Report of Meeting
L-60-1 Surveillance Panel
PRI Headquarters, Apollo Room, Warrendale, Pa.
June 21, 2006

Sign-in/Review of Membership: The meeting was called to order at 9:23 am. The sign-in sheet is ***Attachment 1***. A review of membership was not performed.

Meeting Agenda
The L-60-1 Surveillance Panel (SP) meeting agenda is included as ***Attachment 2***.

Approval of minutes:
The meeting minutes from the August 24, 2005 and November 2, 2005 Surveillance Panel are on the TMC website which can be found from the following path (ftp://ftp.astmtmc.cmu.edu/docs/gear/l601/minutes/).

Motion 1 (Motion ⇒ Cory Koglin, Second ⇒ Hector DelaFuente) To approve the August 24, 2005 Surveillance Panel meeting minutes as written with no corrections. The motion passed unanimously.

Motion 2 (Motion ⇒ Cory Koglin, Second ⇒ Brian Koehler) To approve the November 2, 2005 Surveillance Panel meeting minutes as written with no corrections. The motion passed unanimously.

Summary of Meeting Discussions

Oven Air Flow Calibration Procedure
The oven fan serves as the heat transport mechanism for keeping the oil temperature elevated at 325°F. Dating back to the June 11, 2003 SP meeting and with Information Letter 03-4, the presso venturi and dwyer digital manometer were implemented for calibrating the oven air flow in the D5704. This information letter not only specified the equipment but the calibration frequency and service provider. The SP found value in standardizing the equipment and calibration service as an effort to reduce lab to lab variability for average carbon varnish. Vastly different air flow values were formerly obtained at different labs from the use of different equipment and measurement techniques. Information Letter 03-4 identified the calibration service provider as Bowser Morner in Dayton, OH.

In order to refresh the panel members' memory, the chairman presented a drawing showing the venturi oven blower airflow meter and calibration process. The calibration frequency for the equipment is once per year. The Lubrizol lab recently sent its equipment out for the 2006 annual calibration and was informed by Bowser Morner that the meter had shifted approximately 30 percent across the entire operating range. Lubrizol's annual calibration records for the prior 2 years did not show much movement between the standard and their equipment. A reason for the shift could not be identified with the venturi and Lubrizol questioned the process.

Lubrizol had a spare venturi that was originally calibrated by Bowser Morner in 2002 and then placed in storage. With this device being in storage, it was doubtful that its calibration should have shifted significantly. The spare meter and calibration records were sent to Bowser Morner for a test. The test revealed a similar shift of 30 percent. It was determined that the Bowser

Morner lab had an error in their calibration process. The chairman requested a detailed explanation from Bowser Morner which is included as ***Attachment 3.***

The SP felt a wise action would be to consider an alternate supplier that is ISO 17025 certified. Mr. De Le Fuente has offered to search for an alternate supplier. Mr. Rae asked if a 30% shift would make a significant impact on the test. The chairman provided additional detail in an effort to provide more information to new SP members and guests. A change of this magnitude would certainly result in different operational warm-up times that would need to be addressed for meeting the required test warm-up in 45 to 60 minutes. In terms of test severity, it is unknown whether a 30% change in air flow would affect results such as ACV, sludge, viscosity increase, and insolubles. Knowing that standardization would only serve to bring the labs closer together on results, the SP elected to go to a common air flow measurement device without conducting testing. Numerous changes were made around this same time making it difficult to confirm the affects of these changes. Since the 2003 time frame, Mr. Lind mentioned that lab variability had been reduced.

Action Item: Mr. De Le Fuente has offered to search for an alternate calibration supplier for the panel to discuss at a future meeting.

ASTM L-60-1 Apparatus Drawings
Background
The SP chairman provided a background to prepare the panel for discussion and action. As believed to be a result of a long-term standardization effort, the current status of the L-60-1 is such that ACV severity has leveled off and lab-to-lab differences appear to be minimized. During the initial severity investigation, significant differences in performance between stands within labs were observed. The surveillance panel asked the task force to conduct an in depth review of the apparatus drawings that were never updated when the D5704 transferred from the L-60 to the L-60-1. This was a large effort for the task force and culminated in revised drawings being approved by the SP during the August 2004 meeting. The motion required all labs to be in compliance by January 1, 2005.

In previous meetings, the Surveillance Panel discussed the time commitment and logistical issues involved with conducting stand audits to review compliance with the drawings. While the intent was to have the TMC eventually review all stands at each lab, the Panel members agreed that it would be sufficient for the TMC to pick one test stand within a laboratory to conduct an initial review. Depending on the findings, additional stands could be checked on the first visit if the TMC felt it is necessary.

After the TMC first lab visit, Don Lind and the SP Chairman decided to wait until all visits were completed and then hold an L-60 Task Force meeting to discuss observations. This stemmed from the feeling that areas of identified as being noncompliant were insignificant to test severity. The task force met from 8:30 am until 3 pm on 6/20/06 to discuss the lab findings. Don Lind mentioned that measurement task was difficult because of the lack of a reference point such as determining distances between the centerlines of holes. There were many commonalities in the findings. The task force classified the observations into a three categories:

1. Parts being outside of tolerances and judged to be non-critical.
2. Parts being outside of tolerances and assumed to be non-critical while acknowledging that data doesn't exist to prove this hypothesis.
3. Parts being outside of tolerances and labs making changes to conform.

Between the lab visits and the Task Force meeting, outcomes were aimed at building a secondary set of drawings that contain performance specific dimensions which labs and the TMC can use to check the stand apparatus set-up. While most of the findings from the lab visits are felt to be noncritical to test severity, the Task Force felt that significantly modifying the existing drawings would compromise the ability to manufacture new rigs or replacement parts.

Attachment 4 details the TMC summary of drawing differences identified from the "single stand audit" by the TMC at each lab. Areas with issues are identified with handwritten dimensions or notes on the drawings. As an example, the chairman presented a couple dimensions out of compliance for one lab on the driveshaft. The lab was outside of the tolerances on snap ring groove width and location by thousands of an inch. The Task Force felt that the magnitude of these deviations weren't critical to test operation or severity. However these tolerances should not be increased because it could compromise future fabrication of parts.

The Task Force believes focus should be placed on apparatus dimensions that could affect test severity. An example of an adequate dimension in the test method would be the location of the thermocouple. The x, y, z dimensions for the installed thermocouple location is clearly labeled in the procedure. An example of a deficiency would be the location of the gears installed in the gear case assembly. Differences in the gear location could affect the lubricant splash and deposit formation. The Task Force agreed that more importance should be placed on the gear location and some flexibility should exist in the manufacturing of the shaft for locating the gears. Action items and details from the 6/20/06 Task Force meeting are included as ***Attachment 5***.

Mr. Lind provided a verbal summary of his lab audits. After completing all three lab visits, approximately 25% of the 19 drawings had some component dimensions outside of the tolerance on the prints. These are likely a result of the minor design differences at various labs, mostly due to the different production companies that manufactured the rigs. Other tolerance issues come from general wear on the hardware.

Per the previously approved motion from the June 15, 2004 L-60-1 SP meeting, the labs were to be in compliance with the revised drawings by January 1, 2005. In addition, section 6.2 of the D5704 standard (***Attachment 6***) does not allow much room for interpretation. Even though the discrepancies found during lab visits appear minor, the TMC voiced concern that the industry could be shutdown based on the interpretation of section 6.2 and asked the Surveillance Panel for guidance. Some panel members also voiced concern that the second sentence in section 6.2 could give future L-60-1 apparatus manufactures too much leniency in varying the product design. This margin could lead to future increase in test variability.

As for guidance to the TMC about handling the compliance issues identified in the lab audits, SP members commented about the deviations from the prints being very minor and not likely to impact the test. Additional points were raised about the L-60-1 test method utilizing stand severity bias adjustments which would mathematically correct any severity offsets in rig performance. The SP felt that shutting down the test from the findings in these lab visits was not warranted. The Chairman also commented that it would not be a wise use of resources to require labs to build new rigs for the purpose of addressing these minor deviations. The SP went on to agree that the L-60 Task Force should be allowed to continue on its plan to address critical performance areas. The TF action plan includes designing a template for locating the position of the gears within the case and building performance drawings that can be placed within the D5704 procedure.

The Chairman described to the panel a template that Lubrizol volunteered to develop (with help from the other two labs) that effectively would measure the X and Y distances and holes with in the template that would allow the TMC to use depth micrometers to measure all of the Z component measurements. The following action item was collectively agreed upon by the labs and committee members.

Action Item: By the November 2006 Panel meeting, the Task Force shall present the proposed performance drawings with critical dimensions and new template for locating the gears within the gear case to the Surveillance Panel members for discussion. The SP will also need to address section 6.2 with any proposed changes at that time. SwRI and Lubrizol will work collectively to develop the performance drawings within the TF and build a template for confirming gear placement. Also noted was that there will be a 30-day implementation time frame after the November implementation.

Attachment 5 details the issues needing resolved and the Task Force proposal for modifying section 6.2.

Task Force Recommendation on Saving Parts.

During the L-60-1 Task Force meeting, Mr. Lind indicated that some panels had previously approved motions directing labs to keep parts for them to be used at the Gear Rating Calibration Workshop. However no memo was ever issued and the panel requests have gone unheard or forgotten in some instances. In an effort to draw attention to the need for keeping parts to conduct future Gear Rating Calibration Workshops the Task Force requests all L-test Surveillance Panels, including the L-60-1 SP, to adopt a motion for the TMC to issue a memorandum requiring all labs to follow. Page 3 of ***Attachment 5*** details the Task Force Recommendation on saving reference test parts.

Motion 3 (Motion ⇒ Bill Sullivan, Second ⇒ Cory Koglin) The L-60-1 Surveillance Panel directs the TMC to issue a memorandum for all labs to keep the rated parts for all reference tests for 1-year from the end of test. The parts are to be made available to the TMC for purposes such as Gear Oil rating Calibration Workshops or other defined panel needs.

Motion Results: Passed

In favor: 6
Opposed: 0
Abstain: 0

Procedural Housekeeping Items

Section 12 of the D5704 pertains to the cleaning of the catalyst strip after the test. Section 12.1.1 specifies to remove the deposits by soaking in Oakite 811 or Penmul L460 but places a limit of 30 minutes. A lab requested to either add a tolerance or make the 30 minute limit approximate. Knowing that the purpose is to remove the deposits, it was decided that a fixed time limit was inappropriate. The 30 minutes could be left as a guide but flexibility was needed.

Motion 4 (Motion ⇒ Cory Koglin, Second ⇒ Hector De Le Fuente) Direct the TMC to issue an information letter to clarify the 30 minute soak time in Section 12.1.1 of the D5704 as approximate.

Motion Results: Passed

In favor: 4
Opposed: 0
Abstain: 2

Mr. Don Bartlett questioned a house cleaning issue with respect to sections 6.1.8.1 and 6.1.8.3 containing duplicate contents with the Presso Venturi air flow meter calibration requirement. The SP felt the changes were editorial and could be cleaned up through the next information letter.

Action Item: Mr. Farber indicated that the TMC will do a 'housekeeping clarification' to address Section 6.1.8.1 and 6.1.8.3 which will be released with the next information letter.

The meeting was adjourned at 10:54 am (Mr. Smith/Mr. Koglin).

Respectfully submitted,

Chris Schenkenberger
L-60-1 Surveillance Panel Chairman

ASTM L-60-1 Surveillance Panel Membership/Mailing List

Meeting Date: ~~November 2, 2005~~ June 21, 2006

Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
	Anderson, H.	Non-voting	Falex Corporation 1020 Airpark Drive Sugar Grove, Illinois 60554-9585	Phone: 630-556-3669 Fax: 630-556-3679 E-Mail:
DTB	Bartlett, Don	Non-voting	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092	Phone: 440-347-2388 Fax: 440-347-2878 E-Mail: dtb@lubrizol.com
DRB	Bell, Don	Non-voting	Afton Chemical Corporation 500 Spring Street Richmond, Virginia 23219	Phone: 804-788-6332 Fax: 804-788-6342 E-Mail: Don.Bell@aftonchemical.com
	Boschert, Tom	Non-voting	Afton Chemical Corporation 2000 Town Center, Suite 1750 Southfield, MI 48075	Phone: 248-350-0640 Fax: 248-350-0025 E-Mail: tom_boschert@ethyl.com
	Bryson, Tom	Voting	Mack Trucks 13302 Pennsylvania Avenue Hagerstown, Maryland 21740	Phone: 301-790-5454 Fax: 301-790-6744 E-Mail: tom.bryson@macktrucks.com
	Buitrago, Juan	Voting	Chevron Oronite Co. 100 Chevron Way Richmond, California 94802-0627	Phone: 510-242-1161 Fax: 510-242-3392 E-Mail: jabu@chevrontexaco.com

* Initial to indicate attendance at subject meeting

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ASTM L-60-1 Surveillance Panel Membership/Mailing List

Meeting Date: ~~November 2, 2005~~ June 21, 2006

Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
	Chambers, Harold	Non-voting	Cube C290 81 17000 Rotunda Drive Dearborn, MI 48120	Phone: (313) 755-4246 Fax: E-Mail: hchamber@visteon.com
	Comfort, Allen	Non-voting	AMSTA-TR-D/210 (Allen Comfort) U S Army Tank, Automotive, and Armament Command Warren, Michigan 48397-5000	Phone: 586-574-4225 Fax: 586-574-4244 E-Mail: comforta@cc.tacom.army.mil
DMF	De La Fuente, Hector	Voting	Southwest Research Institute 6220 Culebra Road San Antono, Texas 78238	Phone: 210-522-5996 Fax: 210-680-1777 E-Mail: hdelafuente@swri.edu
	DuBois, David	Non-voting	Performance Review Institute 161 Thornhill Road Warrendale, Pennsylvania 15086-7527	Phone: 724-772-1616, ext. 8136 Fax: 724-772-1699 E-Mail: dubois@sae.org
	Duckstein, Ron	Non-voting	Parc Technical Services Inc. 100 William Pitt Way Pittsburgh, Pennsylvania 15238	Phone: 412-826-5115 Fax: 412-826-5443 E-Mail: rhd@usaor.net
fmf	Farber, Frank	Non-voting	ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, Pensylvania 15206	Phone: 412-365-1030 Fax: 412-365-1047 E-Mail: fmf@astmtmc.cmu.edu

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Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
	Figueredo, Pedro	Non-voting	Intevep, S. A. Los Teques Edo. Miranda Apdo. 76343 Caracas 1070A Venezuela	Phone: (02) 9086793 Fax: (02) 9087723 E-Mail:
	Goyal, Arjun	Non-voting	ExxonMobil Research and Engineering Company 600 Billingsport Road Paulsboro, New Jersey 08066-0480	Phone: 609-224-2115 Fax: 609-224-3613 E-Mail:
JLG	Gropp, Jerry	Non-voting	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092	Phone: 440-347-1223 Fax: 440-347-1555 E-Mail: jlg@lubrizol.com
	Harold, Scott	Non-voting	Infineum USA L.P. 1900 East Linden Avenue PO Box 735 Linden NJ, 07036	Phone: 908-474-2318 Fax: 908-474-3597 E-Mail: Scott.Harold@Infineum.com
	Huron, John	Non-voting	Chevron Oronite 4502 Centerview Drive, Suite 210 San Antonio, Texas 78228	Phone: 210-731-5609 Fax: 210-731-5699 E-Mail: HURO@ChevronTexaco.com
	Johnson, Ron	Non-voting	Chevron Products Company 100 Chevron Way Richmond, California 94802-0627	Phone: 510-242-4374 Fax: 510-242-3385 E-Mail: rljo@chevron.com

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Meeting Date: ~~November 2, 2006~~ June 21, 2006

Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
	Koehler, Brian	Non-voting	Southwest Research Institute 6220 Culebra Road Bldg. 61 San Antonio, TX 78238-5166	Phone: (210) 522-3588 Fax: (210) 680 1777 E-Mail: bkoehler@swri.org
C.K	Koglin, Cory	Voting ~~Non-voting~~	Afton Chemical Corporation 500 Spring Street Richmond, Virginia 23219	Phone: 804-788-5305 Fax: 804-788-6358 E-Mail: cory.koglin@aftonchemical.com
	Layton, Kevin	non-voting ~~Voting~~	Afton Chemical Corporation 500 Spring Street Richmond, Virginia 23219	Phone: 804-788-5363 Fax: 804-788-6358 E-Mail: kevin.layton@aftonchemical.com
	Lee, Don	Non-voting	Elco Corporation 1000 Beltline Road Cleveland, Ohio 44109-2848	Phone: 216-749-2605 Fax: E-Mail:
DML	Lind, Don	Voting	ASTM Test Monitoring Center 6555 Penn Avenue Pittsburgh, Pensylvania 15206	Phone: 412-365-1034 Fax: 412-365-1047 E-Mail: dml@astmtmc.cmu.edu
TM	Marougy, Thelma	Voting	Eaton Corporation 26201 Northwestern Highway Southfield, Michigan 48037	Phone: 248-354-6985 Fax: 248-354-2739 E-Mail: thelmaemarougy@eaton.com

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Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
	Marty, Steve	Non-voting	Southwest Research Institute 6220 Culebra Road San Antonio, Texas 78238	Phone: 210-522-5929 Fax: 210-680-1777 E-Mail: smarty@swri.edu
	McGlone, Bruce	Voting	ArvinMeritor 2135 West Maple Troy, Michigan 48084	Phone: 248-435-9929 Fax: 248-435-1411 E-Mail: mcglonbf@meritorauto.com
SR.	Rea, Salvatore	Voting	Infineum USA L.P. 1900 East Linden Avenue PO Box 536 Linden NJ, 07036	Phone: 908-474-6602 Fax: 908-474-3597 E-Mail: Salvatore.Rea@Infineum.com
	Rettmann, Kevin	Non-voting	PerkinElmer Fluid Sciences 5404 Bandera Road San Antonio, Texas 78238	Phone: 210-706-1546 Fax: 210-523-4614 E-Mail: Kevin.Rettmann@perkinelmer.com
	Schenkenberger, Chris	Voting	The Lubrizol Corporation 29400 Lakeland Boulevard Wickliffe, Ohio 44092	Phone: 440-347-2927 Fax: 440-347-2878 E-Mail: csc@lubrizol.com
	Shah, Rajesh	Non-voting	Koehler Instrument Company 1595 Sycamore Avenue Bohemia, New York 11716	Phone: 516-589-3800 Fax: 516-589-3815 E-Mail:

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Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
	Smith, Dale	Non-voting	Parc Technical Services Inc. 100 William Pitt Way Pittsburgh, Pennsylvania 15238	Phone: 412-826-5051 Fax: 412-826-5443 E-Mail: dsmith@parctech.com
J	MIKE FOLLIS NON VOTING		DANA	419-887-3424 MIKE.FOLLIS@DANA.COM

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Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
WJS	Sullivan, Bill	Voting	ExxonMobil Chemical Company P. O. Box 3140 Edison, New Jersey 08818	Phone: 732-321-3354 Fax: 732-321-6064 E-Mail: william.t.sullivan@exxonmobil.com
	Vettel, Paula	Voting	D. A. Stuart Company 4580 Weaver Parkway Warrenville, Illinois 60555	Phone: 630-393-8859 Fax: 630-393-8577 E-Mail: pvettel@dastuart.net
	Villahermosa, Luis	Non-voting	AMSTA-TR-D/210 (Luis Villahermosa) U S Army Tank, Automotive, and Armament Command Warren, Michigan 48397-5000	Phone: 586-574-4207 Fax: 586-574-4123 E-Mail: villahel@cc.tacom.army.mil
	Whitton, Claire	Non-voting	Ethyl Research Center 500 Spring Street P. O. Box 2158 Richmond, Virginia 23218-2158	Phone: 804-788-5052 Fax: 804-788-6243 E-Mail: Claire_Whitton@ethyl.com
	Zakarian, Jack	Non-voting	Chevron Products Company 100 Chevron Way Richmond, California 94802-0627	Phone: 510-242-3595 Fax: 510-242-3758 E-Mail: jaza@chevron.com
	Zreik, Khaled	Voting	US Army TACOM AMSRD-TAR-D U S Army Tank, Automotive, and Armament Command Warren, Michigan 48397-5000	Phone: 586-574-4227 Fax: 586-574-4244 E-Mail: zreikk@tacom.army.mil

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Attachment 1
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L-60-1 Surveillance Panel

June 21, 2006
PRI Apollo Room – Warrendale, PA

Agenda

I. Call to order/Review Membership

II. Review agenda

III. Approval of meeting minutes
- August 24, 2005 L-60-1 SP Meeting
- November 2, 2005 L-60-1 SP Meeting

IV. Oven Air Flow Calibration Procedure
- Discuss recent issues with the calibration provider.

V. ASTM L-60-1 Apparatus Drawings

VI. Procedural Housekeeping Items
- Request to clarify 12.1.1
  - Pertains to cleaning copper catalyst.
  - Add tolerance to time limit of 30 minutes or make 'approximate'.

VII. New Business

VIII. Adjournment

Attachment 3
Page 1 of 2
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Schenkenberger, Chris

From: Michael W. Liberty [mliberty@bowser-morner.com]
Sent: Monday, June 19, 2006 9:12 AM
To: Schenkenberger, Chris
Subject: FW:

Chris,

Copy of what I sent Don.

Mike

From: Michael W. Liberty [mailto:mliberty@bowser-morner.com]
Sent: Friday, June 16, 2006 4:20 PM
To: 'DTB@lubrizol.com'
Cc: 'Duncan, Donald G.'; 'Kosztya, Steven L.'; 'Sortman, Thomas J.'
Subject:

Don,

Status of Venturi Flow Meter Calibration

We have determined that our calibration results for the Preso LPL200NF-38 Flow Meters were in error. While we had indicated that we were concerned with the reported values of the recent calibration, we had been unable to determine what had caused the deviations from previous history. After an in-depth investigation, we were able to locate the source of the discrepancies and have outlined the situation below.

Our historical calibrations were conducted using a 2 inch PVC flow straightening tube and an Alnor analog air velocity meter. The meter probe was inserted in the flow tube and the flow volume was calculated as Q = A * V, where A is the area of the tube cross sectional diameter and V is the air stream velocity.

Our current calibration was conducted using an in-line Omega, 0 to 40 SCFM, flow meter feeding into a 2 inch PVC flow straightening adapter. The readings we got were low, indicating a higher flow would have been achieved if the UUT had been used to set flow at 29.5 CFM as the ASTM requires. We had several people look at the set-up and took multiple readings, all with the same basic results. Our consensus at that time was that the UUT had somehow drifted, but questioned the results.

When we returned the UUT we requested that the backup unit be sent to us to be used as a verification of our set-up and procedure. We found that the second unit acted much the same as the first one (you had also been verified this on your L-60 stand prior to sending us the backup unit) and was reading low. Since, by design, this type of flow meter is not subject to much drift we now suspected our procedure and or set-up.

We proceeded to recalculate all of the test parameters and make sure our original standard data was good. We found it to be satisfactory in using both Ideal Gas Law calculations and the manufacturer's engineering data. We then checked our method for various size tubes and were able to obtain consistent results. Eventually we checked the Omega 0 to 40 SCFM in-line flow gauge. We found this unit to be out of specification when used in our application. We have ascertained that this gauge was causing the discrepancies.

We retrieved our analog Alnor standard velocity meter (which is not calibrated and has had to be replaced by a different unit) and performed the calibration using it with results similar to the historical data. We have two digital velocity meters and are in the process of adapting and calibrating one or both of them for use in a 4 inch velocity tube that the Preso units can be adapted to for calibration. Preliminary data indicates the Preso units are repeating historical data well within 1 sigma limits and we can proceed with their calibration once our setup is verified and calibrated.

We thank you for your patience in this matter and are sorry for the inconvenience it has caused. We expect to be returning your

calibrated units early next week. As we indicated from the start, we are dedicated to providing quality service and will continue to do whatever is necessary to provide that service to our clients. We appreciate your help is resolving this issue.

Mike

Michael W. Liberty, Manager
Analytical Services Division
Bowser Morner, Inc.

Attachment 3
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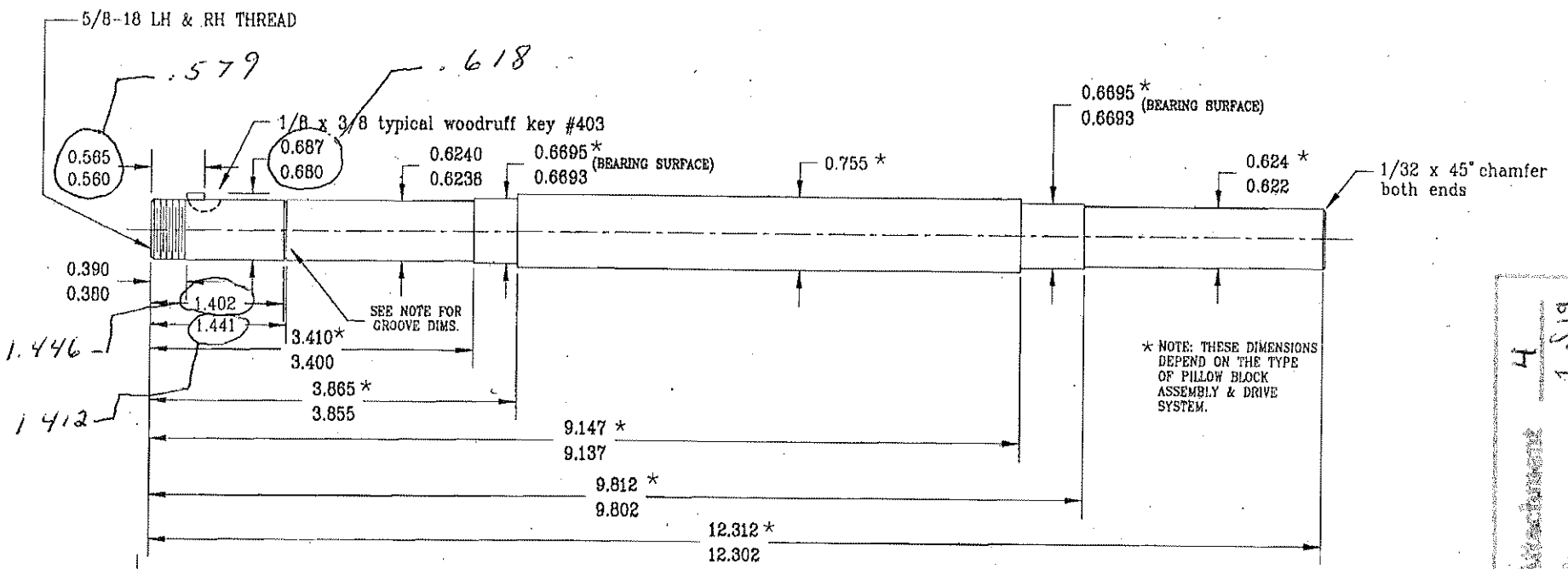
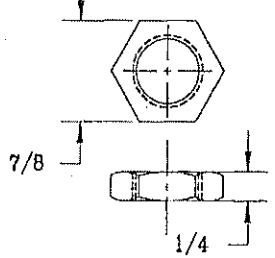
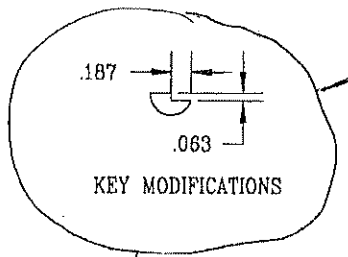
(SR) Top shaft





303 or 304 stainless nut
5/8-18 LH & RH



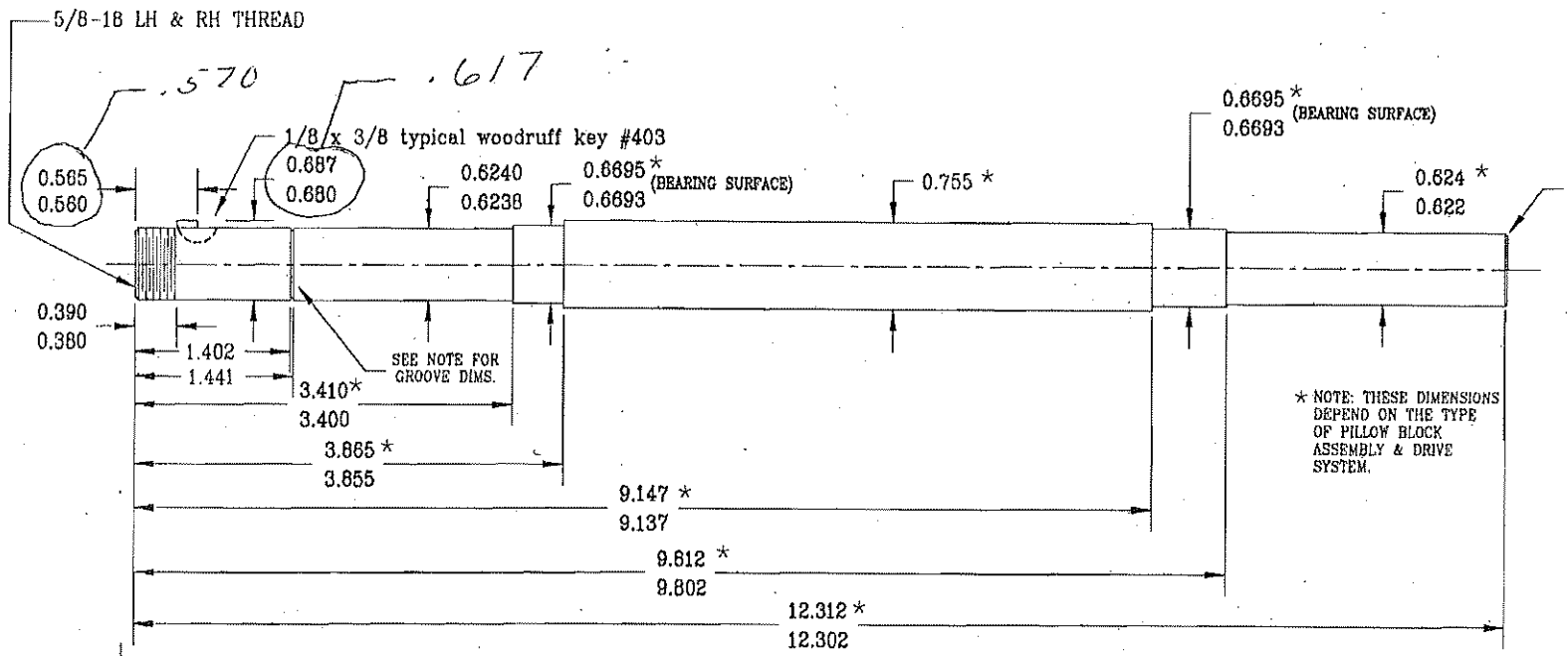
note- .015 rad all corners

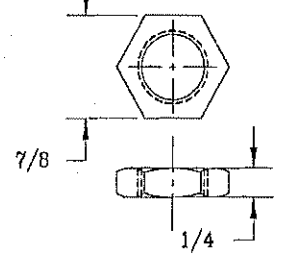
1 SHAFT-5/8-18 RH THREAD (DRIVER)
1 SHAFT-5/8-18 LH THREAD (DRIVEN)

GROOVE DIMENSIONS
DEPTH: .019 ±.001 — .0156
WIDTH: .039 ±.002

TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE A:74
DECIMAL ± .001	L-60-1	SCALE 1=1	DRAWN BY T. HABY
FRACTION ± 1/32	TITLE GEAR SHAFT AND NUT (EXTENDED)		MATERIAL DRILL ROD OR SS
REVISION 2	ANGULAR ±	DATE 15JAN2004	DRAWING NO B-1996-629-Z

(SR) Bottom Shaft

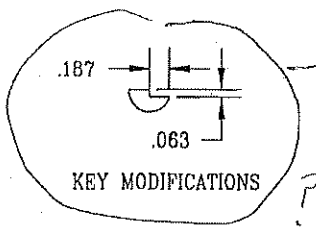




303 or 304 stainless nut
5/8-18 LH & RH

note- .015 rad all corners

1 SHAFT-5/8-18 RH THREAD (DRIVER)
1 SHAFT-5/8-18 LH THREAD (DRIVEN)



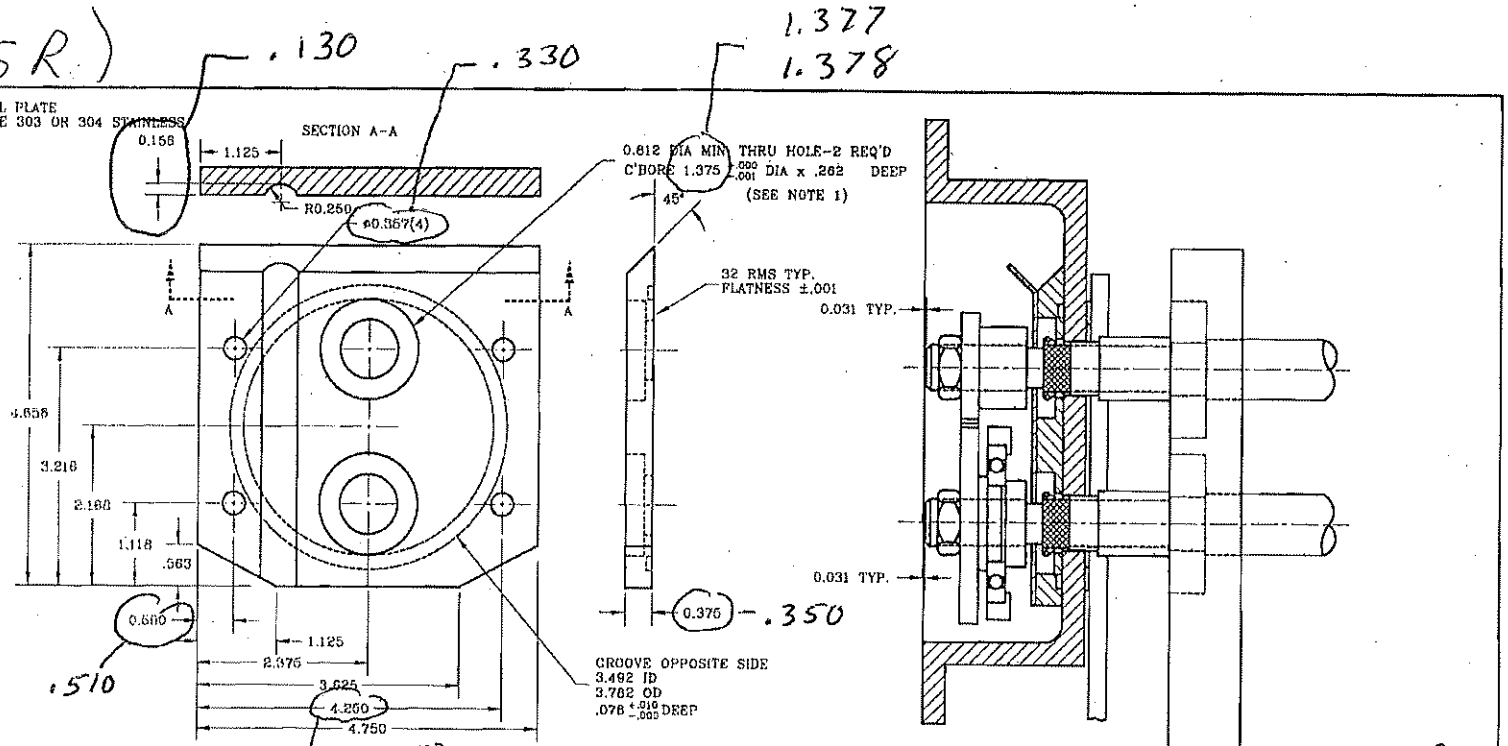
KEY MODIFICATIONS ?

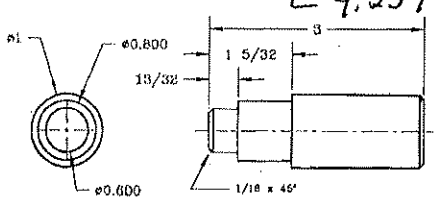
GROOVE DIMENSIONS
DEPTH: .019 ±.001 — .0156
WIDTH: .039 ±.002

TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE A:74
DECIMAL ± .001	L-60-1	SCALE 1=1	DRAWN BY T. HABY
FRACTION ± 1/32	TITLE GEAR SHAFT AND NUT (EXTENDED)		MATERIAL DRILL ROD OR SS
REVISION 2	ANGULAR ±	DATE 15JAN2004	DRAWING NO B-1996-629-Z

Attachment 4
2.5.19
Page Reference L-60-1

(SR)



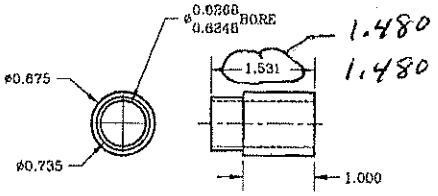


SEAL REMOVAL TOOL-CRS

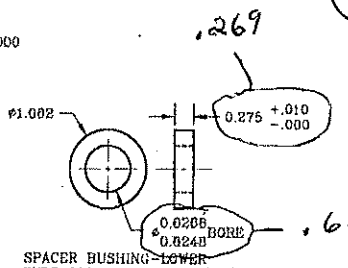
NOTE 1:
MATERIAL MAY BE REMOVED FROM SHOULDER TO FACILITATE LIP SEAL REMOVAL

NOTE 2:
"O" RING-NO.2-153
OIL SEAL-CR-6363 2 REQ'D
SPEEDI SLEEVE-CR-99062 2 REQ'D
V-RING-CR-400164 2 REQ'D

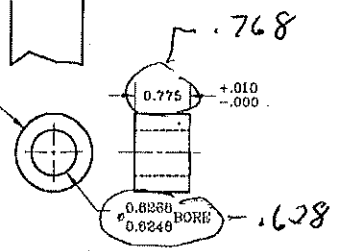
NOTE 3:
FOR PROPER STACK-UP ASSEMBLY, THE DISTANCE FROM THE SNAP RING GROOVE TO THE COUNTER BORE OF THE SEAL PLATE SHOULD BE .400 ±.03125 INCHES. THE COUNTER BORE DEPTH OF .262 INCHES MAY BE ADJUSTED TO GIVE PROPER STACK-UP ASSEMBLY OF THE OIL SEAL (CR-6363) AND V-RING (CR-400164).



RETAINER BUSHING-2 REQ'D
TYPE 303 OR 304 STAINLESS



SPACER BUSHING-LOWER
TYPE 303 OR 304 STAINLESS

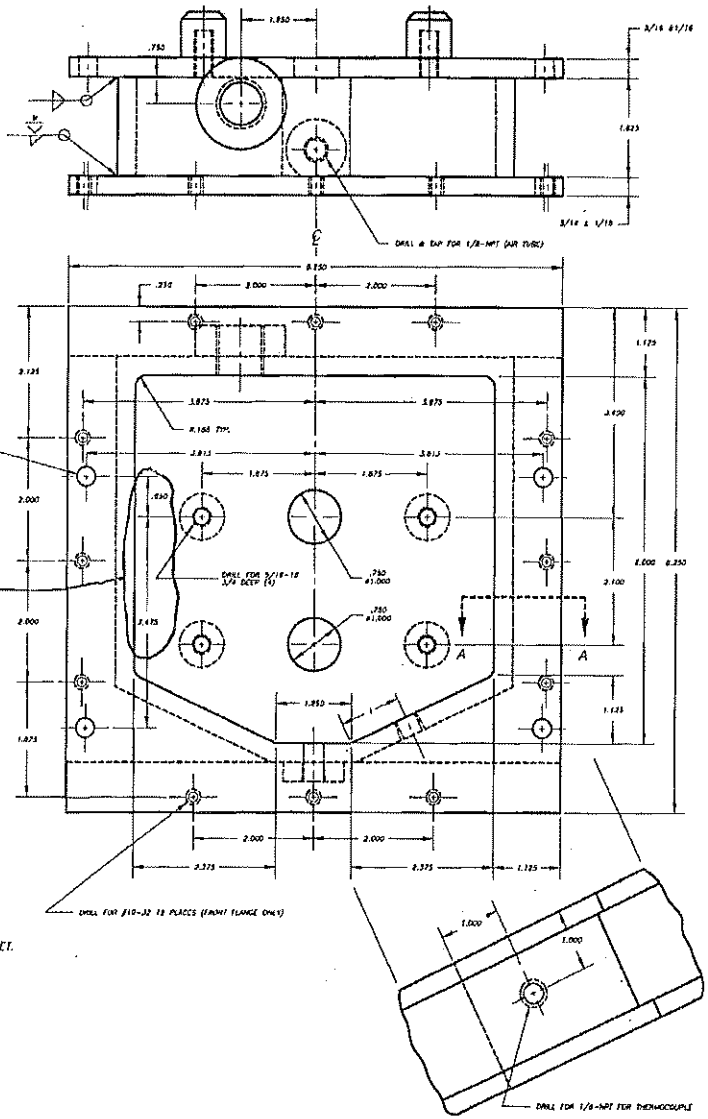


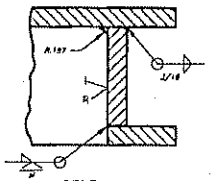
SPACER BUSHING-UPPER
TYPE 303 OR 304 STAINLESS

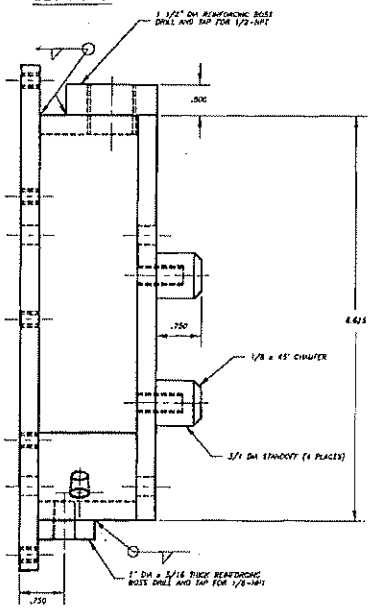
TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE C:SLPLT
DECIMAL ± .005	L-60-1	SCALE 1=1	DRAWN BY T. HABY
FRACTION ± 1/32	TITLE MODIFIED SEAL PLATE		MATERIAL
REVISION NO. 3	ANGULAR ±	DATE 29SEPT04	DRAWING NO C-3963-1277-Z

Attachment 4
3-3-19
Page
Reference
L-60-1

(SR)







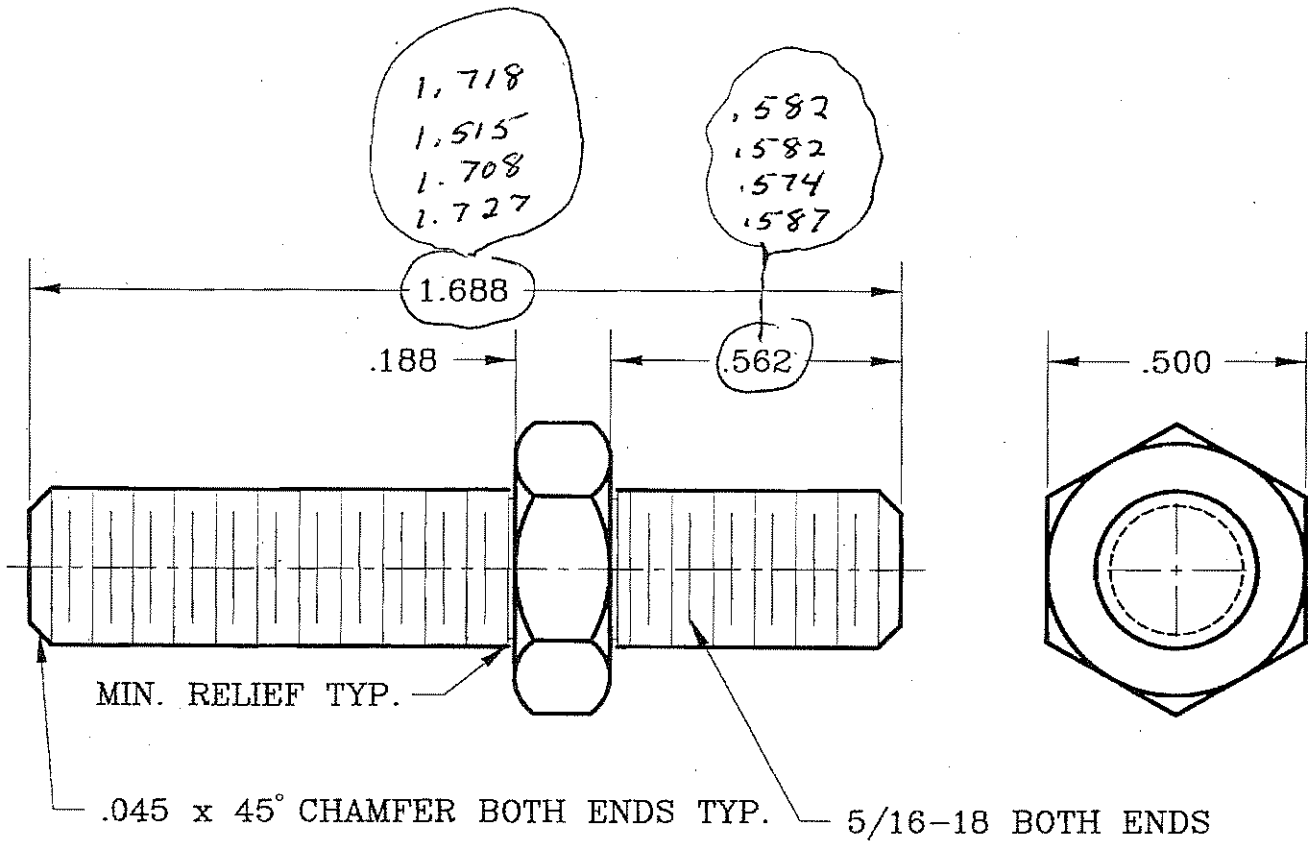
3.475
.650
4.125
was not correct

1. MATERIAL - 303 STAINLESS STEEL 5/16 THICK; ALL JOINTS TO BE WELDED ON BOTH SIDES (INSIDE AND OUTSIDE CASE) OR MACHINE FROM BILLET.
2. STRESS RELIEVE AFTER WELDING
3. MACHINE FRONT FACE FLAT ±.001; MACHINE SIDES
4. MACHINE INSIDES OF BACK FLAT ±.001
5. MUST BE LEAK PROOF
6. INSIDE SURFACE OF CASE MUST BE FREE OF TOOL MARKS

TOLERANCES UNLESS NOTED	ASTM		DWG FILE C:GRCSE
DECIMAL ± .005	L-60-1	SCALE 1=1	DRAWN BY T.L. HARY
FRACTION ±	TITLE GEAR CASE		APPROVED BY
REVISION NO. 2	ANGULAR ±	DATE 3MAY2004	DRAWING NO D-6-6376-42-Z

Attachment 4 Page 4 of 19 Reference L-60-1

(SR)

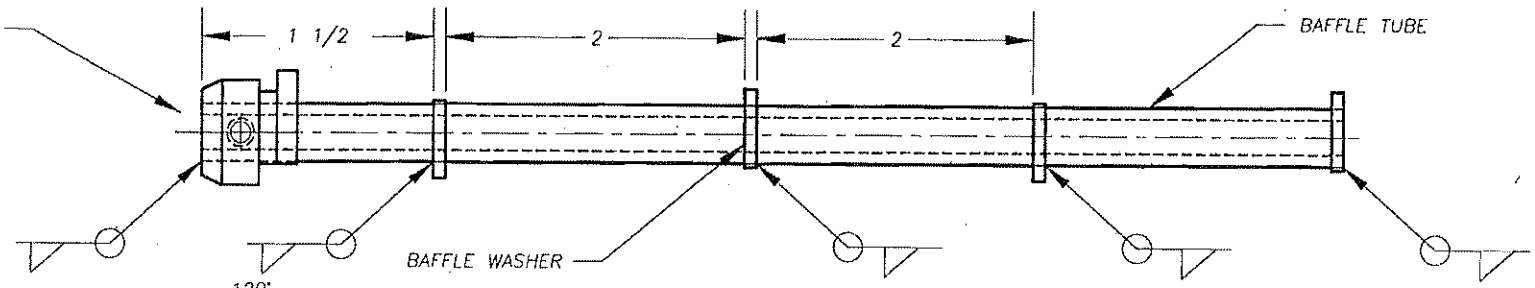


MAT'L TYPE 303 OR 304 SS 4 REQ'D

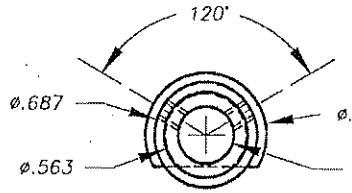
REVISION NO. 2			
DWG FILE A:35	L-60-1	TITLE SEAL PLATE BOLTS	
DRAWN BY T.L. HABY ± .010			
ASTM	SCALE 3=1	DATE 15JAN2004	DRAWING NO A-6-6376-19-Z

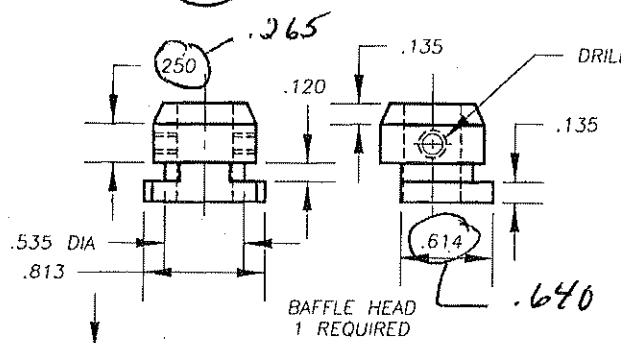
Attachment
Page 5 of 19
Reference L-60-1

(SR)

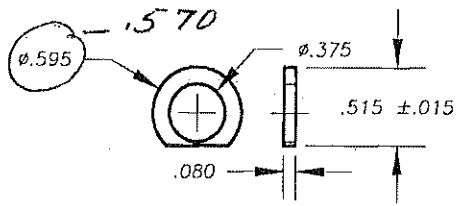


BAFFLE TUBE ASSEMBLY



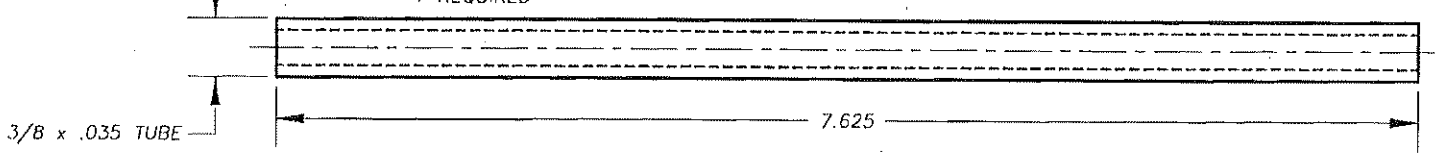


BAFFLE HEAD
1 REQUIRED



BAFFLE WASHER
4 REQUIRED

NEW BAFFLES BUILT AFTER JULY 30, 2004 MAY BE BUILT WITH SOLID STEEL.

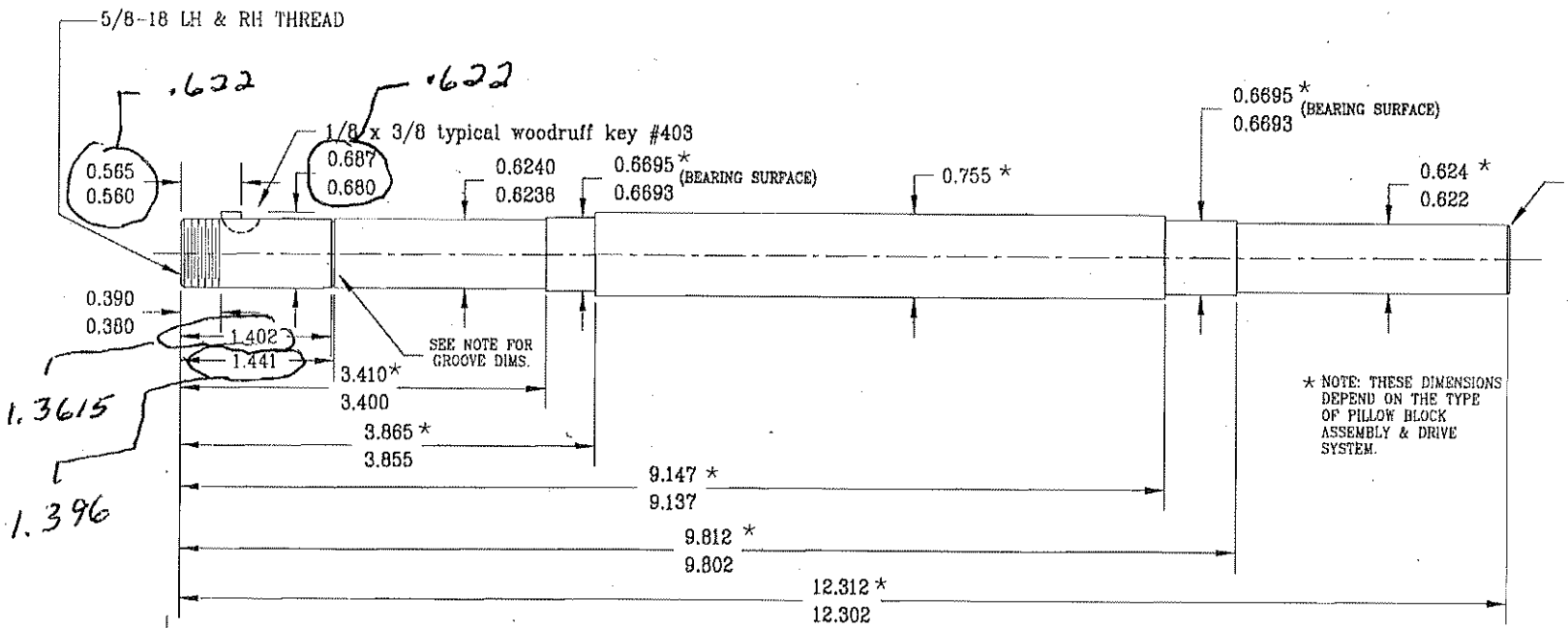


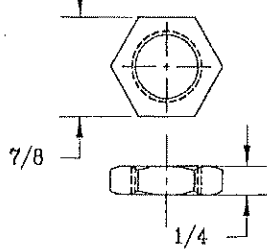
BAFFLE TUBE
1 REQUIRED

TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE 66A
DECIMAL ± 0.010	L-60-1	SCALE NTS	DRAWN BY T. HABY
FRACTION ± 1/16	TITLE VENT TUBE BAFFLE		MATERIAL 304 SS
REVISION NO. 1	ANGULAR ± 1°	DATE 13MAY2004	DRAWING NO B-6-6376-35-Z

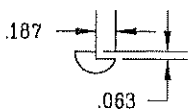
Attachment 4 Page 6 of 9 L-60-1 Baffles

(EV) upper Shaft





303 or 304 stainless nut
5/8-18 LH & RH



KEY MODIFICATIONS

note- .015 rad all corners

1 SHAFT-5/8-18 RH THREAD (DRIVER)
1 SHAFT-5/8-18 LH THREAD (DRIVEN)

GROOVE DIMENSIONS
DEPTH: .019 ±.001
WIDTH: .039 ±.002

TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE A:74
DECIMAL ± .001	L-60-1	SCALE 1=1	DRAWN BY T. HABY
FRACTION ± 1/32	TITLE GEAR SHAFT AND NUT (EXTENDED)		MATERIAL DRILL ROD OR SS
REVISION 2 / ANGULAR ±	DATE 15JAN2004	DRAWING NO B-1996-629-Z	

Attachment 4
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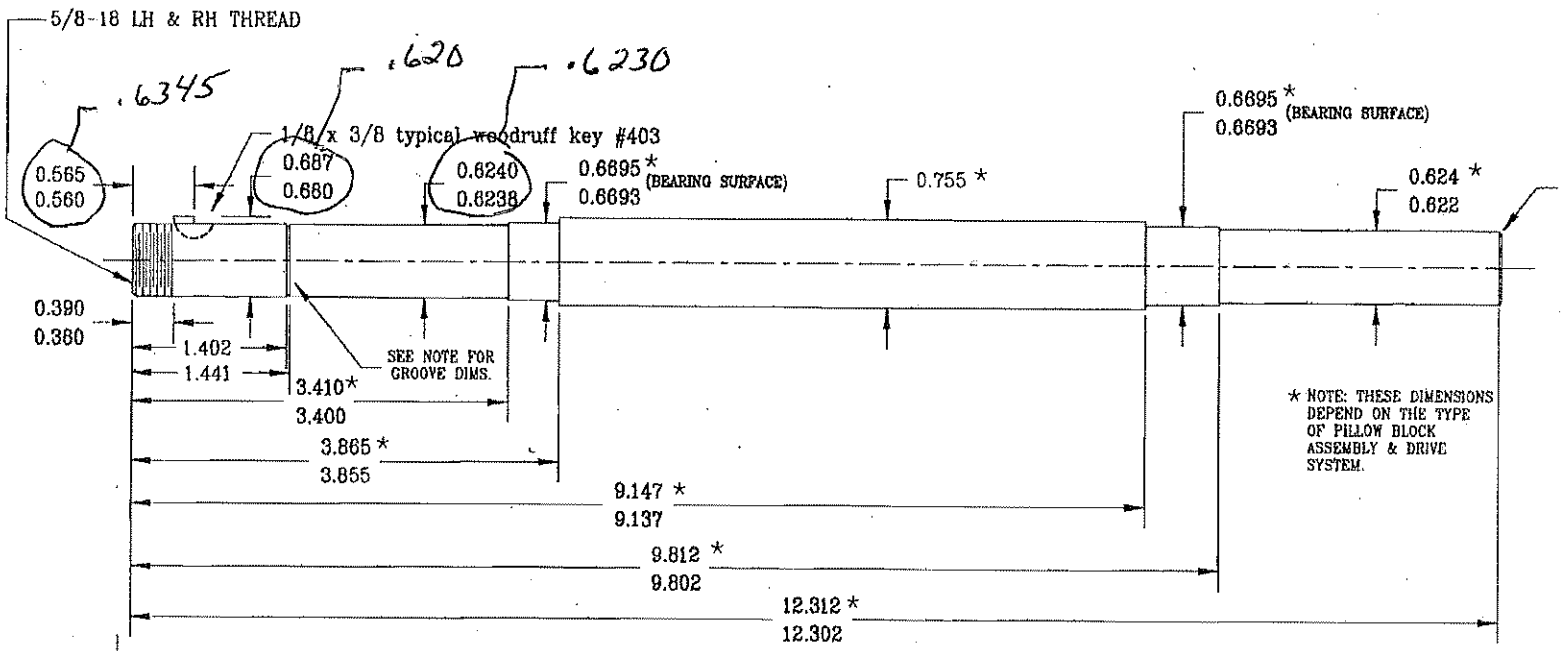
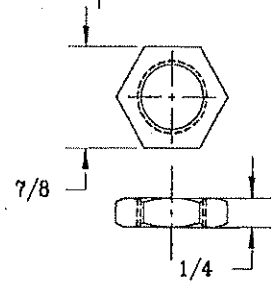
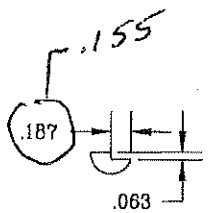
L-60-1
Belleville

(EV) Lower Shaft





303 or 304 stainless nut
5/8-18 LH & RH



KEY MODIFICATIONS

note- .015 rad all corners

1 SHAFT-5/8-18 RH THREAD (DRIVER)
1 SHAFT-5/8-18 LH THREAD (DRIVEN)

GROOVE DIMENSIONS
DEPTH: .019 ±.001
WIDTH: .039 ±.002

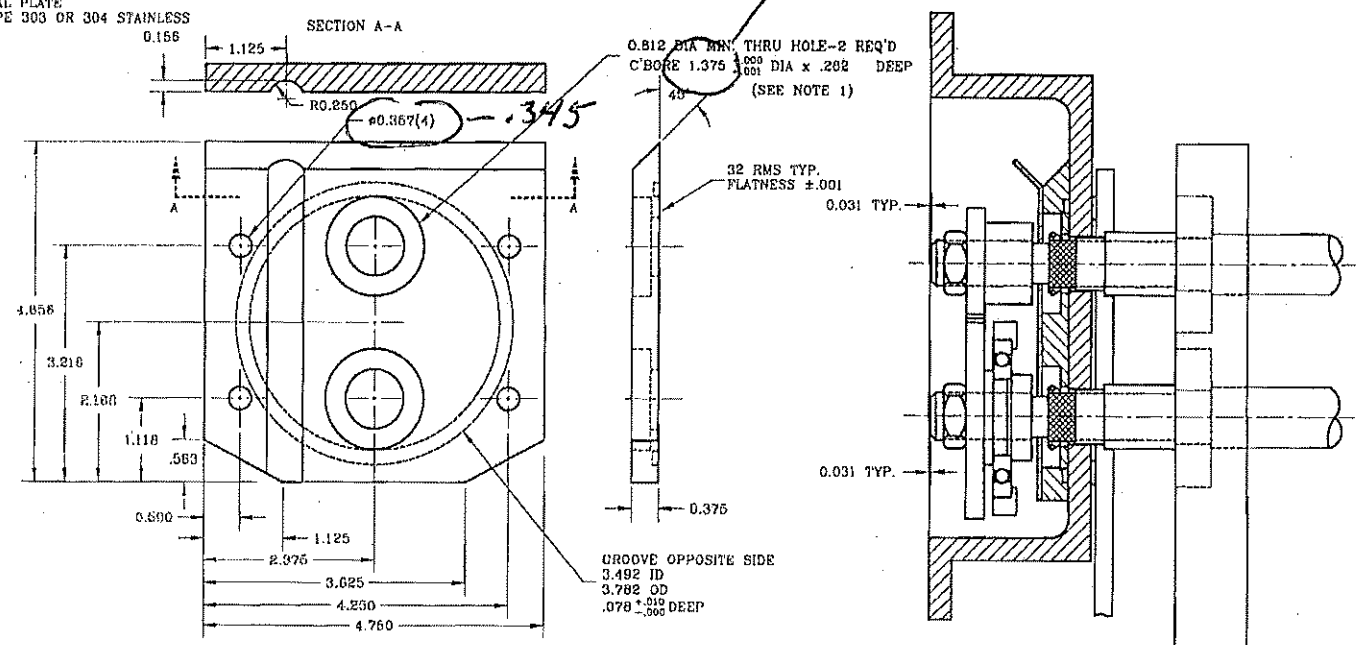
TOLERANCES (EXCEPT AS NOTED)	ASTM			DWG FILE A:74
DECIMAL ± .001	L-60-1		SCALE 1=1	DRAWN BY T. HABY
FRACTION ± 1/32	TITLE GEAR SHAFT AND NUT (EXTENDED)			MATERIAL DRILL ROD OR SS
REVISION 2	ANGULAR ±	DATE 15JAN2004	DRAWING NO B-1996-629-Z	

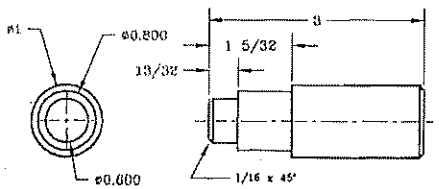
Attachment 4 6.1.19 L-60-1 Page Reference

(EV)

1.367
1.368

SEAL PLATE
TYPE 303 OR 304 STAINLESS



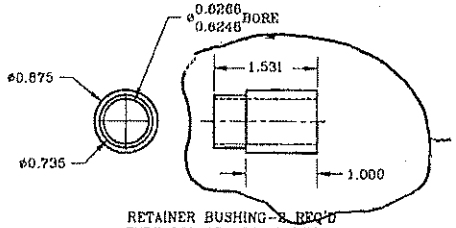


SEAL REMOVAL TOOL-CRS

NOTE 1:
MATERIAL MAY BE REMOVED FROM SHOULDER
TO FACILITATE LIP SEAL REMOVAL

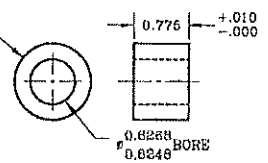
NOTE 2.
"O" RING-NO.2-153
OIL SEAL-CR-6383 2 REQ'D
SPEEDI SLEEVE-CR-99062 2 REQ'D
V-RING-CR-400164 2 REQ'D

NOTE 3:
FOR PROPER STACK-UP ASSEMBLY, THE DISTANCE
FROM THE SNAP RING GROOVE TO THE COUNTER
BORE OF THE SEAL PLATE SHOULD BE .400
±.03125 INCHES. THE COUNTER BORE DEPTH
OF .262 INCHES MAY BE ADJUSTED TO GIVE PROPER
STACK-UP ASSEMBLY OF THE OIL SEAL (CR-6383)
AND V-RING (CR-400164).

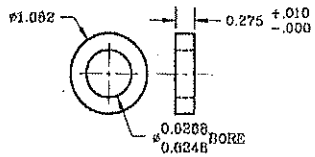


Not used

RETAINER BUSHING-8 REQ'D
TYPE 303 OR 304 STAINLESS



SPACER BUSHING-UPPER
TYPE 303 OR 304 STAINLESS



SPACER BUSHING-LOWER
TYPE 303 OR 304 STAINLESS

TOLERANCES EXCEPT AS NOTED	ASTM		DWG FILE C:SLPLT
DECIMAL ± .005	L-60-1	SCALE 1=1	DRAWN BY T. HABY
FRACTION ± 1/32	TITLE MODIFIED SEAL PLATE		MATERIAL
REVISION NO. 3	ANGULAR ±	DATE 20SEPT04	DRAWING NO C-3963-1277-Z

Attachment 4
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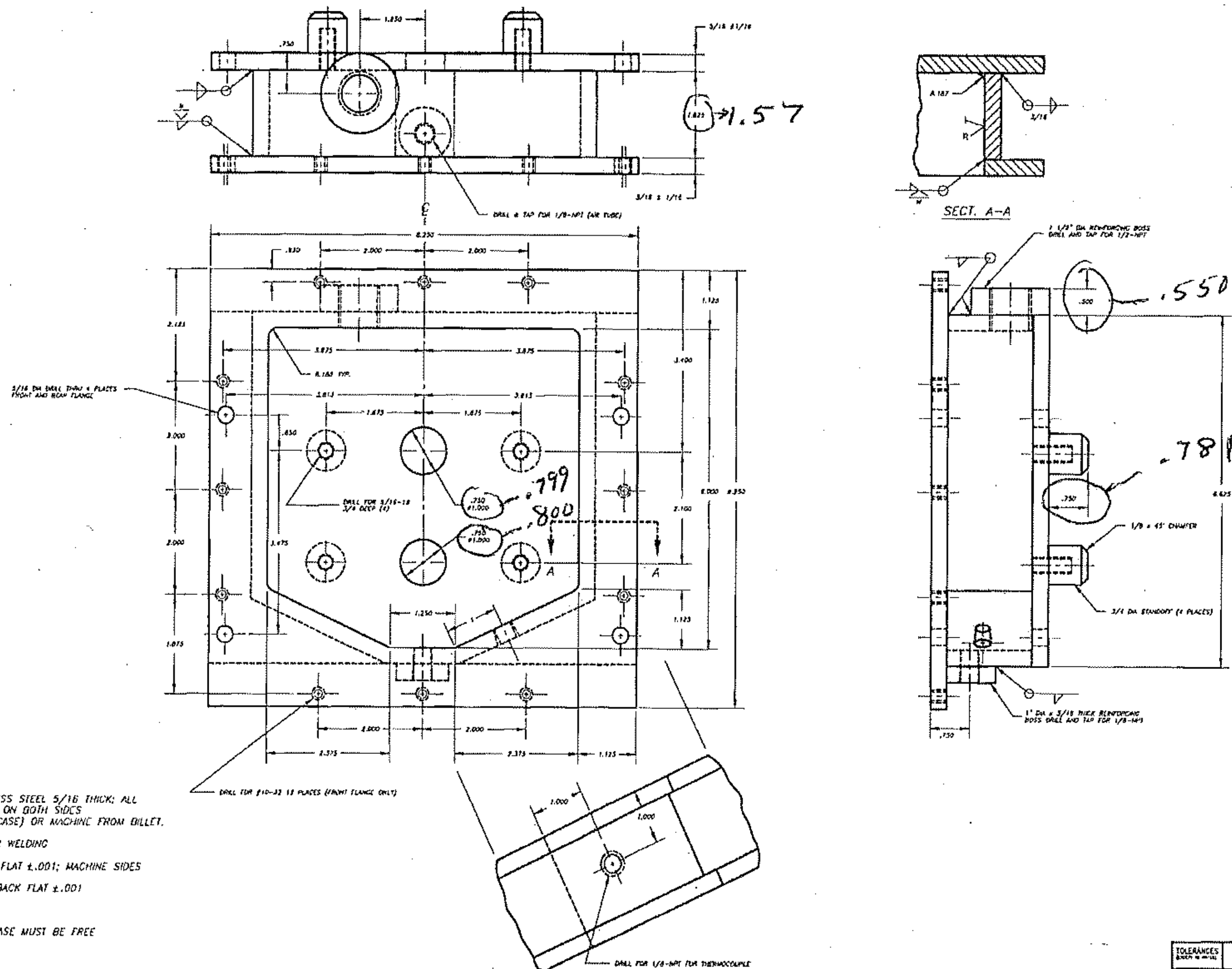
Reference L-60-1

(EV)



1. MATERIAL-303 STAINLESS STEEL 5/16 THICK; ALL JOINTS TO BE WELDED ON BOTH SIDES (INSIDE AND OUTSIDE CASE) OR MACHINE FROM BILLET.
2. STRESS RELIEVE AFTER WELDING
3. MACHINE FRONT FACE FLAT ±.001; MACHINE SIDES
4. MACHINE INSIDES OF BACK FLAT ±.001
5. MUST BE LEAK PROOF
6. INSIDE SURFACE OF CASE MUST BE FREE OF TOOL MARKS

	TOLERANCES	ASTM		DWG FILE C:GRCSE
	DECIMAL ±.005	L-60-1	SCALE 1=1	DRAWN BY T.J. HABY / APPROVED BY
	FRACTION ±	TITLE GEAR CASE		
REVISION NO. 2	ANGULAR ±	DATE 3MAY2004	DRAWING NO D-6-6376-42-Z	

Attachment 4
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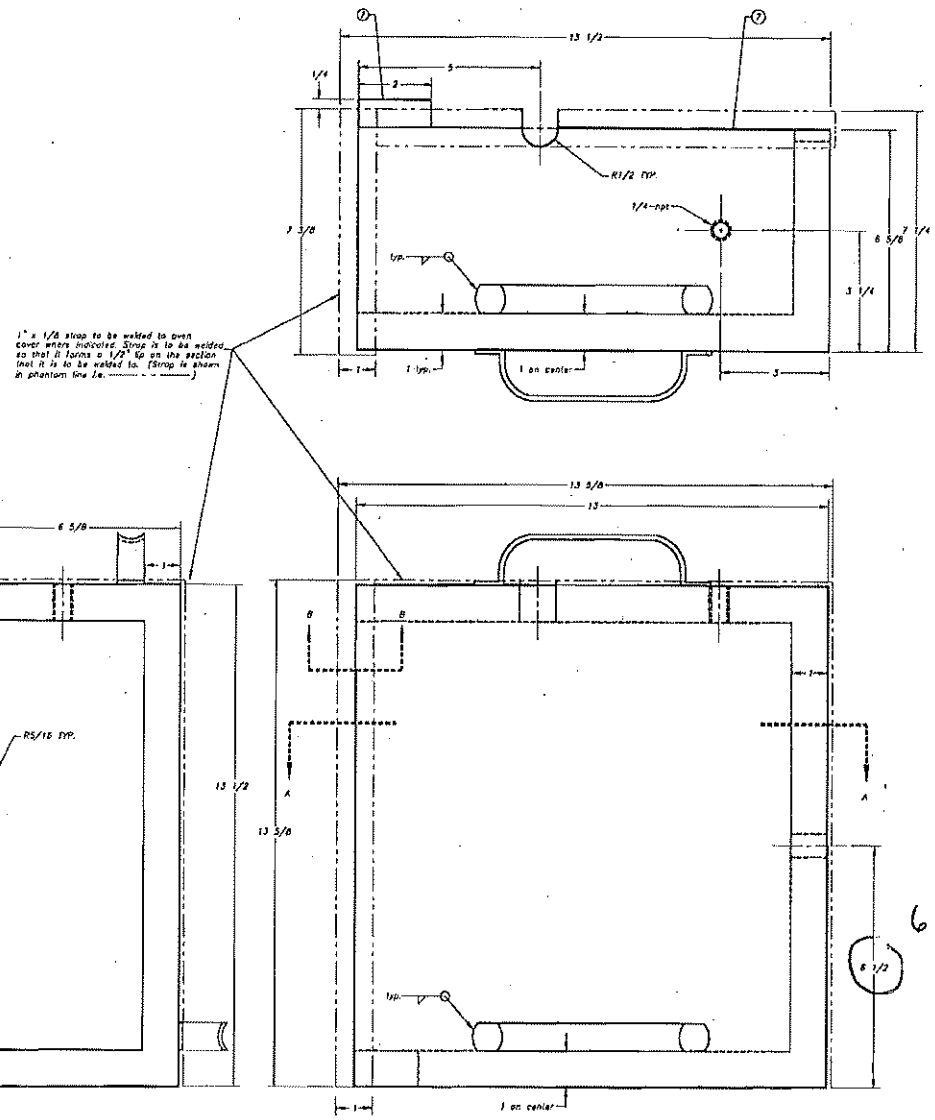
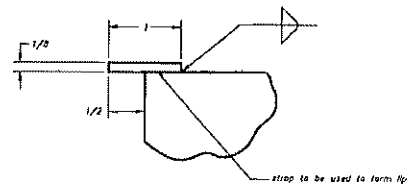
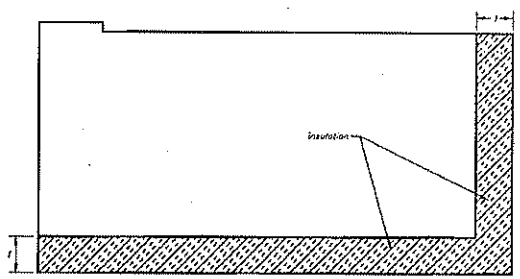
Reference L-60-1

(EV)





SECT. B-B



SECTION A-A

NOTES

1. CASE CONSISTS OF A DOUBLE WALL CONTAINER WITH INSULATION BETWEEN THE WALLS.
2. WALLS TO BE 16 GA. HOT ROLLED STEEL.
3. ALL JOINTS TO BE WELDED LEAK PROOF.
4. INSULATION TO BE INSTALLED DURING CONSTRUCTION.
5. ALL HOLES THRU CASE TO BE LINED WITH METAL TUBE AND WELDED TO INNER AND OUTER WALLS.
6. MUST MATCH OVEN WITHIN 1/8"
7. FLANGED MOUNTING SURFACE OF THE OVEN COVER ASSEMBLY CAN BE MODIFIED FOR PROPER SEALING, PROVIDED THE INNER DIMENSIONS OF THE BOX ARE MAINTAINED ACCORDING TO THE PRINT.

TOLERANCES (UNLESS OTHERWISE NOTED)	ASTM		DWG FILE: C:OVEN2
DECIMAL ±	L-60-1	SCALE NTS	DRAWN BY T.L. HABY
FRACTION ± 1/8	TITLE HEATER CASE COVER		APPROVED BY
REVISION NO. 1	ANGULAR ±	DATE 12-2-04	DRAWING NO D-6-6376-410-Z

Attachment 4
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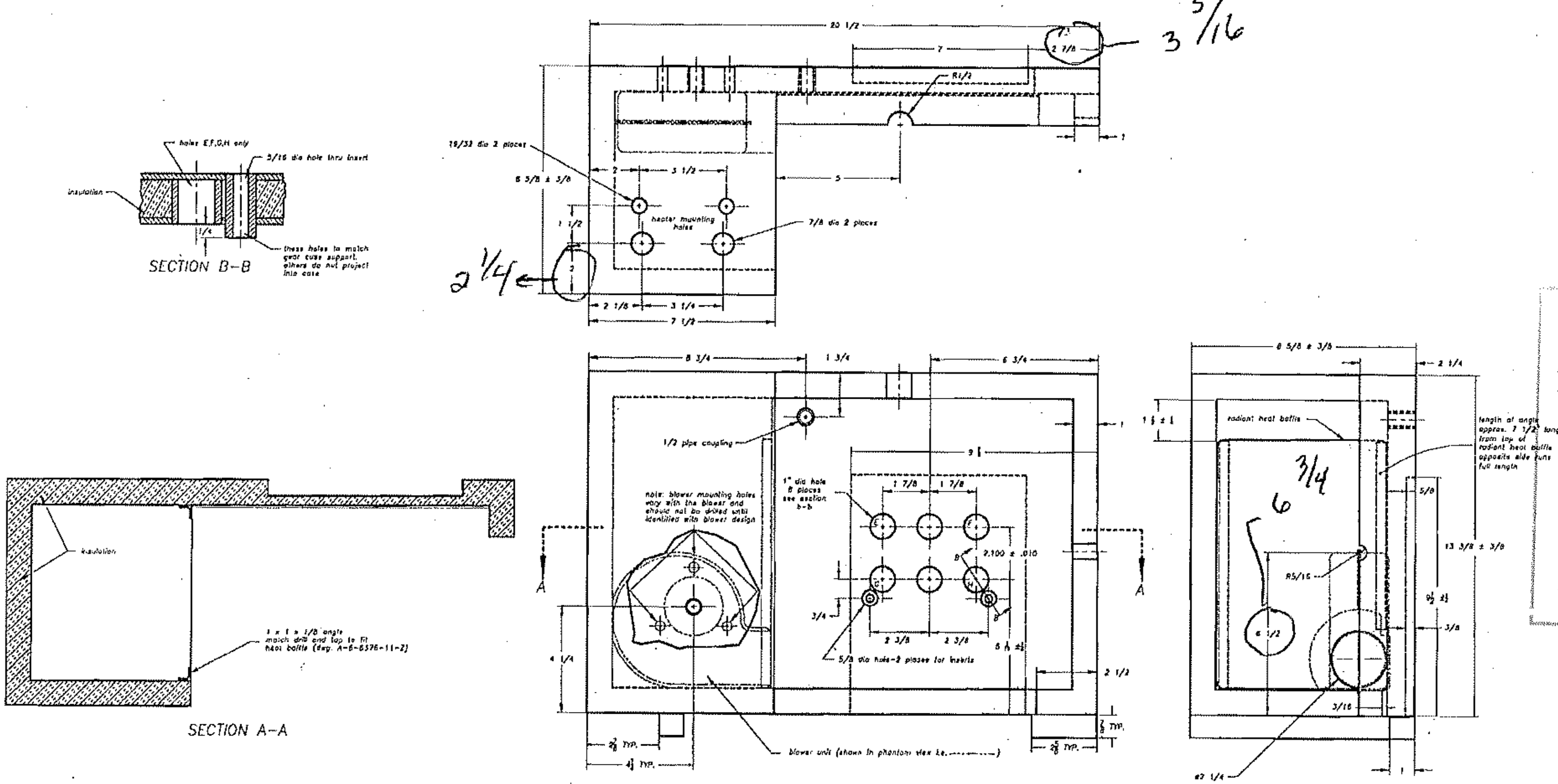
Reference L-60-1

(EV)



NOTES

1. CASE CONSISTS OF A DOUBLE WALL CONTAINER WITH INSULATION BETWEEN THE WALLS
2. WALLS TO BE 16 GA HOT OR COLD ROLLED STEEL
3. ALL JOINTS TO BE WELDED LEAK PROOF
4. INSULATION TO BE INSTALLED DURING CONSTRUCTION
5. ALL HOLES THRU CASE TO BE LINED WITH METAL TUBE AND WELDED TO INNER AND OUTER WALLS
6. MUST MATCH COVER WITHIN 1/8"

	TOLERANCES	ASTM		DWG FILE C:OVEN
	DECIMAL ± .010	L-60-1	SCALE NTS	DRAWN BY T.J. HABY / APPROVED BY
	FRACTION ± 1/8	TITLE HEATER CASE		
REVISION NO. 2	ANGULAR ±	DATE 14JAN2004	DRAWING NO D-6-6376-41-Z	

Attachment 4
Page 12 of 19
Reference L-60-1

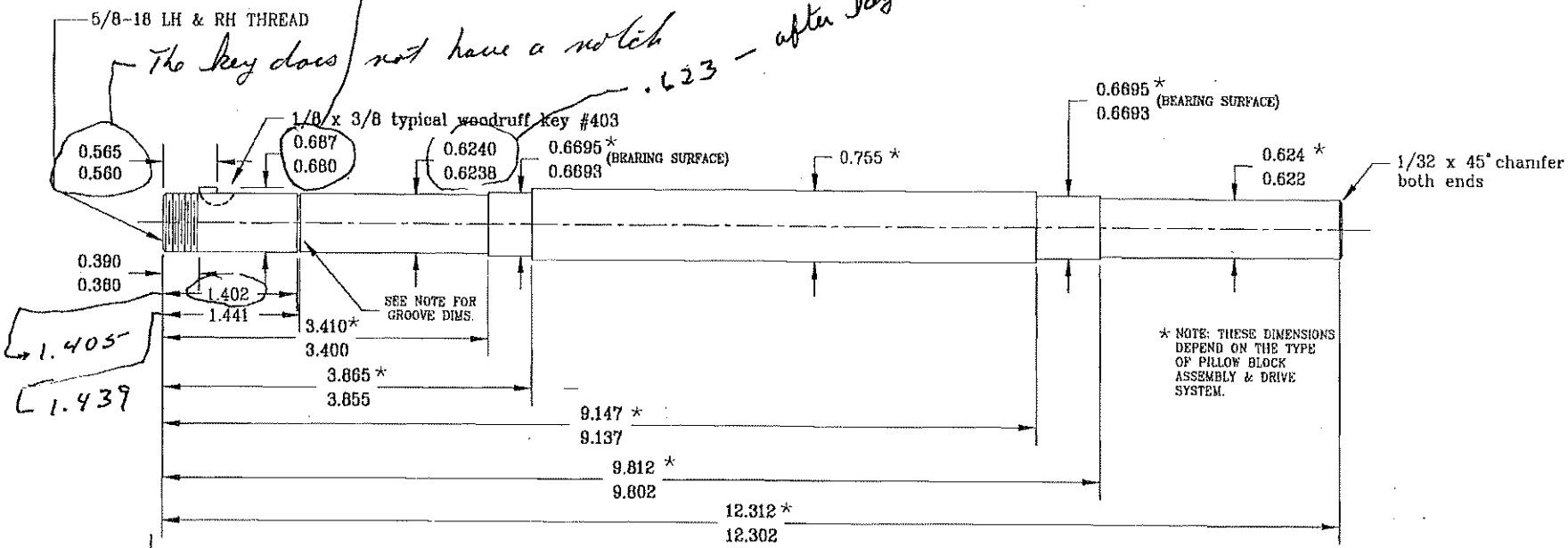
Top Shaft

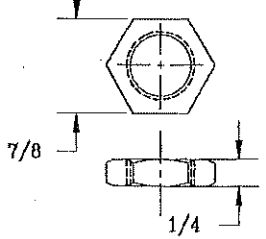
(LZ)

.670

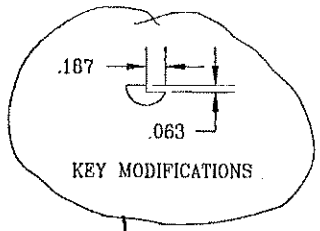
.623 - after keyways & before snap ring .614

The key does not have a notch





303 or 304 stainless nut
5/8-18 LH & RH



KEY MODIFICATIONS

note- .015 rad all corners

1 SHAFT-5/8-18 RH THREAD (DRIVER)
1 SHAFT-5/8-18 LH THREAD (DRIVEN)

GROOVE DIMENSIONS
DEPTH: .019 ±.001
WIDTH: .039 ±.002

TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE A:74
DECIMAL ± .001	L-60-1	SCALE 1=1	DRAWN BY T. HABY
FRACTION ± 1/32	TITLE GEAR SHAFT AND NUT (EXTENDED)		MATERIAL DRILL ROD OR SS
REVISION 2	ANGULAR ±	DATE 15JAN2004	DRAWING NO B-1996-629-Z

Are these typical

Attachment 4
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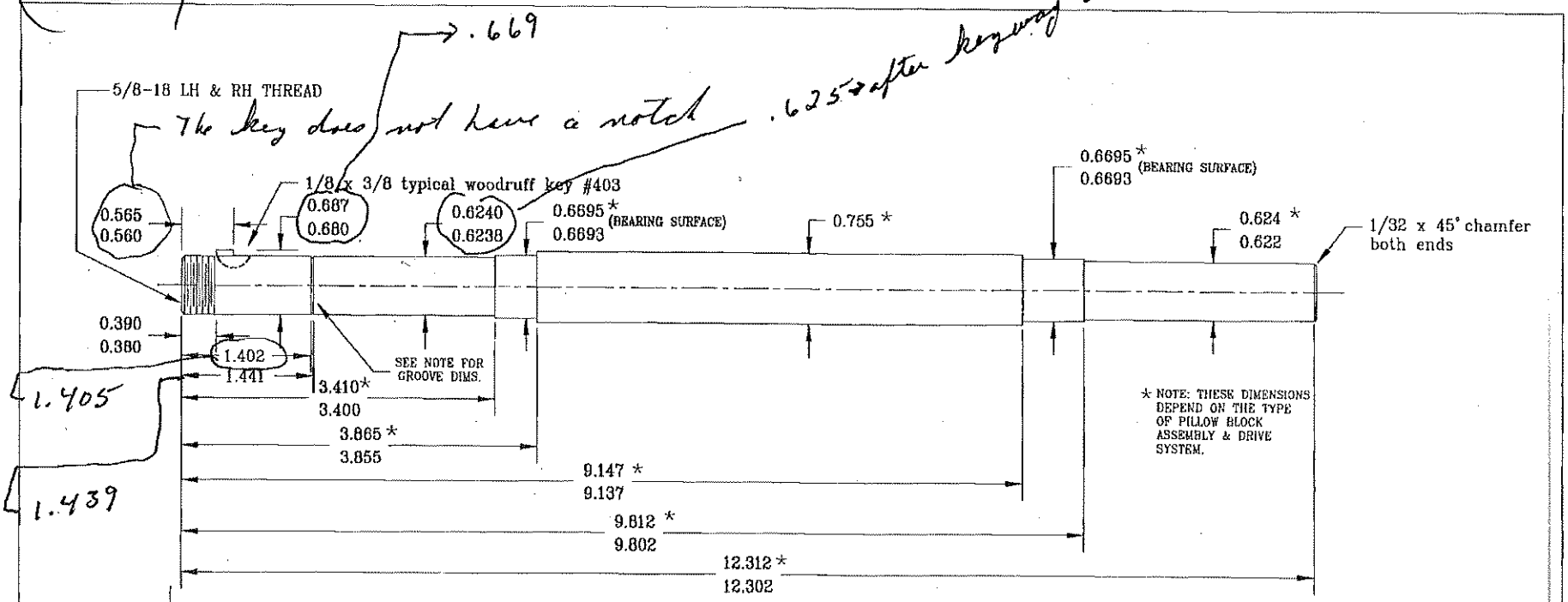
References L-60-1

Bottom Shaft

(LZ)



note- .015 rad all corners

1 SHAFT-5/8-18 RH THREAD (DRIVER)
1 SHAFT-5/8-18 LH THREAD (DRIVEN)

GROOVE DIMENSIONS
DEPTH: .019 ±.001
WIDTH: .039 ±.002

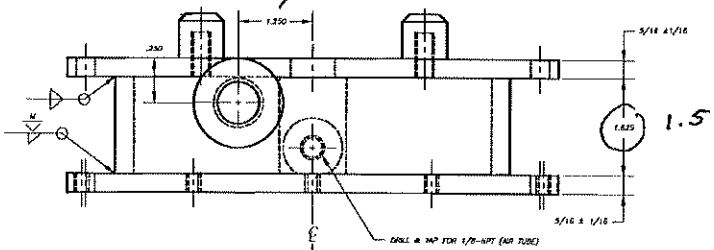
TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE A:74
DECIMAL ± .001	L-60-1	SCALE 1=1	DRAWN BY T. HABY
FRACTION ± 1/32	TITLE GEAR SHAFT AND NUT (EXTENDED)		MATERIAL DRILL ROD OR SS
REVISION 2	ANGULAR ±	DATE 15JAN2004	DRAWING NO B-1996-629-Z

Are these typical

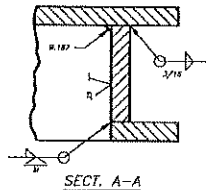
Attachment 4
Page 4 of 19
Reference L-60-1

(L2)

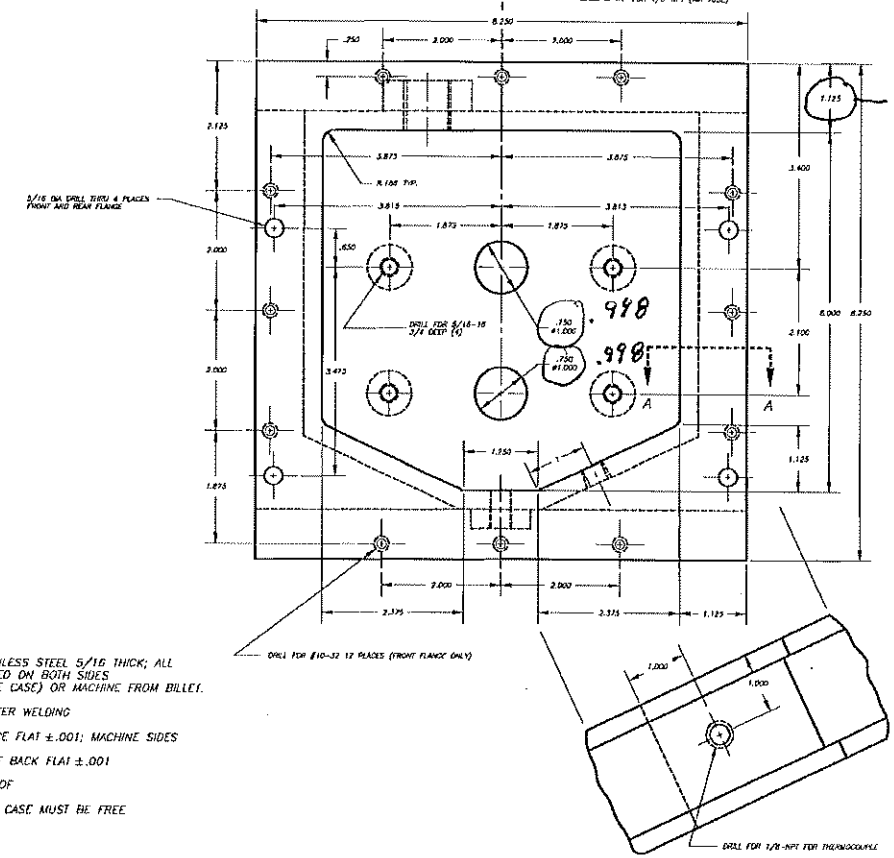
How do we measure this



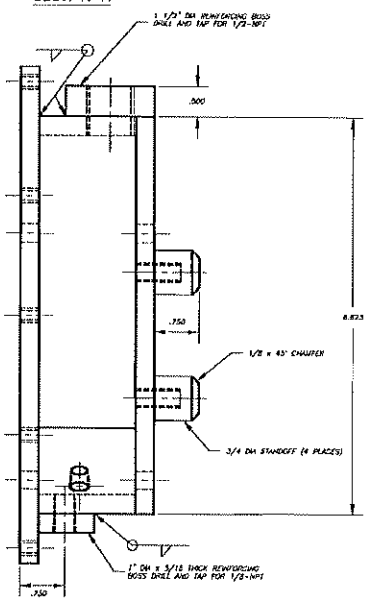
1.58 - 1.60



SECT. A-A



1.16



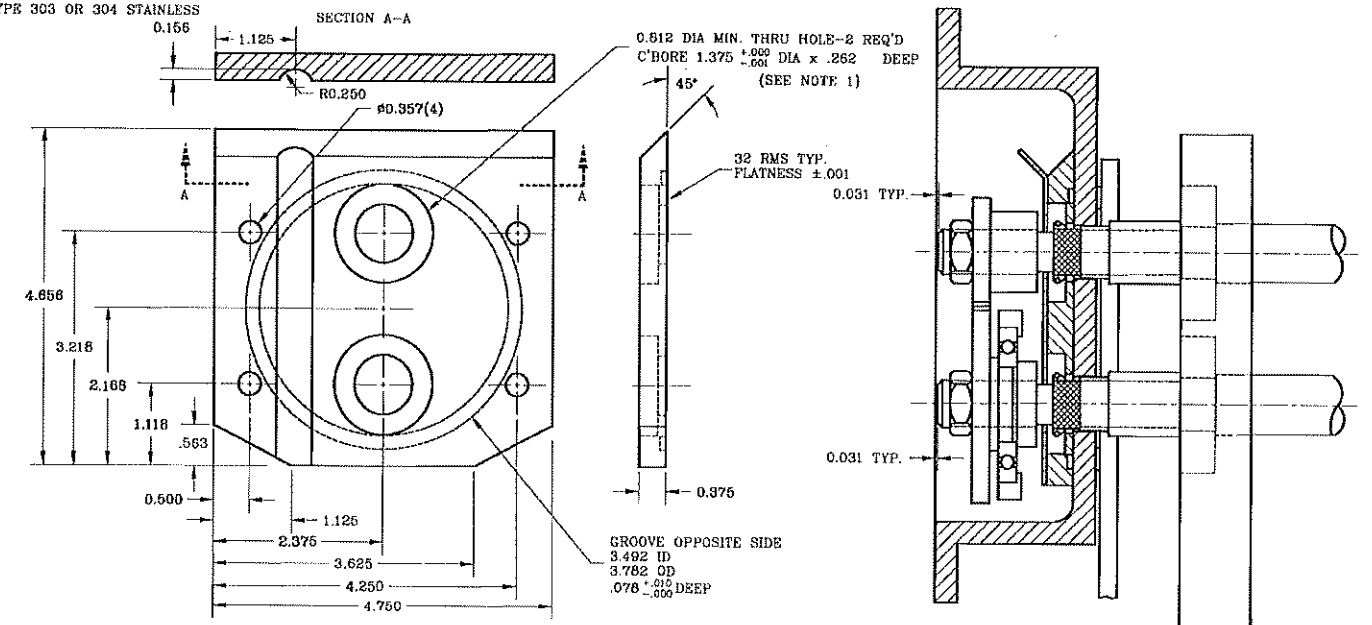
1. MATERIAL - 303 STAINLESS STEEL 5/16 THICK; ALL JOINTS TO BE WELDED ON BOTH SIDES (INSIDE AND OUTSIDE CASE) OR MACHINE FROM BILLET.
2. STRESS RELIEVE AFTER WELDING
3. MACHINE FRONT FACE FLAT ±.001; MACHINE SIDES
4. MACHINE INSIDES OF BACK FLAT ±.001
5. MUST BE LEAK PROOF
6. INSIDE SURFACE OF CASE MUST BE FREE OF TOOL MARKS

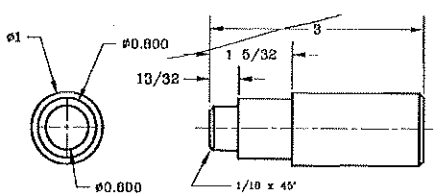
TOLERANCES EXCEPT AS NOTED	ASTM		DWG FILE C:GRCSE
DECIMAL ± .005	L-60-1	SCALE 1-1	DRAWN BY T.L. HABY
FRACTION ±	TITLE GEAR CASE		APPROVED BY
REVISION NO. 2	ANGULAR ±	DATE 3MAY2004	DRAWING NO. D-6-6376-42-Z

4
Attachment
Page 15 of 19
Reference L-60-1

(22)

SEAL PLATE
TYPE 303 OR 304 STAINLESS



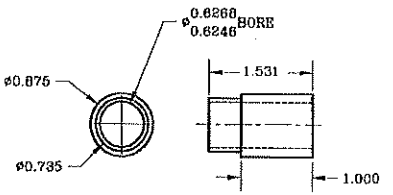


SEAL REMOVAL TOOL-CRS

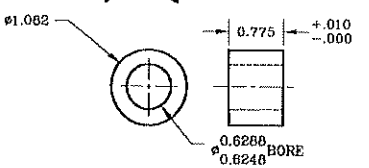
NOTE 1:
MATERIAL MAY BE REMOVED FROM SHOULDER
TO FACILITATE LIP SEAL REMOVAL

NOTE 2:
"O" RING-NO.2-153
OIL SEAL-CR-6363 2 REQ'D
SPEEDI SLEEVE-CR-99062 2 REQ'D
V-RING-CR-400164 2 REQ'D

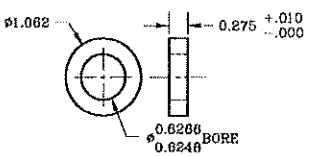
NOTE 3:
FOR PROPER STACK-UP ASSEMBLY, THE DISTANCE
FROM THE SNAP RING GROOVE TO THE COUNTER
BORE OF THE SEAL PLATE SHOULD BE .400
±.03125 INCHES. THE COUNTER BORE DEPTH
OF .262 INCHES MAY BE ADJUSTED TO GIVE PROPER
STACK-UP ASSEMBLY OF THE OIL SEAL (CR-6363)
AND V-RING (CR-400164).



RETAINER BUSHING-2 REQ'D
TYPE 303 OR 304 STAINLESS



SPACER BUSHING-UPPER
TYPE 303 OR 304 STAINLESS



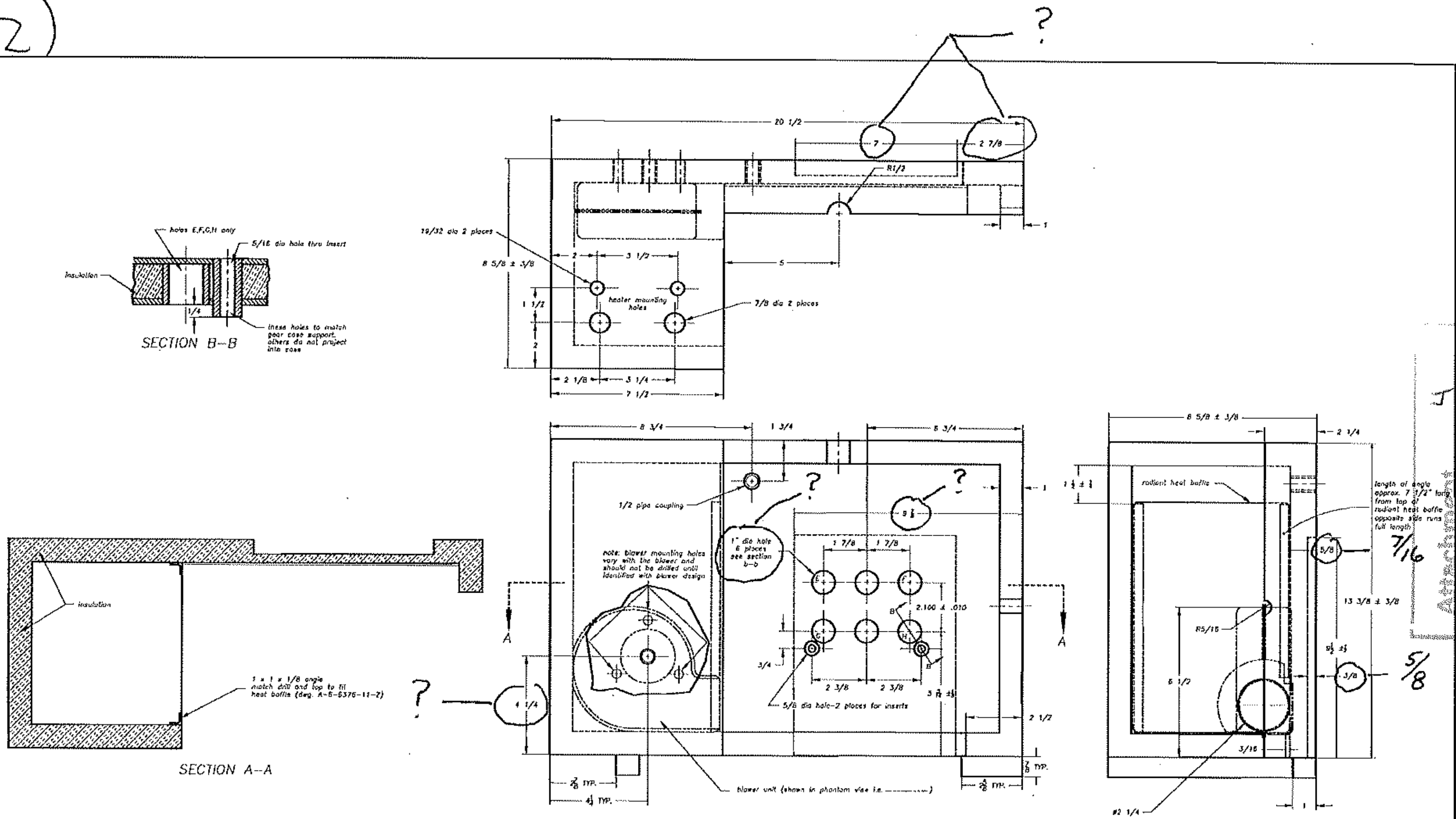
SPACER BUSHING-LOWER
TYPE 303 OR 304 STAINLESS

TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE C:SLPLT
DECIMAL ± .005	L-60-1	SCALE 1=1	DRAWN BY T. HABY
FRACTION ± 1/32	TITLE MODIFIED SEAL PLATE		MATERIAL
REVISION NO. 3	ANGULAR ±	DATE 29SEPT04	DRAWING NO C-3963-1277-Z

* Do we define the thickness of snap-ring
* How do we measure the stack-up clearance in Note 3

Attachment 4
Page 16 of 19
Reference L-60-1

(L2)

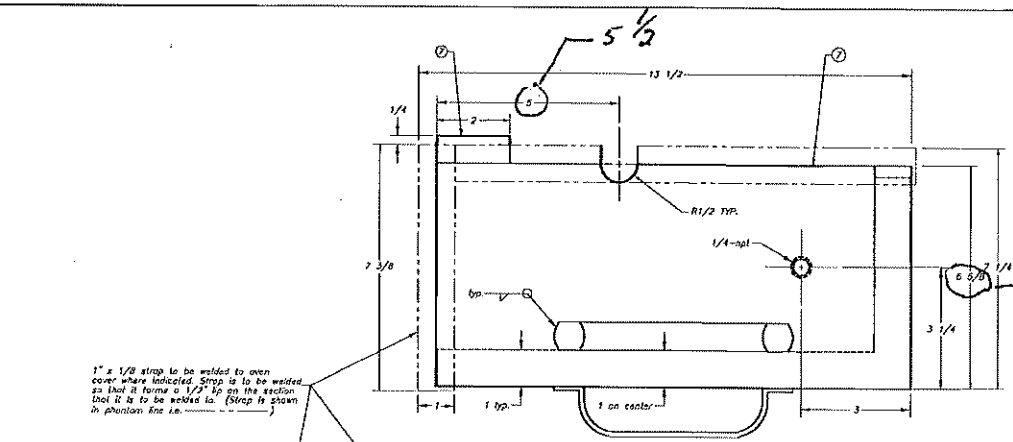


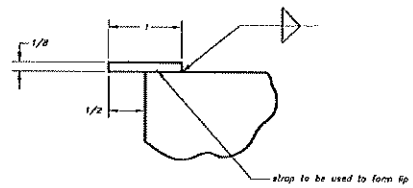
NOTES

1. CASE CONSISTS OF A DOUBLE WALL CONTAINER WITH INSULATION BETWEEN THE WALLS
2. WALLS TO BE 16 GA HOT OR COLD ROLLED STEEL
3. ALL JOINTS TO BE WELDED LEAK PROOF
4. INSULATION TO BE INSTALLED DURING CONSTRUCTION
5. ALL HOLES THRU CASE TO BE LINED WITH METAL TUBE AND WELDED TO INNER AND OUTER WALLS
6. MUST MATCH COVER WITHIN 1/8"

TOLERANCES EXCEPT AS NOTED	ASTM		DWG FILE C:OVEN
DECIMAL ± .010	L-60-1	SCALE NTS	DRAWN BY T.L. HADY / APPROVED BY
FRACTION ± 1/8	TITLE HEATER CASE		
REVISION NO 2 / ANGULAR ±	DATE 14JAN2004	DRAWING NO D-6-6376-41-Z	

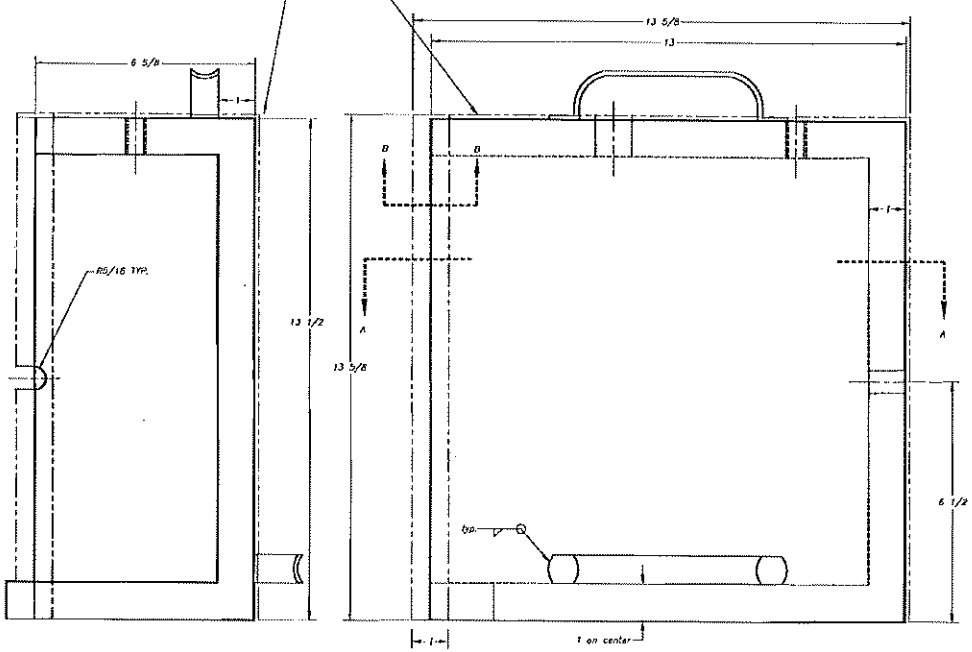
(L2)

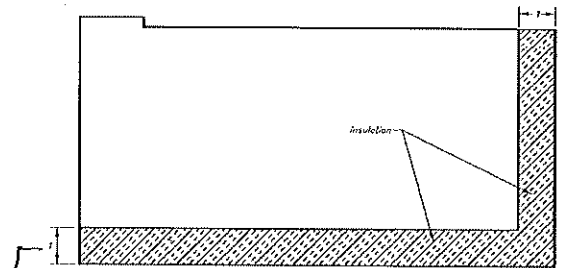




SECT. B-B

1" x 1/8 strap to be welded to oven cover where indicated. Strap is to be welded as that it forms a 1/8" lip on the section that it is to be welded to. (Strap is shown in phantom line i.e. - - - - - -)





SECTION A-A

what are we measuring

NOTES

1. CASE CONSISTS OF A DOUBLE WALL CONTAINER WITH INSULATION BETWEEN THE WALLS.
2. WALLS TO BE 16 GA. HOT ROLLED STEEL.
3. ALL JOINTS TO BE WELDED LEAK PROOF.
4. INSULATION TO BE INSTALLED DURING CONSTRUCTION.
5. ALL HOLES THRU CASE TO BE LINED WITH METAL TUBE AND WELDED TO INNER AND OUTER WALLS.
6. MUST MATCH OVEN WITHIN 1/8"
7. FLANGED MOUNTING SURFACE OF THE OVEN COVER ASSEMBLY CAN BE MODIFIED FOR PROPER SEALING, PROVIDED THE INNER DIMENSIONS OF THE BOX ARE MAINTAINED ACCORDING TO THE PRINT.

TOLERANCES UNLESS OTHERWISE NOTED	ASTM		DWG FILE C:OVEN2
DECIMAL ±	L-60	SCALE NTS	DRAWN BY T.L. HABY
FRACTION ± 1/8	TITLE HEATER CASE COVER		APPROVED BY
REVISION NO. 1	ANGULAR ±	DATE 12-7-04	DRAWING NO D-6-6376-41a-Z

Attachment 4
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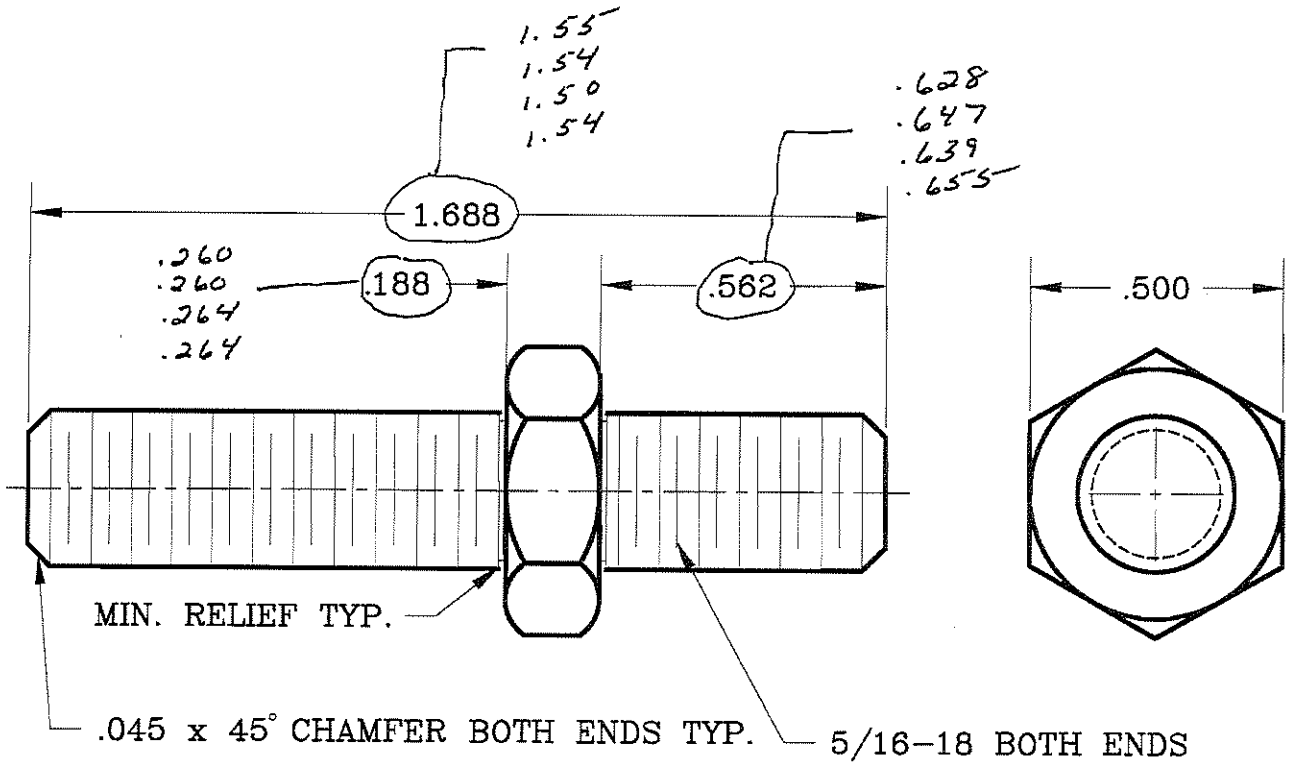
Reference L-60-1

(LZ) STD 182A



MAT'L TYPE 303 OR 304 SS 4 REQ'D

REVISION NO. 2				
DWG FILE A:35		L-60-1	TITLE SEAL PLATE BOLTS	
DRAWN BY T.L. HABY	± .010			
ASTM	SCALE 3=1	DATE 15JAN2004	DRAWING NO 4	A-6-6376-19-Z

Attachment
Page 19 of 19
Reference L-60-1

Report of Meeting
L-60-1 Task Force
PRI Headquarters, Apollo Room, Warrendale, Pa.
June 20, 2006

Outcomes from lab visits to review drawings

From the August 25, 2004 SP meeting minutes the revised drawings were approved for use in the ASTM procedure:

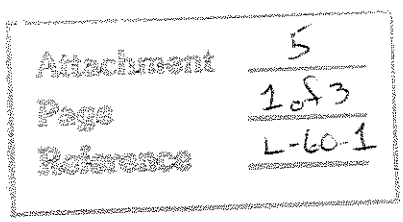
> ***Motion 3*** (Motion⇒ Bill Sullivan Second⇒ Brian Koehler) Approve all 19 revised drawings as recommend by the L-60-1 Hardware Task Force. A copy of all 19 drawings will be included as ***Attachment 5*** to the minutes.
>
> **Motion Results: Approved**
> In favor: 4
> Opposed: 0
> Abstain: 0
>
> After the drawings were approved, the SP discussed the process for issuing the drawings to ASTM and making them available for use. The following action items provide details on what needs to happen for implementing the stand drawings:
>
> Per a previously approved motion from the June 15, 2004 L-60-1 SP meeting, the Chairman reminded all the labs that they must be in compliance with the revised drawings by January 1, 2005.

The Task Force recommends there are competing purposes for the drawings which are that they are being used for a performance specification versus manufacturing specification. The following sections detail the Task Force recommendations and actions for areas found to be out of compliance during the lab audits.

Task Force recommendations and action items:

B-1996-629-Z

Drawing B-1996-629-Z pertains to the manufacturing dimensions for the gear shafts. We do not have empirical data to prove that these dimensions have an effect on severity. However the shaft dimensions are part of determining the location of the gears within the gear case. The Task Force agrees that the most critical performance criteria is the location of the gears within the gear case. This relates to static lube coverage of the lower gear, lube splash during rotation, and heat transfer. However a tool is needed for confirming the stack-up dimensions meet the performance specification which we currently to do not have for the location of the gear. The group recognizes that forecasting the outcomes from multiple stack-up tolerances on the gear location is hard to determine. The Task Force recommends that the labs be allowed to continue with their current driveshaft configuration until a tool is built to determine the absolute gear location in the case.



Task Force recommendations for drawing B-1996-629-Z:
Place a note stating the drawing tolerances are for manufacturing only.
Place an asterisk next to the 'Key Modification' stating typical.

Action Items:
Lubrizol – Determine accurate measurements for xyz gear location relative to the gear case.
All Labs – Measure gear location relative to the gear case.
Lubrizol – Build a common template to measure the location of the gears and send to all labs for confirmation. The labs need to meet once again after the measurements are completed to build a performance specification on the gear location. The 4 templates for measuring the location of the gears.

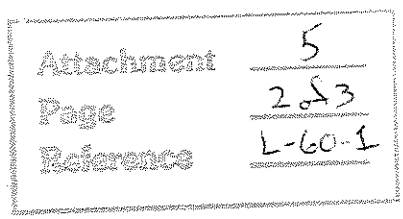
Drawing D-6-6376-42-Z
Action Items:
Hector: Using an old cover plate, drill 6 X ¼" holes at various locations for labs to check gear case depth.
All Labs: Use the template that Hector supplies and report measurements.
All Labs: Conduct measurements with the template and build a performance specification.
Lubrizol: Confirm that the lexan pieces are flat.

Drawing A-6-6376-19-Z – Seal Plate Bolts
Action Items:
Hector: Ask SwRI to place a note on the threaded end lengths as being typical as well as the nut width of 0.5".
SwRI/LZ: To make new studs.

Drawing B-6-6376-35-Z – Vent Tube Baffle
Action Item:
Hector: SwRI to make changes to comply.

Drawing D-6-6376-41-Z – Heater Case
Action Items:
Hector: Ask SwRI to place a note of 'typical' next to all dimensions pertaining to the recessed area on the back side of the heater case. Place 'typical' next to the 6 ½" dimension for channeling the airline and thermocouple. Also place 'typical' next to the heater mounting holes.

Drawing D-6-6376-41a-Z – Heater Case Cover
Action Items:
LZ: Check measurement on the location of the oven t/c and change if needed to comply.
Hector: Ask SwRI to place a note of 'typical' next to the location of the chimney port and oil thermocouple port.



Task Force Recommended revision to Section 6.2 of D5704

For the manufacturing of test apparatus parts, engineering drawings (set A) are available as an adjunct from ASTM Headquarters. Tolerances on set A are for manufacturing purposes and are not for performance requirements. In order to meet the procedure calibration requirements, another set of engineering drawings (set B) are available for setting performance requirements. Builders unable to obtain specified parts and wishing to use substitutes shall request approval from ASTM Subcommittee D02.B0.03.

Notes: Set B would be included as an annex (mandatory information) of the D5704.

Task Force Recommendation on saving parts

During task force discussions, the TMC mentioned that while in general the ACV test severity with reference fluids seem to be stable, there will be a sporadic 1 to 2 standard deviation shift. In order to investigate this further, we are recommending that all labs keep the test parts for all reference tests for 1-year from the end of test. This will allow the parts to be available for rating workshops where at least one variable (rating) could be ruled out.

Section 6.2 of the D5704

6.2 All new equipment shall be constructed in accordance with the engineering drawings available as an adjunct from ASTM Headquarters[6] in order to meet calibration requirements. Builders unable to obtain specified parts and wishing to use substitutes shall request approval from ASTM Subcommittee D02.B0.03.