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Committee D02 on PETROLEUM PRODUCTS AND LUBRICANTS

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January 24, 2005

Reply to:
Chris Schenkenberger
The Lubrizol Corporation
29400 Lakeland Blvd.
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(440) 347-2388
(440) 347-2878 (FAX)

ASTM D02.B0.03 L-60-1 Surveillance Panel
Members and Guests:

Attached are the corrected meeting minutes of the August 25, 2004 L-60-1 Surveillance Panel meetings held at the PRI Headquarters, Warrendale, PA. These minutes include a correction to Motion 1 which was approved at the November 3, 2004 L-60-1 Surveillance Panel meeting. The correction consisted of inserting the following sentence into Motion 1: "*...Labs can continue using extra insulation when they feel it is necessary and the use of extra insulation as an enclosure around the test rig...*" Please direct any corrections or comments to my attention.

Sincerely,

Chris Schenkenberger

Chris Schenkenberger, Chairman
L-60-1 Surveillance Panel

Attachments

Report of Meeting
L-60-1 SP Meeting
PRI Headquarters, Apollo Room, Warrendale, Pa.
August 25th, 2004

Sign-in/Review of Membership: The meeting was called to order at 08:05. A review of the agenda was completed and is included as ***Attachment 1***. The sign-in sheet is ***Attachment 2***. There were no membership changes to report.

Approval of meeting minutes:
Before the minutes were approved, Mr. Lind had a question pertaining to the following Motion which was sighted in the June 16, 2004 meeting minutes.

> ***Motion 1*** (Motion ⇒ Bill Sullivan, Second ⇒ Claire Whitton)
> All L-60-1 test stands, under their current configuration, are grandfathered to June 30th, 2004. Labs can continue using extra insulation when they feel it is necessary and the use of extra insulation as an enclosure around the test rig. Effective July 1st 2004, any stand not meeting the updated stand drawings is out of compliance with D5704.

The Test Monitoring Center's (TMC) interpretation was that the motion allowed labs to continue to use insulation exterior to the L-60-1 oven assembly. Once the updated test apparatus drawings have been approved, the use of extra insulation will be addressed by the Surveillance Panel. The Chairman and Surveillance Panel members agreed that Mr. Lind's interpretation was correct. Once the drawings are in place, the Surveillance Panel carries the action item of addressing if the use of extra insulation should be continued and how it can be used.

Motion 1 (Motion⇒ Brian Koehler Second⇒ Cory Koglin) Unanimous approval of the June 16, 2004 Surveillance Panel meeting minutes as written.

Information Letter 04-2 was issued since the last meeting and is included as ***Attachment 3***. The primary subject was the specified model numbers for the unit used to calibrate the oxidizing airflow controller. There was no further discussion.

Summary of Meeting Discussions

Test Stand Drawings:

TF proposal to resolve seal plate counter bore depth issues:

- Since the last meeting, there is one last issue to resolve, revolving around the modified seal plate that the primary seals are pressed into. When the V-ring seal was adopted for use in the D5704, guidance for modifying test components for proper installation was not given. Labs had to make changes to their stands to allow the proper stack up of tolerances so the v-ring would work properly. Two options for proper installation were identified. One way was to drill the primary seal counter bore, on the modified seal plate, a little deeper. This would allow the primary seal to go further into the plate and provide the proper crush on the v-ring. The second option was to move the location of the shafts which required changes to the pillow block assembly and location. Both options were taken by respective

labs. In order to accommodate the needed adjustment of the seal plate counter bore depth, additional guidance needed to be added to the seal plate drawing (Drawing # C-3963-1277-Z). The SP had directed the L-60-1 Laboratory Task Force to review this issue and provide a recommendation. Meeting minutes from the August 10, 2004 TF Teleconference are included as ***Attachment 4***. The following proposal was a result of the 8/10/04 Task Force Teleconference.

The labs would like to propose that the drawing # C-3963-1277-Z be modified to include this note: "For the proper stack up assembly, the distance from the snap ring groove to the counter bore of the seal plate should be 0.400 +/- 0.03125 inches. The counter bore depth of 0.262 inches may be adjusted to give proper stack up assembly of the oil seal (CR-6383 and V-ring (CR-400164.

Motion 2 (Motion⇒ Bill Sullivan Second⇒ Brian Koehler) Approve the Task Force proposal for adding Note 3 to drawing number C-3963-1277-Z as proposed in the 8/10/04 Task Force Minutes.

Motion Results: Approved
In favor: 4
Opposed: 0
Abstain: 0

Approval/Implementation of Revised L-60-1 Apparatus Drawings

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:

1. The Chairman will work with SwRI to make the final corrections to drawing C-3963-1277-Z and will forward an electronic copy of all 19 drawings to the TMC in pdf format.
2. The TMC will issue a TMC memo for using the revised drawings and forward the drawings onto ASTM headquarters so they can be incorporated into the next procedure revision.

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.

TMC 148-1 Industry Matrix

A remaining action item from the June 15th meeting was for labs to finish their 1 donated test using TMC 148-1. The purpose for running the matrix was to explore any perceived differences in lab-to-lab viscosity increase results. The TF outlined the details of the matrix process which included splitting the end of test L-60-1 drains 3-ways and running concurrent D445 @ 100°C tests at each laboratory. This will help determine if there is any value in doing future work (i.e. further testing, lab visits, etc.).

The Chairman presented the results which are included as ***Attachment 6***. It was discussed that duplicate D445 test results were not available at Lab A and D because of limited sample volume. Mr. Lind compared the results to the labs existing TMC 148-1 data from the LTMS system. This comparison showed no statistical differences from the labs existing results. Mr. Lind also commented that statistical conclusions could not be drawn for laboratory reproducibility because of the limited data set.

TMC Visits and D445 Testing

The Chairman started the SP discussion on this topic. The TMC has completed its 2004 lab visits for the purpose of reviewing the L-60-1 and its sub-procedures such as the D445 and D893. Based on these visits, a couple discrepancies between lab procedures and the interpretation of the D445 were observed. These discrepancies were documented in the TMC lab audit reports. A Hardware Task Force Teleconference was held on July 8, 2004 to openly discuss the issues. The TF minutes from the Teleconference are included as ***Attachment 7***.

Mr. Lind presented the following as findings of lab visits and asked for clarification and guidance from the Surveillance Panel.

Issue: Thermometer Resolution – D445, Section 6.3.1 and 6.4

As stated in the D445, the bath temperature can not vary by more than ± 0.02°C. The accuracy of the liquid-in-glass thermometer after calibration is also stated as ± 0.02°C. Section 6.4 references Annex A2 which contains general specifications for thermometers. Contained in the annex are thermometer scale mark subdivisions of 0.05°C. For two of the labs using automated viscometers, the thermometer scale marks are 0.05°C. Mr. Lind asked for the SP interpretation on this issue.

As a result of the SP discussions, Mr. Sullivan will take the action item of asking for clarification within Subcommittee D02.07 at the Winter ASTM D02 meetings. This will remain an open SP action item.

The two Labs using automatic measurements are checking the thermometer in the morning and not checking during the days runs. Also, the thermometer designations do not meet the procedure designation for reading. The lab doing manual measurement does have a digital readout, strip chart, and data logging as well as the ability to check during the actual measurements.

Issue: D445, Section 12.3

Section 12.3 specifies to charge two viscometers as dictated by the design of the equipment being used. Section 12.5 requires the viscosity be calculated from charging two viscometers. Section 12.5.1 calls for the reported value to be the average of the two results. Mr. Lind reported that one lab was not reporting averaged results because only single runs were conducted. It was reported that the issue was immediately addressed and has been corrected within the laboratory.

Issue: D445, Section 12. 5.1 for Opaque Liquids and Section 17.1.1 for Determinability
Section 12.5.1 covers determinability for the test procedure and also gives direction to repeat the kinematic viscosity measurements if repeatability is outside of a certain range. Mr. Lind mentioned that laboratories are using different thresholds to determine when repeat runs are necessary.

Section 12.5.1 also references section 17.1.1 which contains determinability for various materials at specified temperatures. For material or temperature, or both, not listed in 17.1.1 and for temperatures between 15 and 100°C, section 12.5.1 says to use an estimate of determinability of 1.0%. Mr. Lind asked for Surveillance Panel clarification on whether fluids used in the L-60-1 meet any of the descriptions in section 17.1.1 or fall outside of that category?

Knowing that the original intent of the D445 was for testing viscosity of new formulated oil samples, the SP feels that end of test L-60-1 drains do not fit any of these descriptions within section 17.1.1. Therefore 1.0% should be used as an estimate of determinability.

D893

Background:

November 2003 Surveillance Panel Meeting

At the November 2003 Surveillance Panel Meeting, L-60-1 data was reviewed from laboratory donated tests which used extra insulation to evaluate possible effects on ACV. One test (CMIR# 49691), which was conducted at Lab D, had to be repeated because it was statistically invalid due to pentane insolubles being outside of the LTMS limits. Many Labs felt that this issue was not an uncommon issue as statistically invalid L-60-1 tests were typically caused by variability in pentane/toluene.

Mr. Layton asked the question if pentane/toluene insolubles should be continued to be tracked and, instead, deemed non-critical parameters. This resulted in the SP requesting that the TMC gather a summary of pentane and toluene failures over the course of L-60-1 test (i.e. How many references failed due to insolubles only?).

June 2004 Surveillance Panel Meeting

At the June 15 SP meeting, Mr. Lind presented the total amount of statistically invalid L-60-1's due to pentane/toluene. Over a 9 year period, Pentane/Toluene insolubles accounted for 25% of the total statistically invalid tests. At the June SP meeting, the group was reminded that lab visits had taken place during the 2001 timeframe which yielded many findings pertaining to the D893 procedure. The SP asked that the TMC revisit the data to see if the number of statistically unacceptable tests was reduced after the lab visits.

Present Meeting

As a result of an action item from the June SP meeting, the Mr. Lind revisited the Pentane/Toluene results for all reference tests in the LTMS database over a 2 year period (6/1/02 to 6/1/04). Mr. Lind presented the revised data which is included as ***Attachment 8***. Out of 81 valid tests, there were 11 statistically invalid tests and 3 were invalid due to pentane/toluene. All 3 of the statistically invalid tests were conducted at Lab D. Based on this data, the SP agreed that the system appears to be working properly as it has identified a lab issue. The SP felt that the issue should be dropped from the current action item list.

(Motion to adjourn ⇒ Cory Koglin, Second ⇒ Don Bartlett) The meeting was adjourned at 10:22 am.

Respectfully submitted,

Chris Schenkenberger

Chris Schenkenberger
L-60-1 Surveillance Panel Chairman

L-60-1 Surveillance Panel

8:00 – 10:00 August 25, 2004
PRI Apollo Room – Warrendale, PA

Agenda

I. Call to order/Review Membership

II. Review agenda

III. Approval of meeting minutes
- June 16, 2004 L-60-1 SP Meeting

IV. Information Letters issued since last meeting
- Information Letter 04-2

V. L-60-1 Test Stand Drawings
- Task Force proposal to resolve seal plate counter bore depth issue
- Approve implementation of revised drawings

VI. TMC Visits and D445 Testing
- Thermometer resolution
- Section 12.3 and 12.5.1 for Opaque Liquids
  a) **double test run requirement**
  b) **determinability**

VII. D893

VIII. New Business

IX. Adjournment

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

Meeting Date: 8/25/04

Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
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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
	Boschert, Tom	Non-voting	Ethyl Petroleum Additives 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

Attachment 2
Page Page 1 of 7
Reference L-60-1

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

Meeting Date: 8/25/04

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	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
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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

* Initial to indicate attendance at subject meeting

Attachment 2
Page Page 2 of 7
Reference L-60-1

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

Meeting Date: 8/25/04

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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

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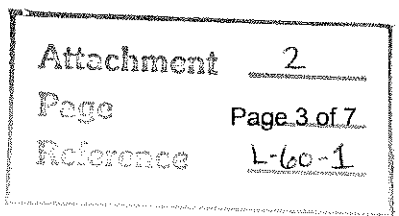

ASTM L-60-1 Surveillance Panel Membership/Mailing List

Meeting Date: 8/25/04

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	Layton, Kevin	Voting	Ethyl Petroleum Additives 500 Spring Street Richmond, Virginia 23218	Phone: 804-788-5363 Fax: 804-788-6358 E-Mail: Kevin_Layton@ethyl.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

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Attachment 2
Page Page 4 of 7
Reference L-60-1

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

Meeting Date: 8/25/04

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	McGlone, Bruce	Voting	ArvinMeritor 2135 West Maple Troy, Michigan 48084	Phone: 248-435-9929 Fax: 248-435-1411 E-Mail: mcglonbf@meritorauto.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

* Initial to indicate attendance at subject meeting

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

Meeting Date: 8/25/04

Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
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	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
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@email.mobil.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

* Initial to indicate attendance at subject meeting

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

Meeting Date: 8/25/04

Initials*	Name	Voting Status	Company Name & Address	Phone & Fax & E-Mail
CMW	Whitton, Claire	Non-voting	AFTON CHEMICAL ~~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~~ claire.whitton@aftonchemical.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	Non-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

CASTANIEN, CHRIS NV Lubrizol 29400 Lakeland Wickliffe OH 44092 440 [redacted] 347 2973 CCA @ Lubrizol.com

Brian Koehler V. SwRI 210-522-3588
C Voting for Hector De La Fuente, this meeting only

Janice Becker NV Afton Chemical 804 788-5293

* Initial to indicate attendance at subject meeting

Attachment 2
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Reference L-60-1

Test Monitoring Center
6555 Penn Avenue
Pittsburgh, PA 15206-4489
(412) 365-1000

L-60-1 Information Letter 04-2
Sequence Number 28
July 19, 2004

ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.

TO: L-60-1 Mailing List

SUBJECT: 1. Air Flow Controller Calibration Standard Model Number Addition
2. Revised Precision Statement

1. At the June 16, 2004 L-60-1 Surveillance Panel meeting, the panel approved a motion specifying the use of Sierra Top Trak Models 822S-L-2-OV1-V1-A1 or 822S-L-2-OV1-PV1-V4-A1 for air flow calibration. A revised Section 8.10 of Test Method D5704 is attached.

2. At the request of Subcommittee D02.B9 the definitions of Intermediate Precision and Reproducibility have been revised. Revised Sections 16.1.1.1 and 16.1.2.1 of Test Method D5704 are attached.

These changes are effective June 30, 2004.

Chris Schenkenberger
Chairman
L-60-1 Surveillance Panel

John L. Zalar
Administrator
ASTM Test Monitoring Center

Attachment

c: ftp://ftp.astmtmc.cmu.edu/docs/gears/l601/procedure_and_ils/il04-2.pdf

Distribution: Email

Attachment 3
Page 1 of 2
Reference L-60-1

8.10 *Air Flow Controller Calibration*—Prior to the start of a calibration cycle on a stand, calibrate the air flow controller to a traceable standard. Calibrate the traceable standard a minimum of once every year to the sole flow rate specification of 22.08 ± 2.01 mg/min at the outlet and 30 psig (206 kPa) inlet pressure. Connect the calibrated traceable standard, Sierra Top Trak Model 822S-L-2-OV1-V1-A1 or 822S-L-2-OV1-PV1-V4-A1, to the inlet of the Sierra Side Trak Model 840. Connect the outlet line of the Sierra Side Trak Model 840 to the gear box. Install an air pressure measurement device to monitor and regulate the inlet pressure to 30 psig (206 kPa). Charge the gear box with a commercial 80W-90 grade oil and bring to test conditions [325 ± 1°F (162.8 ± 0.5°C) at 1750 ± 50 r/min]. Remove the Top Trak after completing the calibration.

16.1.1.1 *Intermediate Precision Limit (i.p.)*—The difference between two results obtained under intermediate precision conditions that would, in the long run, in the normal and correct conduct of the test method, exceed the values shown in Table 2 in only one case in twenty. When only a single test result is available, the Intermediate Precision Limit can be used to calculate a range (test result ± Intermediate Precision Limit) outside of which a second test result would be expected to fall about one time in twenty.

16.1.2.1 *Reproducibility Limit (R)*—The difference between two results obtained under reproducibility conditions that would, in the long run, in the normal and correct conduct of the test method, exceed the values shown in Table 2 in only one case in twenty. When only a single test result is available, the Reproducibility Limit can be used to calculate a range (test result ± Reproducibility Limit) outside of which a second test result would be expected to fall about one time in twenty.

L-60-1 Task Force Teleconference

Topic: Resolving L-60-1 Drawings
Date/Time: August 10, 2004 10:00 – 10:30 am EDT

Participants:
TMC – Don Lind
Lubrizol – Chris Schenkenberger, Don Bartlett
SwRI –Hector De La Fuente
Ethyl – Cory Koglin

Purpose:
Action plan to resolve L-60-1 drawings (seal bore depth/v-ring location)

Summary:
Chris Schenkenberger proposed the following note be added to the seal plate drawing to resolve the issue:

Add the following Note to Drawing No. C-3963-1277-Z (see attached drawing):

> For proper stack-up assembly, the distance from the snap ring groove to the counter bore of the seal plate should be **0.400 ± .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).

Labs were not able to measure all of their stands prior to the conference call. This data needs to be gathered and reviewed before a decision can be made. Task Force participants were going to gather this data in time for a follow-up conference call scheduled for August 17th.

Hector mentioned that, in the past, SwRI had to lap the back of the seal plates to refurbish them from normal wear and tear. Pressing in seals and contact with other large parts (gear case) during the cleaning process can be contributing factors. Don Bartlett mentioned that Lubrizol had to replace all of their seal plates in the 1999 time frame because of this. Don mentioned that we have done a better job in minimizing possible abuse to the seal plate, and other small L-60-1 parts, with attention to detail in the cleaning process. Lubrizol made cleaning baskets and segregated different compartments to keep the small, more fragile, parts out of contact from larger ones. This seems to have helped.

Measurements from counter-bore of seal plate to the shaft snap ring groove:

Lubrizol

Stand 181A	Top Shaft	Bottom Shaft
Build 1	.374"	.370"
Build 2	.372"	.372"

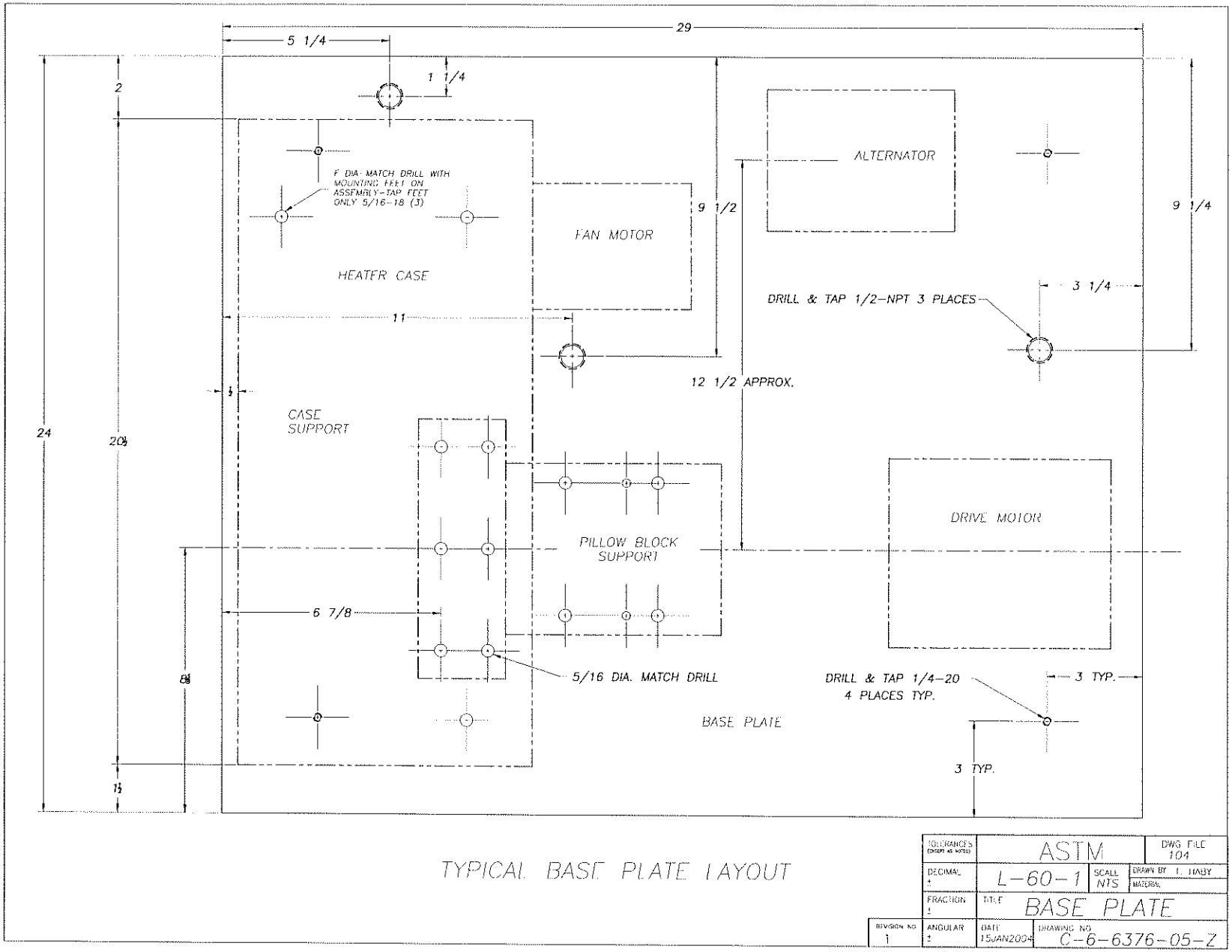
Attachment 4
Page 1 of 2
L-60-1

Stand 182A	Top Shaft	Bottom Shaft
Build 1	.405"	.397"
Build 2	.385"	.406"
Build 3	.380"	.402"

New Koehler Rig	Top Shaft	Bottom Shaft
Build 1	.333"	.472"
Build 2	.323"	.465"
Build 3	.332"	.472"

Action Items(s):

Koglin/ De La Fuente – conduct measurements on stand and forward to Task Force.
Schenkenberger – e-mail digital pictures of Lubrizol's baskets used to clean parts.
Schenkenberger – conduct measurements on new Koehler L-60-1 rig.
Schenkenberger – schedule a follow-up Task Force conference call for 8/17/04.

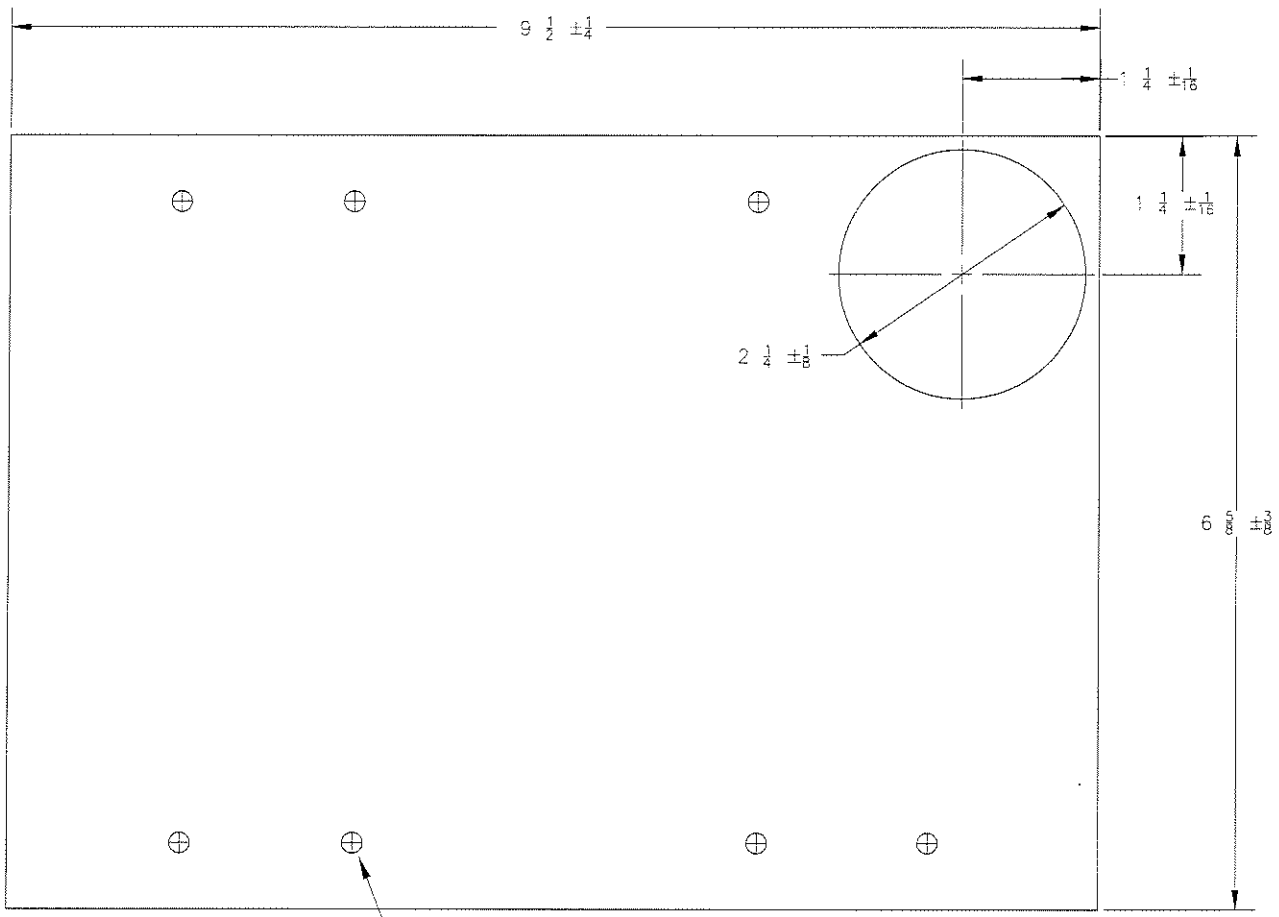


TYPICAL BASE PLATE LAYOUT

TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE 104
DECIMAL ±	L-60-1	SCALE NTS	DRAWN BY I. TABY
FRACTION ±	TITLE BASE PLATE		MATERIAL
REVISION NO 1	ANGULAR ±	DATE 15JAN2004	DRAWING NO C-6-6376-05-Z

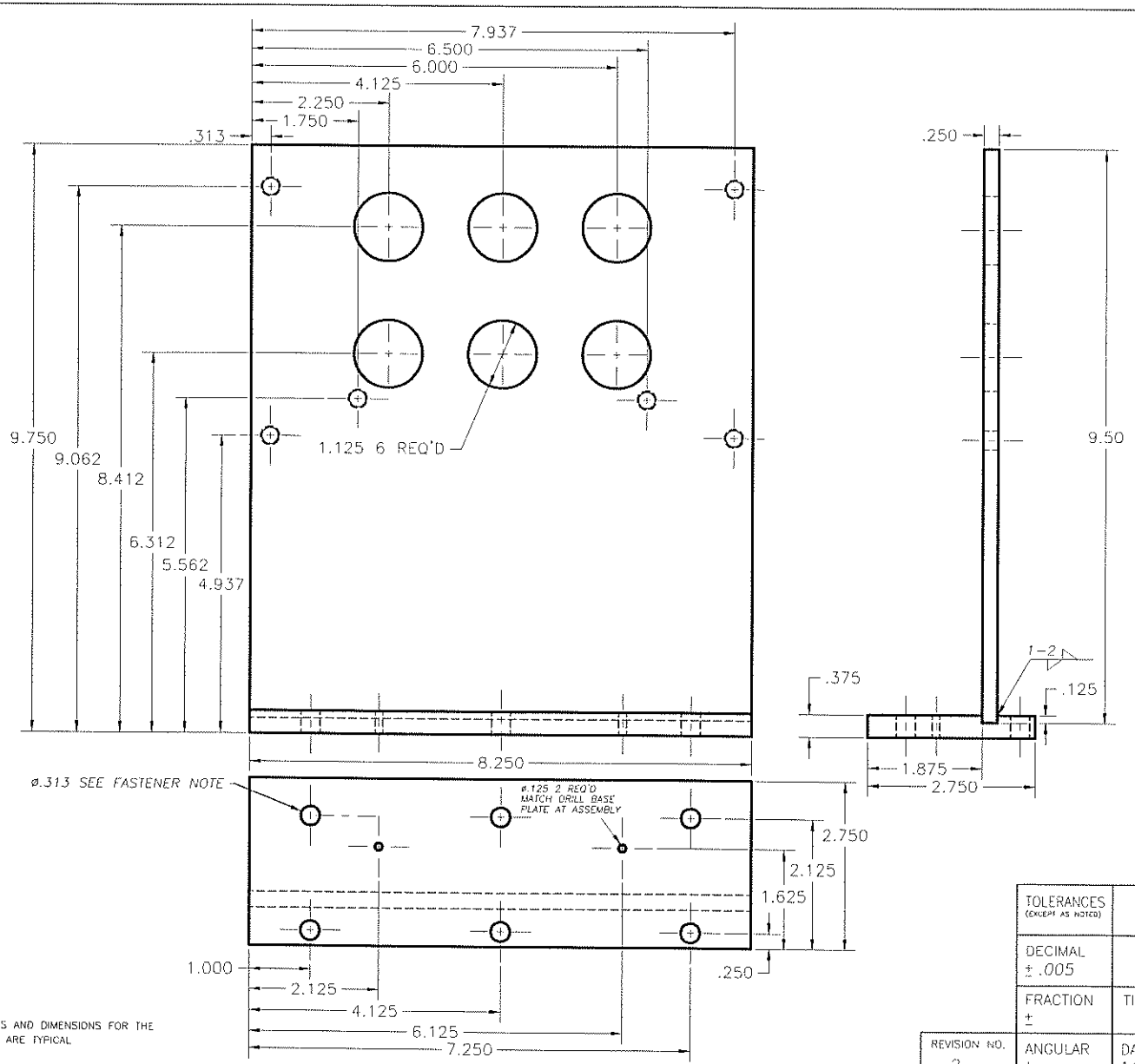
Attachment 5
Page 1 of 19
Reference L-60-1

Attachment	5
Page	2 of 19
Reference	L-60-1



MAT'L 12 GA MILD STEEL OR STAINLESS STEEL 1 REQ'D

2			
DWG FILE A:24	L-60-1	TITLE RADIANT HEAT BAFFLE	
DRAWN BY T.L. HABY ± .015			
ASTM	SCALE NTS	DATE 14JAN2004	DRAWING NO A-6-6376-11-Z

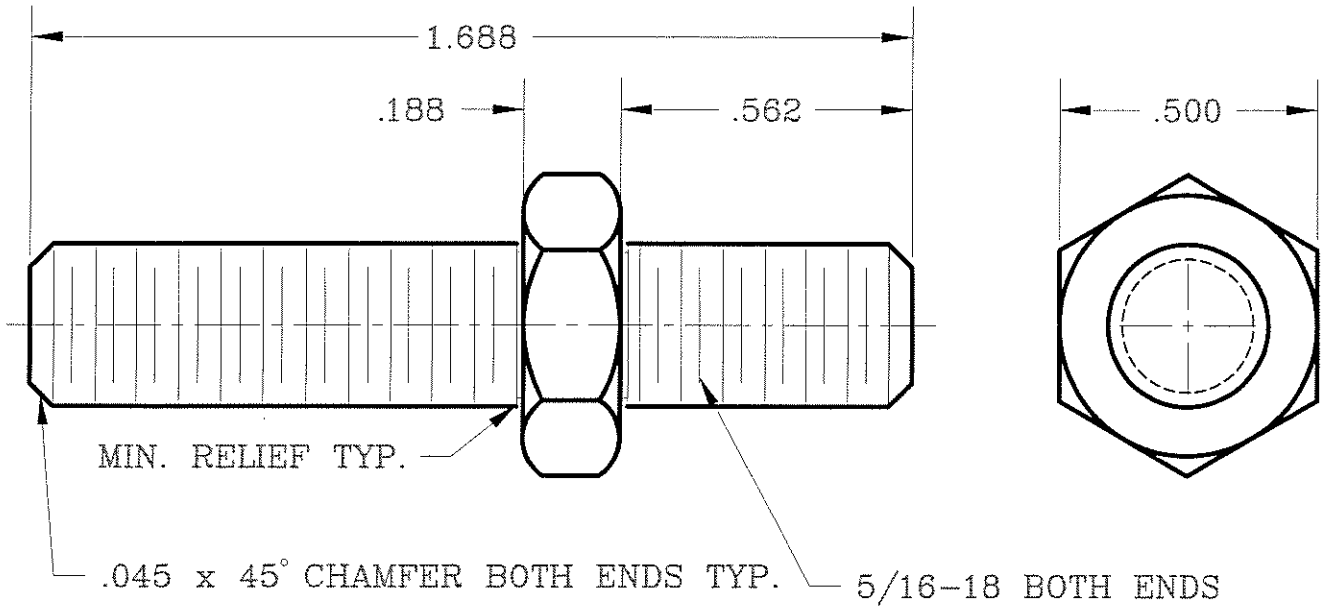


NOTE:
ALL HOLE LOCATIONS AND DIMENSIONS FOR THE BASE PLATE MOUNT ARE TYPICAL

Attachment 5
Page 3 of 9
Reference L-60-1

TOLERANCES (EXCEPT AS NOTED)	**ASTM**		DWG FILE 76A
DECIMAL ± .005	L-60-1	SCALE NTS	DRAWN BY T. HABY
FRACTION ±	TITLE GEAR CASE SUPPORT		MATERIAL HOT/COLD ROLL
REVISION NO. 2	ANGULAR ±	DATE 14JAN2004	DRAWING NO B-6-6376-18-Z

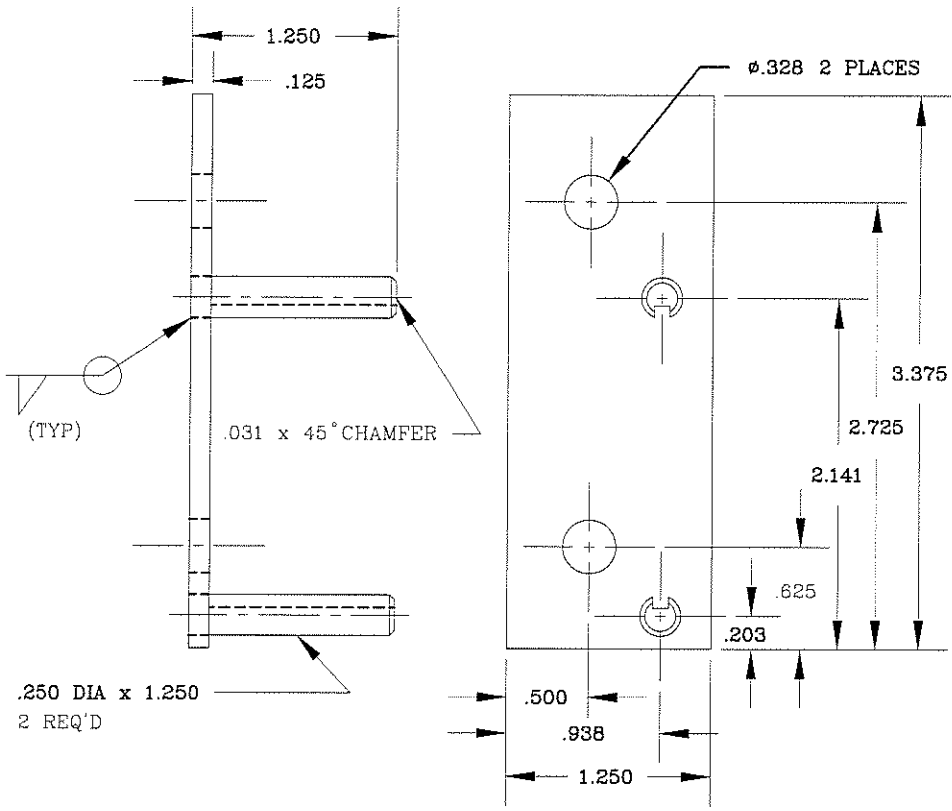
Attachment 5
Page 4 of 19
Reference L-60-1

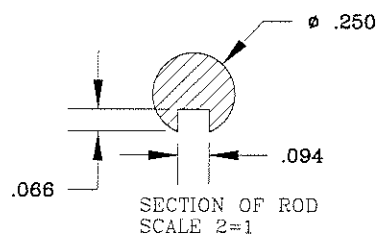


MAT'L TYPE 303 OR 304 SS 4 REQ'D

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 5
Page 5 of 19
Reference L-60-1

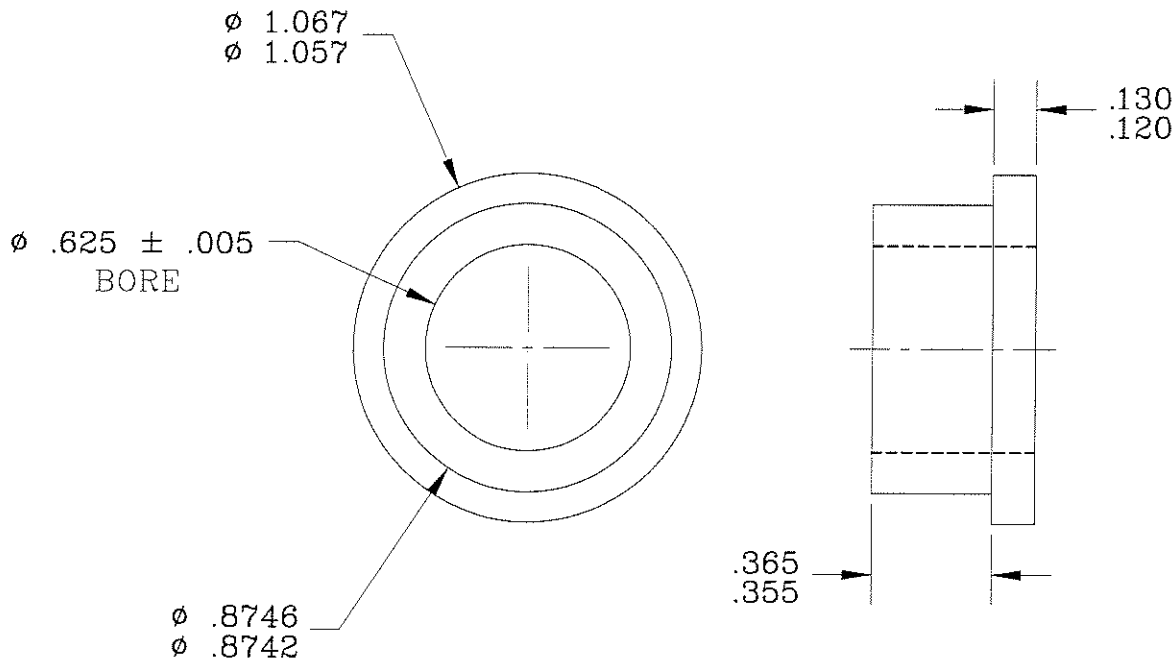




NOTE 1: TOLERANCES ARE FOR FABRICATION PURPOSES ONLY
NOTE 2: TYPE 303 OR 304 20 GA. ' REQ'D

REVISION NO. 1			
DWG FILE A:32	L-60-1	TITLE CATALYST HOLDER	
DRAWN BY T.L. HABY ± .005			
ASTM	SCALE 1=1	DATE 15JAN2004	DRAWING NO A-6-6376-23-Z

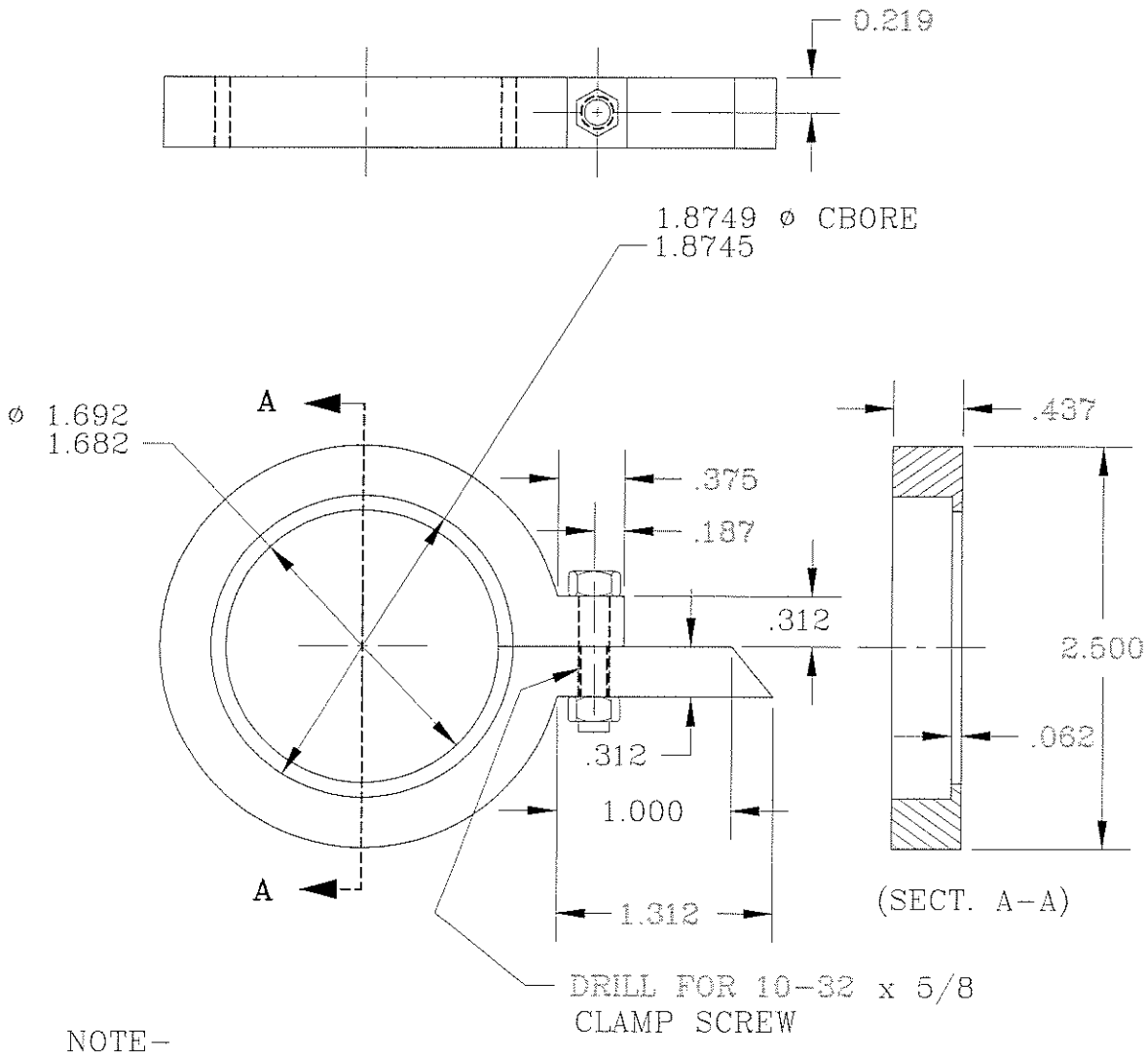
Attachment	5
Page	6 of 19
Reference	L-60-1



NOTE 1: TOLERANCES ARE FOR FABRICATION PURPOSES ONLY
NOTE 2: TYPE 303 OR 304 20 GA. 1 REQ'D

REVISION NO. 1			
DWG FILE A:33	L-60-1	TITLE TEST BEARING BUSHING	
DRAWN BY T.L. HABY			
ASTM	SCALE 2=1	DATE 15JAN2004	DRAWING NO A-6-6376-24-Z

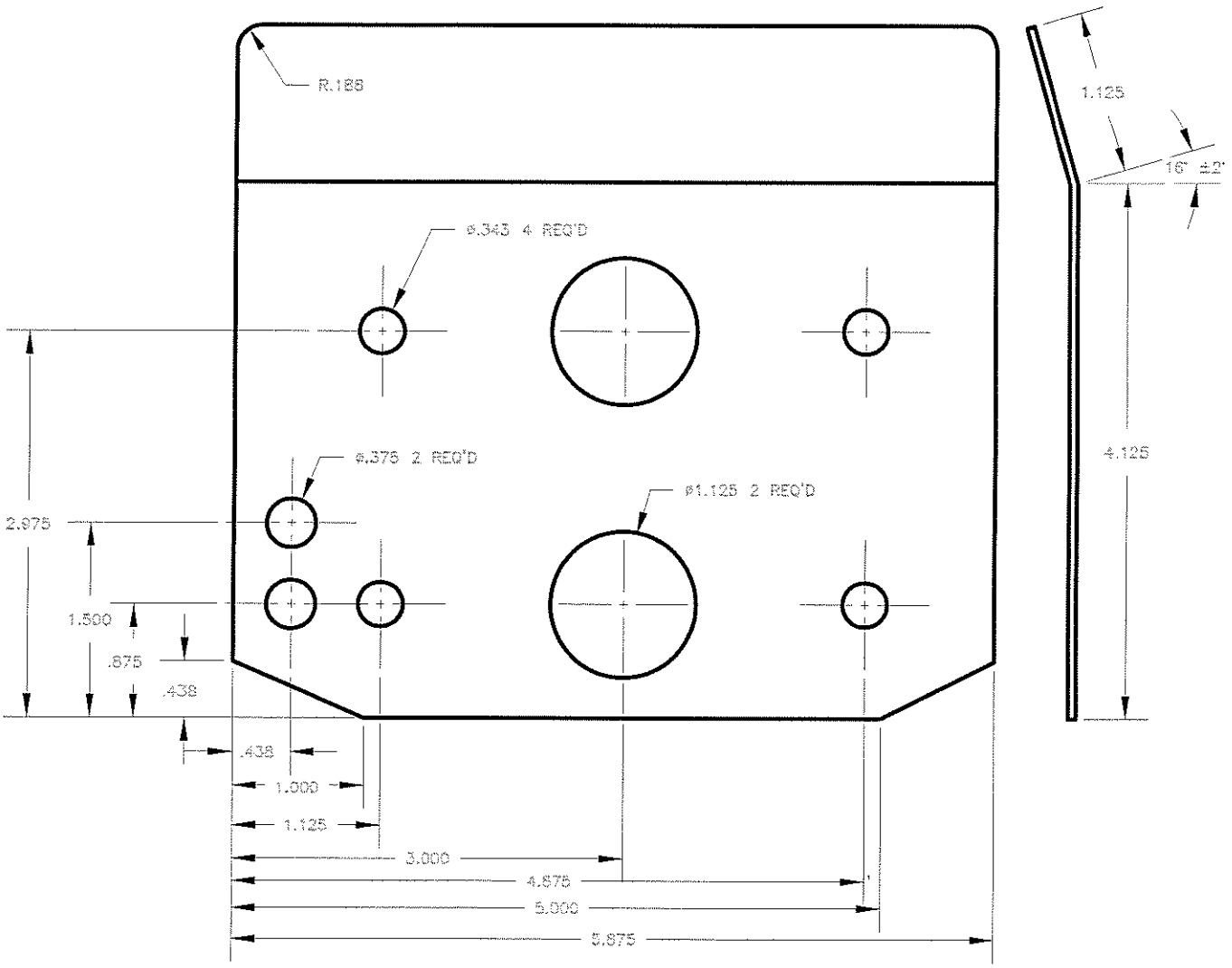
NOTE 1: TOLERANCES ARE FOR FABRICATION PURPOSES ONLY
NOTE 2: TYPE 303 OR 304 20 GA. 1 REQ'D



NOTE-
1. SAW OUT PART & ROUGH BORE
2. SLOT & CLAMP TIGHTLY WITH CLAMP SCREW
3. FINISH MACHINE BORE

REVISION NO. 1			
DWG FILE A:27	L-60-1	TITLE TEST BEARING CLAMP	
DRAWN BY T.L. HABY ± .005			
ASTM	SCALE 1=1	DATE 15JAN2004	DRAWING NO A-6-6376-25-Z

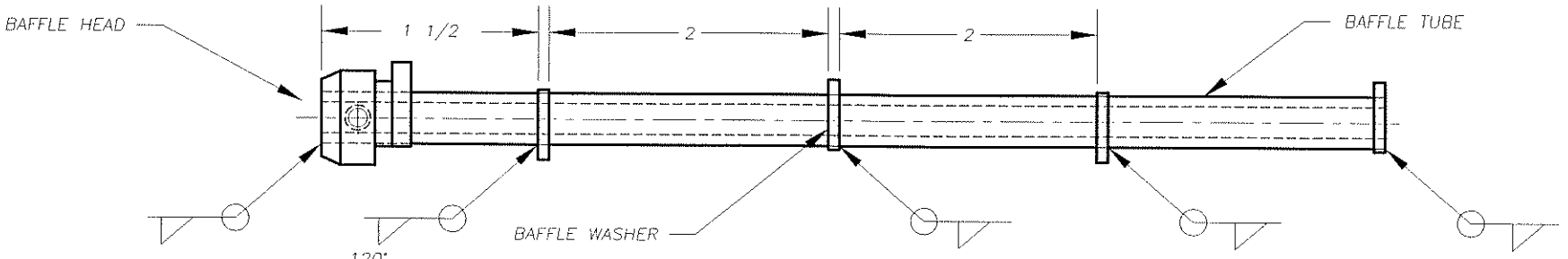
Attachment	5
Page	8 of 19
Reference	L-60-1



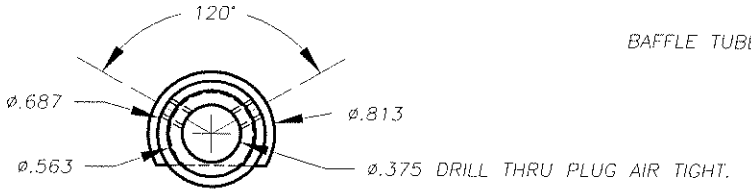
NOTE 1: TOLERANCES ARE FOR FABRICATION PURPOSES ONLY
NOTE 2: TYPE 303 OR 304 20 GA. 1 REQ'D

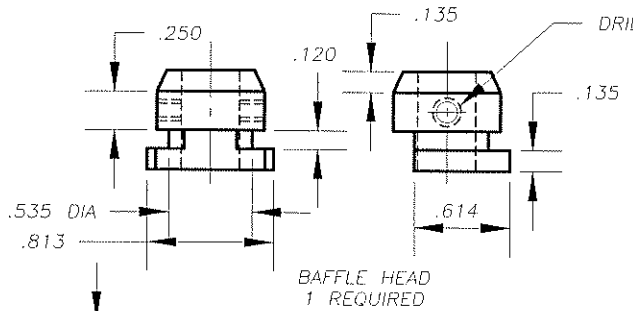
MAT'L TYPE 304 20 GA 1 REQ'D

REVISION NO. 2			
DWG FILE A:34	L-60-1	TITLE BAFFLE PLATE	
DRAWN BY T.L. HABY ± .010			
ASTM	SCALE NTS	DATE 15JAN2004	DRAWING NO A-6-6376-27-Z

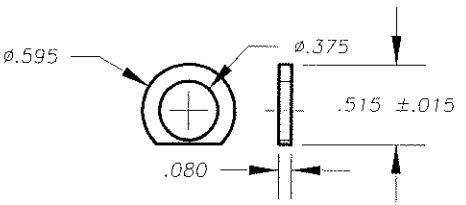


BAFFLE TUBE ASSEMBLY



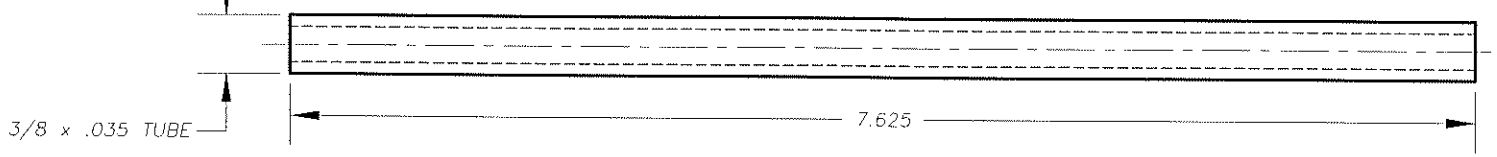


BAFFLE HEAD
1 REQUIRED



BAFFLE WASHER
4 REQUIRED

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



BAFFLE TUBE
1 REQUIRED

Attachment 5
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Reference L-60-1

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 5
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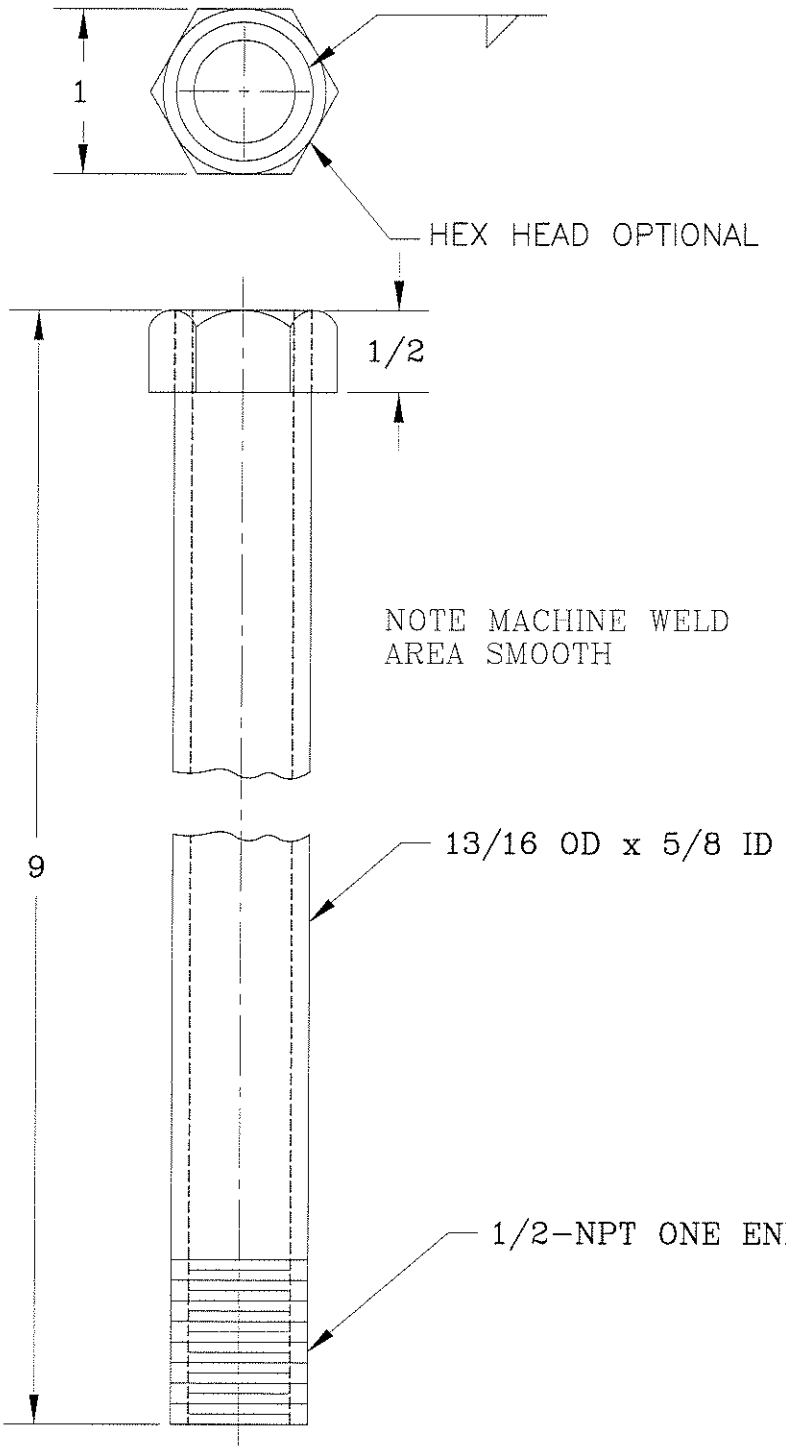
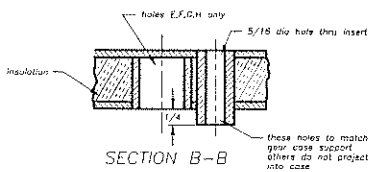
Reference L-60-1



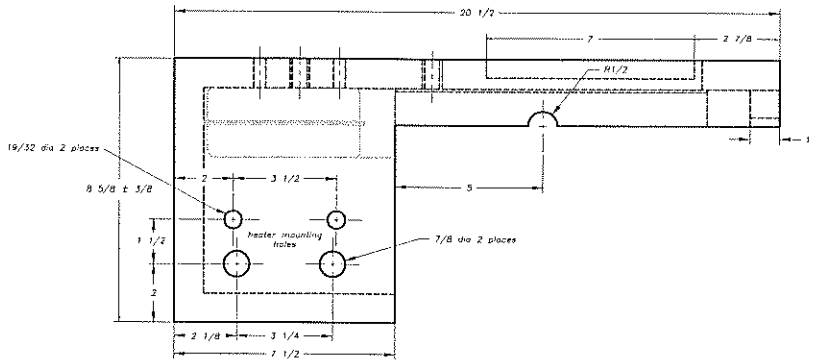
MAT'L 1/2 SCHED 40 STAINLESS PIPE

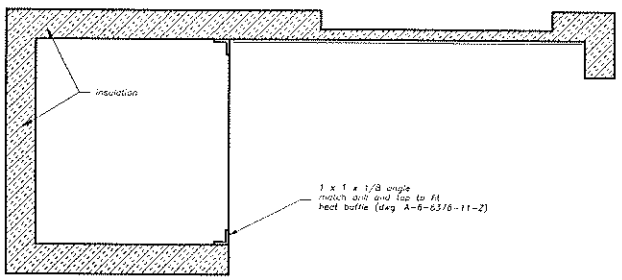
REVISION NO. 1			
DWG FILE A:39	L-60-1	TITLE VENT TUBE	
DRAWN BY T.L. HABY ± 1/16			
ASTM	SCALE 1=1	DATE 14JAN2004	DRAWING NO A-6-6376-36-Z

Attachment 5 Page 2 of 11 Reference L-60-1

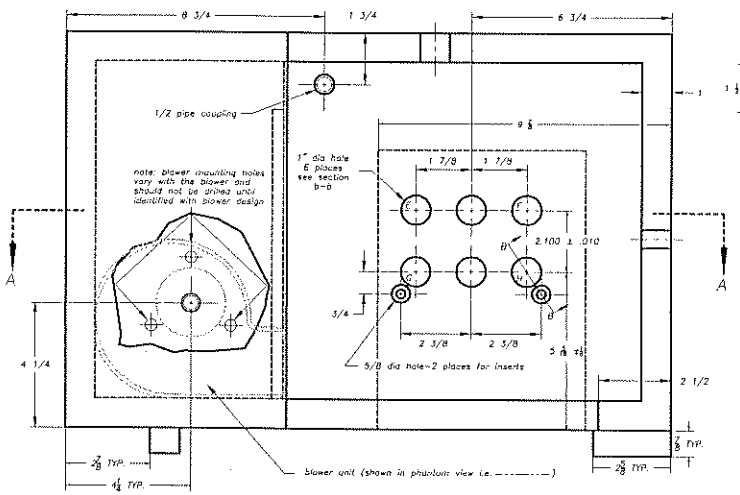


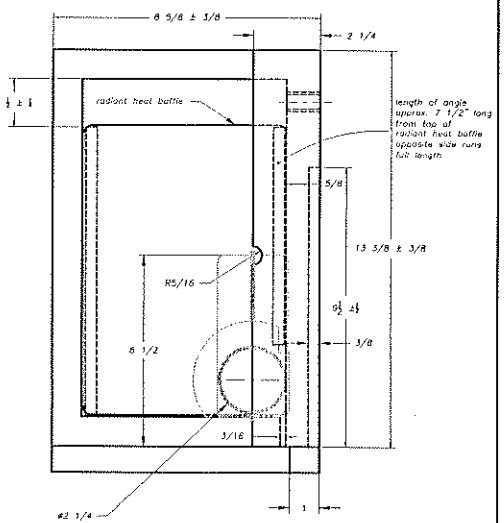
SECTION B–B





SECTION A–A





NOTES

1. CASE CONSISTS OF A DOUBLE WALL CONTAINER WITH INSULATION BETWEEN THE WALLS
2. WALLS TO BE 16 GA HOT 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 (UNLESS NOTED)	ASTM		DWG FILE C:\OVEN
DECIMAL ± .010	L-60-1	SCALE NTS	DRAWN BY T.L. HAHN
FRACTION ± 1/8	TITLE HEATER CASE		APPROVED BY
REVISION NO. 2	ANGULAR ±	DATE 14 JAN 2004	DRAWING NO D-6-6376-41-Z

Attachment 5
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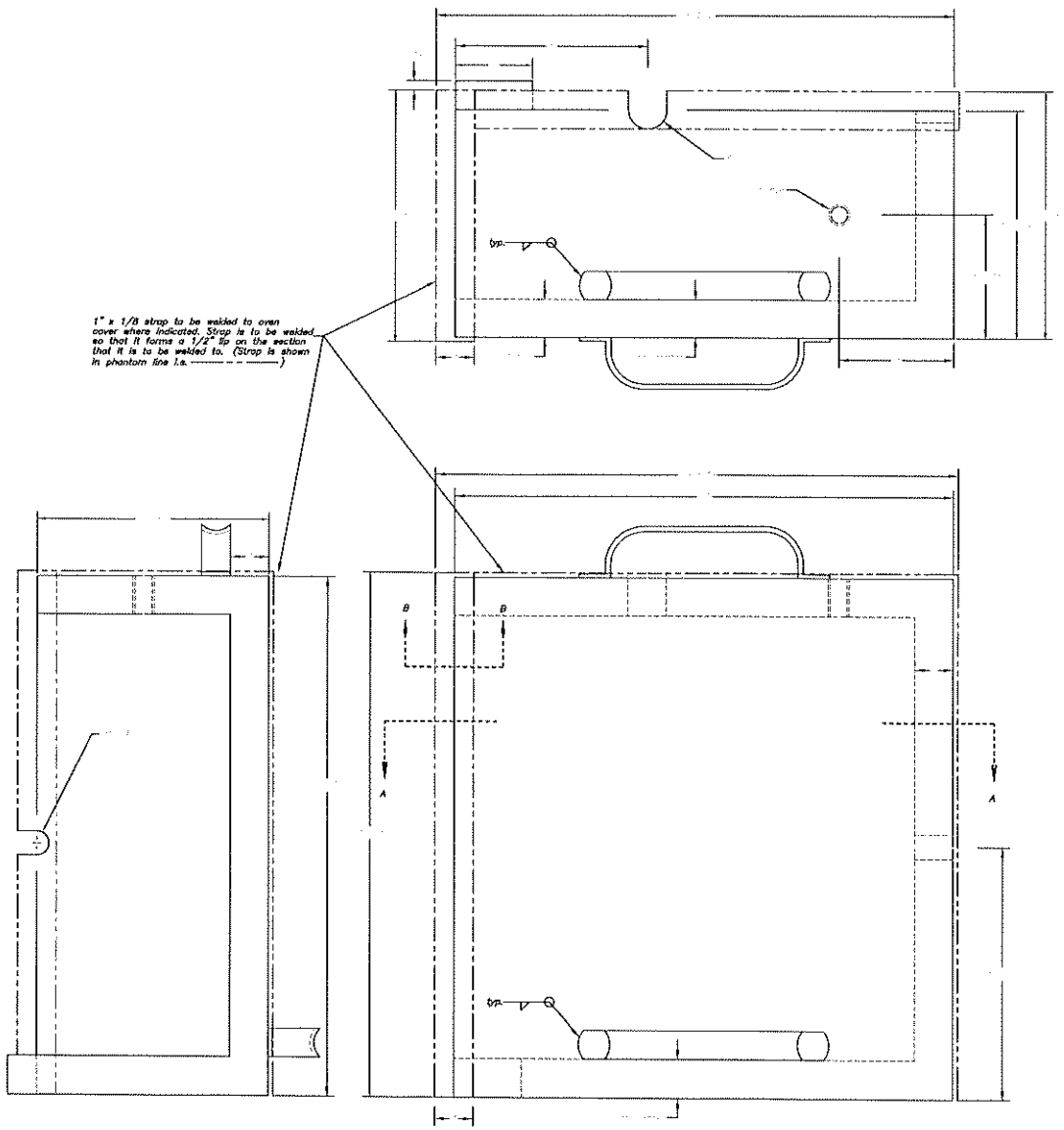
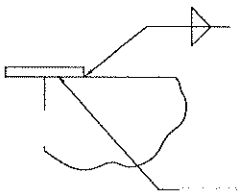
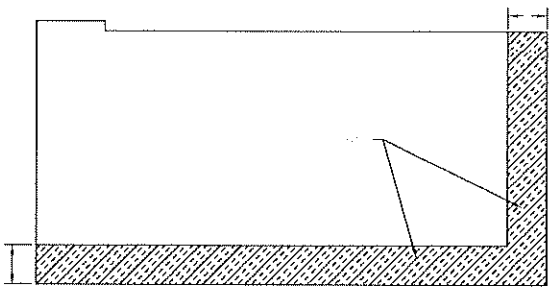
Reference L-60-1





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"

TOLERANCES (EXCEPT AS 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 3–29–95	DRAWING NO D–6–6376–41a–Z

Attachment 5
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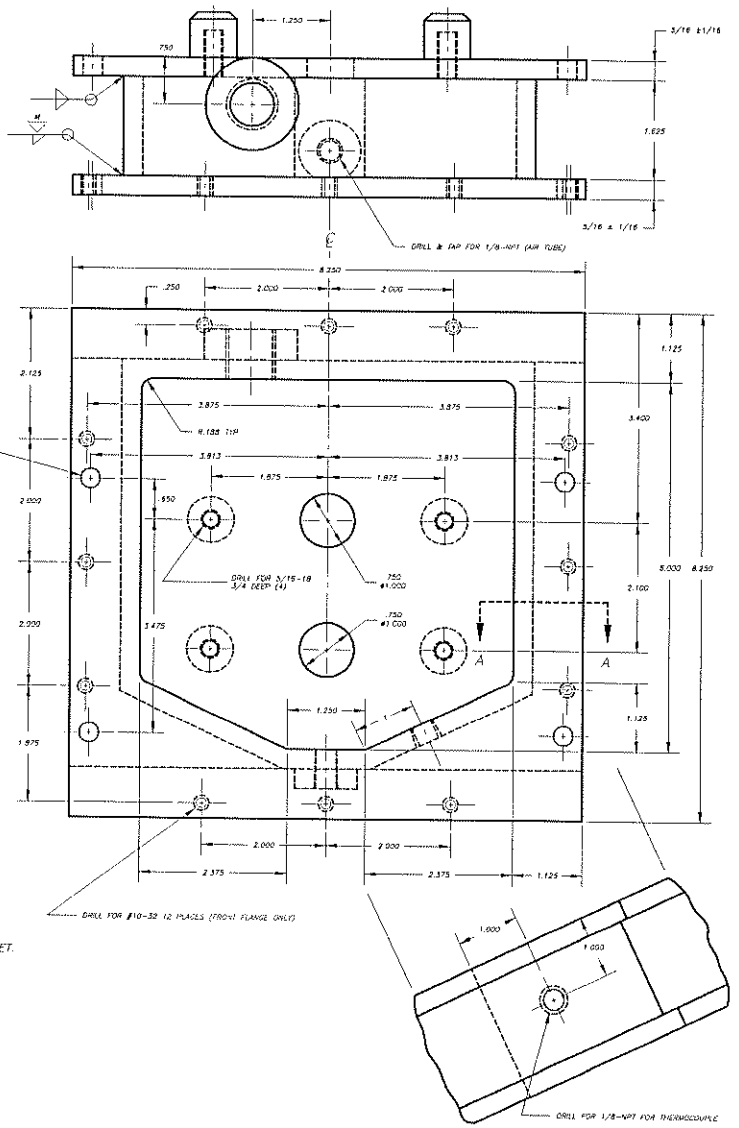
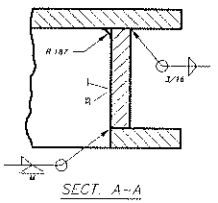
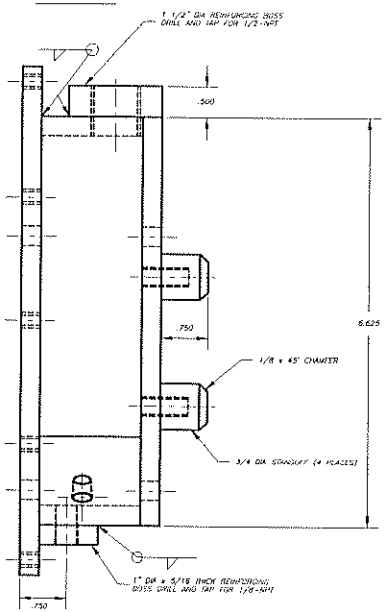
Reference L-60-1





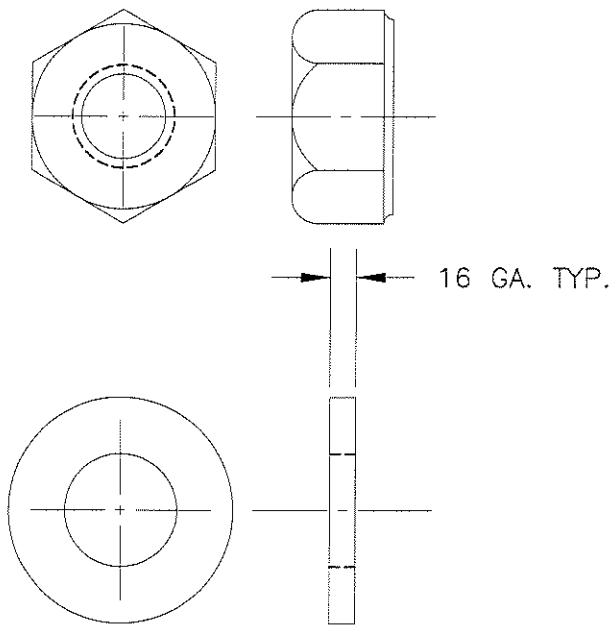


1. MATERIAL-303 STAINLESS STEEL 5/16 THICK; ALL JOINTS TO BE WELDED ON BOTH SIDES (INSIDE AND OUTSIDE CASE) OR MACHINE FROM BILLET.
2. STRESS RELIEVE AFTER WELDING
3. MACHINE FRONT FACE FLAT ±.001; MACHINE SIDES
4. MACHINE INSIDES OF BACK FLAT ±.001
5. MUST BE LEAK PROOF
6. INSIDE SURFACE OF CASE MUST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

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

Attachment 5
Page 14 of 19
Reference L-60-1

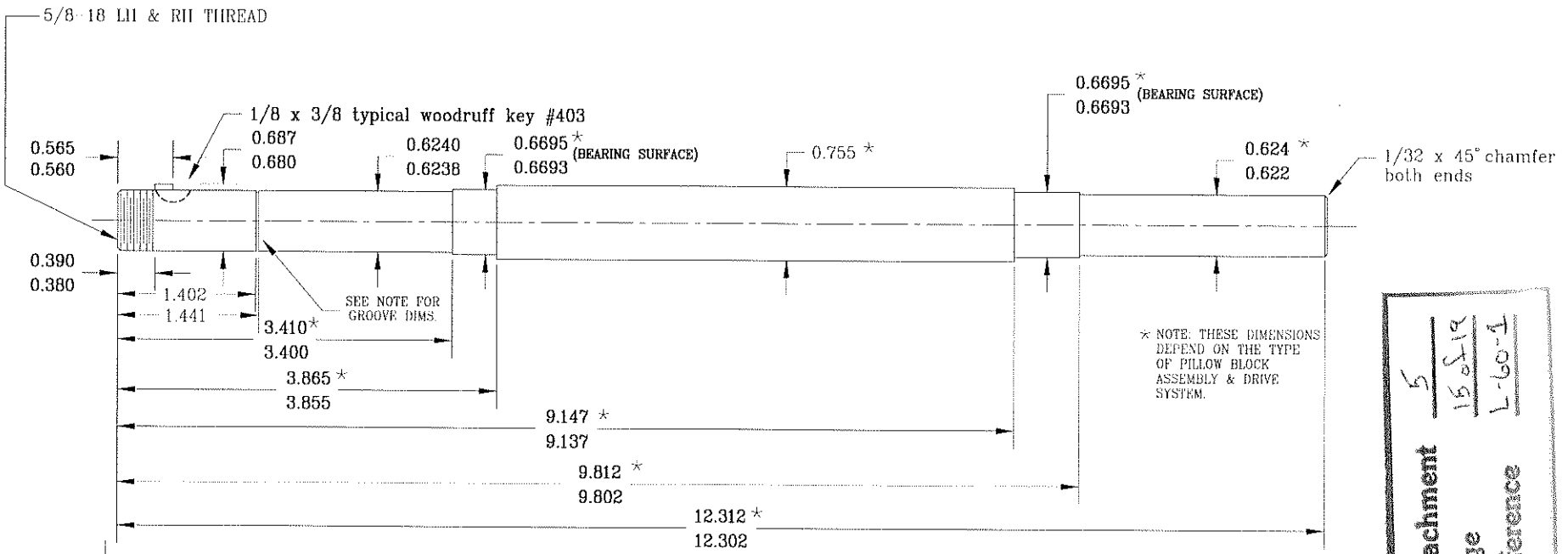
TYPICAL 5/16-18 STAINLESS NUT

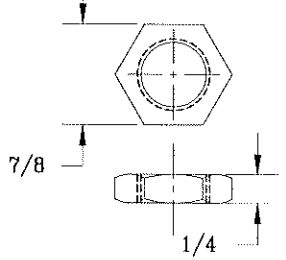


TYPICAL STAINLESS WASHER 11/16 OD x 11/32 ID

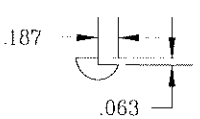
4 EACH REQ'D

REVISION NO. 1			
DWG FILE A:55	L-60-1	TITLE SEAL PLATE NUT AND WASHER	
DRAWN BY T.L. HABY ±			
ASTM	SCALE 2=1	DATE 15JAN2004	DRAWING NO A:6-6376-44-Z





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

Attachment 5
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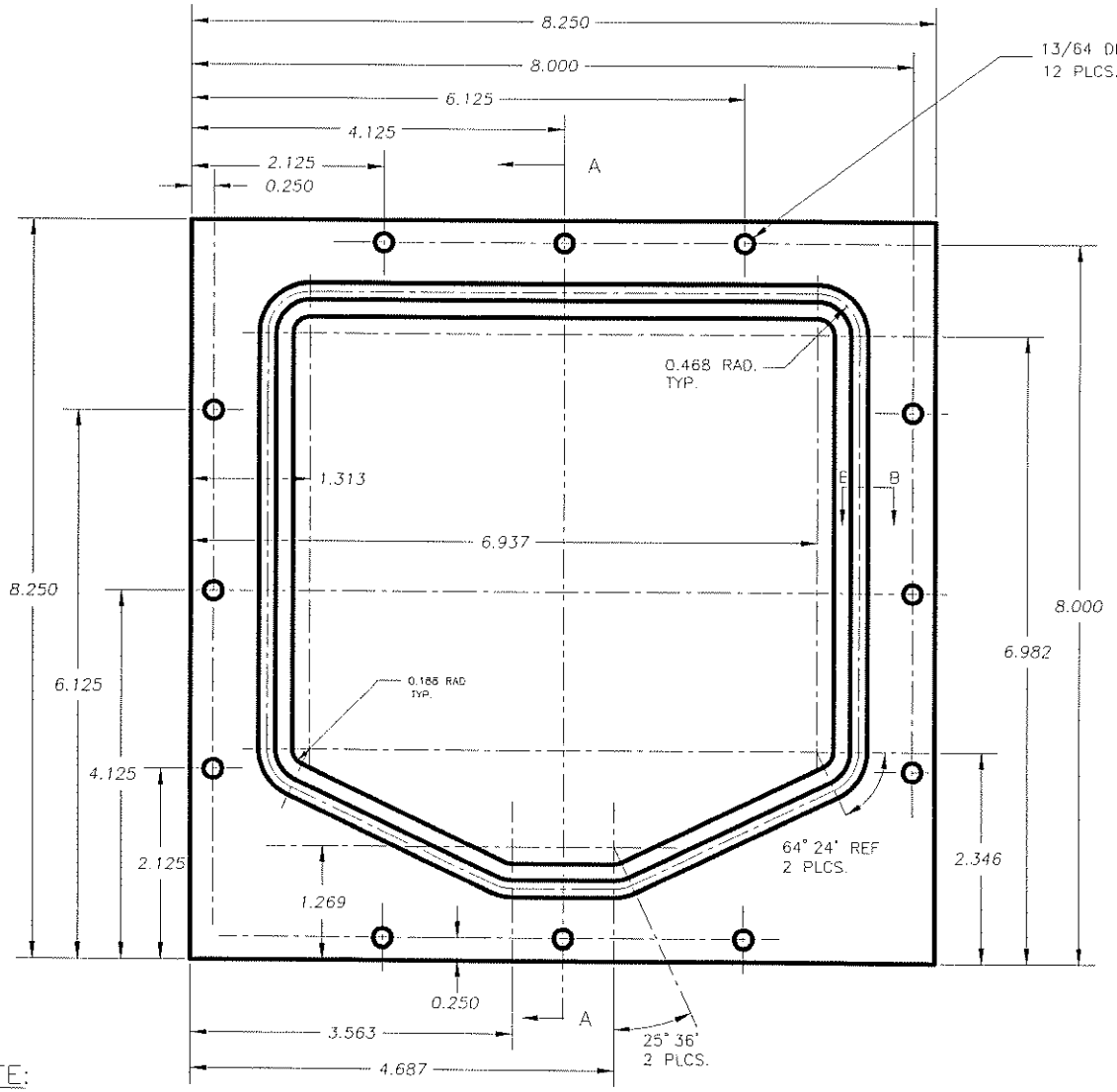
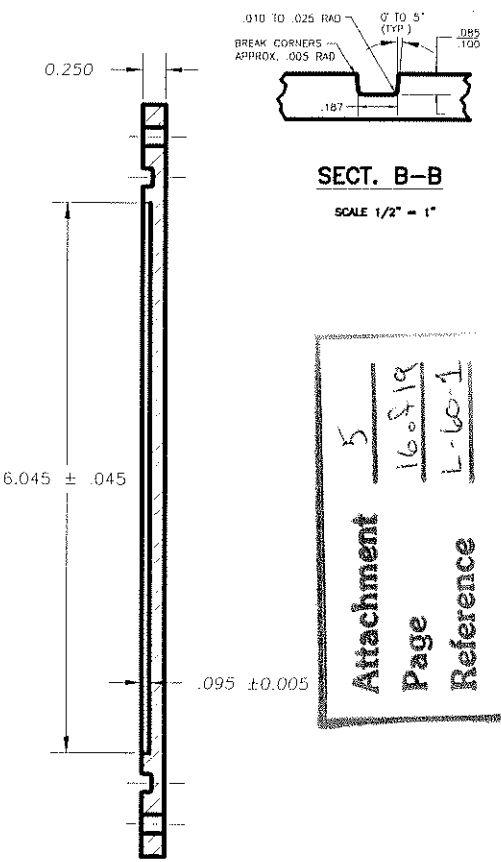
Reference L-60-1

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





SECTION A–A

SECT. B–B

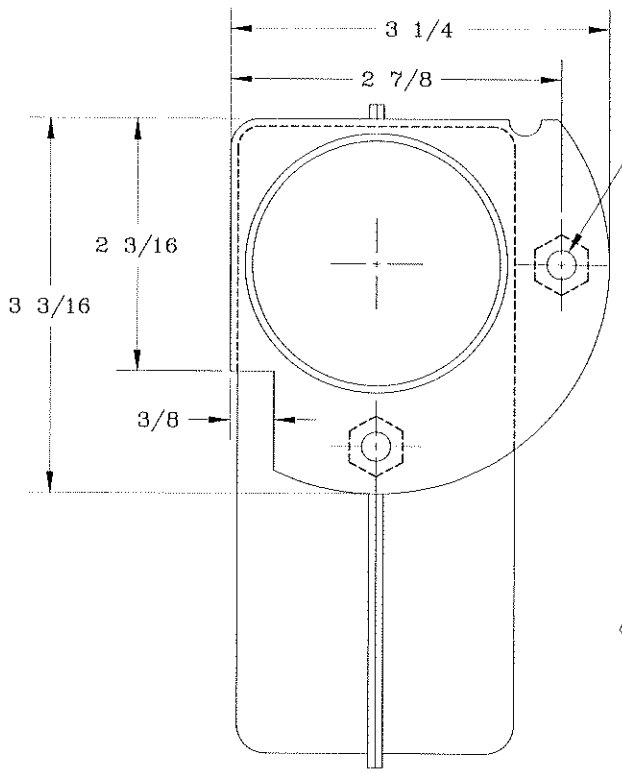
SCALE 1/2" = 1"

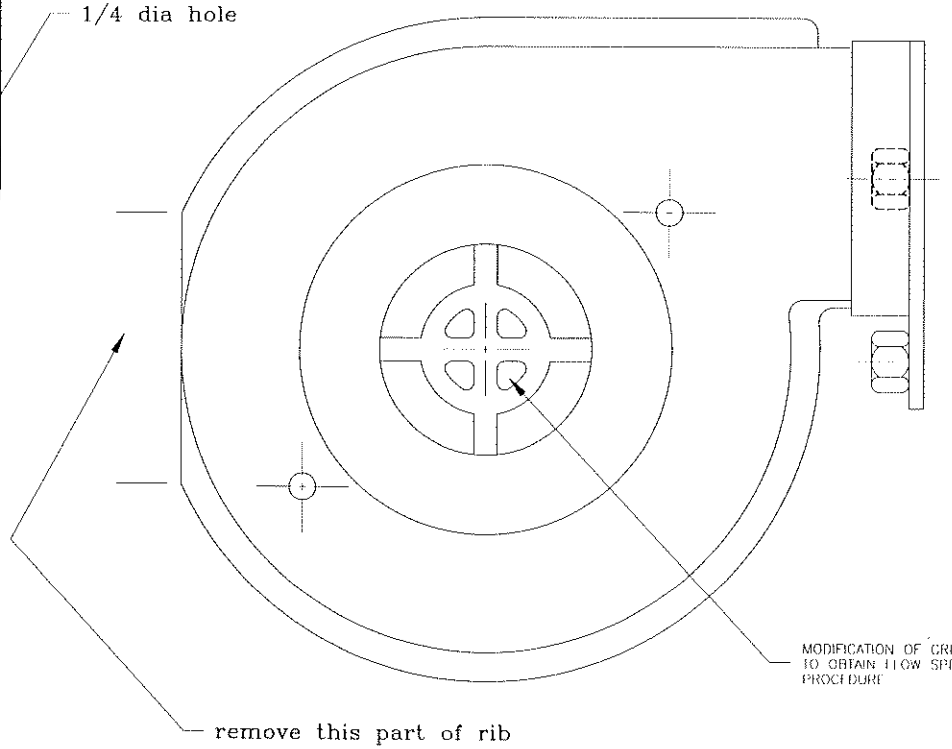
Attachment 5
Page 16 of 19
Reference L-60-1

NOTE:

1. 2–264 FLUOROCARBON RUBBER O–RING.
2. ALL DIMENSIONS ARE IN INCHES.
3. SURFACE FINISH 32 RMS TYP.

TOLERANCES (UNLESS AS NOTED)	ASTM		
DECIMAL ± 0.005	MATERIAL 303 OR 304 SS	SCALE 1=1	DRAWN BY T.HABY
FRACTION ±	TITLE COVER, T.O.S.T GEARCASE O–RING, L–60–1		
REVISION NO. 1	ANGULAR ±0° 30"	DATE 13MAY2004	DRAWING NO C–7518–655–Z





Attachment 5
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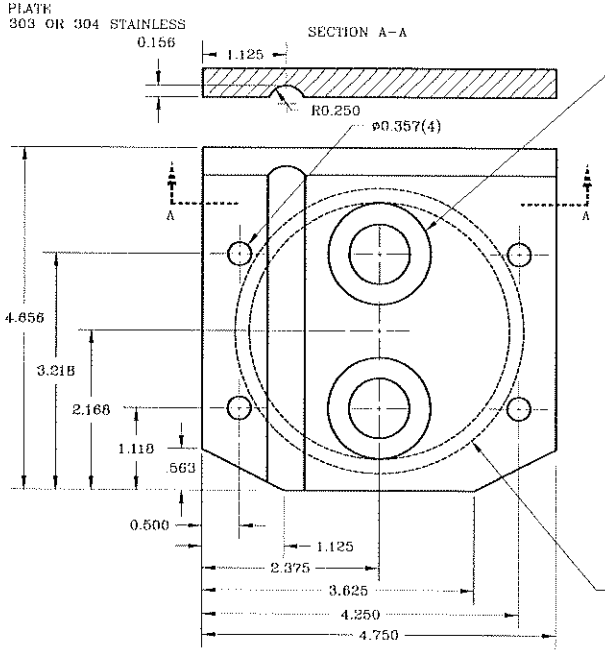
Reference L-60-1

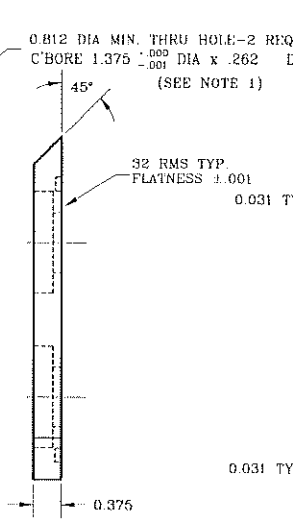
NOTE: MODIFY FLANGE AS SHOWN.
-ADD 1/4 DIA HOLE AND WELD 1/4-20 HEX NUTS AS SHOWN.
-BLOWER HOUSING IS FROM DAYTON MODEL 4C440 SHADED POLE BLOWER (MOTOR IS NOT USED).

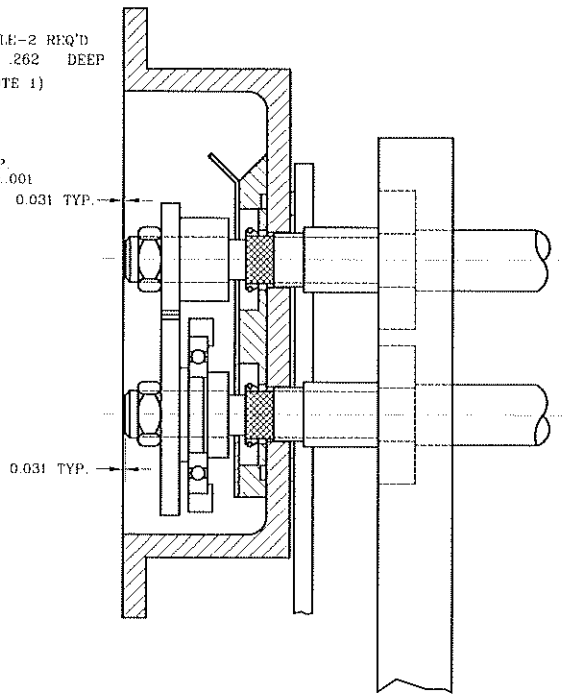
TYPICAL BLOWER HOUSING (OTHERS MAY BE USED BUT MUST COMPLY WITH FLOW SPECIFICATIONS IN THE D5704 PROCEDURE.)

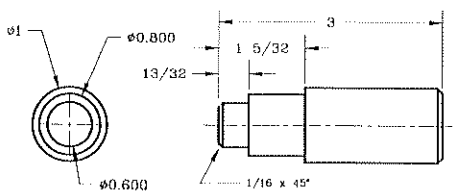
TOLERANCES (EXCEPT AS NOTED)	**ASTM**		DWG FILE A:86
DECIMAL ±	L-60-1	SCALE 1=1	DRAWN BY I. HABY
FRACTION ± 1/16	TITLE MODIFIED BLOWER HOUSING		MATERIAL
REVISION NO. 1	ANGULAR ±	DATE 15JAN2004	DRAWING NO B-3752-1118-Z

SEAL PLATE
TYPE 303 OR 304 STAINLESS







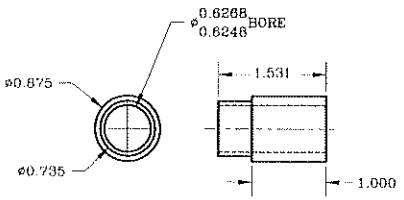


SEAL REMOVAL TOOL-CRS

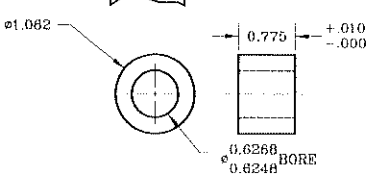
NOTE 1:
MATERIAL MAY BE REMOVED FROM SHOULDER TO FACILITATE LIP SEAL REMOVAL

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

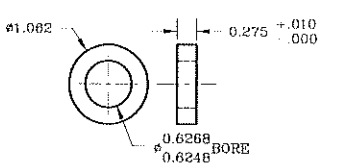
NOTE 3:
FOR PROPER STACK-UP ASSEMBLY, THE DISTANCE FROM THE SNAP RING GROOVE TO THE COUNTER BORE OF THE SEAL PLATE SHOULD BE .400 ±.03125 INCHES. THE COUNTER BORE DEPTH OF .262 INCHES MAY BE ADJUSTED TO GIVE PROPER STACK-UP ASSEMBLY OF THE OIL SEAL (CR-6383) AND V-RING (CR-400164).



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. HARY
FRACTION ± 1/32	TITLE MODIFIED SEAL PLATE		MATRIX
REVISION NO. 3	ANGULAR ±	DATE 29SEPT04	DRAWING NO C-3963-1277-Z

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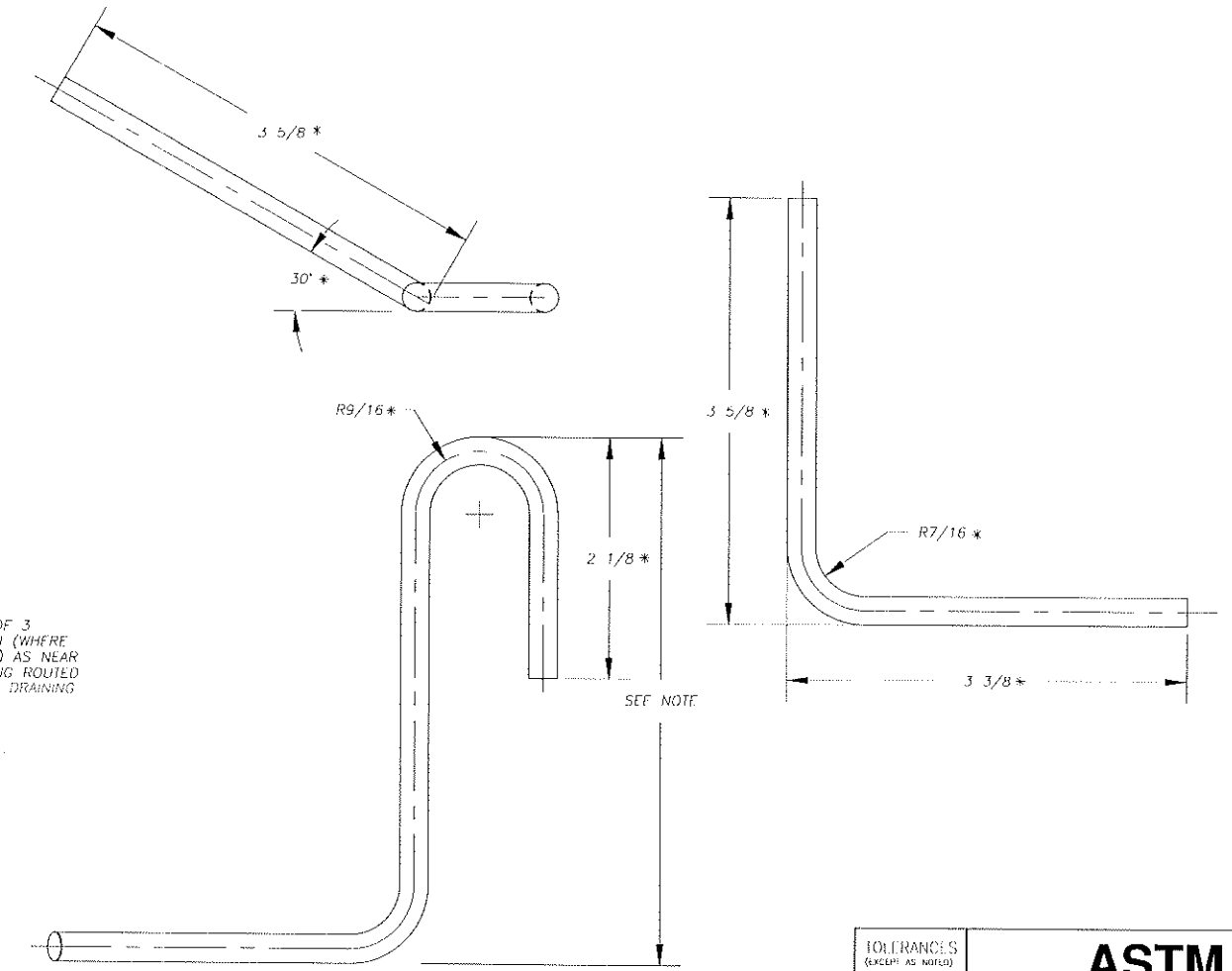

NOTE: TUBE MUST RISE A MINIMUM OF 3 INCHES VERTICALLY ABOVE THE DRAIN (WHERE OIL ACTUALLY LEAVES THE GEARCASE) AS NEAR THE CASE AS POSSIBLE BEFORE BEING ROUTED TO THE AIR SUPPLY TO PREVENT OIL DRAINING FROM THE CASE.

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USE 1/4 O.D. STAINLESS TUBE

* TYPICAL DIMENSIONS

NOTE: STAINLESS 303 OR 304

TYPICAL AIR TUBE

TOLERANCES (EXCEPT AS NOTED)	ASTM		DWG FILE O:AIRSUPTB
DECIMAL ±	L-60-1	SCALE 1=1	DRAWN BY T. HABY; MATERIAL SS
FRACTION ± 1/16	TITLE AIR SUPPLY TUBE		
REVISION NO. 2	ANGULAR 2°	DATE 15JAN2004	DRAWING NO B-4805-1374-Z

Background: The purpose for running the matrix is to explore possible causes that are contributing to variations in lab-to-lab viscosity results. The Surveillance Panel wishes to determine whether differences are a result of the oil degradation caused by the L-60-1 test, the D445 procedure, or both. Splitting the end of test L-60-1 drains 3-ways and running concurrent D445 @ 100□C tests at each laboratory will be the 1st step in this investigation. This will help determine if there is any value in doing future work (i.e. further testing, lab visits, etc.).

Lab/Stand	L-60-1 EOT Date/Time	Stand Run#	CMIR #	Gear Set ID#	Ratings		Viscosity Results for home lab			1st EOT Viscosity Result			2nd EOT Viscosity Result		
					ACV	Sldg	New Oil (cST)	EOT (cST)	Vis Inc (%)	Ethyl (cST)	Lubrizol (cST)	SwRI (cST)	Ethyl (cST)	Lubrizol (cST)	SwRI (cST)
Lab D, 4A			49882		8.00	9.49	13.87	19.48	40.45	19.48	19.539	19.53	19.45	19.535	N/A
Lab B, 181A	6/09/04, 06:51	351	50375	11-00-09	8.00	9.54	13.884	19.354	39.41	19.360	19.354	19.650	N/A	19.665	N/A
Lab A, 12			49769		7.09	9.32	13.87	19.23	38.64	19.06	19.111	19.23	N/A	19.161	N/A

Ship Samples to:
Cory Koglin/Pat Adams — The Lubrizol Corporation — Southwest Research Institute

Attachment 6
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Reference L60-1

L-60-1 Task Force Teleconference

Topic: D445 Viscosity testing
Date/Time: July 8, 2004 10:00 – 12:00 am EDT

Participants:
TMC – Don Lind
Lubrizol – Chris Schenkenberger, Don Campbell
SwRI –Hector De La Fuente, Ken Jackson, Raymond Fox
Ethyl – Cory Koglin, Mike Jennings

Purpose:
The TMC has completed its 2004 lab visits for reviewing the L-60-1 and sub-procedures such as the D445 and D893. Based on these visits, a couple discrepancies between lab procedures and the interpretation of the D445 were observed. These discrepancies were documented in the TMC lab audit reports. This conference call was spent discussing the outcomes, confirming interpretations, and discussing means of resolution.

Section 6.3.1 – Temperature Control

- As stated in the D445, the temperature bath can not vary by more than ± 0.02°C.
- Bath temperature is monitored at all labs either manually or automatically via an RTD and computer display.
- However 2 labs currently using Canan Automated Viscometers can not read at a resolution of 0.02°C with the current thermometers. The 1 lab that uses an RTD and digital display can monitor the bath temperature at this accuracy.

Section 12.3 and 12.5.1 for Opaque Liquids

- D445 states to run 2 tests and report the average of the results if they are within the guidelines for the fluid family stated in the procedure.
- One lab is not conducting double test runs.
- What should the determinability between the 1st and 2nd result be for the new & used oils coming from the D5704?

Action Items(s):
Lab B/Lab D: What bath thermometer is being used and what are the graduations (i.e. 0.05°C)? Can new thermometers be obtained that provides resolution to 0.05°C?
Lab B/Lab D: What cut-offs are being used for both and used oils to determine if another test run (3rd run) is needed? How was this figure determined?

Summary:
Prior to making any changes to current lab practices in the D445, the conference call participants asked that these issues be presented at the next L-60-1 Surveillance Panel meeting on August 25, 2004. The L-60-1 SP Chairman felt that this was the proper next step.

Unless the SP disagrees, the precision of the temperature thermometer for the viscosity bath at all labs will need to be within 0.02°C and all labs will need to conduct duplicate viscosity tests. The SP will also need to provide guidance as to whether the determinability of the end of test L-60-1 drains fall underneath a category in 17.1.1 or fall back to 1.0% as mentioned in 12.5.1.

Break Down Of Statistically Unacceptable Tests Due To Pentane & Toluene Insolubles (6/01/02 to 6/01/04)

Total Operationally Valid Tests	81
Total Statistically Unacceptable Tests	11
Statistically Unacceptable Tests Due To Pentane/Toluene	3
Additional Statistically Unacceptable Tests Due To Pentane / Toluene With Other Parameters	1

Lab	Total Operationally Valid Tests	Total Statistically Unacceptable Tests	Statistically Unacceptable Tests Due to Pentane/Toluene	Statistically Unacceptable Tests Due to Pentane/Toluene With Other Parameters
A	29	3	0	0
B	24	3	0	0
D	28	5	3	1

Statistically Unacceptable Tests Due To Pentane/Toluene By Parameter			
Pentane	Toluene	Pentane & Toluene	Pentane & ASL
1	0	2	1

Statistically Unacceptable Tests Due To Other Parameter	No. of Tests
ACV Severe	1
ACV EWMA Precision Alarm	1
ACV Severe and ASL EWMA Precision Alarm	1
ACV Severe, ASL Mild, and ACV Precision Alarm	1
ASL Severe	1
ASL EWMA Precision Alarm	1
Viscosity Mild	1

Attachment 8
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Reference L-60-1