



# TANANA CHIEFS CONFERENCE

Altona Brown Health Clinic • Ruby, Alaska



## FOUNDATION SETTLEMENT ASSESSMENT

November 8, 2016

*Prepared by:*



Glen Kravitz  
410 Second Avenue, Suite 206  
Fairbanks, AK 99701  
T. 907.374.6938

# **Altona Brown Health Clinic Ruby, Alaska**

## **Foundation Settlement Assessment**

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## 1.0 EXECUTIVE SUMMARY

This report provides an assessment of existing conditions and concerns regarding building settlement at the Altona Brown Health Clinic in Ruby, Alaska. The Clinic opened in November 2013 and over the years building personnel have noticed several indications of building settlement. Recent photos provided by the Ruby Tribal Council showed one of the wood foundation pads on the west side of the building exhibited signs of settlement. Other indicators include the main entry door dragging on the carpet, an office window that was difficult to latch, and a visibly noticeable gap at the wall/ceiling intersection in the waiting area.

At the request of Tanana Chiefs Conference, Randy Jorgenson of Watterson Construction and Glen Kravitz, ARCADIS Project Manager, performed a site visit on October 1, 2016. The purpose was to accurately measure building settlement, determine potential causes, make recommendations to remedy the situation, and raise the building's low point to the extent possible. We were assisted by Malcom Nikolai the Clinic maintenance person who is very knowledgeable about the building and has monitored building settlement over the years.

The approximately 30' x 60', 1900 square foot, one-story wood-framed Clinic facility was constructed on a site adjacent to the Washeteria on the same general location where an existing maintenance shop that had since been relocated was sited (see photo #1). During construction, the existing gravel pad was completely covered with new gravel and increased in size to extend beyond the new building footprint (see photo #2).

The foundation system consists of six steel posts that elevate the building off the ground to maintain air flow beneath the building to minimize the transfer of building heat into the ground below and keep the local ice-rich ground frozen. Due to these unstable subsurface conditions the design team anticipated building settlement would occur and provided a structural foundation system that was adjustable.

Based on measurements using a laser level, the southwest corner of the building has settled approximately 2.5 inches over 40 feet. While this is something to be concerned about, this amount of settlement is not considered excessive particularly if building operations are not affected. I also did a thorough investigation of the interior and exterior of the clinic and did not find any other issues that had not already been noted.

However, it is worth noting that while trying to raise the southwest corner of the building, the jacks and steel support plates sunk approximately 4-6 inches into the ground before meeting enough resistance to raise the building (see photo #3). Any future leveling work should be done when the ground is frozen.

In the short-term I recommend the one foundation post below the main entry door be lowered  $\pm 1.0$  inch this year to allow the main door to operate properly. Gutters and downspouts should be added to the building eaves in summer 2017 to reduce the quantity of water saturating the gravel pad where the foundation/footing pads are located.

In the long term if the building continues to settle beyond where minor adjustments to one post at a time are not sufficient, hire a professional building moving/leveling company to raise and level the entire building and adjust all the foundation posts as needed.

If settlement continues to occur over the years after a major leveling effort is performed consult with a structural engineer to design an alternative foundation system. See Section 4.0 "Recommendations" for additional thoughts and ideas.

## **2.0 EXISTING CONDITIONS AND OBSERVATIONS**

### **Gravel Pad and Foundation:**

Grading around the building appears comparable to when the building opened in November 2013. While there are some low spots and muddy areas along the west side of the ramp there were no other noticeable indications that the gravel pad had settled unevenly (see photo #4).

The structural foundation system for the main portion of the building consists of six adjustable steel pipe posts bolted to built-up 4 x 12 treated wood timber footings. Two additional footings and posts support the arctic entry (see Appendix B - foundation plan). All the wood footings sit directly on top of two layers of high density rigid insulation and the footings are buried approximately 18 inches below grade to minimize lateral movement (see photo #5). The wood footing material and steel pipe posts are in very good condition.

The three footings on the west side of the building have settled the most. The middle footing shows a slight unevenness in the timber footing (see photo #6). The other footings appear to have settled less. This observation is supported by the measurements taken with a laser level. The measurements show the northern most footing of the arctic entry is approximately 2.5 inches higher than the southwest corner of the building (see Appendix B settlement measurements). This would explain why the main entry door drags on the carpet.

### **Building:**

The Clinic building is well maintained and in very good condition. The stairs and ramp on the east side of the building did not show any noticeable signs of settlement (see photo #7). Floor and ceiling finishes did not show any signs of movement. There is a visibly noticeable gap at the intersection of the south wall of the waiting area and ceiling. This was first noted at the time of substantial completion in 2013 and is now approximately 1/8" wide at the worst spot. (see photo #8). Since the gap was there when the building first opened, the cause is likely due to wind uplift and not foundation settlement.

Except for the main entry door all other doors in the clinic swung freely and latched properly when closed. Window and door frames were visibly square, however, as reported by maintenance personnel, the operable window on the south wall of Clinic Office 104 was difficult to latch.

### **3.0 ON-SITE ACTIVITIES**

We were met at the airport by Malcom and taken to the Clinic where we toured the inside of the facility and then walked the site. Using a laser level, we took baseline measurements at each of the foundation pads/posts and determined the southwest corner of the building was the low point.

#### **Foundation Leveling:**

Our initial attempt at raising the building's low point involved setting a 20-ton hydraulic jack on wood timbers approximately five feet from the southwest post. When we started jacking, the wood timbers immediately sank into the soft gravel and we were unable to gain any resistance. Seeing the need to spread the load over a greater surface area, Malcom rounded up steel plate material, a 5-ton jack, more wood timbers and a log. After several attempts using both jacks and various plate and timber arrangements (see photo #9), we were finally able to raise the low point of the building approximately 1.5 inches. High impact bearing shims were placed below the post (see photo #10) but when the pressure from the jacks was released the post lowered approximately 0.5 inches for a final height increase of 1.0 inch (see photo #11). This improvement reduced the height difference between the low point and high point of the building from 2.5 inches to 1.5 inches.

#### **Main Entry Door:**

Malcom and Randy investigated the operation of the main entry door and noted the door started to drag on the carpet about one third of the way into the door swing. This condition was likely caused by the foundation post at that location being the high point of the building.

Randy tried to reduce the door drag by replacing the screws in the top hinge with much longer ones (see photo #12). This helped some but the foundation post should be lowered too.

#### **Window at Clinic Office 104:**

Malcom and Randy investigated the operation of the operable window on the south wall of the office. Malcom had noted that he had to push the window in from the outside to latch it properly.

Randy adjusted the latch mechanism and could get it to latch from the inside.

## **4.0 RECOMMENDATIONS**

### **Short-term (2016-2017)**

- Purchase (2) 20-ton hydraulic jacks, laser level, high density composite shims, various sized wood blocking material, and ¼ inch steel plate material for minor leveling adjustments (December 2016).
- Lower the post below the exterior arctic entry door approximately  $\pm 1.0$  inch to allow the main entry door to swing properly (December 2016).
- Fill gap at wall/ceiling intersection on south wall of Waiting Room with caulk and paint to match.
- Add gutters and downspouts along east and west building eaves to reduce water saturating the gravel pad where the footings/foundation posts are located (Summer 2017).
- Measure and record building settlement from the same exact location on an annual basis starting in Fall 2017.

### **Long-term (2018-2023)**

- If the building continues to settle beyond where minor adjustments to one post at a time are not sufficient, hire a professional building moving/leveling company to raise and level the entire building and adjust all the foundation posts as needed.
- If settlement continues to occur over the years after a major leveling effort is performed, consult with a structural engineer to design an alternative foundation system.
- Extend the gravel pad to the east approximately 4 feet to provide larger compacted gravel area to spread the footing loads (optional).

## 5.0 PHOTOS



#1 Building site prior to new clinic construction



#2 New compacted gravel pad



#3 Blocking sunk into gravel 4" to 6" under pressure



#4 Low spots at east side of clinic parking area

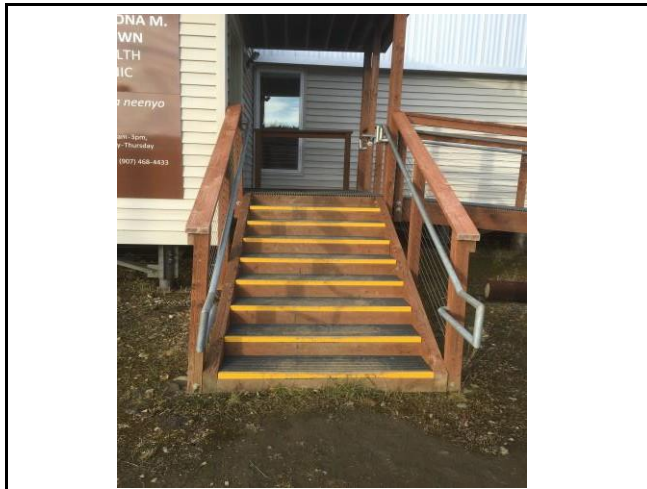


#5 Timber footing installation



#6 Middle footing on west side of clinic





#7 Main entry stairs



#8 Gap at wall/ceiling intersection in waiting area



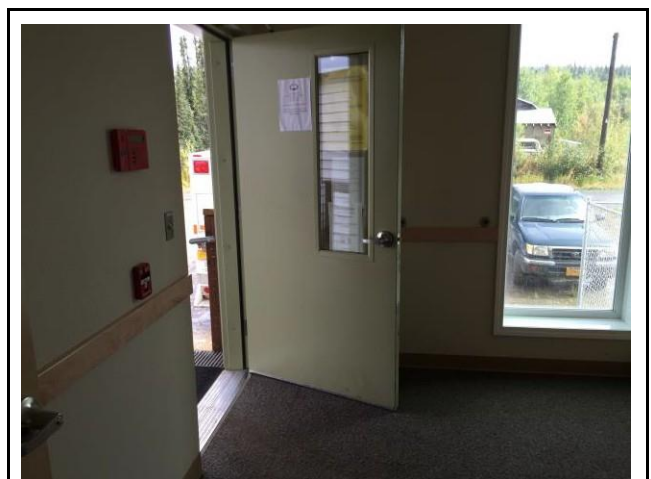
#9 Jacking arrangement



#10 Southwest corner post-raised position



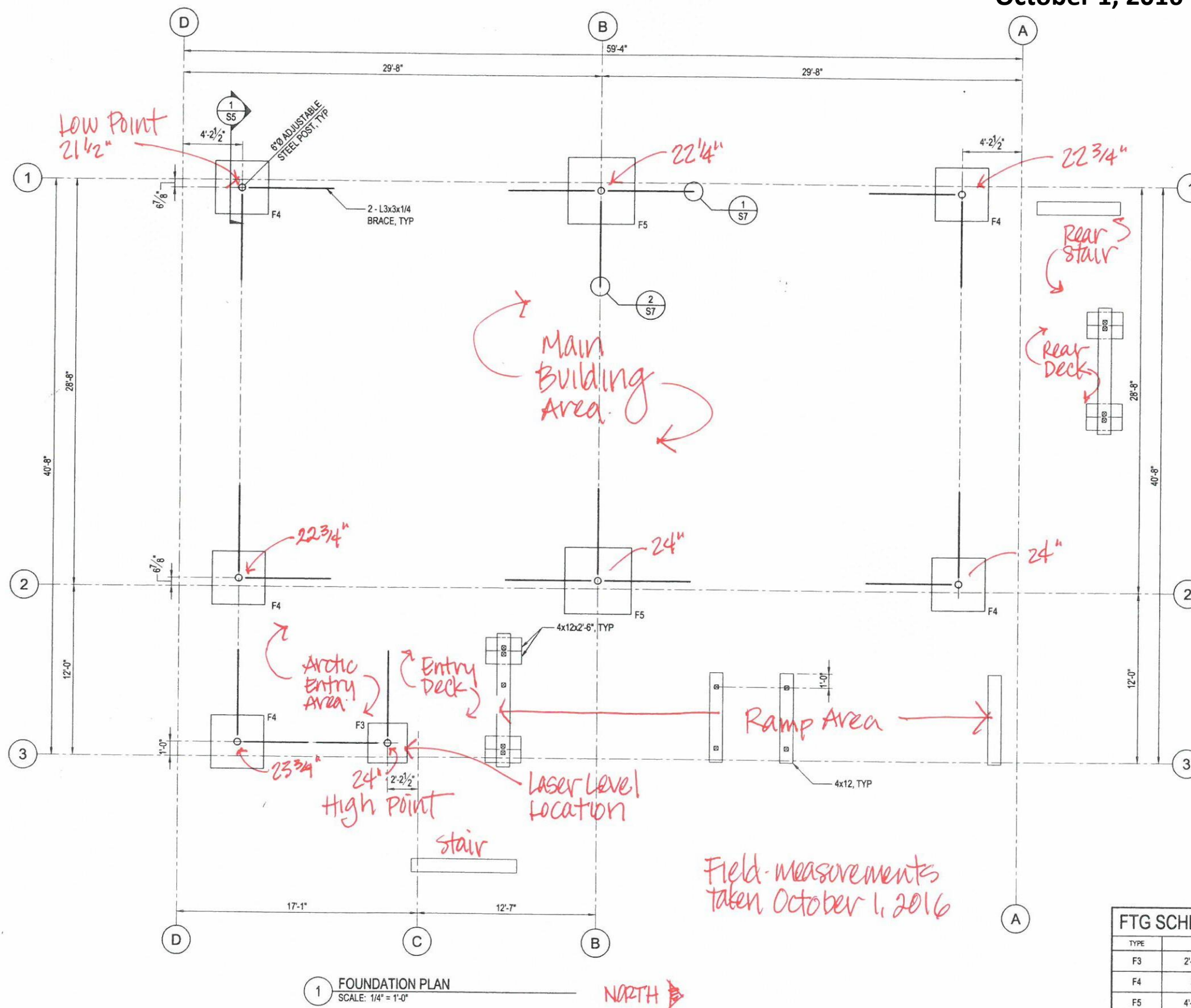
#11 Southwest corner post with shims



#12 Main entry door – drags on carpet



IF THIS DIMENSION DOES NOT MEASURE ONE INCH (1") EXACTLY, THIS DRAWING HAS BEEN ENLARGED OR REDUCED, AFFECTING ALL LABELED SCALES

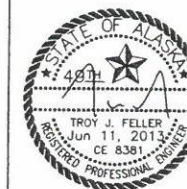


# Appendix A

## Field measurements taken October 1, 2016

WATERSON CONSTRUCTION  
ph: (907)563-7441 fax: (907)563-7222

BETTISWORTH NORTH  
ARCHITECTS AND PLANNERS



100% CONSTRUCTION DRAWINGS

12-152  
TANANA CHIEFS CONFERENCE  
**RUBY CLINIC**

RUBY, ALASKA

CONSULTANT:  
**BBFM**  
Engineers Inc.  
510 L Street, Suite 200  
Anchorage, AK 99501-1949  
Phone: (907) 274-2236 Fax: 274-2320

PROJECT NO: 12-152  
DATE: 14 JUNE 2013  
DRAWN BY: JWC  
CHECKED BY: TJF  
REVISIONS: -

FTG SCHEDULE	
TYPE	SIZE
F3	2'-9 3/4" SQ
F4	3'-9" SQ
F5	4'-8 1/4" SQ

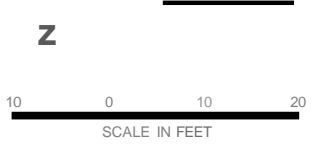
NOTE:  
SEE DETAILS 1 AND 2/S5 FOR FTG CONSTRUCTION.

FOUNDATION PLAN

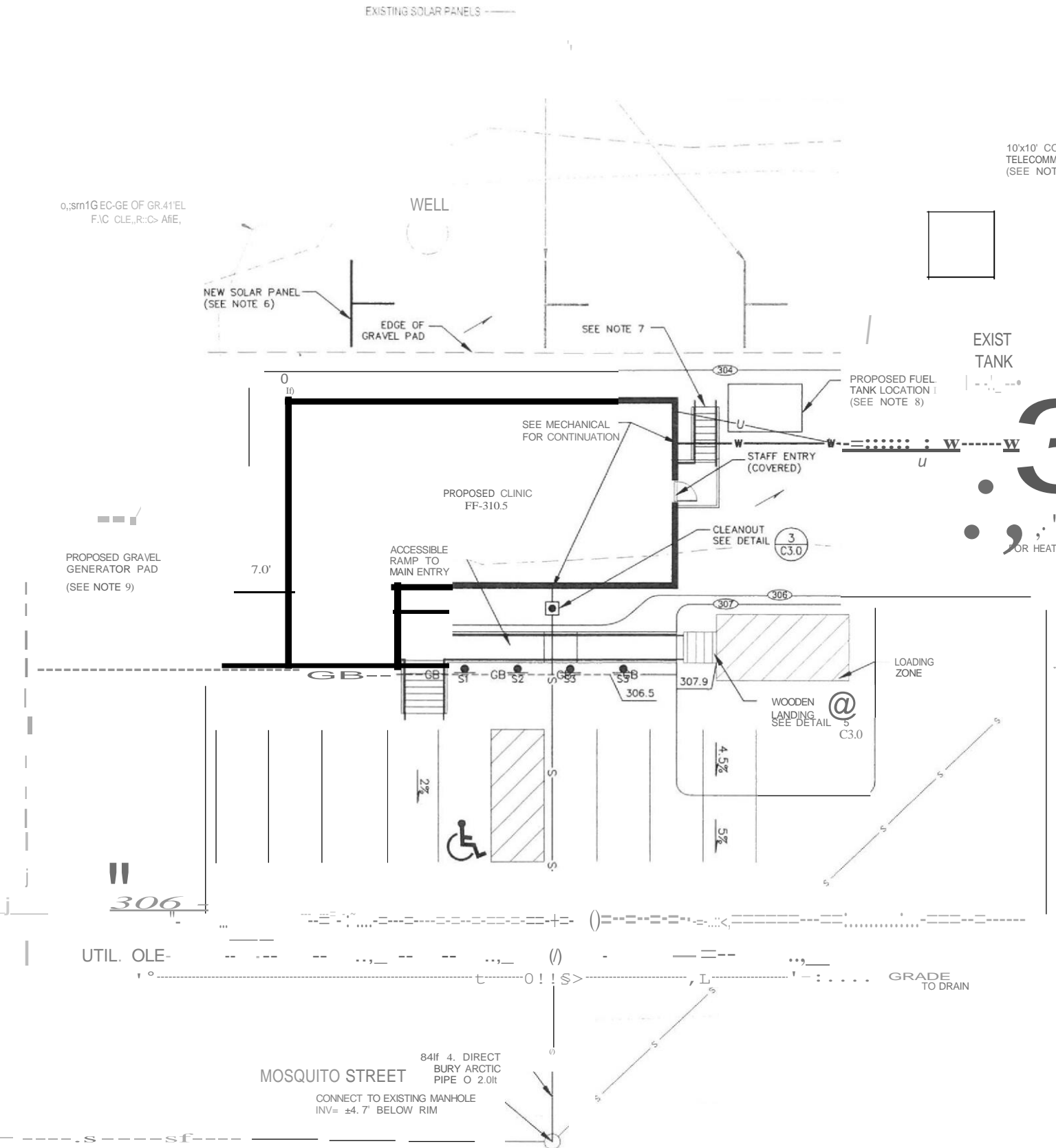
**S2**

2600 DENALI STREET SUITE 710 ANCHORAGE, ALASKA 99503 907 561-5780  
212 FRONT STREET FAIRBANKS, ALASKA 99701 907 456-5780  
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Appendix B



- SIGN SUMMARY:
- 1. SEWER SERVICE SHOULD MATCH FLOW LINE OF MANHOLE. Z-LOK OR EQUAL SEAL SHALL BE USED TO CONNECT SERVICE TO EXISTING MANHOLE.
  - 2. GRADE A MINIMUM 10-FOOT AROUND BUILDING TO DRAIN
  - 3. INSTALL GRAVEL LANDING AT BOTTOM OF STAIRS. LANDING SHALL BE MINIMAL 5-FOOT BY 5-FOOT AND HAVE NO MORE THAN 2% SLOPE.
  - 4. SEE ARCHITECTURAL FOR FINISHED ELEVATION.
  - 5. TELECOMMUNICATIONS EQUIPMENT AND PAD TO BE LOCATED BY INSTALLER.
  - 6. SEE ELECTRICAL FOR DETAILS. LOCATION TO BE DETERMINED BY INSTALLER.
  - 7. MAINTAIN A MINIMUM 5-FOOT CLEARANCE FROM END OF STAIRS RAILING.
  - 8. FUEL TANK SHALL REST ON 4"x12" TREATED SLEEPERS ON A GRAVEL PAD. FIELD LOCATE SO NOT TO INTERFERE WITH STAIRS OR EXISTING SOLAR ARRAYS.
  - 9. SEE ELECTRICAL DETAILS. PAD WILL BE AT A MINIMUM ELEVATION OF 305 WITH 2-FT OF CLEARANCE AROUND GENERATOR.



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CONSULTANT:

PROJECT NO: 12-152  
DATE: 14 JUNE 2013  
DRAWN BY: JR  
CHECKED BY: DEN  
REVISIONS:

C1.0

## Appendix B

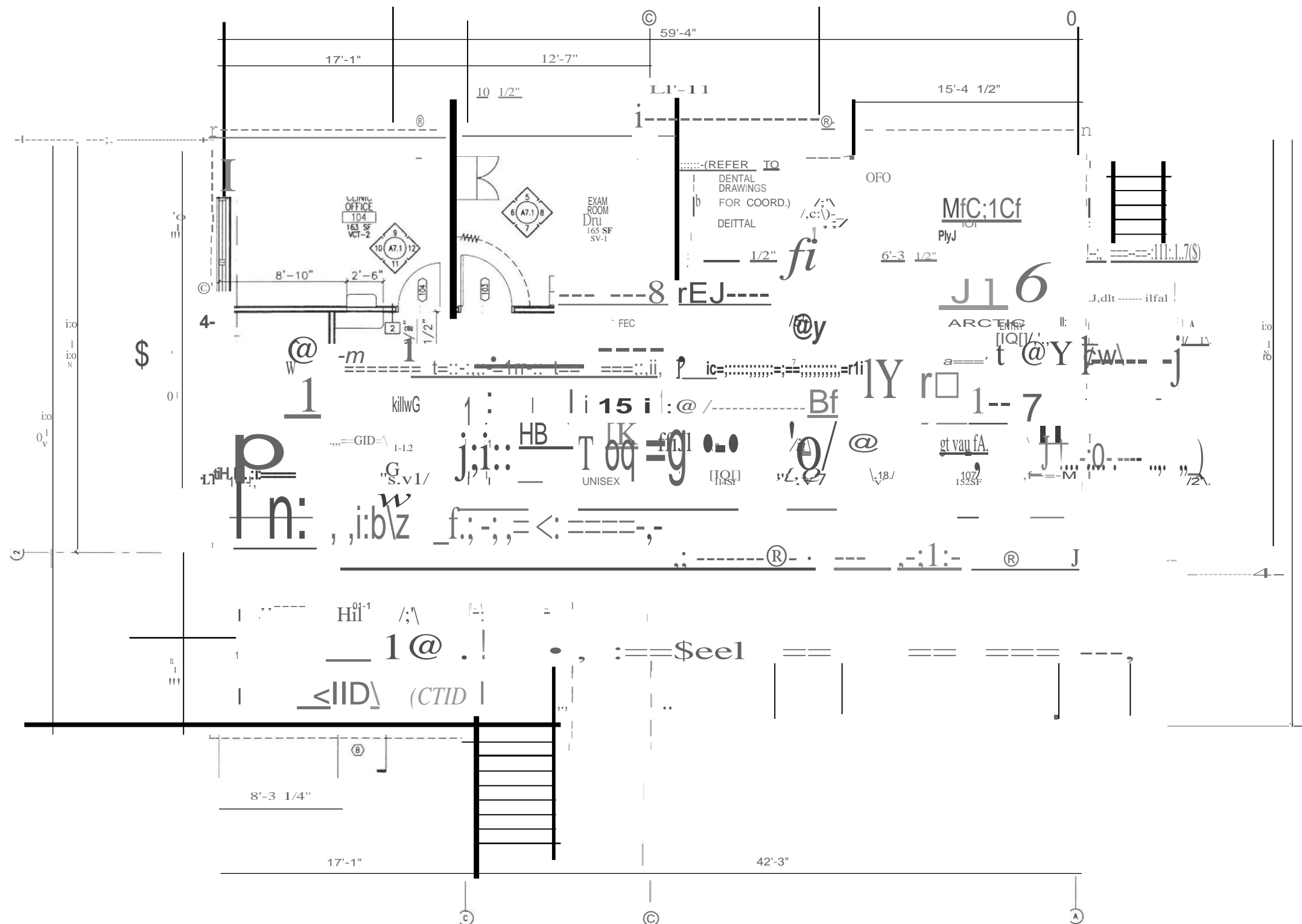
PLAN NOTES:

CONSTRUCTION TYPE: V "I"  
OCCUPANCY TYPE: B WITH ACCESSORY W1-R  
TOTAL OCCUPANCY: 15  
FIRE PROTECTION: 13-0 SPRINKLER THROUGHOUT

1. ALL QUESTIONS ARE TO OUTSIDE FACE OF SIP OR STRUCTURE  
UNLESS NOTED OTHERWISE.
2. FOR EXTERIOR WALL CONSTRUCTION, SEE WALL SECTIONS.
3. PRIVACY CURTAIN; TYPICAL AT ALL DASH ROOMS.
4. SPRINKLER SYSTIM, SEE MECHANICAL.
5. OWNER-FURNISHED AND OWNER-INSTALLED.  
PROCURE INFRASTRUCTURE AS RECD.
6. UCHT TROUGHS AT COUNG
7. SIPS EXTERIOR WALL, SHOWN AT 6 1/2"
8. trRfIcI'fJ,c8 nr\.,,if-[: ::i .
9. UND-SIGN:UO INTERIOR WALL'S SHILLI BE  
WALLTYPE [TI UNLESS NOTED OTHERWISE.
10. REFER TO ENARGEO PEX SHIT AS I. FOR OODFIOMM.  
EUVATION SYMBOL LOCATION.
11. PINACY CURTAIN; m>LOC AT ALL EXIM ROOMS.



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## FLOOR PLAN

**-E9N**

## PLAN

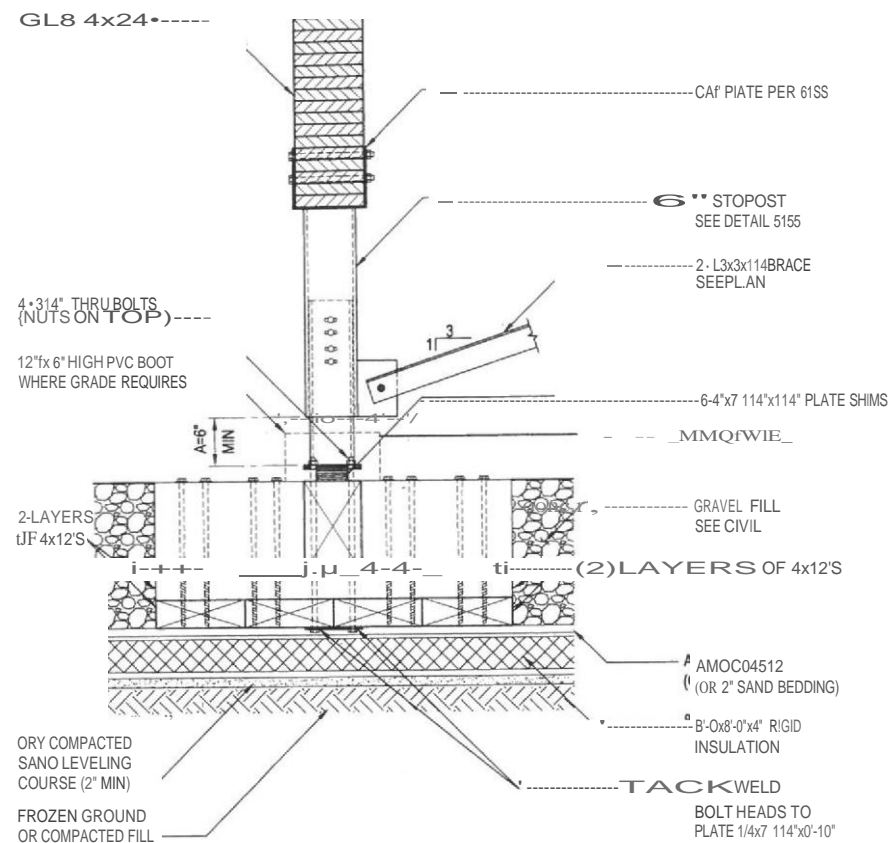
NOT FOR CONSTRUCTION

PROJECT NO:	12-152
DATE:	10 MAY 2013
DRAWN BY:	MG, JS
CHECKED BY:	RR
REVISIONS:	

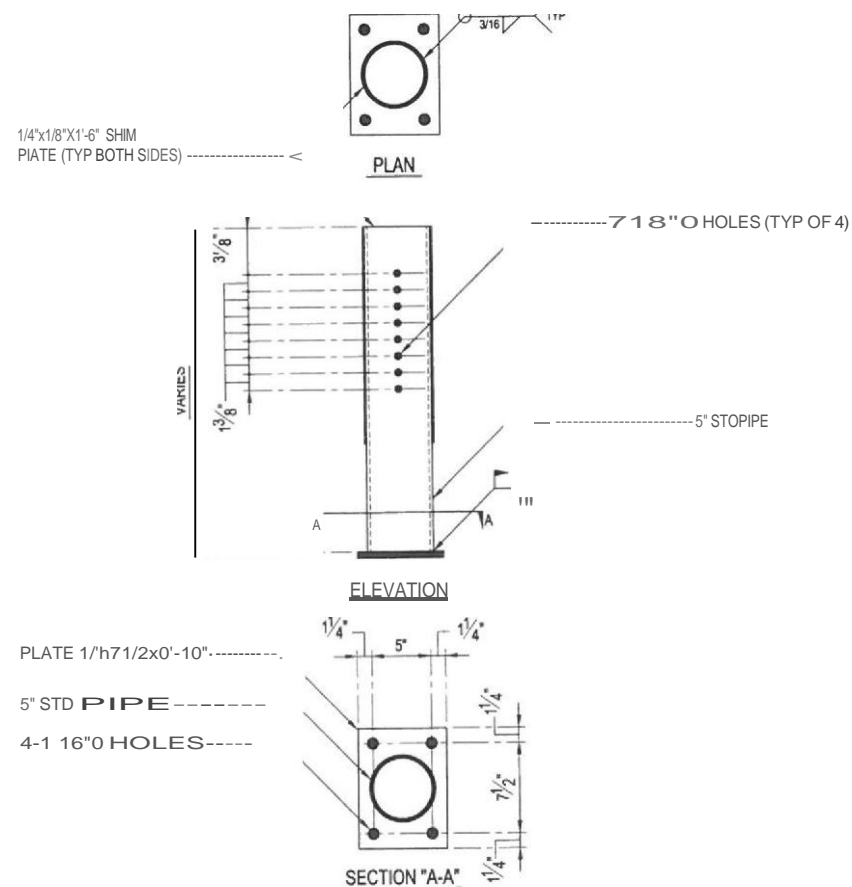
## FLOOR PLAN

## A1.1

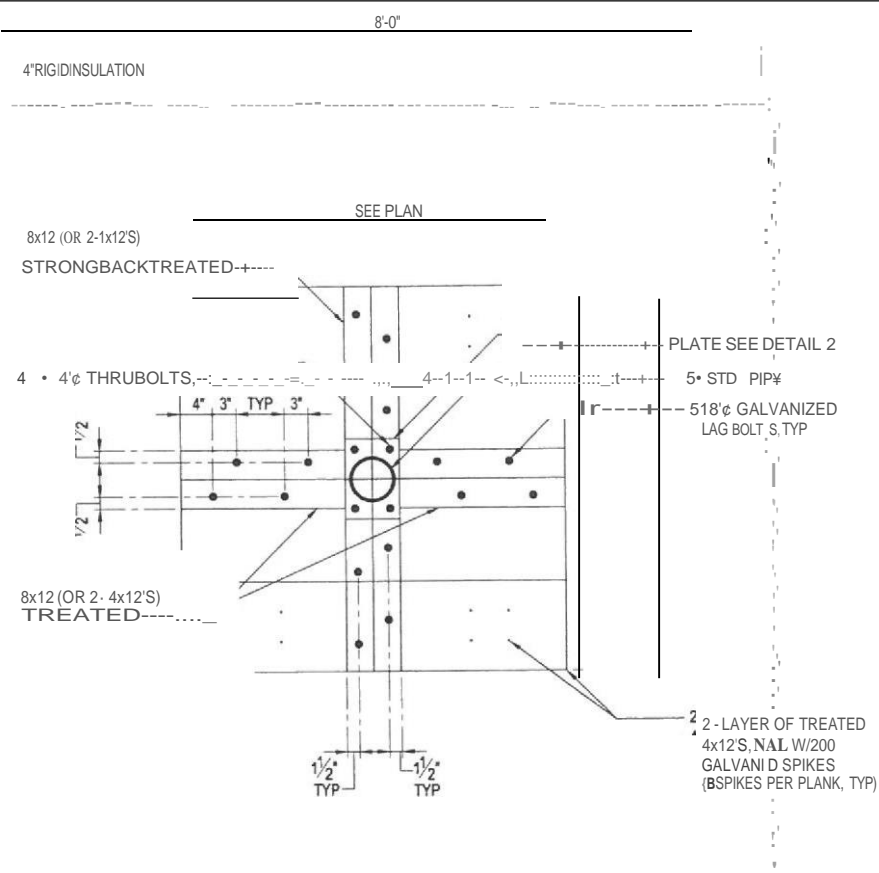
## Appendix B



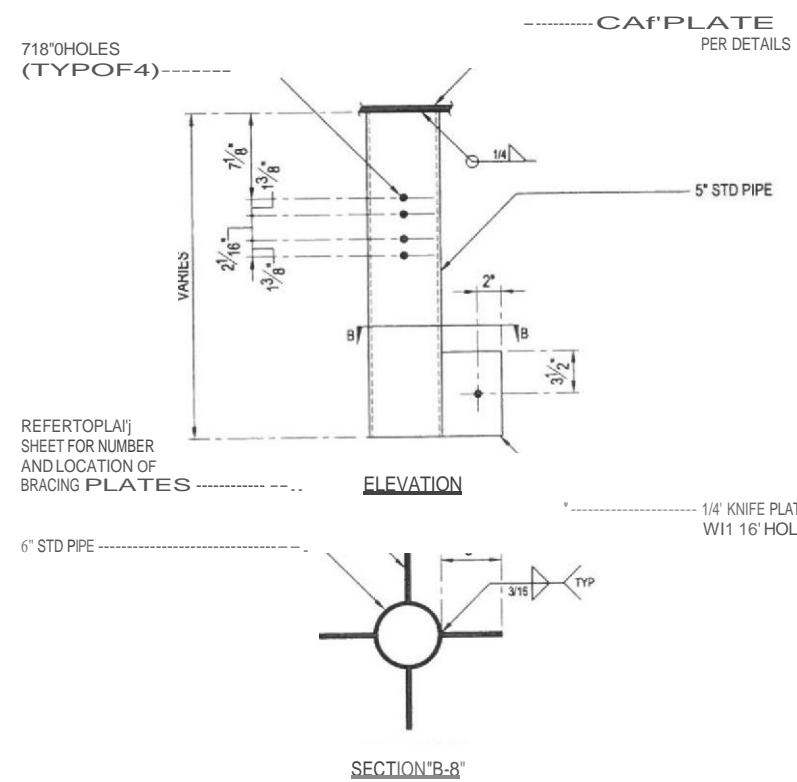
1 FOUNDATION SECTION  
SCALE: 1" = 1'-0"



4 EASY LEVEL POST DETAIL  
SCALE: 1 1/2" = 1'-0"



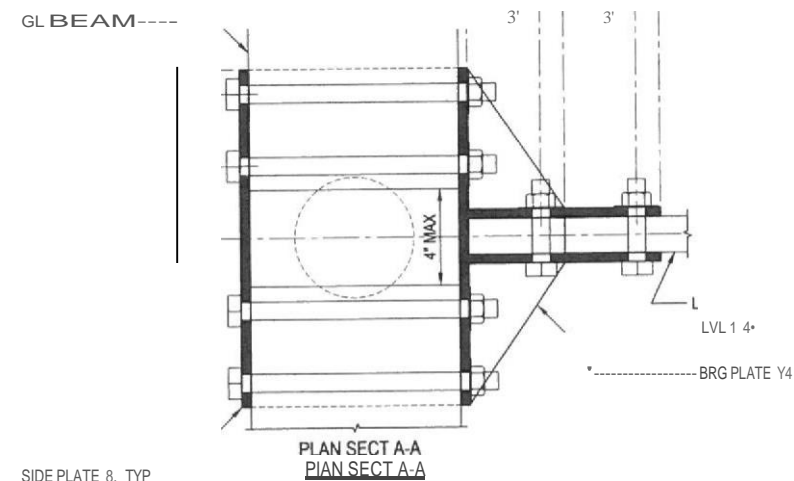
2) FOOTING - PLAN VIEW  
SCALE: 1" = 1'-0"



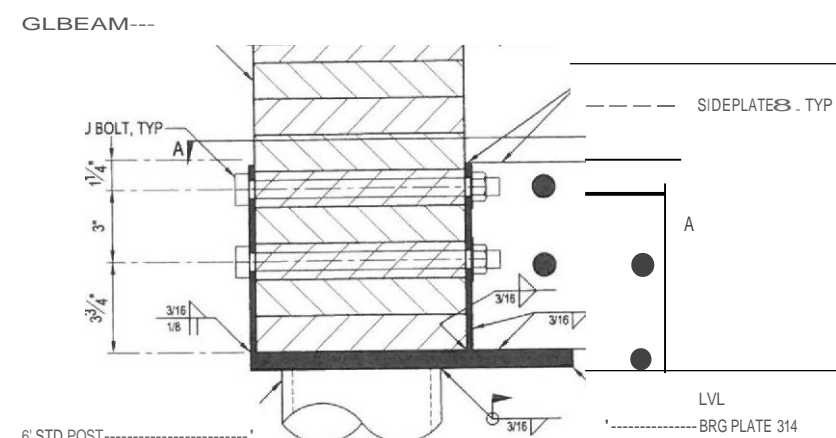
(5) EASY LEVEL POST DETAIL  
SCALE: 1 1/2" = 1'-0"

NOTES: EASY LEVEL POST & PAOSYSTEM

1. DIMENSIONS ARE FOR FLAT GROUND, WHERE STRUCTURE IS BUILT ON SLOPING GROUND. DIMENSION 'A' CAN BE INCREASED TO A MAXIMUM OF 3'-0".
2. APPLY HEAVY COATING OF 90WT GREASE TO THE INSIDE OF THE 6" PIPE PRIOR TO SETTING. THE INITIAL PIN SETTINGS ARE TO BE PLACED SO THAT THE POST SYSTEM CAN BE ADJUSTED 4" IN EITHER DIRECTION.
3. CONTRACTOR SHALL FURNISH 6 SHIMS. INITIAL SETTING SHALL HAVE A MINIMUM OF 11/2" OF SHIMS AND A MAXIMUM OF 11/2" OF SHIMS.
4. CONTRACTOR SHALL TAKE ALL MEASURES TO KEEP THE GROUND BENEATH THE TIMBER PADS FROZEN WHEN EXCAVATING FOR THE TIMBER PADS. THE GROUND SHALL BE OVER EXCAVATED IF NECESSARY AND THE EXCAVATED AREA FILLED WITH COMPACTED TYPE IIA FILL OR FILL MATERIAL AS APPROVED BY THE ENGINEER. THE BALANCE OF THE CONSTRUCTION INCLUDING THE LAYING OF THE SAND BEDDING MATERIAL, RIGID INSULATION AND TIMBER PADS SHALL PROCEED AS QUICKLY AS POSSIBLE TO MAINTAIN THE GROUND BENEATH THE PADS IN A FROZEN CONDITION. FAILURE TO KEEP THE GROUND BENEATH THE PADS FROZEN DURING THE INSTALLATION SEQUENCE WILL RESULT IN THE PAD SYSTEM BEING REJECTED.
5. FOR INSTALLATIONS ON SLOPED GROUND, THE CONTRACTOR SHALL BE RESPONSIBLE FOR SIZING ALL POSTS AND BRACING TO FIT THE EXISTING CONDITIONS.
6. THE GRADE SHALL NOT EXCEED THIS ELEVATION. THIS ELEVATION SHALL BE USED FOR THE POSTS WITH THE DEEPEST PENETRATION INTO THE FINAL GRADE. IN ALL CASES THE POST WITH THE DEEPEST PENETRATION SHALL BE SET AT THIS GRADE WITH THE INTENT OF KEEPING THE F.F. ELEVATION AS LOW AS POSSIBLE WITH RESPECT TO THE SURROUNDING GROUND.
7. ADJUSTMENTS SHALL BE MADE USING THE POST PINS AND BASE PLATE SHIMS WHENEVER DIFFERENTIAL VERTICAL MOVEMENT OF THE GLULAM BEAM EXCEEDS 1" BETWEEN ADJACENT POSTS OR 2" BETWEEN ANY POSTS.
8. TOP OF POST ELEVATION SHALL BE PLACED WITHIN 1/4" WITH RESPECT TO ALL OTHER POSTS & POSTS SHALL BE PLUMB WITHIN 2% OF VERTICAL. POSTS SHALL BE PLACED WITH A HORIZONTAL TOLERANCE OF 1" WITH RESPECT TO ALL OTHER POSTS.
9. CONTRACTOR MAY SUBSTITUTE EXTRA STRONG FOR 6" STD. PIPE AND ELIMINATE SHIM PLATE ON 5' LOWER SECTION. IT SHALL BE CONTRACTORS RESPONSIBILITY TO ASSURE A SMOOTH FIT BETWEEN LOWER AND UPPER SECTIONS.



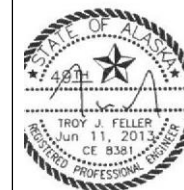
SIDE PLATE 8. TYP



6' STD POST

6 SCALE: 3" = 1'-0"

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SUITE 710 ANCHORAGE, ALASKA 99503 907 561-5  
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CONSULT-NT:

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A.ictaaga, AK WJS01-11MV  
(907)274-2235Fu:27-4-2520

PROJECT NO:	12-152
DATE:	14 JUNE 2013
DRAWN BY:	JWC
CHECKED BY:	TJF
REVISIONS:	

## DETAILS

**S5**