

Report of Meeting
L-37-1 Surveillance Panel Conference Call
May 12th, 2021

Attendees:

SwRI -	Warden , Kostan
Lubrizol -	Venhoff, Slocum , Drjla, Bealko, Manouchehri
Afton -	Sangpeal , Bell
Intertek -	Lange , Smith, Chadwick
TMC -	Beck
ExxonMobil -	Banas , Kanga
BASF -	Goyal , Mosher
Dana -	Zyski
Meritor -	LaBond, Carter
Army -	Comfort
AAM -	Muransky
Oronite -	Martinez

Voting Members in **BOLD**

1.0 Membership Review

- No Change

2.0 Meeting minutes Approval

- February 10th, 2021 (LRI# 200)
- March 11th, 2021 Conf Call

Motion #1 → W. Venhoff 1st /2nd A. Goyal to approve the meeting minutes from the February 10th, 2021 (LRI# 200) and March 11th, 2021 Conf Call. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

3.0 L-37-1 LTMS Target Initiative Update

- Martin Chadwick slide presentation appended at end of meeting minutes
- Zi and ei used on engine vs. Yi on gear oil side
- 2019-2020 Gleason same batch
- Anthony Lange comment on time frame when labs started building their own axles. Any issues within data set?

4.0 Test Report Packet Revision Proposal

Motion #2 → W. Venhoff 1st /2nd A. Zyski to approve to add the Rater Calibration Expiration Date to Form 2 of the L-37-1 test report effective July 16th, 2021. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

5.0 Test Hardware Prints

- Gleason provided prints. Appended in end of meeting minutes

6.0 L-37-1 Axle Build Procedure

- In progress with edits between labs

7.0 Gleason Purchase Update

- Waiting on material vendor timing before update from Gleason.

8.0 Adjourn

Motion #3 → D. Smith 1st /2nd T. Muransky to adjourn. Motion passed unanimously, 11-0-0 (Yes-No-Abstain).

Respectfully submitted,

Robert Slocum
L-37-1 Surveillance Panel Chairman



D02.B0.03

L-37-1 Surveillance Panel Meeting

05/12/2021

4:00 pm – 5:00 pm

Robert Slocum

Agenda

- Call to Order/Agenda review
- Membership Review
- Meeting Minute Approvals
 - February 10th, 2021 (LRI# 200)
 - March 11th, 2021 Conf Call
- L-37-1 LTMS Target Initiative Update
- Test Report Packet Revision Proposal
- Test Hardware Prints
- L-37-1 Axle Build Procedure
- Gleason Purchase Update
- New Business
- Adjournment

Membership Review

Rob Banas	ExxonMobil
Allen Comfort	US Army
Troy Muransky	AAM
Matt Sangpeal	Afton
Arjun Goyal	BASF
Amy Zyski	Dana
Dylan Beck	TMC
Jason Carter	Meritor
Anthony Lange	Intertek
Robert Slocum	Lubrizol
Rebecca Warden	SwRI
Kaled Zreik	GM
Mike Cabaj	Linamar

Total Voting Members = 13

Meeting Minutes Approval

- February 10th, 2021 (LRI# 200)
- March 11th, 2021 Conf Call

L-37-1 LTMS Target Initiative Update

- Progress Summary



Test Report Packet Revision Proposal

- Add Rater Calibration Expiration Date

TEST METHOD D8165
L-37-1
Form 2

Gear Tooth Surface Condition

Lab:	Stand:	Stand Run:
Oil Code:	Test Version:	

Hardware Identification		
Batch:	Pinion Batch:	Ring Batch:
Test Hardware:		
Match Number:	Serial Number:	
Assemble Date:	Builder's Initials:	
Pattern Contact Length Rating:	Pattern Contact Flank Rating:	

Gear Test Phase – After Completion of Pinion and Ring Gear Drive Side Inspection		
Rater's Initials:	Rater Calexp Date:	
Gear Condition	Original Ring Rating	Original Pinion Rating
Burnish		

L-37-1 Axle Build Procedure

- Initial edit of LZ and SwRI inputs from an older document distributed to labs this week
- What other sections will we need?
 - Strange specific best practices?
 - Document eventually to TMC
 - Separate doc for strange??
 - Strange main data appendix

Gleason Purchase Update

- Gleason waiting on the material vendor on availability before timing on gear manufacturing



New Business

- ?



D02.B0.03

L-37-1 Surveillance Panel Meeting

Adjourn

L37-1 LTMS Data Review

5/12/21

Stat Group Participants

- Martin Chadwick, Intertek
- Travis Kostan, SWRI
- Dylan Beck, TMC
- Jo Martinez, Oronite
- Todd Dvorak, Afton
- Kevin Manouchehri, Lubrizol
- Rebecca Warden, SWRI

Goals

- Evaluate L37-1 data to determine if improvements can be made in identifying unacceptable references and appropriate severity adjustments for candidates.
 - Data Transforms
 - RO Targets
 - Hardware Changes
 - RO Changes
 - LTMS Calculations
- In the last 6 years Zi & ei limits with an excessive influence calculation, instead of Yi limits, have been adopted on many engine tests. An early review of L37-1 charted references found adopting this system would help reduce some of the issues caused by the step changes in rating values, but additional review of targets and transforms was needed.

Some Brief Descriptions

- Target Mean = The estimate selected to represent expected performance of a reference oil. This is expected to remain fixed for a given RO.
- Target Standard Deviation = The estimate selected to represent the expected variability around the Target Mean of a give RO. This is expected to be evaluated and updated, if necessary, based on recent performance.
- Transform = A formula applied to test results intended to improve the ability to interpret comparisons between results at different severity levels or when applying estimates obtained on known oils to adjust future results on “unknown” oils; such as when applying severity adjustments or correction factors.
- Y_i = Standardized Test Result calculated by $(\text{Result} - \text{Target Mean}) / \text{Target Standard Deviation}$. The current estimate of severity in units of expected variability.
- Z_i = An average of Y_i results where the most recent data is weighted the most and each historical data point is weighted slightly less as you go back in chart order. The most recent average, based on run count, of severity in units of expected variability.
- e_i = Prediction error; the difference between the current test Y_i and the previous test Z_i . How much does the current result differ form the previously expected performance.
- Excessive Influence = A calculation that minimizes the impact of failing results on Z_i when the test following is different from the failing result and in the direction of past performance.

Identifying the Correct Data Set

- After an initial review and discussions in the group the following data was selected for analysis
 - Original target setting data with one exception. 144502 used for Lubrited target setting was determined to be run in the “Canadian” version and removed.
 - Charted RO tests.
 - Five tests were identified in the LTMS data set with Chart = N when they should have been “Y”, and these were corrected by TMC. TESTKEY’s = 106962 & 146188 in lab D, and 144746, 144747 & 144748 in lab B.
 - Valid information runs on hardware or test conditions that was later accepted. This includes early tests with undefined distress if all ratings were present.

Final Data Set (Last LTMSDATE = 20210422)

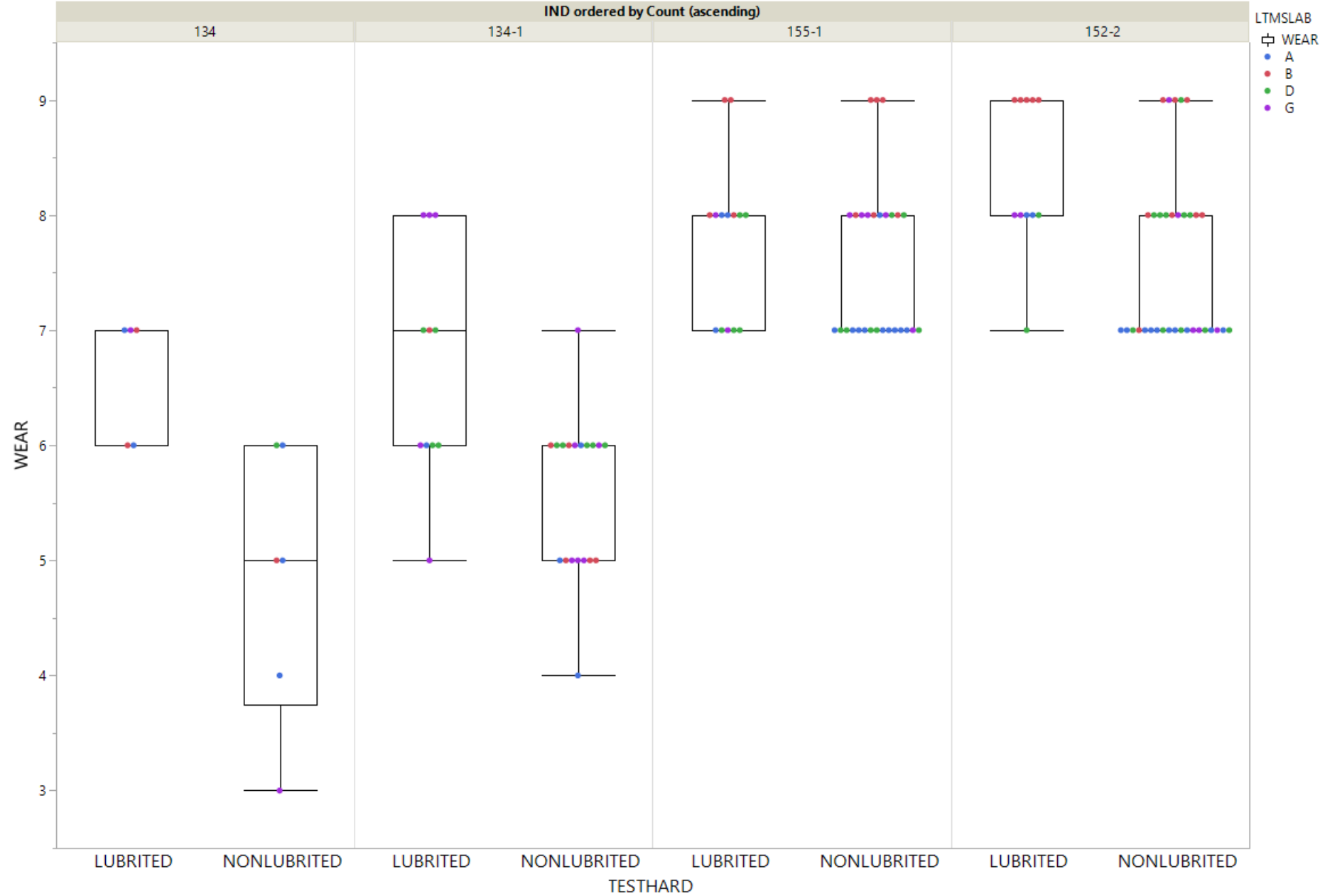
N Size	04-2014	06-2018	12-2019*	01-2020*	Total
LUBRITED	41				41
134	5				5
134-1	11				11
152-2	11				11
155-1	14				14
NONLUBRITED	39	24	13	11	87
134	6				6
134-1	8	5	4	2	19
152-2	12	12	5	5	34
155-1	13	7	4	4	28
Grand Total	80	24	13	11	128

** It was noted that 12-2019 and 01-2020 should be considered the same batch for analysis purposes.*

- 18 tests on NONLUBRITED hardware were from 2015 and all others 2017 or later.
- Revisions were made to 30 BATCH values due to blank (19), GLEASON (8), an extra “-” (2), and “04-2017” corrected to “04-2014”; 23 were pulled from the MATCHNO, 6 were 2015 runs from one lab identified as 04-2014, and the “04-2017” was corrected based on input from the lab.

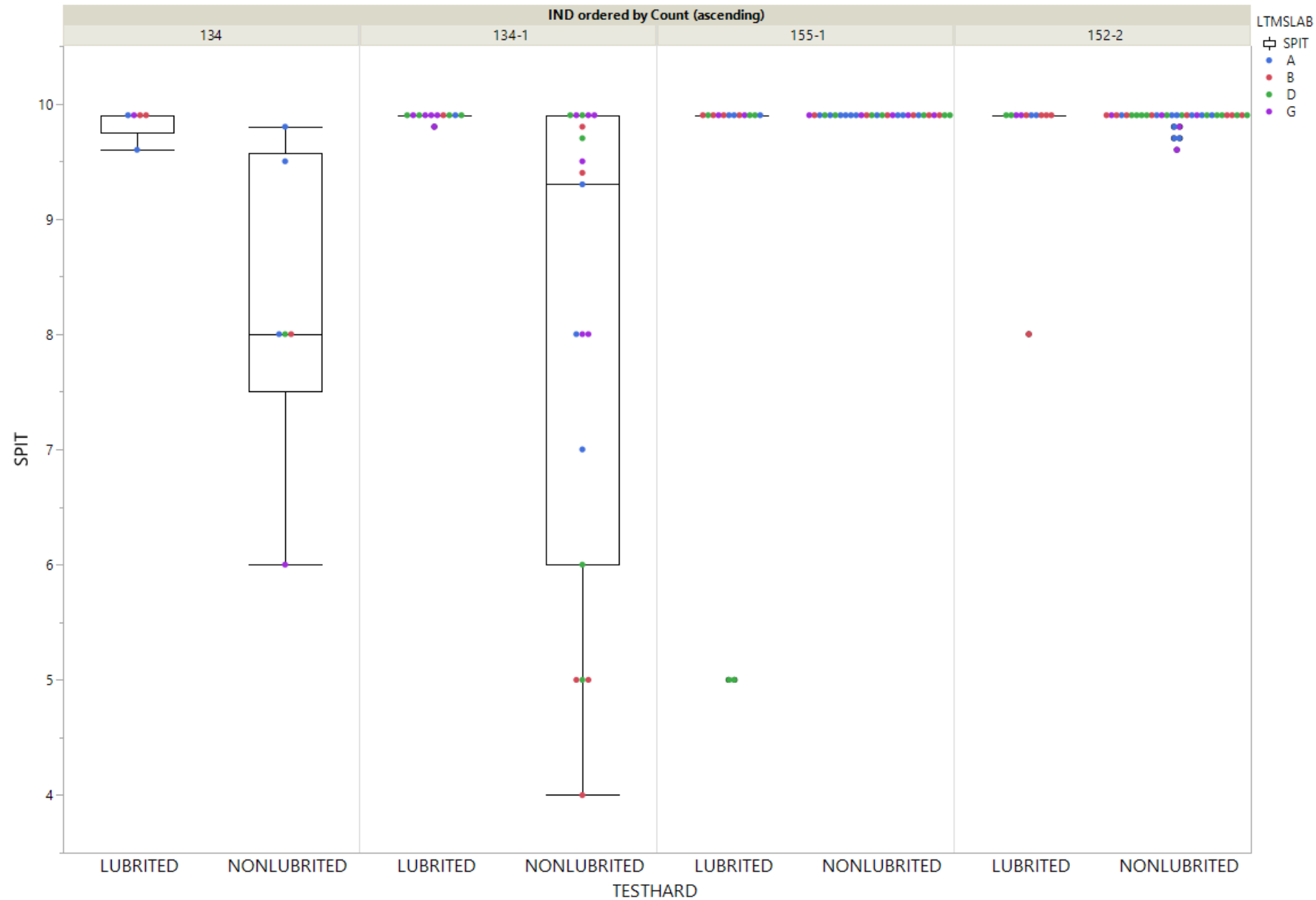
WEAR vs. TESTHARD

IND ordered by Count (ascending)



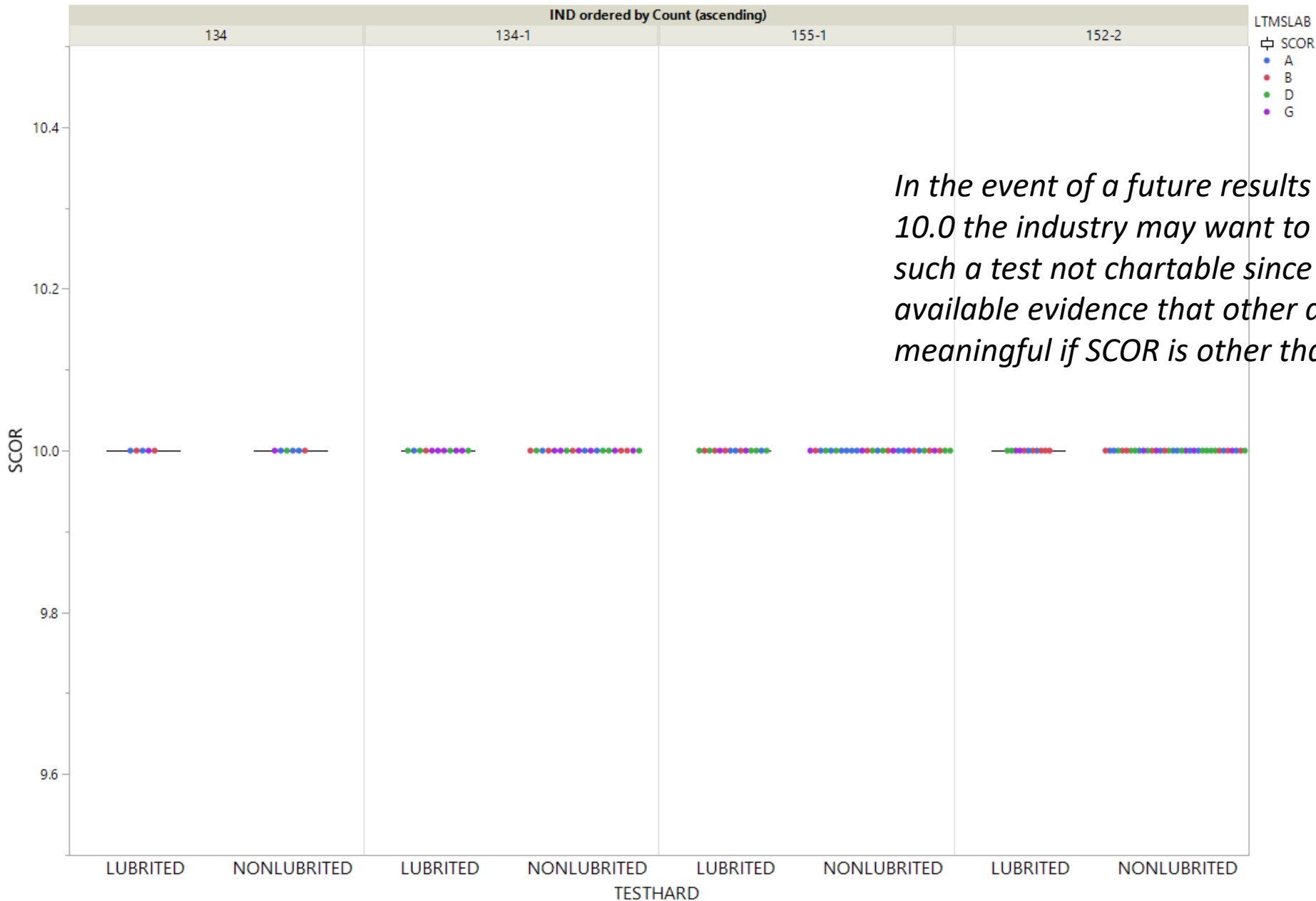
SPIT vs. TESTHARD

IND ordered by Count (ascending)



SCOR vs. TESTHARD

IND ordered by Count (ascending)



In the event of a future results other than 10.0 the industry may want to consider such a test not chartable since there is no available evidence that other data is meaningful if SCOR is other than 10.0.

Next Steps

- Determine if RO 134 & 134-1 can be combined for target setting purposes.
- Evaluate potential data transforms.
- Evaluate hardware differences.
 - Determine if hardware batches need correction factors.
- Determine appropriate RO targets.
 - Should RO targets be set based on 04-2014 hardware only?
- Evaluate updated LTMS calculations based on findings above.
 - Calculations different from those used in other test types might be required due to the nature of the measurements.
- Submit recommendations to SP for review.

THIS DRAWING IS IN ACCORDANCE WITH ASME Y14.5M-2009
UNLESS OTHERWISE SPECIFIED ALL UNTOLERANCED DIMENSIONS ARE BASIC

.040 A B

NOMINAL TOOL SIZE TOLERANCES AS SPECIFIED BY GLEASON STANDARDS.

THIRD ANGLE PROJECTION

BREAK ALL SHARP CORNERS.

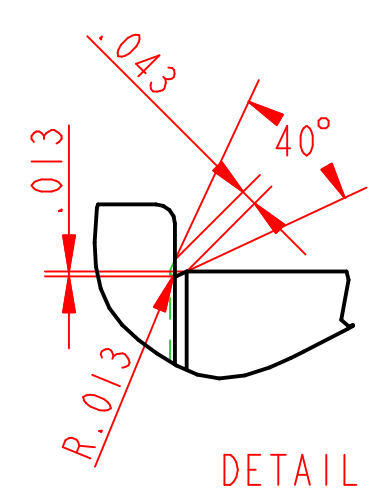
<	>	PART NO.	NAME	REQ	MAT'L
					1806475(8620)
					HEAT TREAT CASE HARDEN .055-.065
					DRAW TEMP
					HARDNESS 60-63 Rc

DRAWN	D. BURMINGHAM	8/9/18
DESIGNER	D. BURMINGHAM	8/9/18
CHECKER		
ENGR IN CHARGE		
PATT NO.	SCALE	1/1
CHANGES	15.171485	25.177918
	3	4
	5	6
	7	8
	9	10

The Gleason Works ROCHESTER, N.Y., U.S.A.		1758277
PART 7T PINION, LH		
MACH ASTM		
SIMILAR PART 1564634		

SAE Fillet Root Side Fit
24/48 Diametral Pitch

Number of Teeth..... 29
Pitch Diameter..... 1.2083
Pressure Angle..... 45°
Base Diameter..... .8544
Major Diameter..... 1.234-1.237
Minor Diameter..... 1.166 MIN.
Measurement over .070 Pins..... 1.3145-1.3160



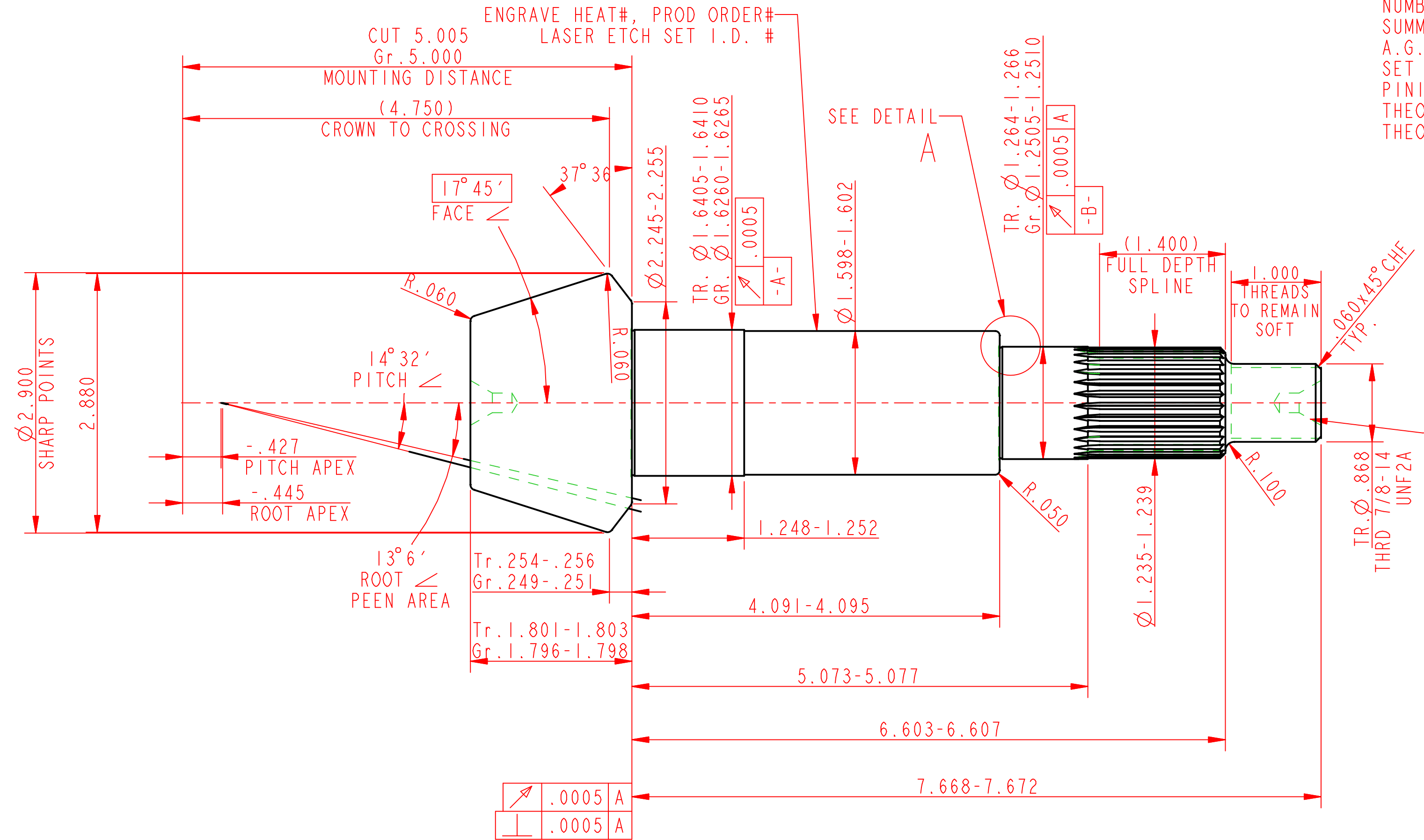
DETAIL A
GRIND CHECK
2 PLACES
SCALE 2/1

SURFACE FINISHING NOTE

SHOT PEEN:
-SPEC: SATURATION CURVE DEVELOPMENT AND PART PEENING PER AMS-2430
-PEEN AREA: REFER TO ROOT ANGLE DIMENSION
-EDGE PREP: NONE
-PART PREP: PARTS TO BE CLEANED OF ALL DEBRIS PRIOR TO SHOT PEENING
-MASKING: NONE. USE PROVIDED PART TOOLING. PER ROUTER.
-MEDIA: S-170 CAST STEEL SHOT, Hrc 62+
-INTENSITY: .014 +/- .002, ALMEN A
-COVERAGE: 200%, VERIFIED BY VISUAL INSPECTION WITH A 10x MAGNIFICATION LENS. MINIMAL OVERSPRAY AND EDGE ROLL-OVER ALLOWED.

HYPOID BEVEL TEETH

NUMBER OF TEETH 7
DIAMETRAL PITCH 4.205
PITCH ANGLE 14° 32'
SHAFT ANGLE 90°
PRESSURE ANGLE CONCAVE..... 21° 51'
PRESSURE ANGLE CONVEX..... 20° 9'
SPIRAL ANGLE 53° 14'
HAND OF SPIRAL LH
DRIVER OR DRIVEN DRIVER
DIRECTION OF ROTATION REV
BACKLASH IN ASSEMBLY006-.008"
TOOTH FILLET RADIUS
PART NUMBER OF MATE 1758278
NUMBER OF TEETH IN MATE 41
SUMMARY NUMBER H021556A
A.G.M.A. QUALITY 12
SET NUMBER 1758276
PINION OFFSET 1.125
THEORETICAL OUTSIDE DIAMETER ... 2.900"
THEORETICAL BACKING Gr.250"



.0005
DATUM A, B AND SPLINE @ SOFT TR.

ALL RADII .06
ALL CHAMFERS .06 x 45°
ALL HOLES .03 x 45° CHAMFER
UNLESS OTHERWISE SPECIFIED

CHANGE RESTRICTED
NO MANUAL CHANGES
PRO/ENGINEER SYSTEM

MODEL NAME: 1758277

SHEET 1 OF 1

HYPOID GEAR DATA

NO. OF TEETH	41
DIAMETRICAL PITCH	4.205
PITCH DIAMETER (THEORETICAL)	9.750
PITCH ANGLE	75° 0'
SHAFT ANGLE	90°
PRESSURE ANGLE CONCAVE	21° 51'
PRESSURE ANGLE CONVEX	20° 9'
SPIRAL ANGLE	37° 58'
HAND OF SPIRAL	Right Hand
DRIVER OR DRIVEN	Driven
DIRECTION OF ROTATION	Reversible
SPEED - R.P.M.	
BACKLASH IN ASSEMBLY	.006"-.008"
TOOTH FILLET RADIUS	
PART NO. OF MATE	1564634
NO. OF TEETH IN MATE	7
SUMMARY NO.	H021556A
A.G.M.A. QUALITY NO.	12
SET NUMBER	1564633
PINION OFFSET	B.C. 1.125
THEORETICAL OUSIDE DIAMETER	9.779"
THEORETICAL BACKING	Tr. 1.281" Gr. 1.276"

SURFACE FINISHING NOTE

SHOT PEEN:
 -SPEC: SATURATION CURVE DEVELOPMENT AND PART PEENING PER AMS-2430
 -PEEN AREA: REFER TO ROOT ANGLE DIMENSION
 -EDGE PREP: NONE
 -PART PREP: PARTS TO BE CLEANED OF ALL DEBRIS PRIOR TO SHOT PEENING
 -MASKING: NONE. USE PROVIDED PART TOOLING. PER ROUTER.
 -MEDIA: S-170 CAST STEEL SHOT, HRc 62+
 -INTENSITY: .014 +/- .002, ALMEN A
 -COVERAGE: 200%, VERIFIED BY VISUAL INSPECTION WITH A 10x MAGNIFICATION LENS. MINIMAL OVERSPRAY AND EDGE ROLL-OVER ALLOWED.

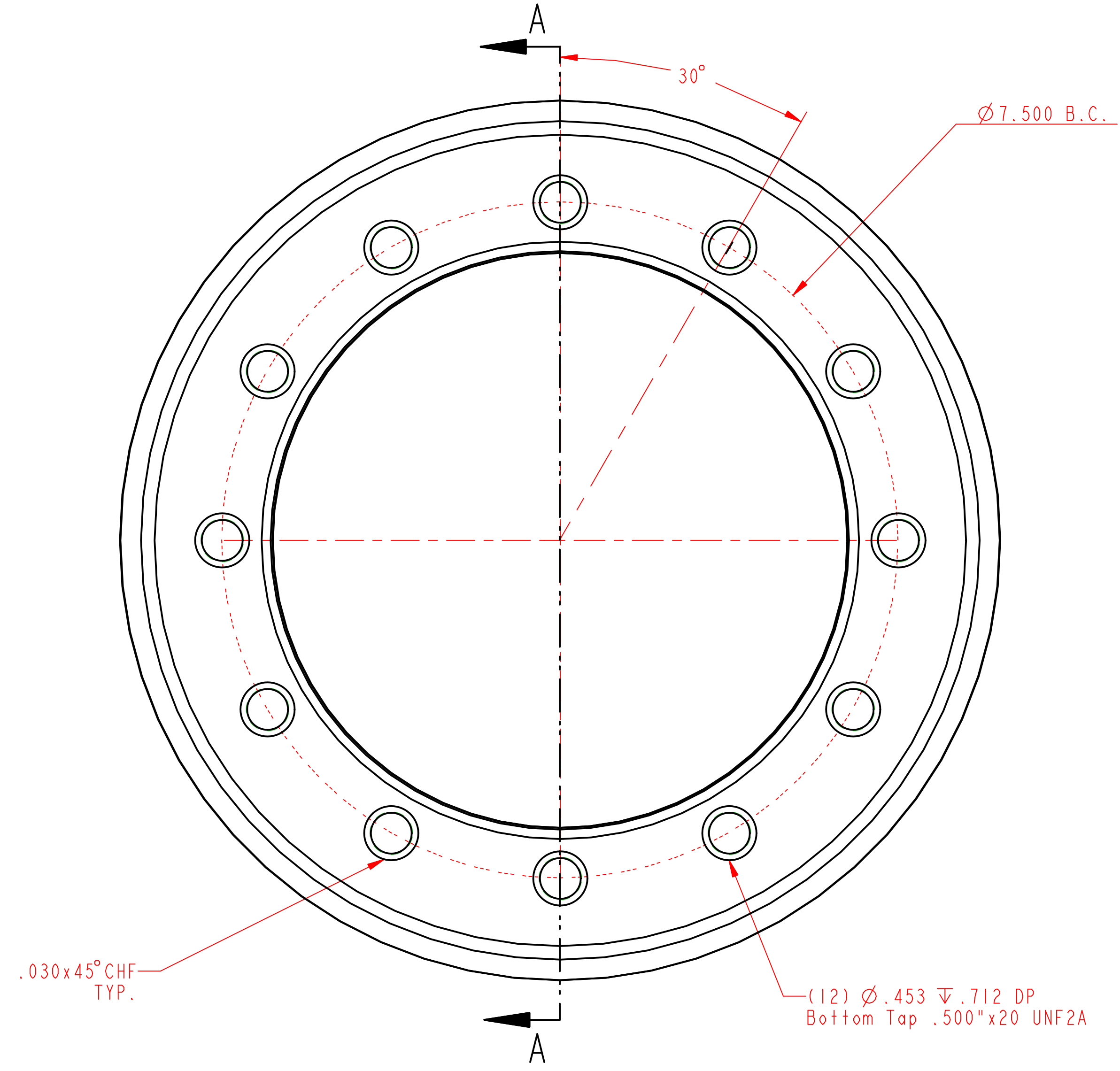
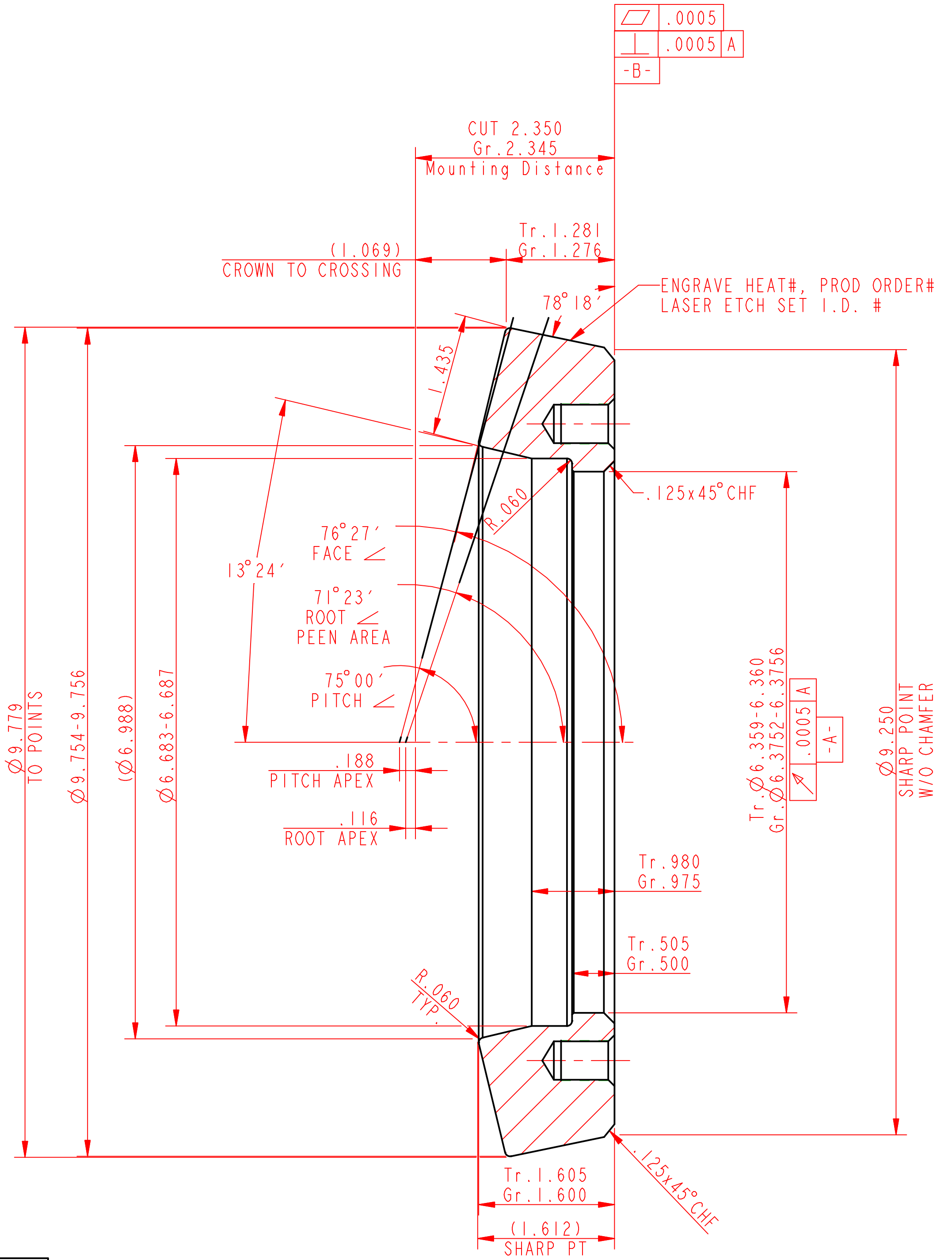
SUPERFINISHING:
 -NONE

A

B

C

D



CHANGE RESTRICTED
 NO MANUAL CHANGES
 PRO/ENGINEER SYSTEM

MODEL NAME: 1758278

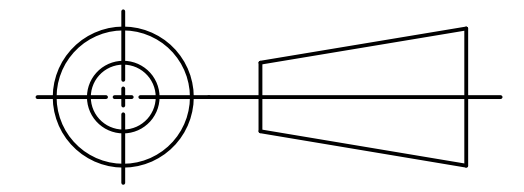
SECTION A-A

SHEET 1 OF 1

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∇ .005 A B

NOMINAL TOOL SIZE TOLERANCES AS SPECIFIED BY GLEASON STANDARDS.



THIRD ANGLE PROJECTION

BREAK ALL SHARP CORNERS

<	>	PART NO.	NAME	REQ	<	>	PART NO.	NAME	REQ

MAT'L	1806476(8620)	CHANGES	15-171485 25-177918 3	4	5	6	7	8	9	10
HEAT TREAT	CASE HARDEN .050-.060"	DRAWN	D. VER PLANK	5/10/10	PART 41T GEAR					
CHECKER		DESIGNER	D. VER PLANK	10/5/18	MACH ASTM					
DRAW TEMP		ENGR IN CHARGE			SIMILAR PART 1564635					
HARDNESS	60-63 Rc	PATT NO.			The Gleason Works 1758278					
				SCALE	1/1	ROCHESTER, N.Y., U.S.A.				
NOTICE: THIS DRAWING MAY INCLUDE UNPUBLISHED PROPRIETARY MATERIAL DEVELOPED BY THE GLEASON WORKS AND AS SUCH IS NOT TO BE COPIED, REPRODUCED, DISCLOSED OR USED IN ANY WAY OR FORM WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE GLEASON WORKS										