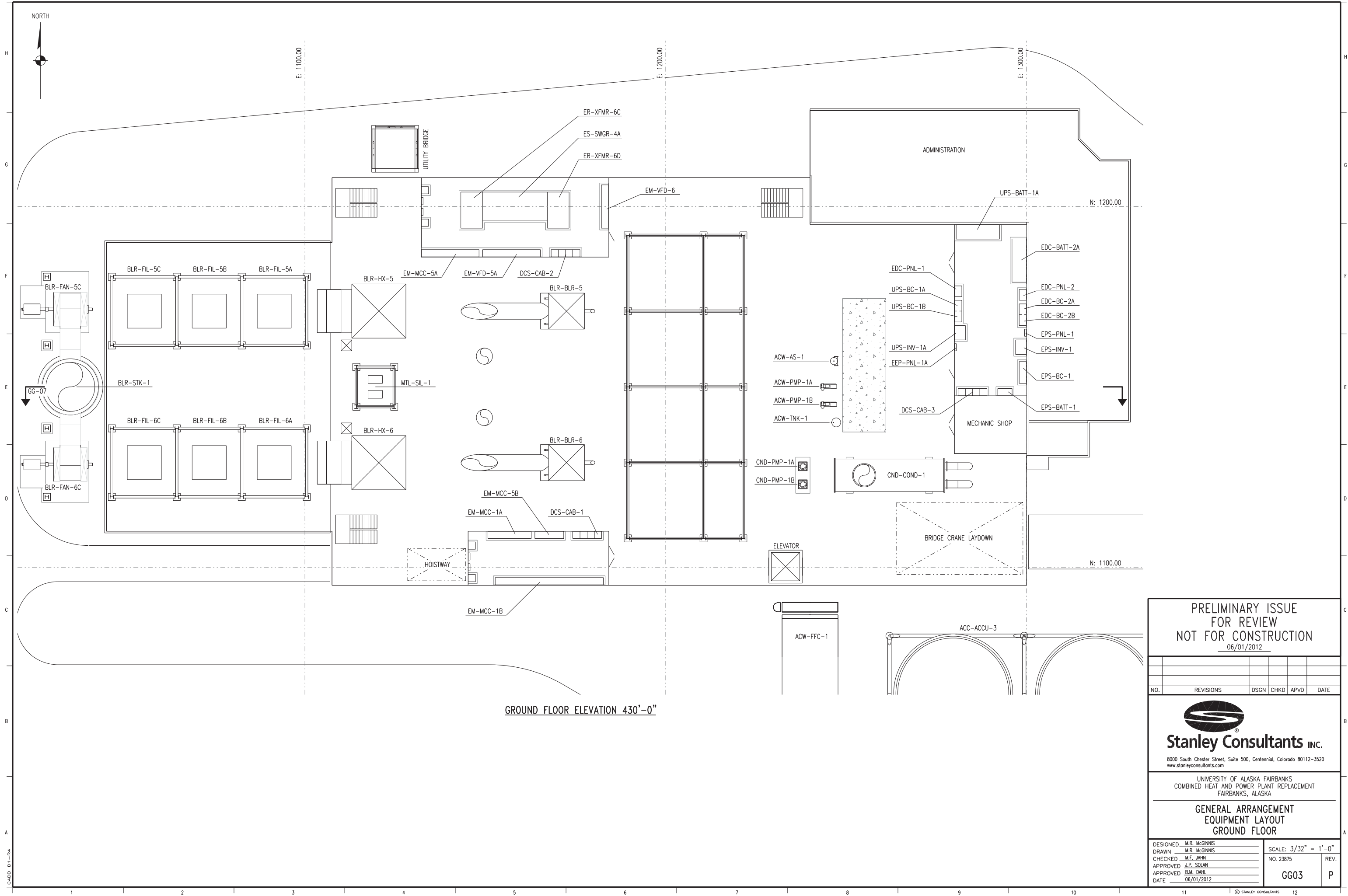


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8000 South Chester Street, Suite 500, Centennial, Colorado 80112-3520
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UNIVERSITY OF ALASKA FAIRBANKS
COMBINED HEAT AND POWER PLANT REPLACEMENT
FAIRBANKS, ALASKA

**GENERAL ARRANGEMENT
EQUIPMENT LAYOUT
BASEMENT**

DESIGNED <u>M.R. McGINNIS</u>	SCALE: 3/32" = 1'-0"
DRAWN <u>M.R. McGINNIS</u>	NO. 23875
CHECKED <u>M.F. JAHN</u>	REV.
APPROVED <u>J.P. SOLAN</u>	GG02
APPROVED <u>B.M. DAHL</u>	P
DATE <u>06/01/2012</u>	



PRELIMINARY ISSUE
FOR REVIEW
NOT FOR CONSTRUCTION
06/01/2012

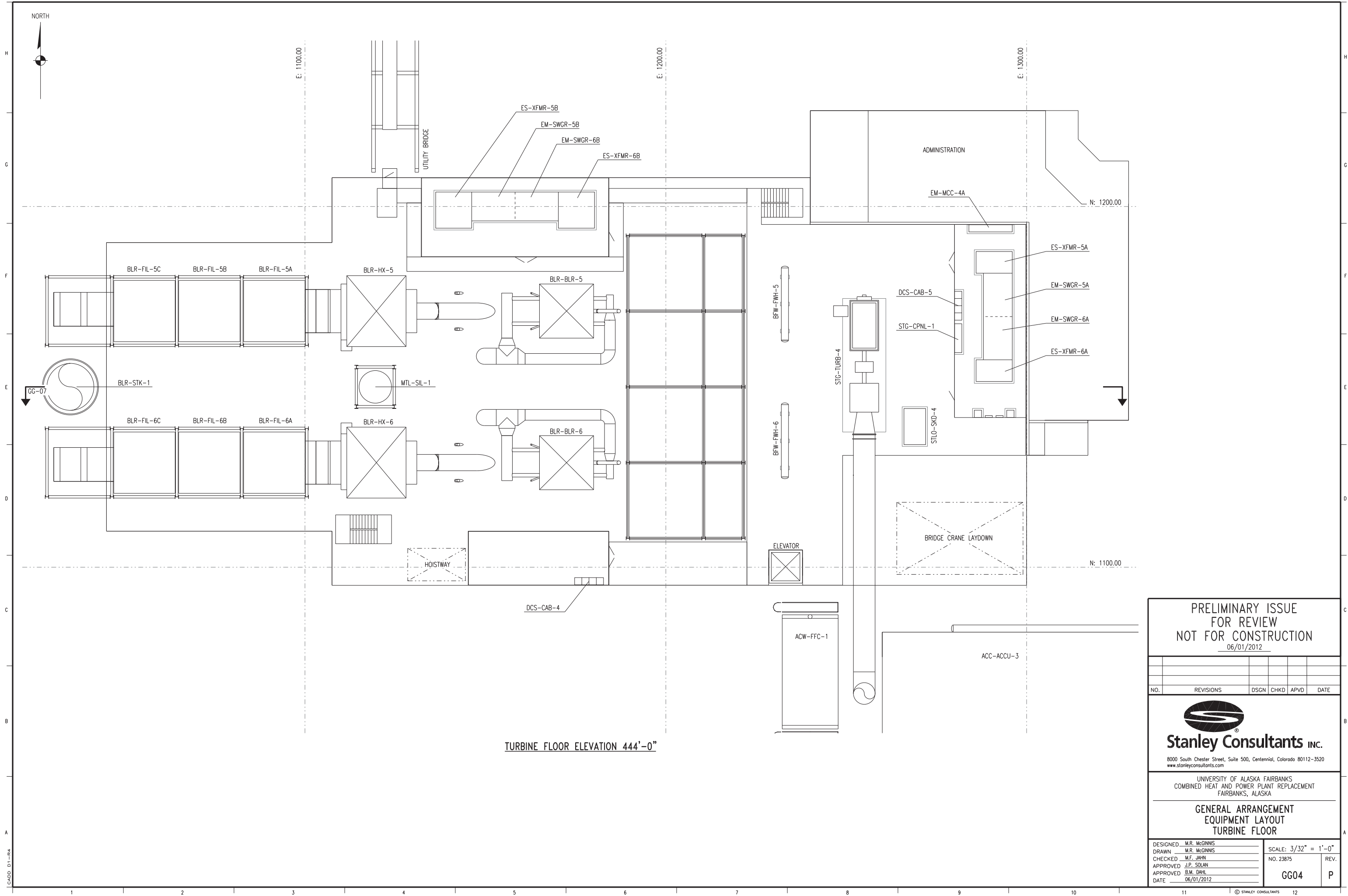
NO.	REVISIONS	DSGN	CHKD	APVD	DATE

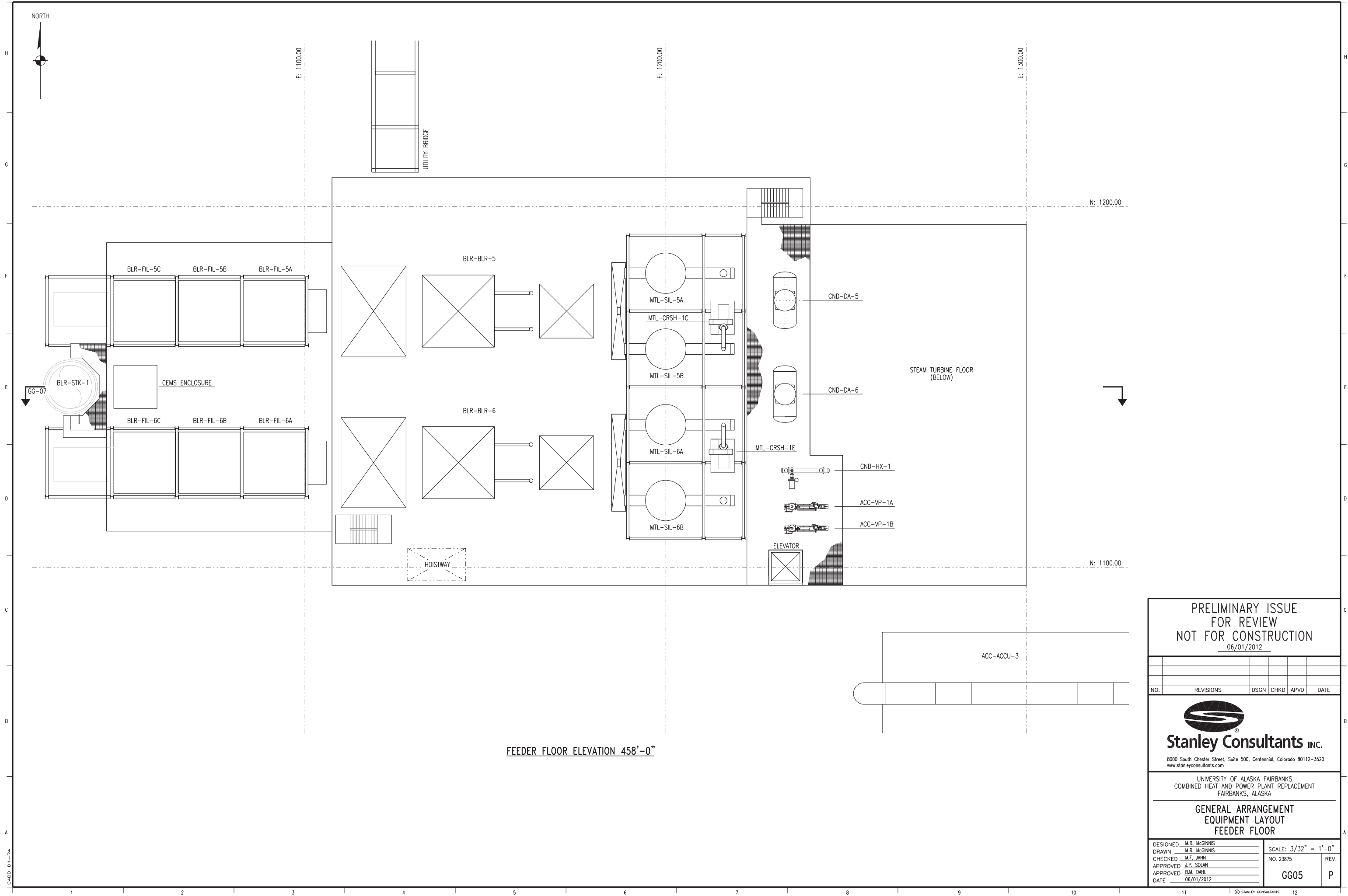
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COMBINED HEAT AND POWER PLANT REPLACEMENT
FAIRBANKS, ALASKA

**GENERAL ARRANGEMENT
EQUIPMENT LAYOUT
GROUND FLOOR**

DESIGNED <u>M.R. McGINNIS</u>	SCALE: 3/32" = 1'-0"
DRAWN <u>M.R. McGINNIS</u>	NO. 23875
CHECKED <u>M.F. JAHN</u>	REV.
APPROVED <u>J.P. SOLAN</u>	GG03
APPROVED <u>B.M. DAHL</u>	P
DATE <u>06/01/2012</u>	





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06/01/2012

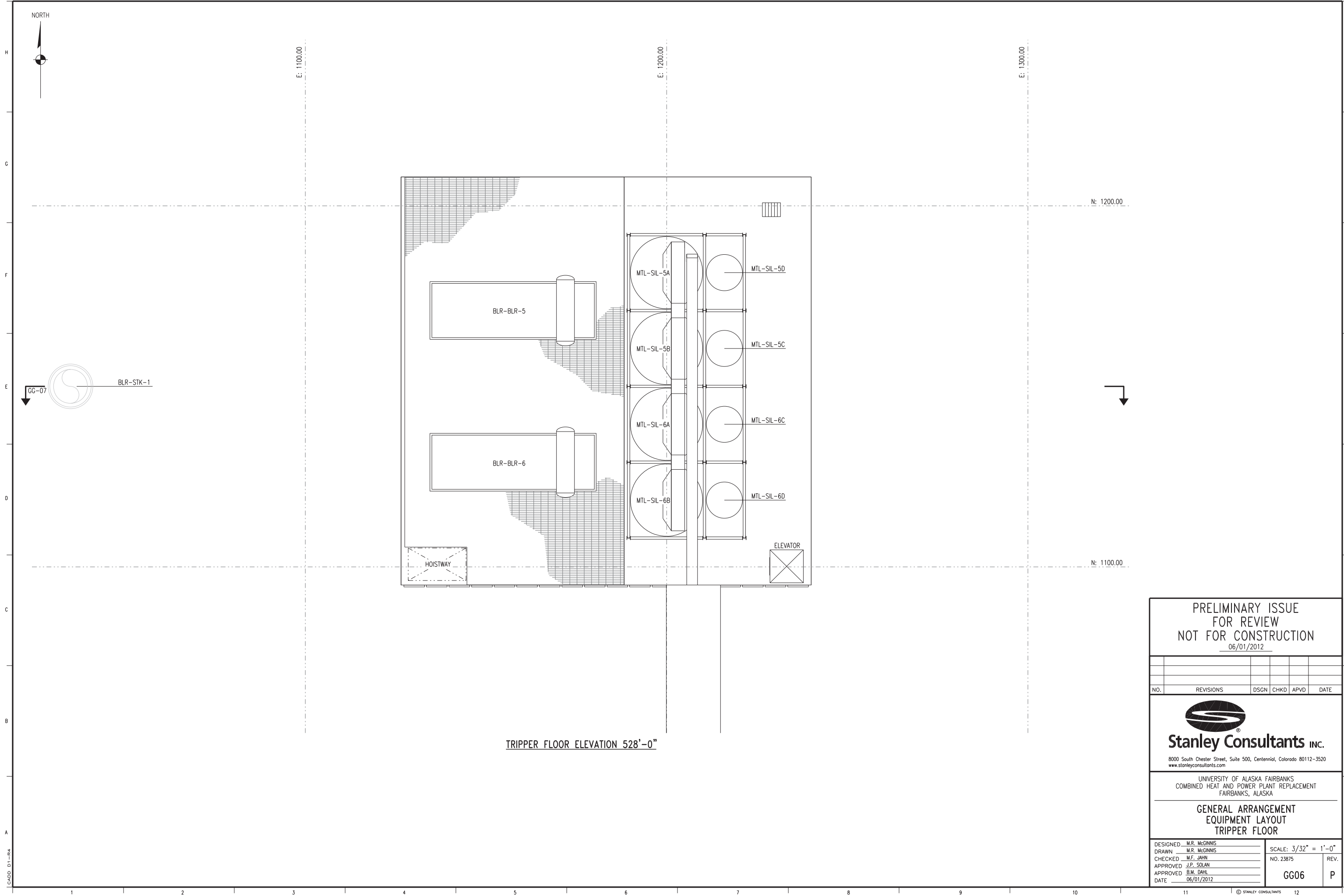
NO.	REVISIONS	DSGN	CHKD	APVD	DATE

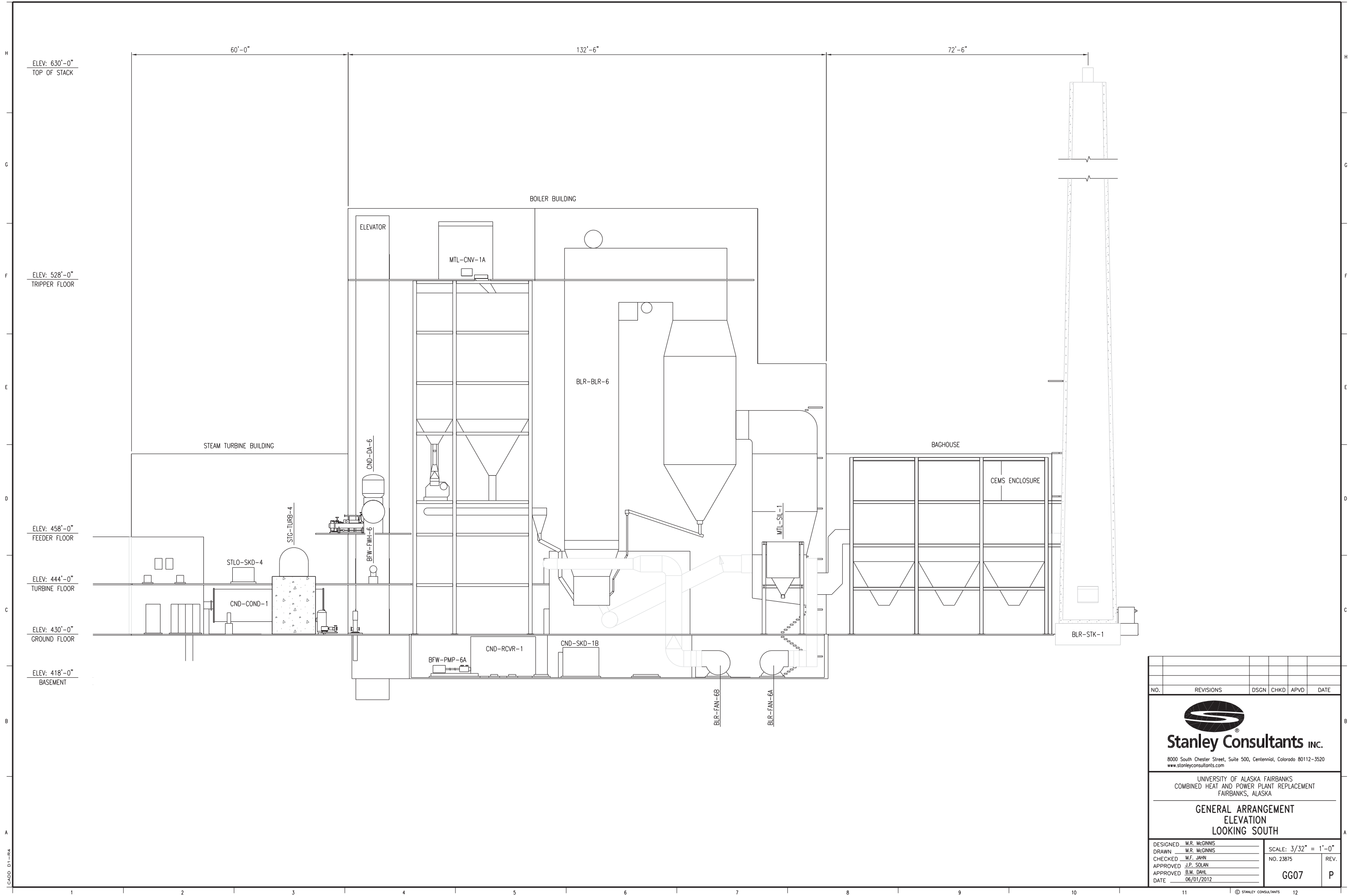

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FAIRBANKS, ALASKA


GENERAL ARRANGEMENT
EQUIPMENT LAYOUT
FEEDER FLOOR

DESIGNED <u>M.R. McGINNIS</u>	SCALE: <u>3/32" = 1'-0"</u>
DRAWN <u>M.R. McGINNIS</u>	NO. <u>23875</u>
CHECKED <u>M.F. JAHN</u>	REV. <u> </u>
APPROVED <u>J.P. SOLAN</u>	GG05
APPROVED <u>B.M. DAHL</u>	P
DATE <u>06/01/2012</u>	





NO.	REVISIONS	DSGN	CHKD	APVD	DATE



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FAIRBANKS, ALASKA

**GENERAL ARRANGEMENT
ELEVATION
LOOKING SOUTH**

DESIGNED <u>M.R. McGINNIS</u>	SCALE: <u>3/32" = 1'-0"</u>
DRAWN <u>M.R. McGINNIS</u>	NO. <u>23875</u>
CHECKED <u>M.F. JAHN</u>	REV. <u> </u>
APPROVED <u>J.P. SOLAN</u>	GG07
APPROVED <u>B.M. DAHL</u>	P
DATE <u>06/01/2012</u>	