Project Title:
Alaska Wood Biomass Energy Project

Award Number: DE-FG36-05GO85001

Recipient: Alaska Energy Authority
Project Location: Craig, Alaska

Project Period: From 7/1/2005 through 9/30/2008
Date of Report: March 2, 2009
Written by: Mr. Jon Bolling, Craig City Administrator
Program Manager: Mr. Peter Crimp

Cost-Sharing Partners: Alaska Energy Authority
USDA Forest Service
Denali Commission
City of Craig, Alaska

Project Contact(s): Mr. Peter Crimp, Alaska Energy Authority - 907-771-3000; PCrimp@aidea.org
Mr. Jon Bolling, City of Craig - 907-826-3275; JBolling@aptalaska.net

DOE Project Team
DOE-HQ contact: Paul Grabowski
DOE Field Project Officer: Debo Aichbhaumik
DOE Contract Specialist: Nicole Blackstone
DOE Project Monitor: Jessica Price

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CITY OF CRAIG, ALASKA

FINAL REPORT

CRAIG WOOD-FIRED BOILER PROJECT

March 2009

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Executive Summary

Project Purpose The purpose of the Craig Wood Fired Boiler Project is to use waste wood from local sawmilling operations to provide heat to local public buildings, in an effort to reduce the cost of operating those buildings, and put to productive use a byproduct from the wood milling process that otherwise presents an expense to local mills.

Project Scope The scope of the project included the acquisition of a wood boiler and the delivery systems to feed wood fuel to it, the construction of a building to house the boiler and delivery systems, and connection of the boiler facility to three buildings that will benefit from heat generated by the boiler: the Craig Aquatic Center, the Craig Elementary School, and the Craig Middle School buildings.

Project Results

Start up of the wood boiler occurred in April 2008. After some break in time the system was shut down for summer in June. The facility restarted in early October 2008. City of Craig staff expects the facility to operate uninterrupted at least through May 2009 or until energy demands from the recipient buildings is too low to efficiently operate the boiler. Results from operation during the current school year (fuel savings, operational costs, labor commitment, wood fuel consumption, etc.) will not be known until June or July of 2009.

Conclusions and Recommendations Initial operation of the boiler facility shows great promise. The facility's mechanical systems appear to perform well, and the system appears to have ample capacity for its intended use. Formal conclusions and recommendations will have to wait until the system completes its first full winter's operation as noted above. Given staff's initial impressions, however, the following observations can be made:

- The wood fuel drying system installed in the building appears to work very well, with wood at the receiving auger recording very low moisture content.
- Should operations through the 2008-2009 school year present unused capacity, efforts should be made to add additional demand to the facility.
- Personnel time as of November 2008 amounts to about two hours per day, seven days per week. Staff hopes to reduce the personnel demand by one-half as operations become routine.
- Staff should move toward combustion of hog fuel as a test to determine how well the material burns relative to the wood chips that the facility currently uses.

Background

The project began in earnest in 2004 when the City of Craig, located on Prince of Wales Island, in the Tongass National Forest in Southeast Alaska, as part of an investigation into ways to reduce heating costs at the Craig Aquatic Center, hired Murray & Associates, a mechanical design company based in Juneau, Alaska, to review options for converting the Craig Aquatic Center heating systems from propane to diesel. In addition, the city asked Murray to also consider a conversion to wood heat. The company responded that a conversion to diesel fuel would reduce the city's cost to heat the aquatic center. The company also stated that a conversion to wood heat also looked promising as a means to reduce costs, and recommended that an analysis of wood heat be completed by a company more familiar with wood heat applications. On that note, the Alaska Energy Authority agreed to sponsor a technical review of the merits of a wood heat conversion. Mr. Tom Miles from TR Miles Technical Consultants, visited Craig and after some analysis published a letter to AEA recommending a wood heat conversion that included the Craig Aquatic Center and two adjacent public buildings: the Craig Elementary School and Craig Middle School buildings. These preliminary reports led to the design, engineering, and construction that followed.

Details

The project may be described in four categories: scoping, engineering, construction, and operation.

Scoping

The scoping phase began in earnest with the publication of the Murray & Associates and the Tom Miles reports. Once these reports pointed to a likely benefit to the City of Craig and the Craig City School District of a conversion to wood heat, staff from the city, school district, Alaska Energy Authority, and other agencies traveled to the Bitterroot Valley in Montana in February 2005 to inspect existing wood fired facilities in Darby, MT that heat school buildings. A second trip, also to western Montana to inspect a Chiptec-manufactured wood burning system at Western Montana College took place in 2006.

Both these trips were very instructive. The Darby trip provided enough first hand information to city and school district staff to believe that the style of system we saw in operation in Darby could work in Craig. Staff was impressed by the automation built into the boiler system, and by the minimal amount of operator time needed to oversee operation of the facility. The group's review of the mechanical connections to the existing school heating systems also demonstrated that the application seen in Darby could be duplicated in Craig. Staff did come away from the trip concerned about the high moisture content of wood fuel on Prince of Wales Island, and understood that any application in Craig would have to include a means to dry the wood fuel prior to combustion. Another useful result of the trip was the confirmation that the facility in Darby did not generate smoke, odor, or other unpleasant or potentially unhealthful externalities. City staff took measures to speak with Darby residents about the wood burning facility to determine if the typical local resident had concerns about the facility. Staff initiated a

half dozen "man-on-the-street" conversations with Darby residents, none of whom expressed doubt or complaint regarding the operation of the wood burning facility. One notable feature of the Darby system is that it borders on a playground of the Darby Elementary School, with apparently no ill effects to students or staff resulting from the facility's operation.

Upon returning to Craig, city and school district staff reported findings back to local officials. Staff received authorization to continue working on the project, and efforts were made to make the project known locally to generate public input. Those efforts included discussions of the project at city council meetings, city staff meetings with school district staff and the Craig School Board, a presentation about the project to the Prince of Wales Island Chamber of Commerce, presentations to local wood industry groups, and frequent one-on-one conversations with Craig residents. Some local residents expressed the same concerns about the project that city staff had prior to the trip to Darby: will the project result in a perpetual blue haze of smoke in Craig; will it emit ash and particulates that might cause breathing problems for school students, staff, or residents near the wood burning facility; will the facility generate noise that will impact nearby residential areas. City staff discussed these concerns with Craig residents as they were expressed by the public.

After frequent discussions with local residents, funding was assembled from the City of Craig, Alaska Energy Authority, and USDA Forest Service to undertake design of a wood fired system based in Craig that would provide heat to the Craig Aquatic Center, Craig Elementary School, and Craig Middle School buildings.

Engineering

An engineering team was assembled that included several companies. R&M Engineering oversaw the design process, and provided civil engineering services for the project; CTA Consultants was brought on as a subcontractor to R&M Engineering to complete the mechanical design; and Northstar Power Engineering subcontracted to complete the electrical design work. The engineering team worked closely with city and school district staff, Tom Miles, and Alaska Energy Authority staff to complete design work.

The design included a new building to house the boiler and the needed mechanical and electrical systems, as well as to house wood fuel between the time of delivery and the time it is combusted. It was during the design phase that additional attention was paid to how to dry local wood fuel to a moisture content that would render the wood waste suitable for combustion in a wood boiler. The design team settled on a system that would dry the wood waste after it was delivered to the boiler building, by forcing heated air through the wood waste pile, using a twenty horse power electric fan, to evaporate water, and exhaust the resulting water vapor through an exhaust fan installed at the north gable end of the wood storage area. The system would direct the heated air through troughs embedded in the floor of the storage area. The troughs would vent the heated and pressurized air into the wood fuel through perforated steel plates that cover the troughs. This design feature is unique to the Craig project. City staff harbored some concern over the effectiveness of this method, as it was untried in other applications, and because it was critically important to properly dry the wood fuel prior to combustion.

Final design drawings resulted in an engineer's construction cost estimate of $1.2 million. Consistent with findings from the Miles and Murray & Associates reports, the engineering firms completed a cost-benefit

analysis that demonstrated positive cash flow for the project. City staff worked with funding agencies to compile funding totaling $1 million.

Project managers held a competitive bid process for the purchase of the wood burning and wood fuel delivery system needed for the facility. Because of Craig's remote location, and a high demand nationwide environment for wood heating systems, the bidding process resulted in the receipt of only one competitive bid. That bid, from Chiptec, Inc. of Vermont, was reviewed and ultimately accepted. This event triggered the need to review Chiptec system under installation at Western Montana College in Dillon, Montana. City and school district staff traveled to Dillon to inspect the system, and paid special attention to the wood delivery component of the Chiptec package. Like the prior trip to Darby, the visit to Dillon was quite instructive for Craig staff in understanding the design and operating parameters of the Chiptec system, which was quite different from the system reviewed on the Darby trip.

With the vendor of the wood burning system now established, the balance of the project was subsequently put out to bid. Two responsive bids were received for the work, one totaling $1.675 million, the other at $2.264 million. Because even the lowest bid was well in excess of the funding available, local staff work with the engineering team to change a number of elements of the project to lower costs. The city also elected to complete the project via force account, rather than by competitive bid, and hired force account labor to undertake the reduced scope project. After much design modification, and securing additional financing, the project was ready for construction by Spring of 2006.

It is worth noting here that during the scoping and design phase, energy prices rose dramatically. The price of oil began a climb that peaked at more than $140/barrel in July 2008. This sharp rise in energy costs supported local efforts to find a way to construct the project in spite of the high competitive bid costs.

Construction

Staff and the engineering team developed the following construction budget.

Financing			$ 1,513,435
Expenses			
	Site Work	$50,000	
	Boiler Assembly	$350,867	
	Boiler Freight	$35,000	
	Concrete	$35,000	
	Concrete Materials	$3,500	
	Rebar	$15,000	
	Force Account Labor	$200,000	
	Framing Package	$32,000	
	Freight	$15,000	
	Mechanical	$600,000	
	Elecrical materials	$50,000	
	Elecrical labor	$10,000	
	Project Manager	$20,000	
	Equipment Rental	$10,000	
	Engineering	$15,000	
	Sub total	$1,441,367	
	Contingency (5%)	$ 72,068	
	Total Expenses		($1,513,435)

Site work began in 2006, with construction immediately following. The city hired a project manager to oversee and coordinate the multiple components of the project. Construction of the mechanical and control improvements, apart from those provided by Chiptec, were awarded to a mechanical subcontractor. The building's foundation and other concrete components were formed and poured during the summer months, with simple wood framing and roofing work following. The wood burning components from Chiptec arrived over a several month period and were stored on site. Once the building was weatherproofed, the Chiptec gasifier and boiler were placed in the boiler room. Chiptec personnel arrived on site in early 2008 and installed the equipment their company provided. The mechanical subcontractor completed installation of the hydronic system between the Craig Aquatic Center and the Craig Elementary and Middle School buildings.

The city force account labor crew worked well in building the facility under the redesign that reduced the scope of the project. The crew was able to best fit the mechanical and electrical components of the project in the redesigned building. This effort required substantial planning and skill.

The construction phase was reduced to a series of punch list items by August 2008. Punch lists were also developed by the project manager for the mechanical subcontractor as well as for Chiptec Inc.

Operation

Start up of the facility occurred in April 2008. Representatives from Chiptec and the mechanical subcontractor were on site to oversee the start up routine of the boiler and hydronic system. Start up was somewhat problematic due to wet wood fuel. Because the boiler had not yet operated there was no heat available to pre-dry wood fuel stored in the chip bin portion of the boiler building. After some struggle the gasifier was lit and the hydronic system slowly brought up to temperature. After several days of troubleshooting the hydronic system was activated and hot water was pumped to the recipient buildings.

The system operated until June, when the Craig Aquatic Center closed for two weeks for its annual maintenance shut down. At that point, with no demand from the pool building and no demand from the school buildings, the boiler was shut down. Staff restarted the system in early October. After some additional troubleshooting efforts, the wood boiler has run very well for two consecutive months (as of the ending date of this report – December 6, 2008), and staff has every expectation that the system will continue to operate well throughout the winter.

The forced air wood fuel drying system installed in the facility to address moisture concerns appears to work very well. Several grab samples taken during operations since early October recorded only five percent moisture content—too dry for the system, as the augers that deliver the wood fuel from the storage bin to the gasifier rely on a wood fuel moisture content higher than five percent to help lubricate the delivery system. On those occasions when the wood fuel was too dry, the facility's operator used a garden hose to wet the wood fuel in the feed augers to increase the moisture content to a slightly higher level.

Since October, the system has burned approximately 5,000 pounds of wood chips per day, slightly higher than anticipated by the design. Fuel consumption is higher when wood fuel is wetter. Ash production totals about twelve gallons per 35,000 pounds of wood burned.

Accomplishments

The project's goal—construction of a wood fired facility to reduce heating costs at the Craig Aquatic Center, Craig Elementary School, and Craig Middle School—was completed successfully. City and school district staff are working together now to achieve a second critical goal: efficient and steady operation of the boiler throughout the 2008-2009 school year. Staff is working with a graduate level student based on Prince of Wales Island who is working on a thesis project for her Masters degree in rural development. This partnership will compile operational data on the boiler throughout this first year of operation and compile this data to determine the costs and benefits of operation during the study period. This work will assist the student in completion of her degree while providing valuable operational data for the city and school district as they prepare for the second year of operation beginning with the start of the 2009-2010 school year.

Conclusions

- Readily available commercial and industrial wood combustion assemblies have productive applications in Southeast Alaska.
- Attention to controlling wood moisture content is critical to project success.
- Preliminary conclusions regarding cost savings resulting from the combustion of wood waste from the Craig project will be available in mid 2009.
- Preliminary results from operation look promising as it relates to reducing heating costs.

- Craig project benefited from a good pool of local skilled labor and availability of a highly skilled project manager who was available to work on the project on contract.
- Efforts to disseminate project information to the public to build local support are critically important for such projects.
- There may be surplus capacity in the boiler system that could be put to use in productive ways, such as by adding demand from nearby buildings and producing electricity. Additional study is needed here.

Recommendations

- Future projects in Southeast Alaska similar to scope of the Craig project should ensure measures to pre-dry wood fuel.
- Should operations through the 2008-2009 school year present unused capacity, efforts should be made to add additional demand to the facility.
- Staff should move toward combustion of hog fuel as a test to determine how well the material burns relative to the wood chips that the facility currently uses.
- So long as fossil fuel prices remain high, the State of Alaska should provide funding for similar alternative energy efforts at local levels, provided that fund recipients demonstrate ability to operate such facilities over the long-term.
- State funding should include both grant funds and loans. The Power Project Loan Fund is a good source for loan money, but the loans should be made available to communities and non-profits at nominal interest rates (>/= 1 percent), far lower than current rates.

Appendix I – Design Drawings

CITY OF CRAIG, ALASKA
WOOD FIRED HEATING SYSTEM

MAYOR
Dennis Watson

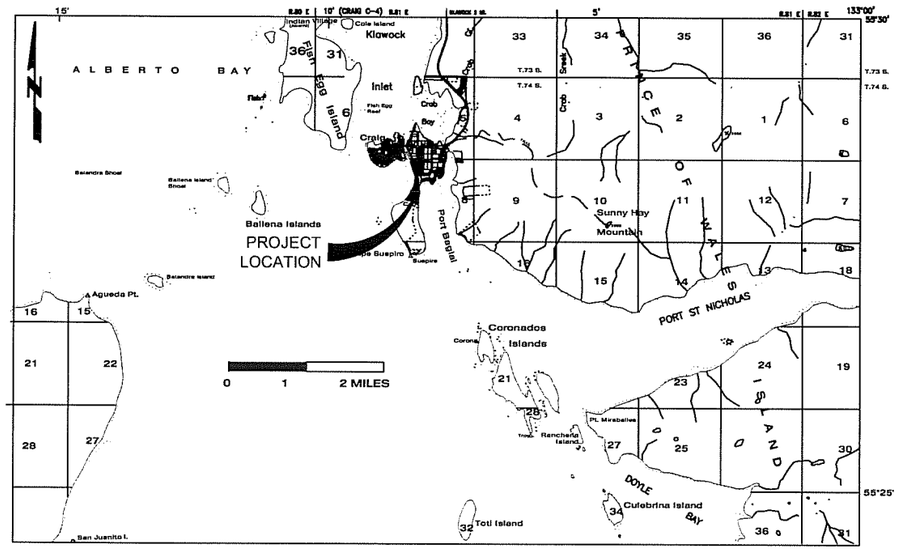
CITY ADMINISTRATOR
Jon Bolling

PUBLIC WORKS DIRECTOR
Steve Tanner

CITY COUNCIL
Millie Stevens
Fred Hamilton Sr.
Don Pierce
Mike Douville
Wanda Rice
Jim See

VICINITY MAP

CRAIG (B-4) QUADRANGLE
ALASKA
1:63360 SERIES (TOPOGRAPHIC)



SHEET LIST

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M #: 052348
CADD FILE: SITEWORK.DWG

R&M ENGINEERING–KETCHIKAN, INC.
355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901

STATE OF ALASKA
49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

SHEET DESCRIPTION
TITLE SHEET/
VICINITY MAP

SHEET
G001

GENERAL NOTES

PARTICIPANTS

OWNER
CITY OF CRAIG
P.O. BOX 725
CRAIG, ALASKA 99921
(907) 826-3275
FAX (907) 826-3278

CIVIL/STRUCTURAL ENGINEER

R&M ENGINEERING, INC.
355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901
(907) 225-7917
FAX (907) 225-3441

ELECTRICAL ENGINEER

NORTH STAR POWER ENGINEERING
P.O. BOX 1337
CRAIG, ALASKA 99921
(907) 826-2893

MECHANICAL ENGINEER

CTA ARCHITECTS/ENGINEERS
306 W. RAILROAD AVE.
SUITE 104
MISSOULA, MT 59802
(406) 728-9522
FAX (406) 728-8287

ZONING

LEGAL DESCRIPTION
LOT 8, USS 2611
ADDRESS: UNASSIGNED

ZONING
NONE

LOT AREA
S.F., ACRES

DEVELOPMENT REQUIREMENTS
HEIGHT RESTRICTIONS: NONE
SETBACKS: NONE
LOT COVERAGE RESTRICTIONS: NONE

DESIGN CRITERIA

1. CODES

   ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF THE 2003 EDITION OF THE INTERNATIONAL BUILDING CODE (IBC).

2. DESIGN LIVE LOADS:

   ROOFS: a) 20 PSF LIVE
   b) 40 PSF SNOW
   c) 5 PSF MECHANICAL
   d) 15 PSF DEAD

   FLOORS: 125 PSF

3. WIND DESIGN:

   120 MPH, 3 SECOND GUST
   Exposure D
   Importance 1.0

4. SEISMIC DESIGN:
   Site Class C
   Ss = 28.30%g
   S1 = 20.90%g
   Importance = 1.0
   Use Group = 1

SPECIAL INSPECTION

1. ALL CAST IN PLACE CONCRETE WHICH INCLUDES, BUT NOT LIMITED TO, CONCRETE FOUNDATION, CONCRETE GRADE BEAMS AND CONCRETE SLAB ON GRADE.
2. BOLTS INSTALLED IN CONCRETE WHICH INCLUDES, BUT NOT LIMITED TO, COLUMN ANCHOR BOLTS.
3. PLACING OF REINFORCING STEEL FROM ITEM 1.
4. ANCHOR BOLTS
5. EXPANSION ANCHORS
6. THE ENGINEER SHALL VERIFY THAT THE SUBGRADES HAVE BEEN PROPERLY PREPARED PRIOR TO FOUNDATION CONSTRUCTION.

GENERAL

1. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION. THE ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCIES OR INCONSISTENCIES.
2. DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALES SHOWN ON THE DRAWINGS.
3. OPENINGS LARGER THAN 6" SHALL NOT BE PLACED IN CONCRETE SLABS, DECKS, BEAMS, JOISTS, COLUMNS, WALLS, ETC. UNLESS SPECIFICALLY DETAILED ON THE STRUCTURAL DRAWINGS. NOTIFY THE STRUCTURAL ENGINEER WHEN DRAWINGS BY OTHERS SHOW OPENINGS, POCKETS, ETC. LARGER THAN SIX INCHES NOT SHOWN ON THE STRUCTURAL DRAWINGS, BUT WHICH ARE LOCATED IN STRUCTURAL MEMBERS.
4. THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. OBSERVATION VISITS TO THE SITE BY THE STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.
5. THE ENGINEERING FOR THE ROOF TRUSSES AND ROOF FRAMING BE PROVIDED BY THE CONTRACTOR.

ARCHITECTURAL

1. ALL WORK SHALL CONFORM TO THE 2003 IBC AS ADOPTED AND ALL APPLICABLE MECHANICAL AND ELECTRICAL CODES AS ADOPTED BY THE STATE OF ALASKA. FOR LIGHT FRAME CONSTRUCTION PROVISIONS, SEE UBC CHAPTER 23.

2. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND BUILDING DIMENSIONS PRIOR TO PROCEEDING WITH THE WORK. ANY VARIATION FROM THE CONDITIONS AND DIMENSIONS SHOWN ON THE DRAWING SHALL BE REPORTED TO THE OWNER'S REPRESENTATIVE FOR RESOLUTION PRIOR TO CONSTRUCTION. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS. DIMENSIONS ARE TO CENTERLINE OF COLUMNS OR TO FACE OF FRAMING, UON.

3. STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS FOR BIDDING AND CONSTRUCTION.

4. PROVIDE FIRE BLOCKING, DRAFT STOPS, AND FIRE STOPS PER IBC SECTION 717.

5. CONTRACTOR-INITIATED CHANGES SHALL BE SUBMITTED IN WRITING TO THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO FABRICATION OR CONSTRUCTION. CHANGES SHOWN ON SHOP DRAWINGS ONLY WILL NOT SATISFY THIS REQUIREMENT.

6. WINDOWS IN OCCUPIED, HEATED AREAS OF BUILDING TO BE DOUBLE PANE, INSULATED GLAZING.

7. SAFETY GLAZING: WIRED, TEMPERED, AND LAMINATED SAFETY GLASS MUST MEET UBC STANDARDS. GLAZING IN OR ADJACENT TO DOORS (12") AND GLAZING LESS THAN 18" ABOVE FLOOR, AND OTHER HAZARDOUS LOCATIONS PER UBC SEC. 2406.

8. MINIMUM INSULATION REQUIREMENTS IN OCCUPIED, HEATED AREAS OF BUILDING, UON:

ROOF/CEILING	R38
EXT. WALLS	R21
FLOORS & SOFFITS	R21
HOT WATER PIPES	1/2"

ALLOW 2' MIN. AIR SPACE OVER INSULATION WHEN BATTS ARE USED BETWEEN RAFTERS & TRUSSES. SEAL ALL TEARS AND JOINTS WITH TAPE. ALL ROOF INSULATION APPLIED DIRECTLY TO EXTERIOR FRAMING MEMBERS SHALL BE PROVIDED WITH VAPOR BARRIER ON HEATED SIDE. ALL OPENINGS (DOORS, WINDOWS, ETC.) SHALL BE CAULKED, SEALED, OR WEATHERSTRIPPED.

9. RATED ASSEMBLY NOTES:
   A. 1-HOUR FLOOR ASSEMBLY (GA FILE NO FC 5407): BASE LAYER 5/8" TYPE X GYPSUM WALLBOARD APPLIED AT RIGHT ANGLES TO WOOD I-JOISTS MAXIMUM 24" O.C. WITH 1-1/4" TYPE w OR s DRYWALL SCREWS 24" O.C. FACE LAYER 5/8" TYPE X GYPSUM WALLBOARD OR GYPSUM VENEER BASE APPLIED AT RIGHT ANGLES TO I-JOISTS WITH 1-7/8" TYPE W OR S DRYWALL SCREWS 12" O.C. AT JOINTS AND INTERMEDIATE I-JOISTS AND 1-1/2" TYPE G DRYWALL SCREWS 12" O.C. PLACED 2" BACK ON EITHER SIDE OF END JOINTS. JOINTS OFFSET 24" FROM BASE LAYER JOINTS. WOOD I-JOISTS SUPPORTING 1/2" WOOD STRUCTURAL PANELS APPLIED AT RIGHT ANGLES TO JOISTS WITH 8D NAILS.

   B. 1-HOUR ROOF ASSEMBLY (GA FILE NO. RC 2602): SAME AS ABOVE WITH ROOF TRUSSES INSTEAD OF I-JOISTS.

FOUNDATIONS

1. CONTRACTOR TO PROVIDE FOR DE-WATERING OF EXCAVATIONS FROM EITHER SURFACE WATER, GROUNDWATER OR SEEPAGE.
2. CONTRACTOR SHALL PROVIDE FOR DESIGN AND INSTALLATION OF ALL CRIBBING, SHEATHING AND SHORING REQUIRED TO SAFELY RETAIN THE EARTH BANKS.
3. ALL EXCAVATION SHALL BE PROPERLY BACKFILLED. DO NOT PLACE BACKFILL BEHIND RETAINING WALLS UNTIL CONCRETE HAS ATTAINED FULL DESIGN STRENGTH. CONTRACTOR SHALL BRACE OR PROTECT ALL BUILDINGS AND PIT WALLS BELOW GRADE FROM LATERAL LOADS UNTIL ATTACHING FLOORS ARE COMPLETELY IN PLACE AND HAVE ATTAINED FULL DESIGN STRENGTH. CONTRACTOR SHALL PROVIDE FOR DESIGN, PERMITS, AND INSTALLATION OF SUCH BRACING.
4. FOOTINGS SHALL BE PLACED ACCORDING TO THE DEPTHS SHOWN ON THE DRAWINGS. SHOULD SOIL ENCOUNTERED AT THESE DEPTHS NOT BE APPROVED BY THE ENGINEER, FOOTING ELEVATIONS WILL BE ALTERED BY CHANGE ORDER.
5. FOOTING BACKFILL AND UTILITY TRENCH BACKFILL WITHIN BUILDING SHALL BE MECHANICALLY COMPACTED IN LAYERS TO THE APPROVAL OF THE ENGINEER.

CONCRETE

1. CONCRETE MIX SHALL BE DESIGNED BY A QUALIFIED TESTING LABORATORY AND SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW AND APPROVAL.
2. MATERIALS
   -PORTLAND CEMENT: ASTM C-150, TYPE 22, LOW ALKALI
   -AGGREGATE: ASTM C-33
   -AIR ENTRAINMENT: SEE SPECIFICATIONS
   -ADMIXTURES: SEE SPECIFICATIONS
3. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS, UNLESS OTHERWISE NOTED.
4. DESIGN FORMS TO PROVIDE SPECIFIED CHAMFERS SHOWN ON THE DRAWINGS. PROJECTING CORNERS SHALL BE FORMED WITH A 3/4" CHAMFER UNLESS OTHERWISE NOTED.
5. MINIMUM CLEAR COVER OVER REINFORCING SHALL BE AS SHOWN ON THE DRAWINGS.
6. ALL REINFORCING BARS, ANCHOR BOLTS AND OTHER CONCRETE INSERTS SHALL BE WELL SECURED IN POSITION PRIOR TO PLACING CONCRETE.
7. PROVIDE SLEEVES FOR PLUMBING AND ELECTRICAL OPENINGS IN CONCRETE BEFORE PLACING. DO NOT CUT ANY REINFORCING WHICH MAY CONFLICT. CORING IN CONCRETE IS NOT PERMITTED EXCEPT AS SHOWN. NOTIFY THE STRUCTURAL ENGINEER IN ADVANCE OF CONDITIONS NOT SHOWN ON THE DRAWINGS.
8. CONDUIT OR PIPE SIZE SHALL NOT EXCEED 30 PERCENT OF SLAB THICKNESS AND SHALL BE PLACED BETWEEN THE TOP AND BOTTOM REINFORCING. UNLESS SPECIFICALLY DETAILED OTHERWISE. CONCENTRATIONS OF CONDUITS OR PIPES SHALL BE AVOIDED EXCEPT WHERE DETAILED OPENINGS ARE PROVIDED.
9. CONCRETE SHALL BE PLACED IN A CONTINUOUS OPERATION UNTIL THE SECTIONS ARE COMPLETE BETWEEN PREDETERMINED CONSTRUCTION JOINTS.

REINFORCING STEEL

1. REINFORCING BARS SHALL CONFORM TO ASTM A615 GRADE 60. BARS TO BE WELDED SHALL BE ASTM A706.
2. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A-185
3. DETAIL, FABRICATE, LABEL, SUPPORT AND SPACE ALL CONCRETE REINFORCEMENT IN ACCORDANCE WITH ACI 315, ACI 318 AND THE UNIFORM BUILDING CODE.
4. REINFORCING SPLICES SHALL BE SHOWN ON THE DRAWINGS OR PER ACI REQUIREMENTS.
5. FOR WELDING OF REINFORCING, SEE SPECIFICATIONS
6. WELDING OF A706 BARS SHALL BE MADE WITH E80XX ELECTRODES BY QUALIFIED WELDERS.
7. MATERIAL SHALL MEET THE REQUIREMENTS OF THE FOLLOWING SPECIFICATIONS UNLESS NOTED OTHERWISE:

STRUCTURAL STEEL	ASTM A36
PIPE	ASTM A53, TYPE E OR S, GRADE B
STRUCTURAL TUBING	ASTM A500, GRADE B, Fy=46 KSI
MACHINE BOLTS	ASTM A307
HIGH STRENGTH BOLTS	ASTM A325

8. ALL CONNECTIONS SHALL BE MADE WITH BEARING TYPE HIGH STRENGTH BOLTS ASTM A-325N, UNLESS OTHERWISE NOTED.
10. WELDING SHALL BE MADE WITH E70XX ELECTRODES BY QUALIFIED WELDERS.
11. ALL CONNECTIONS SHALL CONFORM TO TABLE III OF THE LATEST EDITION OF THE AISC MANUAL. IN UTILIZING TABLE III THE DETAILER SHALL USE THE MAXIMUM NUMBER OF 3/4" DIAMETER BOLTS IN A VERTICAL ROW OF THE CONNECTION MEMBER UNLESS OTHERWISE SHOWN ON THE DRAWINGS.

WOOD FRAMING

1. WOOD FRAMING
   PRESSURE-TREATED WOOD - ALL WOOD FRAMING IN CONTACT WITH THE GROUND SHALL BE ACZA TREATED TO A NET RETENTION OF 0.6 PCF.
2. GRADE AND SPECIES - UNLESS OTHERWISE NOTED, WOOD FRAMING SHALL BE HEM-FIR NO. 2 OR APPROVED EQUAL. FRAMING SHALL MEET ALL REQUIREMENTS OF THE IBC AND THE PROJECT SPECIFICATIONS.
3. SHEATHING
   WALLS - EXTERIOR WALLS SHALL BE SHEATHED ON EXTERIOR SIDE WITH 15/32-INCH APA STRUCTURAL 1 RATED CDX PLYWOOD WITH LONG AXIS OF PANELS ORIENTED HORIZONTALLY. SHEAR WALLS MAY REQUIRE SHEATHING ON BOTH SIDES (SEE SCHEDULE). FOLLOW NAILING SCHEDULE FOR FASTENING.
4. ROOF
   ROOF AREAS SHALL BE SHEATHED WITH 5/8 -INCH APA RATED CDX PLYWOOD WITH LONG AXIS OF PANELS ORIENTED PARALLEL TO EAVE OF ROOF AREAS. FOLLOW NAILING SCHEDULE FOR FASTENING.
5. STRUCTURAL CONNECTORS
   ALL CONNECTORS FOR WOOD-FRAMING SHALL BE AS MANUFACTURED BY SIMPSON STRONG-TIE, OR APPROVED EQUAL. MODEL NUMBERS SHALL BE AS SPECIFIED ON PLANS.

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

R&M ENGINEERING-KETCHIKAN, INC.
355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901

STATE OF ALASKA
49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

SHEET DESCRIPTION
NOTES

SHEET
G002

SURVEY CONTROL POINTS

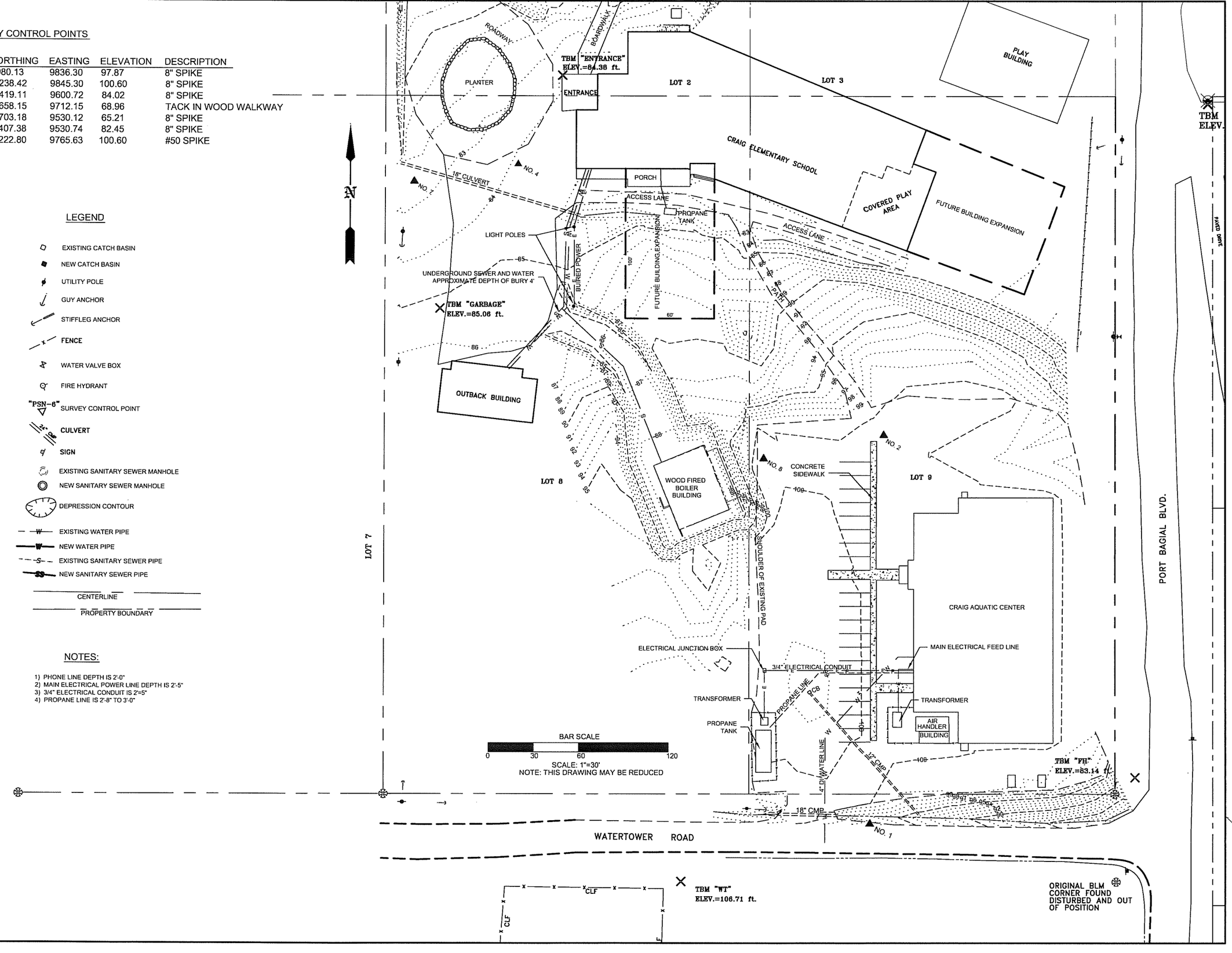
P#	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	9980.13	9836.30	97.87	8" SPIKE
2	10238.42	9845.30	100.60	8" SPIKE
4	10419.11	9600.72	84.02	8" SPIKE
5	10658.15	9712.15	68.96	TACK IN WOOD WALKWAY
6	10703.18	9530.12	65.21	8" SPIKE
7	10407.38	9530.74	82.45	8" SPIKE
8	10222.80	9765.63	100.60	#50 SPIKE

LEGEND

- EXISTING CATCH BASIN
- NEW CATCH BASIN
- UTILITY POLE
- GUY ANCHOR
- STIFFLEG ANCHOR
- FENCE
- WATER VALVE BOX
- FIRE HYDRANT
- "PSN-6" SURVEY CONTROL POINT
- CULVERT
- SIGN
- EXISTING SANITARY SEWER MANHOLE
- NEW SANITARY SEWER MANHOLE
- DEPRESSION CONTOUR
- EXISTING WATER PIPE
- NEW WATER PIPE
- EXISTING SANITARY SEWER PIPE
- NEW SANITARY SEWER PIPE
- CENTERLINE
- PROPERTY BOUNDARY

NOTES:

1) PHONE LINE DEPTH IS 2'-0"
2) MAIN ELECTRICAL POWER LINE DEPTH IS 2'-5"
3) 3/4" ELECTRICAL CONDUIT IS 2'=5"
4) PROPANE LINE IS 2'-8" TO 3'-0"



BAR SCALE
0 30 60 120
SCALE: 1"=30'
NOTE: THIS DRAWING MAY BE REDUCED

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

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SHEET DESCRIPTION
EXISTING CONDITIONS

SHEET
C100

CRAIG ELEMENTARY SCHOOL

COVERED PLAY AREA

PORCH

EXISTING CULVERT

NO. 4

NO. 7

NO. 8

NO. 2

DITCHING AS REQUIRED FOR POSITIVE DRAINAGE

HEATING LINES, SEE MECHANICAL

OUTLET INVERT 92.5'

TBM "GARBAGE"
ELEV.=85.06 ft.

INLET INVERT. 93.5'

OUTBACK BUILDING

ACCESS DRIVEWAY

NEW 4" C900 PVC SEWER SEE SHEET C102

SEWER CLEANOUT

PROPOSED BUILDING 36'

S1

S2

NEW TRUCK LANE

PATH

PAVED DRIVE

PORT BAGIAL BLVD.

LOT 7

LOT 8

LOT 9

WATER METER

NEW 2" HDPE WATER LINE

HEATING LINES, SEE MECHANICAL

CRAIG AQUATIC CENTER

AIR HANDLER BUILDING

CB

SIGN SCHEDULE

S1 - TRUCK TURN AROUND
S2 - NO PARKING

POINT #	NORTHING	EASTING	ELEV.	DESCRIPTION
1	10189.00	9742.58	–	BLDG COR
2	10231.88	9725.04	–	BLDG COR
3	10218.13	9691.41	–	BLDG COR
4	10175.25	9708.95	–	BLDG COR
5	10270.12	9715.34	98.8	EDGE FILL
6	10278.92	9719.00	98.3	EDGE FILL
7	10288.70	9744.18	98.3	EDGE FILL
8	10284.29	9752.34	98.8	EDGE FILL
9	10259.99	9772.81	99.3	EDGE FILL
10	10252.09	9788.52	99.5	EDGE FILL
11	10290.63	9884.64	99.5	EDGE FILL
12	10275.86	9890.79	100.0	EDGE FILL
13	10085.68	9754.54	99.5	EDGE FILL
14	10322.66	9629.91	–	SEWER CONNECT

0 20 40 FEET

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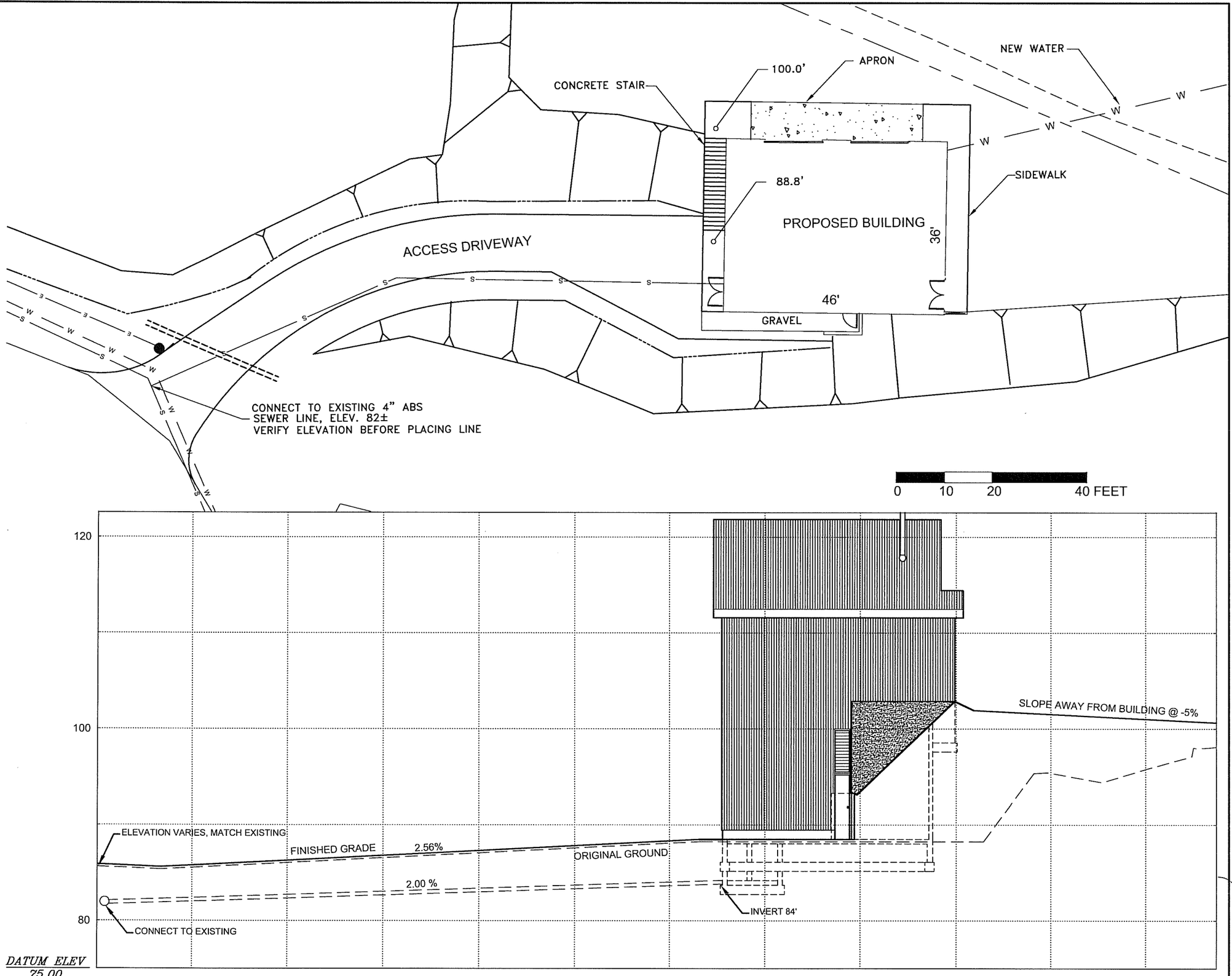
SHEET DESCRIPTION
BUILDING
SITE PLAN

SHEET
C101



REVISIONS:

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WOOD FIRED HEATING SYSTEM

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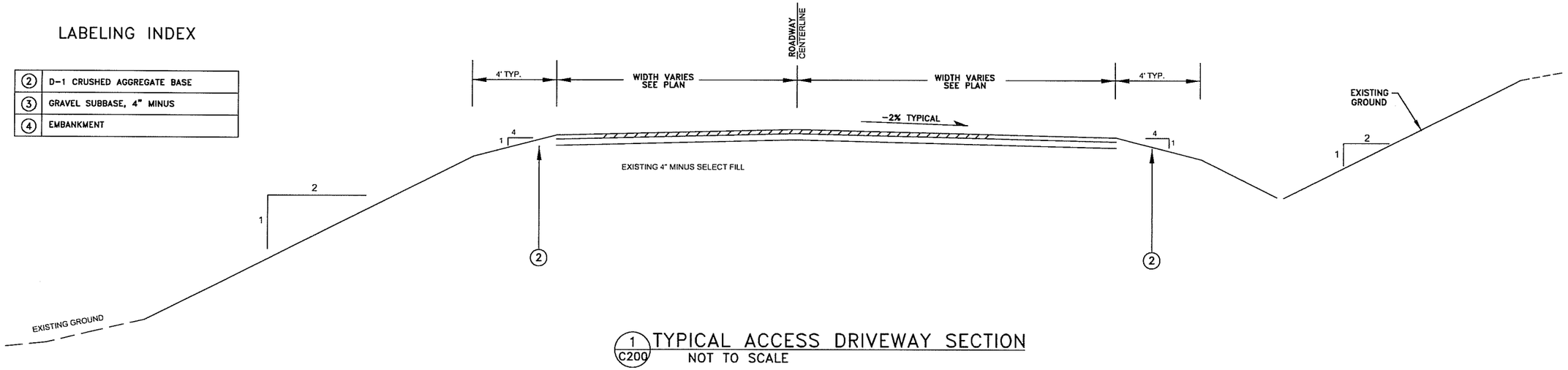
SHEET DESCRIPTION
PLAN & PROFILE

SHEET
C102

LABELING INDEX

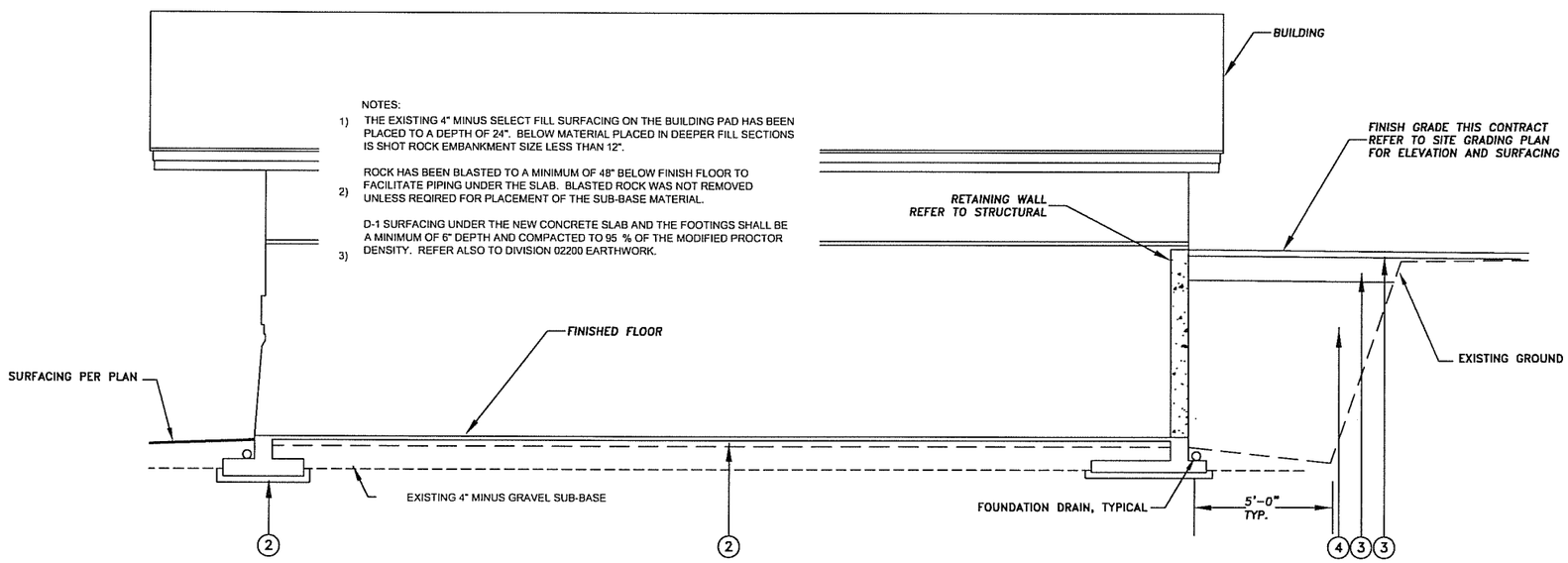
(2)	D-1 CRUSHED AGGREGATE BASE
(3)	GRAVEL SUBBASE, 4" MINUS
(4)	EMBANKMENT



1 / C200 TYPICAL ACCESS DRIVEWAY SECTION
NOT TO SCALE

GENERAL NOTES:

1. TYPICAL SECTION No. 1 IS APPLICABLE FOR ROADWAYS, AND PARKING AREAS.
2. ROADWAY & PARKING CROSS SLOPES MAY VARY, REFER TO SITE LAYOUT FOR GRADES.
3. THE EXISTING DENSE GLACIAL TILL IS A SUITABLE FILL MATERIAL IN NON-STRUCTURAL EMBANKMENT PROVIDED THAT THE MATERIAL IS DRY. THE ENGINEER MAY DIRECT THE CONTRACTOR TO REMOVE GLACIAL TILL WITH EXCESSIVE MOISTURE AND REPLACE WITH ROCK.
4. EMBANKMENT TO BE PLACED IN LIFTS AND COMPACTED TO 90% OF MAXIMUM DRY DENSITY WITH A VIBRATORY ROLLER. THE DEPTH OF THE LIFT SHALL BE APPROPRIATE FOR THE SIZE OF THE ROLLER USED FOR COMPACTION.
5. SUBBASE TO BE PLACED IN LIFTS NOT TO EXCEED 12" IN DEPTH AND COMPACTED TO 95% OF MAXIMUM DRY DENSITY.



2 / C200 TYPICAL BUILDING FOUNDATION SECTION
NOT TO SCALE

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WOOD FIRED HEATING SYSTEM

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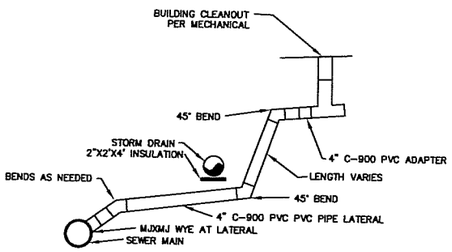
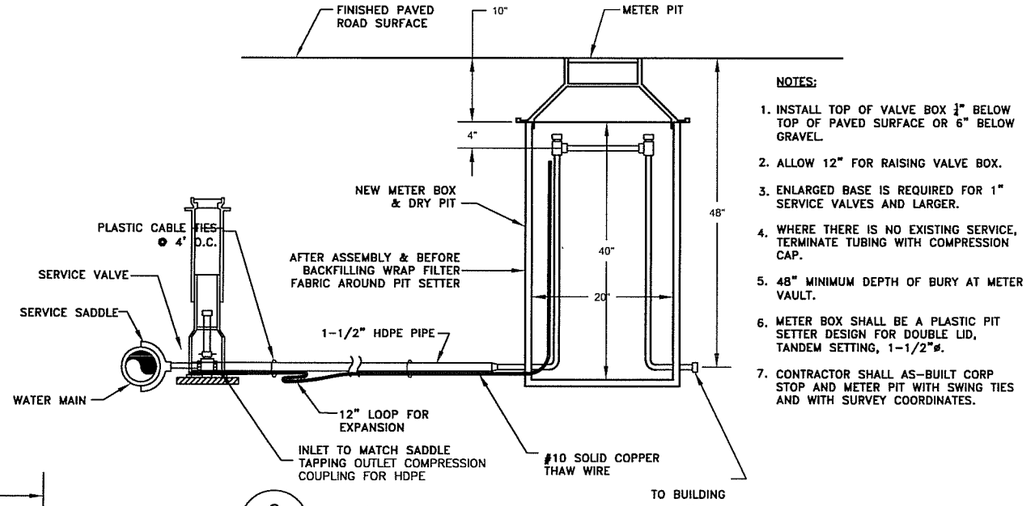
SHEET DESCRIPTION
TYPICAL SECTIONS

SHEET
C200



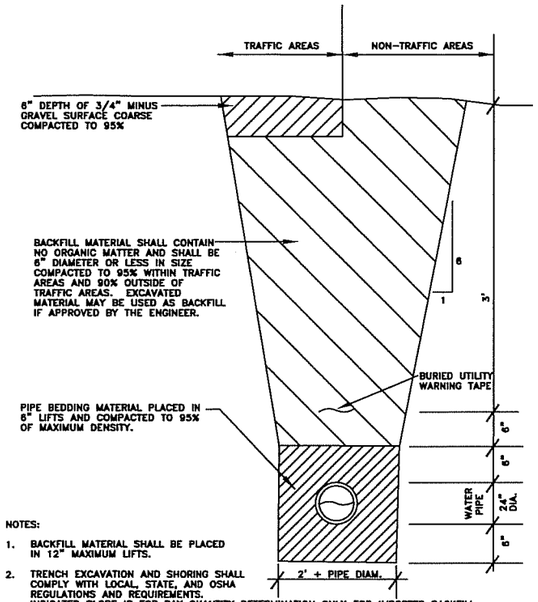
1 C300 SEWER LATERAL PROFILE



NOTES:

1. INSTALL TOP OF VALVE BOX 1" BELOW TOP OF PAVED SURFACE OR 6" BELOW GRAVEL.
2. ALLOW 12" FOR RAISING VALVE BOX.
3. ENLARGED BASE IS REQUIRED FOR 1" SERVICE VALVES AND LARGER.
4. WHERE THERE IS NO EXISTING SERVICE, TERMINATE TUBING WITH COMPRESSION CAP.
5. 48" MINIMUM DEPTH OF BURY AT METER VAULT.
6. METER BOX SHALL BE A PLASTIC PIT SETTER DESIGN FOR DOUBLE LID, TANDEM SETTING, 1-1/2"ø.
7. CONTRACTOR SHALL AS-BUILT CORP STOP AND METER PIT WITH SWING TIES AND WITH SURVEY COORDINATES.

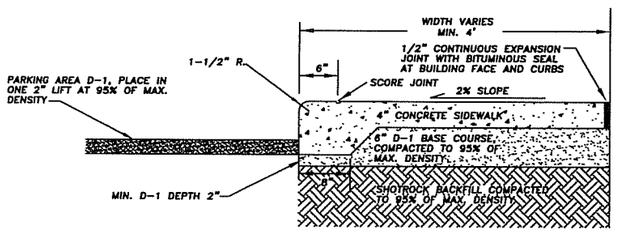
2 C300 TYPICAL BURIED WATER SERVICE – 2" AND SMALLER



NOTES:

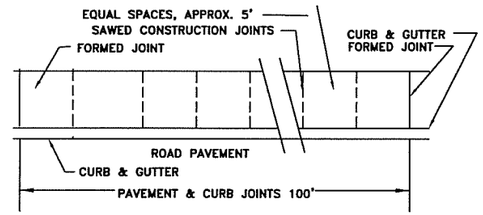
1. BACKFILL MATERIAL SHALL BE PLACED IN 12" MAXIMUM LIFTS.
2. TRENCH EXCAVATION AND SHORING SHALL COMPLY WITH LOCAL, STATE, AND OSHA REGULATIONS AND REQUIREMENTS. INDICATED SLOPE IS FOR PAY QUANTITY DETERMINATION ONLY FOR IMPORTED BACKFILL GRAVEL AND RESURFACING REQUIREMENTS.
3. IF UNSUITABLE PIPE FOUNDATION MATERIAL IS ENCOUNTERED DURING EXCAVATION, ENGINEER MAY DIRECT THE CONTRACTOR TO OVER-EXCAVATE AND BACKFILL WITH SUITABLE MATERIAL.
4. THE DITCH LINE, IF ONE EXISTS, SHALL BE RESHAPED IN SUCH A MANNER TO ALLOW POSITIVE DRAINAGE TO MATCH PRE-CONSTRUCTION CONDITIONS.

3 C300 TYPICAL TRENCH SECTION
NOT TO SCALE



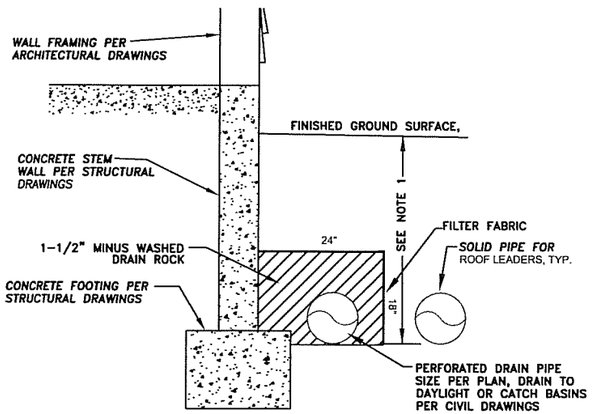
NOTES: – DUMMY JOINTS 5' O.C. MAX. THROUGH JOINTS @ CURVE POINTS OF TANGENCY

4 C300 CONCRETE SIDEWALK
NOT TO SCALE



NOTE: LOCATE 1/4" X 3-1/4" PRE-MOLDED FILLER THROUGH THE SIDEWALK AT PAVEMENT AND MATCHING CURB JOINTS. THIS LENGTH SHALL BE DIVIDED INTO EQUAL SPACES BY SAWED OR FORMED CONTRACTION JOINTS 1" DEEP. ALL JOINTS SHALL BE SEALED WITH JOINT SEALING COMPOUND.

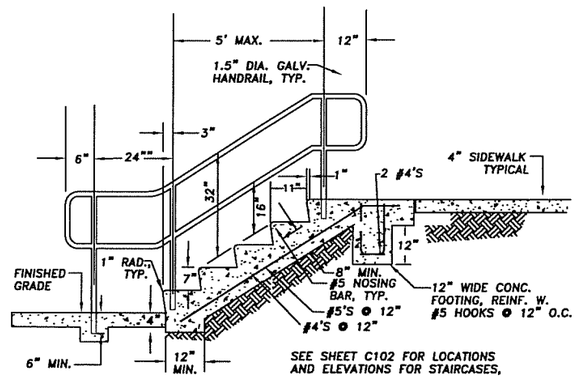
5 C300 SIDEWALK JOINT DETAIL
NOT TO SCALE



NOTES:

1. PIPE DEPTH TO BE TO GREATER DEPTH OF A) 24" BELOW FINISHED FLOOR OR B) 18" BELOW FINISHED GRADE.

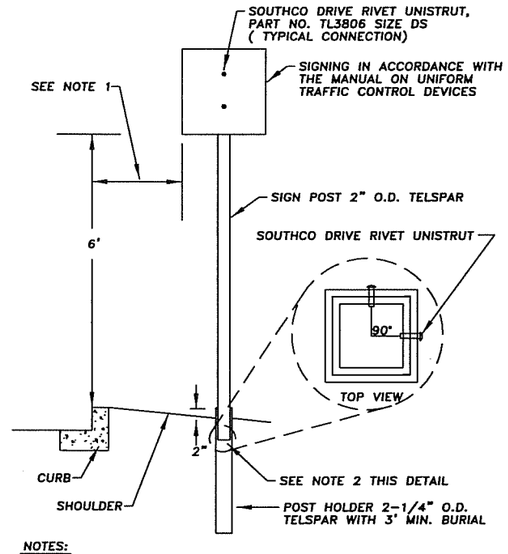
6 C300 FOUNDATION DRAIN
NOT TO SCALE



REFER TO SHEET C102 FOR ELEVATIONS OF LANDING AND TOTAL LENGTH AND HEIGHT OF STAIRS

WIDTH OF STAIRS TO BE 4'-6" WITH HANDRAIL 6" FROM EDGE

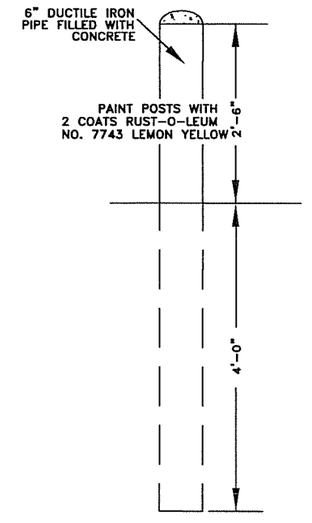
7 C300 CONCRETE STAIRCASE
NOT TO SCALE



NOTES:

1) MAXIMUM & MINIMUM DIMENSIONS PER MANUAL ON UNIFORM TRAFFIC CONTROL DEVICE, PER PART II SIGNS.
2) SIGN POST MUST BE INSERTED INTO HOLDER A MAXIMUM OF 12" AND A MINIMUM OF 6".

8 C300 SIGN DETAIL
NOT TO SCALE



9 C300 PROTECTION POSTS
NOT TO SCALE

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

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R&M # 052348
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355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901

STATE OF ALASKA 49th TREVOR SANDE CE 9778 REGISTERED PROFESSIONAL ENGINEER

SHEET DESCRIPTION
CONSTRUCTION DETAILS

SHEET
C300

ABBREVIATIONS

A.B.	ANCHOR BOLT
ACOUS.	ACOUSTICAL
A.C.T	ACOUSTICAL TILE
A.D.A.	AMERICANS WITH DISABILITES ACT
ADJ.	ADJUSTABLE
A.F.F.	ABOVE FINISHED FLOOR
AGGR.	AGGREGATE
AL., ALUM.	ALUMINUM
ANOD.	ANODIZED
APPROX.	APPROXIMATE
ARCH.	ARCHITECTURAL
ASPH.	ASPHALT
BD.	BOARD
BTWN	BETWEEN
BLDG.	BUILDING
BLKG.	BLOCKING
BM.	BEAM
BOT.	BOTTOM
CAB.	CABINET
C.B.	CATCH BASIN
CEM.	CEMENT
CER.	CERAMIC
CHAMF.	CHAMFER
CIP	CAST IN PLACE CONCRETE
C. JT.	CONTROL JOINT
CLG.	CEILING
CLR.	CLEAR
C.M.U.	CONCRETE MASONRY UNIT
COL.	COLUMN
CONC.	CONCRETE
CONN.	CONNECTION
CONSTR.	CONSTRUCTION
CONT.	CONTINUOUS
CORR.	CORRIDOR
CPT.	CARPET
CTSK.	COUNTERSUNK
CNTR.	COUNTER
C.T.	CERAMIC TILE
CTR.	CENTER
DBL.	DOUBLE
DTL.	DETAIL
DEMO.	DEMOLITION
D.F.	DRINKING FOUNTAIN
DIA.	DIAMETER
DIAG.	DIAGONAL
DIM.	DIMENSION
DISP.	DISPENSER
DN.	DOWN
D.O.	DOOR OPENING
DR.	DOOR
DS.	DOWNSPOUT
D.T.	DRAIN TILE
DWG.	DRAWING
E.	EAST
E.I.F.S.	
EA.	EACH
EXP. JT.	EXPANSION JOINT
EL.	ELEVATION
ELEC.	ELECTRICAL
ELEV.	ELEVATOR
EMER.	EMERGENCY
ENCL.	ENCLOSURE
EQ.	EQUAL
EQUIP.	EQUIPMENT
EXH.	EXHAUST
EXIST.	EXISTING
EXP.	EXPANDED, EXPANSION
EXT.	EXTERIOR
E.S.	EYEWASH STATION

F.A.	FIRE ALARM
F.B.	FLAT BAR
F.B.O.I.C.	
F.D.	FLOOR DRAIN
FDN.	FOUNDATION
F.E.	FIRE EXTINGUISHER
F.E.C.	FIRE EXTINGUISHER CABINET
F.H.	FIRE HYDRANT
F.H.C.	FIRE HOSE CABINET
F.H.M.S.	FLAT HEAD MACHINE SCREW
FIN.	FINISH
FL; FLR.	FLOOR
FLASH.	FLASHING
FLUOR.	FLOURESCENT
F.O.C.	FACE OF COLUMN, OR CONCRETE
F.O.F.	FACE OF FINISH
F.O.M.	FACE OF MASONRY
F.O.S.	FACE OF STUDS
FPRF.	FIREPROOF
FR.	FRAME
FT.	FOOT OR FEET
FTG.	FOOTING
FURR.	FURRED, FURRING
FUT.	FUTURE
FW	FULL WIDTH
GA.	GAUGE
GAL.	GALLON
GALV.	GALVANIZED
G.B.	GRAB BAR
G.L.	GLUE-LAMINATED
GL.	GLASS, GLAZING
GND.	GROUND
GR.	GRADE
GWB	GYPSUM WALL BOARD
GYP.	GYPSUM
H.B.	HOSE BIBB
H.C.	HOLLOW CORE
HD.	HEAD
HDCP	HANDICAP
HDO	HIGH DENSITY OVERLAY
HDR	HEADER
HDWD	HARDWOOD
HDWE.	HARDWARE
H.M.	HOLLOW METAL
HORIZ.	HORIZONTAL
HR.	HOUR
HT.	HEIGHT
HTG.	HEATING
H.V.A.C.	HEAT/VENTILATION/AIR CONDITIONING
HW	HOT WATER
HWT	HOT WATER TANK
I.D.	INSIDE DIAMETER
IHM	INSULATED HOLLOW METAL
IN.	INCH
INC.	INCLUDING
INSUL.	INSULATION
INT.	INTERIOR
JAN.	JANITOR
J.B.	JUNCTION BOX
JST.	JOIST
JT.	JOINT
KIT.	KITCHEN
K.O.	KNOCK-OUT
L.	LENGTH, LONG
LAM	LAMINATE, LAMINATED
LAV.	LAVATORY
L.F.	LINEAL FEET
L.H.	LEFT HAND
LKR.	LOCKER
LT.	LIGHT
LTL	LINTEL

MAT'L	MATERIAL
MARB.	MARBLE
MAS	MASONRY
MAX.	MAXIMUM
M.B.	MACHINE BOLT
MDO	MEDIUM DENSITY OVERLAY
MECH.	MECHANICAL
MEMB.	MEMBRANE
MEZZ.	MEZZANINE
MTL.	METAL
MFR.	MANUFACTURER
MH.	MANHOLE
MIN.	MINIMUM
MIR.	MIRROR
MISC.	MISCELLANEOUS
M.O.	MASONRY OPENING
MTD.	MOUNTED
MUL.	MULLION
N.	NORTH
N.I.C	NOT IN CONTRACT
NO., (#)	NUMBER
NOM.	NOMINAL
N.T.S.	NOT TO SCALE
O.A.	OVERALL
OBS.	OBSCURE
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
OFF.	OFFICE
O.F.R.D.	OVERFLOW FLOOR DRAIN
O.H.	OVERHANG
OPNG	OPENING
OPP. H.	OPPOSITE HAND
O.T.S.	OPEN TO STRUCTURE
OPNG.	OPENING
OPP.	OPPOSITE
PA	PUBLIC ADDRESS
P.BD.	PARTICLE BOARD
PERF	PERFORATED
PL	PROPERTY LINE, PLATE
P. LAM.	PLASTIC LAMINATE
PLAS.	PLASTER
PLYWD.	PLYWOOD
PNL	PANEL
PR.	PAIR
P.S.F.	POUNDS PER SQUARE FOOT
P.S.I.	POUNDS PER SQUARE INCH
PT.	POINT
P.T.	PRESSURE TREATED
P.T.D.	PAPER TOWEL DISPENSER
P.T.D./R	COMBINATION PAPER TOWEL DISPENSER AND RECEPTACLE
PTN.	PARTITION
Q.T.	QUARRY TILE
R	RISER
RAD.	RADIUS
R.C.P.	REFLECTED CEILING PLAN
R.D.	ROOF DRAIN
REF.	REFERENCE
REFL.	REFLECTED
REFR.	REFRIDGERATOR
RGTR.	REGISTER
REINF.	REINFORCED
RH	ROUND-HEAD
REQ.	REQUIRED
RESIL.	RESILIENT
R.H.	RIGHT HAND
RM.	ROOM
R.O.	ROUGH OPENING
R.O.W.	RIGHT OF WAY
RT	RESILIENT TILE
RWD.	REDWOOD

S.	SOUTH
S.C.	SOLID CORE
S.C.D.	SEAT COVER DISPENSER
SCHED.	SCHEDULE
S.D.	SOAP DISPENSER
SEAL.	SEALANT
SECT.	SECTION
SH.	SHELF
SHR.	SHOWER
SHT.	SHEET
SHTG.	SHEATHING
SIM.	SIMILAR
SL.	SLOPE
SM	SHEET METAL
S.N.D.	SANITARY NAPKIN DISPENSER
SPEC.	SPECIFICATION
SQ.	SQUARE
SQ. FT.	SQUARE FOOT (FEET)
SQ. IN.	SQUARE INCH(ES)
SST.	STAINLESS STEEL
STA.	STATION
STD.	STANDARD
STL.	STEEL
STOR.	STORAGE
STRL.	STRUCTURAL, STRUCTURE
SUSP.	SUSPENDED
SYM.	SYMMETRICAL
S.V.	SHEET VINYL
T., TRD.	TREAD
T.B.	TOWEL BAR
T.O.C.	TOP OF CURB
T.&G.	TONGUE AND GROOVE
T.S.	TUBE STEEL
TEL.	TELEPHONE
TEMP.	TEMPERED
TER.	TERRAZZO
THK.	THICK
THRESH.	THRESHOLD
T.JT.	TOOLED JOINT
T.O.S.	TOP OF SLAB
T.P.H.	TOILET PAPER HOLDER
TYP.	TYPICAL
UL	UNDERWRITERS' LABORATORIES
UNFIN.	UNFINISHED
U.O.N.	UNLESS OTHERWISE NOTED
UR.	URINAL
VIF	VERIFY IN FIELD
VT	VINYL TILE
VERT.	VERTICAL
VEST.	VESTIBULE
W.	WEST
W/	WITH
W.C.	WATER CLOSET
WD.	WOOD
WDO.	WINDOW
W/O	WITHOUT
WL	WATER LINE
WP	WATERPROOFING
WS	WEATHERSTRIP OR WOOD SCREEN
WSCT.	WAINSCOT
WT.	WEIGHT
W.W.F.	WELDED WIRE FABRIC

DRAWING SYMBOLS

GRID LINES

DETAIL BUBBLE

BUILDING SECTION

INTERIOR ELEVATION

WALL TYPE

WINDOW TYPE

DOOR SYMBOL

DATUM POINT, ELEVATION

MATCH LINE

EQUIPMENT SYMBOL

REVISION, WITH CLOUD

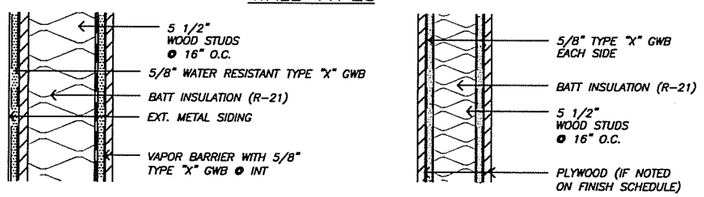
CENTERLINE, FOR DIMENSIONING

PROPERTY LINE

ROOM NUMBER

EXISTING CONSTRUCTION

WALL TYPES

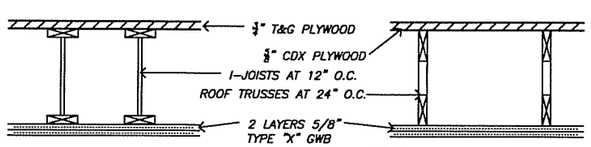


1 NEW EXTERIOR WALL
One-Hour Fire Rated

2 TYP. INT. DEMISING WALL
One-Hour Fire Rated
GA File No. WP 1200

FLOOR & CEILING TYPES

REFER TO NOTE 9 FOR ASSEMBLY



3 NEW EXTERIOR WALL
One-Hour Fire Rated
GA File No. FC 5407

4 TYP. INT. DEMISING WALL
One-Hour Fire Rated
GA File No. RC 2602

CODE ANALYSIS

CODE: International Building Code – 2003

A. USE AND OCCUPANCY CLASSIFICATION (Chapter 3):

New: Wood Fired Boiler Plant: *Group S-1: Wood Biomass Storage & Boiler*

B. TYPE OF CONSTRUCTION (Chapter 6):

Proposed: *V-A* *Type V-A Description: Structural Elements, Exterior Walls and Interior Walls may be of Any Material Permitted by Code. (Section 601 & Table 602).*

Fire Resistive Rating for Building Elements (Table 601):

Exterior:	*1*
Interior:	*1*
Floor Construction:	*1*
Roof Construction:	*1*

C. ALLOWABLE HEIGHT (Table 503):

Proposed:	*35'-0" / 2 Story*
Permitted:	*50'-0" / 3 Story*

D. ALLOWABLE FLOOR AREA (Table 503):

Proposed:	*2,622 s.f.*
Permitted:	*14,000 s.f.*

E. OCCUPANT LOAD CALCULATIONS: (Table 1004.1.2)

	Occupancy	Area	Factor	Occupant Load
Chip Bin:	*Storage*	*460 sf*	*300 (gross)*	*2*
Boiler Room:	*Industrial*	*1196 sf*	*300*	*4*
Storage:	*Industrial*	*966 sf*	*300*	*4*
			Total Building Occupant Load:	*10*

F. Existing: (Table 1003.2.3):

10 Occupants x 0.2"/occupant = 2"

1st Floor: 2 Exits @ 36" Wide = 72"
2nd Floor: 1 Exit @ 36" Wide = 36"
Total Exit Width: 108"

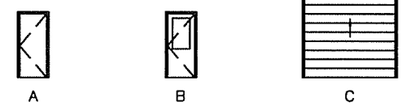
G. Fire Resistive Rating for Exterior Walls Based on Fire Separation: (Table 602):

Distance from Exterior Wall to Property Line	*Required Rating*	*Opening Protection (Table 714.2)*
Less than 5'	*1 Hour*	*3/4 Hour*
Greater than or equal to 5', Less than 10'	*1 Hour*	*3/4 Hour*
Greater than or equal to 10', Less than 30'	*0*	*0*
Greater than 30'	*0*	*0*

DOOR SCHEDULE

No.	Type	Size (WxH)	Thick	Construction		Details			Remarks
				door	frame	head	jamb	thresh.	
1	A	3'-0"x7'-0"	1-3/4"	H/M	HM	1/A200	1/A2.0	2/A2.0	EXTERIOR DOOR 1-HR
2	B	3'-0"x7'-0"	1-3/4"	H/M	HM	1/A2.0	1/A2.0	2/A2.0	EXTERIOR DOOR 1-HR
3	C	12'X15'	1-3/4"	H/M	HM	3/A200	3/A200	3/A200	ROLL UP DOOR
4	A	6'-0"x7'-0"	1-3/4"	H/M	HM	1/A2.0	1/A2.0	2/A2.0	EXTERIOR DOOR 1-HR

DOOR TYPES



WINDOW TYPES

WINDOW SCHEDULE

No.	Type	Size (WxH)	Construction	Details			Remarks
				head	jamb	sill	
1	A	4'-0"x3'-0"	VINYL	3/A5.0	–	3/A5.0	SLIDING WINDOW

ROOM FINISH SCHEDULE

LOCATION	FLOOR	FINISH	BASE	FINISH	WALLS	FINISH	CEILING	FINISH	NOTES
BOILER ROOM	CONC	–	–	–	GYP	PNT	PLYWD	PNT	5/8" MDO PLYWD
CHIP BIN	CONC	SEAL	–	–	GYP	–	PLYWD	–	1/2" CDX PLYWD
STORAGE ROOM	PLYWD	PNT	6" RBR	FF	GYP	PNT	GYP	PNT	–

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

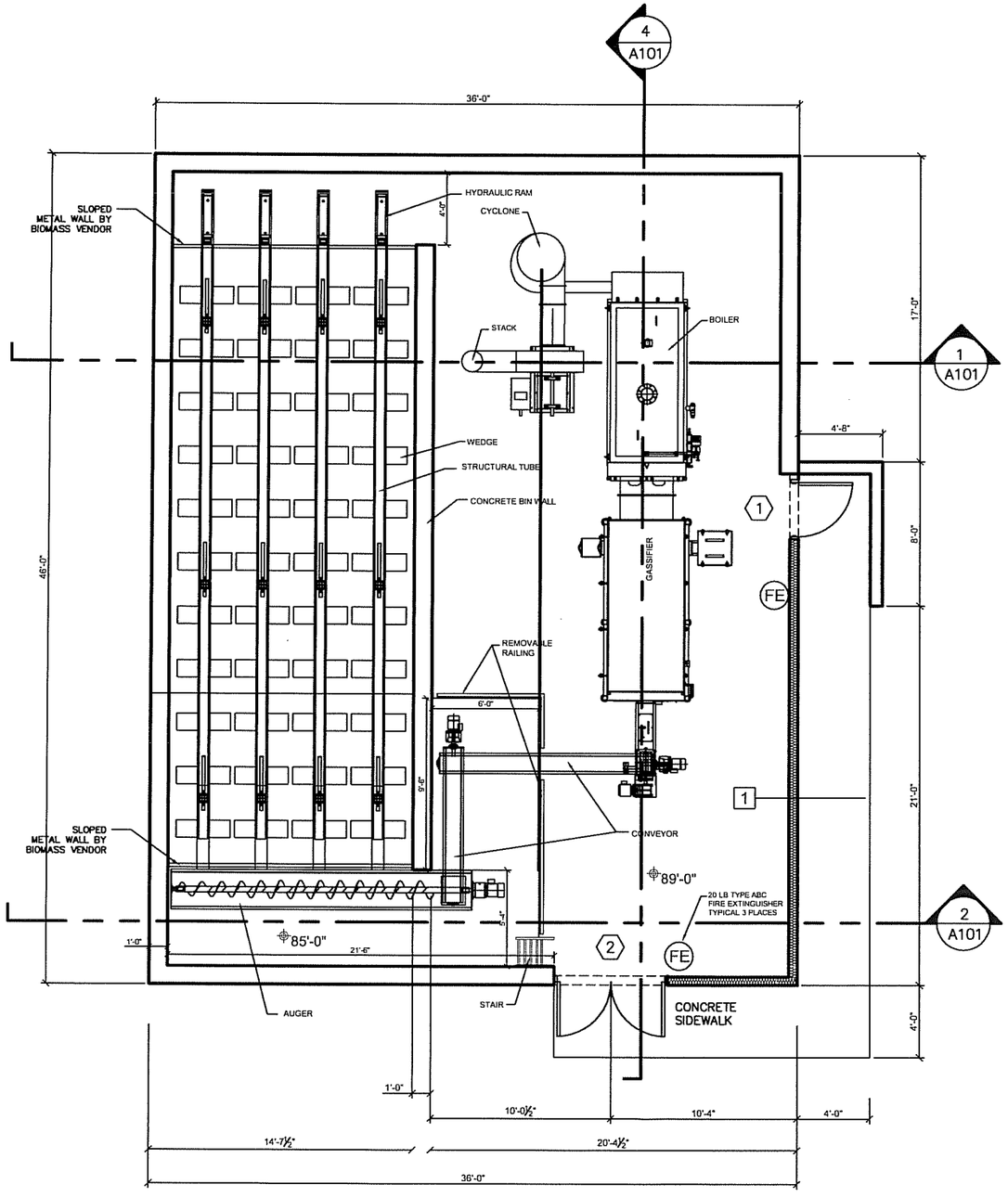
DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

R&M ENGINEERING-KETCHIKAN, INC.
355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901

STATE OF ALASKA
49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

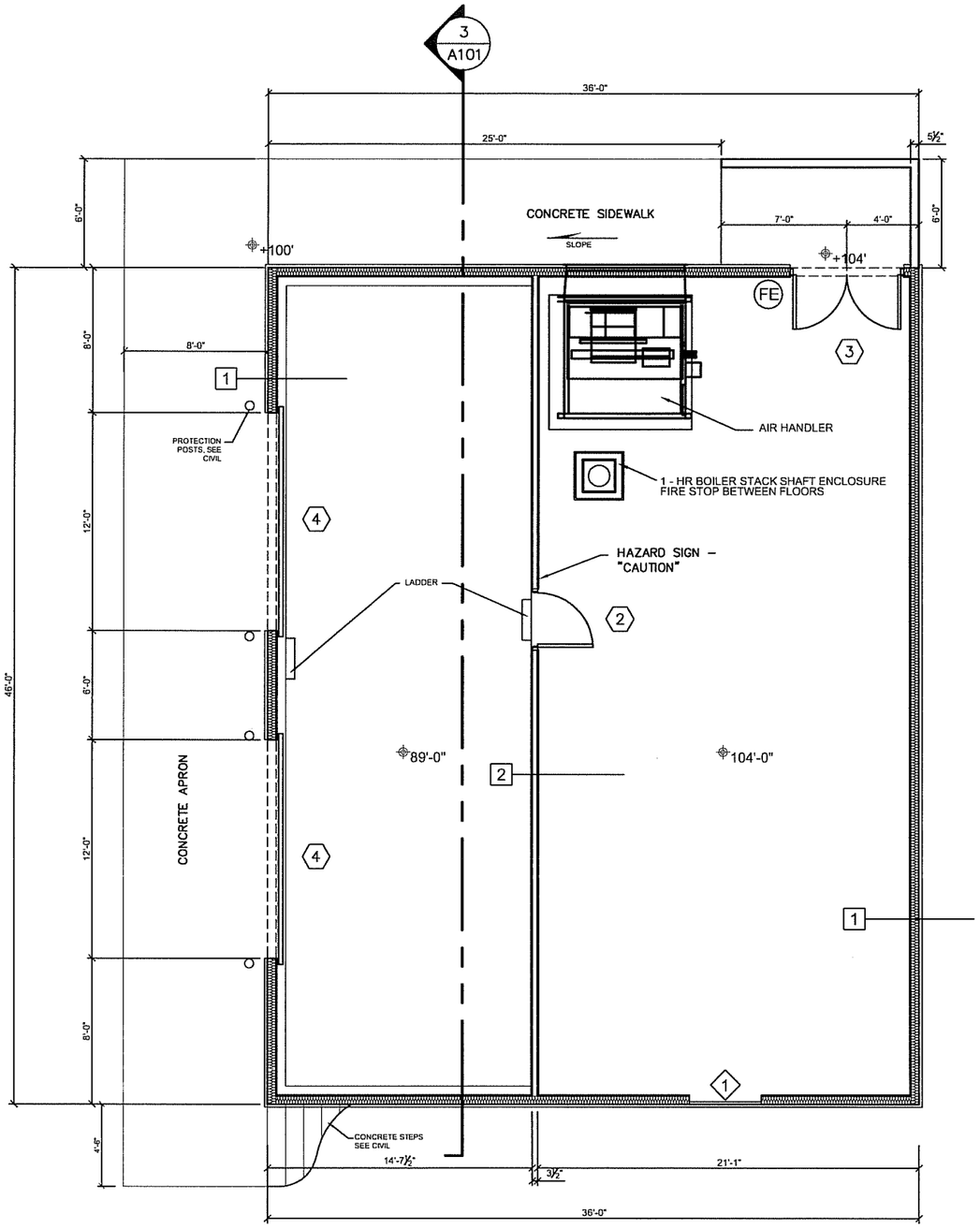
SHEET DESCRIPTION
ARCHITECTURAL NOTES

SHEET
A001



1 FIRST FLOOR PLAN

1/4" = 1'



2 SECOND FLOOR PLAN

1/4" = 1'

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

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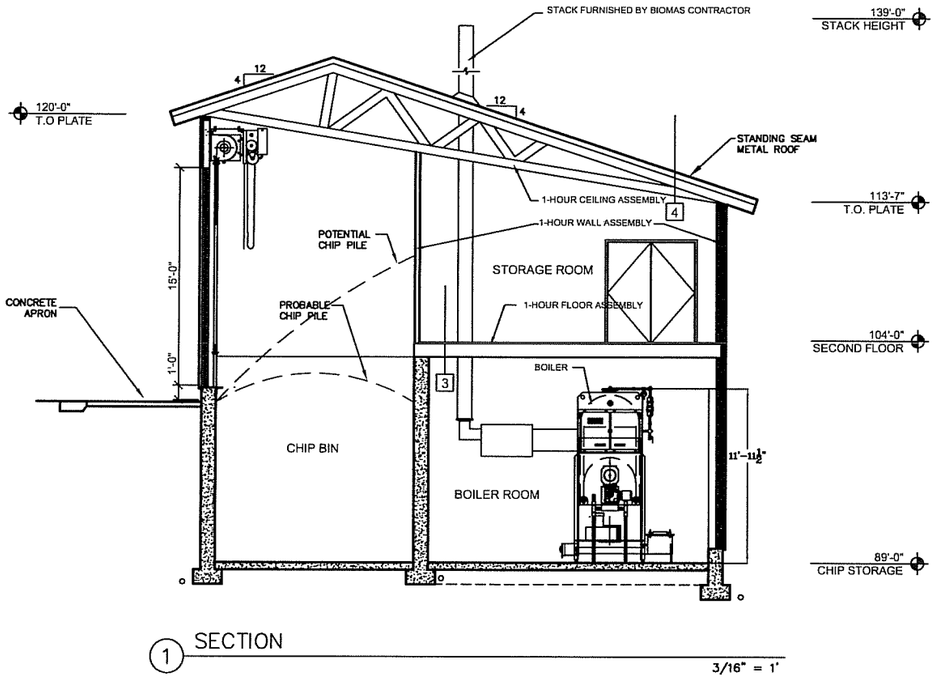
355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901

STATE OF ALASKA
49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

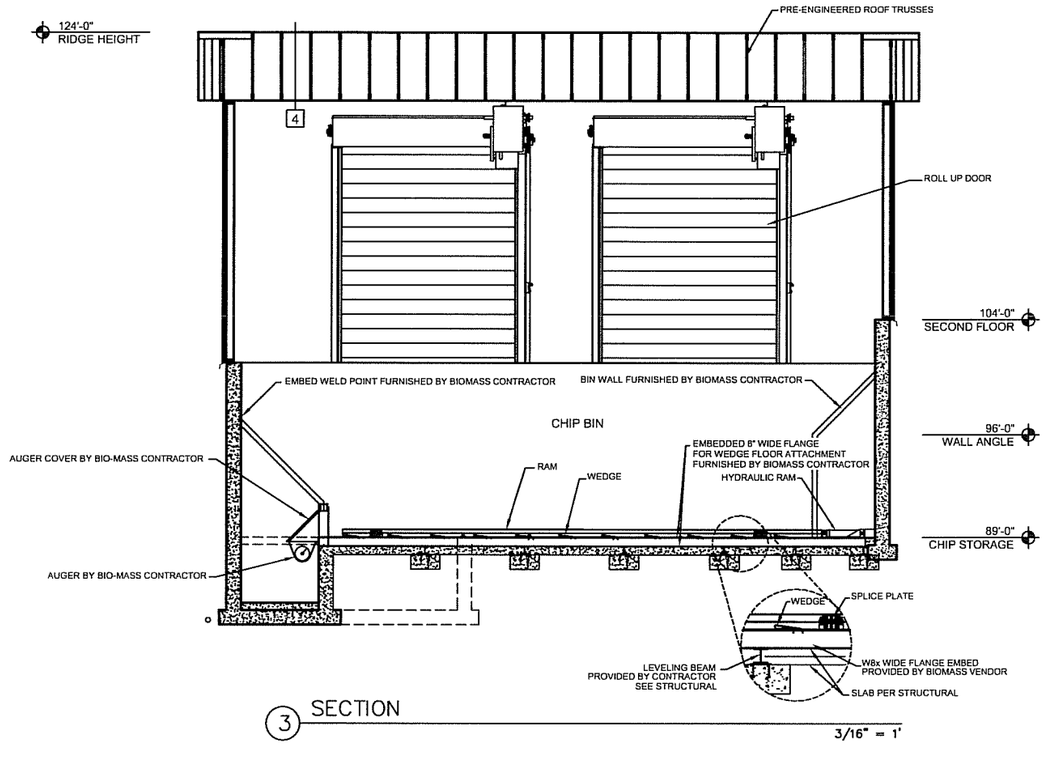
SHEET DESCRIPTION
FLOOR PLANS

SHEET
A100



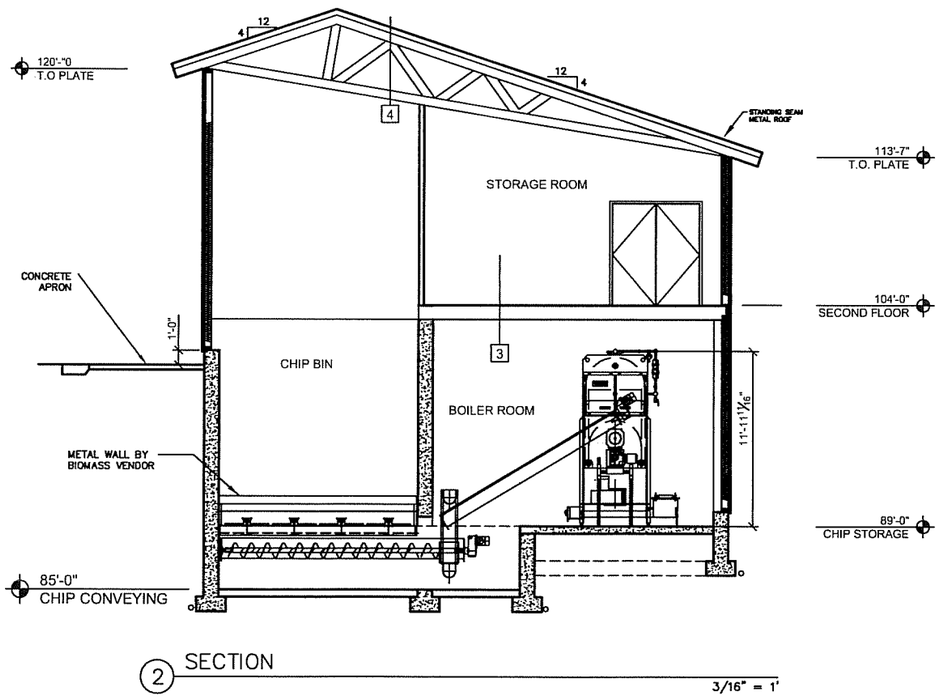
1 SECTION

3/16" = 1'



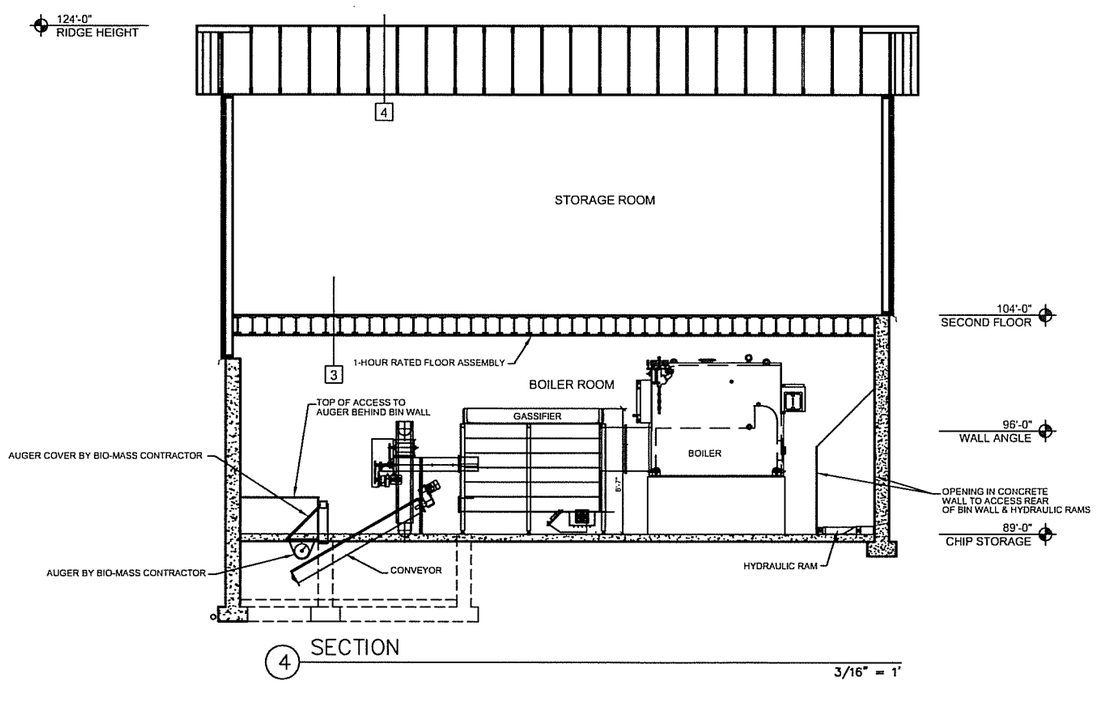
3 SECTION

3/16" = 1'



2 SECTION

3/16" = 1'



4 SECTION

3/16" = 1'

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

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CHECKED BY: TSS
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R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

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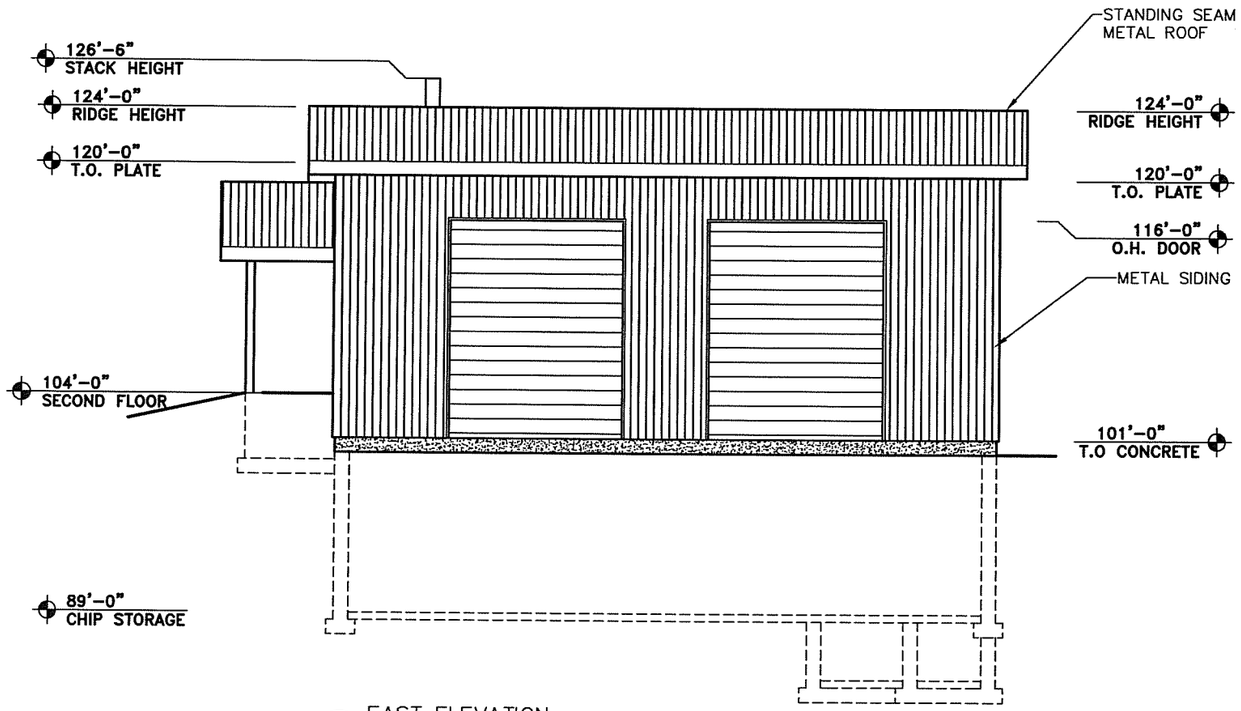
STATE OF ALASKA
49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

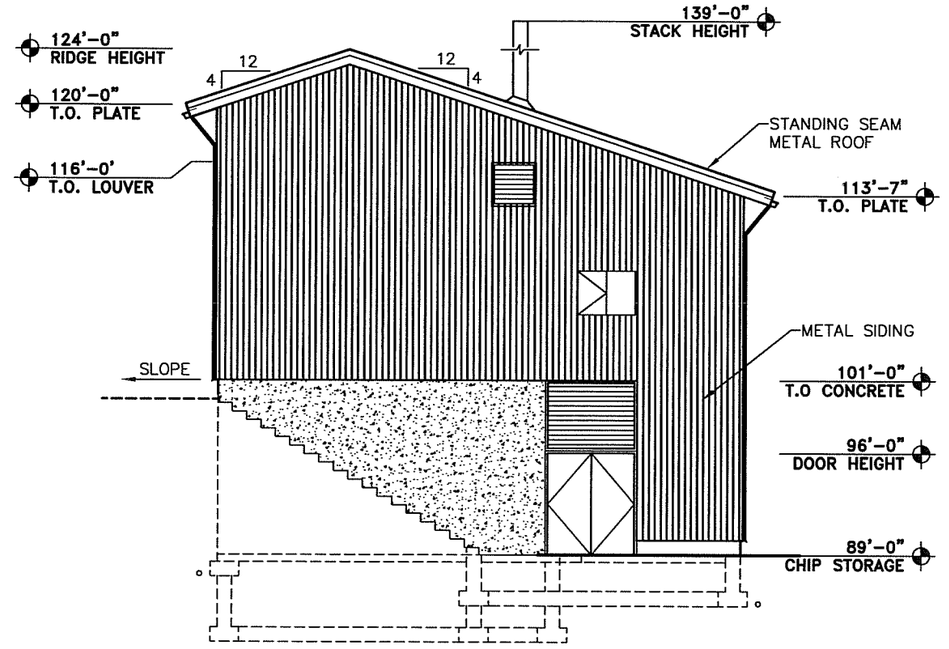
SHEET DESCRIPTION
SECTIONS

SHEET
A101



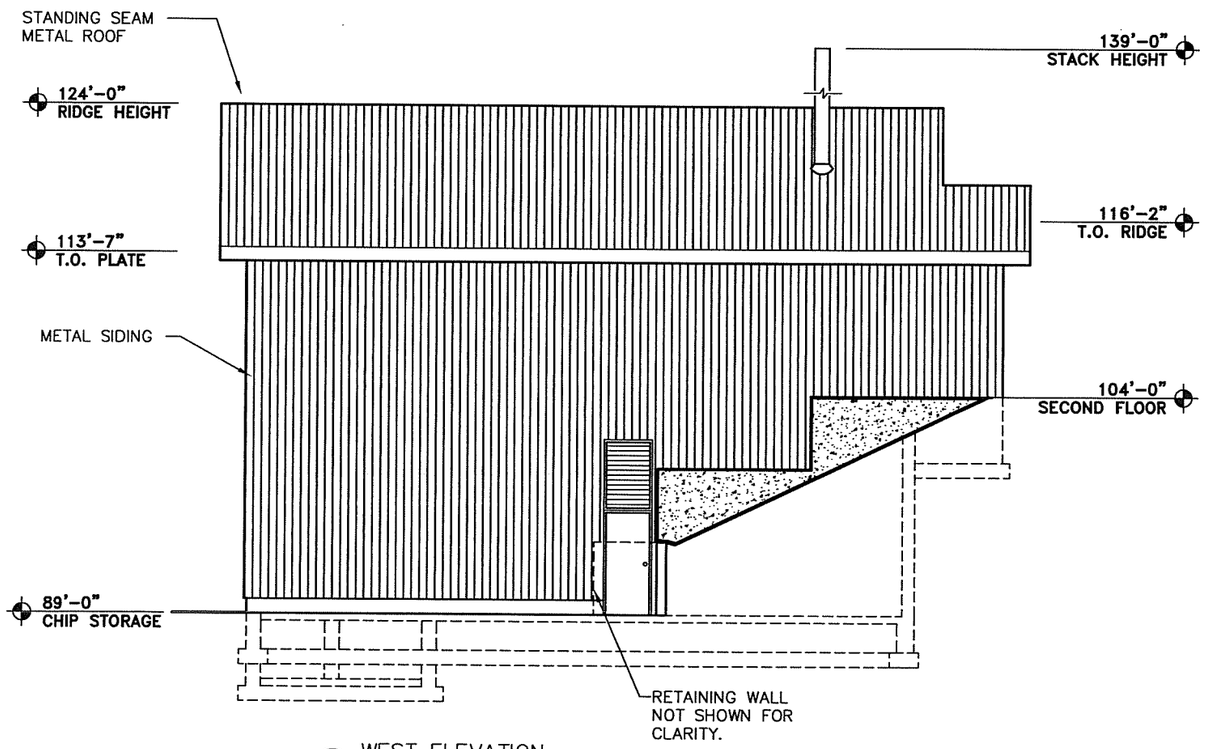
1 EAST ELEVATION

3/16" = 1'



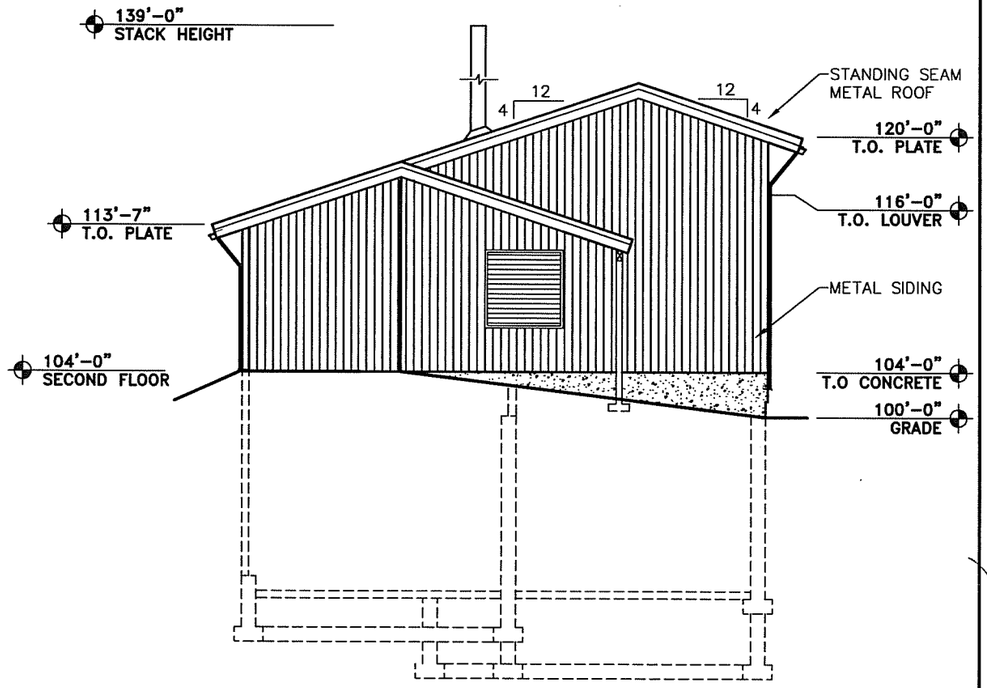
2 NORTH ELEVATION

3/16" = 1'



3 WEST ELEVATION

3/16" = 1'



4 SOUTH ELEVATION

3/16" = 1'

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

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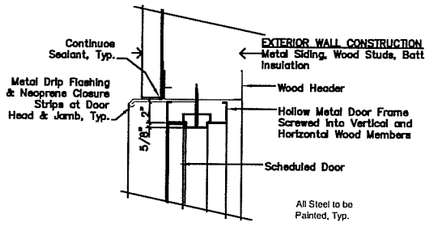
KETCHIKAN, ALASKA 99901

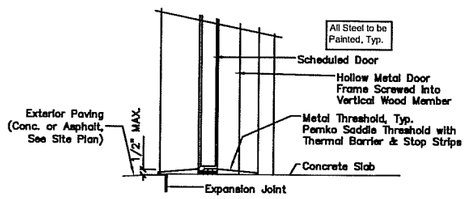
STATE OF ALASKA
49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

SHEET DESCRIPTION
ELEVATIONS

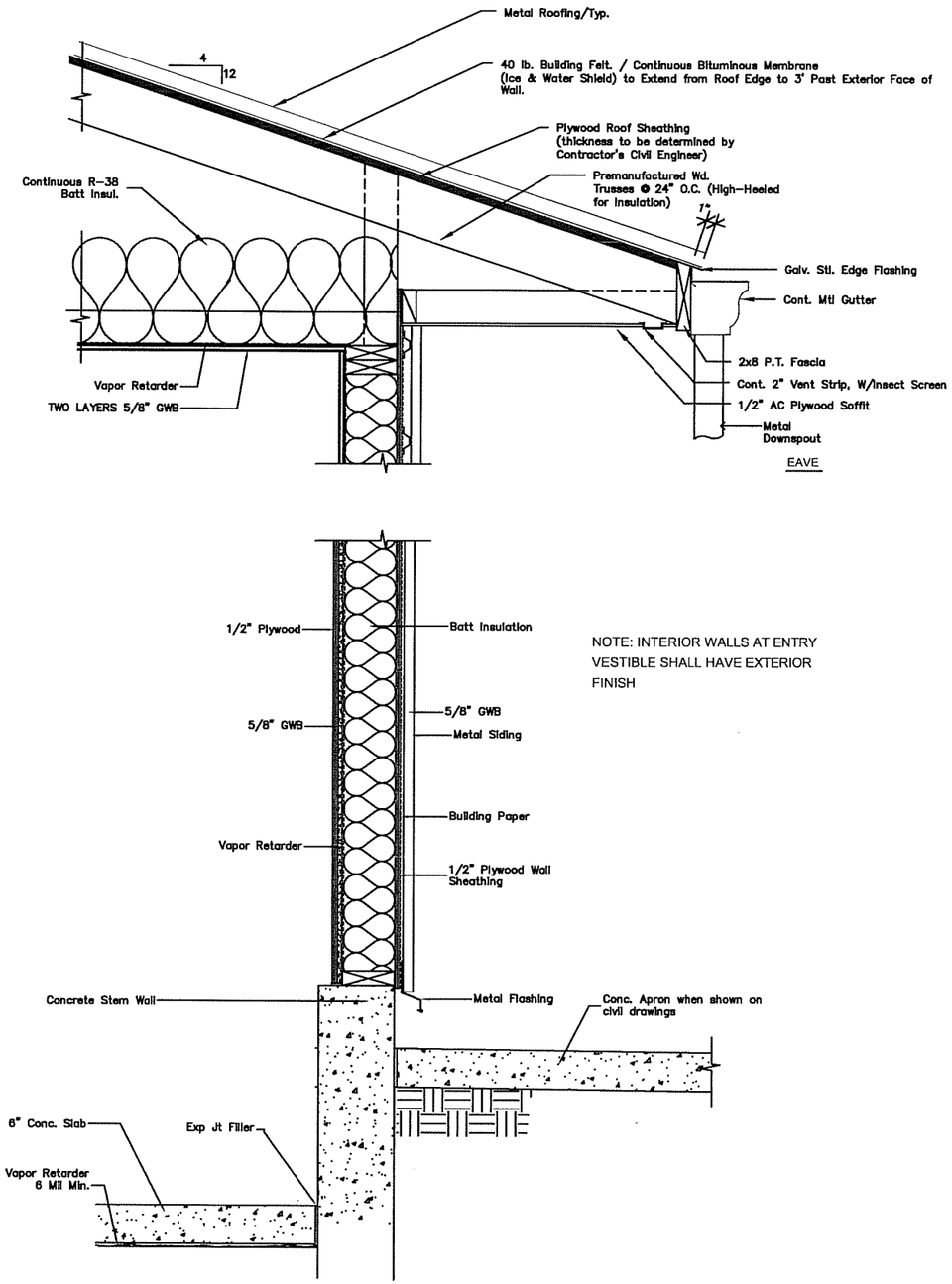
SHEET
A102



1 EXTERIOR DOOR HEAD/ JAMB SIMILAR



2 EXTERIOR DOOR THRESHOLD, TYPICAL WALL SECTION



NOTE: INTERIOR WALLS AT ENTRY VESTIBLE SHALL HAVE EXTERIOR FINISH

3 TYPICAL WALL SECTION

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_DETAILS.DWG

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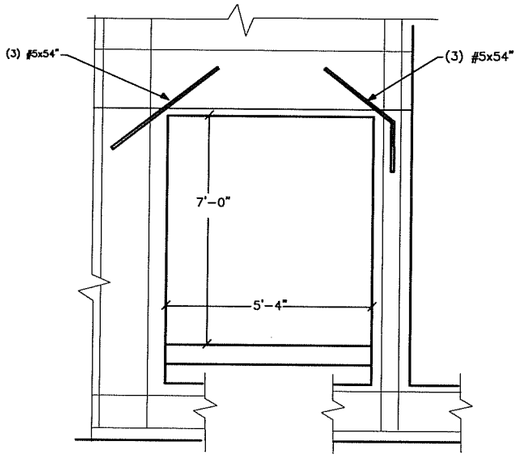
KETCHIKAN, ALASKA 99901

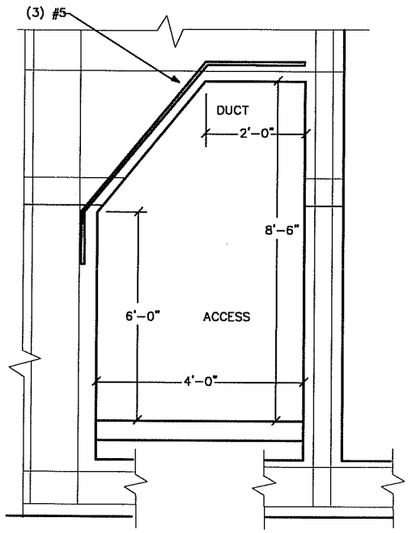
STATE OF ALASKA 49th
TREVOR SANDE CE 9778
REGISTERED PROFESSIONAL ENGINEER

SHEET DESCRIPTION
ARCHITECTURAL DETAILS

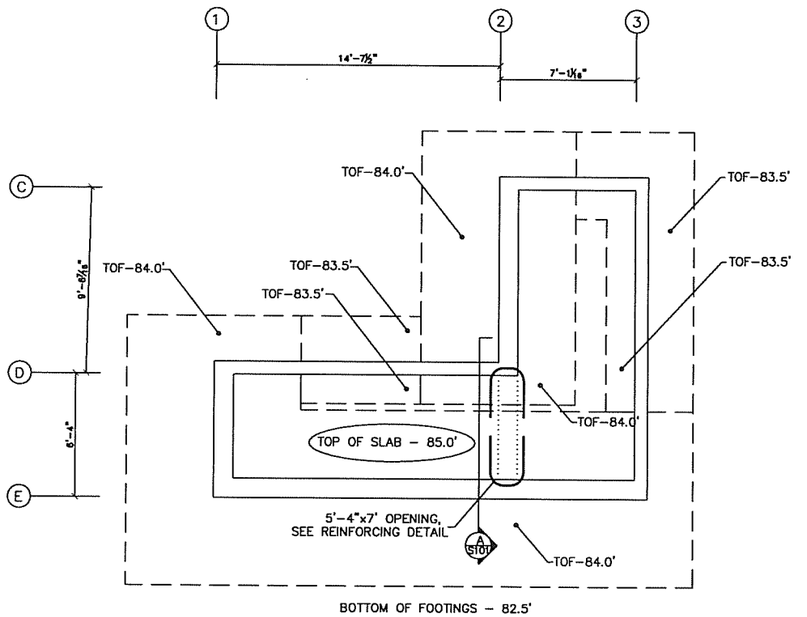
SHEET
A200



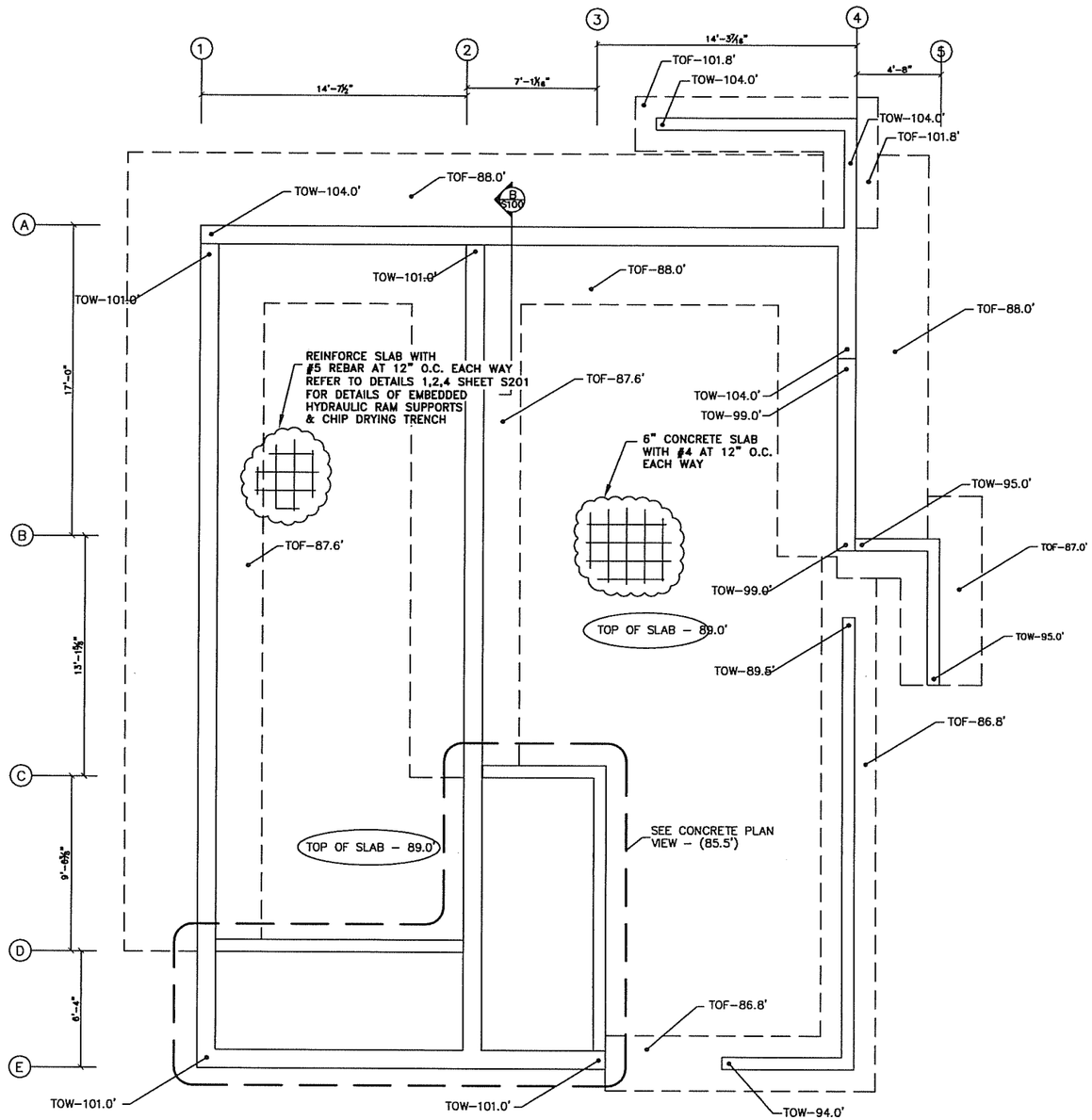
A CONCRETE OPENING AT AUGER



B ACCESS AND FAN OPENING



1 CONCRETE PLAN VIEW - (85.5')



2 CONCRETE PLAN VIEW - (104.5'-85.5')

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

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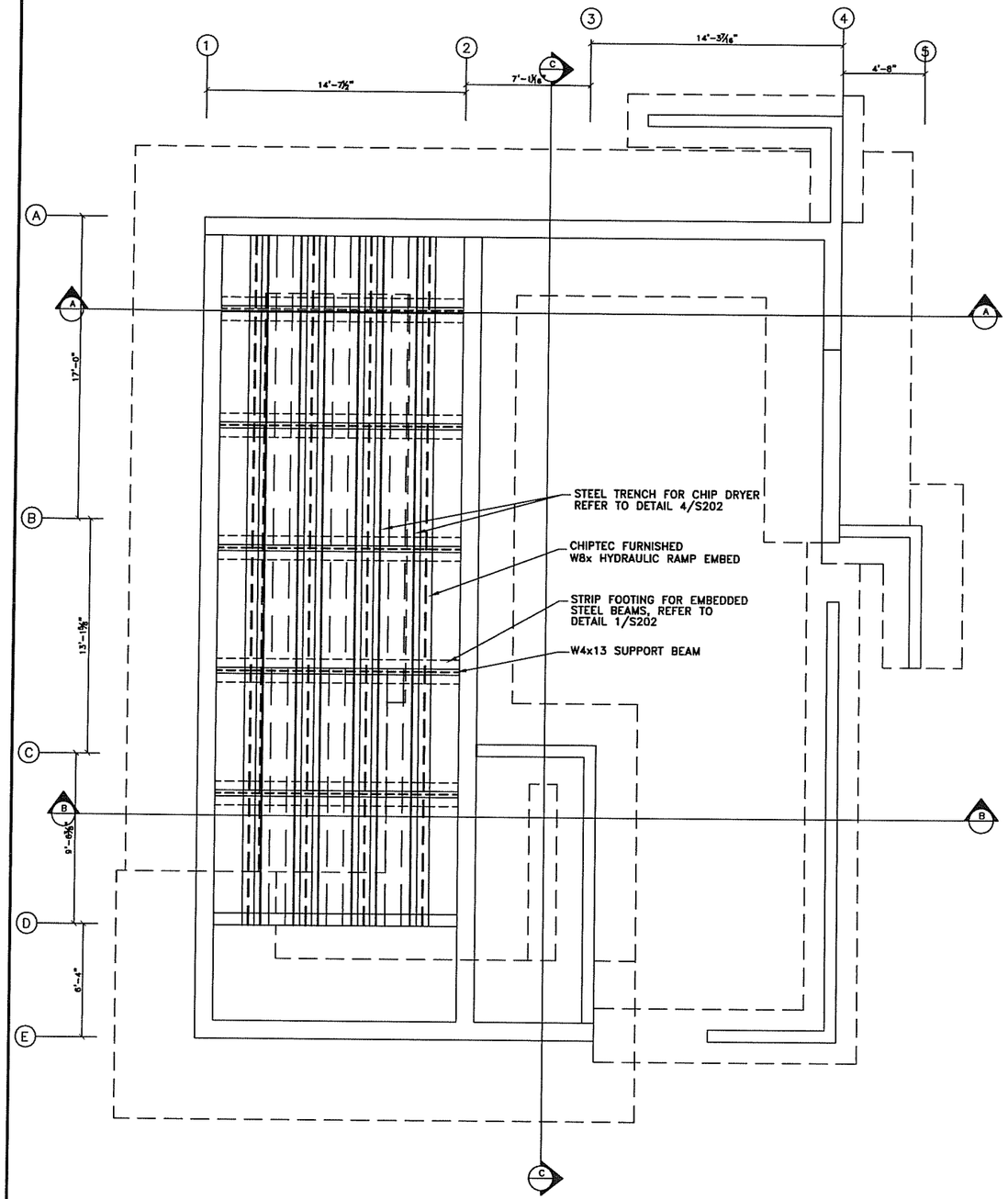
KETCHIKAN, ALASKA 99901

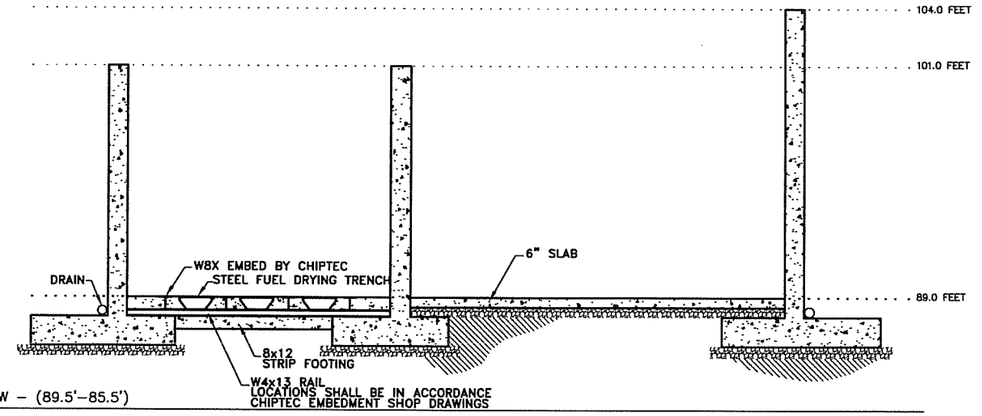
STATE OF ALASKA
49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

SHEET DESCRIPTION
FOUNDATION PLAN

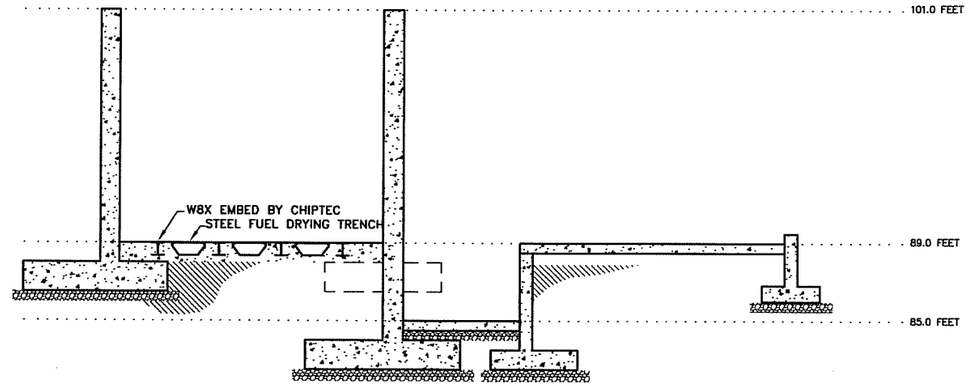
SHEET
S100



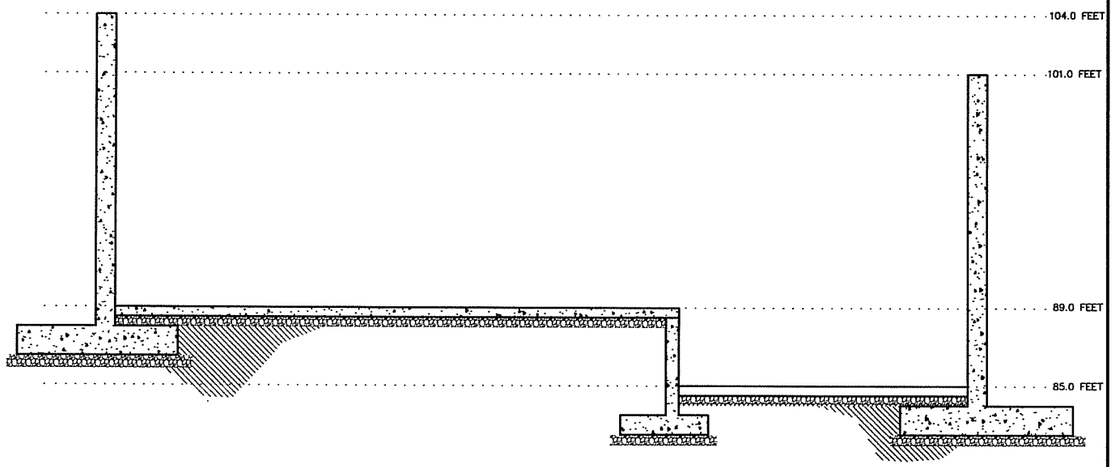
1 PLAN VIEW



A S100 PLAN VIEW – (89.5'–85.5')



B S100 PLAN VIEW – (89.5'–85.5')



C S100 PLAN VIEW – (89.5'–85.5')

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

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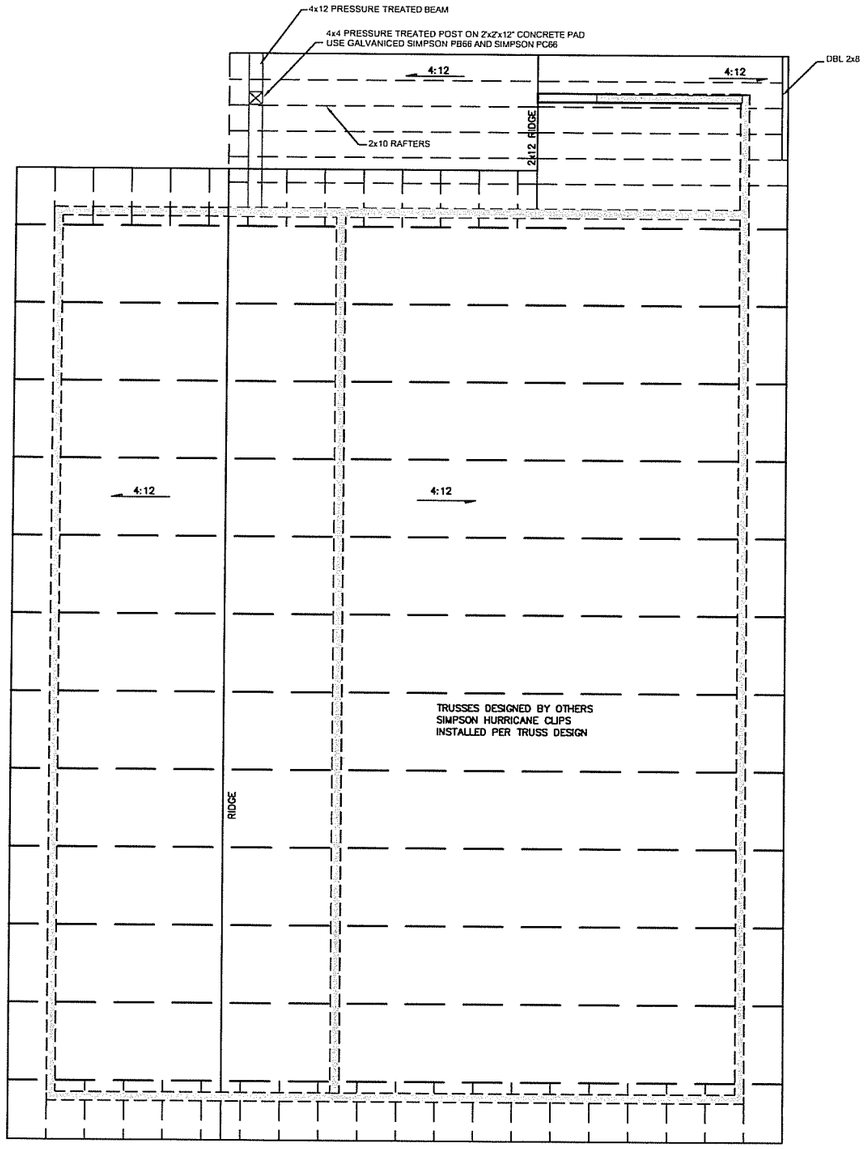
KETCHIKAN, ALASKA 99901

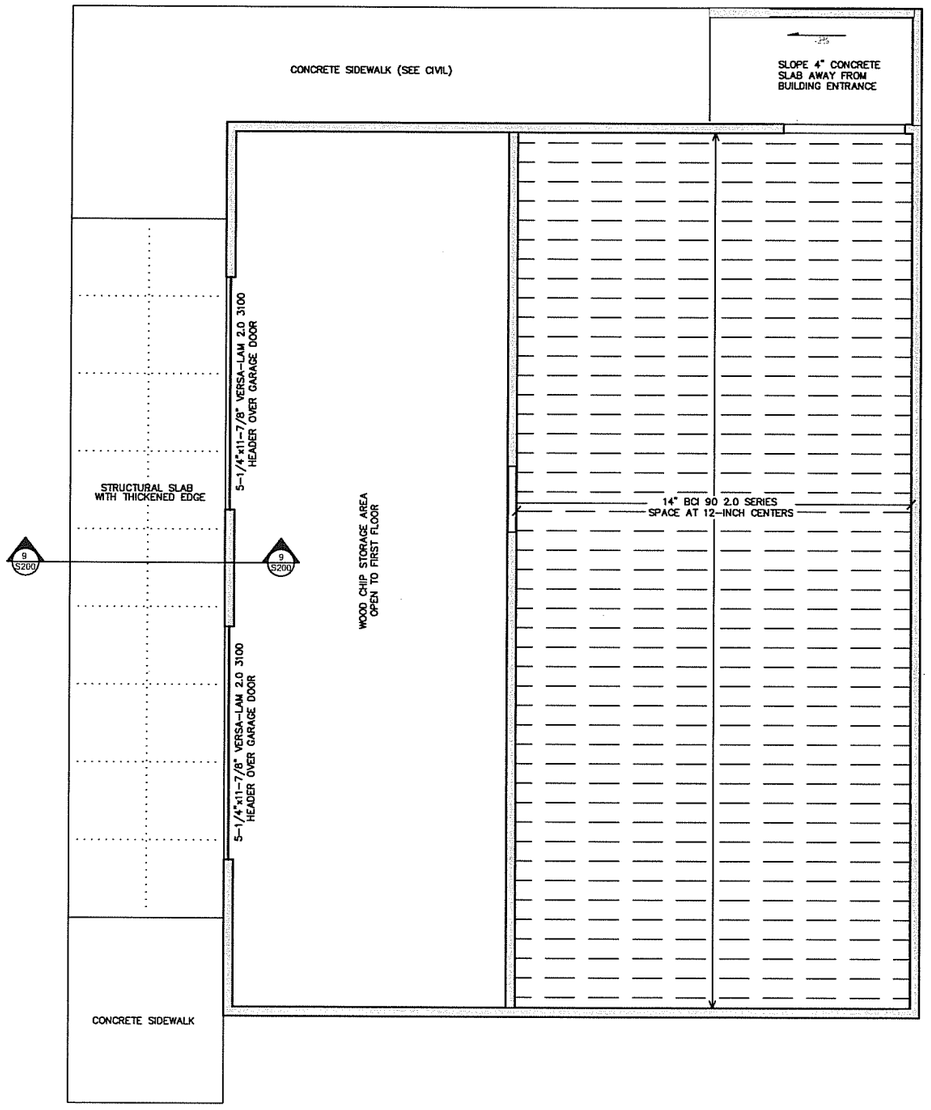
STATE OF ALASKA
49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

SHEET DESCRIPTION
ELEVATIONS

SHEET
S101



1 ROOF LAYOUT



2 SECOND FLOOR LAYOUT

5

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

TSS
TSS
12/11/06
052348
ARCH_STRUCT.DWG

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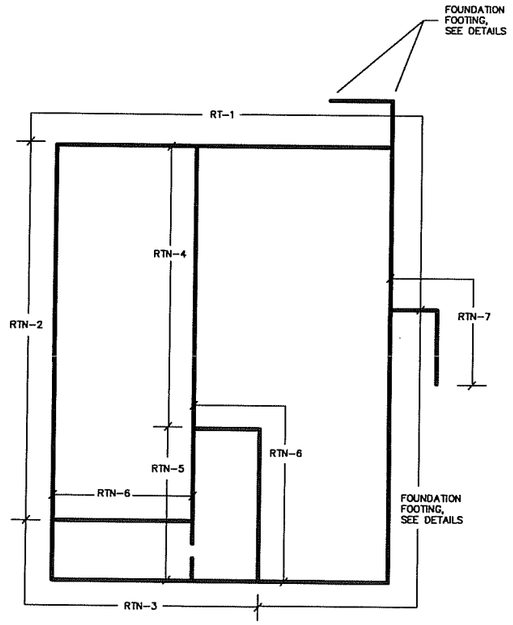
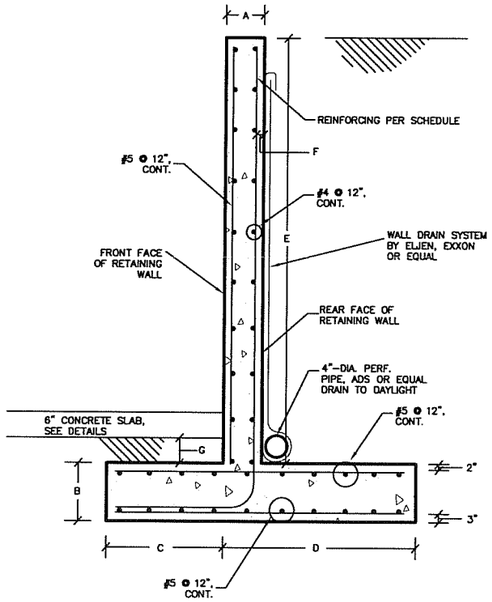
355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901

STATE OF ALASKA
49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

SHEET DESCRIPTION
LAYOUT

SHEET
S102



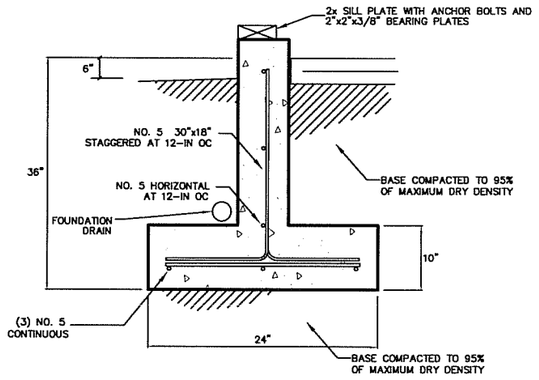


RETAINING WALL SIZE SCHEDULE							
RETAINING WALL	A	B	C	D	E	F	G*
RTN-1	12"	18"	3'-3"	5'-0"	16"	2-1/2"	6"
RTN-2	12"	18"	2'-6"	5'-0"	13"	2-1/2"	6"
RTN-3	12"	18"	3'-6"	5'-6"	17"	2-1/2"	6"
RTN-4	12"	18"	2'-0"	4'-0"	13"	2-1/2"	6"
RTN-5	12"	18"	3'-0"	5'-0"	17"	2-1/2"	6"
RTN-6	8"	12"	1'-6"	3'-0"	5'-6"	1-3/4"	12"
RTN-7	8"	12"	1'-6"	3'-0"	8'-0"	1-3/4"	18"

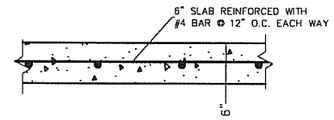
* MINIMUM DEPTH

RETAINING WALL REINFORCEMENT SCHEDULE			
	FOOTING		REAR WALL REINFORCEMENT
RETAINING WALL	TOP	BOTTOM	(SOME WALLS HAVE STAGGERED HEIGHTS)
RTN-1	#7 @ 9"	#7 @ 9"	0-4': #7 @ 7"; 4'-16': #7 @ 14"
RTN-2	#5 @ 10"	#5 @ 10"	#7 @ 12"
RTN-3	#5 @ 7"	#5 @ 7"	0-4': #7 @ 6"; 4'-17': #7 @ 12"
RTN-4	#5 @ 16"	#5 @ 16"	#6 @ 10"
RTN-5	#5 @ 10"	#5 @ 10"	0-4': #7 @ 7"; 4'-17': #7 @ 14"
RTN-6	#5 @ 16"	#5 @ 16"	#5 @ 12"
RTN-7	#5 @ 16"	#5 @ 16"	#5 @ 12"

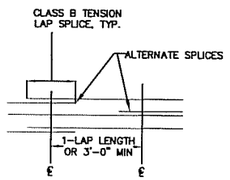
1 RETAINING WALL SCHEDULE



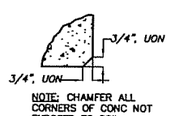
2 8" PERIMETER FOUNDATION



3 6" CONCRETE SLAB

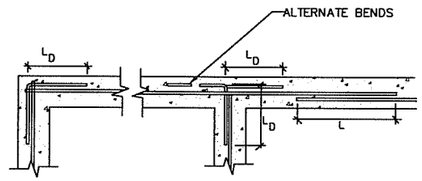


4 REINFORCING STAGGERED LAP SPLICE



NOTE: CHAMFER ALL CORNERS OF CONC NOT EXPOSED TO SOIL.

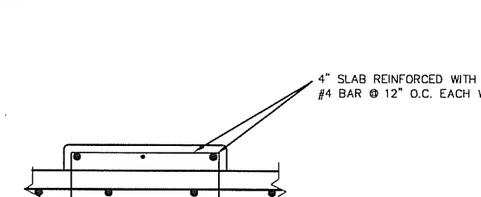
5 CONCRETE CHAMFER



BAR SIZE			
#4	L	30"	36"
#5	L_D	18"	24"

SINGLE CURTAIN @ STEM WALLS

6 WALL AND FOOTING REINFORCING AT CORNERS AND INTERSECTIONS



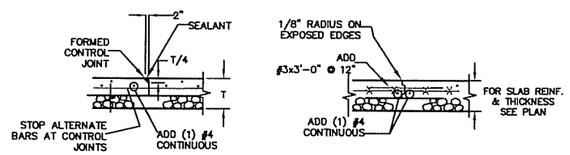
7 HOUSEKEEPING PAD

BAR SIZE	LD	LDT	LSB	LSBT	LB
3	14	18	18	24	8
4	19	25	25	32	10
5	24	31	31	40	12
6	28	37	37	48	14

NOTES:

1. LENGTHS EXPRESSED IN INCHES.
2. LENGTHS APPLICABLE FOR f'c = 4000 PSI, NORMAL WEIGHT CONCRETE ONLY, AND REINFORCEMENT WITH fy=60,000 PSI.
3. LD TENSION DEVELOPMENT LENGTH, BARS OTHER THAN TOP BARS
   LDT TENSION DEVELOPMENT LENGTH, TOP BARS (SEE NOTE 4)
   LSB CLASS B TENSION SPLICE, BAR SPACING
   LSBT CLASS B TENSION SPLICE, TOP BARS (SEE NOTE 4)
   LB COMPRESSION DEVELOPMENT LENGTH, BOTTOM BAR OR DOWEL
4. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12 INCHES OF CONCRETE CAST BELOW THE BARS.
5. FOR EPOXY COATED BARS, INCREASE ALL LENGTHS 50 PERCENT.
6. USE OF THIS CHART IS RESTRICTED TO BARS WITH CONCRETE COVER OF AT LEAST ONE BAR DIAMETER AND CLEAR SPACE BETWEEN BARS OF AT LEAST TWO BAR DIMENSIONS. FOR OTHER SITUATIONS, SPLICE LENGTHS SHALL BE INCREASED BY 50 PERCENT, EXCEPT FOR LB.

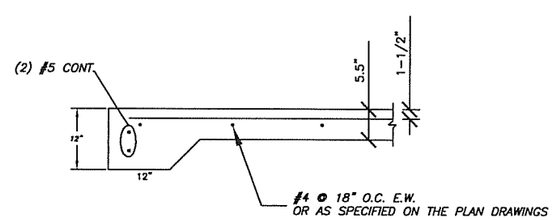
8 CONCRETE REINFORCING BAR LAP SPLICE AND DEVELOPMENT LENGTHS



NOTES:

1. SLAB ON GRADE IS 6 INCHES THICK, UNLESS OTHERWISE NOTED.
2. LOCATE CONSTRUCTION JOINTS UNDER PARTITIONS OR ON COLUMN LINES. PROVIDE CONTROL JOINTS ON ALL COLUMN LINES AND AT 30 TIMES SLAB THICK MAXIMUM SPACING EACH WAY IN BETWEEN. PROVIDE CONTROL JOINTS AT ALL RE-ENTRANT CORNERS. CONTRACTOR SHALL SUBMIT A JOINTING PLAN TO ENGINEER FOR REVIEW.
3. SAWED JOINTS SHALL BE MADE AS SOON AS THE JOINT CAN BE CUT WITHOUT EDGES RAVELING AND WITHIN 24 HOURS OF SLAB PLACEMENT. SAWED JOINTS SHALL BE FILLED WITH SEALANT AS APPROVED BY THE ENGINEER.
4. LOCATE REINFORCING AT HALF THE DEPTH FROM TOP OF SLAB.
5. TYPICAL SLAB REINFORCING: #4 @ 12" EACH WAY FOR 6" SLAB

9 CONCRETE JOINTS



10 EXTERIOR SLAB W/ THICKENED EDGE

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

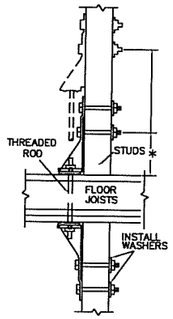
DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

R&M ENGINEERING-KETCHIKAN, INC.
355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901

STATE OF ALASKA 49th
TREVOR SANDE CE 9778
REGISTERED PROFESSIONAL ENGINEER

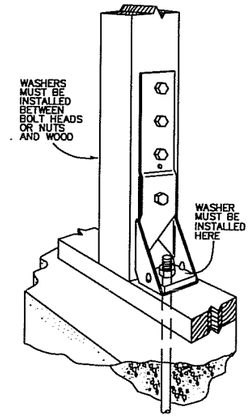
SHEET DESCRIPTION
STRUCTURAL DETAILS

SHEET
S200

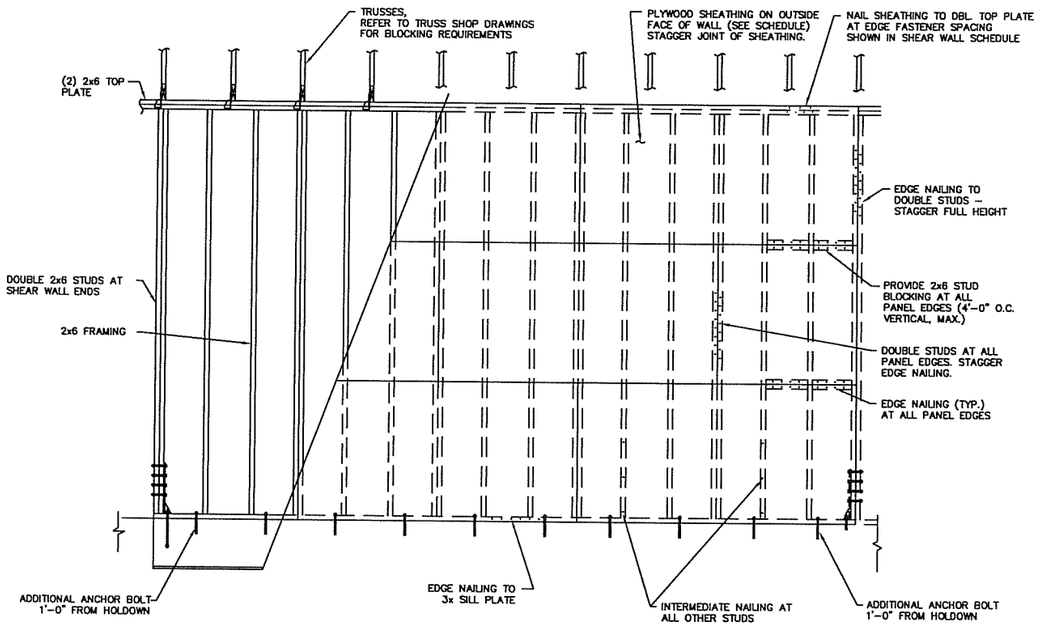


* MINIMUM OF SEVEN BOLT DIAMETERS TO ACHIEVE LOAD CAPACITIES. THIS DISTANCE IS DESIGNED INTO HOLDOWNS. DISTANCE MAY BE INCREASED WITHOUT AFFECTING LOAD CAPACITY, PROVIDED THE ANCHOR NUT IS NOT OVER-TORQUED.

HOLDOWN TIE BETWEEN FLOORS



TYPICAL HOLDOWN INTO CONCRETE



- EXTERIOR PLYWOOD SHEATHING SHALL BE APA RATED, STRUCTURAL I
- SEE SHEAR WALL SCHEDULE FOR FASTENER SPACING REQUIREMENTS
- STRUCTURAL PLYWOOD APA RATED SHEATHING IS PERMITTED TO BE APPLIED EITHER PARALLEL OR PERPENDICULAR TO FRAMING. STAGGER JOINT OF SHEATHING.
- FACE NAIL DOUBLE STUDS 16d at 6" O.C. FOR SHEAR TRANSFER BETWEEN PANELS
- ANCHOR BOLT FOR SILL PLATE TO BE 5/8" SIMPSON ET MIN. EMBEDMENT 7" AT 2 FOOT CENTERS

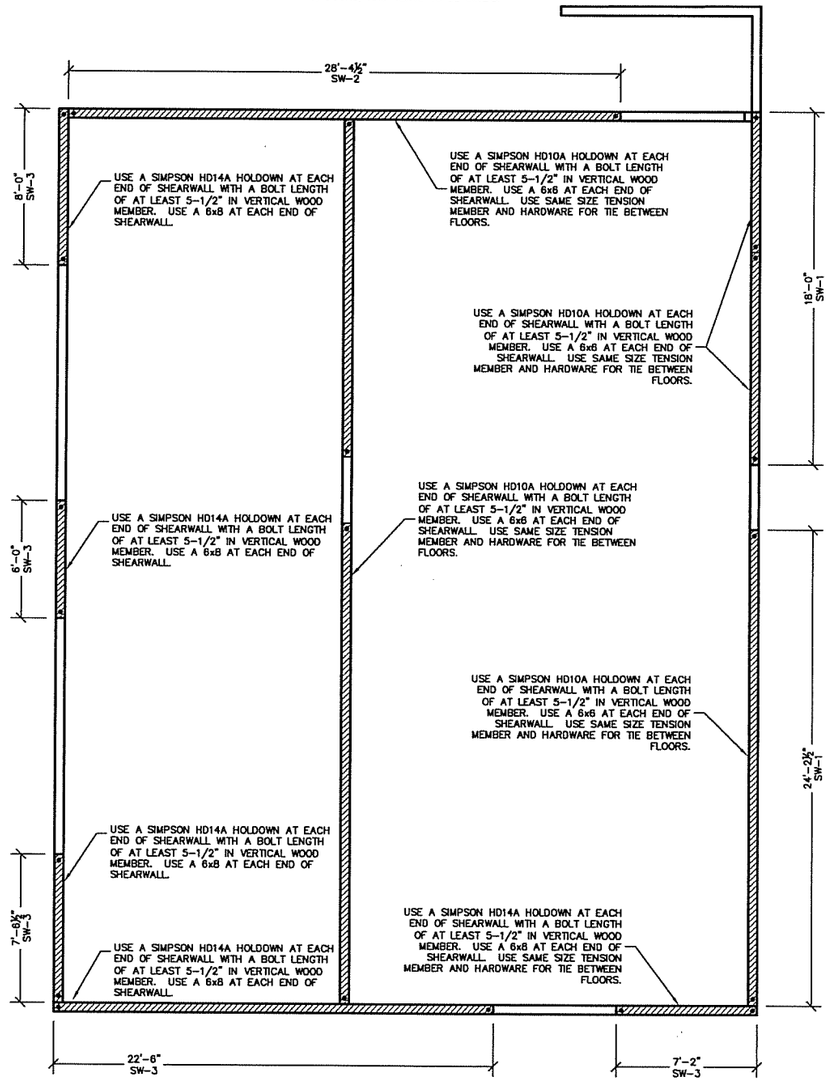
TYPICAL STUD WALL

SW-1 15/32" STRUCTURAL I SHEATHING ONE SIDE (EXTERIOR), NAIL SIZE TO BE 10d, 1-1/2" MINIMUM FASTENER PENETRATION IN FRAMING, FASTENER SPACING TO BE 6 INCH AT PANEL EDGES, 12 INCH FASTENER SPACING FOR INTERMEDIATE SUPPORTS IN PANELS.

SW-2 15/32" STRUCTURAL I SHEATHING ONE SIDE (EXTERIOR), NAIL SIZE TO BE 10d, 1-1/2" MINIMUM FASTENER PENETRATION IN FRAMING, FASTENER SPACING TO BE 4 INCH AT PANEL EDGES, 12 INCH FASTENER SPACING FOR INTERMEDIATE SUPPORTS IN PANELS.

SW-3 15/32" STRUCTURAL I SHEATHING ONE SIDE (EXTERIOR), NAIL SIZE TO BE 10d, 1-1/2" MINIMUM FASTENER PENETRATION IN FRAMING, FRAMING AT ADJOINING PANEL EDGES TO BE 3" NOMINAL OR WIDER, FASTENER SPACING TO BE 3 INCH AT PANEL EDGES (STAGGERED), 12 INCH FASTENER SPACING FOR INTERMEDIATE SUPPORTS IN PANELS.

NOTES:
1. ALL SHEAR WALLS TO HAVE (3)2x12 DRAG STRUTS TRANSFERRING THE LOAD, AT THE TOP OF EACH WALL AND AT THE BOTTOM OF A WALL WITH VARYING BASE ELEVATIONS.
2. HEADERS FOR WINDOWS, DOORS, AND VENTS TO BE 6x12'S.



SHEARWALL SCHEDULE

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

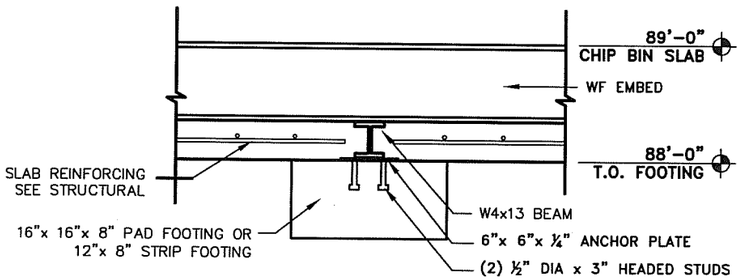
DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

R&M ENGINEERING-KETCHIKAN, INC.
355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901

STATE OF ALASKA
749th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

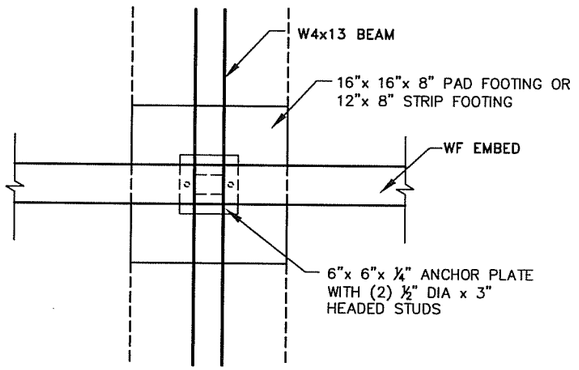
SHEET DESCRIPTION
STRUCTURAL DETAILS

SHEET
S201



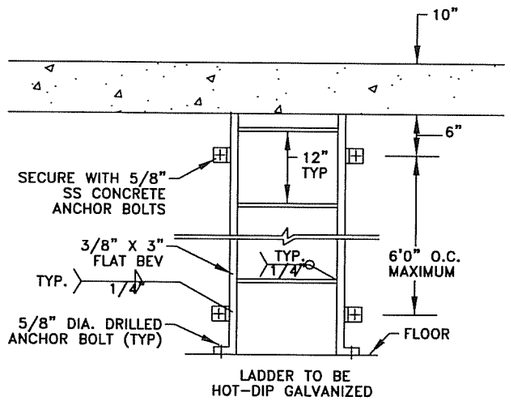
1 / S202 **SECTION SUPPORT FOR WF EMBED**

NOT TO SCALE



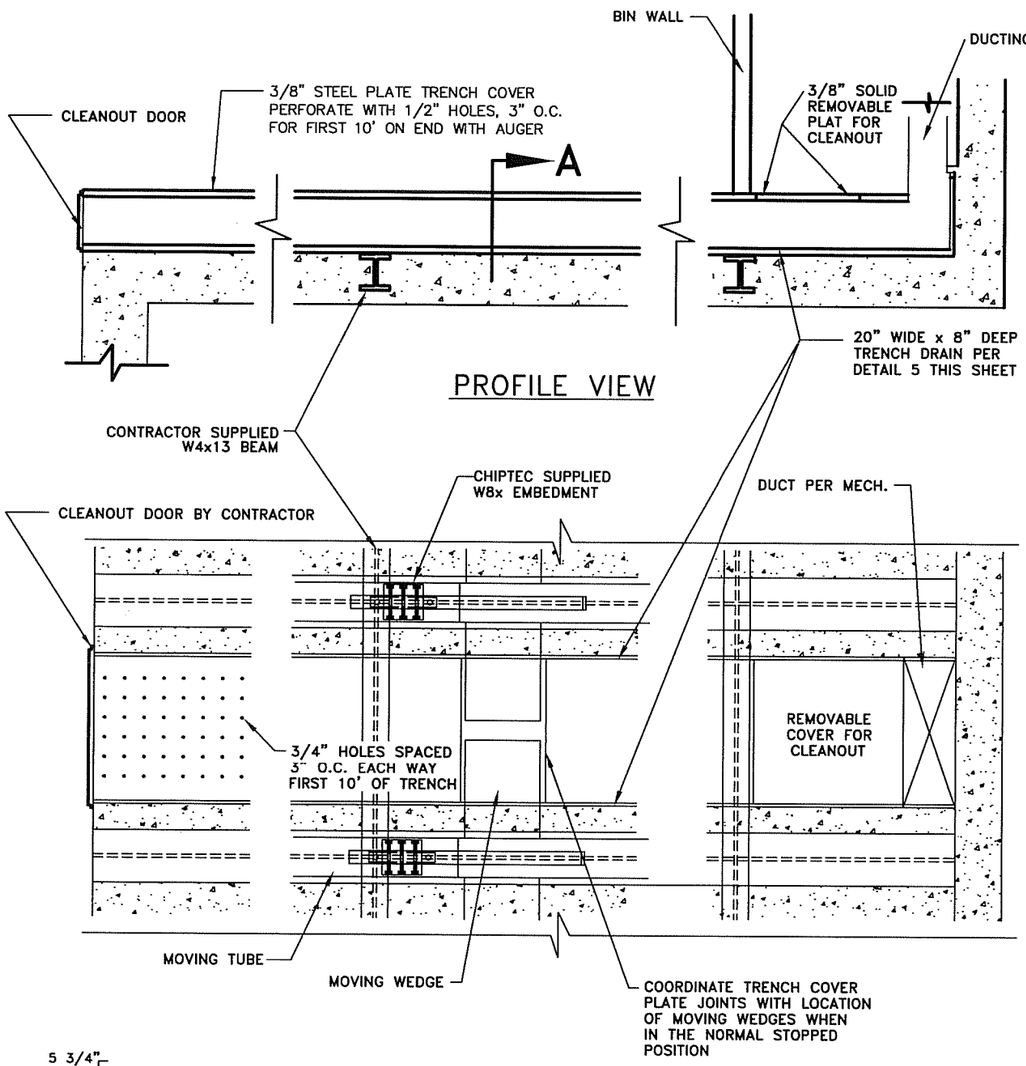
2 / S202 **PLAN VIEW SUPPORT FOR WF EMBED**

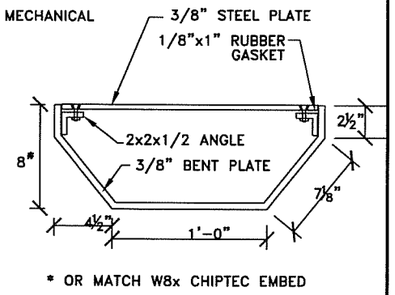
NOT TO SCALE



3 / S202 **CHIP BIN LADDER DETAIL**

NOT TO SCALE



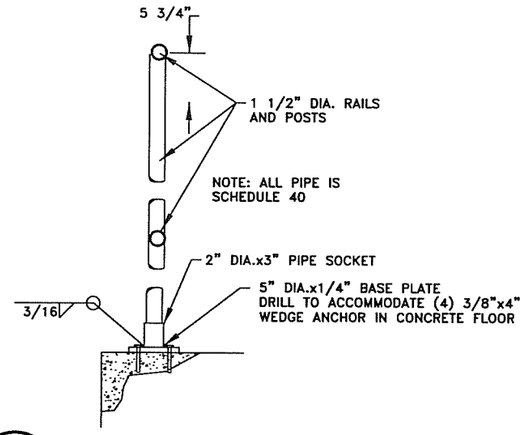


* OR MATCH W8x CHIPTEC EMBED

SECTION A

4 / S202 **TRENCH SECTION CHIP DRYER**

NOT TO SCALE



5 / S202 **REMOVABLE GUARDRAIL DETAIL**

NOT TO SCALE

NOTES:

REVISIONS:

CITY OF CRAIG
WOOD FIRED HEATING SYSTEM

DRAWN BY: TSS
CHECKED BY: TSS
DATE: 12/11/06
R&M # 052348
CADD FILE: ARCH_STRUCT.DWG

R&M ENGINEERING–KETCHIKAN, INC.
355 CARLANNA LAKE ROAD
KETCHIKAN, ALASKA 99901

STATE OF ALASKA 49th
TREVOR SANDE
CE 9778
REGISTERED PROFESSIONAL ENGINEER

SHEET DESCRIPTION
STRUCTURAL DETAILS

SHEET
S202

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
D	DRAIN
HWS	HEATING WATER SUPPLY
HWR	HEATING WATER RETURN
	GATE VALVE
	BALL VALVE
	BUTTERFLY VALVE
	GLOBE VALVE
	TRIPLE DUTY VALVE
	SWING CHECK VALVE
	STRAINER
	FLEX CONNECTOR
	HOSE END DRAIN VALVE
	PRESSURE REDUCING VA.
	SAFETY RELIEF VALVE
	UNION
	MOTORIZED T.C. VALVE/2-WAY
	MOTORIZED T.C. VALVE/3-WAY
	VALVE IN RISER
	TEE UP
	TEE DOWN
	ELBOW UP
	ELBOW DOWN
	PIPE SIZE CHANGE
	MANUAL FLOW BALANCING VALVE
	PIPE GUIDE
	PRESSURE/TEMP. TEST PLUG
T OR	THERMOMETER
P	PRESSURE GAUGE W/ SNUBBER
T	ELECTRIC THERMOSTAT
	MANUAL BALANCING DAMPER
	FLEX CONNECTOR
A.D. A.D.	ACCESS DOORS
M	MOTORIZED DAMPER
	TURNING VANE ELL
SD-1 (PLAN CODE) 8x8 (NECK SIZE) 200 (CFM)	DIFFUSER,REGISTER OR GRILLE THROW PATTERN SHOWN ON DWGS.
	CONNECT NEW WORK TO EXISTING

HVAC ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
ACFM	ACTUAL CFM
AHU	AIR HANDLING UNIT
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AMP	AMPERE (AMP,AMPS)
APD	AIR PRESSURE DROP
APPROX	APPROXIMATE
BHP	BRAKE HORSEPOWER, BOILER HORSEPOWER
BTU	BRITISH THERMAL UNIT
MBH	BTU PER HOUR (THOUSAND)
CU FT	CUBIC FEET
CU IN	CUBIC INCH
CFM	CUBIC FEET PER MINUTE
SCFM	CFM, STANDARD CONDITIONS
DB	DECIBEL
DIA	DIAMETER
ID	DIAMETER, INSIDE
OD	DIAMETER, OUTSIDE
DBT	DRY-BULB TEMPERATURE
EAT	ENTERING AIR TEMPERATURE
E.C.	ELECTRICAL CONTRACTOR
EDR	EQUIVALENT DIRECT RADIATION
EXP	EXPANSION
EWT	ENTERING WATER TEMPERATURE
F	FAHRENHEIT
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FOOT OR FEET
HZ	FREQUENCY
GA	GAGE OR GAUGE
GAL	ALLONS
G.C	GENERAL CONTRACTOR
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GPD	GALLONS PER DAY
HD	HEAD
HGT	HEIGHT
HP	HORSEPOWER
RH	HUMIDITY, RELATIVE
KW	KILOWATT
KWH	KILOWATT HOUR
LAT	LEAVING AIR TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
LF	LINEAR FEET
MAX	MAXIMUM
M.C.	MECHANICAL CONTRACTOR
MIN	MINIMUM
N O	NORMALLY OPEN
N C	NORMALLY CLOSED
N/A	NOT APPLICABLE
N/C	NOT IN CONTRACT
NTS	NOT TO SCALE
NO	NUMBER
OBD	OPPOSED BLADE DAMPER
OA	OUTSIDE AIR
%	PERCENT
PH	PHASE(ELECTRICAL)
LBS	POUNDS
PSI	POUNDS PER SQUARE INCH
PSIA	PSI ABSOLUTE
PD	PRESSURE DROP OR DIFFERENCE
PSIG	PSI GAUGE
R/O	RUN OUT
RH	RELATIVE HUMIDITY
RA	RETURN AIR
RPM	REVOLUTIONS PER MINUTE
SH	SENSIBLE HEAT
SPEC	SPECIFICATION
SP VOL	SPECIFIC VOLUME
STD	STANDARD
SP	STATIC PRESSURE
SUCT	SUCTION
SA	SUPPLY AIR
TEMP	TEMPERATURE
TD	TEMPERATURE DIFFERENCE
T STAT	THERMOSTAT
TONS	TONS OF REFRIGERATION
T.C.	TEMPERATURE CONTROL
VAC	VACUUN
VAV	VARIABLE AIR VOLUME
VEL	VELOCITY
V	VOLT
VOL	VOLUME
VFD	VARIBLE FREQUENCY DRIVE
WPD	WATER PRESSURE DROP
W/	WITH

GLYCOL MAKE-UP UNIT SCHEDULE

PLAN CODE	MFGR	MODEL NO	GPM	HEAD	RPM	HP	POWER (V/PH/HZ)	TANK GALLONS	TANK MATERIAL	FILL PRESSURE	REMARKS
GMU-1	EXPANFLEX	GMP2-50	2	70 PSI	1725	1/4	120-1-60	50	POLYETHYLENE	18 PSI	SIMPLEX PUMP UNIT

AIR HANDLING UNIT SCHEDULE

PLAN CODE	AHU-1
MANUFACTURER	MCQUAY
MODEL NO.	CAH017GHAC
ARRANGEMENT	VERTICAL DOWN FLOW
FAN SECTION	
NUMBER OF FANS	1
DIAMETER	19.69 IN.
TYPE	AIR FOIL CLASS 2
ACFM (AT SEA LEVEL)	9,000
OSA CFM	9,000
ACTUAL ESP (IN. WG)	6.0
ACTUAL TSP (IN. WG)	7.06
RPM @ ACFM & TSP	2452
HP	20
FLA	57
POWER (V/PH/HZ)	480/3/60
HEATING COIL (NOTE 2)	
FLUID TYPE	30% PROP. GLYCOL
FACE AREA (SF)	16.75
COIL ACFM	9,000
FACE VELOCITY (FPM)	537
NO. OF ROWS/FPI	3/14
EWT/LWT (DEG F)	190.0/152.4
GPM	72
WATER P.D. (FT)	12.0
EAT-DB (DEG. F)	-10.0
LAT-DB (DEG. F)	120.0
OUTPUT MBH	1285.0
AIR P.D. (IN. WG)	0.41
FILTER SECTION	
(QTY.) SIZE IN.	(3) 24x24x2 (6) 24x20x2 (3) 24x12x2
UNIT DIMENSION (NOTE 1)	
LxWxH (IN.)	80x80x92
UNIT WEIGHT (LBS)	2,500
REMARKS	NOTE 2, 3, 4

NOTE: 1) DIMENSIONS INDICATED BY THE SIZES OF THE UNITS IN THE LARGE SCALE PLANS AND SECTIONS ARE THE APPROXIMATE MAXIMUM ALLOWED. LARGER UNITS WHICH DO NOT PROVIDE SIMILAR MAINTENANCE CLEARANCES WILL NOT BE ACCEPTABLE.
2) PROVIDE UNIT WITH FACTORY MOUNTED VFD. GRAHAM MODEL VLT6000 OR EQUAL.
3) PROVIDE UNIT WITH OUTSIDE AIR DAMPER.
4) PROVIDE PREMIUM EFFICIENCY MOTOR.

UNIT HEATER SCHEDULE

PLAN CODE	MFGR	MODEL NO.	MBH (NOTE 1)	FLOW (GPM)	W.P.D. (FT.)	CFM	HP.	POWER V/PH/HZ	REMARKS
UH-1	MCQUAY	UH-63	38.0	2.0	1.0	1,120	1/12	120/1/60	NOTE 2
UH-2	MCQUAY	UH-108	70.0	4.0	1.0	2,010	1/8	120/1/60	NOTE 2

NOTE: 1) CAPACITY AT 60°F EAT, 200°F EWT.
2) CONTROLLED BY THERMOSTAT PROVIDED BY T.C. CONTRACTOR.

HEATING COIL SCHEDULE

PLAN CODE	SERVICE	MFGR	MODEL NO.	SIZE (H" x L")	FACE AREA	ROWS/ FPI	AIRFLOW (CFM)	OUTPUT (MBH)	EAT (°F)	LAT (°F)	EWT (°F)	LWT (°F)	GPM	WPD (FT.)	APD IN W.C.	REMARKS
HC-1	POOL AHU	MCQUAY	5MS1002B	45 x 110	34.4 SF	2/10	20,000	1488.0	20.0	88.0	190	159	101	5	0.25	NOTE 1, 2
HC-2	POOL OFFICE AHU	MCQUAY	5WH1102B	24 x 24	4 SF	2/11	2,300	117.4	50.0	96.7	190	159	8	1	0.26	NOTE 1, 2

NOTE: 1) BASED ON 30% PROP. GLYCOL HEATING WATER.
2) FIELD VERIFY EXACT SIZE REQUIRED TO FIT IN EXISTING UNITS.

PUMP SCHEDULE

PLAN CODE	MFGR	MODEL NO.	TYPE	FLUID			ELECTRICAL			SERVICE	REMARKS
				FLOW RATE (GPM)	HEAD LOSS (FT.)	TYPE	MOTOR SIZE (HP.)	MOTOR SPEED (RPM)	POWER VOLT/PH/HZ		
HWP-1	TACO	KS2510	VERT. INLINE	280	95	30% PROP. GLYCOL	15	1,760	480/3/60	MAIN DISTRIBUTION PUMP	NOTE 1, 2
HWP-2	TACO	KS2510	VERT. INLINE	280	95	30% PROP. GLYCOL	15	1,760	480/3/60	MAIN DISTRIBUTION PUMP	NOTE 1, 2
HWP-3	TACO	1635	INLINE	72	25	30% PROP. GLYCOL	1	1,750	480/3/60	AHU-1 LOOP	NOTE 1
IP-1	TACO	0012	INLINE	30	8	50% PROP. GLYCOL	1/8	3,250	120/1/60	HX-1	
IP-2	TACO	IL122	INLINE	38	9	BOILER WATER	1/4	1,725	120/1/60	HX-2	
IP-3	TACO	IL122	INLINE	39	8	30% PROP. GLYCOL	1/4	1,725	120/1/60	HX-3	
IP-4	TACO	1635	INLINE	49	21	POOL WATER	3/4	1,750	120/1/60	HX-4	
IP-5	TACO	0010	INLINE	8	11	POOL WATER	1/8	3,250	120/1/60	HX-5	
IP-6	TACO	0014	INLINE	12	15	POOL WATER	1/8	3,250	120/1/60	HX-6	
IP-7	TACO	006-B	INLINE	3	6	DOMESTIC WATER	1/4	3,250	120/1/60	HX-7, BRONZE CONSTRUCTION	
CP-1	TACO	1635	INLINE	72	16	30% PROP. GLYCOL	3/4	1,750	120/1/60	BOILER PLANT AHU-1	
CP-2	TACO	1635	INLINE	101	15	30% PROP. GLYCOL	1	1,750	480/3/60	POOL AHU-1	

NOTE: 1) PROVIDE PREMIUM EFFICIENCY MOTOR.
2) PROVIDE INVERTOR DUTY MOTOR COMPATIBLE WITH VARIABLE SPEED DRIVE.

WALL LOUVER SCHEDULE

PLAN CODE	MFGR	MODEL NO.	SERVICE	SIZE (W" x H")	FRAME STYLE	FREE AREA(SF)	MATERIAL	REMARKS
L-1	RUSKIN	ELF375	COMB. AIR	76 x 60	BOX	17.0	ALUMINUM	NOTE 1, 2
L-2	RUSKIN	ELF375	COMB. AIR	60 x 48	BOX	10.7	ALUMINUM	NOTE 1
L-3	RUSKIN	ELF375	AHU-1 INTAKE	78 x 66	BOX	19.63	ALUMINUM	NOTE 1
L-4	RUSKIN	ELF375	CHIP BIN EXHAUST	60 x 54	BOX	12.12	ALUMINUM	NOTE 1

NOTE: 1) PROVIDE BIRDSCREEN AND BAKED ENAMEL FINISH IN COLOR SELECTED BY ARCHITECT.
2) VERIFY DOOR WIDTH. LOUVER SHALL BE THE SAME WIDTH.

EXPANSION TANK

PLAN CODE	MFGR	MODEL NO.	TOTAL VOLUME	ACCEPTANCE VOLUME	PRECHARGE PRESSURE	MAX. PRESSURE	MIN. TEMP	MAX. TEMP	ESTIMATED SYSTEM VOLUME	REMARKS
ET-1	TACO	CA-1600	422 GAL.	422 GAL.	18 PSIG	27 PSIG	50°F	190°F	2300 GAL.	-

EXHAUST FAN SCHEDULE

PLAN CODE	SERVICE	MFGR	MODEL NO.	DRIVE	CFM	RPM	E.S.P. (IN W.G.)	HP.	POWER (V/PH/HZ)	TYPE	WEIGHT (LBS.)	REMARKS
EF-1	CHIP DRYING	COOK	402SQN-HP	BELT	9,000	515	1.0	5	480/3/60	INLINE	650	NOTE 1, 2, 3, 4, 5

NOTE: 1) PROVIDE BACKDRAFT DAMPER.
2) PROVIDE VIBRATION ISOLATORS.
3) PROVIDE REINFORCED WHEEL.
4) PROVIDE INVERTOR DUTY MOTOR COMPATIBLE WITH VARIABLE SPEED DRIVE.
5) PROVIDE PREMIUM EFFICIENCY MOTOR.

AIR SEPARATORS

PLAN CODE	MFGR	MODEL NO.	GPM	PIPE SIZE	REMARKS
AS-1	TACO	AC4F	280	4"	WITH STRAINER

BRAZED PLATE HEAT EXCHANGER SCHEDULE

PLAN CODE	SERVICE	MFGR	MODEL NO.	HEAT TRANSFER AREA (SF)	HOT SIDE (NOTE 1)					COLD SIDE					FOULING RESISTANCE °FT - H - °F / BTU
					GPM	INLET TEMP	OUTLET TEMP	MAX. W.P.D. (PSI)	HEAT TRANSFER (MBH)	FLUID TYPE	GPM	INLET TEMP	OUTLET TEMP	MAX. P.D. (PSI)	
HX-1	ELEM. HYDRONIC	TACO	TFP10X20-50	63.0	19	190°F	160°F	0.6	270.0	50% PROP. GLYCOL	30	156°F	176°F	1.6	0.0001
HX-2	MID. SCHL HYDRONIC	TACO	TFP10X20-50	63.0	26	190°F	160°F	1.2	369.3	BOILER WATER	38	156°F	176°F	2.3	0.0001
HX-3	M.S. GYM HYDRONIC	TACO	TFP10X20-60	76.1	26	190°F	160°F	0.6	369.3	30% PROP. GLYCOL	39	156°F	176°F	1.7	0.0001
HX-4	LAP POOL	TACO	TMPN5X12-80	29.9	62	190°F	160°F	9.2	880.6	POOL WATER	49	84°F	120°F	6.2	0.0001
HX-5	KID POOL	TACO	TMPN5X12-16	5.4	10	190°F	160°F	5.6	142.0	POOL WATER	8	84°F	120°F	3.1	0.0001
HX-6	SPA	TACO	TMPN5X12-20	6.9	15	190°F	160°F	7.6	213.1	POOL WATER	12	84°F	120°F	4.4	0.0001

NOTE: 1) PERFORMANCE BASED ON 30% PROPYLENE GLYCOL (BIOMASS BOILER HEATING WATER).

SHELL & TUBE HEAT EXCHANGER SCHEDULE

PLAN CODE	SERVICE	MFGR	MODEL NO.	TYPE	PASS	DIA. (INCH)	LENGTH (INCH)	SHELL						TUBES						REMARKS
								GPM	MAX. W.P.D.	EWT (°F)	LWT (°F)	FOULING FACTOR	MAX. VEL.	FLUID	GPM	MAX. WPD	EWT (°F)	LWT (°F)	FOULING FACTOR	MAX. VEL.	FLUID	
HX-7	POOL BLDG. DOM. HOT WATER	TACO	G04410-4LD	WTR/WTR	4	4	60	11	2 FT.	190	160	0.001	1.1 FPS	30% PROP. GLYCOL	3	2.0 FT	40	140	0.001	2.0 FPS	DOM. WATER	NOTE 1

NOTE: 1) DOUBLE WALL HEAT EXCHANGER FOR USE WITH DOMESTIC WATER SYSTEMS.

REVISIONS:
1 -
2 -
3 -
4 -

WOOD FIRED
HEATING SYSTEM
CRAIG, ALASKA

CONSTRUCTION DOCUMENTS

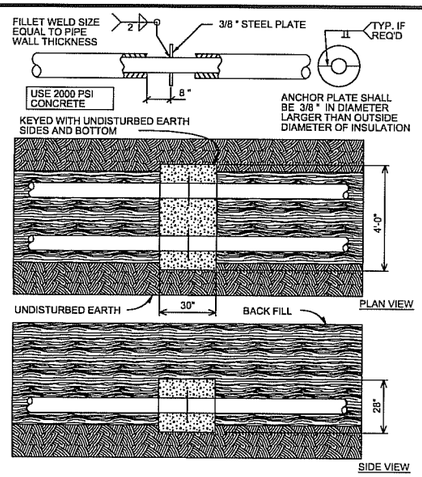
DRAWN BY: GSP
CHECKED BY: NR
DATE: 12-11-06
CTA # CRAIG BIOMS
CADD FILE: CRIGM101

STATE OF ALASKA
Gerald T. Baker
Reg. No. AE-5012
REGISTERED PROFESSIONAL ENGINEER

CTA
ARCHITECTS
ENGINEERS

MECHANICAL
LEGEND
& SCHEDULES

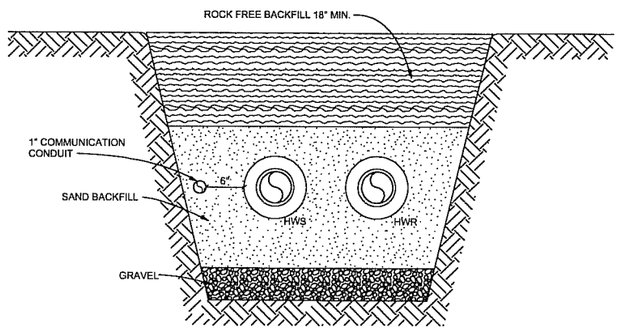
SHEET
M101



FOR REFERENCE ONLY. THIS SHALL BE DESIGNED BY THE PRE-INSULATED PIPING MANUFACTURER. INSTALL PER MANUFACTURERS INSTALLATION INSTRUCTIONS.

A / M102 ANCHOR BLOCK DETAIL

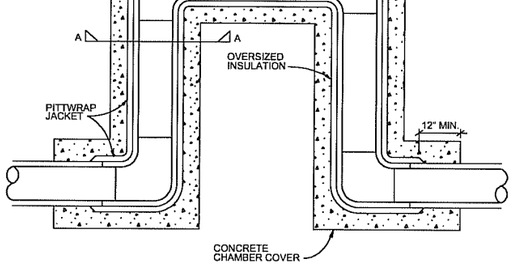
SCALE : NONE

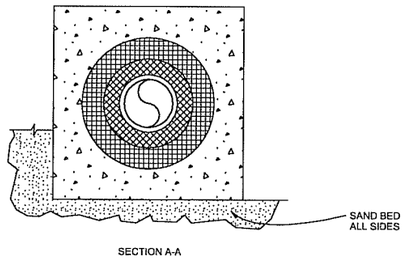


FOR REFERENCE ONLY. THIS SHALL BE DESIGNED BY THE PRE-INSULATED PIPING MANUFACTURER. INSTALL PER MANUFACTURERS INSTALLATION INSTRUCTIONS.

B / M102 BACKFILL DETAIL

SCALE : NONE



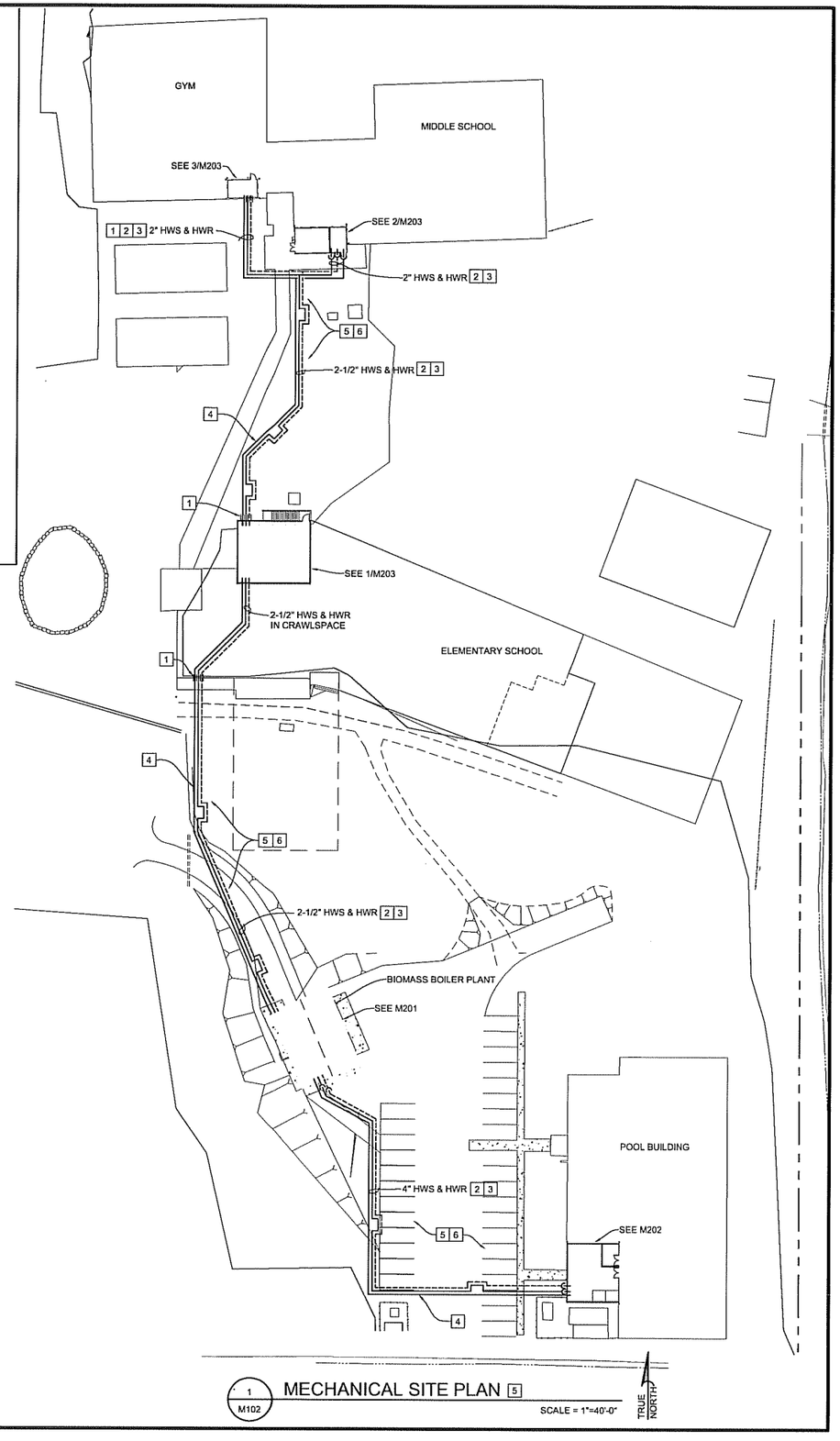


SECTION A-A

FOR REFERENCE ONLY. THIS SHALL BE DESIGNED BY THE PRE-INSULATED PIPING MANUFACTURER. INSTALL PER MANUFACTURERS INSTALLATION INSTRUCTIONS.

C / M102 DIRECT BURRIED INSULATION SYSTEM EXPANSION LOOP DETAILS

SCALE : NONE



1 / M102 MECHANICAL SITE PLAN 5

SCALE = 1"=40'-0"

TRUE NORTH

SHEET NOTES:

1. CORE DRILL AND USE MECHANICAL SLEEVE SEAL AT PENETRATION.
2. PRE-INSULATED UNDERGROUND PIPING SYSTEM. PROVIDE EXPANSION LOOPS AND THRUST RESTRAINTS AS DESIGNED BY UNDERGROUND PIPING SYSTEM MANUFACTURER.
3. VERIFY EXISTING TERRAIN SLOPE AND PROVIDE MULTIPLE ELBOWS AS REQUIRED TO MATCH SLOPE AND ENTER BUILDINGS PERPENDICULAR TO BASEMENT AND FOOTING WALLS. MAINTAIN 24" COVER AT ALL TIMES.
4. PROVIDE A 1" SCHEDULE 40 PVC CONDUIT WITH PULL STRING IN TRENCH FOR TEMPERATURE CONTROL COMMUNICATION WIRING. MAINTAIN 6" SEPARATION FROM HYDRONIC PIPING.
5. FIELD VERIFY EXISTING UNDERGROUND UTILITIES AND ADJUST ROUTING AS REQUIRED TO AVOID.
6. RESTORE ALL SURFACES TO ORIGINAL CONDITION.

REVISIONS:
1 -

WOOD FIRED HEATING SYSTEM
CRAIG, ALASKA

CONSTRUCTION DOCUMENTS

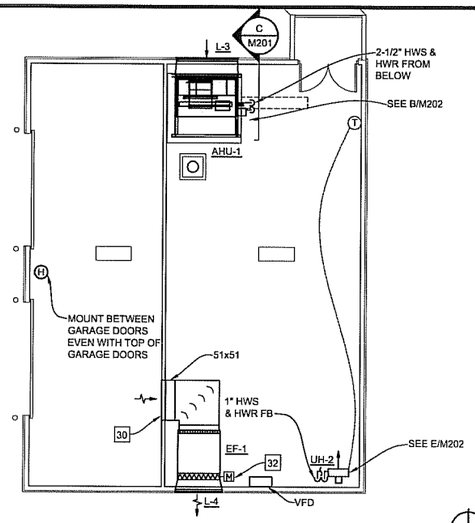
DRAWN BY: GSP
CHECKED BY: NR
DATE: 12-11-06
CTA # CRAIG BIOMS
CADD FILE: CRIGM102

STATE OF ALASKA
49th
Fred T. Baker
No. ME-5012
PROFESSIONAL ENGINEER

CTA ARCHITECTS ENGINEERS

MECHANICAL SITE PLAN

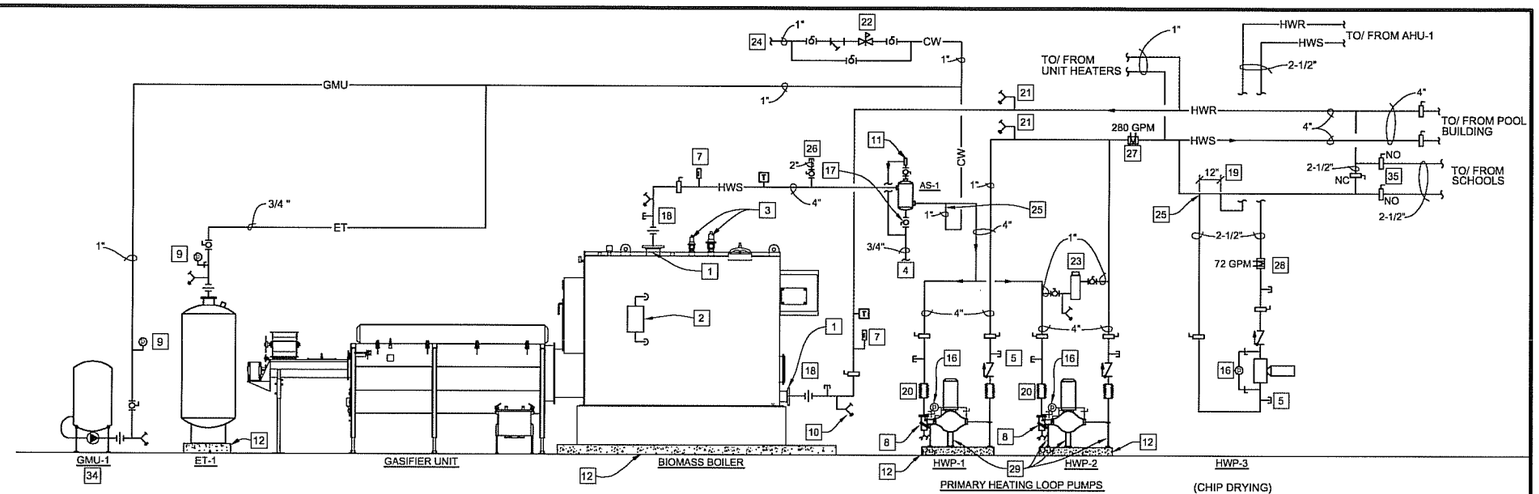
SHEET
M102



1 M201 **BOILER PLANT SECOND FLOOR HVAC PLAN**

SCALE = 1/8"=1'-0"

NORTH REF.



3 M201 **BOILER PLANT FLOW DIAGRAM** 13 14 15 38

SCALE = NONE

SHEET NOTES:

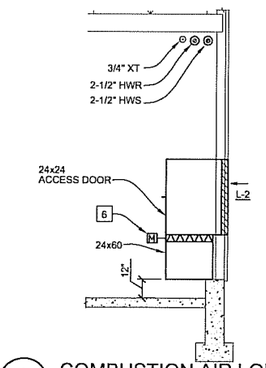
1. INSTALL INCREASERS AS REQUIRED. TYPICAL.
2. BOILER SAFETY CONTROLS, BOILER TRIM, ETC. INSTALLED BY BOILER CONTRACTOR.
3. RELIEF VALVE FURNISHED WITH BOILER. PIPE RELIEF VALVE (OR VALVES) FULL SIZE TO FLOOR DRAIN.
4. PIPE FULL SIZE TO FLOOR DRAIN.
5. P/T TEST PLUG. TYPICAL.
6. INSTALL 60x24 MOTORIZED DAMPER IN COMBUSTION AIR DUCT. INTERLOCK WITH BOILER. SEE A & B/M201.
7. THERMOMETER. TYPICAL.
8. SUCTION DIFFUSER WITH SUPPORT FOOT AND DRAIN VALVE TYP. REMOVE START-UP STRAINER AFTER 14 DAYS, PRIOR TO FINAL BALANCING.
9. PRESSURE GAUGE.
10. PROVIDE A 3/4 " DRAIN VALVE AT LOW POINT OF PIPING CONNECTIONS.
11. AUTOMATIC AIR VENT WITH MINIMUM 3/8 " LINE TO DRAIN.
12. 4" CONCRETE HOUSEKEEPING PAD BY G.C.
13. KEEP PIPING UP HIGH TO CLEAR BOILER AND ALLOW WALKING HEIGHT THROUGH BOILER ROOM. TYPICAL THROUGHOUT ROOM.
14. THIS DIAGRAM SHALL TAKE PRECEDENCE OVER FLOOR PLAN VIEWS.
15. COORDINATE INSTALLATION WITH PLUMBING PIPING.
16. LIQUID FILLED PRESSURE GUAGE WITH SNUBBER, 1/4 " GAUGE COCKS AND 1/4 " RIGID COPPER TUBING FROM PUMP SUCTION AND DISCHARGE GAUGE PORTS AND (IF APPLICABLE) SUCTION DIFFUSER GAUGE PORT.
17. LOCATE VALVE 5'-0" ABOVE FLOOR AND TAG: "BLOW DOWN OCCASIONALLY".
18. VERIFY BOILER CONNECTION SIZES. INSTALL NEAR BOILER PIPING PER MANUFACTURERS RECOMMENDATIONS.
19. COMMON PIPING. INSTALL TEES WITHIN 12" OF EACH OTHER.
20. FLEXIBLE CONNECTOR. TYPICAL.
21. HOSE END DRAIN VALVE FOR AIR VENT. INSTALL AT HIGHEST POINT. TYPICAL.
22. 1" PRESSURE REDUCING VALVE. SET TO FILL SYSTEM AT 12 PSI. THIS WILL ACT AS THE EMERGENCY FILL.
23. 5 GALLON CHEMICAL FEEDER WITH FILL CAP. TOP OF FEEDER SHALL NOT BE HIGHER THAN 4'-0" ABOVE FINISHED FLOOR.
24. FROM BACKFLOW PREVENTER. SEE SHEET P101.
25. MAKE CONNECTIONS OFF BOTTOM OF MAIN.
26. QUICK FILL POINT.
27. 4" VENTURI STYLE BALANCING VALVE. INSTALL BALANCE VALVE WITH MANUFACTURER RECOMMENDED STRAIGHT PIPE UPSTREAM AND DOWNSTREAM.
28. 2-1/2" VENTURI STYLE BALANCING VALVE. INSTALL BALANCE VALVE WITH MANUFACTURER RECOMMENDED STRAIGHT PIPE UPSTREAM AND DOWNSTREAM.
29. PROVIDE SUPPORT FOOT FOR PUMP, SUCTION DIFFUSER, AND PIPE.
30. PROVIDE SCREEN OVER OPENING.
31. OFFSET TIGHT TO WALL.
32. NORMALLY CLOSED DAMPER.
33. TEMPERATURE CONTROL PANEL.
34. SET GMU-1 TO FILL SYSTEM AT 18 PSI.
35. SCHOOL BYPASS VALVES. INTENT IS TO VALVE OFF THE SCHOOL LEG DURING SUMMER MONTHS WHEN NO HEAT IS NEEDED AT THE SCHOOLS, AND THEN OPEN THE BYPASS TO ALLOW FLOW FOR THE CHIP DRYING AHU.
36. MECHANICAL SLEEVE SEAL AT WALL PENETRATION. TYPICAL.
37. STATIC PRESSURE SENSOR IN AIR TRENCH BY T.C. CONTRACTOR.
38. COORDINATE FINAL PIPING AND EQUIPMENT LOCATIONS WITH FINAL BIOMASS BOILER LAYOUT. EQUIPMENT AND PIPING LOCATIONS MAY NEED TO BE ADJUSTED.

GENERAL NOTES:

A) DO NOT RUN ANY DUCTWORK OVER ELECTRICAL PANELS FROM PANEL TO STRUCTURE ABOVE AND FROM PANEL ACCESS SPACE TO 80" ABOVE FLOOR.

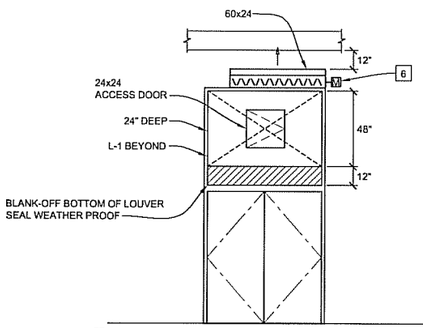
B) NO DUCTWORK IS TO BE FABRICATED PRIOR TO FIELD VERIFICATION OF DUCT SIZES BY MECHANICAL CONTRACTOR.

C) THERMOSTAT/HUMIDISTAT LOCATIONS SHALL BE REVIEWED WITH ARCHITECTURAL FIELD REPRESENTATIVE PRIOR TO INSTALLATION. INSTALL THERMOSTATS 54" ABOVE FINISHED FLOOR AS REQUIRED FOR PROPER EQUIPMENT OPERATION.



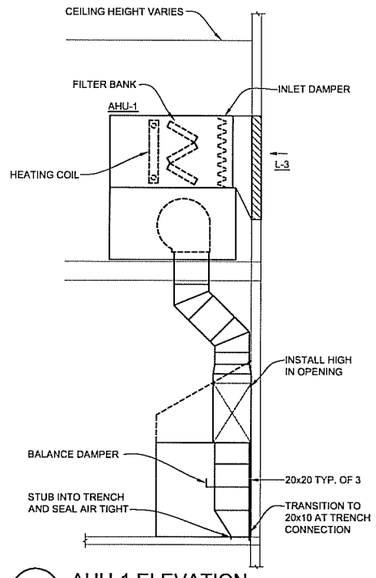
A M201 **COMBUSTION AIR LOUVER DETAIL**

SCALE = 1/4"=1'-0"



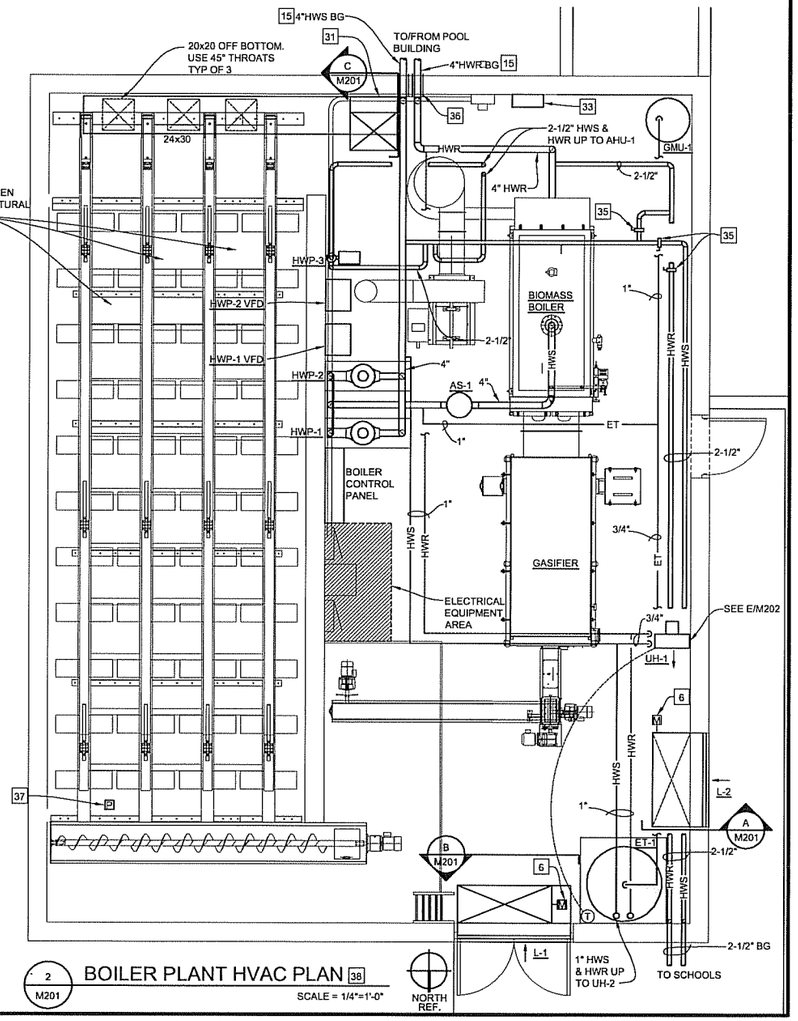
B M201 **COMBUSTION AIR LOUVER DETAIL**

SCALE = 1/4"=1'-0"



C M201 **AHU-1 ELEVATION**

SCALE = 1/4"=1'-0"



2 M201 **BOILER PLANT HVAC PLAN** 38

SCALE = 1/4"=1'-0"

REVISIONS:

WOOD FIRED
HEATING SYSTEM
CRAIG, ALASKA

CONSTRUCTION
DOCUMENTS

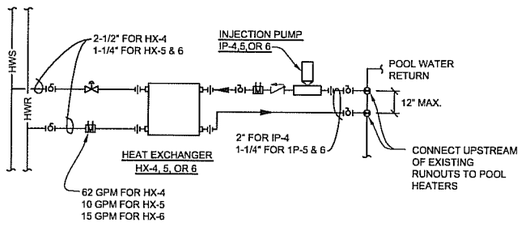
DRAWN BY: GSP
CHECKED BY: NR
DATE: 12-11-06
CTA # CRAIG BIOMS
CADD FILE: CRIGM201

STATE OF ALASKA
49 ZU
Arnold T. Baker
No. ME-5012
REGISTERED
PROFESSIONAL ENGINEER

CTA
ARCHITECTS
ENGINEERS

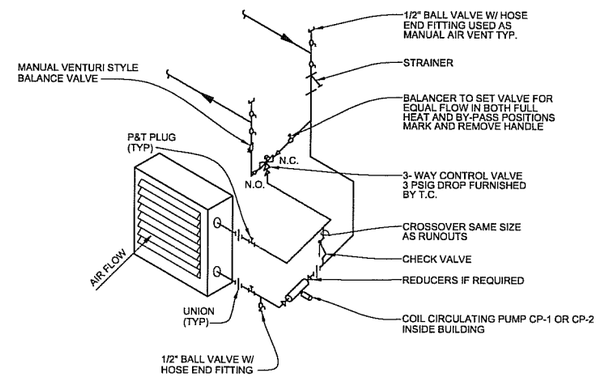
BOILER PLANT
HVAC PIPING
PLAN

SHEET
M201



A M202 **POOL HEAT INJECTION DETAIL**

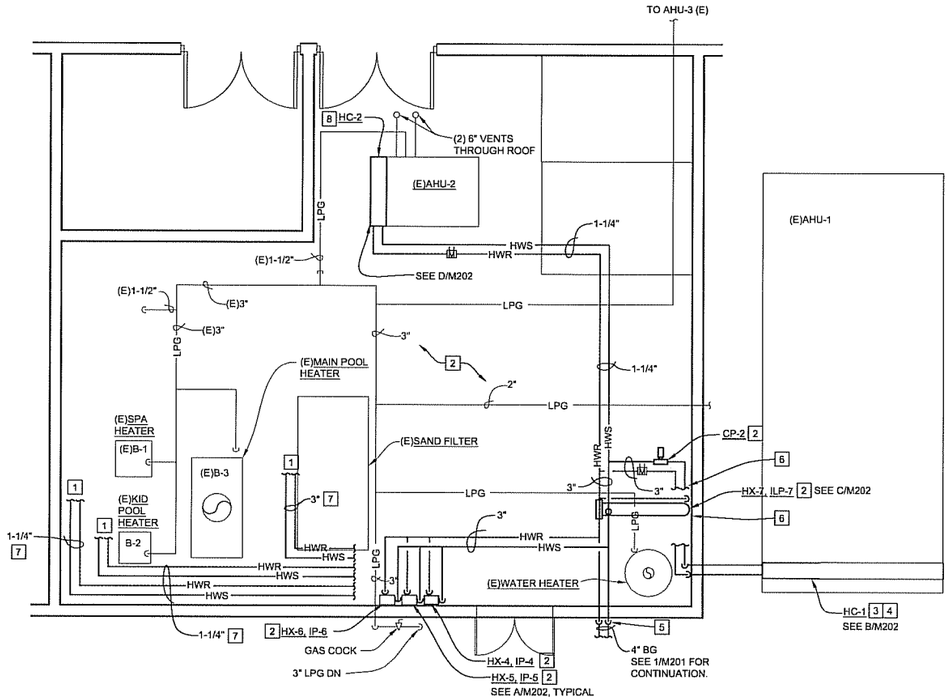
NTS



B M202 **AHU HEATING COIL PIPING DETAIL**

WITH COIL PUMP

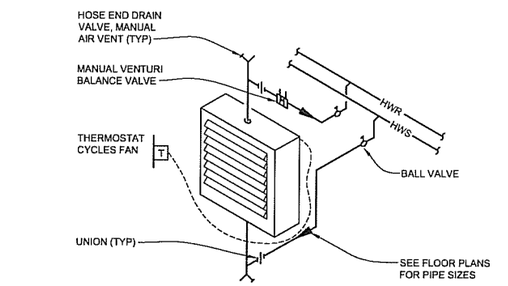
NTS



1 M202 **ENLARGED POOL MECHANICAL ROOM PLAN** 2

SCALE = 1/4"=1'-0"

NORTH REF.



C M202 **WATER HEATER DETAIL**

NTS

D M202 **HEATING COIL PIPING DETAIL**

NTS

E M202 **UNIT HEATER DETAIL**

NOT TO SCALE

GENERAL NOTES:

A) DO NOT RUN ANY DUCTWORK OVER ELECTRICAL PANELS FROM PANEL TO STRUCTURE ABOVE AND FROM PANEL ACCESS SPACE TO 80" ABOVE FLOOR.

B) NO DUCTWORK IS TO BE FABRICATED PRIOR TO FIELD VERIFICATION OF DUCT SIZES BY MECHANICAL CONTRACTOR.

C) THERMOSTAT/HUMIDISTAT LOCATIONS SHALL BE REVIEWED WITH ARCHITECTURAL FIELD REPRESENTATIVE PRIOR TO INSTALLATION. INSTALL THERMOSTATS 54" ABOVE FINISHED FLOOR AS REQUIRED FOR PROPER EQUIPMENT OPERATION.

SHEET NOTES:

1. CONNECT TO RESPECTIVE POOL WATER SYSTEMS.
2. FIELD VERIFY EXISTING CONDITIONS AND WORK WITH OWNER TO INSTALL EQUIPMENT IN BEST LOCATION. ADJUST ROUTING AS REQUIRED.
3. FIELD VERIFY ACTUAL UNIT SIZE AND PROVIDE COIL TO FIT IN EXISTING SPACE.
4. MOUNT COIL AT 45° ANGLE IN SUPPLY AIR SECTION.
5. OFFSET ABOVE GRADE AT BUILDING. PROVIDE ADDITIONAL INSULATION ON EXPOSED PIPING.
6. COORDINATE INSTALLATION WITH EXISTING WATER PIPING ON THIS WALL.
7. POOL WATER PIPING SHALL BE CPVC COMPATIBLE FOR USE WITH POOL WATER.
8. FIELD VERIFY DUCT SIZE AND INSTALL COIL JUST DOWNSTREAM OF AHU.

REVISIONS:
-

WOOD FIRED
HEATING SYSTEM
CRAIG, ALASKA

CONSTRUCTION
DOCUMENTS

DRAWN BY: GSP
CHECKED BY: NR
DATE: 12-11-06
CTA # CRAIG BIOMS
CADD FILE: CRIGM202

STATE OF ALASKA
Registered
Professional
Engineer
Harold T. Baker
No. ME-5012
PROFESSIONAL

CTA ARCHITECTS ENGINEERS

ENLARGED POOL
MECHANICAL
PLANS

SHEET
M202

GENERAL NOTES:

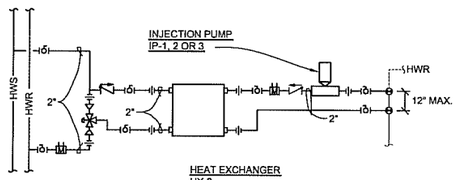
A) DO NOT RUN ANY DUCTWORK OVER ELECTRICAL PANELS FROM PANEL TO STRUCTURE ABOVE AND FROM PANEL ACCESS SPACE TO 80" ABOVE FLOOR.

B) NO DUCTWORK IS TO BE FABRICATED PRIOR TO FIELD VERIFICATION OF DUCT SIZES BY MECHANICAL CONTRACTOR.

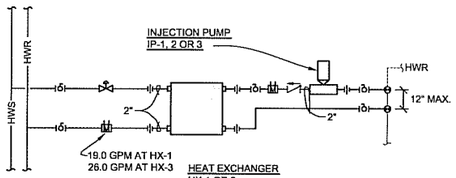
C) THERMOSTAT/HUMIDISTAT LOCATIONS SHALL BE REVIEWED WITH ARCHITECTURAL FIELD REPRESENTATIVE PRIOR TO INSTALLATION. INSTALL THERMOSTATS 54" ABOVE FINISHED FLOOR AS REQUIRED FOR PROPER EQUIPMENT OPERATION.

SHEET NOTES:

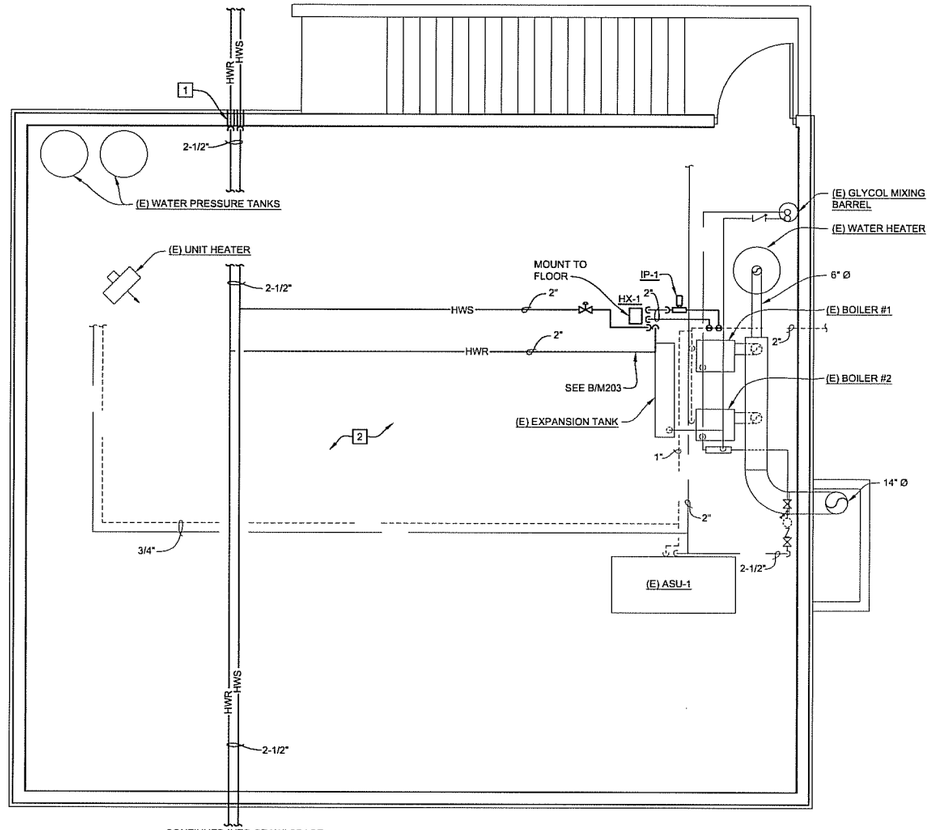
1. CORE DRILL THROUGH EXISTING WALL. INSTALL MECHANICAL SLEEVE SEAL AT NEW PENETRATION, TYPICAL.
2. FIELD VERIFY EXISTING CONDITIONS PRIOR TO INSTALLATION. ADJUST PIPE ROUTING AND EQUIPMENT LOCATIONS AS REQUIRED.
3. OFFSET ABOVE GRADE AND ENTER MECHANICAL ROOM. PROVIDE 2" ADDITIONAL INSULATION ON PIPING EXPOSED TO EXTERIOR.
4. MOUNT TO FLOOR OR WALL.



A M203 HEAT INJECTION DETAIL
SCALE = NTS

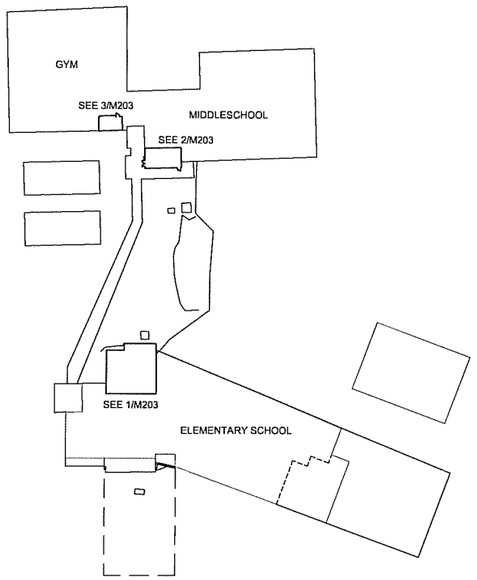


B M203 HEAT INJECTION DETAIL
SCALE = NTS

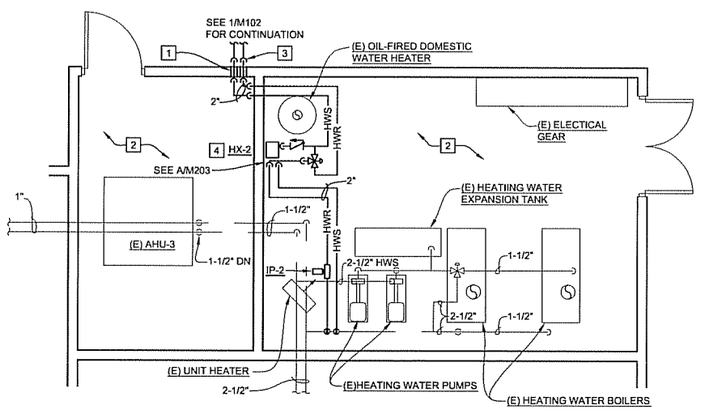


1 M203 ENLARGED ELEMENTARY SCHOOL MECHANICAL ROOM PLAN 2
SCALE = 1/4"=1'-0"

NORTH REF.

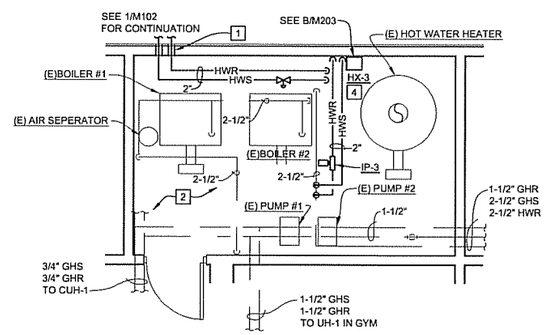


KEY PLAN - NTS



2 M203 ENLARGED MIDDLE SCHOOL MECHANICAL ROOM PLAN 2
SCALE = 1/4"=1'-0"

NORTH REF.



3 M203 ENLARGED MIDDLE SCHOOL GYM BOILER ROOM PLAN 2
SCALE = 1/4"=1'-0"

NORTH REF.

REVISIONS:

WOOD FIRED
HEATING SYSTEM
CRAIG, ALASKA

CONSTRUCTION DOCUMENTS

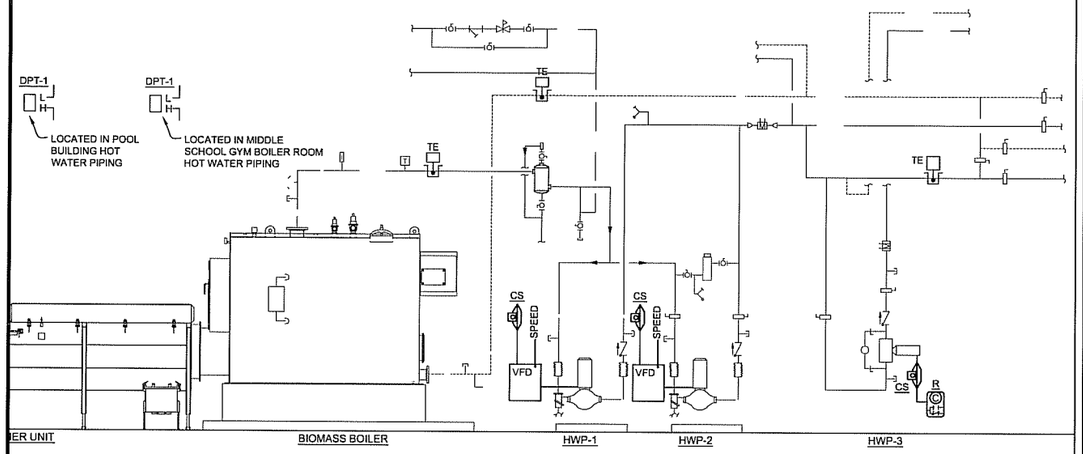
DRAWN BY: GSP
CHECKED BY: NR
DATE: 12-11-06
CTA # CRAIG BIOMS
CADD FILE: CRIGM203

STATE OF ALASKA
49TH
Reed T. Baker
No. AK-5012
REGISTERED PROFESSIONAL ENGINEER

CTA
ARCHITECTS
ENGINEERS

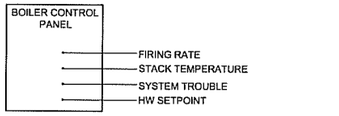
ENLARGED SCHOOL MECHANICAL PLANS

SHEET
M203



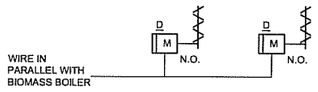
BIOMASS BOILER HEATING PLANT TEMPERATURE CONTROL SCHEMATIC

1 / M301 — NTS



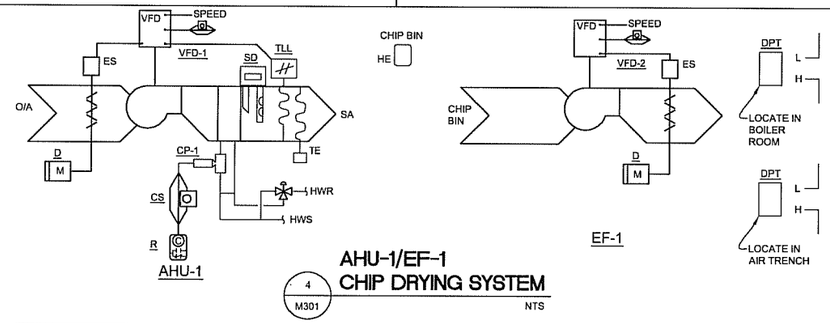
BIOMASS BOILER CONTROL PANEL INTERFACE

2 / M301 — NTS



BIOMASS BOILER COMBUSTION AIR DAMPERS

3 / M301 — NTS



AHU-1/EF-1 CHIP DRYING SYSTEM

4 / M301 — NTS

BOILER ROOM SEQUENCE OF OPERATION

ALL CONTROL SETPOINTS DESCRIBED IN THE SEQUENCE OF OPERATION SHALL BE ADJUSTABLE BY THE FACILITY OPERATOR.

HEATING SYSTEM:

HOT WATER SUPPLY CONTROL: THE DDC SYSTEM SHALL SEND THE HOT WATER SETPOINT TO THE BIOMASS BOILER CONTROL PANEL. THE BIOMASS BOILER CONTROL PANEL SHALL ALARM THE DDC SYSTEM ON SYSTEM ALARMS AND EQUIPMENT TROUBLES, SHALL PROVIDE A 4-20 MA SIGNAL TO THE DDC SYSTEM FOR STACK TEMPERATURE AND SHALL PROVIDE DIGITAL INPUTS TO THE DDC SYSTEM TO DISPLAY BOILER FIRING RATE.

HWP 1&2: HOT WATER SUPPLY PUMPS HWP-1 AND HWP-2 SHALL OPERATE IN A LEAD/LAG MODE. THE DDC SYSTEM SHALL ENABLE THE LEAD HWS CIRCULATING PUMP. NORMALLY CLOSED RELAYS SHALL START AND STOP THE PUMPS FOR FAIL SAFE OPERATION. CURRENT SENSING RELAYS SHALL PROVIDE STATUS AND ALARM SIGNALS. IF THE LEAD PUMP FAILS, START THE LAG PUMP AND AN ALARM REQUIRING ACKNOWLEDGMENT SHALL BE SENT TO THE OWS. A FAILURE MUST BE MANUALLY RESET BY THE FACILITY OPERATOR TO RETURN THE LEAD PUMP OPERATION. PROVIDE A LEAD LAG SELECTOR IN SOFTWARE CAPABLE OF BEING SWITCHED BY PUMP RUN TIME. TWO DIFFERENTIAL PRESSURE SENSORS SHALL BE LOCATED ACROSS THE HWS AND HWR MAIN (WHERE RECOMMENDED BY THE T.C. CONTRACTOR) FOR VARIABLE SPEED CONTROL. ONE SENSOR SHALL BE LOCATED IN THE POOL BUILDING AND THE OTHER SHALL BE LOCATED IN THE MIDDLE SCHOOL GYM BOILER ROOM. LOW SELECT BETWEEN THE TWO SENSORS AND MODULATE THE SPEED OF THE OPERATING HWS PUMP TO MAINTAIN THE MINIMUM REQUIRED OPERATIONAL PRESSURE DIFFERENTIAL. THE INITIAL SETPOINT SHALL BE 15 FEET (6.5 PSI).

BIOMASS BOILER: THE TEMPERATURE CONTROL CONTRACTOR SHALL INTERLOCK THE COMBUSTION AIR DAMPERS WITH THE BIOMASS BOILER. THE COMBUSTION AIR DAMPERS SHALL OPEN WHEN THE BOILER FIRES.

HWP 3: HOT WATER SUPPLY PUMP HWP 3 SHALL OPERATE WHEN AHU-1 CALLS FOR HEAT. A CURRENT SENSING RELAY SHALL PROVIDE STATUS AND ALARMS THE DDC SYSTEM UPON PUMP FAILURE.

UH-1, 2: PROVIDE A THERMOSTAT TO CYCLE ON UNIT HEATER FAN WHEN THERE IS A CALL FOR HEAT.

CHIP DRYING:

AHU 1 & EF 1: THE DDC SYSTEM SHALL ENABLE AHU-1. UPON A CALL FOR AHU 1 TO OPERATE, THE OUTDOOR AIR DAMPER SHALL OPEN AND THE DAMPER END SWITCH SHALL ENABLE THE FAN TO OPERATE THROUGH THE VFD. THE ROOM HUMIDISTAT SHALL MODULATE THE FAN SPEED TO MAINTAIN ROOM HUMIDITY SETPOINT. DISCHARGE AIR TEMPERATURE SENSOR SHALL MODULATE THE HEATING VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SETPOINT OF 120°F. THE HEATING COIL PUMP SHALL RUN WHEN AHU 1 IS OPERATING. A LOW LIMIT MANUAL RESET THERMOSTAT LOCATED ON THE DISCHARGE AIR SIDE OF THE HEATING COIL SHALL STOP THE FAN AND ALARM THE DDC SYSTEM IF THE TEMPERATURE FALLS BELOW 35 DEG.
EF 1 SHALL BE INTERLOCKED TO RUN WHEN AHU 1 RUNS. UPON A CALL FOR EF 1 TO OPERATE, THE EXHAUST DAMPER SHALL OPEN AND THE DAMPER END SWITCH SHALL ENABLE THE FAN TO OPERATE THROUGH THE VFD. EXHAUST FAN SPEED SHALL MODULATE TO MAINTAIN A SLIGHT POSITIVE PRESSURE IN THE BOILER ROOM OF 0.05 IN. W.C. LOCATE A SMOKE DETECTOR IN THE SUPPLY DISCHARGE OF AHU-1. UPON ACTIVATION OF THE SMOKE DETECTOR, AHU-1 AND EF-1 SHALL DE-ENERGIZE AND AN ALARM SHALL BE GENERATED.

ENERGY MANAGEMENT CONTROL SYSTEM POINTS LIST

POINT DESCRIPTION	INPUT TO EMCS: DIGITAL INPUT: PULSE	END SWITCH	AUX. CONTACT	ALARM CONTACT	PRESSURE SWITCH (PRESS. / DIFF. PRESS.)	TEMPERATURE SWITCH	VOLTAGE SENSING RELAY	CURRENT SENSING SWITCH	OTHER	INPUT TO EMCS: ANALOG INPUT: POSITION FEEDBACK	4-20 MA INPUT	0-10 VDC INPUT	TEMPERATURE SENSOR	PRESSURE SENSOR (PRESS. / DIFF. PRESSURE)	HUMIDITY SENSOR	OUTPUT FROM EMCS: DIGITAL OUT: MOMENTARY	MAINTAINED	ANALOG OUT: 4-20 MA OUTPUT	0-10 VDC OUTPUT	CONTROL PT. ADJUST/ POSITION ADJUST: INCR. BOI 4-20 MA / 0-10VDC WITH FEEDBACK (CLOSED LOOP)	INCR. BOI 4-20 MA / 0-10VDC WITHOUT FEEDBACK (OPEN LOOP)
BOILER PLANT																					
AHU 1/ EF 1																					
OA DAMPER																	x				
EA DAMPER																	x				
DAMPER POSITION (2)		x																			
LOW LIMIT						x															
HEATING VALVE																			x		
VFD START/STOP (2)																	x				
VFD SPEED (2)																		x			
FAN STATUS (2)								x													
DISCHARGE AIR TEMPERATURE													x								
CHIP STORAGE HUMIDITY															x						
BOILER ROOM STATIC PRESSURE														x							
COIL PUMP START/STOP																	x				
COIL PUMP STATUS								x													
SMOKE DETECTOR			x																		
HEATING WATER PUMPS																					
PUMP START/STOP (3)																	x				
VFD SPEED (2)																		x			
PUMP STATUS (3)								x													
TEMPERATURE SENSORS (3)													x								
BOILER																					
COMBUSTION AIR DAMPERS																	x				
HOT WATER SETPOINT																		x			
STACK TEMPERATURE											x										
BOILER ALARMS (2)			x																		
FIRING RATE (4)								x													
MIDDLE AND ELEMENTARY SCHOOLS																					
HEAT EXCHANGERS (3)																					
HX VALVE																			x		
WATER TEMPERATURE													x								
HX PUMP START/STOP																	x				
HX PUMP STATUS							x														
VAR. SPD. PUMPING DIFF. PRESS.														x							
POOL BUILDING																					
AHU (2)																					
HEATING VALVE (2)																			x		
COIL PUMP START STOP																	x				
COIL PUMP STATUS								x													
DISCHARGE AIR TEMPERATURE (2)													x								
LOW LIMIT (2)						x															
HEAT EXCHANGERS (3)																					
HX VALVE																			x		
WATER TEMPERATURE													x								
HX PUMP START STOP																	x				
HX PUMP STATUS								x													
DOMESTIC WATER HEAT EXCHANGER																					
WATER TEMPERATURE													x								
HX PUMP START/STOP																	x				
HX PUMP STATUS							x														
VAR. SPD. PUMPING DIFF. PRESS.														x							

DDC TEMPERATURE CONTROL LEGEND

SD-1	SMOKE DETECTOR
D-1	CONTROL DAMPER W/ ACTUATOR (NORMALLY CLOSED DAMPER INDICATED)
C02-1	CARBON DIOXIDE SENSOR
R-1	CONTROL RELAY
CS-1	CURRENT-SENSING STATUS SWITCH
V-1	3-WAY CONTROL VALVE (NORMALLY OPEN, NORMALLY CLOSED & COMMON PORTS INDICATED)
V-1	2-WAY CONTROL VALVE. (NORMALLY OPEN VALVE INDICATED)
TT-1	AVERAGING TEMPERATURE SENSOR
TT-1	OUTDOOR TEMPERATURE SENSOR (WITH SUN SHIELD)
TE-1	ROOM TEMPERATURE SENSOR
TE-1	WELL-MOUNTED INSERTION SENSOR
TE-1	DUCT-MOUNTED INSERTION SENSOR
TLL-1	LOW LIMIT TEMPERATURE SWITCH
TS-1	WELL-MOUNTED TEMPERATURE SWITCH
TS-1	DUCT-MOUNTED TEMPERATURE SWITCH
DPS-1	DIFFERENTIAL PRESSURE SWITCH
DPT-1	DIFFERENTIAL PRESSURE TRANSIMITTER
HE-1	ROOM HUMIDITY SENSOR
HE-1	DUCT-MOUNTED HUMIDITY SENSOR
	EMCS CONTROL POINT
EA	EXHAUST AIR
RA	RETURN AIR
RLA	RELIEF AIR
SA	SUPPLY AIR
OA	OUTDOOR AIR
NC	NORMALLY CLOSED VALVE OR DAMPER
NO	NORMALLY OPEN VALVE OR DAMPER
ES	END SWITCH

T.C. COMPONENT SCHEDULE

PLAN CODE	DESCRIPTION/DUTY	SPECIFICATIONS
VFD-1	AHU-1 VFD	20 HP 480-3-60
VFD-2	EF-1 VFD	5 HP 480-3-60
VFD-3	HWP-1 VFD	15 HP 480-3-60
VFD-4	HWP-2 VFD	15 HP 480-3-60

REVISIONS:

WOOD FIRED HEATING SYSTEM
CRAIG, ALASKA

CONSTRUCTION DOCUMENTS

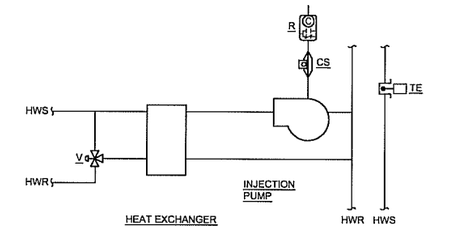
DRAWN BY: GSP
CHECKED BY: NR
DATE: 12-11-06
CTA # CRAIG BIOMS
CADD FILE: CRIGM301

STATE OF ALASKA — Registered Professional Engineer — Robert T. Boyer — No. ME-5012

CTA ARCHITECTS ENGINEERS

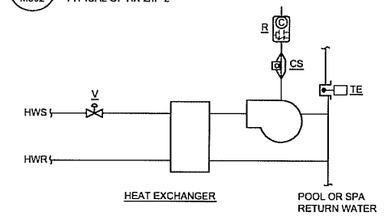
TEMPERATURE CONTROL LEGEND & DIAGRAMS

SHEET
M301



1 M302 **HEAT EXCHANGER SCHEMATIC**

TYPICAL OF HX-2/IP-2 NTS



2 M302 **HEAT EXCHANGER SCHEMATIC**

TYPICAL OF HX-1, 3/ IP-1, 3 NTS

ELEMENTARY AND MIDDLE SCHOOLS SEQUENCE OF OPERATION

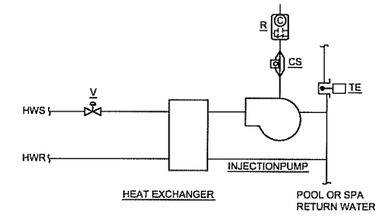
ALL CONTROL SETPOINTS DESCRIBED IN THE SEQUENCE OF OPERATION SHALL BE ADJUSTABLE BY THE FACILITY OPERATOR.

HEATING SYSTEM:

HOT WATER SUPPLY CONTROL (HX 1,2,3): THE DDC SYSTEM SHALL SEQUENCE THE HEAT EXCHANGER TO BE THE FIRST STAGE OF HEATING FOR THE RESPECTIVE HEATING LOOPS. UPON A CALL FOR HEAT FROM THE BUILDING CONTROL SYSTEM THE BIOMASS BOILER VALVE SHALL BE MODULATED AND THE RESPECTIVE INJECTION PUMP STARTED TO MAINTAIN HOT WATER SET POINT. A CURRENT SENSING RELAY SHALL PROVIDE STATUS AND ALARMS THE DDC SYSTEM UPON PUMP FAILURE. IF THE LOOP TEMPERATURE CANNOT BE MAINTAINED THROUGH THE HEAT EXCHANGER THE HEATING LOOP BOILER WILL BE ENABLED TO CONTROL TEMPERATURE SETPOINT.

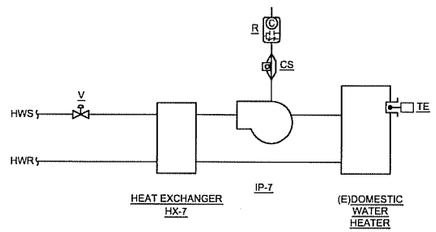
OVERALL CONTROL SYSTEM

THE INTENT IS FOR THIS ENTIRE CONTROL SYSTEM TO BE AN EXTENSION OF THE EXISTING DDC SYSTEM IN THE POOL BUILDING. THE TEMPERATURE CONTROL CONTRACTOR SHALL INTERLINK ALL THE BUILDINGS WITH COMMUNICATION WIRING. ALL CONTROLS AND EQUIPMENT SHALL BE OBSERVED FROM THE EXISTING FRONT END SOFTWARE. PROVIDE A NEW CONTROLLER (DX9100) FOR THE BOILER PLANT WITH A VISUAL INTERFACE DEVICE. PROVIDE CONTROLLERS AS REQUIRED IN THE SCHOOL BOILER ROOMS.



3 M302 **HEAT EXCHANGER SCHEMATIC**

TYPICAL OF HX-4, 5, 6/ IP-4, 5, 6 NTS



4 M302 **HEAT EXCHANGER/ DOMESTIC WATER HEATER SCHEMATIC**

NTS

POOL BUILDING SEQUENCE OF OPERATION

ALL CONTROL SETPOINTS DESCRIBED IN THE SEQUENCE OF OPERATION SHALL BE ADJUSTABLE BY THE FACILITY OPERATOR.

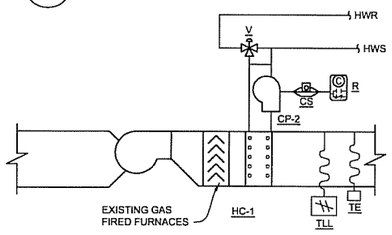
HEATING SYSTEM:

HOT WATER SUPPLY CONTROL (HX 4, 5, 6): THE DDC SYSTEM SHALL SEQUENCE THE HEAT EXCHANGER TO BE THE FIRST STAGE OF HEATING FOR THE RESPECTIVE POOL HEATING LOOPS. UPON A CALL FOR HEAT FROM THE BUILDING CONTROL SYSTEM THE BIOMASS BOILER VALVE SHALL BE MODULATED AND THE RESPECTIVE INJECTION PUMP STARTED TO MAINTAIN HOT WATER SET POINT. A CURRENT SENSING RELAY SHALL PROVIDE STATUS AND ALARMS THE DDC SYSTEM UPON PUMP FAILURE. IF THE LOOP TEMPERATURE CANNOT BE MAINTAINED THROUGH THE HEAT EXCHANGER, THE POOL LOOP BOILER WILL BE ENABLED TO CONTROL TEMPERATURE SETPOINT.

DOMESTIC HOT WATER CONTROL (HX 7): SEQUENCE THE HEAT EXCHANGER TO BE THE FIRST STAGE OF HEAT FOR THE WATER HEATER. UPON A CALL FOR HEAT, THE HEATING HOT WATER CONTROL VALVE SHALL BE MODULATED AND THE INJECTION PUMP STARTED TO MAINTAIN THE DOMESTIC HOT WATER SET POINT. A CURRENT SENSING RELAY SHALL PROVIDE STATUS AND ALARM THE DDC SYSTEM UPON PUMP FAILURE.

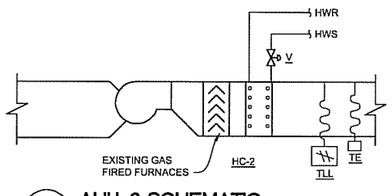
AIR HANDLING UNIT (AHU 1): THE DDC SYSTEM SHALL SEQUENCE THE BIOMASS HEATING TO BE THE FIRST STAGE OF HEAT FOR THE AIR HANDLER. THE TEMPERATURE CONTROL CONTRACTOR SHALL DISCONNECT CONTROL WIRING FOR THE FIRST STAGE OF GAS HEAT AND ADD A RELAY TO ENABLE HOT WATER HEAT ON A CALL FOR HEAT. A TEMPERATURE SENSOR IN THE DISCHARGE AIR OF THE AIR HANDLER SHALL MODULATE THE HEATING VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE. THE HEATING COIL PUMP SHALL RUN WHEN THE HEATING VALVES OPENS TO THE COIL OR WHEN THE OUTDOOR AIR TEMPERATURE FALLS BELOW 35 DEG. A LOW LIMIT MANUAL RESET THERMOSTAT LOCATED ON THE DISCHARGE AIR SIDE OF THE HEATING COIL SHALL STOP THE FAN AND ALARM THE DDC SYSTEM IF THE TEMPERATURE FALLS BELOW 35 DEG.

AIR HANDLING UNIT (AHU 2): THE DDC SYSTEM SHALL USE THE BIOMASS HEATING TO MAINTAIN HEAT FOR THE AIR HANDLER. THE TEMPERATURE CONTROL CONTRACTOR SHALL REPROGRAM THE CONTROLLER TO MODULATE THE HEATING VALVE IN LIEU OF ENABLING THE GAS HEATING VALVE TO MAINTAIN CONTROLLER SETPOINT. A LOW LIMIT MANUAL RESET THERMOSTAT LOCATED ON THE DISCHARGE AIR SIDE OF THE HEATING COIL SHALL STOP THE FAN AND ALARM THE DDC SYSTEM IF THE TEMPERATURE FALLS BELOW 35 DEG.



5 M302 **AHU-1 SCHEMATIC**

NTS



6 M302 **AHU-2 SCHEMATIC**

TYPICAL OF AHU-1, 2 NTS

REVISIONS:

WOOD FIRED
HEATING SYSTEM
CRAIG, ALASKA

CONSTRUCTION DOCUMENTS

DRAWN BY: GSP
CHECKED BY: NR
DATE: 12-11-06
CTA # CRAIG BIOMS
CADD FILE: CRIGM302

STATE OF ALASKA
Harold T. Baker
No. AE-3012
REGISTERED PROFESSIONAL ENGINEER

CTA ARCHITECTS ENGINEERS

TEMPERATURE CONTROL DIAGRAMS

SHEET
M302

PLUMBING FIXTURE & CONNECTION SCHEDULE

ALL PLUMBING EQUIPMENT SHALL BE IN ACCORDANCE WITH APPLICABLE SPECIFICATIONS AND BE OF SIZE AND TYPE INDICATED. EACH SHALL BE OF MAKE AND MODEL LISTED OR EQUAL.

FIXTURE							TRIM			ACCESSORIES			CONNECTIONS				REMARKS
CODE	ITEM	MFGR	MODEL	TYPE	MATERIAL	COLOR	ITEM	MFGR	MODEL	ITEM	MFGR	MODEL	COLD	HOT	WASTE	VENT	
BP-1	BACKFLOW PREVENTER	WILKINS	975XLS	RED. PRESSURE	CAST IRON	-	STRAINER	WILKINS	-	AIR GAP	WILKINS	AG	1"	-	-	-	PROVIDE WITH STRAINER
FCO	FLOOR CLEAN OUT	J.R.SMITH	4021	FLOOR	CAST IRON	POL. BRONZE	-	-	-	-	-	-	-	-	-	-	MATCH PIPE SIZE
FD-1	FLOOR DRAIN	J.R.SMITH	2632	SQUARE	CAST IRON	-	-	-	-	-	-	-	-	-	3"	2"	-
GCO	GRADE CLEAN OUT	J.R.SMITH	4021	FLOOR	CAST IRON	STANDARD	-	-	-	-	-	-	-	-	-	-	MATCH PIPE SIZE, NOTE 2
HB-1	HOSE BIBB	WOODFORD	24	WALL	BRASS	CHROME	FAUCET	-	-	-	-	-	3/4 "	-	-	-	MOUNT 36" AFF
WH-1	WALL HYDRANT	WOODFORD	27	FREEZELESS	BRASS	-	BACKFLOW	WILKINS	37HA/INTEGRAL	LOOSE KEY	WOODFORD	-	3/4 "	-	-	-	NOTE 1

SCHEDULE NOTES:
1 - MOUNT 30" ABOVE FINISH GRADE. PROVIDE 3/4 " HOSE THREAD.
2 - CLEAN-OUT TEE BY PLUMBING CONTRACTOR.

PLUMBING LEGEND

SYMBOL	DESCRIPTION
CW	DOMESTIC COLD WATER
W	WASTE
V	VENT
	PIPE CAP
FCO	FLOOR CLEAN OUT
GCO	GRADE CLEAN OUT
	BALL VALVE
	STRAINER

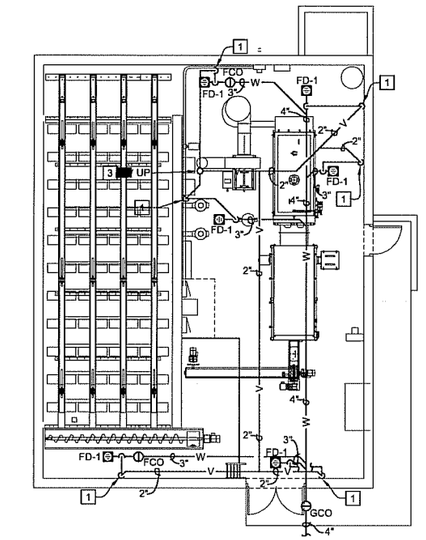
SYMBOL	DESCRIPTION
T	THERMOMETER
	SWING CHECK VALVE
	TEE UP
	TEE DOWN
	ELBOW UP
	ELBOW DOWN
BF	BELOW FLOOR
FA	FROM ABOVE
FB	FROM BELOW

SHEET NOTES:

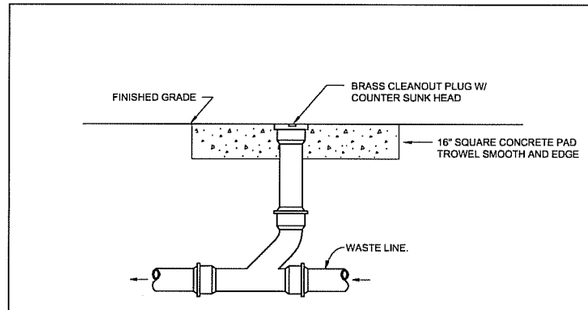
1. ALL VENTS FROM FLOOR DRAINS RUN BELOW FLOOR TO EXTERIOR WALL AND THEN UP. THEY ARE INSTALLED UP TIGHT TO WALL. (TYP)
2. THE BOILER ROOM EQUIPMENT LAYOUT IS DEPENDENT ON THE FINAL BIOMASS BOILER LAYOUT. MOVE EQUIPMENT AND FIXTURE LOCATIONS AS REQUIRED.
3. AVOID BOILER STACK IN THIS AREA.
4. TO HYDRONIC SYSTEM MAKE-UP VALVE. SEE SHEET M201.
5. MECHANICAL SLEEVE SEAL AT WALL PENETRATION.
6. COORDINATE INSTALLATION OF PLUMBING EQUIPMENT AND PIPING WITH HVAC PIPING AND EQUIPMENT. SOME AREAS ARE VERY CONGESTED.
7. 3/4" CW DOWN TO GASIFIER FIRE PROTECTION DEVICE. COORDINATE WITH BIOMASS BOILER MANUFACTURER FOR FINAL CONNECTION.

GENERAL NOTES:

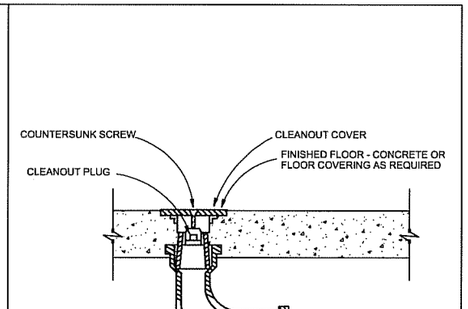
A) DO NOT RUN ANY PIPING OVER ELECTRICAL PANELS FROM PANEL TO STRUCTURE ABOVE AND FROM PANEL ACCESS SPACE TO 80" ABOVE FLOOR.



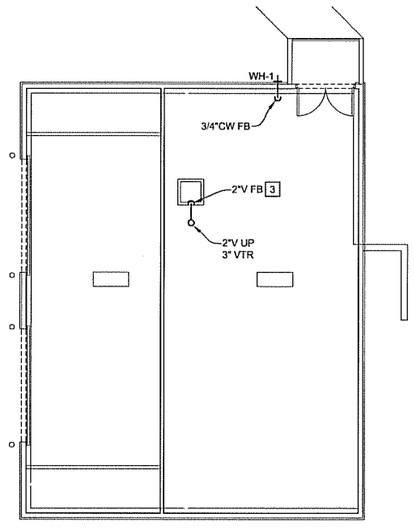
1 / P101 BOILER PLANT D-W-V PLAN [2] [6]
SCALE = 1/8"=1'-0"
NORTH REF.



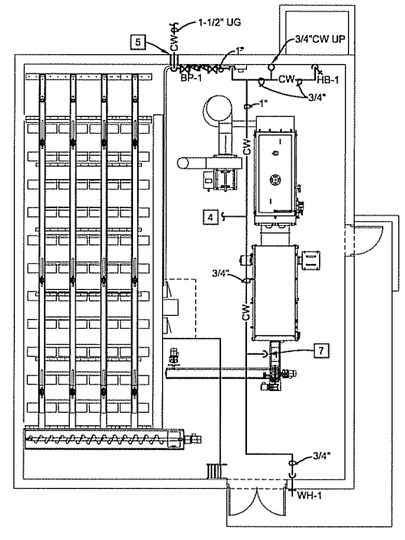
A / P101 GRADE CLEANOUT DETAIL
NTS



B / P101 FLOOR CLEANOUT DETAIL
NTS



2 / P101 BOILER PLANT SECOND FLOOR PLUMBING PLAN [6]
SCALE = 1/8"=1'-0"
NORTH REF.



3 / P101 BOILER PLANT DOMESTIC WATER PLAN [2] [6]
SCALE = 1/8"=1'-0"
NORTH REF.

REVISIONS:

WOOD FIRED
HEATING SYSTEM
CRAIG, ALASKA

CONSTRUCTION DOCUMENTS

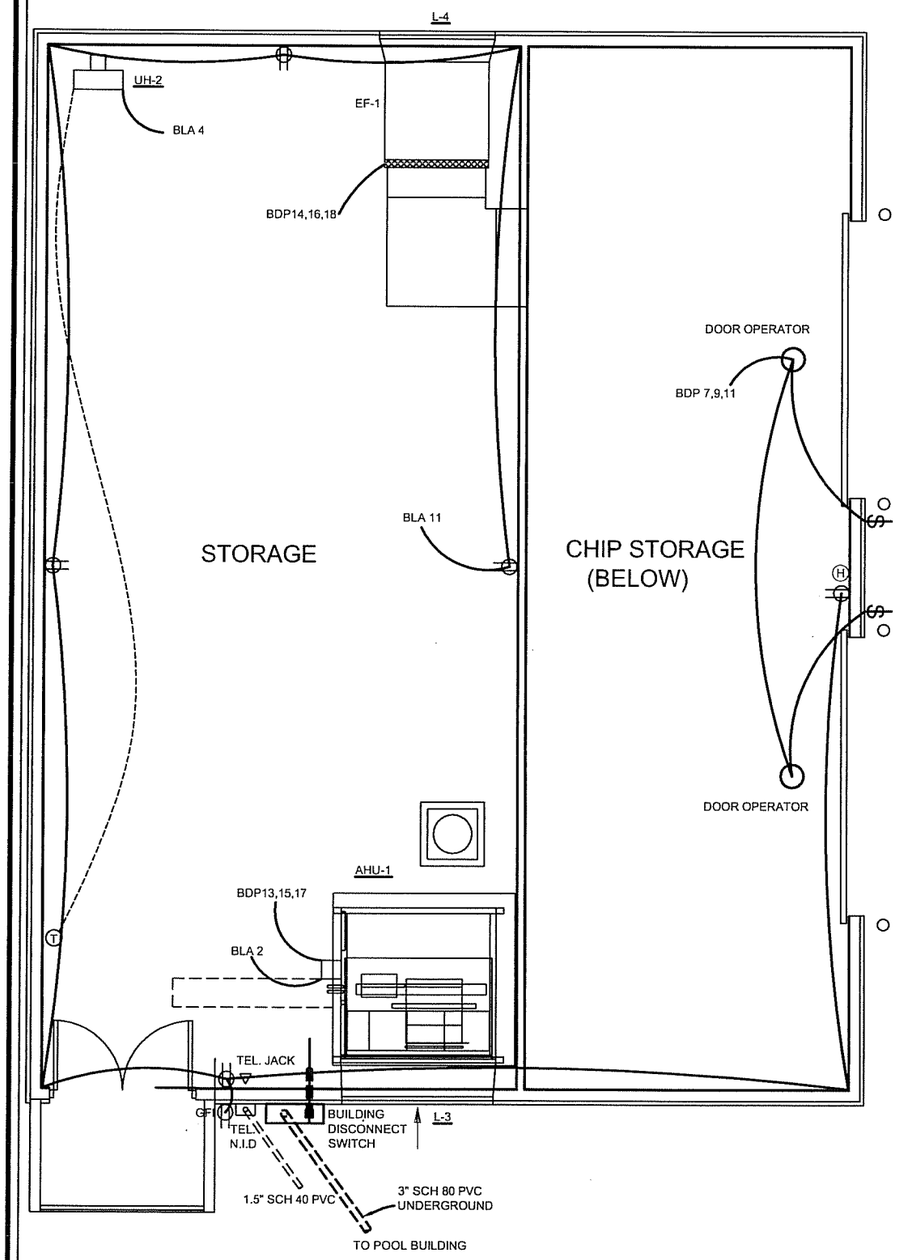
DRAWN BY: GSP
CHECKED BY: NR
DATE: 12-11-06
CTA # CRAIG BIOMS
CADD FILE: CRIGAP101

STATE OF ALASKA
Arvid T. Bauer P.E.
No. ME-5012
REGISTERED PROFESSIONAL ENGINEER

CTA ARCHITECTS ENGINEERS

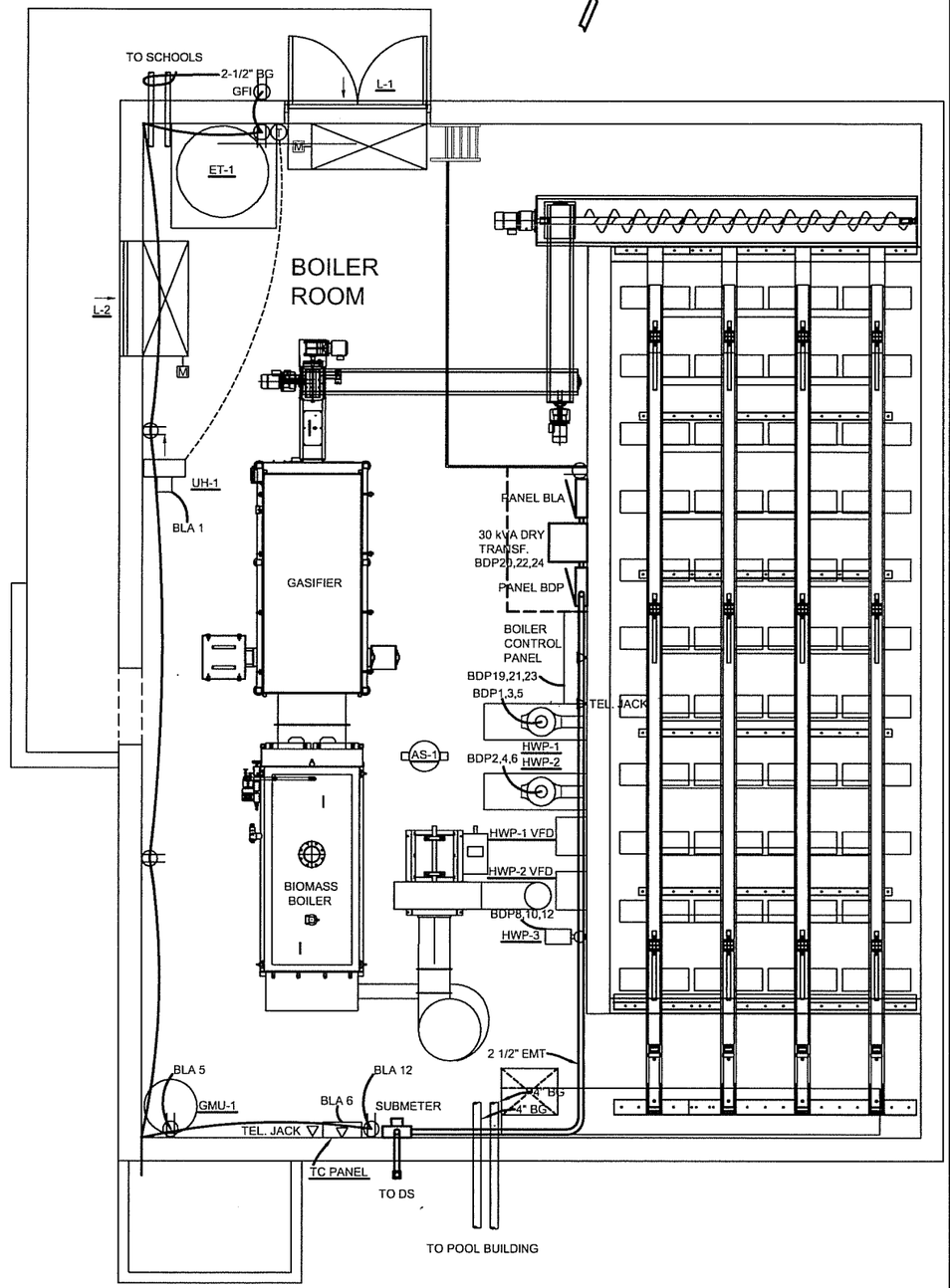
PLUMBING
LEGEND, SCHEDULES,
DETAILS, AND PLANS

SHEET
P101



SECOND FLOOR POWER PLAN

0 4' 8' 12'



FIRST FLOOR POWER PLAN

NORTHSTAR POWER ENGINEERING
P.O. BOX 1337, CRAIG, ALASKA 99921
826-2893 nstarpower@aptalaska.net

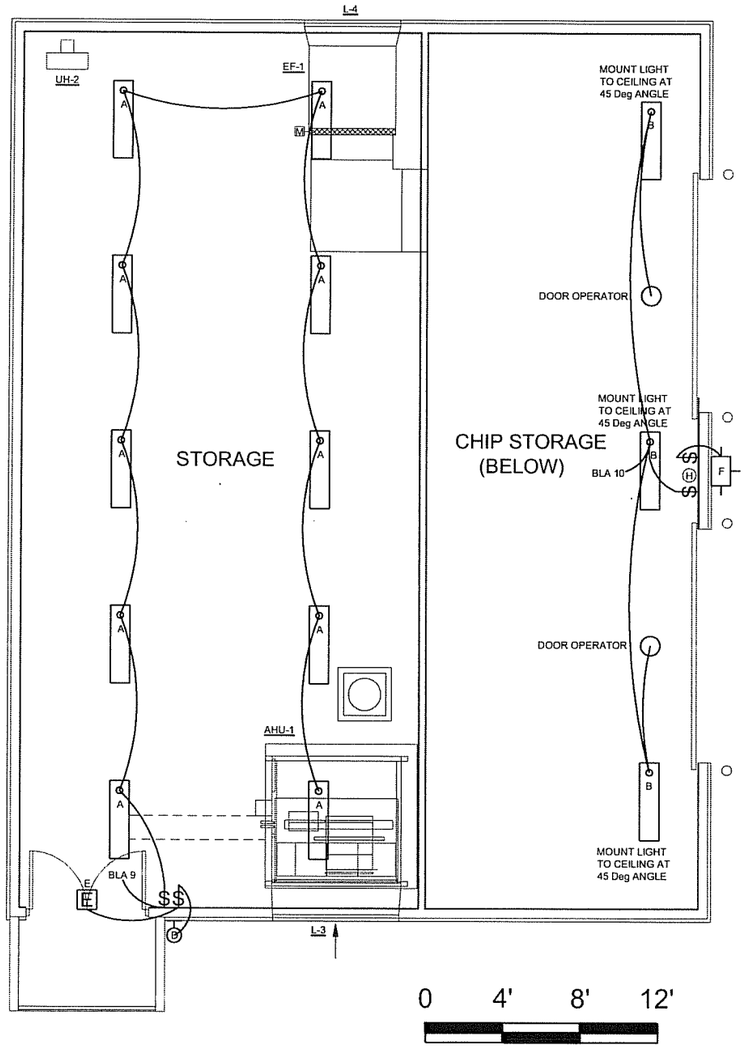
STATE OF ALASKA 49th
FRANK MICHAEL CARSON
E.E. 5604
REGISTERED ELECTRICAL ENGINEER

BOILER PLANT POWER PLAN

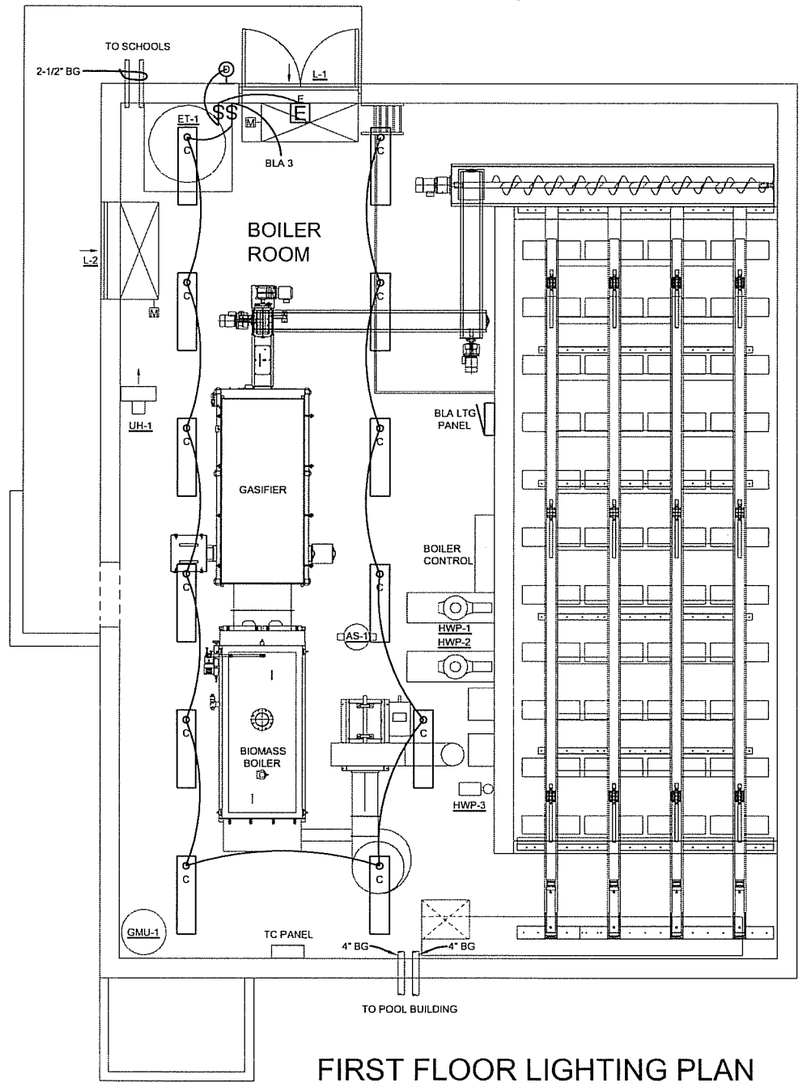
WOOD FIRED HEATING SYSTEM FOR CRAIG SCHOOLS
CITY OF CRAIG, PO BOX 725, CRAIG, ALASKA 99921

DATE: 12-11-06
PROJ. 00000

E101
Boiler Plant
Power Plan



SECOND FLOOR LIGHTING PLAN



FIRST FLOOR LIGHTING PLAN

LIGHTING NOTES:

1. Suspend A and C fixtures at 12 foot mounting height in Storage Room and Boiler Room. Suspend B fixtures so that fixtures will be at elevation of top of plate in Chip Storage Area.
2. Attach fixtures to roof purloins or ceiling joists with fixture hangers and hardware approved by the manufacturer.
3. Lighting materials and installation shall conform to the requirements of the Underwriters Laboratories and the National Electrical Code.
4. Connect chip storage lighting circuit to dry contacts in overhead door operators so that the lights turn on when the door operators are energized.

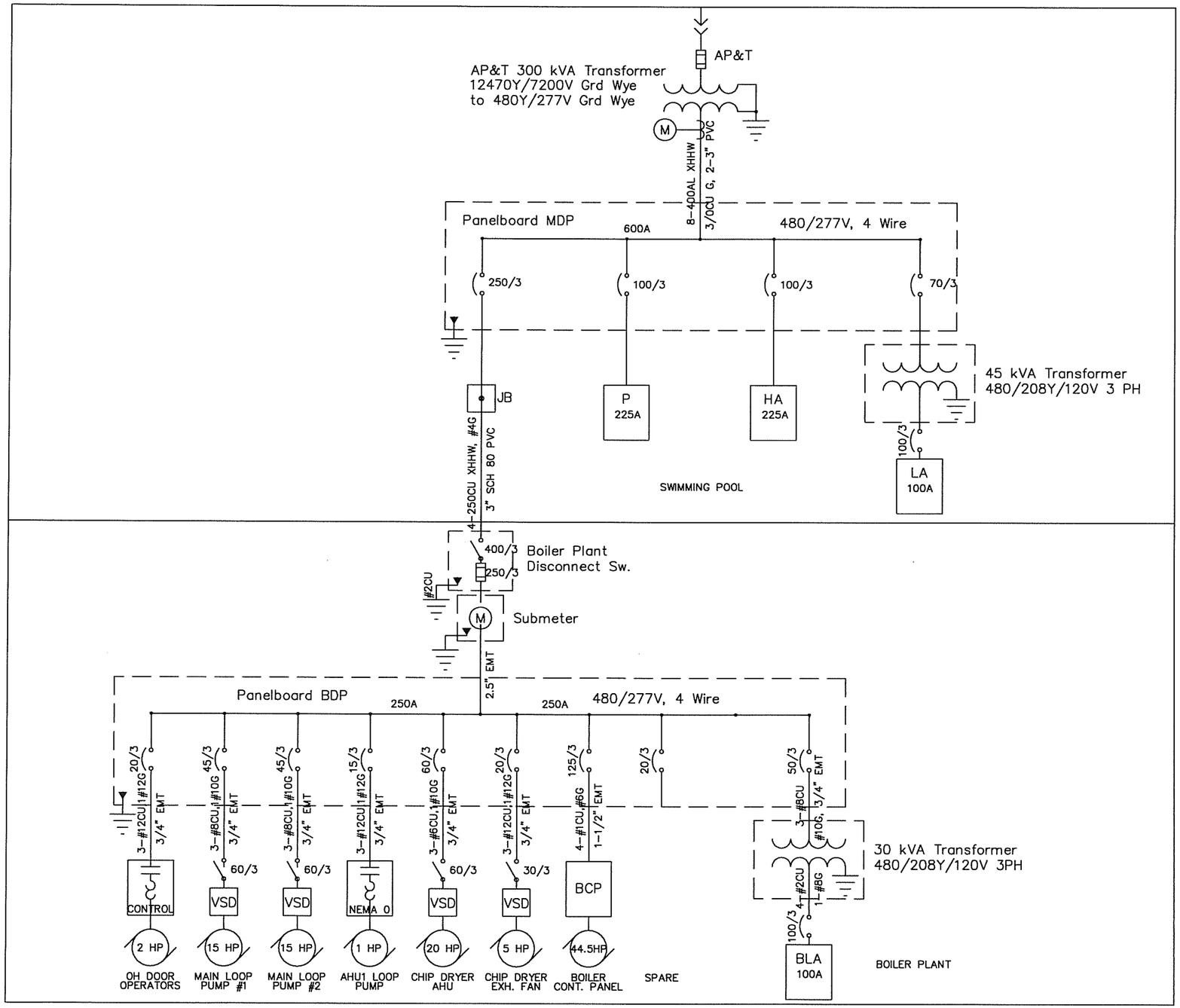
STATE OF ALASKA 49th
FRANK MICHAEL CARSON E.E. 5604
REGISTERED ELECTRICAL ENGINEER

NORTHSTAR POWER ENGINEERING
P.O. BOX 1337, CRAIG, ALASKA 99921
826-2893 nstarpower@optionalaska.net

BOILER PLANT LIGHTING PLAN
WOOD FIRED HEATING SYSTEM FOR CRAIG SCHOOLS
CITY OF CRAIG, PO BOX 725, CRAIG, ALASKA 99921

DATE: 12-10-06
PROJ. 00000

E102
Boiler Plant Lighting Plan



GENERAL NOTES:

1. The new 250A 480Y/277V four wire NEMA 1 boiler distribution panelboard with main lugs only shall be installed as shown. The panelboard and circuit breaker shall be rated for 18000A symmetrical short circuit current at 480V. Panelboard shall be Square D NF442L2C or approved equal.
2. The new 100A 208Y/120V four wire NEMA 1 boiler distribution panelboard with 100 A main circuit breaker shall be installed as shown. The panelboard and circuit breakers shall be rated for 10000A symmetrical short circuit current at 208V. Panelboard shall be Square D NQOD430M100CU or approved equal.
3. The new 400A 480Y/277V four wire NEMA 3R boiler building disconnect switch shall be installed as shown. The fused disconnect switch shall be Square D H365NR with Type R fuses or approved equal.
4. The new 30 kVA 480/208Y/120V three phase NEMA 1 low impedance dry type transformer shall be installed as shown. The transformer shall be Square D Watchdog 30T3HF with 115C rise or approved equal.
5. The new submeter shall be Elster A1D Alpha Plus Model ZQ3400000 with Square D Form 16S 320A 7 Jaw Socket UTH7300T or approved equal.
6. All electrical equipment shall conform with applicable requirements of ANSI, IEEE, NEMA and UL standards. Installation shall conform to the National Electrical Code, 2005 edition. Contractor shall confirm circuit breaker and wire sizes.
7. A grounding electrode system in accordance with NEC Article 250 shall be provided at the boiler plant that effectively grounds all electrical equipment and the grounded circuit conductor. The grounding electrode system shall include a concrete-encased ufer ground as described in the specifications.
8. A six line Network Interface Device shall be provided for the communications system. Run Category 5e telephone and data cables to the boiler control panel, temperature control panel and the three outlet boxes shown on the electrical plan.

FIXTURE SCHEDULE

NO	QTY	LAMPS	BULBS	SIZE	TYPE	VENDOR	MODEL
A	10	2/32W	F32T8	12"x48"	General Purpose Industrial	Lithonia	EJA-232-120-GEB-WGEJ-HC36/72
B	3	3/32W	F32T8	8"x48"	Wet Location Industrial	Lithonia	DMW-332-120-GEB10RS-WLF
C	12	2/32W	F32T8	8"x48"	Damp Location Industrial	Lithonia	DM-232-120-GEB10RS-BCD-HC36
D	2	2/75W	INC	9"x11"	Door Wall Mount	Lithonia	MSP-FK-I-DDB-L/LP
E	2	10W	FLUOR		Exit Sign & Emergency Lt	Lithonia	LHQM-S-W-1-R-120-N
F	1	250W	HPS	16"x18"	HPS WallPack	Lithonia	TWH-250S-120-CR-LPI

PANEL BDP SCHEDULE

VOLTAGE: 480/277 V 4 WIRE
AIC: 10000 A
TYPE: 250A MAIN LUGS
SPACES: 42

CKT	WIRE	DESCRIPTION	CB	KVA CKT	A PH	B PH	C PH	KVA CKT	CB	DESCRIPTION	WIRE	CKT
1	3#8	HWP-1 Main Pump	45/3	5.58	11.16			5.58	45/3	HWP-2 Main Pump	3#8	2
3				5.58		11.16		5.58				4
5				5.58			11.16	5.58				6
7	3#12	Door Operators	20/3	1.12	1.68			0.56	15/3	AHU-1 Pump	3#12	8
9				1.12		1.68		0.56				10
11				1.12			1.68	0.56				12
13	3#6	Chip Drying AHU	60/3	7.17	9.19			2.02	20/3	Chip Exhaust Fan	3#12	14
15				7.17		9.19		2.02				16
17				7.17			9.19	2.02				18
19	3#1	Boiler Control	125/3	22.32	26.07			3.75	50/3	Stepdown Transf.	3#8	20
21				22.32		25.68		3.36				22
23				22.32			26.15	3.83				24
25		Spare	20/3									26
27												28
29												30
31												32
33												34
35												36
37												38
39												40
41												42
				TOTAL	48.10	47.71	48.18					

PANEL BLA SCHEDULE

VOLTAGE: 208/120 V 4 WIRE
AIC: 10000 A
TYPE: 100A MAIN CIRCUIT BREAKER
SPACES: 30

CKT	WIRE	DESCRIPTION	CB	KVA CKT	A PH	B PH	C PH	KVA CKT	CB	DESCRIPTION	WIRE	CKT
1	2#12	Unit Heater 1	20/1	0.42	2.01			1.59	20/1	AHU-1 Coil Pump	2#12	2
3	2#12	Boiler Rm Lights	20/1	1.59		2.01		0.42	20/1	Unit Heater 2	2#12	4
5	2#12	Glycol Pump	20/1	0.67			1.67	1.00	20/1	TC Panel	2#12	6
7	2#12	Chip Storage Lts.	20/1	1.74	1.74				20/1	Spare		8
9	2#12	StorageRm Lights	20/1	1.35		1.35			20/1	Spare		10
11	2#12	Mezzanine Rec.	20/1	1.08			2.16	1.08	20/1	Boiler Room Rec.	2#12	12
13												14
15												16
17												18
19												20
21												22
23												24
25												26
27												28
29												30
				TOTAL	3.75	3.36	3.83					

STATE OF ALASKA 49th
FRANK MICHAEL CARSON
E.E. 5604
REGISTERED ELECTRICAL ENGINEER

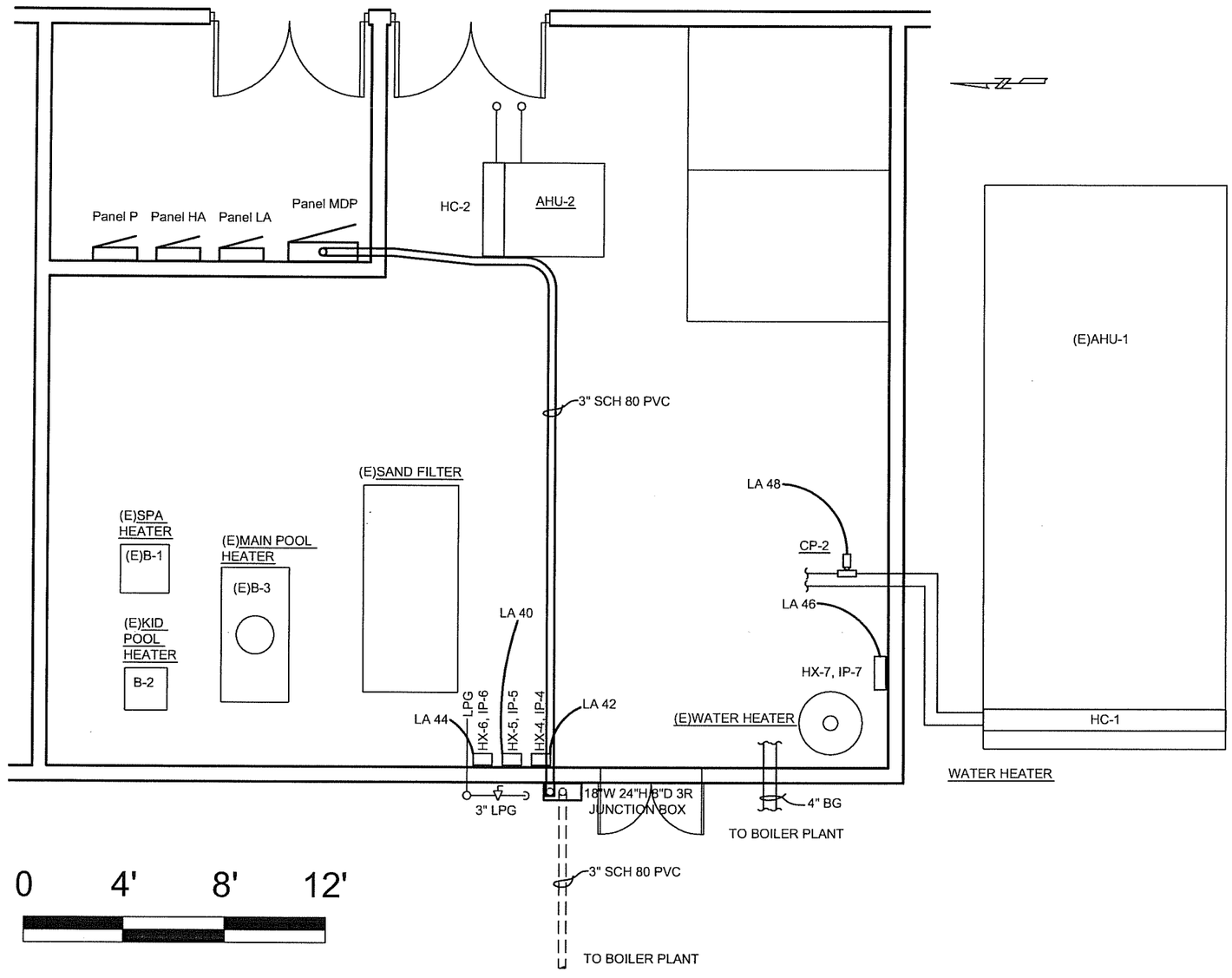
NORTHSTAR POWER ENGINEERING
P.O. BOX 1337, CRAIG, ALASKA 99921
826-2893 nstarpower@aptalaska.net

ONE LINE DIAGRAM, SCHEDULES & NOTES

WOOD FIRED HEATING SYSTEM FOR CRAIG SCHOOLS
CITY OF CRAIG, PO BOX 725, CRAIG, ALASKA 99921

DATE: 12-10-06
PROJ. 000000

E103
One Line, Schedules& Notes



POOL MECHANICAL ROOM PLAN

NOTES:

1. Suspend 3" Schedule 80 PVC feeder conduit along main transverse building beam using 3" stainless steel conduit hangers with beam clamps. Attachments shall be Thomas and Betts(Steel City) 6H7SS conduit hangers, 1/4" threaded rod as required and Type 500 beam clamps. Support conduit at 6 foot maximum spacing.
2. An 18" wide by 24" high by 8" deep NEMA 3R junction box shall be mounted on the outside wall as shown. Junction box shall be Circle AW/BeeLine 18248RTSCNK or approved equal. Use LB fitting through wall and seal conduit penetration.
3. Install new 250A/3 P circuit breaker in main distribution panel for boiler plant feeder. Feeder conductors shall be 4-250 copper XHHW with #4 copper ground.
4. Install the following branch circuits in Panel LA for new pumps:

Circui	Equip	n	Loa	Breaker	Conductor
		-5	0.	HP20A/12/#12	
		-4	0.	HP30A/12/#10	
		-6	0.	HP20A/12/#12	
		-7	0.	HP20A/12/#12	
		-2	1.	HP30A/12/#10	

Balance phase loads on panel and add new load to phases with the least current. Verify that the total load does not exceed panel rating. Replace with larger panel if necessary.
5. Electrical materials and installation shall conform to the requirements of the Underwriters Laboratories and the National Electrical Code.

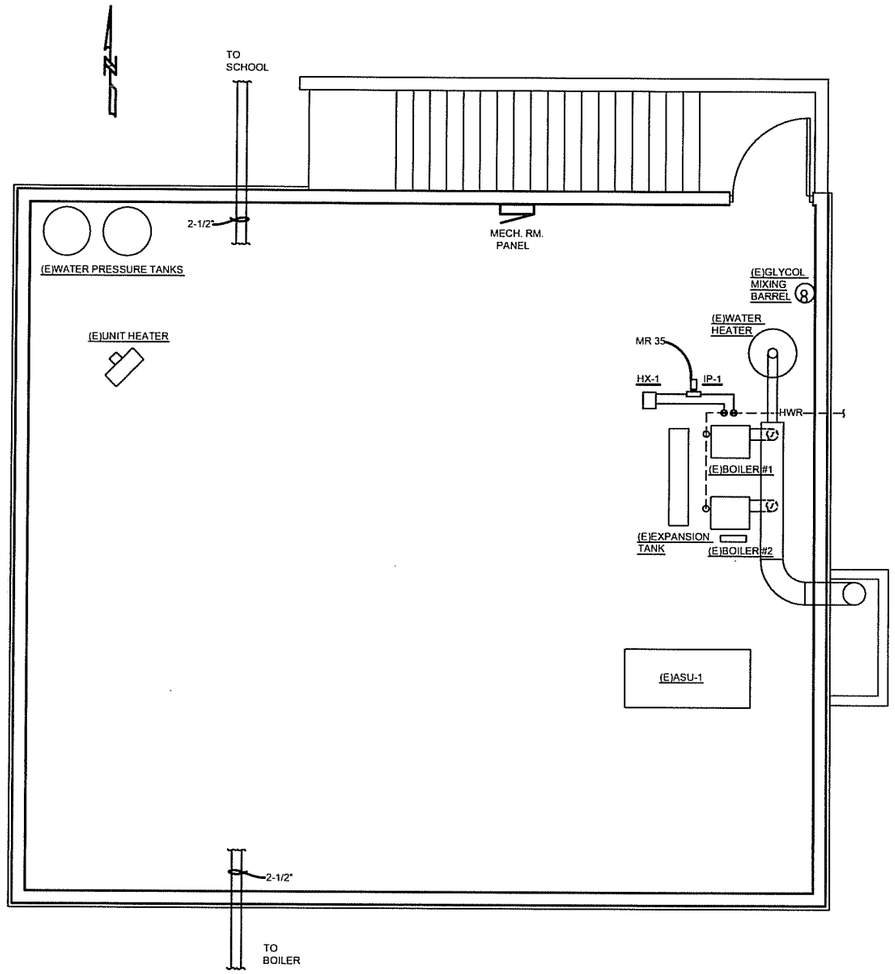
STATE OF ALASKA 49th
FRANK MICHAEL CARSON E.E. 5604
REGISTERED ELECTRICAL ENGINEER

NORTHSTAR POWER ENGINEERING
P.O. BOX 1337, CRAIG, ALASKA 99921
826-2893 nstarpower@optalaska.net

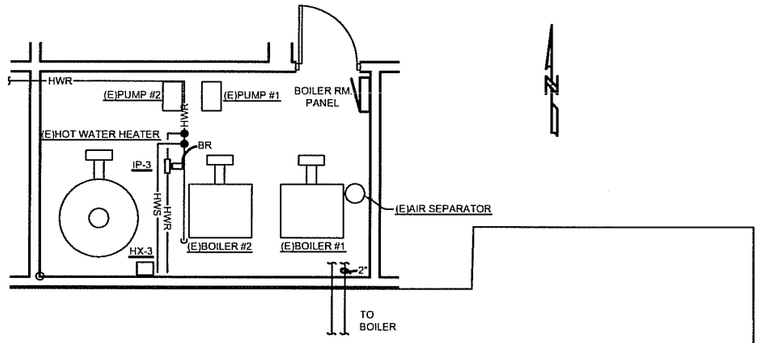
SWIMMING POOL POWER PLAN
WOOD FIRED HEATING SYSTEM FOR CRAIG SCHOOLS
CITY OF CRAIG, PO BOX 725, CRAIG, ALASKA 99921

DATE: 12-5-06
PROJ. 00000

E104
Swimming Pool Power Plan



ELEMENTARY SCHOOL
MECHANICAL ROOM

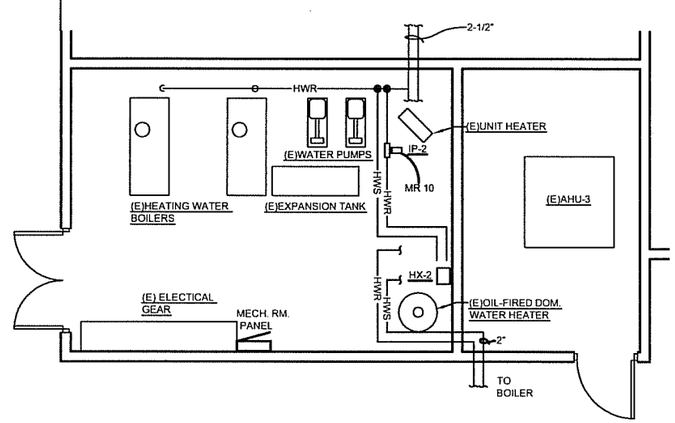


MIDDLE SCHOOL
GYM BOILER ROOM

NOTES:

1. Install one new 20A/1 circuit breaker in the existing 208/120V panelboard in the elementary school and two new 20A/1 circuit breakers in the existing 208/120V panelboards in the middle school as shown. Confirm circuit breaker location with school maintenance personnel. Circuits for IP-1, IP-2 and IP-3 shall be 2#12 copper with ground. Verify that the total loads do not exceed the panelboard ratings.
2. Electrical materials and installation shall conform to the requirements of the Underwriters Laboratories and the National Electrical Code.

0 4' 8' 12'



MIDDLE SCHOOL
MECHANICAL ROOM

STATE OF ALASKA
49th
FRANK MICHAEL CARSON
E.E. 5604
REGISTERED ELECTRICAL ENGINEER

NORTHSTAR POWER
ENGINEERING
P.O. BOX 1337, CRAIG, ALASKA 99921
826-2893 nstarpower@aptalaska.net

ELEM. AND MIDDLE SCHOOL POWER PLAN

WOOD FIRED HEATING SYSTEM FOR CRAIG SCHOOLS
CITY OF CRAIG, PO BOX 725, CRAIG, ALASKA 99921

DATE: 12-05-06
PROJ. 00000

E105
Power Plan
for Schools

Appendix II – Construction Photographs

View of boiler building south wall. Wood storage area at right. August 2007

View of boiler building footing and stem wall at mechanical room. August 2007

Siding of east wall at fuel delivery doors. October 2007

Framing of North wall. Note mechanical room door. October 2007

Wood storage bin floor. Note ram assemblies and air ducts. October 2007.

Auger pit at north end of wood bin. October 2007.

Placement of boiler into mechanical room. November 2007

Placement of gasifier into mechanical room. November 2007.

Hot water supply and return lines at pool south wall. January 2008

Heat exchangers at pool mechanical room. January 2008

Gasifier in place and operational.

Control screen for Chiptec equipment

Wood storage bin loaded with chips. Note gable end exhaust fan above

Substantially complete north wall of boiler building.