# UPDATE ON GISP2 DRILLING AND OPERATIONS


Polar Ice Coring Office
University of Alaska Fairbanks
Fairbanks, Alaska 99775-1710

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PICO
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# UPDATE ON GISP2 DRILLING AND OPERATIONS

## TABLE OF CONTENTS

## DEPTH MEASUREMENT OF BOREHOLE

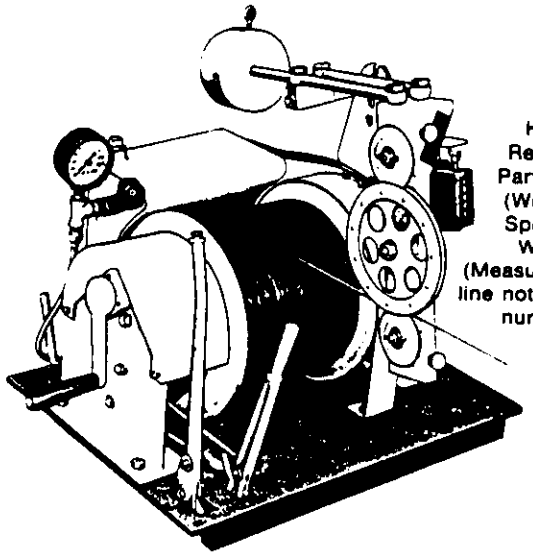
A number of options have been examined in an effort to determine the most accurate depth measurement of the borehole at various stages of the drilling process.

Acoustic depth sounding devices have been examined that are in use by oceanographic disciplines. A number of factors affect the performance of these devices. The conditions found in the borehole at the GISP2 project do not lend themselves to the application of acoustic devices. Chips from the cutting process are pumped up into the screen section for removal at the surface. The screen sections are made from spirally wound stainless wire with a triangular cross section. There is a .010 inch gap between each successive wrap. Thus, all chips that are less than .010 inch in diameter are not filtered out in the screen section. This poses no problem for the operation of the drill but does influence the acoustic signal, making it a less than desirable option.

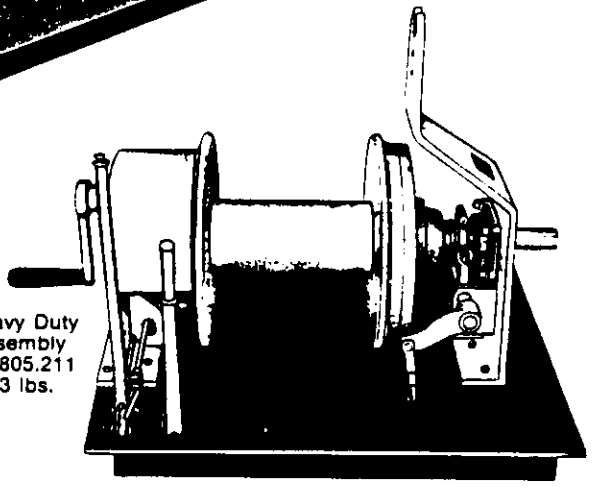
Laser distance measuring devices used in the surveying trade have also been examined. Here again the fact that the drill fluid is slightly clouded as a result of the presence of fine chips makes this approach less than ideal. The scattering of the light would make the measurement inaccurate.

The rock drilling industry uses a wire spool arrangement for measuring depths. Typical wire sixes are from .060 inch diameter wire to 9/64 inch diameter. These are typically made of piano wire. While this material gives good service because of it's stretch properties, they have more stretch than Kevlar of equal size.

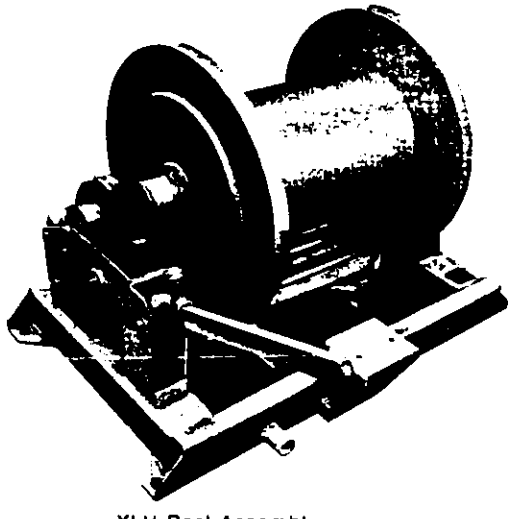
In light of the availability and cost as well as the less than ideal performance of the various options for depth measurement, it is suggested that the drill cable itself be used as the depth sounding method. During the upper 1000 meters of the borehole numerous measurements using a steel surveyors tape will used to calibrate an offset for the shaft encoder mounted on the drill sheave. Thus a comparison between actual and indicated depth will be established and correlated with the core log.



Extra
Heavy Duty
Reel Assembly
Part No. 805.201
(With Hydraulic
Speed Control)
Wt., 472 lbs.
(Measuring Device and
line not included in part
number shown)



Extra Heavy Duty
Reel Assembly
Part No. 805.211
Wt., 393 lbs.



XLH Reel Assembly
Extra Line Hydraulic
Part No. 805.4005
Approximate Wt., 975 lbs.

# Horsepower and Component Selection

## Power-Driven Reels

Halliburton offers several power drive configurations for four different reel assemblies with a wide range of power choices. The choice of a power-driven reel drive configuration and its horsepower is determined by the type of work to be performed.

THE PRIMARY DRIVE CONFIGURATIONS ARE:

1. Direct belt or chain reduction drive from the power supply to the reel drum shaft.
2. Three speed transmission gear box and chain-belt reduction drive.
3. Hydraulic motor with chain drive to reel drum.
4. Direct hydraulic drive with hydraulic motor mounted in the reel drum.

Reel drum speed variation is entirely dependent on prime mover rpm and/or gear selection in the 100% mechanical linkage. Reel drum speed is variable by controlling the flow of hydraulic fluids and/or gear box selection in the hydraulic system, completely independent of prime mover speed change.

The direct drive configuration is a smaller package than the transmission gear box configuration and is adequate for most oil well operations such as temperature and directional surveys and depth measuring. Where very slow line speeds and line pulls up to the breaking strength of the line are desired, the three speed gear box configuration is available.

The accompanying graph will assist in selection of adequate power to drive your reel. The horsepower requirement is determined by: The line recovery speed desired and the total weight of the measuring line and tools to be hoisted from the well bore. The estimated drag of the tools and line in the well bore must also be included.

HALLIBURTON SERVICES

The brake discs contact machined surfaces on both heavy drum flanges. Both the clutch and disc brake were selected because of their anti-fade characteristics and their resistance to mud, water and oil spray that are so common in wire line service operations. The disc brake is operated by a standard automotive-type master cylinder that is actuated by a draw-works-type brake lever. Brake maintenance is simple and linings may be replaced in a matter of minutes.

No. 805.4001 has a line capacity as follows: 52,000' of .066"; 43,000' of .072"; 33,000' of .082"; 26,000' of .092"; 14,000' of .125"; 11,000' of 9/64"; 9,000' of 5/32"; 6,500' of 3/16"; 3,500' of 1/4" or 2,300' of 5/16".

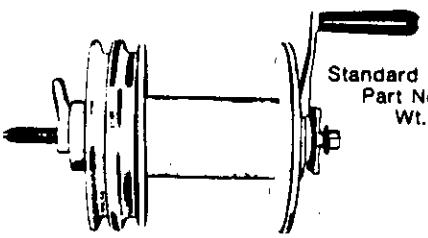
The XLC Reel illustrated is shown with the mounting arms for the Special XLC Measuring Device. These mounting arms are not included in the reel assembly part number. They will be supplied with a measuring device when specified.

## XLH Reel Assembly Extra Line Hydraulic Part No. 805.4005

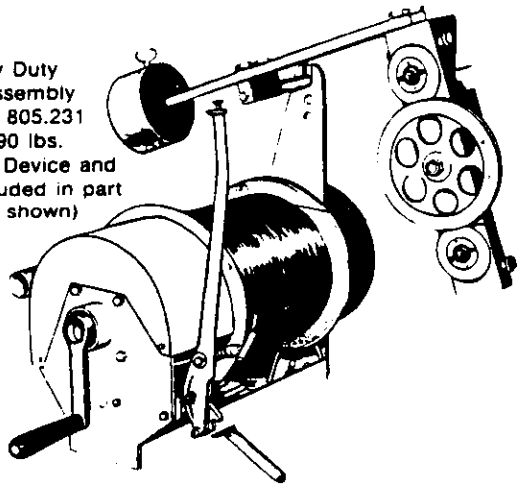
The XLH Reel Assembly is an ideal unit for work on offshore platforms; it permits rapid recovery of wire line and instruments from deep holes and heavy mud systems. The reel drum has a large carrying capacity for various size wire lines and cables. It is fabricated in one piece and is heat treated for strength.

No. 805.4005 has a line capacity as follows: 43,000' of .082"; 34,000' of .092"; 18,000' of 1/8"; 15,000' of 9/64"; 12,000' of 3/32"; 10,000' of 3/16"; 5,000' of 1/4"; 3,500' of 5/16".

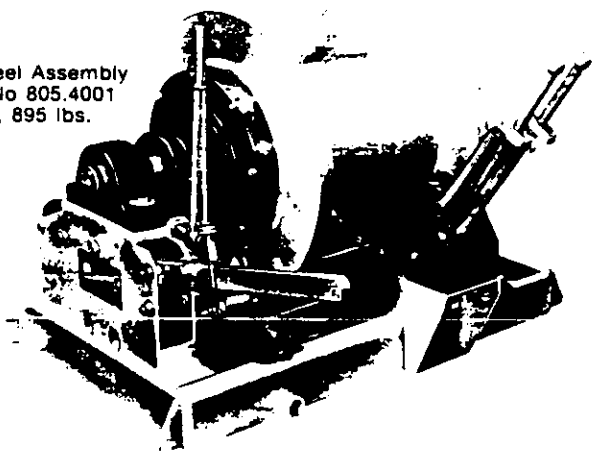
The simplified operation of the XLH is possible because the hydraulic motor is mounted inside the reel drum. The high capacity reel drum has a 22-inch outside diameter and a 12-inch spooling core and is 17½ inches long. For stopping or holding the reel, a hydraulically operated, spot type disc brake is used. The brake discs contact machined surfaces on both reel drum flanges. The brake disc units were selected because of their anti-fade characteristics and their resistance to mud, water and oil spray. The disc brake is operated by a standard automotive-type master cylinder attached to a draw works type brake lever.



Standard Reel Assembly
Part No. 805.0017
Wt., 98 lbs.



Heavy Duty
Reel Assembly
Part No. 805.231
Wt., 190 lbs.
(Measuring Device and line not included in part number shown)



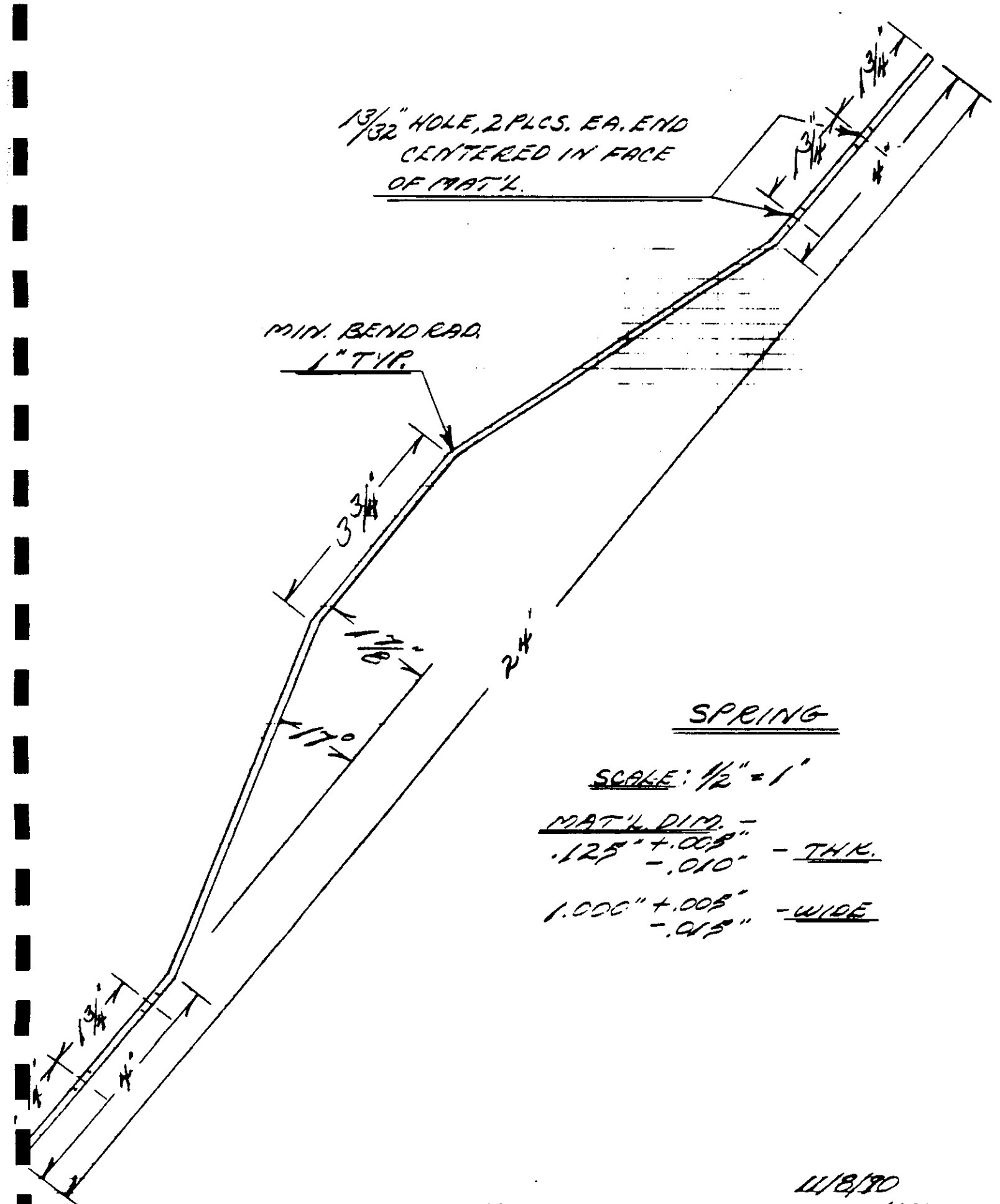
XLC Reel Assembly
Part No 805.4001
Wt., 895 lbs.

## ANTI-TORQUES

A new anti-torque arrangement has been designed and built. It replaces, but yet is compatible with, the existing anti-torque assembly. The new configuration incorporates wheels mounted on the anti-torque springs that will allow the anti-torque to move freely up and down the borehole. These wheels are designed so that more than one wheel per spring can be used if necessary. (See attached drawings) It also allows various wheel types to be tested. If desired, the wheels can be replaced with skates that would be compatible with the anti-torque springs.

The anti-torque sliders that the springs mount to have been increased to hold 6 springs per assembly. With a longer anti-torque slider shaft, additional slider assemblies can be added until the anti-torques provide adequate holding power for the ice conditions.

The idea is to have maximum flexibility of the system so that various combinations can be used to match the conditions encountered.




## SPRING

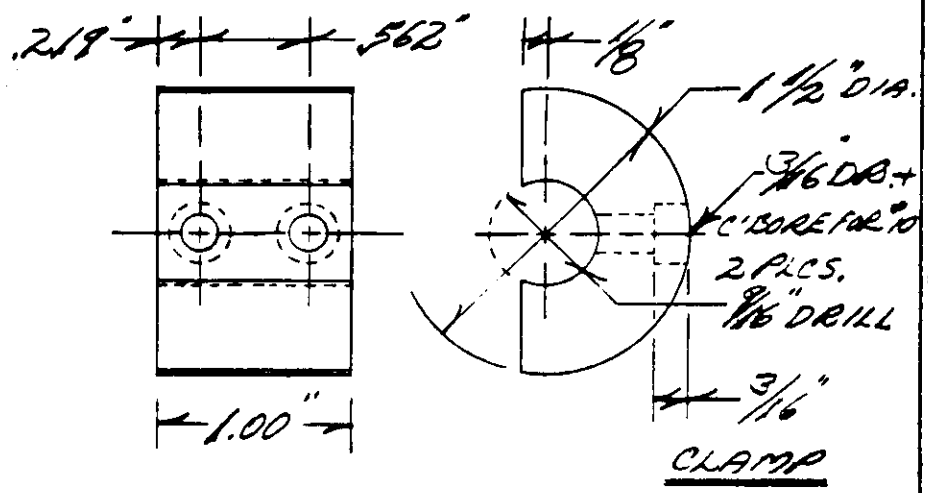
SCALE: 1/2" = 1"

MAT'L DIM. –

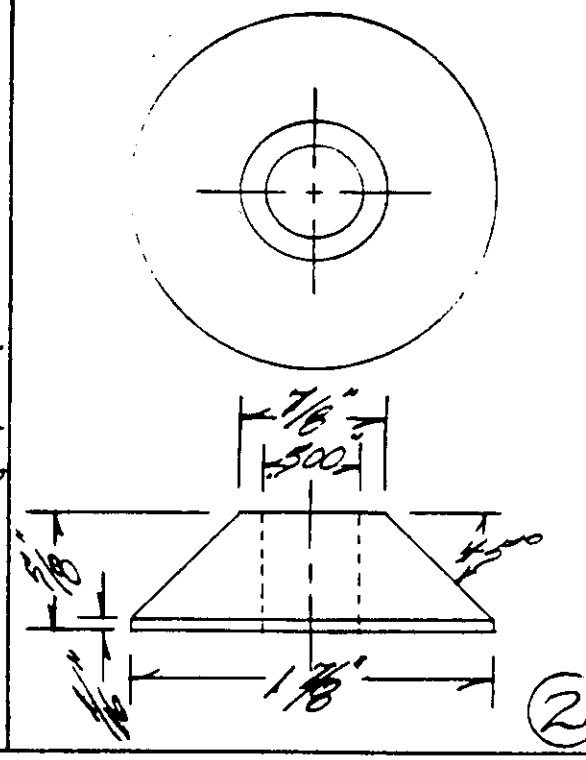
.125" +.005" −.010" – THK.

1.000" +.005" −.015" – WIDE

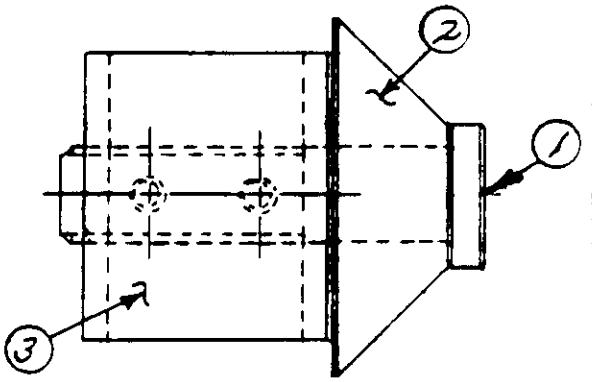
11/8/90
LYK

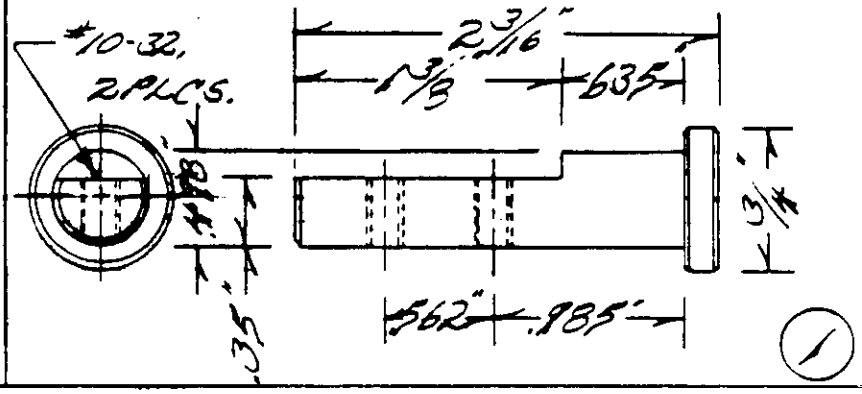

.219"
.562"
1.00"
1/8"
1 1/2" DIA.
3/16 DIA.+
C'BORE FOR #10
2 PLCS.
9/16" DRILL
3/16"

CLAMP

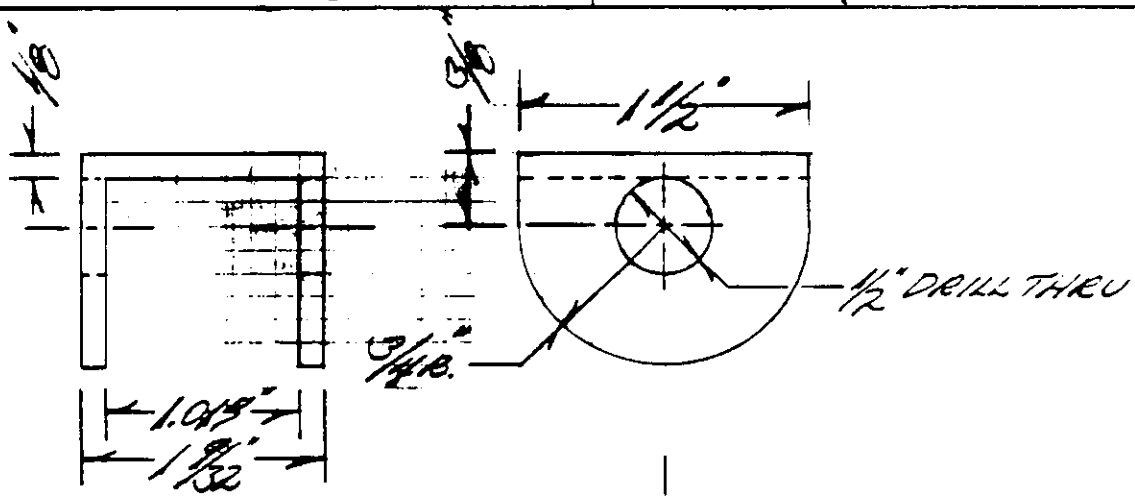

7/8"
.500"
5/8"
1 1/8"

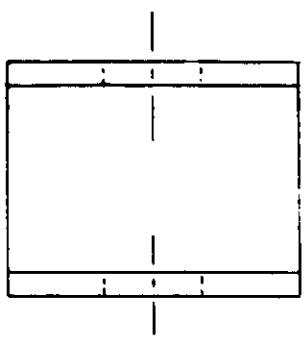
(2)


2
1
3


#10-32,
2 PLCS.
2 3/16"
1 3/8"
.635"
.418"
.35"
3/4"
.562"
.985"

(1)


1/8"
3/8"
1 1/2"
1/2" DRILL THRU
3/4"R.
1.015"
1 9/32"



(3)

## MOTOR SECTION MODIFICATIONS

Due to the detrimental effect of running the drill motor immersed in butyl acetate, it was decided to seal the motor inside the motor section which is in turn filled with oil. This is a common practice in the deep water well industry and lends itself well to our present design. The DC drill motor and gear reducer will be housed inside the sealed, oil filled motor section. This will prevent the infusion of butyl acetate into the motor and gear reducer. Two types of oil are being tested in the motor section. Both are compatible with the materials used in the construction of the motor and gear reducer as well as the seal and O-ring materials. The two oils being examined are Texaco brand type 1600 transformer oil and Texaco brand aircraft hydraulic oil type 15.

The incorporation of a fluid filled motor section will certainly lengthen the service life of the components by removing them from direct contact with butyl acetate.

A synopsis of the effects of butyl acetate is included for review.

DC DRILL MOTOR INSPECTION EVALUATION
GISP2 1990 FIELD SEASON

Manufacturer Industrial Drives
201 Rock Road
Radford, Virginia 24141

Model No. TT-29370-1010CA
Serial No. 90B152-31

This DC motor was used in the motor section of the 1990 version GISP2 wet drill. It is estimated that total time of useage is between 50 and 100 hours running time. Sudden and violent current surges indicated problems with the motor and it was replaced. Upon return to Fairbanks it was dismantled and inspected with the following observations.

Corrosion of the external case was evident but attributed to the shipping conditions encountered when retrograded from the field.

Bearings- The bearing seals were all intact with no obvious breakdown of seal material. All lubrication had been washed out of the bearings and as a result had failed. The bearings were not frozen but felt rough when turned by hand.

Armature- The varnish insulation on the armature was inspected closely and found to have broken down in the area where two wires were in close proximity to each other. Bare spots on the wire and bubbling of the varnish were also observed. Also visible were several wear spots on the armature laminations where it had struck the magnets. This was attributed to the bearing failure allowing misalignment of the armature in the magnet housing.

Brushes- The brushes were well worn and had little useful life left. An inspection of these brushes took place a short time before the motor failed and were found to have very little wear at that time.

Commutator- Inspection of the commutator revealed arcing and over current conditions. The commutator was well worn where the brushes made contact. Some carbon dust was present imbedded between commutator segments.

Magnets- The adhesive used to secure the magnets to the motor housing had deteriorated and several magnets were loose.

## HEAD STATUS

The drill head used during the 1990 field season has been modified. A more open chip path has been created. This will give a smoother path for chip flow whether drilling wet or dry.

A number of other changes will be incorporated for this drill head during the 1991 field season. The lack of an adequate cutter supply has been addressed and a more substantial selection of cutters will be on hand. Two different styles will offer a wider selection to address the different types of ice that are expected to be encountered during the 1991 season.

The sparse selection of cutter shoe geometries were another shortcoming. A penetration angle of 1.2 degrees was the only option on site. This caused frustration in the tuning of the head to match the anti-torque holding power. This season we will have 3 different penetration shoe geometries. .8, 1, and 1.2 degrees.

The new version wet drill head is progressing nicely. The machine shop at the Geophysical Institute led by Larry Kozycki is producing 2 of the 1991 version heads. With the recent addition of a 4 axis CNC vertical mill, a number of valuable prototype cutters can be produced much more quickly. This will allow the luxury of further performance tests before being deployed in the field.

This new version head has also undergone several design changes and improvements. The 3 piece cutter design has been replaced with a single cutter ring. This will allow a more accurate and quicker change over when a new cutter assembly is required. It is also easier and quicker to machine which will aid in having a greater selection of cutters on hand without prohibitive cost. Also, design changes in the field can be telexed back to UAF and the changes incorporated in metal and shipped out on the next flight period. This will be an improvement over the old style cutter configuration which takes 6-8 weeks to produce.

With the modifications to the old head as well as the attractive features of the new version, we expect to have the flexibility needed to produce the 2000 meter goal of the 1991 drill season.

## PUMP SECTION MODIFICATIONS

The pump used in the PICO deep drill is a Moyno type progressive cavity pump. The rotor is made of hardened tool steel and the stator was made of EPDM rubber. After approximately 100 hours of operation the pump failed. Upon inspection the stator was found to have excessive wear. First impressions would indicate degradation by immersion in butyl acetate, which was the case. Closer inspection revealed small fractured pieces of blue epoxy adhesive. These fragments of epoxy came from the casing in the upper 77 meters of the borehole. When the pump was dismantled, there were many pieces of epoxy imbedded in the wall of the stator.

In the 1991 version of the drill, the stator has been replaced by one made of teflon having two lobes instead of one as used in 1990. Teflon is not affected by butyl acetate and degradation is not expected to be a problem.

## VIBRATOR STATUS

The chip cleaning process used on the screen sections uses vibration as a vehicle to remove the chips. During the 1990 drill season an electric vibrator was used. It had a frequency of 3600 vpm with a maximum impact force of 220 lbs. Although a restricted chip path caused some difficulty in cleaning the screen, the vibrator was effective in getting the chips to clear after the lower screen coupling had been removed.

This year we will also have the electric vibrator on had. We will also have a pneumatic vibrator that will be tuneable in frequency and amplitude. Varying amplitudes can be realized by increasing the air pressure and frequency adjustments can be made by adjusting the timing device that controls the air delivered to the vibrator. This will allow the ideal frequency and amplitude to be applied to the screen section.

## 4000 METER WINCH STATUS

A new winch has been designed as is being built by Lebus International Inc., Longview, Texas. Lebus is recognized through out the rock drilling industry as a leader in innovative winch design. Lebus has developed and patented the grooving design incorporated on almost all heavy pull winch systems used in the petroleum industry. This grooving provides a more controlled loading of the cable as it spooled from one side of the winch drum to the other. This is particularly important for a Kevlar cable such as we use with the PICO deep drill.

The basic winch is of the drum type. Our first choice was a traction drive style of winch but proved to be prohibitively expensive as well as having a delivery time that would rival the next ice age. Therefore a drum type winch was selected.

The winch is hydraulically driven. It will have a capacity of 4000 meters of Cortland cable. The winch drum has been designed specifically for this cable. It is equipped with a levelwind assembly to insure proper winding of the cable without any overlap. This overlap can be very damaging to a cable, especially Kevlar. Speed, tension and payout controls are incorporated into a turn sheave mounted at the base of the drill tower. These parameters are displayed at the control panel located in the control room. All critical winch functions will be controlled by the operator. An emergency band brake has also been selected in case of power failure or other emergency.

The prime mover providing the hydraulic power to operate the winch will be a separate unit located up to 30 meters away. The diesel engine driving the hydraulic pump will be a Detroit diesel 4-71N engine with a hydraulic governor set at 70 HP at 1800 RPM. It is designed to run at an elevation of 3800 meters with an operating temperature range of down to -40 degrees C. A plethora of safety features are incorporated into the design as well.

With the depths expected to be reached in the 1991 drill season, trip time will become a more important factor in core production. The 4000 meter winch will have a retrieval rate of up to 150 meters per minute.

SPECIFICATIONS, HYDRAULIC POWER UNITS
FOR WINCH DRIVE, ARCTIC OPERATIONS

I. Environmental Conditions

A. Altitude - 12,500 ft.
B. Operating Ambient Temperature - -40 Degrees F to +40 Degrees F
C. Storage Temperature - -80 Degrees F
D. Sound Attenuation - 70 dba at 10 meters
E. Chemical Resistance - All materials resistant to Butyl Acetate and Alcohol

II. Engine Specifications, Detroit Diesel 4-71N engine, hydraulic governor 70HP (hydraulic) at 1800 RPM

III. Engine Safeties and Accessories

A. Cold weather starting
B. Overspeed shutdown
C. Low oil pressure shutdown
D. High coolant temp. shutdown
E. Loss of coolant pressure shutdown
F. Engine block heater
G. Engine oil sump heater
H. Battery heater
I. Fuel tank heater
J. Hydraulic tank heater
K. Battery charger
L. Fan clutch with thermostatic control

IV. Packaging Requirements

A. Oil field type skid, I beam construction, with solid bottom plate
B. Fuel tank, 50 gallon capacity, for approximately 10 hours running, with connections and valving for external fuel supply
C. Hydraulic tank - 30 gallon capacity
D. Hydraulic system filters - suction strains, charge pressure filter (10 micron), high pressure filters (2 ea) 10 micron with reverse flow check valves
E. Connection panel on exterior of enclosure for hydraulic power, electrical power, and instrumentation
F. Sound attenuating, weatherproof enclosure for engine, fuel and hydraulic tanks, hydraulic system. Air inlet and exhaust louvers thermostatically controlled by D.C. motors
G. Hydraulic pump, engine driven, closed loop hydrostatic, pressure compensated with electro-hydraulic direction and pressure controls for remote control. Denison Model P7P-1R1A-601.

V. Controls and Instrumentation

A. Engine gages, electronic, LCD
   1. Oil pressure
   2. Coolant temperature
   3. Voltmeter
B. Hydraulic system, electronic, LCD
   1. Charge pressure 0-600 psi
   2. Main loop pressure - 0-10,000 psi
C. Controls
   1. Hydraulic pump control, electronic, flow and direction
   2. Hydraulic pump pressure control, electronic
   3. Engine speed control, electrical, idle and governed speed
D. Winch instrumentation - Supplied by LEBUS INT.
E. Mounting - All controls and instrumentation mounted on a stainless steel, engraved panel. Customer to mount panel.
F. Interconnect cable from power unit to control enclosure with jumper cable from control enclosure to control panel. Interconnect cable stored on hand powered reel.

VI. Power Hose Reel and Hoses

A. Hose reel to store and reel in and out power hoses and case drain hose.
B. Reel power by hydraulic pump driven from engine cam tower. Speed and direction controls mounted at reel.
C. Power hoses, 1 1/4 I.D., 150 feet long, with quick disconnects, rated at 5000 psi working pressure. Hoses covered with teflon tube for chemical resistance.

VII. Current Exceptions to Specifications

The following exceptions are based on limitations of current commercially available components and quoted price of unit.

A. Unit shall not be operated or transported at temperature below -40 Degrees C
B. Pump controller and pump pressure control electronic components operation and storage temperature limited to -20 Degrees C.
C. All other electronics may operate at -40 Degrees C but storage temperatures are limited to -65 Degrees F.

# DRAFT

## Phase-In GISP2 1991
Febuary 1,1990

There will be 26 to 29 camp and science personnel during the first month of camp operation. The following are areas that will be addressed during this time.

1 Establish radio contact with both the 109th and PICO Sondi

2 Install and activate TELEX system

3 Install and activate weather instruments

4 Dig out, preheat and activate 931 CAT and Tucker

5 Dig out and relocate groomer to surface, make required repairs

6 When 931 CAT and groomer are operational - begin flightline preparation- this will begin with the center line working to both edges

7 Dig out generator & bath modules

8 Preheat and activate CAT generators

9 Reconnect supply and waste lines between "Big House" & bath module

10 Activate snow melter

11 Dig out shop and storage Weatherports

12 Reconnect all plumbing lines in Big House

13 Grade and compact berthing area for Weatherports

14 Establish distances between berthing structures prior to erecting

15 Erect 15' x 30' berthing Weatherport

16 Erect 15' x 40' berthing Weatherport

17 Erect 15' x 40' berthing Weatherport

18 Erect 15' x 20' berthing Weatherports 2 each

19 Dig out and remove 15' x 20 Weatherport entrance

20 Erect 15' x 20' for drillers berthing

21 Level Big House if required

22 Remove carpet in kitchen and paint both galley and kitchen floors

23 Install book shelves in dining area

24 Excavate entrances to science trench

25 Remove cap for drill dome

26 Groom area for new15' x 40' science Weatherport and 16' x 16' JW

27 Erect both science Weatherport and JamesWay

28 Erect both above science structures

29 Re-plumb bath house

30 Re-excavate alcoves

31 Install wiring and ventilation in CPT

32 Install frequency controller for main exhaust fan

33 Construct new lab van entrance

34 Install freezer extension panels, recirculation duct work and defuser
35 insulate duct work as appropriate

36 Relocate compressor

37 Excavate 12' x 34' relaxation trench

38 Replace doors as required

39 Install improved water supply piping in lab van

40 Erect dressing room structure for Safety apparel - does this require heat?

4 1 ATM what assistance will be required - in Sondi - on site -?Sky lights and entrance extensions

4 2 Electrical upgrades: Trench lighting, intercoms, alcove lighting, drill dome improvements and generator module

4 3 Towing yokes for Magline sleds

4 4 Boxes for Ram and vapor sampling, tables and furnishings inside science structures, tables and frames for dome

# FACILITIES
January 31,1991

## BIG HOUSE

Remove window and door blanks
Re-connect all plumbing
Install water hydrostatic pressure valve on storage tank
Complete plumbing in Big House bath
Complete interior of bath finish work
Remove kitchen carpet, apply nonslip decking paint
Re-stretch carpet in Big House dining area

### Bath Module

Install pressure tank
Re-plumb supply piping to showers
Panel shower stall

### Generator Module

Activate and modify melter circulation system
Install make-up air fan
Upgrade service entrance boxes
Install auto oil level/shut down devises

### Berthing

Erect 2 each 15' x 40', 1 each 15' x 30' and 3 each 15' x 20' Weatherports

### Drill Dome

Construct 8' x 8' x 8' and 8' x 8' x 24' dog houses, these would have three sides and would be removed at the end of each season

### Relaxation Trench

Excavate a new 12' x 34' trench and install roof assembly

### Freezer extension

2' panels will be added to the existing unit

### Compressor relocation

This will be relocated to the side of the Dome similar to the Exhaust fans now in place

Lab Van

A new entrance will be installed on the roof of the existing Lab Van
Water distribution and drainage will be modified

Science Weatherport & Jamesway

To be erected in an undetermined location, connection, doors and entry way to be discussed

Science Trench

Alcoves will be re-excavated and new doors installed in some locations there will be an additional escape ladder installed in the emergency exit
Roof

ATM

Not defined at this time

Communications and Weather

The C.C.T. from the U.S.A.F. will evaluate how we might improve our weather monitoring and our antenna system

## GISP-2 1991 PUT-IN PERSONNEL

Febuary 1, 1991

| Position | Name |
|---|---|
| Camp Manager | Jay KLinck |
| MEDIC | T.B.A. |
| Cook | Sarah Sturges |
| Cook Asst. | TBA |
| Electrician | Paul Sulinare |
| Plumber | Sam Lamont |
| Mechanic | Pat Smith |
| Equipment Operator | Jake Matluka |
| Carpenter | Rob Coats |
| | Bill Danford |
| | Travis Larson ? |
| G.F.A. | Bill Barber ? |
| | Lesia Prestridge |

Note:
The electrician and plumber will leave at the end of the second flight period. Two of the carpenters will also leave at the end of the second flight period however, if required, will stay on until required work is complete.

| Drillers | Name |
|---|---|
| | Terry Gacke |
| | Mark Wumpkes |
| | Plus 4 others T.B.A. |

| Science Personnel | Name |
|---|---|
| | Mark Twickler |
| | Bill Kimball |
| | Jack Dibb |
| | Travis Sailing |
| | 2 others T.B.A. |

**USAF Combat Control Team**

Three memebers T.B.A.

Note:
At this time the three C.C.T. group form the U.S.A.F. are plannig on being in Greenland for the put-in flight period until the beginning for the May.

There will be a total of 29 people arriving at GISP2 during the first flight period.

## SAFETY TRAINING
February 1,1991

**PICO Sondrestrom will be responsible for the following:**

Introduction to Sondrestrom

1. Safe C-130 boarding and emergency exits
2. Brief on snow machine operation
3. survival bag review
4. Radio briefing - introduction only
5. Fire safety - film
6. Health, safety and environment overview

**GISP2 camp will be responsible for the following:**

1. Operation of Motorola portable radios
2. Operation of SC-120 (only for those who require training)
3. survival bag contents review:
   a. ELT operation
   b. Stove operation
   c. Survival procedures
4. Snowmobile safety
   a. operation
   b. minor repairs
   c. traverses and towing
   d. fueling
5. Review of how HALON fire extinguishers operate
6. Fire alarm drill response
7. Aircraft safety: working around a parked aircraft and boarding

Starting with the least initial cost, as we discussed this past season, is the use of insulated blankets to cover the already in use core boxes.

Our suggestion is to procure three of these covers to use as a protective aid over the insulated boxes that are currently on site at GISP2 for movement of the ice to Sondrestrom.

**MATERIALS REQUIRED FOR CONSTRUCTION**
**INSULATED BLANKETS**

| | |
|---|---|
| 18oz. | Shelterite - 29yds.<br>outside fabric |
| 4oz. | Oxford nylon treated cloth - 29yds.<br>inside liner |
| | Duratherm - without covering Duratherm has a "R" factor of 8 - 29yds. |
| 2" | Velcro |
| 8 | D - rings |

These blankets would be made of panels that would easily roll up for storage and transport.

Manufacturing time = 3 weeks

Cost including labor and material = **$987.00ea.**

## KNOCK-DOWN PANELS

Another idea that has been discussed is the construction of a panelized insulated box that would "knock-down" for transport and storage.

The existing core boxes could fit inside the new design however it is optimally use with a collapsable core box.

This would work ideally with continuous flights from the ice cap on to the U.S.

The design that Mark Wumkes has configured has a cost projection of $5,000.00ea.

Constuction time = 30 days

His design is enclosed. See attachment A,B,andC.

## INSULATED AIR CARGO CONTAINER

Suggestions arose at the Tahoe meeting of an cold transport system currently used by commercial air lines.

Research into the procurement or leasing possiblities have lead to the AAR Brooks company that maufacture a container that is constructed on a standard Air Force pallet.

Although initially expensive this means of ice transport may prove to be the most, long term, economical as well as most convenient to use.

Delivery of May 1st if order recieved by Febuary 15th

Cost of unit = $33,500.00ea.

See attachment D.

## SUMMARY

The blankets will work fine with the current situatuion and if we continue to use the insulated core boxes.

» The insulated core boxes cost = $64.33 @ 46" x 15" x 10"
$52.20 @ 46" x 13" x 13"

» A box that would lay flat to be used in the air cargo container and in the knock-down box cost = $14.48ea. This cost includes shipping to Mcguire.

This box would not only save in initital cost but also in shipping weight and cube.

» The knock-down box would insulate well and would be handy if the ice retro went straight through to the states. If we had to take the box appart in Sondy then we deal with uninsulated boxes exposed to an ambient temperature up to 65°F. The unisulated boxes would also be less shock resistant, a factor to consider for the handling in Sondy and in the States. If the container remained sealed from the ice sheet to the States it would hold its temperature longer than the individual insulated core boxes ( figures are being collected to show the heat loss).

» The Air Cargo Container would be the most protective and offer the safest way to transport the ice core. With its self cooling capabilities it eliminates the dependencies on the ice storage in Sondrestrom. It obviously then would eliminate the handling of the ice core twice in Sondy and in the case of a long term landing in Goose Bay or Gander the unit could then be pluged in or operated on its diesel refridgerator.

The problems are of course the cost and the shipment of the containers back to Greenland.

We will work on the comparrison figures to outline the cost for each item.

Purchase cost + shipping cost

Also the "what if's".

We hope you have time before you arrive in Fairbanks to look this over and can do a bit of quick figuring yourselves to the pros and cons of any of the possibilities.

All the options have merit so what ever you folks decide on will work for us.

See you in Febuary with snow, cold and 6 hrs of light!

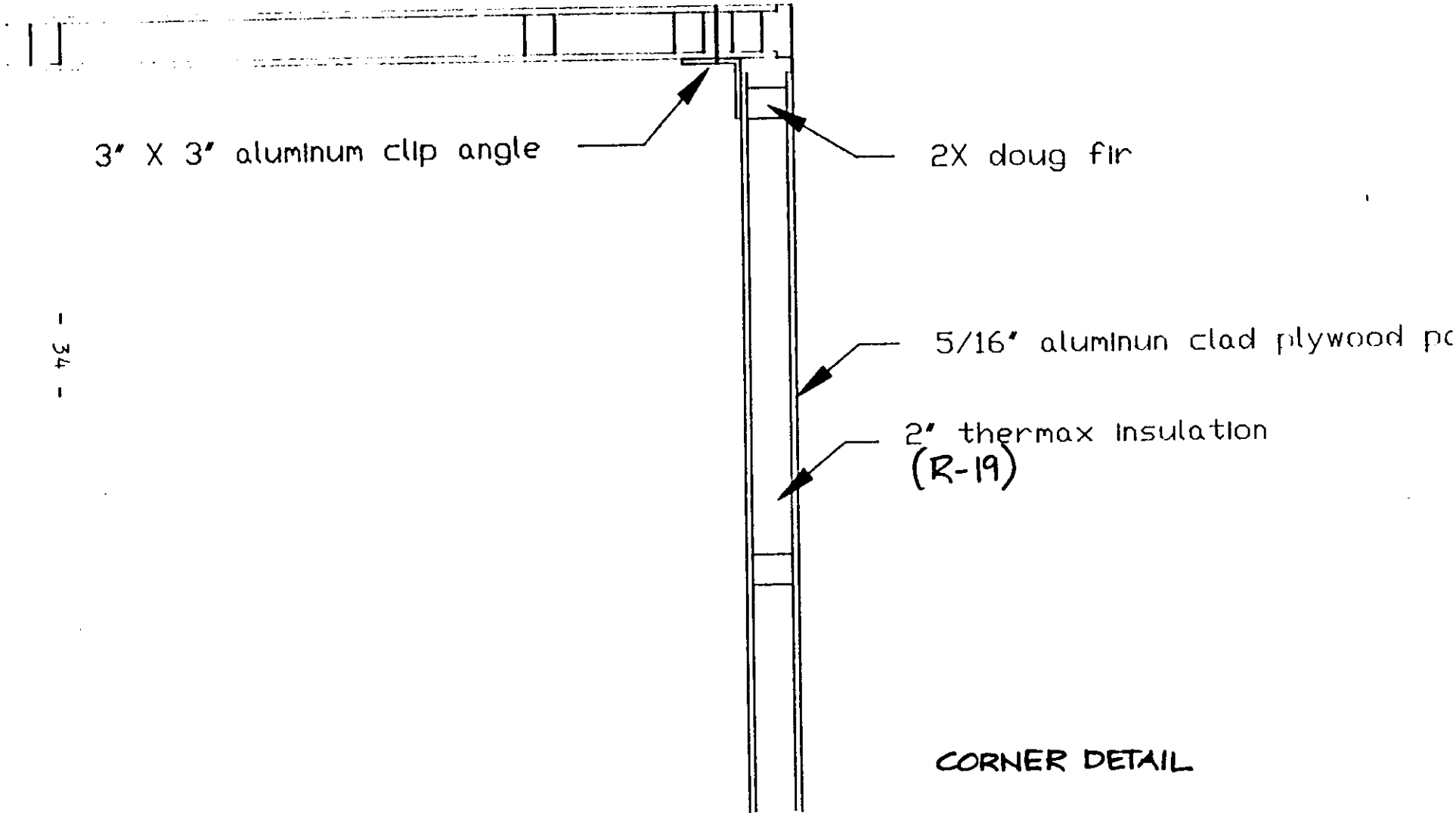
A

MATERIALS LIST- KNOCKDOWN SHIPPING CONTAINER

| | |
|---|---|
| 18 Sheets | Weyerhauser Panel 15 aluminum-clad. 4'x8' sheets, 5/16" thick. Available in two finishes. 1. Textured 10 mil aluminum with baked on acrylic finish on face and reflective 1.5 mil aluminum foil back. 2. Textured 10 mil aluminum with baked on acrylic finish both sides. Price- $87.51 per sheet. $1575.18 total |
| 32 sheets | 2'x8' rigid foam Thermax insulation. R-38. Price $7.45 each. $2384 total |
| 30 | 2x4x8' clear Doug fir $2.50 each. $75 total |
| 60' | 2x2x1/4" aluminum angle. $30 per 20' length. $90 total |
| | Misc. hardware and fasteners. $100 total |

This represents an estimate of materials to produce one unit. The total material costs at Alaska prices is $4224.18. This does not account for labor.

The shipping container will occupy a space when broken down that measures 102"x84"x22". Therefor three units when dismantled will fit on one pallet position that measures 66" high. This will allow enough room to also ship the cardboard core boxes on top when folded flat.




CORNER DETAIL

D

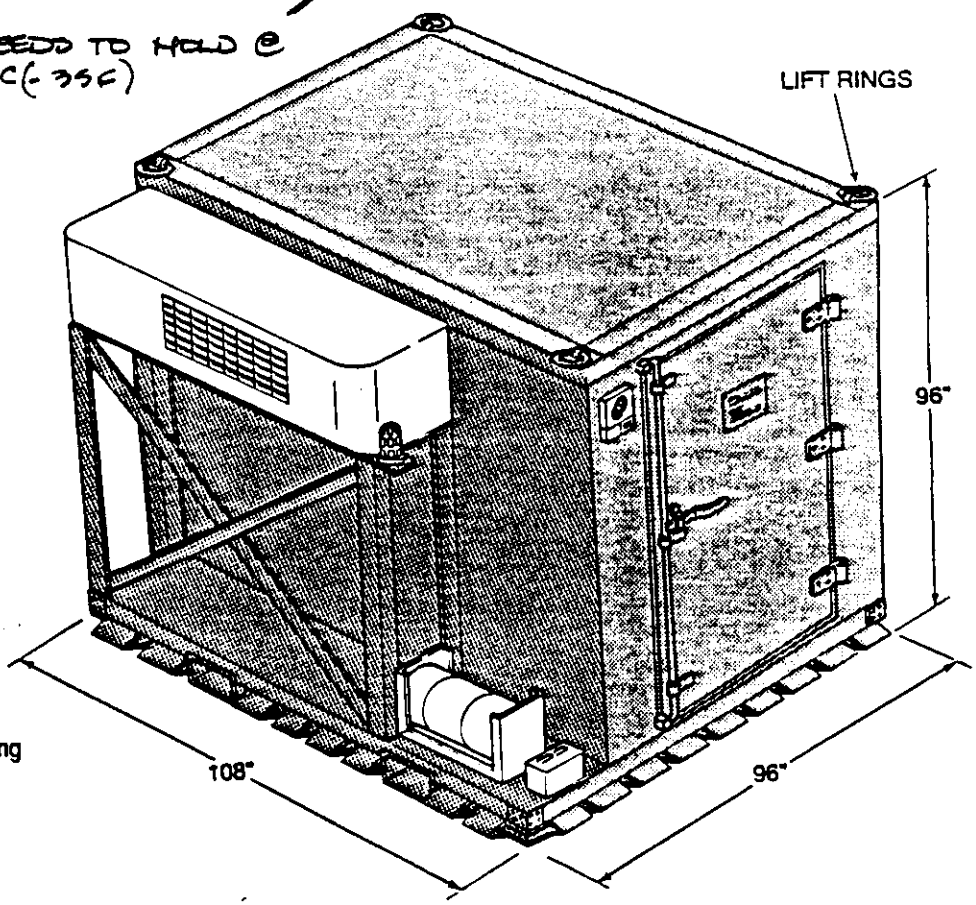
# ISU-96RC
## Insulated Air Cargo Container

TECHNICAL BULLETIN
No. 121.47
PART No. 50055-002

ACCORDING TO BETTY - JANUARY 21, TEMPERATURE WILL HOLD -15C (-35F)

### Capabilities

- Provides cold storage of temperature-sensitive goods on-site, and during transit
- Maintains temperature when used in sub-zero environments
- Completely intermodal
- Forkliftable with standard 10,000 lb. fork trucks (72" tines)
- Maintains temperatures from 16 °C (61 °F) to -6 °C (21 °F) ← NEEDS TO HOLD @ -15C(-35C)
- Reduces total airlift requirement
- 6,000 lb. capacity




### Features

- Size: 108" x 96" x 96"
- 6,000 lb. capacity, 220 cu. ft. minimum interior volume
- Weatherproof
- Military and commercial airlift compatible
- Temperature Data Recorder, 7 day capability
- Integral audio and visual alarm system
- Built-in automatic pressure relief valve
- Securable swing-out door with dual thermal seals
- FDA approved interior with crevis-free design for easy maintenance and servicing
- Lightweight and durable
- Deletes requirement for dry ice - allows carriage of passengers on same flight
- Operates on 50/60 cycle AC power or on integral diesel refrigeration unit

### Other Models

- ISU-96R: 175 cu. ft. 108" x 88" x 96"
- ISU-96RI: 165 cu. ft. 108" x 88" x 96" with aisleway provision (C-130 operation)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