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AFML-TR-77-185

VOLUME II

VERIFICATION OF PRODUCTION HOLE QUALITY

METCUT RESEARCH ASSOCIATES INC.
CINCINNATI, OH 45209

NOVEMBER 1977

TECHNICAL REPORT AFML-TR-77-185
FINAL REPORT AUGUST 1975-SEPTEMBER 1977

attn: LTM

AIR FORCE MATERIALS LABORATORY
AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

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This final report was submitted by Metcut Research Associates Inc., Cincinnati, Ohio, under Contract No. F33615-75-C-5173, Manufacturing Methods Project 760-5, "Verification of Production Hole Quality". Mr. William A. Harris, AFML/LTM, was the laboratory monitor.

This technical report has been reviewed and is approved for publication.

William A. Harris

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FOR THE COMMANDER

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AIR FORCE/56780/21 August 1978 — 275

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20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

Definitive surface integrity information identifying and ranking the importance of hole quality variables on the performance of tapered interference fit fasteners has been developed. This report summarizes the fatigue behavior of open hole specimens and low load transfer specimens containing a variety of metallurgical and geometric hole quality variables. Limited crack growth behavior is also reported.

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FOREWORD

This final technical report covers all work performed under Contract F33615-75-C-5173 entitled "Verification of Production Hole Quality". This project was accomplished under the technical direction of W.A. Harris of the Metals Branch (LTM), Manufacturing Technology Division, Air Force Materials Laboratory, Wright-Patterson Air Force Base, Ohio. The effort was performed during the period 1 August 1975 through 31 July 1977 and was released by the authors in September 1977. The effort dealt with the quality requirements for an interference fit tapered fastener system, and was oriented toward a specific application within the C-5A aircraft program. The material and fastener design selected were chosen because that combination was one considered for extensive use in future wing structure developments of the C-5A aircraft.

The subject contract was placed with Metcut Research Associates Inc. of Cincinnati, Ohio. Metcut chose as its principal subcontractor the Lockheed-Georgia Company of Marietta, Georgia. Metcut provided the overall technical direction of the program as well as the facilities for manufacturing all test specimens and performing all of the fatigue tests reported herein. The Lockheed-Georgia Company provided engineering direction and support for the analysis of the data which resulted from the effort.

At Metcut, the program was under the supervision of Dr. William P. Koster. John B. Kohls, Dr. John T. Cammett and L.R. Gatto also contributed to the effort. Activities at the Lockheed-Georgia Company were managed by C.G. Trevillion and supported by H.S. Gibson, B.L. Cornell and P.G. Dodd who performed much of the detailed numerical analysis.

This program was a continuation of the effort in the surface integrity/surface quality area which has been supported by the Air Force Materials Laboratory for the past eight years to provide information which will lead to the cost effective manufacturing of aerospace hardware by the American industrial sector.

The final technical report on this contract is being prepared in two volumes. Volume I is the final summary report on all work performed including the necessary tables to document the procedures and the results obtained. Volume II contains the complete inspection reports on all specimens manufactured under this contract.

TABLE OF CONTENTS

INTRODUCTION

Under the performance of Contract No. F33615-75-C-5173 entitled "Verification of Production Hole Quality", something in excess of 360 aluminum panel fatigue specimens were prepared. These included specimens for evaluating the parent metal fatigue strength of the material, open hole specimens and low load transfer specimens of both dogbone/strap and reverse dogbone design.

All of these specimens, with the exception of the parent metal group, contained two tapered holes. For each specimen, a detailed inspection sheet or manufacturing report was prepared. This document identified the specific parameters used to finish the test holes. In addition, these sheets contain an inspection report summarizing the measured characteristics of both holes in the same specimen. Data includes surface finish, fastener protrusion (a measure of interference), perpendicularity, flushness, capacitance gage reading and a compilation of the air gage measurements taken on each hole. The results of a standard bluing pin test and the percentage of bearing indicated by this test are also included in these sheets.

This volume, an appendix to the main technical report, contains copies of the manufacturing reports for all of the specimens produced in this program which contained tapered holes. They are placed in order of test series as indicated in the Table of Contents. This information is being provided to permit further detailed study and analysis and interpretation of the data presented in the accompanying technical report.

INSPECTION SHEETS FOR BASELINE

EFFECTS OF HOLE QUALITY

Test Series _____ Quality Variable BASE LINE - S/N CURVE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Results: Specimen No. 582B Hole #1
Surface Finish, AA 35 - 65 μin.
Protrusion, in. .193
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 400 AFTER BLUING
Exit Burr Height, in. .02 ±

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	± 1	± 1	± 1.5	± 1	± 1.5	± 2	± 2.5	2
#2	± 1	± 1	± 0.5	± 1	± 2	± 3	± 2	± 1.5
#3	0	± 1.5	± 2	± 2	± 2.5	± 2.5	± 1.5	± 1
#4	2.5	± 3	± 3	± 3	± 3	± 2	± 2	2
#5	± 3	± 4	± 3	± 3	± 2	± 2.5	± 1	2

Hole #2
Surface Finish, AA 40 - 65 μin.
Protrusion, in. .188
Perpendicularity, .001 in./gage length
Longitudinal 002/INCH Transverse 003/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 450 AFTER BLUING
Exit Burr Height, in. .010

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	± 1	±	± 0.5	0	± 1	0	± 1.5	± 1
#2	± 1	±	± 1	± 1	± 1	± 0.5	± 1	± 1
#3	0	0	± 1.5	1.5	± 1	± 0.5	±	0
#4	± 1	± 1.5	± 2	± 2	± 1.5	±	± 1.5	±
#5	± 1	±	±	±	± 1.5	±	± 2	± 2.5

EFFECTS OF HOLE QUALITY

Test Series _____ Quality Variable BASE LINE - S/N CURVE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) 1.953

Results: Specimen No. 5A-[illegible] Hole #1 [illegible]
Surface Finish, AA 50-60 [illegible] Bluing Pin Rollout
Protrusion, in. .019
Perpendicularity, .001 in./gage length
Longitudinal [illegible] Transverse .002/[illegible]
Flush Gage Reading, in. .023
Capacitance Gage Reading: 330
Exit Burr Height, in. .015

Air Gage Readings (.0001 in.) 65%

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2	+2	+3	+2	+3.5	+3	+2	+0.5
#2	+1	+2	+3	+3	+1.5	+1.5	+1	+1
#3	0	-0.5	-1	+2.5	+1	0	-1	-0.5
#4	+1	+1.5	+1	+2.5	+2	+1.5	0	+1
#5	+7	+6.5	+8	+8.5	+5.5	+6.5	[illegible]	+5

Hole #2

Surface Finish, AA 45-55 [illegible] Bluing Pin Rollout
Protrusion, in. [illegible]
Perpendicularity, .001 in./gage length
Longitudinal [illegible] Transverse [illegible]
Flush Gage Reading, in. [illegible]
Capacitance Gage Reading: 327
Exit Burr Height, in. .016

Air Gage Readings (.0001 in.) 70%

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1.5	+1	+1.5	+1.5	+2.5	+3	+2.5	+2.5
#2	+1.5	+1	+1	+1	+2	+2	+2.5	+3
#3	0	[illegible]	+0.5	+2	+2	+1	-1	-2.5
#4	-0.5	+1	+2	+2	+3	+2	+1	+1
#5	+4.5	+6	[illegible]	+9	+9	+5.5	+7	+6

EFFECTS OF HOLE QUALITY

Test Series _____ Quality Variable BASE LINE - SN CURVE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 2[illegible] Feed: [illegible]
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) .[illegible]53

Results: Specimen No. BASE Hole #1 (MARKED END)
Surface Finish, AA 50-65[illegible]
Protrusion, in. .174
Perpendicularity, .001 in./gage length
Longitudinal [illegible] Transverse [illegible]
Flush Gage Reading, in. .025
Capacitance Gage Reading: 2.45
Exit Burr Height, in. .015

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	+1	+3	+1.5	[illegible]	[illegible]	[illegible]
#2	+1	+1	+1	+2	+2	[illegible]	[illegible]	[illegible]
#3	+2.5	+2.5	+1	+[illegible]	+2	[illegible]	+0.5	[illegible]
#4	+3	+3.5	+1	+1.5	[illegible]	[illegible]	[illegible]	[illegible]
#5	+12	[illegible]	+10	+10	+10	-10	[illegible]	[illegible]

Hole #2
Surface Finish, AA 45-65[illegible]
Protrusion, in. .162
Perpendicularity, .001 in./gage length
Longitudinal .006/inch Transverse [illegible]
Flush Gage Reading, in. .001
Capacitance Gage Reading: 3.05
Exit Burr Height, in. .016

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2.5	+3.5	+4	+4	+3	+3	+2	+3
#2	+2.5	+4	+5	+4	+3	+2.5	+2	+2.5
#3	+3.5	+4	2.5	+4	+[illegible]	+1.5	+3	+2
#4	+5	+4.5	4	+4.5	+1.5	+[illegible]	+4	+[illegible]
#5	+11.5	+12	+12	+11.5	+11.5	+12	+11.5	+11.5

EFFECTS OF HOLE QUALITY

Test Series _____ Quality Variable BASE LINE - S/N CURVE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Results: Specimen No. 2A4B. Hole #1 (MILLED END)
Surface Finish, AA 55-63 μ in. Bluing Pin Rollout
Protrusion, in. .182
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH.
Flush Gage Reading, in. .002
Capacitance Gage Reading: 330
Exit Burr Height, in. .016

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+3	+2	+1.5	+1	+1.5	+2.5	+3.5	+3
#2	+2.5	+1.5	+1.5	+1	+1.5	+2	+4.5	+3.5
#3	+2.5	+1.5	+1	+1	+1.5	+1	0	+2
#4	+4.5	+3.5	+2	+1.5	+1	+2	+4	+5
#5	+11	+11	+11	+11	+10	+11	+11	+11

Hole #2
Surface Finish, AA 40-50 μ in. Bluing Pin Rollout
Protrusion, in. .179
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .005/INCH.
Flush Gage Reading, in. .664
Capacitance Gage Reading: 364
Exit Burr Height, in. .016

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2	+2	+2	+2.5	+1.5	+1	+1	+2
#2	+1.5	+2	+3	+3.5	+1.5	+1	+1	+1.5
#3	+1	0	−1	+0.5	0	0	−0.5	+1
#4	+3	+3	+2	+2	0	+0.5	+1.5	+3
#5	+8	+8	+7	+7.5	+4	+6	+6	+8

EFFECTS OF HOLE QUALITY

Test Series ____ Quality Variable BASE LINE – S/N CURVE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Results: Specimen No. 5E58 Hole #1
Surface Finish, AA 58-65 μ in
Protrusion, in. .187
Perpendicularity, .001 in./gage length
Longitudinal .009/INCH Transverse .009/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 410
Exit Burr Height, in. .020

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+ 1.5	+ 0.5	+ 1.5	0	+ 1	0	+ 1
#2	0	+ 1.5	+ 0.5	+ 1.5	0	+ 1	0	+ 1
#3	0	0	0	0	0	+ 1	0	+ 0.5
#4	+ 1.5	+ 1.5	+ 1	+ 1.5	0	+ 1	+ 2.5	+ 1.5
#5	+ 5	+ 5	+ 5	+ 4.5	+ 3	+ 2	+ 3	+ 3.5

Hole #2
Surface Finish, AA 32-40 μ in
Protrusion, in. .187
Perpendicularity, .001 in./gage length
Longitudinal .007/INCH Transverse .007/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 361
Exit Burr Height, in. .005

Bluing Pin Rollout

65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 0.5	0	0	+ 1	0	+ 1.5	+ 1	+ 2.5
#2	+ 1	+ 1	+ 1.5	+ 1.5	+ 1	+ 1.5	+ 2	+ 2.5
#3	0	- 0.5	+ 0.5	- 0.5	0	- 0.5	0	0
#4	+ 3.5	+ 2	+ 2	+ 0.5	+ 1	+ 1	+ 3	+ 2.5
#5	+ 8.5	+ 9	+ 8	+ 11	+ 7	+ 7.5	+ 8	+ 7.5

EFFECTS OF HOLE QUALITY

Test Series _____ Quality Variable BASE LINE - [illegible]

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 2.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Results: Specimen No. 5C53 Hole #1 (MACHINED)
Surface Finish, AA 35-96 μ in. Bluing Pin Rollout
Protrusion, in. .187
Perpendicularity, .001 in./gage length
Longitudinal .003/in. Transverse .004/in.
Flush Gage Reading, in. .004
Capacitance Gage Reading: 332
Exit Burr Height, in. .012

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2	-2	0	+1	+1.5	+2	+4	+3
#2	+2	+1	0	+1	+1.5	+2	+4.5	+4.5
#3	+2	+2	+1	+1.5	+2	+2	+3	+4.5
#4	+4.5	+4	+2.5	+1.5	+2	+0.5	+2	+4.5
#5	+11	+11	+10	+12	+7	+10	+10.5	+11

Hole #2
Surface Finish, AA 40-50 μ in. Bluing Pin Rollout
Protrusion, in. .175
Perpendicularity, .001 in./gage length
Longitudinal [illegible] Transverse [illegible]
Flush Gage Reading, in. [illegible]
Capacitance Gage Reading: 292
Exit Burr Height, in. .016

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+3	+5	+3.5	+4	+3	+2	+3	+4
#2	+2.5	+4	+4	+3.5	+3	+3	+2	[illegible]
#3	+4	+4	+3	+1.5	+2	+2	+2	[illegible]
#4	+6	+5.5	+5	+1	+1.5	+1	+3.5	[illegible]
#5	+12	+12	+12	+12	+12	+12	+12	+13.5

EFFECTS OF HOLE QUALITY

Test Series _____ Quality Variable BASE LINE - S/N CURVE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 324 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Results: Specimen No. 2027 Hole #1 (MARKED END)
Surface Finish, AA 52-62 [illegible] Bluing Pin Rollout
Protrusion, in. .187
Perpendicularity, .001 in./gage length
Longitudinal .002 INCH Transverse .008/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 278
Exit Burr Height, in. .004

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2.5	+2.5	+1	+3	+11	+5	+5.5	+4.5
#2	+2	+1	+1	+2	+4	+5	+1	-3.5
#3	+1	+3	+3	+2	+2.5	+2	-2	+4
#4	+7	+4	+4.5	+1	+1.5	+5	+6.5	+7
#5	+12	+12	+12	+12	+12	+12	+12	+12

Hole #2
Surface Finish, AA 42-98 [illegible] Bluing Pin Rollout
Protrusion, in. .178
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse [illegible]
Flush Gage Reading, in. .001
Capacitance Gage Reading: 310
Exit Burr Height, in. .004

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2	+2	+2.5	+3	+2.5	+2	+1.5	+1
#2	+2	+2.5	+4	+4	+2.5	+2	+2	+1.5
#3	+2.5	+2	+0	+1	+1.5	+0.5	+1	+2
#4	+5	+5	+3	+2	+0.5	+1	+3	+4.5
#5	+11.5	+12	+11	+12	+11	+12	+11.5	+11.5

EFFECTS OF HOLE QUALITY

Test Series _____ Quality Variable BASE LINE - S/A

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STANDARD SOLVENT Depth: (Ind. Reading) 1.953

Results: Specimen No. SP9L Hole #1 (AS DRILLED)
Surface Finish, AA 50-63 AS DRILLED
Protrusion, in. .104
Perpendicularity, .001 in./gage length
Longitudinal .001 INCH Transverse .001 INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 341
Exit Burr Height, in. .017

Bluing Pin Rollout 90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2	+1.5	+1.5	+1.5	+2	+2.5	+3	+3
#2	+2	+0	+2	+2	+2	+2	+4	+3.5
#3	+2	+1	+1	+1	+1	+1	+1	+2
#4	+4.5	+3	+2	+1.5	+1	+2.5	+4	+4.5
#5	+10.5	+10.5	+10.5	+12	+10	+10.5	+11	+11

Hole #2
Surface Finish, AA 45-55 AS DRILLED
Protrusion, in. .104
Perpendicularity, .001 in./gage length
Longitudinal .001 IN. Transverse .001 INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 330
Exit Burr Height, in. .016

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1.5	+2.5	+2.5	+3	+1	+1.5	+1	+2
#2	+1.5	+2.5	+3	+2.5	+1	+0.5	+1	+1
#3	+3	+1	+1.5	+0.5	+1	+0.5	+2	+2
#4	+5	+4	+4	+1	+1	+0.5	+3.5	+4
#5	+11	+11.5	+11.5	+11	+11	+11	+11	+11

EFFECTS OF HOLE QUALITY

Test Series _____ Quality Variable BASE LINE - 2/N [illegible]

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm [illegible] Feed: HAND - [illegible] IPM
Cutting Fluid: [illegible] SOLVENT Depth: (Ind. Reading) 1.752

Results: Specimen No. 9A67 Hole #1 (MARKED END)
Surface Finish, AA 25-32 [illegible]
Protrusion, in. .155
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading. 354 350 AFTER BLUING
Exit Burr Height, in. .010

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2	+2	+2	+1	+1.5	+1.5	+2	+2
#2	+1	+2	+1.5	+1.5	+1.5	+2	+2	+2
#3	+2	+3	+2.5	+2.5	[illegible]	+1	+1	+1.5
#4	+4	+5	+3.5	+2.5	[illegible]	+1	+1	+3.5
#5	+9	+9.5	+9	+7	+5	+8	+9	+9.5

Hole #2

Surface Finish, AA 25-35 [illegible]
Protrusion, in. .133
Perpendicularity, .001 in./gage length
Longitudinal [illegible] Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 350 350 AFTER BLUING 70°
Exit Burr Height, in. .012

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1.5	+1	+1	+1	+1.5	+1.5	+2	+2
#2	+1	+1	+1.5	+2	+2	+2	+1.5	+2
#3	+2.5	+2.5	+2	+1.5	+1	+1.5	+2	+2.5
#4	+3.5	+3	+2	+1.5	+0.5	+1.5	+2.5	+4
#5	+7	+7	+7	+7	+6	+6	+6.5	+7

HOLE 1

-.0[illegible]

EFFECTS OF HOLE QUALITY

Test Series _____ Quality Variable BASE LINE – S/N CURVE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 3[illegible] Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) 1.955

Results: Specimen No. 5[illegible] Hole #1
Surface Finish, AA [illegible] Bluing Pin Rollout
Protrusion, in. .183
Perpendicularity, .001 in./gage length
Longitudinal .00[illegible]/inch Transverse .003/inch
Flush Gage Reading, in. .00[illegible]
Capacitance Gage Reading: 394 [illegible] 70%
Exit Burr Height, in. .015

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	[illegible] 2	+2.5	[illegible]	[illegible] 2	+ 1	+ 2	+ 1	+ 2
#2	+ 1.5	+ 1.5	+	[illegible] 2	+ 1	[illegible] 1.5	+ 1	+ 2.5
#3	[illegible] 1.5	+ 2.5	+ 1	+ [illegible]	+ 1	+ [illegible]	+ 1.5	+ 2.5
#4	[illegible] 4	+ 4	+ 3	[illegible] 2.5	+ 1	+ 1	+ 2	+ 3
#5	+ 9	+ 9	+ 3.5	+ 9	+ 7	+ 6.5	+ 7	+ 8

Hole #2
Surface Finish, AA [illegible] Bluing Pin Rollout
Protrusion, in. .178
Perpendicularity, .001 in./gage length
Longitudinal .003/inch Transverse .00[illegible]/inch
Flush Gage Reading, in. .00[illegible]
Capacitance Gage Reading: [illegible] [illegible] 70%
Exit Burr Height, in. .014

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 2	+ 1.5	+ 1.5	+ 1.5	+ 1.5	+ 1.5	+ 2	+ 1.5
#2	+ 2	+ 2	+ 2	+ 2	+ 2	+ 2	+ 2	+ 1
#3	+ 2	+ 2	+ 2	+ 1.5	+ 1	+ 1	+ 1.5	+ 1
#4	+ 3.5	+ 2.5	+ 1.5	+ 1	+ 1	+ 2	+ 3	+ 3.5
#5	+ 8	+ 7	+ 5.5	+ 5	+ 5	+ 6	+ 11	+ 7

INSPECTION SHEETS FOR TEST SERIES 2 - INTERFERENCE

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0005)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.500
Procedure: REAM GOOD HOLE, TOUCH UP WITH GROUP 2 REAMER WHILE NOT ROTATING, THEN REAM .162" DEEPER

Results: Specimen No. 4C2B Hole #1
Surface Finish, AA 18-25 μin
Protrusion, in. .033
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .001/INCH
Flush Gage Reading, in. 998
Capacitance Gage Reading: 405

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #2	+1	+1	0	0	0	0	0	+0.5
#3	0	+0.5	0	0	0	0	0	0
#4	0	0	0	+0.5	+1	+1	0	0
#5	0	0	0	+0.5	+1	+1	0	0
#6	0	1	0	0	+0.5	0	0	0
#7	+4	+5 OVER	+4	+4	+4.5	+4	+4	+4

Hole #2
Surface Finish, AA 35-45 μin
Protrusion, in. .028
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 420

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #2	+0.5	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	+1	+1	+1	0	0
#5	0	0	0	+0.5	+1	+1	0	0
#6	0	0	0	0	0	0	0	0
#7	+3	+3	+3.5	+3.5	+3.5	+3.5	+3.5	+3.5

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0005)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.506
Procedure: REAM GOOD HOLE, TOUCH UP WITH GROUP 2 REAMER WHILE NOT ROTATING, THEN REAM .162" DEEPER

Results: Specimen No. 5C1B Hole #1
Surface Finish, AA 40-50 max
Protrusion, in. .015
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .003/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 545

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #2	0	0	0	0	+0.5	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0
#6	0	0	0	0	0	0	0	0
#7	+1	+0.5	+0.5	+0.5	0	0	+0.5	+1

Hole #2
Surface Finish, AA 42-48 max
Protrusion, in. .026
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .000
Flush Gage Reading, in. .004
Capacitance Gage Reading: 520

Bluing Pin Rollout
65%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0
#6	0	0	0	0	0	0	0	0
#7	+1	+1	0	0	0	+1	+0.5	+1

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0005)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, TOUCH UP WITH GROUP 2 REAMER WHILE NOT ROTATING, THEN REAM .162" DEEPER

Results: Specimen No. 585CT Hole #1
Surface Finish, AA 28-34 μin.
Protrusion, in. .028
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 453

Bluing Pin Rollout: 95%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #2	+0.5	+1	+0.5	0	0	0	0	0
#3	0	+0.5	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0
#6	+0.5	0	+0.5	0	0	0	0	0
#7	+4.5	+4.5	+4.5	+4.5	+4	+4	+4.5	+4

Hole #2
Surface Finish, AA 30-38 μin.
Protrusion, in. .039
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 453

Bluing Pin Rollout: 80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #2	+0.5	0	0	0	0	0	+0.5	+0.5
#3	0	0	0	0	0	0	+0.5	0
#4	0	0	0	+0.5	+0.5	+0.5	+0.5	0
#5	0	0	0	+0.5	+0.5	+1	0	0
#6	+0.5	0	0	0	0	+0.5	0	+1
#7	+4.5	+4.5	+4.5	+4.5	+4.5	+5	+5	+5

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0005)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.990
Procedure: REAM GOOD HOLE, TOUCH UP WITH GROUP 2 REAMER WHILE NOT ROTATING, THEN REAM .162" DEEPER

Results: Specimen No. 5A3CT Hole #1
Surface Finish, AA 18-25 μ in
Protrusion, in. .026
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .003/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 395

Bluing Pin Rollout: 90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1 2	0	+0.5	+0.5	0	0	0	0	0
#2 3	0	0	0	0	0	0	0	0
#3 4	0	0	0	0	0	+0.5	+0.5	0
#4 5	0	0	+0.5	0	0	0	0	0
#5 6	0	0	+0.5	0	0	0	0	0
#6 7	+4	+4	+4	+3.5	+4	+4	+4	+4

Hole #2
Surface Finish, AA 15-22 μ in
Protrusion, in. .022
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 420

Bluing Pin Rollout: 80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1 2	0	+0.5	0	0	0	0	0	0
#2 3	0	0	0	0	0	0	0	0
#3 4	0	0	0	0	0	0	0.5	0
#4 5	0	0	0	0	0	0	0	0
#5 6	0	0	0	0	0	0	0	0
#6 7	+3	+3	+4	+4	+4	+3.5	+3	+3

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0005)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading)

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, FINISH UP WITH GROUP 2 REAMER WHILE NOT ROTATING, THEN REAM .162" DEEPER

Results: Specimen No. 5EGCL Hole #1
Surface Finish, AA 30-35 μin
Protrusion, in. .018
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse 001/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 388

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #2	+1	+1	+1.5	+1	+2	+1.5	+1.5	+1.5
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0
#6	0	0	0	0	0	0	0	0
#7	+1	+0.5	+1	0	0	+0.5	0	+1

Hole #2
Surface Finish, AA 38-44 μin
Protrusion, in. .030
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 460

Bluing Pin Rollout
65%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #2	0	0	0	0	0	0	+0.5	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0
#6	0	0	0	0	0	0	0	0
#7	+3	+3.5	+4	+4	+4	+4	+4	+4

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0023)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND C.S.I.M.
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GAGE 2 CARBIDE DRILL REAMER
Spindle, rpm 325 Feed: HAND C.S.I.M.
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM GOOD HOLE. TOUCH LIGHTLY WITH GAGE 2 REAMER WHILE NOT ROTATING. TAKE READING. .020" DEEPER

Results: Specimen No. 4E2L Hole #1
Surface Finish, AA 30-38 MAX
Protrusion, in. .118
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .001/INCH
Flush Gage Reading, in. .000
Capacitance Gage Reading: 380

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	+0.5	+0.5
#2	0	0	0	0	0	0	+1	+1
#3	+0.5	0	0	0	0	+1	+1	+1
#4	0	+0.5	+0.5	+1	1	+0.5	0	0
#5	+0.5	0	+0.5	0	0	0	+0.5	+0.5

Hole #2
Surface Finish, AA 32-40 MAX
Protrusion, in. .125
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 414

Bluing Pin Rollout: 60%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	0	+0.5	0	0	+1	+0.5	+1
#2	0	0	0	0	0	0	0	+0.5
#3	0	+1	0	0	0	0	+1	+1
#4	0	0	+0.5	+0.5	0	0	0	0
#5	0	0	+0.5	0	+0.5	0	+0.5	+1

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0023)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.400
Procedure: REAM GOOD HOLE, TOUCH UP WITH GROUP 2 REAMER WHILE NOT ROTATING, THEN REAM .020" DEEPER

Results: Specimen No. 4A3T Hole #1
Surface Finish, AA 25-36 μin
Protrusion, in. .111
Perpendicularity, .001 in./gage length
Longitudinal .010/INCH Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 289

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	+0.5	0	0	0	0	+0.5	+0.5
#2	0	0	0	0	0	0	+0.5	+0.5
#3	0	0	0	0	+0.5	+0.5	+0.5	+0.5
#4	0	0	+0.5	0	0	+0.5	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 40-52 μin
Protrusion, in. .104
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .007/INCH
Flush Gage Reading, in. 000
Capacitance Gage Reading: 417

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	-45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	0	0	0	+0.5	+1	+1
#2	+0.5	+0.5	0	0	0	0	+0.5	+0.5
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (CC23)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.400
Procedure: REAM GOOD HOLE, TOUCH UP WITH GROUP 2 REAMER WHILE NOT ROTATING, THEN REAM .080" DEEPER

Results: Specimen No. 4D4B Hole #1
Surface Finish, AA 20-30 μin
Protrusion, in. .116
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .006/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 380

Bluing Pin Rollout: 90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	+0.5	0	0	0	0	0	0
#2	+0.5	+0.5	0.5	0	0	0	0	0
#3	0	+0.5	0.5	0	0	0	0	0
#4	0	0	0	0	0	+1	0	0
#5	+0.5	+0.5	0	0	0	0	0	0

Hole #2
Surface Finish, AA 38-44 μin
Protrusion, in. .108
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH
Flush Gage Reading, in. 003
Capacitance Gage Reading: 379

Bluing Pin Rollout: 90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	0	0	0	0	0	0	0
#2	0	0	+1	0	0	0	0	0
#3	0	+0.5	+1	+1	0	0	0	0
#4	0	0	0	0	0	+1	+1	+0.5
#5	+0.5	0	0	0	0	+0.5	0	0

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0023)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.400
Procedure: REAM GOOD HOLE, TOUCH UP WITH GROUP 2 REAMER WHILE NOT ROTATING, THEN REAM .080" DEEPER

Results: Specimen No. 5C1T Hole #1
Surface Finish, AA 10-90 μin
Protrusion, in. .112
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 370

Bluing Pin Rollout: 80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	+1	0	+0.5	0	0	+0.5	+1
#2	+0.5	+0.5	0	+0.5	+0.5	+1	+0.5	+1
#3	0	0	0	+1	+1	+1	+0.5	0
#4	0	0	0	+1	+1	+0.5	0	0
#5	0	+0.5	0.5	+0.5	0	0	0	+0.5

Hole #2
Surface Finish, AA 30-45 μin
Protrusion, in. .115
Perpendicularity, .001 in./gage length
Longitudinal .005/INCH Transverse .007/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 422

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	0	0	0	0	0	0	0
#2	+0.5	0	+0.5	0	0	0	0	0
#3	0	0	+0.5	0	+0.5	0	0	0
#4	0	0	0	0	+0.5	+0.5	0	0
#5	+0.5	0	0	0	0	0	+0.5	+0.5

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0023)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND 6.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND 6.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.900
Procedure: REAM GOOD HOLE, TOUCH UP WITH GROUP 2 REAMER WHILE NOT ROTATING, THEN REAM .060" DEEPER

Results: Specimen No. 381T Hole #1
Surface Finish, AA 28-34 μin
Protrusion, in. .123
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .010/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 505

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	+0.5	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 35-44 μin
Protrusion, in. .112
Perpendicularity, .001 in./gage length
Longitudinal .009/INCH Transverse .005/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 560

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0035)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; [illegible]/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) / .952

Results: Specimen No. 4A45 Hole #1 [illegible]
Surface Finish, AA 45-55 [illegible] Bluing Pin Rollout
Protrusion, in. .180
Perpendicularity, .001 in./gage length
Longitudinal .85/inch Transverse .000/in. H
Flush Gage Reading, in. .005
Capacitance Gage Reading: 330
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2.5	+1.5	+1	+1.5	+2	+2	+2.5	+2
#2	+1	+1	+0.5	+1.5	+1.5	+1	+1.5	+2
#3	+2	+2	1	+2	+1.5	+1	+2	+1.5
#4	+3.5	+3.5	+2.5	+2	+0.5	+1	+1.5	+3
#5	+10	+10	+9.5	+9.5	[illegible]	+9	+9	+9.5

Hole #2
Surface Finish, AA 35-45 [illegible] Bluing Pin Rollout
Protrusion, in. .185
Perpendicularity, .001 in./gage length
Longitudinal .004/inch Transverse [illegible]
Flush Gage Reading, in. [illegible]
Capacitance Gage Reading: 325
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	+2	+1	+1	0	0	0
#2	+1.5	+1.5	3	+2	+1.5	0	+0.5	0
#3	+1	0	2	-1	+1	0	0	0
#4	+2.5	+2.5	2	+1	+1.5	+1	1.5	+2
#5	+6	+7	+7	+6.5	+6	+6	+7	+7.5

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.003")

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 2.5 IPM
Cutting Fluid: [illegible] Soluble Depth: (Ind. Reading) 1.955

Results: Specimen No. 5C4 Hole #1 (Air Gage)
Surface Finish, AA 30-40 Bluing Pin Rollout
Protrusion, in. .126
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse [illegible]
Flush Gage Reading, in. .008
Capacitance Gage Reading: [illegible]
Exit Burr Height, in. .002

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 1	[illegible]	+ 1	+ 3	+ 1	[illegible]	[illegible]	[illegible]
#2	+ 1.5	[illegible]	+ 2	+ 0.5	+ 2	[illegible]	[illegible]	[illegible]
#3	+ 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
#4	+ 3	+ 1.5	[illegible]	[illegible]	+ 1	[illegible]	[illegible]	+ 1.5
#5	+ 6.5	- 6	[illegible]	+ 5	+ 4.5	+ 5	[illegible]	+ 5.5

Hole #2
Surface Finish, AA 28-35 Bluing Pin Rollout
Protrusion, in. .126
Perpendicularity, .001 in./gage length
Longitudinal [illegible] Transverse 002
Flush Gage Reading, in. .004
Capacitance Gage Reading: 349
Exit Burr Height, in. .009

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 2	+ 2	+ 3	+ 2.5	+ 2	+ 1	+ 1.5	+ 1.5
#2	+ 2	+ 2.5	+ 4	+ 3	+ 2.5	+ 1.5	+ [illegible]	+ 1.5
#3	+ 2.5	+ 1.5	+ 1	+ 0	+ 1	+ 1.5	+ [illegible]	+ [illegible]
#4	+ 4.5	+ 3.5	+ 2	+ 1.5	+ 0.5	+ 1.5	+ 2.5	3.5
#5	+ 9	+ 9.5	+ 9	+ 8.5	+ 7.5	+ 5	+ 8.5	+ 8.5

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0035)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 3[illegible] Feed: HAND - 2.5 IPM
Cutting Fluid: [illegible] Depth: (Ind. Reading) 1.953

Results: Specimen No. 5C5CB Hole #1 (MARKET END)
Surface Finish, AA 50-60 μ in. Bluing Pin Rollout
Protrusion, in. .162
Perpendicularity, .001 in./gage length
Longitudinal .002/in. Transverse .001/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 330
Exit Burr Height, in. .011

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2	+2	[illegible]	+1	[illegible]	[illegible]	[illegible]	[illegible]
#2	[illegible]	+2	[illegible]	+1	+2.5	+3	[illegible]	[illegible]
#3	[illegible]	+1	+2.5	+1	+1	+0.5	[illegible]	[illegible]
#4	[illegible]	+2	[illegible]	+1.5	+0.5	+1	+1.5	[illegible]
#5	[illegible]	+6	[illegible]	[illegible]	[illegible]	+5.5	+6	+7.5

Hole #2
Surface Finish, AA 30-40 μ in. Bluing Pin Rollout
Protrusion, in. .162
Perpendicularity, .001 in./gage length
Longitudinal .002/in. Transverse [illegible]/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 310
Exit Burr Height, in. .011

60%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	[illegible]	+2.5	+3	[illegible]	+2.5	+3	[illegible]	+3.5
#2	[illegible]	+2	+3	+2.5	[illegible]	+2.5	+3	+2.5
#3	+3	+1	+2	+2.5	[illegible]	+1	+2.5	+2
#4	+5	+3	[illegible]	[illegible]	+1.5	+2	+5	[illegible]
#5	+10.5	+10	+10.5	[illegible]	+10	+10	+10.5	+10

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0035)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Results: Specimen No. 6AGT Hole #1 (MARKED END)
Surface Finish, AA 50-60 μ in
Protrusion, in. .182
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .000
Flush Gage Reading, in. .004
Capacitance Gage Reading: 300
Exit Burr Height, in. .016

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2.5	0.5	+2	+2.5	+2.5	+3	+4	+3
#2	+2.5	0.5	+2.5	+3	+3.5	+4	+5	+3
#3	+2.5	2	+2.5	+1	+2	+0.5	+2.5	+3
#4	+3	3.5	+2.5	0	+1	0	+3	+3
#5	+11.5	11.5	+11.5	+11.5	+11.5	+11.5	+11.5	+11.5

Hole #2
Surface Finish, AA 45 55 μ in
Protrusion, in. .197
Perpendicularity, .001 in./gage length
Longitudinal .001/in. Transverse .004/in.
Flush Gage Reading, in. .004
Capacitance Gage Reading: 332
Exit Burr Height, in. .013

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2.5	+2	+1	0	+0.5	-1	+2.5	+3
#2	+2	+2	+2	+1.5	+1	-1	+1.5	+2
#3	+2.5	+1	+1	+1	+1	+2.5	+1	+1.5
#4	-5	+3.5	+3	+1.5	+1	+2.5	+2	+2.5
#5	+11	-10.5	+10	+10	+12	-9	+9.5	+10

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0035)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed:
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading)

Results: Specimen No. 5C6T Hole #1 (ENTRY END)
Surface Finish, AA 58-65 μin Bluing Pin Rollout
Protrusion, in. .193
Perpendicularity, .001 in./gage length
Longitudinal .0[illegible]/inch Transverse .0[illegible]/inch
Flush Gage Reading, in. .004
Capacitance Gage Reading: 364
EXIT BURR HEIGHT, in. .016

70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+2	+1	+2	+1.5	+2.5	+2	+2
#2	0	+2	+2.5	+2	+1.5	+2.5	+2	+2.5
#3	-0.5	+1.5	0	+2	+1	+2	0	+2
#4	+1	+2	+1	+2	+0.5	+2	0	+2.5
#5	+7	+8	+8	+7.5	+7.5	+3	+2	+8

Hole #2
Surface Finish, AA 30-90 μin Bluing Pin Rollout
Protrusion, in. .202
Perpendicularity, .001 in./gage length
Longitudinal .001/inch Transverse .020
Flush Gage Reading, in. .003
Capacitance Gage Reading: 366
EXIT BURR HEIGHT, in. .013

70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+2	+1	+2	+1	+2	+1	+2.5	+1
#2	+1	0	+1.5	+0	+1	+0.5	+1	0
#3	+1	0	+1	+0.5	+1	+0.5	0	+0.5
#4	+2	+2	+2	+1.5	+1	+1.5	+1	+2
#5	+4	+5	+5	+4	+2.5	+4	+3	+5

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0018)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.905

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW THEN CO'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 2E4T Hole #1
Surface Finish, AA 35-45 μ in.
Protrusion, in. .233
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .006/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 345

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+0.5	0	0	0	−0.5	0	0
#2	0	0	0	0	0	−0.5	0	0
#3	+1	0	0	0	0	0	0	0
#4	+1	+0.5	0	0	0	0	0	0
#5								

Hole #2
Surface Finish, AA 38-42 μ in.
Protrusion, in. .235
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 400

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	+0.5	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	+0.5
#5								

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0018)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.905

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN COUNTERSINK WITH UNDERSIZE REAMER

Results: Specimen No. 5B6T Hole #1
Surface Finish, AA 55-65 μ in.
Protrusion, in. .236
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .005/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 387

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	+0.5	0	+1	+1	+1
#2	0	0	0	0	0	+0.5	+0.5	+0.5
#3	+0.5	+0.5	0	0	0	+0.5	+0.5	+0.5
#4	+1.5	+1.5	+1	0	+0.5	+1	+2	+1.5
#5								

Hole #2
Surface Finish, AA 45-55 μ in.
Protrusion, in. .227
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .008/INCH
Flush Gage Reading, in. 001
Capacitance Gage Reading: 396

Bluing Pin Rollout: 50%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	+0.5	+0.5	0	0	0	0
#2	0	0	+0.5	+1	+0.5	0	0	0
#3	0	0	0	0	0	0	0	0
#4	+1	+1	+1	0	0	0	0	0
#5								

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0018)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.905

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN CO'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 5E2B Hole #1
Surface Finish, AA 50-60 µin
Protrusion, in. .022
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse 000
Flush Gage Reading, in. .002
Capacitance Gage Reading: 370

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 0.5	0	0	0	0	0	+ 1	+ 1
#2	+ 0.5	0	0	0	0	+ 0.5	+ 1	+ 1
#3	+ 1	+ 1	+ 1	0.5	0	0	− 1	+ 0.5
#4	+ 1.5	+ 1.5	+ 1.5	0	0	+ 1	+ 1	+ 1.5
#5								

Hole #2
Surface Finish, AA 36-44 µin
Protrusion, in. .023
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .010/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 396

Bluing Pin Rollout
60%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 0.5	+ 1	+ 1	+ 1	0	0	0	+ 0.5
#2	+ 0.5	+ 1	+ 1	+ 1.5	+ 0.5	0	0	0
#3	0	0	0	+ 0.5	+ 0.5	+ 0.5	+ 0.5	0
#4	+ 1	+ 1	+ 1	+ 0.5	+ 0.5	+ 0.5	+ 0.5	+ 0.5
#5								

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0018)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.905

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN CO'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 5C5CT Hole #1
Surface Finish, AA 38-42 μ in.
Protrusion, in. .225
Perpendicularity, .001 in./gage length
Longitudinal .006/INCH Transverse .006/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 317

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

Hole #2
Surface Finish, AA 35-44 μ in.
Protrusion, in. .242
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 365

Bluing Pin Rollout
95%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0048)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.905

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN CO'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 3B5T Hole #1
Surface Finish, AA 38-44 μ in
Protrusion, in. .235
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 410

Bluing Pin Rollou.

90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

Hole #2
Surface Finish, AA 35-44 μ in
Protrusion, in. .242
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .000
Flush Gage Reading, in. .003
Capacitance Gage Reading: 415

Bluing Pin Rollout

90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0000)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.847

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN C'SINK WITH UNDERSIZE REAMER

Results: Specimen No 5B6B Hole #1
Surface Finish, AA 25-35 μin.
Protrusion, in. .292
Perpendicularity, .001 in./gage length
Longitudinal .005/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 268

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+0.5	±0.5	± 0.5	0	0	0	0
#2	+ 1	+ 0.5	±0.5	0	0	+ 1	+ 1	+ 1
#3	+ 1	+ 1	±0.5	0	0	0	± 0.5	± 1
#4	+ 4	+ 3.5	+ 2.5	+ 3	+ 3.5	+ 3.5	+ 3.5	+ 3.5
#5								

Hole #2
Surface Finish, AA 40-50 μin.
Protrusion, in. .291
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 308

Bluing Pin Rollout
10%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 0.5	- 1	+ 1	+ 1	0	0	0	0
#2	0	0	+ 0.5	+ 1	+ 1	+ 1	0	0
#3	+ 0.5	+ 0.5	± 0.5	0	0	± 0.5	0	0
#4	+ 2	+ 3	+ 3	+ 2.5	+ 2.5	+ 2	+ 2	+ 1.5
#5								

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0000)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND .05 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.847

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.959
Procedure: BEAM HOLE SHALLOW, THEN C'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 4C6T Hole #1
Surface Finish, AA 38-42 μ in
Protrusion, in. .306
Perpendicularity, .001 in./gage length
Longitudinal .02/INCH Transverse .003/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 398

Bluing Pin Rollout
75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+0.5	0	+0.5	+0.5	+1	+1	0
#2	0	+0.5	0	+0.5	+0.5	0	0	+0.5
#3	+1	+1	+1	+0.5	+1	0	+1	+1.5
#4	+3	+4	+4	+4.5	+4.5	+4	+4	+5
#5								

Hole #2
Surface Finish, AA 35-95 μ in
Protrusion, in. .292
Perpendicularity, .001 in./gage length
Longitudinal .02/INCH Transverse .006/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 410

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	+0.5	+0.5	+0.5	-0.5	-0.5
#4	+1	+1	+1	+1	+1	+1.5	+1.5	+1.5
#5								

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0000)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.847

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL - REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN C'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 4A5T Hole #1
Surface Finish, AA 38-45 μm
Protrusion, in. .292
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 355

Bluing Pin Rollout

35°

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5
#2	0	0.5	0	+0.5	0	0	-0.5	0
#3	+0.5	+1	0	+0.5	0	0	0	0
#4	+4	+3.5	+3.5	+4	+3.5	+3.5	+4	+3
#5								

PARTIALLY OPEN

Hole #2
Surface Finish, AA 40-50 μm
Protrusion, in. .296
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .004/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 420

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	+1	+1.5	+0.5	+0.5	0	0	0
#2	0	-0.5	+0.5	+0.5	+0.5	+0.5	0	0
#3	+0.5	0	+1	+0.5	+0.5	+0.5	0	+0.5
#4	+2	+2	+3	+1.5	+1	+2	+1.5	+2
#5								

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0000)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.897

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN C'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 2D1T Hole #1
Surface Finish, AA 35-94 μ in.
Protrusion, in. .297
Perpendicularity, .001 in./gage length
Longitudinal .003/in Transverse 000
Flush Gage Reading, in. .002
Capacitance Gage Reading: 340

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+0.5	+1	+0.5	+0.5	0	0	0
#2	+1	+0.5	0	+0.5	+0.5	+0.5	+1	+0.5
#3	+1	+0.5	0	+0.5	+0.5	+0.5	+0.5	+0.5
#4	+2.5	+2.5	+1	+2	+1.5	+2	+1.5	+1
#5								

Hole #2
Surface Finish, AA 36-45 μ in.
Protrusion, in. .292
Perpendicularity, .001 in./gage length
Longitudinal .003/inch Transverse .003/inch
Flush Gage Reading, in. .003
Capacitance Gage Reading: 380

Bluing Pin Rollout
50%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	+1	+1	+1	0	0	0
#2	0	-0.5	0	+1	+2	+1	+2.5	+0.5
#3	+0.5	+0.5	+0.5	+1	+2	+1	+2.5	+0.5
#4	+2.5	+3	+3	+2.5	+3	+2.5	+2	+0.5
#5								

EFFECTS OF HOLE QUALITY

Test Series 2 Quality Variable INTERFERENCE (.0000)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.847

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN C'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 3A1T Hole #1
Surface Finish, AA 36-45 μ in
Protrusion, in. .291
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 344

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 0.5	+ 1	+ 0.5	0	0	± 0.5	± 1	+ 1
#2	+ 0.5	+ 1	+ 0.5	± 0.5	0	+ 0.5	- 0	+ 0.5
#3	+ 1.5	+ 1.5	± 1	+ 0.5	0	+ 0.5	± 0.5	+ 1
#4	+ 4	+ 5	+ 5	+ 3.5	+ 3	± 3	+ 3	+ 3.5
#5								

Hole #2
Surface Finish, AA 38-44 μ in.
Protrusion, in. .284
Perpendicularity, .001 in./gage length
Longitudinal .007/INCH Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 359

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	+0.5	+0.5	0
#2	-0.5	+ 0.5	+ 0.5	± 1	+ 1	+ 1	+ 0.5	-0.5
#3	0	+ 0.5	. 0	+ 1	+ 0.5	+ 1	- 0.5	0
#4	+1.5	+ 1	+ 1	+ 1	+ 1	+ 1	- 1.5	+ 1.5
#5								

INSPECTION SHEETS FOR TEST SERIES 4, 5, AND 6

CRACK GROWTH TESTING

MANUFACTURING REPORT: TAPERED HOLES

Test Series 4 Quality Variable _____
Specimen No. 3637

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 22.24 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 002
Capacitance Gage Reading 25-1
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#6	4.0	6.0	5.0	7.0	4.0	5.0	6.0
#7	1.0	3.0	3.0	3.0	2.0	3.0	3.0

Hole #2

Surface Finish, AA 50-52 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .003 Transverse .0005
Flush Gage Reading, in. .003
Capacitance Gage Reading 233
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#6	6.0	4.0	3.0	4.0	6.0	7.0	2.0
#7	3.0	2.0	1.0	4.0	4.0	5.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 4 Quality Variable _____
Specimen No. 5727

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 34-36 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .005
Flush Gage Reading, in. .003
Capacitance Gage Reading 275
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#6	3.0	3.0	4.0	5.0	4.0	2.0	5.0
#7	0	3.0	2.0	4.0	1.0	1.0	4.0

Hole #2

Surface Finish, AA 14-16 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .003
Flush Gage Reading, in. .002
Capacitance Gage Reading 293
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#6	4.0	3.0	3.0	4.0	4.0	5.0	3.0
#7	1.0	1.0	1.0	1.0	3.0	1.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 4 Quality Variable _____
Specimen No. 5B1C4

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 32-24 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0035
Flush Gage Reading, in. .002
Capacitance Gage Reading 288
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#6	4.0	3.0	4.0	4.0	4.0	4.0	2.0
#7	2.0	1.0	1.0	2.0	2.0	3.0	1.0

Hole #2

Surface Finish, AA 16-20 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 276
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#6	4.0	3.0	3.0	4.0	6.0	4.0	4.0
#7	3.0	1.0	0	0	4.0	3.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 5 Quality Variable _____
Specimen No. 313613

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 28.32 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 253
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	11.0	5.0	13.0	10.0	11.0	4.0	13.0
#3	12.0	3.0	11.0	5.0	12.0	5.0	9.0
#4	10.0	3.0	7.0	6.0	11.0	8.0	3.0
#5	8.0	5.0	6.0	6.0	10.0	7.0	4.0

Hole #2

Surface Finish, AA 22.24 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. .003
Capacitance Gage Reading 288
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	12.0	11.0	1.0	10.0	11.0	11.0	6.0
#3	10.0	11.0	4.0	11.0	8.0	12.0	3.0
#4	6.0	9.0	4.0	10.0	3.0	9.0	5.0
#5	6.0	7.0	5.0	9.0	4.0	7.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 5 Quality Variable _____
Specimen No. 5B113

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 33-35 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 284
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	14.0	15.0	15.0	15.0	15.0	15.0	—
#2	10.0	8.0	3.0	4.0	8.0	8.0	3.0
#3	9.0	9.0	4.0	7.0	2.0	9.0	1.0
#4	3.0	5.0	0	5.0	0	5.0	0
#5	1.0	4.0	2.0	9.0	5.0	4.0	1.0

Hole #2

Surface Finish, AA 30-35 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 229
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	15.0	15.0	15.0	15.0	15.0	15.0	15.0
#2	9.0	12.0	6.0	11.0	4.0	12.0	0
#3	6.0	12.0	10.0	11.0	2.0	11.0	8.0
#4	4.0	10.0	10.0	10.0	0	7.0	8.0
#5	7.0	9.0	9.0	8.0	2.0	5.0	9.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 5 Quality Variable _____
Specimen No. 4E3T

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 14-16 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 367
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	15.0	14.0	14.0	14.0	14.0	14.0	14.0
#2	11.0	13.0	13.0	12.0	5.0	10.0	12.0
#3	2.0	7.0	7.0	7.0	4.0	6.0	5.0
#4	-2.0	4.0	4.0	4.0	-1.0	2.0	6.0
#5	-2.0	2.0	3.0	4.0	1.0	-1.0	3.0

Hole #2

Surface Finish, AA 18-20 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 332
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	15.0	14.0	14.0	14.0	14.0	14.0	14.0
#2	—	—	—	—	—	—	—
#3	6.0	5.0	2.0	4.0	9.0	6.0	5.0
#4	3.0	2.0	-3.0	3.0	4.0	5.0	0
#5	2.0	3.0	0	0	0	2.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 6 Quality Variable _____
Specimen No. 3D413

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 60-65 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal 1000 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 284
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	14.0	—	—	—	—	—	—
#2	11.0	9.0	0	1.0	12.0	8.0	2.0
#3	9.0	9.0	2.0	4.0	9.0	10.0	2.0
#4	7.0	8.0	0	5.0	7.0	8.0	4.0
#5	4.0	7.0	3.0	9.0	4.0	6.0	3.0

Hole #2

Surface Finish, AA 20-22 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 321
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	14.0	8.0	15.0	11.0	15.0	10.0	14.0
#3	10.0	6.0	5.0	5.0	13.0	4.0	9.0
#4	5.0	3.0	-5.0	6.0	8.0	3.0	4.0
#5	3.0	2.0	-4.0	4.0	6.0	6.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 6 Quality Variable _____
Specimen No. 4C27

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 50-55 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 274
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	15.0	8.0	10.0	10.0	10.0	14.0	11.0
#3	14.0	13.0	9.0	11.0	9.0	15.0	10.0
#4	12.0	13.0	9.0	13.0	11.0	14.0	9.0
#5	11.0	14.0	9.0	12.0	11.0	13.0	11.0

Hole #2

Surface Finish, AA 25-26 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 245
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	14.0	9.0	11.0	5.0	14.0	9.0	12.0
#3	12.0	11.0	6.0	6.0	13.0	11.0	9.0
#4	10.0	11.0	3.0	8.0	10.0	11.0	8.0
#5	9.0	11.0	5.0	9.0	8.0	9.0	7.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 6 Quality Variable _____
Specimen No. 30513

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 12-20 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 331
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	14.0	—	—	—	—	14.0	—
#3	8.0	9.0	11.0	11.0	9.0	4.0	9.0
#4	8.0	4.0	8.0	7.0	7.0	1.0	7.0
#5	8.0	0	4.0	4.0	7.0	-1.0	5.0

Hole #2

Surface Finish, AA 55-60 Bluing Pin Rollout
Protrusion, in. 0
Perpendicularity, .001 in./in.
Longitudinal .005 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 224
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	11.0	13.0	3.0	9.0	10.0	12.0	3.0
#3	9.0	13.0	5.0	12.0	8.0	13.0	6.0
#4	8.0	12.0	6.0	11.0	4.0	11.0	8.0
#5	10.0	12.0	7.0	12.0	9.0	11.0	10.0

INSPECTION SHEETS FOR TEST SERIES 7 - PERPENDICULARITY

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3°
M.N. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.755

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.180
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .060" DEEPER WITH GR.2 REAMER

Results: Specimen No. 5B1T Hole #1
Surface Finish, AA 32
Protrusion, in. .148
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .051/INCH
Flush Gage Reading, in. 028
Capacitance Gage Reading: 370 337 425 496 70%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 28
Protrusion, in. .157
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .050/INCH
Flush Gage Reading, in. 030
Capacitance Gage Reading: 357 426 477 720 80%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3° MIN. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.757

Modify Good Holes Using Following Conditions:

Tool: GROUP 2 OMARK DRILL-REAMER

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.180

Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .010" DEEPER WITH GR. 2 REAMER

Results: Specimen No. 5D5CB Hole #1

Surface Finish, AA 26

Protrusion, in. .143

Perpendicularity, .001 in./gage length

Longitudinal .002/INCH Transverse .053/INCH

Flush Gage Reading, in. .029

Capacitance Gage Reading: 330

Bluing Pin Rollout ↓ ↓

366 384 537 75%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0			0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2

Surface Finish, AA 65

Protrusion, in. .130

Perpendicularity, .001 in./gage length

Longitudinal .004/INCH Transverse .051/INCH

Flush Gage Reading, in. .029

Capacitance Gage Reading: 346

Bluing Pin Rollout ↓ ↓

351 371 401 70%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0						
#2	0	0				0	0	0
#3	0	0	0			0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3° MIN. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.757

Modify Good Holes Using Following Conditions:

Tool: GROUP 2 OMARK DRILL-REAMER

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.180

Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .010" DEEPER WITH GR. 2 REAMER

Results: Specimen No. 5A4T Hole #1

Surface Finish, AA 22

Protrusion, in. .141

Perpendicularity, .001 in./gage length

Longitudinal .003/INCH Transverse .055/INCH

Flush Gage Reading, in. .026

Capacitance Gage Reading: 410 355 375 490

Bluing Pin Rollout ↓ ↓ 70°

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	2	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2

Surface Finish, AA 32

Protrusion, in. .143

Perpendicularity, .001 in./gage length

Longitudinal .003/INCH Transverse .05/INCH

Flush Gage Reading, in. .030

Capacitance Gage Reading: 400 388 413 6.9

Bluing Pin Rollout ↓ 75°

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3°
MIN. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) .757

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.180
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .060" DEEPER WITH GR. 2 REAMER

Results: Specimen No. [illegible] Hole #1
Surface Finish, AA 21 Bluing Pin Rollout
Protrusion, in. .140
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .052/INCH
Flush Gage Reading, in. .027
Capacitance Gage Reading: 325 355 445 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 22 Bluing Pin Rollout
Protrusion, in. .145
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .054/INCH
Flush Gage Reading, in. .027
Capacitance Gage Reading: 408 390 405 386 90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3°
M.N. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.755

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.180
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .010" DEEPER WITH GR. 2 REAMER

Results: Specimen No. 5A4E Hole #1
Surface Finish, AA 60
Protrusion, in. .143
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .051/INCH
Flush Gage Reading, in. 030
Capacitance Gage Reading: 371 371/367 436

Bluing Pin Rollout ↓ ↓ 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 28
Protrusion, in. .138
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .052/INCH
Flush Gage Reading, in. .029
Capacitance Gage Reading: 374 367/362 531

Bluing Pin Rollout ↓ ↓ 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	+0.5	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3°
MIN. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.755

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.180
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .010" DEEPER WITH GR. 2 REAMER

Results: Specimen No. 2BGT Hole #1
Surface Finish, AA 40
Protrusion, in. .137
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .051/INCH
Flush Gage Reading, in. .027
Capacitance Gage Reading: 420 313 274 402 70%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	-0.5	0
#4	+0.5	+0.5	+0.5	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 140
Protrusion, in. .145
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .052/INCH
Flush Gage Reading, in. .028
Capacitance Gage Reading: 411 418 406 50%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3°
MIN. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND -0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.755

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.180
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .060" DEEPER WITH GR.2 REAMER

Results: Specimen No. 5C3T Hole #1
Surface Finish, AA 32
Protrusion, in. .152
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .053/INCH
Flush Gage Reading, in. .029
Capacitance Gage Reading: 419

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
#2	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 105
Protrusion, in. .152
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .055/INCH
Flush Gage Reading, in. .031
Capacitance Gage Reading: 427

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	-0.5	-0.5	-0.5	0	0	0	-0.5	-0.5
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	+0.5	+0.5	+0.5	+0.5	+0.5	0	0
#5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3° MIN. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) .255

Modify Good Holes Using Following Conditions:

Tool: GROUP 2 OMARK DRILL-REAMER

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) .130

Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .010" DEEPER WITH GR. 2 REAMER

Results: Specimen No. 562-4 Hole #1

Surface Finish, AA 30 Bluing Pin Rollout ↓ ↓

Protrusion, in. .156

Perpendicularity, .001 in./gage length

Longitudinal .10/INCH Transverse .05/INCH

Flush Gage Reading, in. .029

Capacitance Gage Reading: 1.4 352 / 440 5.4

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
#3	0	0	0	0	0	0	0	0
#4	0	+0.5	+0.5	+0.5	+0.5	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2

Surface Finish, AA 30 Bluing Pin Rollout ↓ ↓

Protrusion, in. .155

Perpendicularity, .001 in./gage length

Longitudinal .20/INCH Transverse .05/INCH

Flush Gage Reading, in. .028

Capacitance Gage Reading: 4.2 417 / 460 6.0

70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	-1	-1	-1	-1	-1	-1	-1	-1
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3°
MIN. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.755

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.180
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .060" DEEPER WITH GR. 2 REAMER

Results: Specimen No. 5E4CE Hole #1
Surface Finish, AA 18
Protrusion, in. .156
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .050/INCH
Flush Gage Reading, in. .028
Capacitance Gage Reading: 479 387 348 70%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
#2	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
#3	0	0	0	0	0	0	0	0
#4	-0.5	0	0	0	0	0	0	-0.5
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 80
Protrusion, in. .142
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .053/INCH
Flush Gage Reading, in. .028
Capacitance Gage Reading: 490 373 398 526 70%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3°
MIN. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STANDARD SOLVENT Depth: (Ind. Reading) 1.755

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STANDARD SOLVENT Depth: (Ind. Reading) 1.180
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE FOR NOMINAL INTERFERENCE THEN REAM .060" DEEPER WITH GR 2 REAMER

Results: Specimen No. GAB Hole #1
Surface Finish, AA 38 Bluing Pin Rollout
Protrusion, in. .150
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .055/.064
Flush Gage Reading, in. .027 70%
Capacitance Gage Reading: 440 3-15 4-4 4-11

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 28 Bluing Pin Rollout
Protrusion, in. .154
Perpendicularity, .001 in./gage length
Longitudinal [illegible] Transverse [illegible]
Flush Gage Reading, in. .030 70%
Capacitance Gage Reading: [illegible] 4-10 3-9 520

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0						
#2	0	0						
#3	0	0						
#4	0	0			0			
#5	0	0						

EFFECTS OF HOLE QUALITY

Test Series I Quality Variable PERPENDICULARITY DEVIATION - 3° MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.715

Modify Good Holes Using Following Conditions:

Tool: UNDERSIZE OMARK DRILL REAMER

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.810

Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE SHALLOW BY .060" THEN C'SINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. 5B2T Hole #1

Surface Finish, AA 28 Bluing Pin Rollout

Protrusion, in. .253

Perpendicularity, .001 in./gage length

Longitudinal .02/INCH Transverse .05 3/INCH

Flush Gage Reading, in. .029

Capacitance Gage Reading: 350 335 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

MAY

Hole #2

Surface Finish, AA 80 Bluing Pin Rollout

Protrusion, in. .225

Perpendicularity, .001 in./gage length

Longitudinal .005/INCH Transverse .05 2/INCH

Flush Gage Reading, in. .029

Capacitance Gage Reading: 402 290 60%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	
#2	0	0	0	0	0	0	0	
#3								0
#4	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5
#5	0	0	0	0	0	0	0	0

11-1

9/1/-

EFFECTS OF HOLE QUALITY

Test Series I Quality Variable PERPENDICULARITY DEVIATION - 3° MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.715

Modify Good Holes Using Following Conditions:

Tool: UNDERSIZE OMARK DRILL REAMER

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.610

Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE SHALLOW BY .060", THEN CO-SINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. 5P3CT Hole #1

Surface Finish, AA 36

Protrusion, in. .253

Perpendicularity, .001 in./gage length

Longitudinal .001/in. Transverse .055/in.

Flush Gage Reading, in. .030

Capacitance Gage Reading: 400 352 351

Bluing Pin Rollout ↓ 75%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
FAY → #2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

Hole #2

Surface Finish, AA 32

Protrusion, in. .246

Perpendicularity, .001 in./gage length

Longitudinal .003/in. Transverse .055/in.

Flush Gage Reading, in. .030

Capacitance Gage Reading: 368 370 366

Bluing Pin Rollout ↓ 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3°
MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.715

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.810
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE SHALLOW BY .060" THEN C'SINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. 5D6CT Hole #1
Surface Finish, AA 28
Protrusion, in. .242
Perpendicularity, .001 in./gage length
Longitudinal 002 Transverse .053
Flush Gage Reading, in. .027
Capacitance Gage Reading: 400 556 380

Bluing Pin Rollout ↓ ↓ 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
FAY → #2	0	0	1.0	1.0	0	1.0	1.0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0		0	0	0
#5								

Hole #2
Surface Finish, AA 32
Protrusion, in. .248
Perpendicularity, .001 in./gage length
Longitudinal 001 Transverse 054
Flush Gage Reading, in. .029
Capacitance Gage Reading: 402 385 420

Bluing Pin Rollout ↓ ↓ 90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

9/1/76 KSS

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3° MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.715

Modify Good Holes Using Following Conditions:

Tool: UNDERSIZE OMARK DRILL REAMER

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.5[illegible]

Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE SHALLOW BY .060" THEN COUNTERSINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. 5AGCT Hole #1

Surface Finish, AA 25

Protrusion, in. .239

Perpendicularity, .001 in./gage length

Longitudinal .003/INCH Transverse .055/INCH

Flush Gage Reading, in. .026

Capacitance Gage Reading: 365 (366 362)

Bluing Pin Rollout ↓ 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

LAY

Hole #2

Surface Finish, AA 30

Protrusion, in. .236

Perpendicularity, .001 in./gage length

Longitudinal [illegible] Transverse [illegible]

Flush Gage Reading, in. .025

Capacitance Gage Reading: 408 (412 405)

Bluing Pin Rollout ↓ 75%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0
#5								

9/[illegible]

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3° MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.215

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.210
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE — DRILL & REAM HOLE SHALLOW BY .060" THEN C'SINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. 4E18 Hole #1
Surface Finish, AA 24
Protrusion, in. .238
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .054 (3° = .050/in.)
Flush Gage Reading, in. .026
Capacitance Gage Reading: 330 (360)

Bluing Pin Rollout ↓ ↓ 75%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
FAY → #2	+0.5	0	0	0	0	+1	+1	+1
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	OPEN							

Hole #2
Surface Finish, AA 15
Protrusion, in. .018
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .057
Flush Gage Reading, in. .028
Capacitance Gage Reading: 370 (400)

Bluing Pin Rollout ↓ ↓ 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
FAY → #2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5	OPEN							→

EFFECTS OF HOLE QUALITY

Test Series I Quality Variable PERPENDICULARITY DEVIATION - 3° MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.715

Modify Good Holes Using Following Conditions:

Tool: UNDERSIZE OMARK DRILL REAMER

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.610

Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE — DRILL & REAM HOLE SHALLOW BY .060" THEN C'SINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. SC3P Hole #1

Surface Finish, AA 36

Protrusion, in. .266

Perpendicularity, .001 in./gage length

Longitudinal .002/inch Transverse .001/inch

Flush Gage Reading, in. .030 324

Capacitance Gage Reading: 365 415

Bluing Pin Rollout ↓ ↓ 70%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	+0.5	0	0	0	0	+1	+1	+1
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

FAY →

Hole #2

Surface Finish, AA 2R

Protrusion, in. .279

Perpendicularity, .001 in./gage length

Longitudinal 0 Transverse .001/inch

Flush Gage Reading, in. .033 366

Capacitance Gage Reading: 372 378

Bluing Pin Rollout ↓ ↓ 70%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3° MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.715

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.810
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE SHALLOW BY .060" THEN CO'SINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. 5CGCT Hole #1
Surface Finish, AA 22
Protrusion, in. .241
Perpendicularity, .001 in./gage length
Longitudinal .005/INCH Transverse .054/INCH
Flush Gage Reading, in. .029
Capacitance Gage Reading: .381 424 430

Bluing Pin Rollout ↓ ↓ 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

Hole #2
Surface Finish, AA 35
Protrusion, in. .250
Perpendicularity, .001 in./gage length
Longitudinal .003 INCH Transverse .052/INCH
Flush Gage Reading, in. 029
Capacitance Gage Reading: 510 374 388

Bluing Pin Rollout ↓ ↓ 80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

9/1/[illegible]

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3° MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.715

Modify Good Holes Using Following Conditions:

Tool: UNDERSIZE OMARK DRILL REAMER

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.510

Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE — DRILL & REAM HOLE SHALLOW BY .060" THEN C'SINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. 5C4C7 Hole #1

Surface Finish, AA 25 Bluing Pin Rollout

Protrusion, in. .007

Perpendicularity, .001 in./gage length

Longitudinal .003/INCH Transverse .039/INCH

Flush Gage Reading, in. .030

Capacitance Gage Reading: 450 372 / 410 80%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0			0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

Hole #2

Surface Finish, AA 30 Bluing Pin Rollout

Protrusion, in. .245

Perpendicularity, .001 in./gage length

Longitudinal .004/INCH Transverse .056/INCH

Flush Gage Reading, in. .030

Capacitance Gage Reading: 485 390 / 447 80%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3° MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.715

Modify Good Holes Using Following Conditions:

Tool: UNDERSIZE OMARK DRILL REAMER

Spindle, rpm 325 Feed: HAND - 0.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.810

Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SCRIBE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE — DRILL & REAM HOLE SHALLOW BY .060" THEN CO'SINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. 4C5B Hole #1

Surface Finish, AA 34

Protrusion, in. .232

Perpendicularity, .001 in./gage length

Longitudinal .002/INCH Transverse .055/INCH

Flush Gage Reading, in. .025

Capacitance Gage Reading: 309 305 303

Bluing Pin Rollout ↓ 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

FAY

Hole #2

Surface Finish, AA 35

Protrusion, in. .240

Perpendicularity, .001 in./gage length

Longitudinal .001/INCH Transverse .054/INCH

Flush Gage Reading, in. .026

Capacitance Gage Reading: 297 322 227

Bluing Pin Rollout ↓ 70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0					0
#3	0	0	0	0	0		0	0
#4	0	0	0	0	0	0	0	0
#5								

FAY

EFFECTS OF HOLE QUALITY

Test Series 7 Quality Variable PERPENDICULARITY DEVIATION - 3° MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.715

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.810
Procedure: SET HEAD ANGLE 3° IN TRANSVERSE DIRECTION, SPINE HOLE LOCATION, POSITION TABLE IN TRANSVERSE DIRECTION USING CENTERING MICROSCOPE IN SPINDLE - DRILL & REAM HOLE SHALLOW BY .060" THEN C'SINK WITH UNDERSIZE DRILL-REAMER

Results: Specimen No. 5AICT Hole #1
Surface Finish, AA 36 Bluing Pin Rollout
Protrusion, in. .255
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .053/IN.
Flush Gage Reading, in. .030
Capacitance Gage Reading: 301 318 317

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1		0	0	0	0	0	0	0
#2	0	0	+0.5	+0.5	0	0	0	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

FAY

Hole #2
Surface Finish, AA 52 Bluing Pin Rollout
Protrusion, in. .279
Perpendicularity, .001 in./gage length
Longitudinal .004 IN. Transverse .053 IN.
Flush Gage Reading, in. .029
Capacitance Gage Reading: 543 380 420

90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0			0
#2	0	0	0	0	0	+0.5	+0.5	0
#3	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#5								

FAY

4/4 - 7

INSPECTION SHEETS FOR TEST SERIES 8 - BARRELLING

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 402T

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUP II REAMER, FEED BORING BAR INTO HOLE (.100) AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 55
Protrusion, in. .126
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. .0
Capacitance Gage Reading .257
Exit Burr Height, in.

Bluing Pin Rollout

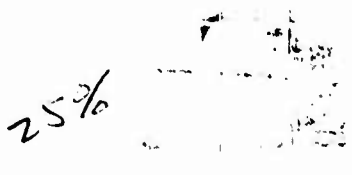
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	9.0	8.0	8.0	6.0	11.0	11.0	13.0
#2	9.0	7.0	6.0	4.0	13.0	14.5	15.0
#3	4.0	6.0	6.0	4.0	9.0	5.0	11.0
#4	-2.0	1.5	3.0	-8.0	6.0	5.0	8.0
#5	-2.0	-1.0	1.5	-3.0	8.0	14.5	14.0

Hole #2

Surface Finish, AA 55
Protrusion, in. .117
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .003
Flush Gage Reading, in. .0
Capacitance Gage Reading .237
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	13.0	13.0	13.0	11.5	12.0	13.0	13.0
#2	14.0	14.0	14.0	14.0	14.0	14.0	14.0
#3	10.0	14.0	13.0	11.5	8.0	5.0	7.0
#4	9.0	11.0	11.5	9.0	6.0	3.0	5.0
#5	10.0	10.0	10.0	10.5	11.0	9.0	8.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 3A6B

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUP II REAMER, FEED BORING BAR INTO HOLE (100) AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 60
Protrusion, in. .121
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .002
Flush Gage Reading, in. .0
Capacitance Gage Reading .246
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	12.0	11.5	11.0	10.0	10.0	11.0	11.0
#2	12.0	11.0	11.0	9.5	10.0	11.0	11.0
#3	10.0	7.5	7.0	5.0	4.0	8.0	9.0
#4	8.0	4.0	2.0	2.0	4.0	5.0	7.0
#5	9.0	3.0	3.0	3.0	6.0	6.0	8.0

Hole #2

Surface Finish, AA 50
Protrusion, in. .106
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .0
Capacitance Gage Reading .304
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	11.0	10.0	11.0	10.0	10.0	11.0	11.0
#2	10.0	10.0	10.0	10.0	10.0	10.0	10.0
#3	6.0	6.0	5.0	6.0	5.0	6.0	6.0
#4	.0	2.0	1.0	3.0	1.0	1.5	2.0
#5	.0	3.0	3.5	4.0	2.5	.0	3.0

MANUFACTURING REPORT: TAPERED HOLES

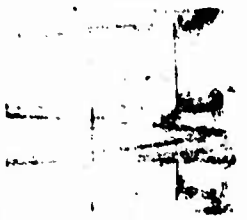
Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 2C5T

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUND II REAMER, FEED BORING BAR INTO HOLE (.100") AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 64
Protrusion, in. .126
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. .0
Capacitance Gage Reading .204
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	12.0	11.0	12.0	10.0	9.0	10.0	11.5
#2	12.0	12.0	11.5	9.0	7.5	10.0	11.0
#3	9.5	10.5	10.0	6.0	4.0	8.5	9.5
#4	12.0	8.5	7.0	2.5	4.0	6.0	7.5
#5	12.0	14.0	13.0	13.0	14.0	13.0	14.0

Hole #2

Surface Finish, AA 50
Protrusion, in. .125
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .002
Flush Gage Reading, in. .0
Capacitance Gage Reading .204
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	11.0	11.0	12.5	10.0	13.0	11.0	11.0
#2	11.5	11.0	12.5	10.0	13.0	10.5	10.5
#3	10.0	10.0	13.0	7.5	11.0	8.5	9.0
#4	8.5	7.5	9.0	4.5	8.0	6.5	6.5
#5	15.0	15.0	—	8.5	15.0	13.0	11.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 3028

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUP II REAMER, FEED BORING BAR INTO HOLE (.100) AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = ¼"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 65
Protrusion, in. .121
Perpendicularity, .001 in./in.
Longitudinal .0025 Transverse .0015
Flush Gage Reading, in. .0
Capacitance Gage Reading .221
Exit Burr Height, in.

Bluing Pin Rollout

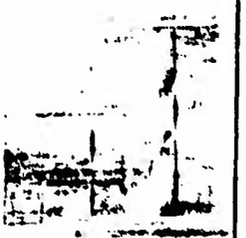
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	4.5	4.0	4.0	3.0	3.0	3.0	5.0
#2	5.5	5.0	5.0	5.0	5.0	5.0	6.5
#3	3.0	4.0	4.0	1.5	3.0	3.0	6.0
#4	3.0	1.5	4.0	-3.0	-.5	-.5	2.5
#5	8.0	7.5	7.0	5.0	7.0	5.0	6.0

Hole #2

Surface Finish, AA 55
Protrusion, in. .122
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading .243
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	4.0	3.5	3.0	4.0	3.5	3.0	3.5
#2	5.5	5.0	5.0	7.0	4.5	5.0	5.0
#3	3.5	1.5	1.5	4.0	1.0	2.5	3.0
#4	-.5	-3.0	-3.0	1.0	-4.0	-1.5	-3.0
#5	5.0	3.0	2.0	7.0	3.5	5.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 3A2T

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUP II REAMER, FEED BORING BAR INTO HOLE (100) AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 65
Protrusion, in. .119
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .0
Flush Gage Reading, in. .001
Capacitance Gage Reading .193
Exit Burr Height, in.

Bluing Pin Rollout

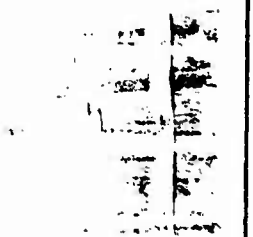
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	12.0	12.0	14.0	10.0	11.0	12.0	12.0
#2	12.0	11.0	13.0	9.0	10.0	11.0	12.0
#3	12.5	11.0	12.0	6.0	8.0	11.0	11.5
#4	10.0	9.0	6.0	7.0	6.0	8.0	9.0
#5	—	—	—	14.0	14.0	—	—

Hole #2

Surface Finish, AA 45
Protrusion, in. .112
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading .232
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	11.0	11.0	12.0	11.0	11.0	13.0	13.0
#2	11.0	11.0	11.0	10.0	10.0	13.0	13.0
#3	9.0	9.0	9.0	7.0	7.0	10.0	11.0
#4	6.0	5.0	5.0	3.0	4.0	2.0	2.0
#5	6.0	.5	1.5	+1.0	3.5	3.0	3.0

MANUFACTURING REPORT: TAPERED HOLES

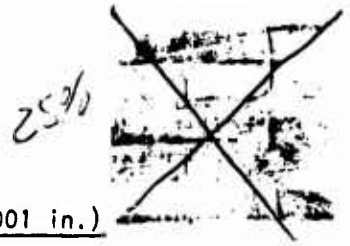
Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 2A6T

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUP II REAMER, FEED BORING BAR INTO HOLE (100) AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = ⅛"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 50
Protrusion, in. .124
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .0
Capacitance Gage Reading .222
Exit Burr Height, in.

Bluing Pin Rollout



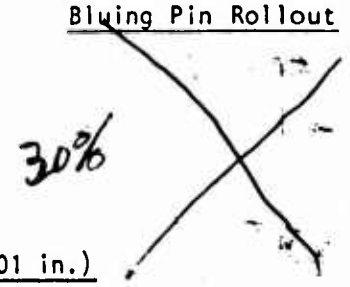
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	5.0	5.0	6.5	2.5	4.5	4.0	4.5
#2	5.0	5.0	7.0	3.0	5.0	5.0	5.0
#3	3.0	2.5	3.5	.0	1.5	2.0	4.5
#4	.0	+2.0	1.5	-3.5	-1.0	-3.0	1.0
#5	8.0	8.0	10.0	7.0	7.0	5.0	6.0

Hole #2

Surface Finish, AA 60
Protrusion, in. .124
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .004
Flush Gage Reading, in. .0015
Capacitance Gage Reading .260
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.0	4.0	4.0	3.5	4.0	3.5	3.0
#2	4.5	5.0	5.0	5.0	5.0	5.0	5.0
#3	2.0	2.0	2.0	2.5	3.5	4.0	3.5
#4	-2.0	-3.0	-2.0	1.0	.0	.0	.0
#5	1.0	-4.0	-2.5	.5	2.0	1.0	.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 204F

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUP II REAMER, FEED BORING BAR INTO HOLE (.190") AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 55
Protrusion, in. .122
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading .204
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	12.0	11.5	11.0	11.0	11.0	14.0	11.0
#2	11.0	11.0	10.0	10.0	10.0	13.0	10.5
#3	9.0	8.0	5.0	7.0	7.0	10.0	7.0
#4	7.0	5.0	3.0	8.0	3.0	8.0	4.5
#5	15.0	13.0	7.0	14.0	14.0	—	13.0

Hole #2

Surface Finish, AA 50
Protrusion, in. .109
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .0
Capacitance Gage Reading .246
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	12.0	12.0	12.0	10.5	10.0	10.5	11.0
#2	11.0	11.5	11.0	10.0	10.0	10.5	11.0
#3	7.0	9.0	8.0	6.0	5.0	7.0	7.0
#4	2.5	4.5	4.0	5.0	2.0	2.0	2.0
#5	4.0	3.0	5.0	3.0	1.0	3.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

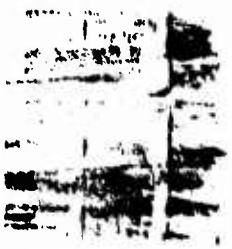
Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 5A6CB

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUP II REAMER, FEED BORING BAR INTO HOLE (100) AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 50
Protrusion, in. .115
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. -0
Capacitance Gage Reading .196
Exit Burr Height, in.

Bluing Pin Rollout



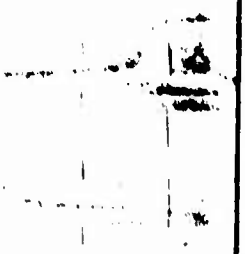
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	14.0	11.0	10.0	11.0	12.0	11.0	11.0
#2	14.0	11.0	9.0	9.0	11.0	11.0	10.0
#3	13.0	9.0	5.0	5.0	6.0	9.0	9.0
#4	11.0	6.0	3.0	3.0	3.0	6.0	6.0
#5	—	14.0	4.0	14.0	13.0	14.0	12.0

Hole #2

Surface Finish, AA 65
Protrusion, in. .119
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. .002
Capacitance Gage Reading .215
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	11.0	11.0	11.0	9.0	12.0	12.0	10.0
#2	11.0	11.0	11.0	9.0	12.0	13.0	10.0
#3	9.0	9.0	7.0	7.0	9.0	10.0	8.0
#4	7.0	7.0	4.0	6.0	5.0	8.0	6.0
#5	14.0	—	14.0	13.0	—	—	13.0

MANUFACTURING REPORT: TAPERED HOLES

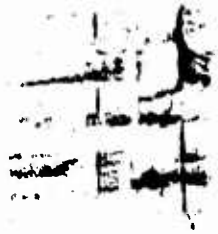
Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 2C47

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUP II REAMER, FEED BORING BAR INTO HOLE (.190) AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 60
Protrusion, in. .119
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading .187
Exit Burr Height, in.

Bluing Pin Rollout



20%

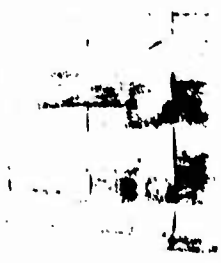
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	12.0	14.0	13.0	13.0	11.0	12.0	12.0
#2	12.0	14.0	13.0	12.0	10.0	11.0	12.0
#3	10.5	13.0	11.0	11.0	7.0	10.0	11.0
#4	8.0	11.0	9.0	11.0	9.0	8.0	9.0
#5	15.0	—	—	—	—	14.0	—

Hole #2

Surface Finish, AA 60
Protrusion, in. .120
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading .202
Exit Burr Height, in.

Bluing Pin Rollout



20%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	13.0	14.0	12.0	11.0	10.0	10.0	12.0
#2	11.0	13.0	11.0	10.0	8.0	10.0	11.0
#3	8.5	11.0	8.0	8.0	4.0	8.0	9.0
#4	5.0	8.0	6.0	6.0	3.0	5.0	7.0
#5	13.0	—	15.0	15.0	13.0	14.0	15.0

MANUFACTURING REPORT: TAPERED HOLES

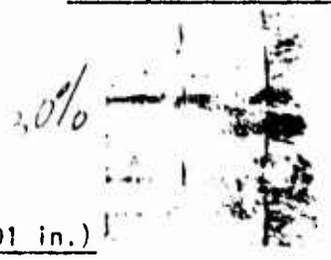
Test Series 8 Quality Variable HOLE BARRELLING (.0023) MIN. INTERFERENCE
Specimen No. 5C2CT

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH GROUP II REAMER, FEED BORING BAR INTO HOLE (190) AND TOUCH ON DIA. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8"
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.160

Hole #1

Surface Finish, AA 55
Protrusion, in. .112
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading .228
Exit Burr Height, in.

Bluing Pin Rollout



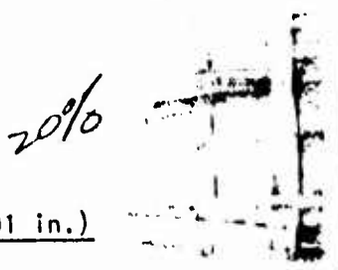
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	12.5	12.5	12.0	10.0	10.0	11.0	12.0
#2	12.0	11.5	12.0	8.5	9.5	10.0	12.0
#3	10.0	9.0	8.0	2.0	7.0	5.0	9.0
#4	8.5	6.5	6.0	0	6.0	4.0	7.0
#5	15.0	—	—	14.0	14.0	13.0	13.5

Hole #2

Surface Finish, AA 50
Protrusion, in. .120
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0025
Flush Gage Reading, in. .001
Capacitance Gage Reading .177
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	11.0	13.0	12.0	11.0	10.0	12.0	12.0
#2	12.5	13.0	13.0	11.0	9.0	12.0	12.0
#3	12.0	12.5	12.0	9.5	5.0	10.5	11.0
#4	10.5	11.0	10.5	7.0	1.5	9.0	9.0
#5	—	—	15.0	15.0	13.0	—	15.0

MANUFACTURING REPORT: TAPERED HOLES

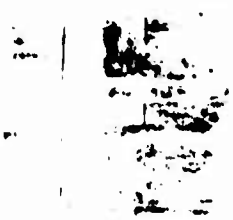
Test Series 8 Quality Variable HOLE BARRELLING (.004B) MAX INTERFERENCE
Specimen No. SE2CT

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE BORE HOLE TO DEPTH OF .585" NOSE RADIUS 1/8 IN.
Spindle, rpm 225-66C Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

Surface Finish, AA 60
Protrusion, in. .243
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .003
Flush Gage Reading, in. .003
Capacitance Gage Reading .235
Exit Burr Height, in.

Bluing Pin Rollout



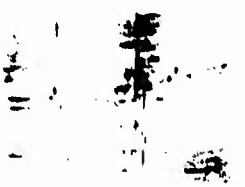
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.0	.5	1.0	2.5	2.5	2.5	2.5
#2	1.5	.5	1.0	2.0	2.5	2.5	2.0
#3	1.0	1.0	1.0	2.0	2.5	2.0	2.0
#4	1.5	3.0	1.0	1.5	3.0	1.5	1.5
#5	3.0	3.5	3.0	3.0	3.5	3.0	3.0

Hole #2

Surface Finish, AA 60
Protrusion, in. .239
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading .231
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.5	2.5	2.5	2.5	2.5	2.5	2.5
#2	2.0	2.0	2.0	2.0	2.0	2.0	2.0
#3	2.0	1.5	1.5	1.5	1.5	2.0	2.0
#4	1.0	.5	1.0	.5	1.0	1.5	1.0
#5	3.5	3.5	3.5	3.5	3.0	3.5	3.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0048) MAX INTERFERENCE
Specimen No. 582CT

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE BORE HOLE TO DEPTH OF .585" NOSE RADIUS 1/8 IN.
Spindle, rpm ~~335~~ 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

Surface Finish, AA 50
Protrusion, in. .235
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading .227
Exit Burr Height, in.

Bluing Pin Rollout

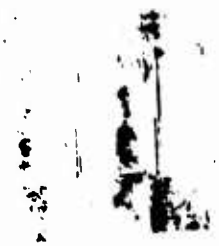
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.5	2.5	2.0	2.0	2.0	2.0	2.0
#2	2.0	2.0	2.0	1.5	1.5	1.5	2.0
#3	1.5	1.5	1.5	.5	1.0	1.0	1.5
#4	1.0	1.0	1.0	.5	.5	1.0	1.0
#5	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Hole #2

Surface Finish, AA 65
Protrusion, in. .233
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading .265
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.5	2.5	2.0	2.0	2.0	2.5	2.5
#2	2.0	2.0	1.5	1.5	1.5	2.0	2.0
#3	1.5	1.5	1.0	1.0	1.5	2.0	2.0
#4	.5	.5	1.0	0	0	1.0	1.0
#5	3.0	3.0	3.0	3.0	3.5	3.0	3.5

MANUFACTURING REPORT: TAPERED HOLES

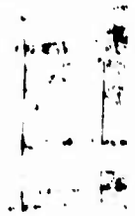
Test Series 8 Quality Variable HOLE BARRELLING (.0048) MAX INTERFERENCE
Specimen No. 581CB

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8 IN.
Spindle, rpm ~~228~~ 665 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

Surface Finish, AA 50
Protrusion, in. .235
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 001
Flush Gage Reading, in. 0
Capacitance Gage Reading 218
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	3.5	3.5	3	2.5	2.5	3	3.5
#2	3	3	3	2	2	3	3
#3	3	3	2.5	1.5	1.5	2.5	3
#4	2.5	2.5	2	1	1	2	2.5
#5	2	2	1.5	1.5	1.5	1.5	2

Hole #2

Surface Finish, AA 55
Protrusion, in. .210
Perpendicularity, .001 in./in.
Longitudinal .003 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 246
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	3	3	3	3	3	3	3
#2	3	3	3	2.5	2.5	3	3
#3	2.5	2.5	2.5	2	2	2.5	2.5
#4	2	2	2	1.5	1.5	2	2
#5	1	1	1	1	1	1	1.5

MANUFACTURING REPORT: TAPERED HOLES

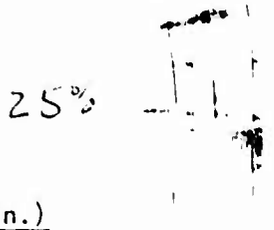
Test Series 8 Quality Variable HOLE BARRELLING (.0048) MAX INTERFERENCE
Specimen No. 5E5CB

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8 IN.
Spindle, rpm ~~325~~ 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

Surface Finish, AA 60
Protrusion, in. .218
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 263
Exit Burr Height, in.

Bluing Pin Rollout



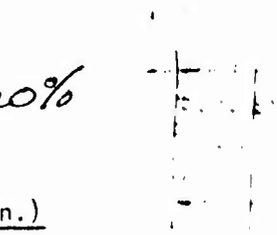
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.5	2	2.5	3.5	3.5	3.5	3.5
#2	2	1.5	2	3	3.5	3	2.5
#3	1.5	1	1	3	3	2.5	2.5
#4	1	1	1	2.5	2.5	2	2
#5	1.5	1.5	1.5	1.5	2	2	1

Hole #2

Surface Finish, AA 65
Protrusion, in. .238
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading 252
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	3.5	3	3	3	3	3	3
#2	3	2.5	2.5	2.5	2.5	3	2.5
#3	2.5	2	2	2	2	2.5	2.5
#4	2	1.5	1.5	1.5	1.5	2	2
#5	4	3.5	3.5	4	3.5	4	3.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0048) MAX INTERFERENCE
Specimen No. SE2CB

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE, BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8 IN.
Spindle, rpm ~~325~~ 610 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

✓ Surface Finish, AA 60
✓ Protrusion, in. .239
✓ Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0035
✓ Flush Gage Reading, in. +.0005
Capacitance Gage Reading 234
Exit Burr Height, in.

Bluing Pin Rollout 25%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	1.5	0	.5	2.5	3	3	2.5
#2	1	.5	0	2.5	2.5	2.5	2.5
#3	0	1.5	1	2	2.5	2.5	2
#4	.5	2	1.5	2	2.5	2.5	1.5
#5	2	2.5	2.5	2	2.5	2.5	2

Hole #2

Surface Finish, AA 50
Protrusion, in. .246
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0005
Flush Gage Reading, in. +.0015
Capacitance Gage Reading 227
Exit Burr Height, in.

Bluing Pin Rollout 25%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.5	2.5	2.0	2.0	2.5	2.5	2.5
#2	2.0	2.0	1.0	1.5	2.0	2.5	2.5
#3	1.5	2.5	2.0	1.0	-.5	+.5	1.0
#4	1.0	1.0	1.5	0.5	-.5	.0	.5
#5	3.0	3.0	3.0	3.0	3.0	3.0	3.0

MANUFACTURING REPORT: TAPERED HOLES

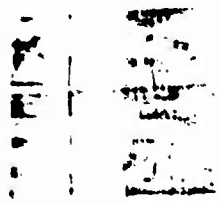
Test Series 8 Quality Variable HOLE BARRELLING (.0048) MAX INTERFERENCE
Specimen No. 2C513

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE, BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8 IN.
Spindle, rpm ~~225~~ 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

Surface Finish, AA 45
Protrusion, in. .239
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. .0015
Capacitance Gage Reading .240
Exit Burr Height, in.

Bluing Pin Rollout



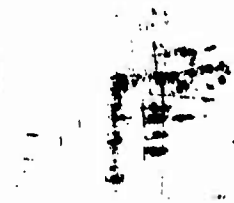
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	1.5	1.0	1.0	2.5	3.0	2.5	2.0
#2	.5	1.0	1.0	2.0	2.5	2.5	1.5
#3	0	0	1.0	2.0	2.5	2.0	1.5
#4	1.0	0	1.5	1.5	2.5	2.0	1.0
#5	3.0	3.5	3.0	3.0	3.5	3.0	3.0

Hole #2

Surface Finish, AA 55
Protrusion, in. .247
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse 0
Flush Gage Reading, in. .0025
Capacitance Gage Reading .237
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.5	2.0	2.0	2.5	2.5	2.5	2.5
#2	2.0	2.0	1.5	2.0	2.0	2.0	2.0
#3	1.5	1.0	1.0	1.0	1.5	1.5	1.5
#4	.5	.5	1.0	.5	1.0	1.0	1.0
#5	3.0	3.5	3.5	3.5	3.5	3.5	3.5

MANUFACTURING REPORT: TAPERED HOLES

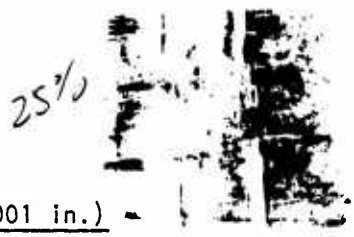
Test Series 8 Quality Variable HOLE BARRELLING (.0048) MAX INTERFERENCE
Specimen No. 203T

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE, BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8 IN.
Spindle, rpm ~~225~~ 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

Surface Finish, AA 50
Protrusion, in. .245
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading .219
Exit Burr Height, in.

Bluing Pin Rollout



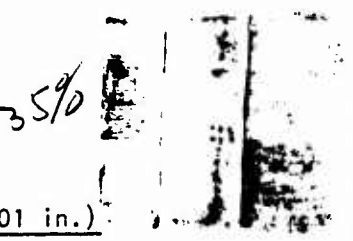
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.0	2.0	1.5	1.5	1.5	2.0	2.0
#2	1.5	1.5	1.0	.0	1.0	1.5	1.5
#3	1.5	1.0	1.0	.0	.0	1.0	1.5
#4	1.0	0	.0	.0	.0	.5	1.0
#5	3.0	3.0	3.0	2.5	3.0	2.5	2.5

Hole #2

Surface Finish, AA 50
Protrusion, in. .244
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading .253
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.0	2.0	2.0	2.0	2.0	2.0	2.0
#2	1.5	1.5	1.0	1.5	1.5	1.5	1.5
#3	1.0	1.0	1.0	1.0	1.0	1.0	1.5
#4	.5	.0	.0	.0	.0	.5	.5
#5	2.5	2.5	3.0	2.5	2.5	3.0	2.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0048) MAX INTERFERENCE
Specimen No. 5C3CT

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8 IN.
Spindle, rpm 325 610 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

Surface Finish, AA 60
Protrusion, in. .243
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .002
Flush Gage Reading, in. .0025
Capacitance Gage Reading 237
Exit Burr Height, in.

Bluing Pin Rollout

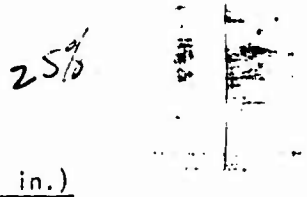
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	1.5	1.0	1.0	3.0	3.0	3.0	2.0
#2	.5	1.0	0	2.5	2.5	2.5	1.5
#3	0	1.0	0	2.5	2.0	2.0	.5
#4	0	1.5	1.0	2.0	2.0	1.5	0
#5	3.0	3.5	3.0	3.0	3.5	3.0	3.0

Hole #2

Surface Finish, AA 55
Protrusion, in. .246
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 266
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.5	2.0	2.0	2.0	2.0	2.5	2.0
#2	2.0	2.0	2.0	1.5	1.5	2.0	2.0
#3	1.5	1.0	1.0	1.0	1.0	2.0	1.0
#4	1.0	.5	0	0	1.0	1.0	1.0
#5	3.5	3.5	3.0	3.5	3.5	3.5	3.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0048) MAX INTERFERENCE
Specimen No. 5A5C8

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE, BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8 IN.
Spindle, rpm ~~335~~ 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

Surface Finish, AA 75
Protrusion, in. .221
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. -.003
Capacitance Gage Reading 237
Exit Burr Height, in.

Bluing Pin Rollout

20%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	3	3	3	3	2.5	3	3
#2	3	2.5	2.5	2	2.5	3	3
#3	2.5	2.5	2.5	2	1.5	1.5	2
#4	2	2	2	2	1	1	1.5
#5	3	3	3	2.5	3.5	3	3

Hole #2

Surface Finish, AA 60
Protrusion, in. .236
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0025
Flush Gage Reading, in. .002
Capacitance Gage Reading 257
Exit Burr Height, in.

Bluing Pin Rollout

30%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	3	3	2.5	+2.5	+2.5	3.	3.
#2	2.5	2.5	2	+2	+2.5	2.5	2.5
#3	2.5	2.5	2	+1.5	1.5	2	2
#4	2	2	1.5	+1	.5	1	1
#5	1.5	1	1	1	1	1	1

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable HOLE BARRELLING (.0048) MAX INTERFERENCE
Specimen No. 4047

Hole Manufacturing Conditions and Procedures: TAPER REAM STD. HOLE FEED BORING BAR INTO HOLE .100", MOVE ECCENTRIC TO TOUCH ON DIA OF HOLE. BORE HOLE TO DEPTH OF .585" NOSE RADIUS = 1/8 IN.
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.675

Hole #1

Surface Finish, AA 65
Protrusion, in. .238
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading .263
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.0	2.0	2.0	1.5	2.0	2.0	2.0
#2	2.0	1.5	1.5	1.0	1.0	1.0	1.5
#3	1.5	1.5	1.0	.5	.5	1.0	1.5
#4	.5	.5	.0	.0	.0	.0	.5
#5	3.0	2.5	2.5	3.0	3.0	2.5	2.5

Hole #2

Surface Finish, AA 45
Protrusion, in. .238
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading .293
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.0	2.0	2.0	2.0	2.0	2.0	2.0
#2	2.0	2.0	1.5	1.0	1.0	1.0	1.5
#3	1.5	1.0	1.0	.5	.0	1.0	1.0
#4	1.0	.0	.0	.0	.0	.5	.5
#5	3.0	3.0	2.5	3.0	3.0	3.0	3.0

INSPECTION SHEETS FOR TEST SERIES 8 - BELLMOUTHING

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELL MOUTHING
Specimen No. 2B13 MIN. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTERSINK

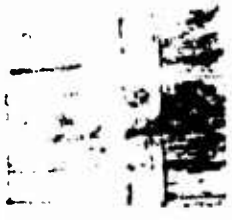
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 25
Protrusion, in. 118
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .004
Flush Gage Reading, in. .002
Capacitance Gage Reading 262
Exit Burr Height, in.

Bluing Pin Rollout

35%



Air Gage Readings (.0001 in.)
Angular Position

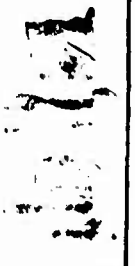
Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	7.0	7.0	7.0	8.0	8.0	8.0	7.0
#2	7.0	6.0	6.0	9.0	8.0	7.0	9.0
#3	5.0	2.0	2.0	8.0	3.0	5.0	9.0
#4	5.0	2.0	2.0	9.0	3.0	4.0	7.0
#5	7.0	4.0	4.0	9.0	4.0	2.0	6.0

Hole #2

Surface Finish, AA 55
Protrusion, in. 124
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .003
Flush Gage Reading, in. .002
Capacitance Gage Reading 220
Exit Burr Height, in.

Bluing Pin Rollout

40%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	8.0	6.0	7.0	6.0	5.0	8.0	9.0
#2	7.0	8.0	8.0	8.0	8.0	8.0	9.0
#3	3.0	8.0	10.0	4.0	8.0	10.0	11.0
#4	0	2.0	8.0	5.0	4.0	6.0	10.0
#5	5.0	2.0	8.0	8.0	0	6.0	10.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELL MOUTHING
Specimen No. 3C2B MIN. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTERSINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 50 Bluing Pin Rollout
Protrusion, in. 125
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 261
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	4.0	5.0	6.0	8.0	6.0	4.0	6.0
#2	5.0	4.0	5.0	8.0	7.0	5.0	8.0
#3	5.0	0	3.0	4.0	4.0	3.0	8.0
#4	4.0	-3.0	-1.0	5.0	2.0	6.0	8.0
#5	7.0	-1.0	-2.0	7.0	1.0	6.0	9.0

Hole #2

Surface Finish, AA 42 Bluing Pin Rollout
Protrusion, in. 124
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 253
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	6.0	5.0	8.0	6.0	5.0	4.0	7.0
#2	7.0	7.0	6.0	8.0	6.0	5.0	7.0
#3	3.0	9.0	5.0	5.0	5.0	3.0	5.0
#4	-3.0	7.0	4.0	-1.0	5.0	3.0	1.0
#5	-1.0	6.0	6.0	-3.0	6.0	5.0	1.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELL MOUTHING / MIN. INTERFERENCE
Specimen No. 285B

Hole Manufacturing Conditions and Procedures: PRODUCE STD HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTERSINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 35
Protrusion, in. 125
Perpendicularity, .001 in./in.
Longitudinal .004 Transverse .004
Flush Gage Reading, in. .002
Capacitance Gage Reading 288
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	11.0	10.0	8.0	-5.0	-2.0	8.0	8.0
#2	11.0	11.0	10.0	4.0	2.0	5.0	9.0
#3	3.0	6.0	6.0	8.0	2.0	5.0	1.0
#4	0	1.0	-1.0	6.0	0	5.0	3.0
#5	4.0	3.0	4.0	3.0	0	3.0	4.0

Hole #2

Surface Finish, AA 28
Protrusion, in. 120
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .004
Flush Gage Reading, in. 0
Capacitance Gage Reading 269
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.0	3.0	6.0	6.0	5.0	6.0	4.0
#2	4.0	9.0	8.0	9.0	7.0	10.0	6.0
#3	-2.0	5.0	8.0	9.0	0	9.0	4.0
#4	-2.0	5.0	7.0	8.0	1.0	6.0	5.0
#5	-1.0	5.0	6.0	7.0	1.0	4.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELL MOUTHING / MIN. INTERFERENCE

Specimen No. 3C5B

Hole Manufacturing Conditions and Procedures: PRODUCE STD HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTERSINK

Spindle, rpm 660 Feed: .0015 IPR

Cutting Fluid: DRY Depth: (Ind. Reading) ____

Hole #1

Surface Finish, AA 27

Protrusion, in. .125

Perpendicularity, .001 in./in.

Longitudinal 0 Transverse .001

Flush Gage Reading, in. .001

Capacitance Gage Reading 294

Exit Burr Height, in. ____

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	7.0	9.0	9.0	9.0	8.0	8.0	9.0
#2	3.0	5.0	4.0	3.0	2.0	5.0	3.0
#3	-1.0	5.0	2.0	3.0	-5.0	3.0	1.0
#4	-4.0	2.0	0	1.0	-11.0	-2.0	0
#5	-5.0	-1.0	1.0	0	-8.0	-3.0	1.0

Hole #2

Surface Finish, AA 35

Protrusion, in. .126

Perpendicularity, .001 in./in.

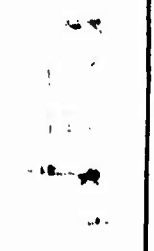
Longitudinal .001 Transverse .004

Flush Gage Reading, in. 0

Capacitance Gage Reading 301

Exit Burr Height, in. ____

Bluing Pin Rollout



Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	8.0	6.0	4.0	1.0	3.0	7.0	8.0
#2	10.0	9.0	8.0	4.0	5.0	2.0	10.0
#3	5.0	5.0	6.0	5.0	4.0	2.0	7.0
#4	2.0	-2.0	2.0	5.0	5.0	1.0	3.0
#5	5.0	0	4.0	1.0	6.0	4.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELL MOUTHING
Specimen No. 3A4B MIN. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTERSINK

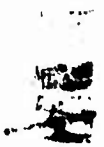
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 25
Protrusion, in. .124
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 283
Exit Burr Height, in.

Bluing Pin Rollout

40%



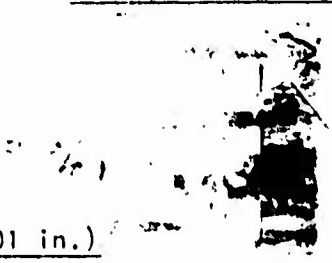
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	5.0	6.0	6.0	5.0	4.0	4.0	5.0
#2	2.0	8.0	8.0	9.0	2.0	6.0	2.0
#3	3.0	6.0	8.0	1.0	4.0	2.0	2.0
#4	5.0	2.0	5.0	3.0	5.0	-1.0	5.0
#5	4.0	-1.0	4.0	1.0	5.0	0	3.0

Hole #2

Surface Finish, AA 15
Protrusion, in. .123
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0025
Flush Gage Reading, in. 0
Capacitance Gage Reading 276
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	5.0	5.0	5.0	5.0	8.0	9.0	8.0
#2	8.0	8.0	8.0	9.0	4.0	7.0	5.0
#3	3.0	5.0	5.0	9.0	-4.0	5.0	-3.0
#4	0	7.0	5.0	2.0	-2.0	2.0	-2.0
#5	-2.0	5.0	5.0	6.0	+10.0	-4.0	1.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELL MOUTHING
Specimen No. 4A4F MIN. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTERSINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 36
Protrusion, in. 100
Perpendicularity, .001 in./in.
Longitudinal .005 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 279
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	6.0	9.0	9.0	5.0	7.0	9.0	9.0
#2	6.0	8.0	9.0	8.0	9.0	7.0	7.0
#3	4.0	8.0	4.0	7.0	9.0	3.0	5.0
#4	4.0	3.0	0	7.0	9.0	1.0	3.0
#5	7.0	5.0	2.0	6.0	9.0	4.0	2.0

Hole #2

Surface Finish, AA 40
Protrusion, in. 137
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 228
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	6.0	8.0	8.0	6.0	7.0	6.0	8.0
#2	7.0	6.0	6.0	7.0	8.0	6.0	8.0
#3	7.0	8.0	8.0	7.0	9.0	5.0	8.0
#4	7.0	7.0	9.0	5.0	8.0	7.0	5.0
#5	6.0	4.0	8.0	8.0	5.0	7.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELL MOUTHING
Specimen No. 2E2B MIN. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTERSINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 25
Protrusion, in. 126
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 260
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	8.0	8.0	6.0	4.0	5.0	7.0	5.0
#2	9.0	10.0	8.0	6.0	5.0	8.0	7.0
#3	5.0	9.0	8.0	9.0	0	3.0	6.0
#4	0	7.0	7.0	7.0	-3.0	0	7.0
#5	1.0	3.0	7.0	6.0	2.0	1.0	6.0

Hole #2

Surface Finish, AA 20
Protrusion, in. 119
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 274
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	4.0	4.0	6.0	9.0	8.0	6.0	5.0
#2	2.0	6.0	7.0	11.0	9.0	5.0	8.0
#3	0	3.0	8.0	8.0	9.0	0	9.0
#4	4.0	0	5.0	0	9.0	-1.0	5.0
#5	4.0	0	4.0	0	6.0	1.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELL MOUTHING
Specimen No. 20513 MIN. INTERFERENCE

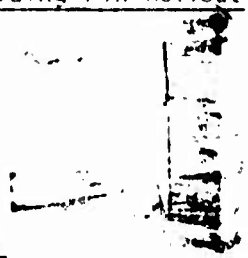
Hole Manufacturing Conditions and Procedures: PRODUCE STD HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTERSINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 30
Protrusion, in. 125
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. -.001
Capacitance Gage Reading 290
Exit Burr Height, in.

Bluing Pin Rollout



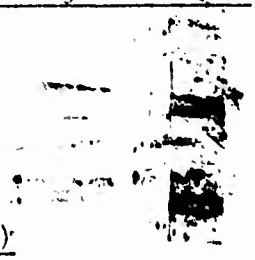
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	6.0	4.0	6.0	8.0	6.0	6.0	6.0
#2	7.0	6.0	6.0	9.0	7.0	7.0	8.0
#3	6.0	1.0	2.0	6.0	2.0	4.0	8.0
#4	4.0	-3.0	-2.0	6.0	2.0	3.0	6.0
#5	3.0	0	-1.0	5.0	0	-2.0	3.0

Hole #2

Surface Finish, AA 38
Protrusion, in. 112
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 260
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	6.0	6.0	6.0	6.0	5.0	5.0	6.0
#2	4.0	6.0	8.0	7.0	7.0	8.0	6.0
#3	2.0	2.0	6.0	5.0	3.0	8.0	3.0
#4	1.0	-1.0	1.0	5.0	-2.0	6.0	4.0
#5	4.0	0	-1.0	4.0	0	4.0	7.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable Best Machine
Specimen No. 2ESB Min Interference

Hole Manufacturing Conditions and Procedures: Reamed Std Hole
Bore Exit before Hole Chamfer Entrance with A
60° Countersink

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: Dri Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 20
Protrusion, in. 120
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0035
Flush Gage Reading, in. 002
Capacitance Gage Reading 330
Exit Burr Height, in.

Blueing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	3.0	4.0	5.0	6.0	5.0	4.0	4.0
#2	6.0	5.0	4.0	2.0	8.0	7.0	7.0
#3	4.0	3.0	2	0	3.0	4.0	3.0
#4	0	2.0	0	0	-1.0	-2.0	0
#5	0	1.0	1.0	2.0	2.0	1.0	0

Hole #2

Surface Finish, AA 25
Protrusion, in. 125
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .005
Flush Gage Reading, in. .002
Capacitance Gage Reading 292
Exit Burr Height, in.

Blueing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	9.0	7.0	5.0	-1.0	6.0	7.0	9.0
#2	11.0	11.0	8.0	2.0	5.0	2.0	10.0
#3	5.0	2.0	5.0	5.0	4.0	3.0	5.0
#4	2.0	0	0	2.0	6.0	5.0	4.0
#5	5.0	0	2.0	3.0	4.0	5.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable Ball Mounting M.O. Interference

Specimen No. 3A4F

Hole Manufacturing Conditions and Procedures: Produce Std Hole Bore Exit orifice five Chamfer Entrance with A 60° Countersink

Spindle, rpm 660 Feed: .0015 IPR

Cutting Fluid: Dex Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 30

Protrusion, in. .125

Perpendicularity, .001 in./in.

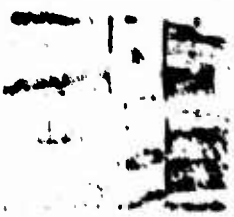
Longitudinal .0015 Transverse .002

Flush Gage Reading, in. .003

Capacitance Gage Reading 280

Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.0	3.0	5.0	6.0	7.0	7.0	4.0
#2	6.0	7.0	7.0	9.0	7.0	7.0	7.0
#3	6.0	2.0	3.0	7.0	2.0	2.0	4.0
#4	4.0	-3.0	0	4.0	4.0	0	3.0
#5	3.0	1.0	-2.0	3.0	3.0	-1.0	4.0

Hole #2

Surface Finish, AA 38

Protrusion, in. .114

Perpendicularity, .001 in./in.

Longitudinal .001 Transverse .021

Flush Gage Reading, in. .003

Capacitance Gage Reading 283

Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	5.0	6.0	7.0	8.0	7.0	4.0	4.0
#2	6.0	7.0	8.0	9.0	5.0	6.0	4.0
#3	4.0	2.0	6.0	5.0	2.0	5.0	2.0
#4	3.0	-4.0	1.0	4.0	-4.0	4.0	2.0
#5	2.0	-2.0	0	3.0	-2.0	2.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING
Specimen No. 203B MAX. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD. HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 45
Protrusion, in. .236
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading .296
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-5.0	-7.0	-3.0	-7.0	-9.0	-4.0
#2	2.0	3.0	3.0	3.0	3.0	0	2.0
#3	2.0	5.0	5.0	4.0	2.0	4.0	0
#4	4.0	5.0	5.0	6.0	7.0	6.2	2.0
#5	—	—	—	14.0	—	—	—

Hole #2

Surface Finish, AA 55
Protrusion, in. .243
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0015
Flush Gage Reading, in. .002
Capacitance Gage Reading .325
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-5.0	-9.0	-4.0	-4.0	-8.0	-8.0
#2	2.0	2.0	1.0	2.0	3.0	-1.0	-2.0
#3	4.0	6.0	5.0	4.0	5.0	3.0	1.0
#4	6.0	6.0	6.0	1.0	5.0	2.0	-1.0
#5	—	—	—	13.0	14.0	15.0	15.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING
Specimen No. 2A47 MAX. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD. HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) ____

Hole #1

Surface Finish, AA 40
Protrusion, in. .237
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 323
Exit Burr Height, in. ____

Bluing Pin Rollout

45°

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-3.0	-5.0	-10.0	-9.0	-9.0	-3.0
#2	0	2.0	2.0	0	0	0	2.0
#3	3.0	1.0	1.0	[illegible]	[illegible]	2.0	[illegible]
#4	4.0	0	0	4.0	0	1.0	4.0
#5	—	—	—	14.0	14.0	—	—

Hole #2

Surface Finish, AA 28
Protrusion, in. .2414
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0025
Flush Gage Reading, in. .001
Capacitance Gage Reading 380
Exit Burr Height, in. ____

Bluing Pin Rollout

45°

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-8.0	-11.0	-7.0	-8.0	-8.0	-7.0
#2	2.0	2.0	0	1.0	1.0	0	-1.0
#3	2.0	2.0	2.0	1.0	3.0	3.0	0
#4	-1.0	0	1.0	0	2.0	2.0	0
#5	—	—	—	13.0	—	15.0	—

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING
Specimen No. 2EC8 MAX. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD. HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK

Spindle, rpm 660 Feed: .0015" IPR
Cutting Fluid: DRY Depth: (Ind. Reading) ____

Hole #1

Surface Finish, AA 32
Protrusion, in. .239
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading .327
Exit Burr Height, in. ____

Bluing Pin Rollout

50%

Air Gage Readings (.0001 in.)
Angular Position

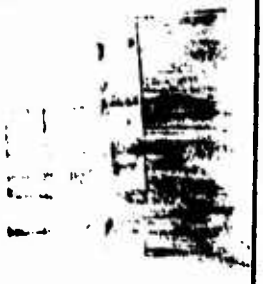
Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-6.0	-9.0	-8.0	-6.0	-10.0	-4.0
#2	-1.0	2.5	1.0	2.0	3.5	1.0	2.5
#3	2.0	4.0	3.5	3.0	5.0	3.0	3.0
#4	3.5	2.0	3.0	3.5	5.0	3.0	1.0
#5	—	—	—	14.0	—	15.0	—

Hole #2

Surface Finish, AA 32
Protrusion, in. .200
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading .294
Exit Burr Height, in. ____

Bluing Pin Rollout

40%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-8.0	-4.0	-4.0	-5.0	-5.0	-4.0
#2	3.0	0	2.0	4.0	2.0	4.0	2.0
#3	6.0	1.5	4.5	6.0	3.0	5.0	2.0
#4	7.0	4.0	5.0	6.5	3.0	5.0	0
#5	—	—	—	—	—	—	—

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING
Specimen No. 266T MAX. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD. HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK

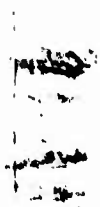
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 80
Protrusion, in. .2414
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0025
Flush Gage Reading, in. -.001
Capacitance Gage Reading 300
Exit Burr Height, in.

Bluing Pin Rollout

35%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-3.0	-7.0	-8.0	-4.0	-9.0	-3.0
#2	0	4.0	1.0	1.0	4.0	0	4.0
#3	2.0	5.0	4.0	3.0	5.0	2.0	5.0
#4	2.0	4.0	3.0	2.0	2.0	3.0	4.0
#5	—	—	—	—	—	14.0	15.0

Hole #2

Surface Finish, AA 30
Protrusion, in. .2411
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 326
Exit Burr Height, in.

Bluing Pin Rollout

45%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-4.0	-7.0	-5.0	-5.0	-7.0	-2.0
#2	1.0	4.0	0	2.0	2.0	1.0	4.0
#3	2.0	4.0	3.0	2.0	3.0	1.0	4.0
#4	3.0	4.0	3.0	2.0	3.0	1.0	5.0
#5	—	—	—	15.0	—	—	—

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING
Specimen No. 3C6B MAX. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD. HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) ____

Hole #1

Surface Finish, AA 40
Protrusion, in. .239
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. -.001
Capacitance Gage Reading 323
Exit Burr Height, in. ____

Bluing Pin Rollout

35%

Air Gage Readings (.0001 in.)
Angular Position

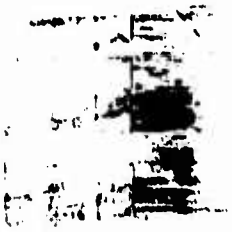
Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-5.0	-8.0	-3.5	-5.0	-8.0	-5.0
#2	2.0	2.5	-1.0	4.5	3.0	-1.0	1.0
#3	4.0	4.5	2.0	4.5	6.0	2.0	1.0
#4	4.0	5.0	2.5	3.0	8.0	3.0	1.0
#5	—	—	—	14.0	—	—	—

Hole #2

Surface Finish, AA 42
Protrusion, in. .245
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 280
Exit Burr Height, in. ____

Bluing Pin Rollout

40%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-6.0	-5.0	-4.0	-6.0	-4.0	-6.0
#2	2.0	3.0	2.0	1.0	5.0	4.0	3.0
#3	2.0	4.0	3.0	2.0	6.0	4.0	5.0
#4	2.0	6.0	2.0	2.0	6.0	6.0	7.0
#5	—	—	—	—	—	—	—

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING
Specimen No. 4B2BC MAX. INTERFERENCE

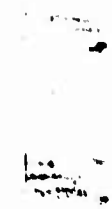
Hole Manufacturing Conditions and Procedures: PRODUCE STD HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 55
Protrusion, in. .230
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 358
Exit Burr Height, in.

Bluing Pin Rollout



40%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-6.0	-6.0	-6.0	-6.0	-7.0	-10.0
#2	2.0	0	3.0	1.0	1.0	2.0	-2.0
#3	2.0	0	3.0	4.0	3.0	4.0	2.0
#4	2.0	-1.0	2.0	3.0	0	4.0	2.0
#5							

Hole #2

Surface Finish, AA 35
Protrusion, in. .244
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 311
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-2.0	-7.0	-10.0	-4.0	-8.0	-9.0	-5.0
#2	4.0	2.0	-2.0	2.0	3.0	0	2.0
#3	4.0	5.0	3.0	4.0	6.0	4.0	2.0
#4	3.0	6.0	3.0	2.0	6.0	4.0	1.0
#5	15.0						

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING
Specimen No. 3D3B MAX. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD. HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 50
Protrusion, in. .245
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 299
Exit Burr Height, in.

Bluing Pin Rollout

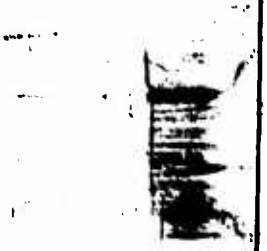
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-7.0	-5.0	-3.0	-10.0	-5.0	-7.0
#2	3.0	-2.0	2.0	5.0	-1.0	2.0	0
#3	5.0	0	2.0	5.0	2.0	5.0	4.0
#4	5.0	8.0	0	3.0	3.0	3.0	4.0
#5	—	13.0	—	—	—	—	—

Hole #2

Surface Finish, AA 32
Protrusion, in. .239
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .015
Flush Gage Reading, in. 0
Capacitance Gage Reading 350
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-4.0	-6.0	-9.0	-4.0	-10.0	-5.0
#2	0	4.0	3.0	1.0	3.0	-1.0	3.0
#3	3.0	3.0	4.0	4.0	5.0	3.0	5.0
#4	4.0	2.0	3.0	4.0	3.0	2.0	6.0
#5	—	—	—	—	14.0	—	—

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING
Specimen No. 3C1T MAX. INTERFERENCE

Hole Manufacturing Conditions and Procedures: PRODUCE STD. HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) ____

Hole #1

Surface Finish, AA 30
Protrusion, in. .244
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .005
Capacitance Gage Reading .302
Exit Burr Height, in. ____

Bluing Pin Rollout

45°

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-7.0	-7.0	-5.0	-8.0	-8.5	-7.0
#2	1.0	3.0	1.0	3.0	3.0	0	2.0
#3	1.0	4.5	1.0	3.5	4.0	0	3.0
#4	3.5	6.0	2.0	3.0	4.0	1.0	3.0
#5	—	—	—	—	—	14.0	—

Hole #2

Surface Finish, AA 75
Protrusion, in. .245
Perpendicularity, .001 in./in.
Longitudinal .0025 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading .290
Exit Burr Height, in. ____

Bluing Pin Rollout

45°

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-2.0	-8.0	-4.0	-5.0	-9.5	-8.0	-3.0
#2	4.0	0	2.0	5.0	0	1.5	4.0
#3	7.0	3.0	3.0	7.0	2.0	4.0	6.0
#4	7.0	3.0	1.0	7.0	2.5	4.0	4.0
#5	—	—	—	—	—	—	—

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING MAX. INTERFERENCE
Specimen No. 4EHT

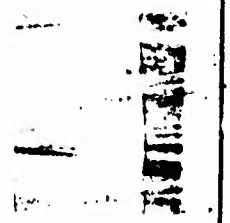
Hole Manufacturing Conditions and Procedures: PRODUCE STD. HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK
Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 70
Protrusion, in. .243
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading .331
Exit Burr Height, in.

Bluing Pin Rollout

50%



Air Gage Readings (.0001 in.)
Angular Position

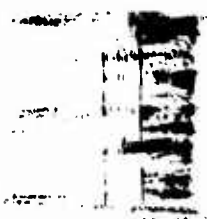
Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-8.0	-5.0	-5.0	-7.0	-6.0	-6.0
#2	2.0	0	2.5	2.0	2.0	3.0	0
#3	3.0	1.0	2.0	2.0	3.0	4.0	2.5
#4	3.0	0	1.0	2.0	4.0	2.0	4.0
#5	14.5	—	—	—	14.5	—	—

Hole #2

Surface Finish, AA 80
Protrusion, in. .240
Perpendicularity, .001 in./in.
Longitudinal .015 Transverse .001
Flush Gage Reading, in. .0
Capacitance Gage Reading .289
Exit Burr Height, in.

Bluing Pin Rollout

45%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-8.0	-7.0	-4.0	-10.0	-7.0	-8.0
#2	5.0	2.0	2.0	5.0	1.0	0	1.0
#3	6.0	4.0	0	5.0	1.0	0	3.0
#4	5.0	5.0	-1.0	3.0	3.0	1.0	2.0
#5	—	—	—	—	13.0	13.0	—

MANUFACTURING REPORT: TAPERED HOLES

Test Series 8 Quality Variable BELLMOUTHING
Specimen No. 1047 MAX. INTERFERENCE

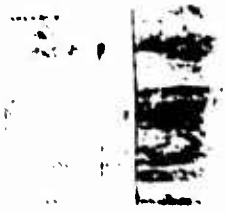
Hole Manufacturing Conditions and Procedures: PRODUCE STD. HOLE BORE EXIT OF HOLE AND CHAMFER ENTRANCE WITH A 60° COUNTER SINK

Spindle, rpm 660 Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) ____

Hole #1

Surface Finish, AA 30
Protrusion, in. .244
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 305
Exit Burr Height, in. ____

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-3.5	-3.0	-6.0	-4.0	-6.0	-4.0
#2	-1.0	2.5	3.0	-1.0	2.0	2.0	3.0
#3	0	3.0	3.0	1.0	3.0	4.0	6.0
#4	0	1.0	1.0	1.0	2.0	3.0	5.0
#5	—	—	—	—	13.0	13.0	—

Hole #2

Surface Finish, AA 40
Protrusion, in. .241
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 318
Exit Burr Height, in. ____

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-8.0	-7.0	-8.0	-4.0	-2.0	-4.0
#2	1.0	1.0	2.0	0	4.0	2.0	4.0
#3	0	2.0	2.0	2.0	4.0	3.0	6.0
#4	0	2.0	1.0	3.0	2.0	3.0	7.0
#5	—	—	—	14.0	—	—	—

INSPECTION SHEETS FOR TEST SERIES 9 - SURFACE ROUGHNESS

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable Spindle Accuracy (Runout)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: .0012 IPR
Cutting Fluid: Standard Soluble Depth: (Ind. Reading) 1.950

Results: Specimen No. 5 Hole #1 Bluing Pin Rollout
Surface Finish, AA 42-62
Protrusion, in. .162
Perpendicularity, .001 in./gage length
Longitudinal .004/inch Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading: 321
Exit Burr Height, in. —

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+2	+2	+2	+2	+2	+2	+2	+2
#4	0	0	0	0	0	0	0	0
#5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5

Hole #2 Bluing Pin Rollout
Surface Finish, AA 50-62 (est.)
Protrusion, in. .172
Perpendicularity, .001 in./gage length
Longitudinal .003/inch Transverse .003/inch
Flush Gage Reading, in. .002
Capacitance Gage Reading: 352
Exit Burr Height, in. —

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+1	+1	+1	+1	+1	+1
#4	0	0	0	0	0	0	0	0
#5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63 μ in)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND – 0.5 IPM
Cutting Fluid: TAP MAGIC – ALUM. Depth: (Ind. Reading) 1.949

Results: Specimen No. 2E1T Hole #1
Surface Finish, AA 48-66 μ in Bluing Pin Rollout
Protrusion, in. .174
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .004/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 268
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	OPEN							
#4	+0.5	0	+0.5	0	+0.5	0	0	0
#5	0	0	0	+1	+0.5	+0.5	0	0

Hole #2
Surface Finish, AA 55-68 μ in Bluing Pin Rollout
Protrusion, in. .172
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 305
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63 µin)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0 5 IPM
Cutting Fluid: TAP MAGIC - E.P. Depth: (Ind. Reading) .949

Results: Specimen No. 5C6B Hole #1
Surface Finish, AA 42-62 µ in. Bluing Pin Rollout
Protrusion, in. .189
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse 0
Flush Gage Reading, in. .004
Capacitance Gage Reading: 288
Exit Burr Height, in.

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+1	+1	+1	+1	+1	+1
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 60-70 µ in. Bluing Pin Rollout
Protrusion, in. .169
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .003/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 275
Exit Burr Height, in.

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+3	+3	+3	+3	+3	+3	+3	+3
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63 μm in.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 1.0 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Results: Specimen No. SAGE Hole #1
Surface Finish, AA 48-52 μ in. Bluing Pin Rollout
Protrusion, in. .174
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 298
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	+0.5	4	+0.5	+0.5	+0.5	0

Hole #2
Surface Finish, AA 63-68 μ in. Bluing Pin Rollout
Protrusion, in. .170
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse 0
Flush Gage Reading, in. .003
Capacitance Gage Reading: 297
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1.5	+1.5	+1.5	+1.5	+1	+1	+1
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	+0.5	0	+0.5	+0.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable Surface Finish (Ground)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: .0040 - .0070 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Results: Specimen No. 5B1ST Hole #1 Bluing Pin Rollout
Surface Finish, AA 45-62 micro in.
Protrusion, in. .224
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 240
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	+0.5	0	+0.5	0	+0.5	0	+0.5
#5	+0.5	+1	+0.5	+1	+2.5	+1	0	+1

Hole #2 Bluing Pin Rollout
Surface Finish, AA 48-64 micro in.
Protrusion, in. .201
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 230
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	+0.5	0	+0.5	0	+0.5	0	+0.5
#5	0	+1	0	+1	0	+1	0	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63 μin)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND - 1.0 IPM
Cutting Fluid: SULFURIZED COOLANT Depth: (Ind. Reading) 1.050

Results: Specimen No. 505 Hole #1
Surface Finish, AA 50-63 μin
Protrusion, in. .193
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH
Flush Gage Reading, in. 003
Capacitance Gage Reading: 229
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	+1	0	+1	+0.5	+1	+0.5	+1
#5	+0.5	0	+0.5	+1	0	+1	+0.5	0.5

Hole #2
Surface Finish, AA 40-53 μin
Protrusion, in. .201
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 261
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1	0	+0.5	0	+0.5	+0.5	+0.5	+0.5
#5	+1	0	+0.5	0	0	+0.5	+0.5	0

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE FINISH (63 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND - 1.23 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Results: Specimen No. 5D6CB Hole #1
Surface Finish, AA 31 - 50 μin
Protrusion, in. .199
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .001/INCH
Flush Gage Reading, in. 003
Capacitance Gage Reading: 260
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	+0.5	+0.5	+2.5	+0.5	0	0	0
#5	+1	+1	+1.5	+1	+1.5	+1	+0.5	+1

Hole #2
Surface Finish, AA 42-55 μin
Protrusion, in. .201
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 267
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	+0.5	0
#5	+1	+0.5	+0.5	+0.5	0	+1	+2.5	+0.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND - 1.0 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Results: Specimen No. 2AGR Hole #1
Surface Finish, AA 35 - 55 μin Bluing Pin Rollout
Protrusion, in. .138
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 266
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 50-60 μin Bluing Pin Rollout
Protrusion, in. .155
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .006/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 262
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1.5	+1.5	+1.5	+1	+1	+1	+1	+1.5
#5	+0.5	+0.5	+0.5	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63 μm)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Results: Specimen No. 5E5CT Hole #1
Surface Finish, AA 42-48 μm Bluing Pin Rollout
Protrusion, in.
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 332
Exit Burr Height, in.

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 42-52 μm Bluing Pin Rollout
Protrusion, in.
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 262
Exit Burr Height, in.

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	+0.5	0	+0.5	0	+0.5	0	+0.5
#5	+1	+1.5	+1	+1.5	+1	+1	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: TAP MAGIC - ALUM Depth: (Ind. Reading) 1.950

Results: Specimen No. 2C3T Hole #1
Surface Finish, AA 55-70 μin Bluing Pin Rollout
Protrusion, in. .161
Perpendicularity, .001 in./gage length
Longitudinal .00 5/INCH Transverse .00 5/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 318
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+4	+4	+4	+4	+4	+4	+4	+4
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 45-68 μin Bluing Pin Rollout
Protrusion, in. .161
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .00 2/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 298
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+2	+2	+2.5	+3	+3	+3	+3	+3
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63μ in.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND-1.02 PM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Results: Specimen No. 5C4CB Hole #1
Surface Finish, AA 56-68 μin
Protrusion, in. .140
Perpendicularity, .001 in./gage length
Longitudinal .00?/inch Transverse .002/inch
Flush Gage Reading, in. .004
Capacitance Gage Reading: 288
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1	+1	+1	+1.5	+1.5	+1	+1	+1
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 48-60 μin
Protrusion, in. .146
Perpendicularity, .001 in./gage length
Longitudinal .003/inch Transverse .001/inch
Flush Gage Reading, in. .004
Capacitance Gage Reading: 200
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1	+1	+1	+1	+1	+1	+1	+1
#5	+1	+1	+1	+1	+1.5	+1	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE - ROUGHNESS (63 μin)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND - 1.0 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Results: Specimen No. 5A5CT Hole #1
Surface Finish, AA 60-72 μin Bluing Pin Rollout
Protrusion, in. .150
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .003
Capacitance Gage Reading: 271
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1	+1	+1	+1	+1	+1	+1	+1
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 52-68 μin Bluing Pin Rollout
Protrusion, in. .151
Perpendicularity, .001 in./gage length
Longitudinal .001/in. Transverse .003/in.
Flush Gage Reading, in. .004
Capacitance Gage Reading: 202
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1	+1	+1	+1	+1	+1	+1	+1
#5	+1	+1	+1	+1	+1	+1	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE - ROUGHNESS (63 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND - 1.0 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Results: Specimen No. 58908 . Hole #1
Surface Finish, AA 35 - 58 μin
Protrusion, in. .160
Perpendicularity, .001 in./gage length
Longitudinal .002 INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 227
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1	+1	+1	+1	+1	+0.5	+1	+1
#5	0	0	+0.5	+[illegible]	+[illegible]	0	0	0

Hole #2
Surface Finish, AA 38-65 μin
Protrusion, in. .163
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 201
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5
#5	+1	+2.5	+1	+1	+1	+1	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND - 1.0 IPM
Cutting Fluid: Dry Depth: (Ind. Reading)

Results: Specimen No. 5A2CT . Hole #1
Surface Finish, AA 50-80 μin. Bluing Pin Rollout
Protrusion, in. .146
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .004/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 212
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1	+1	+1	+1.5	+1.5	+1.0	+1	+1
#5	+1	+1	+1	+1.5	+1.5	+1.0	+1	+1

Hole #2
Surface Finish, AA 48-63 μin. Bluing Pin Rollout
Protrusion, in. .162
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 260
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1	+0.5	+1	+1	+1	+0.5	+1	+1
#5	+0.5	+0.5	+1	+0.5	+0.5	+0.5	+1	+0.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (63 µin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND 1.0 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.949

Results: Specimen No. 5A5E Hole #1
Surface Finish, AA 60-70 µin Bluing Pin Rollout
Protrusion, in. .169
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .003/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 297
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	OPEN							
#4	+1	+1	+1	+1	+1	+1	+1	+1
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 50-60 µin Bluing Pin Rollout
Protrusion, in. .177
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .006/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 304
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 9 Quality Variable SURF ROUGHNESS - 63
Specimen No. 4C5T

Hole Manufacturing Conditions and Procedures: STD REAMER GROUP I

Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.255

Hole #1

Surface Finish, AA 48 Bluing Pin Rollout
Protrusion, in. .157
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. -.001
Capacitance Gage Reading 255
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Hole #2

Surface Finish, AA 53 Bluing Pin Rollout
Protrusion, in. .154
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .002
Flush Gage Reading, in. 001
Capacitance Gage Reading 253
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 9 Quality Variable SURF. ROUGHNESS - 63
Specimen No. 3A5B

Hole Manufacturing Conditions and Procedures: STD. REAMER GROUP I

Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.255"

Hole #1

Surface Finish, AA 60-65 Bluing Pin Rollout
Protrusion, in. .148
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. -.002
Capacitance Gage Reading 239
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Hole #2

Surface Finish, AA 55-60 Bluing Pin Rollout
Protrusion, in. .155
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. -.002
Capacitance Gage Reading 230
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 9 Quality Variable SURF. ROUGHNESS-63
Specimen No. 4D6B

Hole Manufacturing Conditions and Procedures: STD. REAMER GROUP I

Spindle, rpm 660 Feed: .0015"
Cutting Fluid: DRY Depth: (Ind. Reading) 1.255"

Hole #1

Surface Finish, AA 75-80 Bluing Pin Rollout
Protrusion, in. .118
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. -.002
Capacitance Gage Reading 225
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Hole #2

Surface Finish, AA 55-60 Bluing Pin Rollout
Protrusion, in. .139
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. -.001
Capacitance Gage Reading 241
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 9 Quality Variable SURF ROUGHNESS - 63
Specimen No. 4E2T

Hole Manufacturing Conditions and Procedures: STD. REAMER GROUP I

Spindle, rpm 660 Feed: .0015"
Cutting Fluid: DRY Depth: (Ind. Reading) 1.755

Hole #1

Surface Finish, AA 65-70 Bluing Pin Rollout
Protrusion, in. .152
Perpendicularity, .001 in./in.
Longitudinal .0005" Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 208
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Hole #2

Surface Finish, AA 75-80 Bluing Pin Rollout
Protrusion, in. .148
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading 205
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 9 Quality Variable SURF. ROUGHNESS - 63
Specimen No. 4C1B

Hole Manufacturing Conditions and Procedures: STD. REAMER
GROUP I

Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.255

Hole #1

Surface Finish, AA 60-65 Bluing Pin Rollout
Protrusion, in. .130
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. -.002
Capacitance Gage Reading 198
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Hole #2

Surface Finish, AA 65-75 Bluing Pin Rollout
Protrusion, in. .155
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 001
Flush Gage Reading, in. -.002
Capacitance Gage Reading 215
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3							
#4							
#5							

Figure 14 - Sample Manufacturing Report: Tapered Holes

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (32 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND – 0.5 IPM
Cutting Fluid: TAP MAGIC FOR ALUM. Depth: (Ind. Reading) 1.950

Results: Specimen No. 3C4T . Hole #1
Surface Finish, AA 30-38 μin
Protrusion, in. .183
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 326
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5
#4	+0.5	+0.5	+0.5	+0.5	0	0	0	0
#5	0	0	0	0	0	0	0	0

. Hole #2
Surface Finish, AA 30-38 μin
Protrusion, in. .182
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 313
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (32 MM.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-0.5 IPM
Cutting Fluid: TAP MAGIC-ALUM. Depth: (Ind. Reading) 1.949

Results: Specimen No. 4C3E Hole #1
Surface Finish, AA 15-18 MICRO IN. Bluing Pin Rollout
Protrusion, in. .191
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 358
Exit Burr Height, in.

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+2	+2	+1	+1	+1	0	+0.5	+0.5
#4	0	0	0	0	0	0	0	0
#5	+1	+0.5	0	0	0	0	0	0

Hole #2
Surface Finish, AA 14-18 MICRO IN. Bluing Pin Rollout
Protrusion, in. .188
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 390
Exit Burr Height, in.

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+2	+2.5	+2	+2	+1	+1.5	+1.5	+1.5
#4	0	0	0	0	0	0	0	0
#5	0	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (32 μin)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND - 0.5 IPM
Cutting Fluid: TAP MAGIC - ALVM. Depth: (Ind. Reading) 1.950

Results: Specimen No. 5C2CE Hole #1
Surface Finish, AA 18-25 μin Bluing Pin Rollout
Protrusion, in. .199
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 308
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	+1	+1	+1	+1	+1	+1	+1	+1

Hole #2
Surface Finish, AA 19-32 μin Bluing Pin Rollout
Protrusion, in. .198
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse 0
Flush Gage Reading, in. .003
Capacitance Gage Reading: 299
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	+0.5	+0.5	+1	+1	+1	+1	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (32 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 210 Feed: HAND - 0.5 IPM
Cutting Fluid: TAP MAGIC - ALUM. Depth: (Ind. Reading) 1.950

Results: Specimen No. 5B4CB Hole #1
Surface Finish, AA 15-30 μin Bluing Pin Rollout
Protrusion, in. .195
Perpendicularity, .001 in./gage length
Longitudinal .00/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 294
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	+1	+1	+1	+1	+1	+1	+1	+1

Hole #2
Surface Finish, AA 20-25 μin Bluing Pin Rollout
Protrusion, in. .197
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .003
Capacitance Gage Reading: 292
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	+1	+1	+1	+1	+1	+1	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (32 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: TAP MAGIC - ALUM. Depth: (Ind. Reading) 1.949

Results: Specimen No. 4B3T Hole #1
Surface Finish, AA 32-38 μin Bluing Pin Rollout
Protrusion, in. .161
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse 0
Flush Gage Reading, in. .003
Capacitance Gage Reading: 329
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 28-32 μin Bluing Pin Rollout
Protrusion, in. .153
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 315
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+1	+1	+1	+1	+1	+1
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (125 μ in.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, (UNDERSIZE) Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND 40 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.210
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 3C6T Hole #1
Surface Finish, AA 100-130 μ in.
Protrusion, in. .190
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .000
Flush Gage Reading, in. .003
Capacitance Gage Reading: 297

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1.5	+1.5	+1.5	+1.5	+1.5	+2	+1.5
#4	+1	+1	+1	+1	+0.5	+0.5	+1	+1
#5	+2	+1.5	+1	+1.5	+1	+1.5	+2	+2.5

Hole #2
Surface Finish, AA 90-120 μ in.
Protrusion, in. .183
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 293

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+3	+3	+3.5	+3.5	+4	+4	+4	+4
#4	+1	+0.5	+0.5	+1	+1	+1	+1	+1
#5	+1	+1	+1	+2	+1	+1	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (125 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, (UNDERSIZE) Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND 40 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.948

Modify Good Holes Using Following Conditions:
Tool: MODIFIED L.H. SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.200
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 482T Hole #1
Surface Finish, AA 80 - 110 μin
Protrusion, in. .178
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 288

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	CDEN							
#4	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5
#5	0	0	+1	+1	+1	+1	+1	+1

Hole #2
Surface Finish, AA 80 - 125 μin
Protrusion, in. .200
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 305

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+1	+1	+1	+1	+1	+1
#4	+1	+1	+1	+1	+0.5	+1	+1	+1
#5	+3	+3.5	+3	+3.5	+3.5	+3.5	+4	+4

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (125 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (UNDERSIZE) (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-10 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.210
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 365T Hole #1
Surface Finish, AA 85-150 μin
Protrusion, in. .173
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .002/INCH
Flush Gage Reading, in. 0
Capacitance Gage Reading: 265

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	OPEN							
#4	0	0	0	0	0	0	0	0
#5	+1	+1	+1	+1	+1	+1	+1	+1

Hole #2
Surface Finish, AA 90-140 μin
Protrusion, in. .186
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .005/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 235

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+3	+3	+3.5	+3.5	+3.5	+3.5	+3.5	+3
#4	0	0	0	0	0	0	+1	0
#5	0	+1	+0.5	+1.5	+1	0	+1.5	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (125 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, (UNDERSIZE) Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-40 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.258
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 2EGT Hole #1
Surface Finish, AA 80-120 μin.
Protrusion, in. .200
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .005/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 215

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	OPEN							>
#4	0	0	0	0	0	0	0	0
#5	+1	+1	+1	+1	+1	+1	+1	+1

Hole #2
Surface Finish, AA 80-130 μin.
Protrusion, in. .193
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 220

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	OPEN							>
#4	0	+0.5	+0.5	0	0	0	0	0
#5	+1.5	+2	+1.5	+1.5	+1	+0.5	+0.5	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (125 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, (UNDERSIZE) Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-10 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH. SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.210
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 5A4CB .Hole #1
Surface Finish, AA 100-140 μin
Protrusion, in. .208
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 248

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+0.5	+0.5	+0.5	+0.5	+0.5	+1	+1
#4	+1	+1	+1	+1	+0.5	+1	+1	+0.5
#5	+3.5	+3.5	+3	+3.5	+3	+3.5	+3	+3.5

.Hole #2
Surface Finish, AA 95-120 μin
Protrusion, in. .195
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 295

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+1	+0.5	+0.5	+1	+1	+1
#4	+0.5	+1	+0.5	+1	+1	+1	+1	+1
#5	+2	+3	+2	+2.5	+2.5	+3	+3	+3.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5) (UNDERSIZE)
Spindle, rpm 325 Feed: HAND 40 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.949

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.590
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. GAIT Hole #1
Surface Finish, AA 240-280 μin
Protrusion, in. .230
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .005/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 190

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1.5	+1.5	+1	+1	+1	+1	+1	+1
#4	+1	+1	+1	+1	+1	+1	+1	+1
#5	+3	+3	+2.5	+3	+2.5	+2.5	+2	+2

Hole #2
Surface Finish, AA 250-280 μin
Protrusion, in. .236
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .0006/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 186

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1.5	+1	+1	+1.5	+1	+1	+1	+1.5
#4	+0.5	+1	+0.5	+0.5	+0.5	+1	+1	+1
#5	+3.5	+4	+3.5	+3.5	+3.5	+3.5	+3	+3

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250μ in.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, (UNDERSIZE) Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-10 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.590
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 384 P Hole #1
Surface Finish, AA 220-280 μin
Protrusion, in. .205
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .005/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 189

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+3	+3	+3	+3	+2.5	+3	+3.5	+3.5
#4	+1.5	+2	+2	+2	+1.5	+1.5	+1.5	+1.5
#5	+1	+1	+1	+1	+1	+1	+0.5	+1

Hole #2
Surface Finish, AA 220-270 μin
Protrusion, in. .205
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .001/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 170

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+2	+2.5	+3	+4	+4	+4.5	+5	+4
#4	+1.5	+2	+2	+2	+2	+2	+2	+1.5
#5	+3	+1	+0.5	-0.5	+1	+1	+1	+0.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (UNDERSIZE) (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND 40 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.549

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.590
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 4E2B Hole #1
Surface Finish, AA 250-300 μin
Protrusion, in. .203
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 190

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1.5	+1.5	+1.5	+1	+1	+1.5	+1.5
#4	+1	+1	+0.5	+0.5	0	+0.5	+0.5	+1
#5	+4	+3.5	+3	+2	+2	+2.5	+2	+2

Hole #2
Surface Finish, AA 260-280 μin
Protrusion, in. .200
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .003/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 197

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+0.5	+1	+1	+1	+1	+1.5	+1
#4	+0.5	+0.5	+0.5	+0.5	+0.5	+1	+0.5	+1
#5	+2.5	+2	+2	+2	+2	+2	+2	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250 μin.)

Produce Good Hole Using Following Conditions:
Tools. #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5) (UNDERSIZE)
Spindle, rpm 325 Feed: HAND 10 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) .1949

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SUBAC PIN REAMER
Spindle, rpm 135 Feed: HAND 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) .1990
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MANUAL HAND FEED

Results: Specimen No. 2E2T Hole #1
Surface Finish, AA 240-280 μin.
Protrusion, in. .191
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .006/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 253

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+2	+2	+2.5	+2	+1.5	+1.5	+2	+1.5
#4	0	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	0
#5	0	+0.5	0	+1	0	0	+0.5	0

Hole #2
Surface Finish, AA 220-360 μin.
Protrusion, in. .123
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .005/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 196

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1.5	+1.5	+1.5	+2	+1.5	+2	+2	+2.5
#4	+1	+0.5	+0.5	+1	+0.5	+1	+1	+1
#5	+1	+0.5	0	+0.5	+0.5	+0.5	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5) (UNDERSIZE)
Spindle, rpm 325 Feed: HAND 40 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: MODIFIED L.H. SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.570
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 3838 Hole #1
Surface Finish, AA 140-200 μin
Protrusion, in. .192
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .010/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 199

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+0.5	+0.5	+1	+1	+1	0	+1	+1
#4	+1.5	+1	+1	+1.5	+1.5	+2	+1.5	+1.5
#5	+3	+2.5	+3	+3.5	+3.5	+3.5	+3	+3.5

Hole #2
Surface Finish, AA 140-200 μin
Protrusion, in. .190
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .018/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 190

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+1	+0.5	+1	+1	0	0
#4	+2.5	+2	+1.5	+1	+1.5	+1	+1.5	+1.5
#5	+3	+2.5	+2.5	+3.5	+4	+3	+3	+2.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5) (UNDERSIZE)
Spindle, rpm 325 Feed: HAND-40 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.590
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 4A6B Hole #1
Surface Finish, AA 250-280 μin
Protrusion, in. .220
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 241

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+2	+2	+2	+2	+2	+2	+2	+2
#4	+1	+1	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5
#5	+0.5	+1	+1	+0.5	+1	+1	+0.5	+0.5

Hole #2
Surface Finish, AA 240-280 μin
Protrusion, in. .225
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse 0
Flush Gage Reading, in. .003
Capacitance Gage Reading: 193

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+1	+1	+1.5	+1.5	+1.5	+1
#4	+1	+1	+1	+1	+1	+1	+1	+1
#5	+3	+3	+2.5	+2.5	+2.5	+2	+2	+1.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250 μ in)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (UNDERSIZE) (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-10 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.590
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 5E3CB Hole #1
Surface Finish, AA 220-260 μ in
Protrusion, in. .210
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading: 171

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+1.5	+1	+1	+1	+1	+1
#4	+0.5	+1	+0.5	0	0	+0.5	0	+1
#5	+4.5	+4	+4	+4	+3	+3	+3	+3

Hole #2
Surface Finish, AA 240-280 μ in
Protrusion, in. .210
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 185

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+1.5	+1	+1	+1	+1	+1
#4	0	0	+0.5	+1	+0.5	+0.5	+0.5	+0.5
#5	+4	+4	+3.5	+3.5	+3	+3	+3	+3

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, (UNDERSIZE) Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-10 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.590
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 5A4C1 Hole #1
Surface Finish, AA 250-280 μin.
Protrusion, in. .240
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 245

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1.5	+2	+2	+2	+1.5	+2	+2	+2
#4	+1	+1	+1.5	+1	+1	+1	+1	+1
#5	+2.5	+2.5	+3.5	+2.5	+3	+2.5	+2	+2

Hole #2
Surface Finish, AA 180-260 μin.
Protrusion, in. .242
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .003/INCH
Flush Gage Reading, in. 002
Capacitance Gage Reading: 249

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+0.5	+1.5	+1.5	+1	+1	0	0
#4	+0.5	+0.5	+1	+1	+0.5	+1	+0.5	0
#5	+4	+4	+4	+4	-4	+4	+4	4

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (UNDERSIZE) (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-10 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.949

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.590
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 403T Hole #1
Surface Finish, AA 200-240 μin
Protrusion, in. .216
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 169

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	± 1	+ 1.5	+ 1.5	± 1	+ 1	± 1	± 1	± 1
#4	± 1	+ 1.5	+ 0.5	± 1	± 0.5	± 0.5	± 0.5	+ 1.5
#5	+ 4	+ 3.5	+ 3	± 3	+ 3	+ 3	+ 3	+ 3

Hole #2
Surface Finish, AA 240-260 μin
Protrusion, in. .204
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 220

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+ 1	± 0.5	± 1	± 1	± 1	± 1	± 1	± 1
#4	0	+ 0.5	+ 0.5	+ 0.5	+ 0.5	+ 0.5	+ 0.5	+ 0.5
#5	+ 3	+ 3	+ 3.5	+ 3.5	+ 2.5	+ 2.5	+ 2.5	+ 2.5

EFFECTS OF HOLE QUALITY

Test Series 9 Quality Variable SURFACE ROUGHNESS (250 μin.)

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, (UNDERSIZE) Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-10 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: MODIFIED LH SPIRAL PIN REAMER
Spindle, rpm 135 Feed: HAND - 3 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 1.590
Procedure: DRILL & C'SINK WITH UNDERSIZE REAMER THEN REAM WITH MODIFIED PIN REAMER USING MODERATE HAND FEED

Results: Specimen No. 2A5T Hole #1
Surface Finish, AA 290-300 μin
Protrusion, in. .210
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 225

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+1	+1	+0.5	+1	+1	+1	+1	+1
#4	+2.5	+1	+1	+2.5	+2.5	+2	+2	+2
#5	+2.5	+2.5	+2.5	+2	+3.5	+2	+1	+2.5

Hole #2
Surface Finish, AA 240-300 μin
Protrusion, in. .220
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .006/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 234

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	+0.5	+0.5	0	+0.5	0	0	1	1
#4	+3	+3.5	+2.5	+2	+3	+3	+3	+2.5
#5	+3.5	+2	+4	+3.5	+4	+4	+4	+3.5

INSPECTION SHEETS FOR TEST SERIES 10 - RIFLING

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.500" DEEP AFTER TOUCHUP

Results: Specimen No. 2C4E Hole #1
Surface Finish, AA 40-50 μin.
Protrusion, in. .183
Perpendicularity, .001 in./gage length
Longitudinal .005/INCH Transverse .004/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 386
Depth of Rifle, in. .005

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3	0	0	0	0	0	0	0	0
#4	+0.5	+0.5	+1	+0.5	±0.5	0	+0.5	+0.5
#5	+1.5	+1.5	+1.5	+2	+2	+1.5	+1.5	+1.5

Hole #2
Surface Finish, AA 35-45 μin.
Protrusion, in. .195
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 315
Depth of Rifle, in. .005

Bluing Pin Rollout

90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	+0.5	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.550" DEEP AFTER TOUCHUP

Results: Specimen No. TEST Hole #1
Surface Finish, AA 55-65 µin
Protrusion, in. .185
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .000
Flush Gage Reading, in. .002
Capacitance Gage Reading: 290
Depth of Rifle, in. .005

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	–							
#2	–							
#3	–							
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 55-70 µin
Protrusion, in. .186
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .004/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 331
Depth of Rifle, in. .005

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	+1	+1	+1	+1	+1	+1	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.500" DEEP AFTER TOUCH UP

Results: Specimen No. 2E3T Hole #1
Surface Finish, AA 25-35 micro in
Protrusion, in. .181
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 381
Depth of Rifle, in. .004

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 28-35 micro in
Protrusion, in. .183
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 372
Depth of Rifle, in. .004

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.500" DEEP AFTER TOUCH UP

Results: Specimen No. 2E5T Hole #1
Surface Finish, AA 40-50 μ in
Protrusion, in. .182
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 303
Depth of Rifle, in. .004

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 35-45 μ in
Protrusion, in. .183
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 371
Depth of Rifle, in. .004

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.500" DEEP AFTER TOUCH UP

Results: Specimen No. 4E6B Hole #1
Surface Finish, AA 18-25 μ in.
Protrusion, in. .167
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .004/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 365
Depth of Rifle, in. .004

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 15-22 μ in.
Protrusion, in. .181
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse 000
Flush Gage Reading, in. .001
Capacitance Gage Reading: 383
Depth of Rifle, in. .004

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.500" DEEP AFTER TOUCHUP

Results: Specimen No. 284T Hole #1
Surface Finish, AA 15-25 µin
Protrusion, in. .174
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse 000
Flush Gage Reading, in. .002
Capacitance Gage Reading: 358
Depth of Rifle, in. .004

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 18-22 µin
Protrusion, in. .172
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 352
Depth of Rifle, in. .004

Bluing Pin Rollout: 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.500" DEEP AFTER TOUCHUP

Results: Specimen No. 382B Hole #1
Surface Finish, AA 40-60 μ in
Protrusion, in. .183
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 382
Depth of Rifle, in. .004

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 35-95 μ in
Protrusion, in. .180
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .024/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 392
Depth of Rifle, in. .004

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.500" DEEP AFTER TOUCHUP

Results: Specimen No. 2B1T Hole #1
Surface Finish, AA 25-35 μ in
Protrusion, in. .174
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 378
Depth of Rifle, in. .004

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 22-38 μ in
Protrusion, in. .175
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse 000
Flush Gage Reading, in. .00-
Capacitance Gage Reading: 371
Depth of Rifle, in. .004

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STANDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.500" DEEP AFTER TOUCHUP

Results: Specimen No. 3B6T Hole #1
Surface Finish, AA 22-30 Micro in
Protrusion, in. .175
Perpendicularity, .001 in./gage length
Longitudinal, .003/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 390
Depth of Rifle, in. .004

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 18-25 Micro in
Protrusion, in. .173
Perpendicularity, .001 in./gage length
Longitudinal, .003/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 390
Depth of Rifle, in. .004

Bluing Pin Rollout: 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 10 Quality Variable RIFLING

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: MODIFIED 2 FLUTE #6 TAPER PIN REAMER - LH SPIRAL
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE THEN THRUST TAPER PIN REAMER INTO HOLE WITHOUT ROTATING .400"-.500" DEEP AFTER TOUCH UP

Results: Specimen No. 2B3B Hole #1
Surface Finish, AA 25-35 μ in
Protrusion, in. .177
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 401
Depth of Rifle, in. .005

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 20-30 μ in
Protrusion, in. .175
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .001/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 395
Depth of Rifle, in. .004

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

INSPECTION SHEETS FOR TEST SERIES 11 - AXIAL SCRATCHES

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES - AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SHARP POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 4A2B Hole #1
Surface Finish, AA 38 - 55 μin
Protrusion, in. .173
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 359
Depth of Scratch, in. .005

Bluing Pin Rollout: 80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 28 - 38 μin
Protrusion, in. .169
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .005/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 370
Depth of Scratch, in. .005

Bluing Pin Rollout: 90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES - AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SHARP POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 3D1T Hole #1
Surface Finish, AA 35-38 μin
Protrusion, in. .168
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 380
Depth of Scratch, in. .007

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 45-50 μin
Protrusion, in. .170
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 357
Depth of Scratch, in. .007

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES - AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SHARP POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 3D2T . Hole #1
Surface Finish, AA 30-40 micro in
Protrusion, in. .169
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 379
Depth of Scratch, in. .005

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 35-45 micro in
Protrusion, in. .177
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 359
Depth of Scratch, in. .007

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	+0.5	+1	+1	+0.5	+0.5	+0.5	+1

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES - AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SHARP POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 481T Hole #1
Surface Finish, AA 38-42 μin
Protrusion, in. .171
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 371
Depth of Scratch, in. .005

Bluing Pin Rollout: 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 25-36 μin
Protrusion, in. .170
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .004/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 375
Depth of Scratch, in. .006

Bluing Pin Rollout: 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES – AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND – 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SINGLE POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 5C4B Hole #1
Surface Finish, AA 30-50 μin
Protrusion, in. .172
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 362
Depth of Scratch, in. .005

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 40-50 μin
Protrusion, in. .173
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 373
Depth of Scratch, in. .005

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES - AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SHARP POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 2A3T Hole #1
Surface Finish, AA 35-45 μin
Protrusion, in. .171
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 370
Depth of Scratch, in. .006

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 38-45 μin
Protrusion, in. .168
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 380
Depth of Scratch, in. .005

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES - AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SHARP POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 4CIT Hole #1
Surface Finish, AA 38-44 μin
Protrusion, in. .171
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 375
Depth of Scratch, in. .007

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 35-45 μin
Protrusion, in. .168
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 362
Depth of Scratch, in. .006

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES - AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SHARP POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 4D2B Hole #1
Surface Finish, AA 34-45 μm
Protrusion, in. .176
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 373
Depth of Scratch, in. .007

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 25-38 μm
Protrusion, in. .175
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 390
Depth of Scratch, in. .006

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	+0.5	+0.5	+0.5	+0.5	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES - AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SHARP POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 3A6T Hole #1
Surface Finish, AA 38-44 MICRO IN
Protrusion, in. .169
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 406
Depth of Scratch, in. .007

Bluing Pin Rollout: 90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 25-35 MICRO IN
Protrusion, in. .169
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 384
Depth of Scratch, in. .007

Bluing Pin Rollout: 80%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 11 Quality Variable SCRATCHES – AXIAL

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND – 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952

Modify Good Holes Using Following Conditions:
Tool: SPECIAL BORING BAR WITH 60° SHARP POINTED INSERT
Spindle, rpm 0 Feed: HAND
Cutting Fluid: DRY Depth: (Ind. Reading)
Procedure: REAM GOOD HOLE, THEN INSERT BORING BAR AND TOUCH UP AT BOTTOM OF HOLE, CHECK ANGULAR POSITION AND MOVE RADIALLY .005", THEN RETRACT STRAIGHT OUT

Results: Specimen No. 4C4T Hole #1
Surface Finish, AA 40-50 MIN
Protrusion, in. .190
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading: 288
Depth of Scratch, in. .006

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	+0.5	0	+0.5	0	+0.5	0	+0.5
#5	0	+1	+1	+1	0	+0.5	+0.5	0

Hole #2
Surface Finish, AA 36-45 MIN
Protrusion, in. .176
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading: 372
Depth of Scratch, in. .007

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	0	0	0	0	0	0	0	0
#5	0	0	0	+0.5	0	0	0	0

INSPECTION SHEETS FOR TEST SERIES 12 - CHATTER

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: 2-FLUTE LH SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) -
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .005" DEEPER AND DWELL

Results: Specimen No. 3B2T Hole #1
Surface Finish, AA 120-130 μ IN
Protrusion, in. .155
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .007/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 185
Exit Burr Height, in. -

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3 5	+2	+2	+2	+2	+2	+2	+2	+2
#4 6	+0.5	0	+0.5	+1	+1	+1	0	0
#5 7	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5

Hole #2
Surface Finish, AA 0-100 μ IN
Protrusion, in. .130
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 216
Exit Burr Height, in. -

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4 6	+1	+1	+0.5	+0.5	0	0	+0.5	+0.5
#5 7	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: 2 FLUTE LH SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) —
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .005" DEEPER AND DWELL

Results: Specimen No. 505T, Hole #1
Surface Finish, AA 125-140 Min
Protrusion, in. .146
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 188
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#5	+2	+2	+2	+2	+2	+2	+2	+2
#6	+0.5	0	0	0	+1	+0.5	0	0
#7	+1.5	+1.5	+0.5	+0.5	+0.5	+0.5	+1	+1.5

Hole #2
Surface Finish, AA 125-145 Min
Protrusion, in. .135
Perpendicularity, .001 in./gage length
Longitudinal .005/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 196
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#5	+2.5	+2.5	+2.5	+2.5	+2.5	+3	+3	+3
#6	+0.5	0	0	0	0	0	+0.5	+0.5
#7	0	0	+0.5	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.960

Modify Good Holes Using Following Conditions:
Tool: 2-FLUTE LH SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) —
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .005' DEEPER AND DWELL

Results: Specimen No. FA3CT Hole #1
Surface Finish, AA 70-80 μ IN Bluing Pin Rollout
Protrusion, in. .170
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 187
Exit Burr Height, in. —

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4 5	+1.5	+1.5	+1	+1	+1.5	+1.5	+2	+2
#6 6	0	0	+0.5	+0.5	0	+0.5	+0.5	+0

Hole #2
Surface Finish, AA 100-120 μ IN Bluing Pin Rollout
Protrusion, in. .162
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 212
Exit Burr Height, in. —

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+1.5	+1.5	+1	+1	+1	+1.5	+2	+2
#5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: 2 FLUTE LH SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) -
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .005" DEEPER AND DWELL

Results: Specimen No. 5A1B Hole #1
Surface Finish, AA 150-160 MIN
Protrusion, in. .178
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .001/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 200
Exit Burr Height, in. -

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#K5	+1	+0.5	+1	+1	+1	+1	+1	+1
#B6	+1	+1	+0.5	+0.5	0	+0.5	+1	+1

Hole #2
Surface Finish, AA 160-180 MIN
Protrusion, in. .135
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .005/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 184
Exit Burr Height, in. -

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#K5	+2	+2	+1.5	+1	+1	+1	+2	+2
#B6	+0.5	+0.5	+0.5	0	0	+0.5	+0.5	+0.5

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND — 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: 2 FLUTE LH SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) —
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .005" DEEPER AND DWELL

Results: Specimen No. 6A1CT Hole #1
Surface Finish, AA 160 - 180 μ IN
Protrusion, in. .141
Perpendicularity, .001 in./gage length
Longitudinal .012/INCH Transverse 0
Flush Gage Reading, in. .004
Capacitance Gage Reading: 200
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4 5	+1	+1	+0.5	-1	-1.5	+1.5	+1	+0.5
#6	+1	+0.5	0	0	+1	+1	0	0

Hole #2
Surface Finish, AA 160 - 180 μ IN
Protrusion, in. .130
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .004/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 238
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4 5	+0.5	0	0	0	0	0	+0.5	+0.5
#6	0	0	0	0	0	0	0	+0.5

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: 2 FLUTE LH SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) —
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .005" DEEPER AND DWELL

Results: Specimen No. SC1CT . Hole #1
Surface Finish, AA 150 - 180 MM
Protrusion, in. .131
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 172
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+2	+2	+1.5	+1.5	+2	+2	0	+1
#5	+2	+2.5	+0.5	+1	+1.5	+2	+2	+1

Hole #2
Surface Finish, AA 200 - 220 MM
Protrusion, in. .161
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 224
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+2	+1	0	0	0	0	+0.5	+1.5
#5	+1	+1	0	+0.5	+1	+2	+0.5	+0.5

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: 2-FLUTE 6M SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) —
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .005" DEEPER AND DWELL

Results: Specimen No. 5A3T Hole #1
Surface Finish, AA 180-210 MIN
Protrusion, in. .168
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .005/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 186
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+2	+2	+2	+2.5	+3	+2.5	+2.5	+2
#5	+1	+1	+1	+1	+1	+1	+1	+1
#6	+1.5	+1.5	+1	+1	+1	+1.5	+1.5	+1.5

Hole #2
Surface Finish, AA 170-200 MIN
Protrusion, in. .136
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading: 217
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5	+1.5
#6	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: 2 FLUTE LH SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) -
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .005" DEEPER AND DWELL

Results: Specimen No. 6A1CB Hole #1
Surface Finish, AA 200-220 μin
Protrusion, in. .152
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 222
Exit Burr Height, In. -

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#45	+1.5	+2	+2	+2	+2	+2	+2	+1.5
#56	0	0	0	+0.5	+0.5	0	0	0

Hole #2
Surface Finish, AA 180-200 μin
Protrusion, in. .161
Perpendicularity, .001 in./gage length
Longitudinal 0 Transverse .002/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 186
Exit Burr Height, In. -

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#45	+1.5	+1.5	+1	+1	+1	+1	+1.5	+1.5
#56	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: 2-FLUTE LH SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND - 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) —
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .065" DEEPER AND DWELL

Results: Specimen No. 3A2B Hole #1
Surface Finish, AA 140-150 μ IN
Protrusion, in. .185
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .002/INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 270
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3 4	0	0	0	0	0	0	0	0
#5	0	0	0	0	0	0	0	0
#6								

Hole #2
Surface Finish, AA 140-160 μ IN
Protrusion, in. .186
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading: 259
Exit Burr Height, in. —

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5
#5	0	0	0	0	0	0	0	0

EFFECTS OF HOLE QUALITY

Test Series 12 Quality Variable CHATTER

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 1115 Feed: HAND – 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.950

Modify Good Holes Using Following Conditions:
Tool: 2-FLUTE LH SPIRAL PIN REAMER
Spindle, rpm 1115 Feed: HAND – 0.5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) —
Procedure: ADVANCE PIN REAMER INTO HOLE UNTIL IT MAKES CONTACT, THEN FEED .005" DEEPER AND DWELL

Results: Specimen No. 5A2CB Hole #1
Surface Finish, AA 160–180 µ IN Bluing Pin Rollout
Protrusion, in. .182
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse 0
Flush Gage Reading, in. .003
Capacitance Gage Reading: .250
Exit Burr Height, in. —

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+0.5	+1	+1	+1	+1	+1	+1	+1
#5	0	0	0	0	0	0	0	0

Hole #2
Surface Finish, AA 190–200 µ IN Bluing Pin Rollout
Protrusion, in. .133
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: .193
Exit Burr Height, in. —

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4	+2.5	+2.5	+2	+1.5	+1.5	+2.5	+2	+2
#5	+1	+1	+1	+1	+0.5	+1	+1	+1

INSPECTION SHEETS FOR TEST SERIES 12 -

TEARS, LAPS, PLASTIC DEFORMATION

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. 3134T

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BUILT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 20
Protrusion, in. .224
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .025
Flush Gage Reading, in. .002
Capacitance Gage Reading .193
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	.0	1.5	1.5	.5	1.0	1.0	1.0
#4	1.0	1.5	2.5	1.0	2.5	1.5	1.0
#5	3.0	3.0	3.0	2.5	3.0	3.0	3.0

Hole #2

Surface Finish, AA 100-105
Protrusion, in. .218
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .006
Flush Gage Reading, in. .001
Capacitance Gage Reading .191
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	3.0	3.0	3.0	3.0	3.0	3.0	3.0
#4	1.0	.5	.5	1.5	1.0	.5	1.5
#5	1.5	1.5	1.0	1.5	1.5	.5	1.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. 582C8

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BUILT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 111-120
Protrusion, in. .225
Perpendicularity, .001 in./in.
Longitudinal .101 Transverse .002
Flush Gage Reading, in. -.020
Capacitance Gage Reading .168
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	1.5	1.0	1.5	1.5	1.5	1.0	.5
#4	1.5	1.5	2.0	1.5	1.5	1.5	1.0
#5	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Hole #2

Surface Finish, AA 70-80
Protrusion, in. .221
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .0005
Flush Gage Reading, in. .002
Capacitance Gage Reading .192
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	.5	.0	.0	.0	.0	1.0	1.0
#4	1.0	.0	2.5	1.0	.0	1.0	1.5
#5	3.0	3.0	3.0	2.5	3.0	3.0	3.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. 4B38C

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BURNT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 83-87 Bluing Pin Rollout
Protrusion, in. .222
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. .003
Capacitance Gage Reading .191
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	.5	.5	.5	.5	.0	.5	1.5
#4	1.0	.5	.0	1.0	.5	.5	1.0
#5	1.5	1.0	1.0	1.0	1.5	1.0	1.5

Hole #2

Surface Finish, AA 108-110 Bluing Pin Rollout
Protrusion, in. .200
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .003
Capacitance Gage Reading .199
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	1.0	1.0	1.0	1.5	.5	1.0	1.0
#4	.5	.5	.5	1.0	1.0	.5	.5
#5	1.5	1.0	1.5	1.5	1.0	1.5	1.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. 4RLB

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BUILT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 55-58
Protrusion, in. .226
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading .186
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	.0	.0	.5	1.0	1.0	.0	.0
#4	1.0	.0	.0	1.0	.0	.0	1.0
#5	3.0	3.0	3.0	3.0	2.5	2.5	2.5

Hole #2

Surface Finish, AA 70-75
Protrusion, in. .213
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading .206
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	.0	.0	.0	.0	.0	.0	.0
#4	1.0	.0	1.0	.0	.0	.0	.5
#5	1.0	1.0	1.0	1.0	.5	.0	.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. 3B18

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BUILT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 50 Bluing Pin Rollout
Protrusion, in. .227
Perpendicularity, .001 in./in.
Longitudinal .005 Transverse 0
Flush Gage Reading, in. .0
Capacitance Gage Reading .219
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	1.0	1.0	.5	1.0	1.0	.5	.5
#4	.5	1.0	.5	.5	1.0	.0	.5
#5	2.0	1.5	1.0	1.0	1.5	1.0	1.0

Hole #2

Surface Finish, AA 100 - 105 Bluing Pin Rollout
Protrusion, in. .115
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .0
Capacitance Gage Reading .204
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	3.0	3.0	3.0	3.0	3.0	2.5	3.0
#4	1.0	1.0	1.0	.5	1.0	.5	1.0
#5	1.0	1.0	.5	.0	.5	.0	.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. 5E4L+

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BUILT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 83-87 Bluing Pin Rollout
Protrusion, in. .215
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. -.002
Capacitance Gage Reading .184
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	2.5	2.5	2.0	2.0	2.0	2.5	2.5
#4	1.0	1.0	.5	.5	1.0	.5	1.0
#5	1.0	1.0	.5	1.0	1.0	.5	1.0

Hole #2

Surface Finish, AA 90-95 Bluing Pin Rollout
Protrusion, in. .220
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .0005
Flush Gage Reading, in. .001
Capacitance Gage Reading .179
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	.5	1.0	1.0	1.5	.5	1.5	1.5
#4	1.0	1.5	.5	1.5	.5	1.5	1.5
#5	2.0	2.0	1.5	2.0	1.5	1.5	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. 4EL7

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BUILT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 28-32 Bluing Pin Rollout
Protrusion, in. .227
Perpendicularity, .001 in./in.
Longitudinal .005 Transverse .003
Flush Gage Reading, in. 0
Capacitance Gage Reading .227
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	9.0	9.0	7.0	7.0	5.5	8.0	3.0
#4	7.0	6.5	6.0	4.5	3.5	5.0	4.0
#5	12.5	12.0	11.0	7.0	8.0	10.0	9.0

Hole #2

Surface Finish, AA 100-103 Bluing Pin Rollout
Protrusion, in. .210
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading .193
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	5.0	5.0	3.0	8.0	6.0	4.0	6.0
#4	8.0	7.0	5.5	6.0	6.5	2.0	3.5
#5	11.0	11.0	9.5	7.0	7.5	3.5	4.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. 3R1B

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BUILT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 105 - 108 Bluing Pin Rollout
Protrusion, in. .194
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading .213
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	12.0	12.0	12.0	11.0	12.0	12.0	11.0
#4	3.0	5.0	2.0	2.0	5.0	2.5	3.5
#5	.0	1.5	.0	.0	1.0	.0	.0

Hole #2

Surface Finish, AA 103 - 105 Bluing Pin Rollout
Protrusion, in. .223
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading .193
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	5.0	6.0	12.0	7.0	7.0	5.0	3.5
#4	2.0	7.0	10.0	4.0	3.5	3.0	.0
#5	9.0	10.0	10.0	1.0	.5	1.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. SELECT

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BUILT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 38.42 Bluing Pin Rollout
Protrusion, in. .190
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0025
Flush Gage Reading, in. 0
Capacitance Gage Reading .267
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	1.0	1.5	2.0	2.0	2.0	2.0	2.5
#4	.5	.5	.5	.5	1.0	.5	1.0
#5	1.0	.5	.0	.5	.5	.0	.5

Hole #2

Surface Finish, AA 100-105 Bluing Pin Rollout
Protrusion, in. .231
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .0005
Flush Gage Reading, in. .0
Capacitance Gage Reading .188
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	1.0	1.0	1.5	1.5	1.0	2.0	2.0
#4	1.0	.5	.5	1.5	1.0	.5	1.0
#5	1.5	1.0	1.0	2.0	2.0	1.0	1.5

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable TEARS, LAPS, PLASTIC DEFORMATION
Specimen No. 3A3T

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH BUILT UP CUTTER

Spindle, rpm 2720 RPM Feed: .0015 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 1.710

Hole #1

Surface Finish, AA 140-143 Bluing Pin Rollout
Protrusion, in. .321
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .004
Flush Gage Reading, in. .001
Capacitance Gage Reading .223
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	1.5	1.0	1.0	1.0	1.0	1.0	1.5
#4	1.0	.5	.5	.5	.5	1.0	1.0
#5	1.5	1.0	.5	1.0	.5	.5	1.0

Hole #2

Surface Finish, AA 125-130 Bluing Pin Rollout
Protrusion, in. .225
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading .192
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1							
#2							
#3	1.5	1.5	2.0	2.0	2.5	2.5	2.5
#4	1.0	1.0	.5	1.5	.0	.0	1.0
#5	1.5	1.5	1.0	2.0	1.0	1.5	1.5

INSPECTION SHEETS FOR TEST SERIES 17 - OVALITY

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable OVALITY
Specimen No. 383B

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH STD. REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PRODUCE OVALITY
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 125
Protrusion, in. 127
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. -.002
Capacitance Gage Reading 263
Exit Burr Height, in.

Bluing Pin Rollout

318/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	6.0	7.0	7.0	6.0	10.0	7.0	1.0
#2	3.0	4.0	4.0	3.0	3.0	6.0	4.0
#3	2.0	8.0	10.0	3.0	7.0	11.0	8.0
#4	1.0	12.0	13.0	0	10.0	12.0	12.0
#5	6.0	12.0	13.0	0	10.0	13.0	12

Hole #2

Surface Finish, AA 95-100
Protrusion, in. 129
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .002
Flush Gage Reading, in. -.002
Capacitance Gage Reading 296
Exit Burr Height, in.

Bluing Pin Rollout

319/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-9.0	-6.0	-6.0	-9.0	-6.0	-10.0
#2	5.0	1.0	5.0	5.0	2.0	5.0	2.0
#3	5.0	6.0	11.0	5.0	5.0	11.0	6.0
#4	5.0	11.0	13.0	5.0	11.0	12.0	11.0
#5	6.0	12.0	13.0	6.0	10.0	12.0	10.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable OVALITY
Specimen No. 3D113

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH Std. REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PRODUCE OVALITY
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 120-125 Bluing Pin Rollout
Protrusion, in. 1.23
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002 55%
Flush Gage Reading, in. 0
Capacitance Gage Reading 305
Exit Burr Height, in.

314/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-2.0	-2.0	2.0	-4.0	-1.0	0	-4.0
#2	3.0	3.0	7.0	6.0	6.0	9.0	5.0
#3	6.0	5.0	—	8.0	14.0	—	[illegible]
#4	7.0	12.0	—	9.0	—	—	12.0
#5	8.0	—	—	11.0	—	—	13.0

Hole #2

Surface Finish, AA 85-90 Bluing Pin Rollout
Protrusion, in. 1.22
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0 60%
Flush Gage Reading, in. -.001
Capacitance Gage Reading 312
Exit Burr Height, in.

319/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-3.0	-6.0	-6.0	-7.0	-8.0	-8.0
#2	5.0	6.0	5.0	3.0	3.0	4.0	2.0
#3	2.0	8.0	14.0	4.0	10.0	12.0	9.0
#4	7.0	10.0	—	5.0	12.0	13.0	12.0
#5	9.0	13.0	—	4.0	11.0	13.0	10.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable OVALITY
Specimen No. 40576C

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH 5 Fl. REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PRODUCE OVALITY
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 90-95
Protrusion, in. 132
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 262
Exit Burr Height, in.

Bluing Pin Rollout

65%

317/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-8.0	-3.0	-6.0	-[illegible]	-4.0	-5.0
#2	4.0	0	8.0	5.0	[illegible]	6.0	10.0
#3	11.0	9.0	13.0	5.0	[illegible]	11.0	14.0
#4	14.0	13.0	15.0	4.0	5.0	13.0	14.0
#5	14.0	14.0	15.0	6.0	7.0	13.0	13.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. 125
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. -.001
Capacitance Gage Reading 276
Exit Burr Height, in.

Bluing Pin Rollout

54%

317/321

Air Gage Readings (.0001 in.)
Angular Position.

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-4.0	-1.0	-8.0	-4.0	-4.0	-6.0
#2	3.0	2.0	5.0	3.0	4.0	5.0	3.0
#3	4.0	3.0	9.0	4.0	[illegible]	[illegible]	6.0
#4	3.0	[illegible]	14.0	4.0	[illegible]	14.0	[illegible]
#5	4.0	[illegible]	14.0	[illegible]	14.0	14.0	13.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable OVALITY
Specimen No. 2A3B

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH Std
REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED
SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PROMOTE OVALITY
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 95-100
Protrusion, in. .129
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. -.002
Capacitance Gage Reading 285
Exit Burr Height, in. ____ ____

Bluing Pin Rollout

60°

318/322

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-8.0	-1.0	-6.0	-10.0	-7.0	-6.0
#2	2.0	-1.0	6.0	5.0	1.0	5.0	2.0
#3	3.0	7.0	12.0	6.0	6.0	12.0	6.0
#4	5.0	11.0	14.0	5.0	11.0	12.0	11.0
#5	8.0	12.0	14.0	5.0	12.0	12.0	12.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. .131
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .003
Flush Gage Reading, in. -.001
Capacitance Gage Reading 235
Exit Burr Height, in. ____

Bluing Pin Rollout

60°

318/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-3.0	-11.0	-4.0	-6.0	-6.0	-6.0
#2	5.0	7.0	9.0	3.0	8.0	9.0	5.0
#3	7.0	11.0	13.0	3.0	12.0	12.0	10.0
#4	8.0	14.0	15.0	2.0	12.0	12.0	11.0
#5	11.0	12.0	13.0	7.0	12.0	12.0	12.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable OVALITY
Specimen No. 50613

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH 5TD [redacted] REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PRODUCE OVALITY
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. 129
Perpendicularity, .001 in./in.
Longitudinal 1081 Transverse 1002
Flush Gage Reading, in. -.001
Capacitance Gage Reading 246
Exit Burr Height, in.

60

320/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-5.0	-4.0	9.0	-5.0	-2.0	-6.0
#2	1.0	5.0	9.0	1.0	7.0	8.0	6.0
#3	6.0	13.0	13.0	9.0	13.0	13.0	13.0
#4	10.0	14.0	15.0	8.0	14.0	15.0	13.0
#5	13.0	14.0	15.0	7.0	13.0	13.0	14.0

Hole #2

Surface Finish, AA 90-95 Bluing Pin Rollout
Protrusion, in. 129
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0035
Flush Gage Reading, in. -.001
Capacitance Gage Reading 264
Exit Burr Height, in.

55

319/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-9.0	-3.0	-5.0	-9.0	-5.0	-4.0
#2	6.0	0	3.0	6.0	0	5.0	6.0
#3	6.0	4.0	11.0	5.0	10.0	12.0	5.0
#4	6.0	11.0	14.0	5.0	14.0	14.0	8.0
#5	6.0	13.0	14.0	7.0	14.0	14.0	11.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable OVALITY
Specimen No. 4E47C

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH 5 Td [redacted] REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PRODUCE OVALITY
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 85-90 Bluing Pin Rollout
Protrusion, in. 130
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. -.002
Capacitance Gage Reading 266
Exit Burr Height, in.

64%

329/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-4.0	-9.0	-7.0	-6.0	-10.0	-4.0
#2	1.0	5.0	6.0	2.0	6.0	5.0	6.0
#3	0	10.0	11.0	3.0	11.0	12.0	11.0
#4	4.0	13.0	13.0	4.0	12.0	14.0	14.0
#5	9.0	12.0	12.0	5.0	11.0	13.0	13.0

Hole #2

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. 135
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. -.001
Capacitance Gage Reading 310
Exit Burr Height, in.

60%

318/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-9.0	-9.0	-8.0	-8.0	-9.0
#2	0	3.0	1.0	0	3.0	5.0	0
#3	0	6.0	10.0	2.0	10.0	11.0	4.0
#4	0	10.0	13.0	0	12.0	12.0	7.0
#5	1.0	11.0	12.0	3.0	12.0	11.0	10.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable OVALITY
Specimen No. 4B2TC

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH STD. REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PRODUCE
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 85-90 Bluing Pin Rollout
Protrusion, in. .123
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. -.001
Capacitance Gage Reading 269
Exit Burr Height, in.

70%

318/322

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-7.0	-9.0	-5.0	-10.0	-10.0	-9.0
#2	0	3.0	1.0	2.2	3.0	2.0	7.0
#3	9.0	8.0	11.0	2.0	6.0	11.0	12.0
#4	13.0	12.0	13.0	0	10.0	15.0	13.0
#5	13.0	13.0	—	-1.0	11.0	13.0	15.0

Hole #2

Surface Finish, AA 100-110 Bluing Pin Rollout
Protrusion, in. .132
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .002
Flush Gage Reading, in. -.002
Capacitance Gage Reading 282
Exit Burr Height, in.

60%

318/322

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-6.0	-4.0	-8.0	-7.0	-10.0	-6.0
#2	3.0	2.0	5.0	3.0	3.0	7.0	5.0
#3	3.0	4.0	10.0	4.0	6.0	13.0	7.0
#4	5.0	9.0	14.0	4.0	12.0	15.0	11.0
#5	5.0	11.0	15.0	6.0	13.0	15.0	13.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable OVALITY
Specimen No. 4A413C

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH STD [redacted] REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PRODUCE OVALITY
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 120-125 Bluing Pin Rollout
Protrusion, in. .128
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .003
Flush Gage Reading, in. -.001
Capacitance Gage Reading 330
Exit Burr Height, in.

60%

318/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-8.0	-6.0	-10.0	-10.0	-9.0	-9.0
#2	0	1.0	3.0	1.0	2.0	3.0	4.0
#3	0	4.0	11.0	2.0	8.0	12.0	12.0
#4	6.0	11.0	14.0	3.0	13.0	14.0	14.0
#5	11.0	12.0	14.0	2.0	14.0	15.0	14.0

Hole #2

Surface Finish, AA 125-130 Bluing Pin Rollout
Protrusion, in. .134
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. -.002
Capacitance Gage Reading 288
Exit Burr Height, in.

60%

318/322

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-6.0	-6.0	-5.0	-5.0	-8.0	-8.0
#2	4.0	4.0	4.0	5.0	5.0	5.0	3.0
#3	4.0	7.0	11.0	5.0	11.0	13.0	8.0
#4	3.0	10.0	15.0	4.0	13.0	15.0	13.0
#5	4.0	12.0	15.0	9.0	13.0	14.0	12.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable OVALITY
Specimen No. 4038

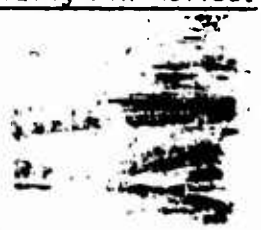
Hole Manufacturing Conditions and Procedures: TAPER REAM WITH Std
[redacted] REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PRODUCE OVALITY
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 95-100
Protrusion, in. 126
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .002
Flush Gage Reading, in. -.001
Capacitance Gage Reading 234
Exit Burr Height, in.

60°

Bluing Pin Rollout



319/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-7.0	-11.0	-3.0	-10.0	-7.0	-7.0
#2	5.0	6.0	7.0	5.0	3.0	7.0	4.0
#3	2.0	11.0	12.0	4.0	10.0	11.0	11.0
#4	8.0	13.0	13.0	5.0	12.0	13.0	12.0
#5	11.0	12.0	12.0	6.0	11.0	11.0	12.0

Hole #2

Surface Finish, AA 120-125
Protrusion, in. 132
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 252
Exit Burr Height, in.

55°

Bluing Pin Rollout

316/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-9.0	-6.0	-6.0	-10.0	-7.0	-9.0
#2	2.0	0	4.0	2.0	2.0	7.0	2.0
#3	3.0	8.0	11.0	1.0	10.0	12.0	9.0
#4	5.0	13.0	13.0	5.0	11.0	12.0	12.0
#5	9.0	12.0	12.0	8.0	10.0	11.0	12.0

MANUFACTURING REPORT: TAPERED HOLES

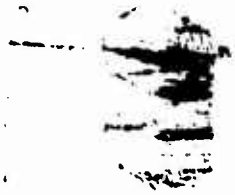
Test Series 17 Quality Variable OVALITY
Specimen No. 2#1B

Hole Manufacturing Conditions and Procedures: TAPER REAM WITH STD REAMER FOR MIN. INTERFERENCE. BACK OUT STRAIGHT FLUTED SIDE CUTTING TAPER REAMER. MOVE ±.007 AND PLUNGE CUT TO PRODUCE OVALITY
Spindle, rpm 660 Feed: .0015
Cutting Fluid: DRY Depth: (Ind. Reading) 1.130

Hole #1

Surface Finish, AA 125-135
Protrusion, in. .133
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0015
Flush Gage Reading, in. 0
Capacitance Gage Reading 288
Exit Burr Height, in.

Bluing Pin Rollout



319/323

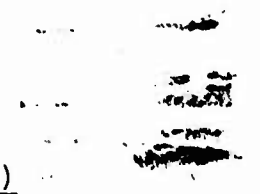
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-2.0	-2.0	9.0	-5.0	-5.0	-8.0
#2	-1.0	3.0	3.0	0	4.0	7.0	5.0
#3	-1.0	8.0	10.0	0	6.0	13.0	9.0
#4	0	12.0	13.0	2.0	12.0	13.0	13.0
#5	9.0	14.0	14.0	4.0	12.0	15.0	14.0

Hole #2

Surface Finish, AA 85-90
Protrusion, in. .126
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. -.004
Capacitance Gage Reading 276
Exit Burr Height, in.

Bluing Pin Rollout



319/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-8.0	-3.0	-7.0	-6.0	-3.0	-5.0
#2	1.0	-1.0	3.0	0	1.0	6.0	3.0
#3	4.0	3.0	14.0	3.0	11.0	13.0	5.0
#4	3.0	10.0	14.0	7.0	14.0	15.0	10.0
#5	4.0	13.0	14.0	10.0	15.0	14.0	12.0

INSPECTION SHEETS FOR TEST SERIES 18 - EXIT BURRS

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/EXIT BURR - MICA INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 2.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 2.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.400
Procedure: REAM GOOD HOLE, TOUCH W/ OVERSIZE REAMER WHILE NOT ROTATING, THEN REAM .680" DEEPER

Results: Specimen No. SE3T Hole #1
Surface Finish, AA 45 max
Protrusion, in. .118
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 411
Exit Burr Height, in. .014

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	+2.5	1 0.5	0	0	+2	+1
#2	+1	+1	+2.5	+2.5	+0.5	+1	+1	+1
#3	+1	+0.5	+2.5	+1	+0.5	+1	+1	+1
#4	+0.5	+2.5	+2.5	+1	+0.5	0	+2	+2
#5	+1.5	+1.5	+1.0	+1	+0.5	0	+2	+2

Hole #2
Surface Finish, AA 45 max
Protrusion, in. .115
Perpendicularity, .001 in./gage length
Longitudinal .003 Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 411
Exit Burr Height, in. .004

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	+1	0	0	0	+0.5	+1
#2	+1	+1	+1	0	0	0	+0.5	+1
#3	+1	+1	+1	+0.5	0	0	+2.5	+1
#4	+0.5	+0.5	+0.5	0	+0.5	+0.5	+0.5	+0.5
#5	+1	+1	+0.5	0	0	+0.5	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/EXIT BURR - MIN INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.400
Procedure: REAM GOOD HOLE, TOUCH UP OVERSIZE REAMER WHILE NOT ROTATING THEN REAM .080" DEEPER

Results: Specimen No. 5D6T Hole #1
Surface Finish, AA
Protrusion, in. .110
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .002/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 415
Exit Burr Height, in. .020"

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	+0.5	0	+0.5	+0.5	+1	+1
#2	0	0	0	+0.5	+1	+1.5	+1.5	+1
#3	0	-0.5	0	+0.5	+1	+2	+2	+1
#4	+1	+1	0	0	0	0	0	+.05
#5	+1.5	+1	+0.5	0	0	0	+1	+1.5

Hole #2
Surface Finish, AA
Protrusion, in. .115
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .006/INCH
Flush Gage Reading, in. .000
Capacitance Gage Reading: 452
Exit Burr Height, in. .008

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+0.5	+0.5	+0.5	0	0	0	0
#2	0	+0.5	+1	+0.5	0	0	0	0
#3	0	+0.5	+1	+1	+0.5	0	0	0
#4	0	0	0	0	0	+0.5	0	0
#5	-1	+1	0	0	0	+0.5	+0.5	+1

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/ Ext - Burr - [illegible]

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: Hand - 0.5 IPM

Cutting Fluid: [illegible] Depth: (Ind. Reading) 1.953

0 ≙ 0.200

Modify Good Holes Using Following Conditions:

Tool: [illegible]

Spindle, rpm 325 Feed: Hand - [illegible] IPM

Cutting Fluid: [illegible] Depth: (Ind. Reading) 1.939

Procedure: [illegible]

Results: Specimen No. 584T Hole #1 (MACHINED)

Surface Finish, AA 20-45 Micro in. Bluing Pin Rollout

Protrusion, in. .110

Perpendicularity, .001 in./gage length

Longitudinal [illegible] Transverse [illegible]

Flush Gage Reading, in. .004

Capacitance Gage Reading: 442 [illegible] 50%

Exit Burr Height, in. .015

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	[illegible]	0	[illegible]	2	+1	+1	+1
#3	0	-2	-1	-2	[illegible]	+1.5	+2	+1.5
#4	+0.5	[illegible]	0	+0.5	[illegible]	0	-0.5	0
#5	+1.5	[illegible]	+1	+0.5	0	0	0	+0.5

Hole #2

Surface Finish, AA 20-40 Micro in. Bluing Pin Rollout

Protrusion, in. .119

Perpendicularity, .001 in./gage length

Longitudinal .003/INCH Transverse .000

Flush Gage Reading, in. .005

Capacitance Gage Reading: 442 [illegible] [illegible]%

Exit Burr Height, in. 0

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	-0.5	-0.5	0	0
#2	0	+0.5	+1	+1	0	[illegible]	0	0
#3	0	+1	+1.5	+1.5	+0.5	0	0	0
#4	0	0	0	+0.5	+0.5	+2.5	2	2
#5	+1	+1	+1	0	0	0	2	+1

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/ Ex. - SURF-TO-N. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: [illegible]
Cutting Fluid: STANDARD SOLVENT Depth: (Ind. Reading) 1.952
0 a [illegible]

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK RICH REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STANDARD SOLVENT Depth: (Ind. Reading) 1.392
Procedure: REAM GOOD HOLE, TOUCH UP WITH OVERSIZE REAMER AND FEEL .062" DEEPER

Results: Specimen No. 5C2T Hole #1 (MACHINED END)
Surface Finish, AA 25-35 [illegible]
Protrusion, in. .115
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse [illegible]
Flush Gage Reading, in. .002
Capacitance Gage Reading: 390
Exit Burr Height, in. .010

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+1	+0.5	0	0	0	0.5	0
#2	0	+0.5	0	0	0	+0.5	1	+0.5
#3	0	0	0	0	+0.5	+1	1.5	+0.5
#4	0	+0.5	0	+0.5	+0.5	0	0	0
#5	+1	+1	+1	+0.5	+0.5	0	0	0

Hole #2
Surface Finish, AA 20-[illegible]
Protrusion, in. .120
Perpendicularity, .001 in./gage length
Longitudinal [illegible] Transverse [illegible]
Flush Gage Reading, in. .002
Capacitance Gage Reading: [illegible]
Exit Burr Height, in. .007

Bluing Pin Rollout 65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	+0.5	0	0	0	0
#3	0	0	+0.5	+1	0	+0.5	0	0
#4	+1	+0.5	0	0	0	0	0	0
#5	+1.5	+1	0	0	0	0	0	+1

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/ EXIT BURR - MIN LATERAL CLEARANCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.400
Procedure: REAM GOOD HOLE, TOUCH OF MIN. OVERSIZE REAMER WHILE NOT ROTATING, THEN FEED .080" DEEPER

Results: Specimen No. 216T Hole #1
Surface Finish, AA 35 μin
Protrusion, in. .114
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .004/INCH
Flush Gage Reading, In. .003
Capacitance Gage Reading: 344
Exit Burr Height, in. .005

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	+0.5	+0.5	+0.5	+1	+1	+1
#2	+1	+0.5	+0.5	+0.5	+0.5	+1	+1	+1
#3	+0.5	+0.5	+2.5	+2.5	+1	+1.5	+1.5	+1
#4	+1	+1	+1	+0.5	+0.5	2	0	+1
#5	+1.5	+1.5	+1	+0.5	0	0	+0.5	+1.5

Hole #2
Surface Finish, AA 35 μin
Protrusion, in. .110
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .003/INCH
Flush Gage Reading, In. .000
Capacitance Gage Reading: 411
Exit Burr Height, in. .020

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	+0.5	+1	+1	+0.5	0	0	+0.5
#2	+0.5	+1	+1	+1	+0.5	0	0	+0.5
#3	+1	+1	+1.5	+1.5	+1	0	0	0
#4	+1	+1	0.5	+1	+0.5	-0.5	+0.5	+0.5
#5	+2	+2	+1	+1	+0.5	+0.5	+1	+1

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/O EXIT BURR - MIN INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.900
Procedure: REAM GOOD HOLE, TOUCH UP OVERSIZE REAMER WHILE NOT ROTATING THEN REAM .060" DEEPER

Results: Specimen No. 5A5T Hole #1
Surface Finish, AA 25 µin.
Protrusion, in. .122
Perpendicularity, .001 in./gage length
Longitudinal .007 INCH Transverse .000 INCH
Flush Gage Reading, in. .005
Capacitance Gage Reading: 457
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
85%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	0	0	0	0	+0.5	+0.5	+1	+0.5
#3	0	0	0	0	+0.5	+1	+1	+1
#4	+0.5	0	0	+0.5	+0.5	0	0	0
#5	+1	+0.5	+0.5	+0.5	+0.5	0	+0.5	+0.5

Hole #2
Surface Finish, AA 32 µin.
Protrusion, in. .112
Perpendicularity, .001 in./gage length
Longitudinal .005 INCH Transverse .004 INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 552
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	+0.5	0	0	0	0
#2	0	0	+0.5	+0.5	0	0	0	0
#3	0	0	0	+0.5	0	0	0	0
#4	0	0	0	+0.5	0	0	0	0
#5	0	0	0	+0.5	0	0	0	0.5

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable WO/Cr - BURR - MIN IMPACT FORCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND-0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GROUP 1 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND-0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.400
Procedure: REAM GOOD HOLE, TOUCH UP WITH OVERSIZE REAMER WHILE NOT ROTATING, THEN REAM .080" DEEPER

Results: Specimen No. 5B6C Hole #1
Surface Finish, AA 40 MIN
Protrusion, in. .120
Perpendicularity, .001 in./gage length
Longitudinal _____ Transverse _____
Flush Gage Reading, in. .001
Capacitance Gage Reading: 455
Exit Burr Height, in. .007 LARGE

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 0.5	0	0	+ 0.5	0	+ 0.5	+ 0.5	+ 0.5
#2	0	0	0	+ 0.5	+ 1	+ 1.5	+ 1	+ 1
#3	0	-0.5	0	+ 1	+ 1	+ 2	+ 1.5	+ 1
#4	+ 0.5	+ 1	+ 0.5	+ 1	+ 0.5	0	0	0
#5	+ 0.5	+ 0.5	+ 0.5	0	+ 0.5	0	0	0

Hole #2
Surface Finish, AA 30 MIN
Protrusion, in. .108
Perpendicularity, .001 in./gage length
Longitudinal _____ Transverse _____
Flush Gage Reading, in. .002
Capacitance Gage Reading: 491
Exit Burr Reamed

Bluing Pin Rollout
75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	0	0	+ 0.5	0	+ 0.5	+ 1
#2	0	0	0	0	0	0	0	0
#3	0	0	0	0	•	0	0	0
#4	0	0	0	+ 0.5	0	0	-0.5	0
#5	0	0	0	+ 0.5	+ 0.5	0		+ 0.5

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/O EXIT BURR - MIN INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.400
Procedure: REAM GOOD HOLE, TOUCH UP OVERSIZE REAMER WHILE NOT ROTATING THEN REAM .080" DEEPER

Results: Specimen No. CAST Hole #1
Surface Finish, AA 35 μ in.
Protrusion, in. .114
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 427
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	0	0	0	+0.5	+1	+1
#2	+1	+0.5	0	0	0	+1	+1	+1
#3	+0.5	0	0	+0.5	+0.5	+1	+1	+1
#4	0	0	+1	+1.5	+1.5	+1	0	0
#5	+1	+1	+1	+1	+1	+1	+0.5	+0.5

Hole #2
Surface Finish, AA 40 μ in.
Protrusion, in. .104
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .002 INCH
Flush Gage Reading, in. .001
Capacitance Gage Reading: 433
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	-0.5	0	0	0	0	0	0
#2	+0.5	+0.5	+2.5	+0.5	0	0	0	+0.5
#3	+0.5	+0.5	+1	+1	0	+0.5	+2.5	+0.5
#4	0	0	0	+0.5	+0.5	0	0	0
#5	+1.5	+1	+1	+1	+0.5	+2.5	+2.5	+1

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/O EXIT BURR - MIN INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill, 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.900
Procedure: REAM GOOD HOLE, TOUCH UP OVERSIZE REAMER WHILE NOT ROTATING THEN REAM .060" DEEPER

Results: Specimen No. 6AGCB Hole #1
Surface Finish, AA 35 MAX
Protrusion, in. .119
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .010/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 466
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
60%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 0.5	+ 0.5	+ 0.5	0	+ 0.5	+ 1	+ 1	+ 1
#2	+ 0.5	+ 0.5	+ 0.5	+ 0.5	+ 1	+ 1	+ 1.5	+ 1.5
#3	0	0	+ 0.5	+ 0.5	+ 1	+ 1.5	+ 1.5	+ 1
#4	+ 0.5	0	+ 0.5	+ 0.5	+ 1	+ 1	+ 2.5	+ 1
#5	+ 1	+ 1	+ 1	+ 1	+ 1	+ 1	+ 1	+ 1

Hole #2
Surface Finish, AA 40 MAX
Protrusion, in. .111
Perpendicularity, .001 in./gage length
Longitudinal .3 INCH Transverse .003/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 466
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
50%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+ 2	+ 2	+ 2	+ 1.5	+ 1	+ 1	+ 1	+ 1
#2	+ 2	+ 1.5	+ 2	+ 2	+ 1.5	+ 1	+ 1	+ 1
#3	+ 1.5	+ 1.5	+ 2	+ 2	+ 1.5	+ 1.5	+ 1	+ 1
#4	+ 1.5	+ 1.5	+ 1.5	+ 2	+ 1.5	+ 1	+ 1	+ 1
#5	+ 2	+ 2	+ 2	+ 1.5	+ 1.5	+ 1.5	+ 1.5	+ 1.5

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W0/EXIT BURR - MIN INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954

Modify Good Holes Using Following Conditions:
Tool: GROUP 2 OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.900
Procedure: REAM GOOD HOLE, TOUCHUP OVERSIZE REAMER WHILE NOT ROTATING THEN REAM .060" DEEPER

Results: Specimen No. 5E2T Hole #1
Surface Finish, AA 35 µ in.
Protrusion, in. .113
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse 000
Flush Gage Reading, in. .001
Capacitance Gage Reading: 377
Exit Burr Height, in. .007 DEBURRED

Bluing Pin Rollout
90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	+1	+0.5	0	0	0	+1
#2	+0.5	0	+1	+1	+1	+1.5	+1	+1
#3	-0.5	-0.5	+1	+1.5	+2	+2	+1.5	+0.5
#4	+1	+0.5	+1	+1	+0.5	0	0	+0.5
#5	+1	+1	+1	+1	0	0	0	+0.5

Hole #2
Surface Finish, AA 40 µ in.
Protrusion, in. .111
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse 000
Flush Gage Reading, in. 002
Capacitance Gage Reading: 434
Exit Burr Height, in. .012 DEBURRED

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	+1	+0	0	0	0	+1.5
#2	+1	+1	+1.5	+1	1	0	0	+1
#3	0	+1	+1.5	+2	1	0	0	0
#4	-1	-1	-1.5	-0.5	-0.5	-1	-1	-1
#5	+0.5	+0.5	+0.5	+1	+0.5	+0.5	+0.5	+1

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/EXIT BURR – MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.910

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE CARBIDE DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN CLEAN WITH UNDERSIZE REAMER

Results: Specimen No. 345T Hole #1
Surface Finish, AA 60 μ in
Protrusion, in. .225
Perpendicularity, .001 in./gage length
Longitudinal .005/INCH Transverse .005/INCH
Flush Gage Reading, in. 003
Capacitance Gage Reading: 404
Exit Burr Height, in. .008

Bluing Pin Rollout
60%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+0.5	0	0	+1	+1	+1	+1
#2	+0.5	0	-0.5	0	+1	+1	+1	+1
#3	+0.5	+1	+1	1	0	0	0	0
#4	+0.5	+0.5	0	0	0	0	0	0
#5								

Hole #2
Surface Finish, AA 60 μ in
Protrusion, in. .225
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse 000
Flush Gage Reading, in. .002
Capacitance Gage Reading: 442
Exit Burr Height, in. 004

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	+1	+1	+0.5	+0.5	0	0	+1
#2	0	+0.5	+0.5	+0.5	+0.5	0	0	0
#3	0	+0.5	+0.5	+0.5	+0.5	0	0	+0.5
#4	+0.5	+1	+1	+1	+1	0	0	+0.5
#5								

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/ EXIT BURR - MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952
0 @ 0.200"

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.952
Procedure: REAM HOLE SHALLOW BY .060" THEN CO'SINK WITH UNDER SIZE REAMER

Results: Specimen No. 5E6T Hole #1 (MARKED END)
Surface Finish, AA 40-50 μ in
Protrusion, in. .226
Perpendicularity, .001 in./gage length
Longitudinal .005/INCH Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 416 (AFTER BLUEING)
Exit Burr Height, in. .013

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1.5	+2.5	+3	+4	+4	+4	+3.5	+2
#2	+1	+2	+3	+4.5	+5	+5	+4	+2
#3	+1	+1	+2	+1	+1	+1	0	0
#4	-1	0	0	0	0	0	0	-0.5
#5	+10	+10	+10	+10	+10	+10	+10	+10

Hole #2
Surface Finish, AA 40-60 μ in
Protrusion, in. .221
Perpendicularity, .001 in./gage length
Longitudinal .003/INCH Transverse .000
Flush Gage Reading, in. .003
Capacitance Gage Reading: 390 (AFTER BLUEING)
Exit Burr Height, in. .010

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+2	+3	+3	+3.5	+3	+2.5	+1
#2	+1.5	+3	+4	+4	+4	+4	+3	+2
#3	-1	+1	+1.5	+1.5	+1.5	+1	0	-1
#4	0	0	0	0	0	0	0	0
#5	+10	+10	+10	+10	+10	+10	+10	+10

EFFECTS OF HOLE QUALITY

Test Series 19 Quality Variable W/ EXIT BURR - MAX. HEIGHT

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)

Spindle, rpm 325 Feed: HAND 2.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.710

Modify Good Holes Using Following Conditions:

Tool: UNDERSIZE OMARK DR-REAMER

Spindle, rpm 325 Feed: HAND - 2.5 IPM

Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953

Procedure: REAM HOLE SHALLOW BY .062", COUNTERSINK WITH UNDERSIZE REAMER

Results: Specimen No. 4AIT Hole #1

Surface Finish, AA 63 MM

Protrusion, in. .227

Perpendicularity, .001 in./gage length

Longitudinal .003/INCH Transverse .000

Flush Gage Reading, in. .003

Capacitance Gage Reading: 408

Exit Burr Height, in. .005

Bluing Pin Rollout

90%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	-1	+0.5	+0.5	0	0	+1	+1
#2	+1	-1	+0.5	+2.5	+1	0	+1	+6.5
#3	+1.5	-1.5	+2.5	0	0	-0.5	0	0
#4	+2.5	-2	+1	0	0	0	+0.5	+1
#5	+10	-10	+10	+10	+10	+9.5	+9.5	+10

Hole #2

Surface Finish, AA 42 MM

Protrusion, in. .227

Perpendicularity, .001 in./gage length

Longitudinal .000 Transverse .001/INCH

Flush Gage Reading, in. .003

Capacitance Gage Reading: 408

Exit Burr Height, in. .016

Bluing Pin Rollout

60%

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	0	0	-2	0	0.5	0.5	0.5
#2	0	0	+2.5	-2	+2.5	0.5	2.5	0
#3	+0.5	+0.5	+2.5	-2	0	0	0	0
#4	+2	+1.5	+1	-2	0	0	1	1
#5	+7	+7	+7	+7	+7	+7	+7	+7

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/ EXIT BURR - MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:

Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.905
0 ≙ 0.200

Modify Good Holes Using Following Conditions:

Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW BY .020" THEN CO'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 2R5T Hole #1 (MARKED END)
Surface Finish, AA 45 µ in
Protrusion, in. .230
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .007/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 3226
Exit Burr Height, in. .015

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+0.5	0	0	+0.5	+1.5	+1.5	+1.5
#2	0	-0.5	0	0	+0.5	+1	+1	+0.5
#3	+1	0	0	0	0	-1	-0.5	0
#4	+2	+1	+1	0	0	-0.5	0	+1
#5	+10	+10	+10	+10.5	+10	+10	+10	+10

Hole #2
Surface Finish, AA 45 µ in
Protrusion, in. .230
Perpendicularity, .001 in./gage length
Longitudinal 000 Transverse .003/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 3088
Exit Burr Height, in. .010

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+1	0
#2	0	0	+1	+1	+0.5	0	0	0
#3	+1	0	0	0	+1	0	0	0
#4	+2	+1.5	0	0	0	0	+1	2
#5	+10	+10	+10	+10	+10	+10	+10	10

EFFECTS OF HOLE QUALITY

Test Series 15 Quality Variable W/ EXIT BURR - MAX INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 2.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.910

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 2.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.953
Procedure: DRILL HOLE UNDERSIZE BY .060" THEN COUNTERSINK WITH CARBIDE REAMER

Results: Specimen No. 58508 Hole #1 M... E...
Surface Finish, AA 25 MAX
Protrusion, in. .230
Perpendicularity, .001 in./gage length
Longitudinal .010/in. Transverse .005/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 387
Exit Burr Height, in. .012

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	-	0		0	0	0	0
#2	0				0	0	0	0
#3	0				-0.5	-1	-1	-0.5
#4	0	-0.5	-0.5	0	-0.5	-1	-0.5	0
#5	+9	+9	+9	-9	+9	+9	+9	+9

Hole #2

Surface Finish, AA 35 MAX
Protrusion, in. .230
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 336
Exit Burr Height, in. .010

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	0	0	0
#2	-1	0	-0.5	0	0	0	0	0
#3	-1	-0.5	-1	0	-1	0	-1	0
#4	0	0	-0.5	0	-1	0	0	+1
#5	+9	+9	+9	+9	+9	+9	+9	+9

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/O EXIT BURR - MAX INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.915

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW THEN CO'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 5E4E Hole #1
Surface Finish, AA 60 MAX
Protrusion, in. .230
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 391
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	0	+0.5	+0.5	+0.5	+1	+1	+1.5
#2	+1	+0.5	+1	+0.5	+0.5	+1.5	+1.5	+1.5
#3	+0.5	0	-0.5	+0.5	0	0	0	+1
#4	+1	+1	+1	+1	0	+0.5	+1	+1.5
#5								

Hole #2
Surface Finish, AA 35 MAX
Protrusion, in. .240
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .003/INCH
Flush Gage Reading, in. .004
Capacitance Gage Reading: 460
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+0.5	0	0	-0.5	0	0	+0.5
#2	-0.5	0	0	0	-0.5	0	0	0
#3	0	0	0	0	-0.5	0	0	0
#4	+1	+1	+1	+1	0	0	+0.5	+1.5
#5								

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/O EXIT BURR - MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.905

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL-REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN CO'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 2A5B Hole #1
Surface Finish, AA 55 μin
Protrusion, in. .230
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .004/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 286
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4								
#5								

Hole #2
Surface Finish, AA 55 μin
Protrusion, in. .231
Perpendicularity, .001 in./gage length
Longitudinal .002/INCH Transverse .001/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 355
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1								
#2								
#3								
#4								
#5								

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable WC / EXIT BURR - MAX. INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading)

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading)
Procedure: REAM HOLE SHALLOW BY , CO'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 5C1CB Hole #1
Surface Finish, AA 50 MICRO IN.
Protrusion, in. .218
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .005/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 350
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout

70 %

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	0	0	0	0	+0.5	+1	+1
#2	+1	0	0	0	0	+0.5	+1.5	+1
#3	+0.5	+1	+1	+0.5	-0.5	0	0	0
#4	+1.5	+1.5	+1.5	+0.5	0	0	+1	+1
#5								

Hole #2
Surface Finish, AA 50 MICRO IN.
Protrusion, in. .220
Perpendicularity, .001 in./gage length
Longitudinal .000 Transverse .005/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 405
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout

70 %

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+0.5	+0.5	0	0	0	0	+0.5	+0.5
#2	0	0	0	0	0	0	+0.5	+0.5
#3	0	0	+0.5	0	0	0	0	0
#4	+0.5	+0.5	+1	0	0	0	0	0
#5								

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/O EXIT BURR - MAX INTERFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.905

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND - 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.954
Procedure: REAM HOLE SHALLOW, THEN FINISH WITH UNDERSIZE REAMER

Results: Specimen No. 5CGCB Hole #1
Surface Finish, AA 40 μin
Protrusion, in. .227
Perpendicularity, .001 in./gage length
Longitudinal .004/INCH Transverse .002/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 407
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	0	0	0	0	+1	+1	+1
#2	+0.5	0	-0.5	-0.5	0	+1	+2	+1.5
#3	0	0	0	0	0	0	0	0
#4	+1	+0.5	0	0	0	+0.5	+1	+1.5
#5								

Hole #2
Surface Finish, AA 40 μin
Protrusion, in. .226
Perpendicularity, .001 in./gage length
Longitudinal .005/INCH Transverse .006/INCH
Flush Gage Reading, in. .002
Capacitance Gage Reading: 330
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	0	+1	+1.5	+1.5	+1	0	0	+1
#2	0	+1	+1.5	+1.5	+1	0	0	0
#3	+1	+0.5	+0.5	+1	+0.5	0	0	0
#4	+1.5	+1.5	+1.5	+1	+1	0	0	+1
#5								

EFFECTS OF HOLE QUALITY

Test Series 18 Quality Variable W/O EXIT BURR – MAX. INTEFERENCE

Produce Good Hole Using Following Conditions:
Tools: #2 Centerdrill; 19/64 in. pilot drill; Group 1, Omark Drill Reamer (TLD2040AR1-5)
Spindle, rpm 325 Feed: HAND – 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.915

Modify Good Holes Using Following Conditions:
Tool: UNDERSIZE OMARK DRILL REAMER
Spindle, rpm 325 Feed: HAND – 0.5 IPM
Cutting Fluid: STODDARD SOLVENT Depth: (Ind. Reading) 1.955
Procedure: REAM HOLE SHALLOW, CO'SINK WITH UNDERSIZE REAMER

Results: Specimen No. 5C2B Hole #1
Surface Finish, AA 40 μin
Protrusion, in. .230
Perpendicularity, .001 in./gage length
Longitudinal .006/INCH Transverse .002/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 347
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+1	+0.5	0	0	+1	+1.5	+1.5
#2	+1	+1	+0.5	0	+0.5	+1.5	+2	+1.5
#3	+0.5	+1	+0.5	+1	+0.5	0	0	0
#4	+1	+1	+1	+1	+0.5	0	+1	+1
#5								

Hole #2
Surface Finish, AA 45 μin
Protrusion, in. .224
Perpendicularity, .001 in./gage length
Longitudinal .001/INCH Transverse .001/INCH
Flush Gage Reading, in. .003
Capacitance Gage Reading: 381
Exit Burr Height, in. DEBURRED

Bluing Pin Rollout
85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	135°	180°	225°	270°	315°
Bottom #1	+1	+0.5	+1	+1	+0.5	+0.5	+1	+1
#2	+1	+0.5	+1	+1	+1	+1	+1	+1
#3	+0.5	+0.5	+0.5	+1	+1	+1	+0.5	+0
#4	+1	+0.5	+0.5	+1	+1	+1	+0.5	+1
#5								

MANUFACTURING REPORT: TAPERED HOLES

Test Series 184 Quality Variable _____
Specimen No. 3648

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 55-57 — Bluing Pin Rollout
Protrusion, in. .178
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 371
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-7.0	-4.0	-6.0	-9.0	-5.0	-4.0
#2	4.0	4.0	5.0	5.0	3.0	3.0	3.0
#3	6.0	3.0	2.0	7.0	6.0	4.0	4.0
#4	5.0	5.0	3.0	3.0	2.0	3.0	4.0
#5	5.0	3.0	6.0	6.0	7.0	4.0	3.0

Hole #2

Surface Finish, AA 46 52 — Bluing Pin Rollout
Protrusion, in. .177
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. -.002
Capacitance Gage Reading 365
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-10.0	-7.0	-9.0	-10.0	-7.0
#2	1.0	2.0	3.0	4.0	3.0	1.0	4.0
#3	4.0	5.0	6.0	5.0	5.0	4.0	5.0
#4	5.0	4.0	5.0	4.0	4.0	5.0	6.0
#5	5.0	4.0	5.0	3.0	3.0	4.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 18A Quality Variable _____
Specimen No. 4A27

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 35-37 Bluing Pin Rollout
Protrusion, in. .172
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0025
Flush Gage Reading, in. .001
Capacitance Gage Reading 374
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-8.0	-10.0	-8.0	-7.0	-9.0	-8.0
#2	2.0	2.0	1.0	0	2.0	1.0	2.0
#3	3.0	2.0	2.0	3.0	3.0	2.0	3.0
#4	2.0	1.0	3.0	5.0	2.0	1.0	1.0
#5	3.0	2.0	3.0	3.0	2.0	2.0	2.0

Hole #2

Surface Finish, AA 30-32 Bluing Pin Rollout
Protrusion, in. .173
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 414
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)

Axial Position	Angular Position 0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-8.0	-9.0	-7.0	-8.0	-6.0	-8.0
#2	0	2.0	0	2.0	2.0	1.0	1.0
#3	3.0	2.0	0	3.0	3.0	3.0	4.0
#4	3.0	2.0	-1.0	4.0	5.0	3.0	5.0
#5	3.0	4.0	0	4.0	3.0	2.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 18A Quality Variable _____
Specimen No. 2C13

Hole Manufacturing Conditions and Procedures: _____

Spindle, rpm _____ Feed: _____
Cutting Fluid: _____ Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 40-42 — Bluing Pin Rollout
Protrusion, in. .168
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 364
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-4.0	-8.0	-8.0	-7.0	-8.0	-6.0
#2	2.0	4.0	2.0	3.0	3.0	3.0	2.0
#3	2.0	4.0	3.0	4.0	4.0	3.0	1.0
#4	1.0	3.0	3.0	5.0	6.0	7.0	2.0
#5	0	2.0	3.0	5.0	4.0	6.0	0

Hole #2

Surface Finish, AA 70-80 — Bluing Pin Rollout
Protrusion, in. .165
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. .003
Capacitance Gage Reading 395
Exit Burr Height, in. _____

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-9.0	-8.0	-6.0	-9.0	-5.0	-8.0
#2	2.0	2.0	2.0	4.0	4.0	4.0	2.0
#3	4.0	5.0	3.0	4.0	5.0	5.0	5.0
#4	4.0	4.0	4.0	1.0	3.0	4.0	5.0
#5	3.0	4.0	1.0	1.0	4.0	3.0	5.0

INSPECTION SHEETS FOR TEST SERIES 19 -

COMBINED VARIABLES, DOGBONE STRAP SPECIMENS

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS 125 AA N. TWT
Specimen No. 4A3TC

Hole Manufacturing Conditions and Procedures: REAM 5/4 (1.625) REAM 1" DIA. H.S. TO 2.500 DEP.

Spindle, rpm 80 Feed: .8 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 125
Protrusion, in. .110
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0015
Flush Gage Reading, in. .003
Capacitance Gage Reading 303
Exit Burr Height, in.

70°F

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-2.0	-4.0	-5.0	-7.0	-9.0	-6.0	-6.0
#2	5.0	4.0	4.0	4.0	4.0	4.0	4.0
#3	3.0	5.0	3.0	4.0	3.0	3.0	2.0
#4	1.0	2.0	3.0	5.0	3.0	1.0	2.0
#5	3.0	4.0	4.0	5.0	5.0	4.0	3.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. .118
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 242
Exit Burr Height, in.

70°F

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-4.0	-4.0	-2.0	-5.0	7.0	-6.0
#2	2.0	3.0	4.0	5.0	4.0	2.0	3.0
#3	2.0	0	3.0	4.0	3.0	4.0	4.0
#4	2.0	0	1.0	3.0	0	2.0	2.0
#5	4.0	4.0	3.0	2.0	3.0	4.0	4.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE Roughness 125 RMS
Specimen No. 1A5T6 M.N Finish

Hole Manufacturing Conditions and Procedures: Ream Std Reamer
1.625 Ream Mod L.H. Spiral Reamer

Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 100-105
Protrusion, in. 125
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 299
Exit Burr Height, in.

Bluing Pin Rollout

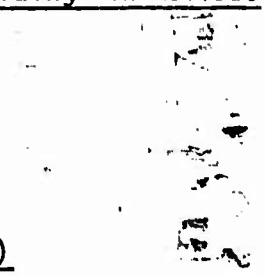
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-3.0	-1.0	-6.0	-10.0	-9.0	-7.0
#2	4.0	5.0	6.0	3.0	2.0	3.0	4.0
#3	3.0	3.0	4.0	2.0	2.0	2.0	4.0
#4	3.0	0	3.0	3.0	2.0	5.0	2.0
#5	12.0	-3.0	3.0	4.0	5.0	12.0	5.0

Hole #2

Surface Finish, AA 100
Protrusion, in. 105
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .003
Flush Gage Reading, in. .001
Capacitance Gage Reading 345
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-10.0	-8.0	-8.0	-5.0	-6.0	-7.0
#2	3.0	3.0	3.0	2.0	4.0	5.0	4.0
#3	2.0	2.0	2.0	1.0	3.0	2.0	3.0
#4	0	1.0	1.0	0	2.0	1.0	2.0
#5	3.0	4.0	4.0	3.0	3.0	3.0	2.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE R. 1 AREAS 125 M.M. I.N.T.
Specimen No. 4A53

Hole Manufacturing Conditions and Procedures: REAM STD. REAMER
1.625 REA... W. L.H. SPIRAL ...

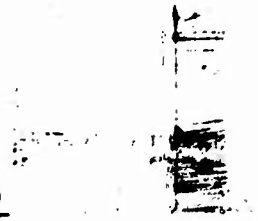
Spindle, rpm 80 Feed: ~5 & 7 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 95-100
Protrusion, in. 105
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0025
Flush Gage Reading, in. .002
Capacitance Gage Reading 341
Exit Burr Height, in.

Bluing Pin Rollout

80%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	1.0	-9.0	-8.0	-4.0	-7.0	-8.0	-8.0
#2	1.0	1.0	2.0	4.0	3.0	2.0	2.0
#3	3.0	0	0	2.0	2.0	1.0	1.0
#4	2.0	0	-1.0	0	2.0	2.0	1.0
#5	4.0	2.0	0	0	3.0	3.0	3.0

Hole #2

Surface Finish, AA 120-125
Protrusion, in. 120
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0025
Flush Gage Reading, in. .004
Capacitance Gage Reading 323
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-10.0	-7.0	-9.0	-7.0	-6.0	-7.0
#2	2.0	2.0	2.0	3.0	4.0	5.0	3.0
#3	3.0	3.0	3.0	3.0	2.0	3.0	4.0
#4	3.0	3.0	2.0	3.0	3.0	2.0	3.0
#5	4.0	3.0	3.0	3.0	3.0	3.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable Surface Roughness 125 RMS M.M. INT.
Specimen No. 4A6T

Hole Manufacturing Conditions and Procedures: Ream Std. Reamer
L625 Ream Mod. L.H. Spiral Reamer

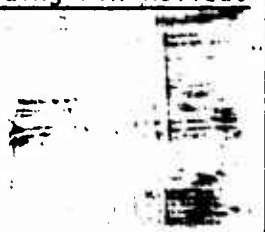
Spindle, rpm 80 Feed: .5 P.I.R.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 90 - 105
Protrusion, in. .115
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading 329
Exit Burr Height, in.

85%

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-8.0	-8.0	-6.0	-8.0	-7.0	-8.0
#2	2.0	2.0	2.0	4.0	3.0	6.0	3.0
#3	3.0	2.0	1.0	2.0	2.0	4.0	3.0
#4	1.0	0	1.0	0	2.0	3.0	1.0
#5	3.0	2.0	2.0	1.0	1.0	4.0	3.0

Hole #2

Surface Finish, AA 100 - 110
Protrusion, in. .110
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 326
Exit Burr Height, in.

75%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-6.0	-6.0	-8.0	-11.0	-7.0	-7.0
#2	4.0	4.0	3.0	2.0	1.0	4.0	3.0
#3	4.0	3.0	1.0	2.0	2.0	3.0	3.0
#4	2.0	3.0	0	0	1.0	1.0	0
#5	3.0	3.0	2.0	2.0	3.0	3.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS 120 RMS
Specimen No. 405T

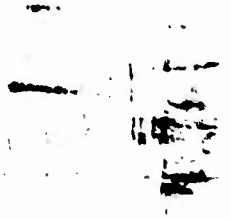
Hole Manufacturing Conditions and Procedures: REAM STD [illegible]
1.625" Ream Mod 6 H. SPIRAL REAMER

Spindle, rpm 80 Feed: [illegible]
Cutting Fluid: DRY Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA 100 - 120
Protrusion, in. 120
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. 002
Capacitance Gage Reading 296
Exit Burr Height, in.

Bluing Pin Rollout 85%



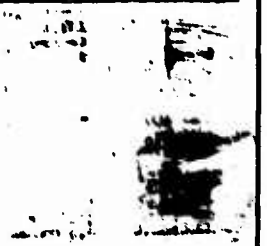
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-4.0	-4.0	-7.0	-8.0	-7.0
#2	3.0	3.0	4.0	5.0	4.0	2.0	2.0
#3	1.0	4.0	4.0	4.0	4.0	3.0	2.0
#4	4.0	4.0	3.0	1.0	4.0	5.0	4.0
#5	4.0	5.0	5.0	3.0	7.0	6.0	5.0

Hole #2

Surface Finish, AA 95 - 105
Protrusion, in. 100
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 331
Exit Burr Height, in.

Bluing Pin Rollout 90%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-6.0	-4.0	-4.0	-7.0	-7.0	-7.0
#2	3.0	3.0	4.0	4.0	3.0	2.0	1.0
#3	2.0	2.0	4.0	4.0	2.0	2.0	1.0
#4	2.0	2.0	3.0	3.0	2.0	4.0	1.0
#5	4.0	4.0	5.0	3.0	3.0	4.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFROUGHNESS 125RMS
Specimen No. 4C23C MAX INTERFERENCE (0048)

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER (1.755), REAM WITH MOD L.H. SPIRAL REAMER

Spindle, rpm 80 Feed: ≈ 8 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) ____

Hole #1

Surface Finish, AA 110-125
Protrusion, in. .222
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 320
Exit Burr Height, in. 100-200

Bluing Pin Rollout

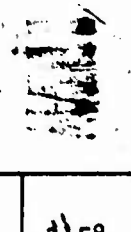
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-7.0	-8.0	-8.0	-8.0	-8.0	-7.0
#2	4.0	3.0	3.0	3.0	2.0	4.0	3.0
#3	4.0	2.0	5.0	4.0	4.0	3.0	3.0
#4	3.0	0	2.0	1.0	2.0	2.0	1.0
#5	13.0	13.0	13.0	10.0	11.0	13.0	12.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. .210
Perpendicularity, .001 in./in.
Longitudinal .0025 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 339
Exit Burr Height, in. ____

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-8.0	-7.0	-7.0	-6.0	-10.0	-10.0
#2	2.0	2.0	3.0	3.0	3.0	2.0	2.0
#3	3.0	3.0	3.0	4.0	3.0	3.0	4.0
#4	0	1.0	1.0	0	1.0	2.0	2.0
#5	11.0	12.0	12.0	11.0	12.0	10.0	12.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFROUGHNESS 125 RMS MAX. INTERFERENCE (.004B)
Specimen No. 3C3B

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER (1.755), REAM WITH MOD. L.N. SPIRAL REACHER
Spindle, rpm 80 Feed: 8 IPM
Cutting Fluid: DRY Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 115-125
Protrusion, in. .223
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 334
Exit Burr Height, in.

Bluing Pin Rollout

75

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-7.0	-7.0	-8.0	-7.0	-7.0	-6.0
#2	3.0	3.0	3.0	3.0	4.0	3.0	3.0
#3	3.0	3.0	4.0	3.0	4.0	2.0	3.0
#4	2.0	0	1.0	2.0	4.0	2.0	1.0
#5	12.0	13.0	13.0	13.0	12.0	13.0	11.0

Hole #2

Surface Finish, AA 110-120
Protrusion, in. .230
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 287
Exit Burr Height, in.

Bluing Pin Rollout

80

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-4.0	-5.0	-9.0	-9.0	-4.0	-5.0
#2	7.0	8.0	8.0	7.0	7.0	7.0	7.0
#3	5.0	6.0	5.0	5.0	5.0	5.0	4.0
#4	4.0	5.0	4.0	3.0	4.0	5.0	3.0
#5	12.0	14.0	14.0	12.0	11.0	15.0	13.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURF ROUGHNESS 125 RMS
Specimen No. 4E4BL MAX. INTERFERENCE .0048

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER (1.755), REAM WITH MOD. L.H. SPIRAL REAMER

Spindle, rpm 80 Feed: ≈ 8 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) _____

Hole #1

Surface Finish, AA 105-115
Protrusion, in. .235
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .003
Flush Gage Reading, in. .001
Capacitance Gage Reading 296
Exit Burr Height, in. _____

Bluing Pin Rollout

75%

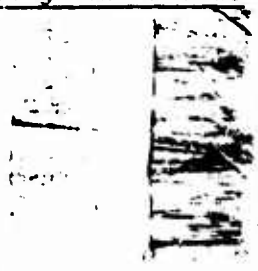
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-3.0	-3.0	-8.0	-9.0	-5.0	-6.0
#2	4.0	4.0	4.0	3.0	3.0	4.0	3.0
#3	5.0	6.0	5.0	4.0	5.0	4.0	4.0
#4	5.0	5.0	4.0	5.0	5.0	3.0	4.0
#5	13.0	15.0	14.0	4.0	11.0	13.0	13.0

Hole #2

Surface Finish, AA 100 110
Protrusion, in. .223
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0025
Flush Gage Reading, in. .001
Capacitance Gage Reading 342
Exit Burr Height, in. _____

Bluing Pin Rollout



70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-6.0	-8.0	-8.0	-9.0	-7.0	-7.0
#2	4.0	5.0	2.0	2.0	3.0	5.0	4.0
#3	1.0	3.0	2.0	3.0	2.0	3.0	3.0
#4	0	2.0	0	1.0	2.0	1.0	1.0
#5	11.0	13.0	13.0	12.0	10.0	11.0	12.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 49 Quality Variable SURF ROUGHNESS 125 MAX
Specimen No. 413513 MIN. INT .0048

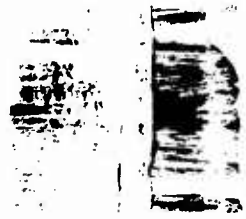
Hole Manufacturing Conditions and Procedures: RIM HOLE WITH 22
REAMER (1755) REAM WITH MOD HS SPIRAL
REAMER

Spindle, rpm 80 Feed: .5 8 IPM
Cutting Fluid: OIL Depth: (Ind. Reading)

Hole #1

Surface Finish, AA 110-125
Protrusion, in. .214
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0025
Flush Gage Reading, in. 0
Capacitance Gage Reading 340
Exit Burr Height, in.

Bluing Pin Rollout



90%

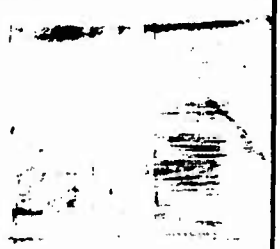
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-4.0	-6.0	-8.0	-9.0	-9.0
#2	2.0	3.0	5.0	7.0	5.0	3.0	3.0
#3	3.0	3.0	3.0	4.0	3.0	3.0	4.0
#4	1.0	1.0	2.0	2.0	2.0	1.0	3.0
#5	13.0	13.0	14.0	11.0	13.0	12.0	14.0

Hole #2

Surface Finish, AA 110-120
Protrusion, in. .235
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 303
Exit Burr Height, in.

Bluing Pin Rollout



70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-8.0	-5.0	-5.0	-5.0	-5.0	-8.0
#2	4.0	4.0	6.0	6.0	7.0	8.0	6.0
#3	5.0	6.0	6.0	5.0	3.0	4.0	5.0
#4	3.0	5.0	4.0	2.0	3.0	3.0	4.0
#5	13.0	15.0	15.0	11.0	11.0	14.0	12.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable [illegible]
Specimen No. 2CC13

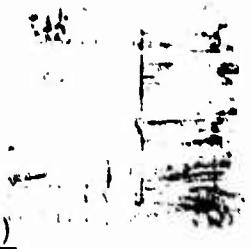
Hole Manufacturing Conditions and Procedures: [illegible]

Spindle, rpm 80 Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) ____

Hole #1

Surface Finish, AA 120-125
Protrusion, in. .235
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 261
Exit Burr Height, in. ____

Bluing Pin Rollout 75%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-1.0	-3.0	0	-1.0	-3.0	-4.0
#2	8.0	[illegible]	9.0	10.0	[illegible]	9.0	[illegible]
#3	3.0	[illegible]	7.0	5.0	5.0	6.0	6.0
#4	4.0	2.0	5.0	2.0	5.0	5.0	6.0
#5	15.0	15.0	—	14.0	15.0	—	—

Hole #2

Surface Finish, AA 100-105
Protrusion, in. .228
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 291
Exit Burr Height, in. ____

Bluing Pin Rollout 85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-7.0	-5.0	-3.0	-4.0	-6.0	-6.0
#2	5.0	6.0	4.0	2.0	2.0	5.0	5.0
#3	6.0	5.0	4.0	5.0	5.0	5.0	5.0
#4	4.0	3.0	2.0	5.0	3.0	3.0	3.0
#5	15.0	14.0	15.0	12.0	13.0	14.0	15.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable Surface Roughness - Scratch
Specimen No. 413STC Inconel 125 [illegible]

Hole Manufacturing Conditions and Procedures: Ream with Universal - Size Reamer 1.750. Ream 100 L.H. Spiral Reamer, use Rotary tool S.T. 005 & Pull Cut [illegible]
Spindle, rpm 80 Feed: 5" per min.
Cutting Fluid: Oil Depth: (Ind. Reading) 1.500

Hole #1

Surface Finish, AA 110-120
Protrusion, in. .102
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading 204
Exit Burr Height, in.

65%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	4.0	4.0	5.0	4.0	4.0	4.0	3.0
#2	9.0	10.0	11.0	9.0	9.0	9.0	9.0
#3	9.0	9.0	9.0	9.0	9.0	9.0	9.0
#4	5.0	1.0	3.0	5.0	7.0	5.0	5.0
#5	4.0	0	2.0	4.0	5.0	4.0	4.0

Hole #2

Surface Finish, AA 125
Protrusion, in. .131
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 230
Exit Burr Height, in.

70%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-2.0	-7.0	-7.0	-5.0	-1.0	-6.0	-1.0
#2	6.0	3.0	4.0	4.0	7.0	5.0	7.0
#3	7.0	4.0	4.0	5.0	5.0	6.0	9.0
#4	8.0	3.0	4.0	6.0	5.0	4.0	7.0
#5	7.0	3.0	4.0	6.0	7.0	6.0	9.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE Roughness Scratch
Specimen No. 485BC M.N.I.M. 125 µin.

Hole Manufacturing Conditions and Procedures: Ream with Undersize Reamer 125. Ream and Hand Spiral Reamer USC Series 1661 Set and Roll out for Scratch
Spindle, rpm 80 Feed: 55 IPM.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 100 110
Protrusion, in. 122
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0015
Flush Gage Reading, in. 0
Capacitance Gage Reading 202
Exit Burr Height, in.

Bluing Pin Rollout 85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	0	-7.0	-8.0	0	2.0	-8.0	2.0
#2	8.0	4.0	4.0	7.0	9.0	3.0	9.0
#3	9.0	4.0	4.0	8.0	9.0	5.0	9.0
#4	10.0	5.0	5.0	9.0	10.0	6.0	10.0
#5	13.0	13.0	13.0	13.0	12.0	4.0	6.0

Hole #2

Surface Finish, AA 105
Protrusion, in. 127
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 229
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	0	-5.0	-7.0	-5.0	-1.0	-4.0	-3.0
#2	6.0	2.0	1.0	5.0	7.0	4.0	5.0
#3	7.0	4.0	2.0	6.0	8.0	4.0	6.0
#4	8.0	4.0	2.0	7.0	5.0	4.0	7.0
#5	8.0	5.0	4.0	6.0	13.0	5.0	6.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE FINISH, CONTOUR, ROUNDNESS
Specimen No. 303T

Hole Manufacturing Conditions and Procedures: REAM WITH UNDERSIZE REAMERS 1.75 - 1.7500 DIA. WITH SPECIAL PROCEDURE USC BORING TOOL SET .005 FROM FINAL SIZE
Spindle, rpm 50 Feed: 55 IPM
Cutting Fluid: OIL Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 100
Protrusion, in. 114
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0025
Flush Gage Reading, in. 0
Capacitance Gage Reading 227
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	0	-3.0	-3.0	-1.0	1.0	0	2.0
#2	9.0	6.0	5.0	7.0	9.0	9.0	9.0
#3	11.0	7.0	5.0	7.0	9.0	9.0	10.0
#4	13.0	10.0	7.0	8.0	11.0	9.0	11.0
#5	—	13.0	11.0	8.0	—	10.0	10.0

Hole #2

Surface Finish, AA 95 - 105
Protrusion, in. 128
Perpendicularity, .001 in./in.
Longitudinal .0021 Transverse .004
Flush Gage Reading, in. 0
Capacitance Gage Reading 236
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	0	-2.0	-3.0	-3.0	0	-3.0	-3.0
#2	7.0	5.0	5.0	6.0	7.0	7.0	8.0
#3	8.0	6.0	6.0	7.0	9.0	7.0	9.0
#4	9.0	6.0	5.0	5.0	8.0	9.0	8.0
#5	9.0	7.0	7.0	7.0	10.0	9.0	9.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable [illegible]
Specimen No. 4E1F

Hole Manufacturing Conditions and Procedures: [illegible]
Spindle, rpm 80 Feed: [illegible]
Cutting Fluid: Oil Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA 110-120
Protrusion, in. 123
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .000
Flush Gage Reading, in. .100
Capacitance Gage Reading 217
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-1.0	-5.0	-5.0	-1.0	1.0	2.0	[illegible]
#2	8.0	7.0	4.0	7.0	[illegible]	9.0	[illegible]
#3	10.0	8.0	4.0	[illegible]	[illegible]	[illegible]	[illegible]
#4	11.0	9.0	5.0	[illegible]	[illegible]	11.0	[illegible]
#5	13.0	13.0	12.0	[illegible]	10.0	[illegible]	[illegible]

Hole #2

Surface Finish, AA 110-12[illegible]
Protrusion, in. 121
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 222
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	0	-4.0	-6.0	-2.0	0	2.0	-1.0
#2	9.0	[illegible]	4.0	5.0	8.0	9.0	[illegible]
#3	9.0	[illegible]	3.0	[illegible]	8.0	9.0	9.0
#4	10.0	[illegible]	3.0	7.0	7.0	10.0	9.0
#5	[illegible]	5.0	14.0	7.0	9.0	[illegible]	9.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable Surface Roughness, RMS
Specimen No. 4C6B 19 w. 3 at 7. 125 max.

Hole Manufacturing Conditions and Procedures: Ream with Union-Size Reamer 1755. Ream Hole to Full Size. Use Cutting Tool Set .015 & Pull Out for Size.
Spindle, rpm 80 Feed: 55 & 3 in.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 112-120
Protrusion, in. 116
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 238
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-6.0	-7.0	-3.0	-1.0	-6.0	-4.0
#2	7.0	3.0	3.0	7.0	7.0	6.0	[illegible]
#3	8.0	4.0	4.0	9.0	9.0	[illegible]	[illegible]
#4	9.0	4.0	5.0	10.0	7.5	[illegible]	[illegible]
#5	8.0	4.0	6.0	10.0	9.0	[illegible]	[illegible]

Hole #2

Surface Finish, AA [illegible]
Protrusion, in. 130
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 247
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-4.0	-3.0	-8.0	-2.0	-6.0	-2.0
#2	6.0	7.0	8.0	7.0	9.0	6.0	7.0
#3	7.0	6.0	7.0	7.0	7.0	6.0	8.0
#4	7.5	6.0	6.0	7.0	7.0	[illegible]	9.0
#5	7.0	5.0	6.0	6.0	10.0	[illegible]	7.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS - SCRATCH
Specimen No. 2C313 MAX. INT. 125 MIN-S

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.255" REAM MOD. H.H. SPIRAL REAMER USE BORING TOOL SET .005 LARGER FOR FINISH
Spindle, rpm 80 Feed: BY HAND
Cutting Fluid: DRY Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 125-
Protrusion, in. .215
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0025
Flush Gage Reading, in. 0
Capacitance Gage Reading 224
Exit Burr Height, in.

Bluing Pin Rollout

65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-7.0	-10.0	-8.0	-2.0	-3.0	-3.0
#2	7.0	4.0	1.0	4.0	6.0	6.0	8.0
#3	9.0	4.0	1.0	5.0	9.0	9.0	10.0
#4	13.0	11.0	9.0	10.0	10.0	11.0	11.0
#5	10.0	13.0	13.0	13.0	10.0	11.0	12.0

Hole #2

Surface Finish, AA 120-125
Protrusion, in. .208
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 220
Exit Burr Height, in.

Bluing Pin Rollout

76%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-7.0	-8.0	-7.0	-3.0	-3.0	-4.0
#2	7.0	5.0	4.0	3.0	7.0	7.0	7.0
#3	9.0	7.0	5.0	4.0	8.0	8.0	9.0
#4	10.0	9.0	7.0	4.0	8.0	10.0	9.0
#5	11.0	11.0	12.0	10.0	10.0	10.0	11.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 17 Quality Variable SURFACE FINISH-SCRATCH
Specimen No. 4A35

Hole Manufacturing Conditions and Procedures: Ream with Under-
size Reamer, Use [illegible]
Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) 2460

Hole #1

Surface Finish, AA 11 - 12
Protrusion, in. .225
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 226
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	0	-6.0	-6.0	-3.0	-1.0	-2.0	-4.0
#2	5.0	4.0	3.0	4.0	6.0	6.0	6.0
#3	9.0	4.0	3.0	7.0	7.0	5.0	6.0
#4	10.0	5.0	3.0	7.0	7.0	12.0	6.0
#5	14.0	12.0	12.0	13.0	9.0	14.0	13.0

Hole #2

Surface Finish, AA 95 - 105
Protrusion, in. .223
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 244
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-2.0	-5.0	-6.0	-5.0	-2.0	-6.0	-5.0
#2	6.0	4.0	4.0	3.0	6.0	4.0	5.0
#3	8.0	6.0	4.0	4.0	8.0	5.0	6.0
#4	9.0	6.0	4.0	3.0	7.0	4.0	7.0
#5	14.0	13.0	13.0	13.0	—	14.0	14.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS-SCOTCH MAX. 110 - 125 RMS

Specimen No. 405B

Hole Manufacturing Conditions and Procedures: REAM WITH U.S.C. SIZE REAMER 1.752" REAM 1700 R.P.M. SIZE WITH P.C. USE BORING TOOL SET .005 FEED FILL WITH [illegible]

Spindle, rpm 80 Feed: .4 .8 IPM

Cutting Fluid: OIL Depth: (Ind. Reading) 2400

Hole #1

Surface Finish, AA 110 - 120

Protrusion, in. .222

Perpendicularity, .001 in./in.

Longitudinal .001 Transverse .003

Flush Gage Reading, in. 0

Capacitance Gage Reading 215

Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	3.0	-5.0	-1.0	0	5.0	-2.0	3.0
#2	11.0	6.0	4.0	8.0	10.0	6.0	10.0
#3	13.0	7.0	5.0	8.0	11.0	8.0	11.0
#4	15.0	9.0	6.0	10.0	11.0	8.0	12.0
#5	—	15.0	—	—	15.0	15.0	—

Hole #2

Surface Finish, AA 115 - 125

Protrusion, in. .220

Perpendicularity, .001 in./in.

Longitudinal .0005 Transverse .002

Flush Gage Reading, in. .001

Capacitance Gage Reading 232

Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	2.0	-3.0	-3.0	0	3.0	3.0	2.0
#2	10.0	7.0	6.0	8.0	10.0	11.0	11.0
#3	10.0	6.0	5.0	9.0	11.0	11.0	12.0
#4	14.0	8.0	7.0	12.0	11.0	13.0	12.0
#5	—	—	—	—	—	—	—

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS AVG. IN
Specimen No. 2U6F MAX. IN 125 AA.

Hole Manufacturing Conditions and Procedures: [illegible]

Spindle, rpm 850 Feed: [illegible]
Cutting Fluid: DRY Depth: (Ind. Reading) 2466

Hole #1

Surface Finish, AA 100 110
Protrusion, in. .230
Perpendicularity, .001 in./in.
Longitudinal .005 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 205
Exit Burr Height, in.

Bluing Pin Rollout 85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-7.0	-10.0	-5.0	3.0	-1.0	-5.0
#2	8.0	4.0	2.0	5.0	6.0	[illegible]	6.0
#3	9.0	6.0	4.0	6.0	7.0	4	[illegible]
#4	12.0	[illegible]	4.0	[illegible]	[illegible]	[illegible]	7.0
#5	10.0	13.0	8.0	12.0	14.0	7.0	11.0

Hole #2

Surface Finish, AA 120-125
Protrusion, in. .222
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 221
Exit Burr Height, in.

Bluing Pin Rollout 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-7.0	-6.0	-3.0	-3.0	-11.0	-3.0
#2	5.0	1.0	1.0	5.0	6.0	2.0	5.0
#3	7.0	1.0	2.0	8.0	8.0	4.0	[illegible]
#4	[illegible]	6.0	[illegible]	2.0	8.0	4.0	[illegible]
#5	[illegible]	11.0	11.0	10.0	10.0	1.0	9.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURF. FIN. ROUGHNESS - SMOOTH
Specimen No. 2E113 MAX INT. 120 AA

Hole Manufacturing Conditions and Procedures: [illegible]
[illegible] REAM ACCEL. SPIRAL REAM and USC Boring Tool [illegible] DRILL UNIT [illegible]
Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) .400

Hole #1

Surface Finish, AA 105-120
Protrusion, in. .221
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .003
Flush Gage Reading, in. .00[illegible]
Capacitance Gage Reading 218
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-10.0	-9.0	-5.0	-5.0	-3.0	-3.0
#2	5.0	0	-1.0	5.0	7.0	6.0	7.0
#3	8.0	5.0	0	7.0	9.0	8.0	9.0
#4	11.0	11.0	11.0	12.0	12.0	10.0	10.0
#5	10.0	12.0	10.0	9.0	9.0	11.0	11.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. .203
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 232
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-2.0	-5.0	-5.0	-3.0	-3.0	-2.0	-3.0
#2	6.0	4.0	3.0	6.0	6.0	3.0	2.0
#3	8.0	5.0	3.0	7.0	8.0	4.0	6.0
#4	8.0	7.0	3.0	9.0	8.0	5.0	10.0
#5	13.0	15.0	12.0	13.0	10.0	11.0	12.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS IN FLUTE
Specimen No. HEAT MIN. INT 125 RMS

Hole Manufacturing Conditions and Procedures: REAM WITH HAND REAMER SIZE REAMED 1.000" REAM MOD LIH SPIRAL FLUTE CARBIDE USE MOD. LIH SPIRAL FLUTE REAMER PUSH IN HAND BY HAND
Spindle, rpm 82 Feed: .3 IPM
Cutting Fluid: OIL Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 100-105
Protrusion, in. .121
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 276
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-14.0	-15.0	-12.0	-13.0	-14.0	-14.0
#2	2.0	2.0	5.0	3.0	1.0	2.0	2.0
#3	3.0	3.0	3.0	4.0	2.0	5.0	3.0
#4	3.0	2.0	2.0	3.0	1.0	4.0	1.0
#5	2.0	2.0	3.0	4.0	2.0	4.0	2.0

Hole #2

Surface Finish, AA 95-110
Protrusion, in. .116
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 312
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-15.0	-12.0	-14.0	-14.0	-15.0	-14.0
#2	2.0	2.0	2.0	1.0	2.0	2.0	2.0
#3	2.0	1.0	2.0	2.0	3.0	2.0	3.0
#4	2.0	1.0	2.0	1.0	1.0	0	2.0
#5	3.0	2.0	3.0	1.0	2.0	1.0	2.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS - BLUING
Specimen No. 206B MIN. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.955" REAM W/OD L.H. SPIRAL REAMER USE MOD. L.H. SPIRAL REAMER PUSH-IN 400-500 No RPM
Spindle, rpm 80 Feed: 5" P IPM.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 110-120 Bluing Pin Rollout
Protrusion, in. 109
Perpendicularity, .001 in./in.
Longitudinal .0005" Transverse .001
Flush Gage Reading, in. 0 75%
Capacitance Gage Reading 275
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-14.0	-15.0	-13.0	-13.0	-12.0	—
#2	3.0	3.0	2.0	3.0	3.0	3.0	2.0
#3	4.0	3.0	2.0	4.0	4.0	6.0	2.0
#4	4.0	3.0	4.0	3.0	3.0	3.0	1.0
#5	4.0	4.0	4.0	3.0	3.0	4.0	2.0

Hole #2

Surface Finish, AA 100-105 Bluing Pin Rollout
Protrusion, in. 115"
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .002
Flush Gage Reading, in. 0 80%
Capacitance Gage Reading 266
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-13.0	-13.0	-14.0	-12.0	-12.0	-11.0
#2	3.0	1.0	2.0	1.0	3.0	4.0	4.0
#3	5.0	2.0	4.0	2.0	4.0	4.0	4.0
#4	4.0	2.0	-1.0	3.0	3.0	2.0	3.0
#5	4.0	2.0	0	3.0	3.0	4.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable Surface Roughness R.F.Hug
Specimen No. 4013 Min Int. [illegible]

Hole Manufacturing Conditions and Procedures: Rough Hole Under-Size Reamed .125" Ream Out with Diamond Reamers USC Modified Spiral Reamed Push thru Hosted No Ream
Spindle, rpm 80 Feed: .5" R.I.P.M.
Cutting Fluid: Dry Depth: (Ind Reading) .5002

Hole #1

Surface Finish, AA 100-105
Protrusion, in. 116
Perpendicularity, .001 in./in.
Longitudinal C Transverse .0010
Flush Gage Reading, in. .001
Capacitance Gage Reading 304
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	—	-14.0	-15.0	-12.0	-12.0	-15.0
#2	2.0	2.0	4.0	3.0	3.0	2.0	2.0
#3	1.0	1.0	3.0	3.0	4.0	3.0	2.0
#4	1.0	2.0	4.0	2.0	3.0	1.0	1.0
#5	2.0	3.0	3.0	3.0	3.0	3.0	3.0

Hole #2

Surface Finish, AA 120-125
Protrusion, in. 120
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0015
Flush Gage Reading, in. .002
Capacitance Gage Reading 266
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-12.0	-13.0	-13.0	-8.0	-9.0	-13.0
#2	4.0	3.0	2.0	2.0	4.0	3.0	3.0
#3	5.0	3.0	3.0	2.0	4.0	3.0	4.0
#4	4.0	3.0	3.0	2.0	4.0	1.0	3.0
#5	4.0	3.0	3.0	4.0	5.0	3.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE Roughness - R. Finish
Specimen No. 4D1F 19 M. FIN. 125 R.A.M.S.

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.73". REAM 1000 R.P.M. WITH SPIRAL REAMER USE MOLY B.H. SOLUBLE OIL AS COOLANT PUSH ~400-500 LBS THRU
Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 100-110
Protrusion, in. 108
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 295
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-14.0	-14.0	-14.0	-12.0	-15.0	-14.0
#2	2.0	2.0	3.0	3.0	3.0	3.0	2.0
#3	1.0	2.0	3.0	3.0	3.0	5.0	2.0
#4	1.0	2.0	2.0	1.0	0	1.0	
#5	2.0	2.0	3.0	2.0	1.0	3.0	2.0

Hole #2

Surface Finish, AA 110-115
Protrusion, in. 111
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 288
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-13.0	-14.0	-14.0	-12.0	-11.0	-13.0
#2	3.0	2.0	3.0	3.0	2.0	4.0	5.0
#3	3.0	2.0	4.0	3.0	3.0	4.0	4.0
#4	3.0	2.0	4.0	2.0	2.0	2.0	3.0
#5	3.0	4.0	4.0	2.0	2.0	3.0	4.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS - RIFLING
Specimen No. 4C2FC M.N. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1755 REAM MOD. L.H. SPIRAL REAMER USE MOD L.H. SPIRAL REAMER PUSH-IN 400-500 NO RPM
Spindle, rpm 80 Feed: 5 IPM.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 120-125
Protrusion, in. .122
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 387
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-15.0	-11.0	-14.0	-12.0	-10.0	-14.0
#2	3.0	3.0	4.0	3.0	4.0	5.0	3.0
#3	3.0	3.0	5.0	4.0	3.0	6.0	3.0
#4	2.0	2.0	2.0	3.0	3.0	3.0	2.0
#5	3.0	3.0	3.0	3.0	3.0	4.0	3.0

Hole #2

Surface Finish, AA 125 32
Protrusion, in. .118
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 269
Exit Burr Height, in.

Bluing Pin Rollout

85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-14.0	-9.0	-14.0	-11.0	-9.0	-13.0
#2	4.0	3.0	4.0	2.0	4.0	3.0	3.0
#3	5.0	4.0	5.0	4.0	5.0	4.0	4.0
#4	5.0	3.0	3.0	5.0	5.0	3.0	3.0
#5	6.0	4.0	4.0	5.0	5.0	3.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS-RELIEF
Specimen No. 2B48 MAT. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM WITH UNDERSIZE REAMER 1.755 REAM MID. L.H. SPIRAL REAMER USE M.D. & H. SPIRAL REAMER PUSH-IN 400-500 PSI RPM
Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 100-110
Protrusion, in. 210
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .0015
Flush Gage Reading, in. .002
Capacitance Gage Reading 294
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-15.0	-14.0	-13.0	-10.0	-12.0	-14.0
#2	3.0	3.0	3.0	2.0	3.0	3.0	4.0
#3	3.0	2.0	4.0	3.0	3.0	2.0	3.0
#4	3.0	2.0	4.0	1.0	2.0	2.0	3.0
#5	11.0	8.0	10.0	8.0	8.0	9.0	10.0

Hole #2

Surface Finish, AA 125-135
Protrusion, in. 212
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. .001
Capacitance Gage Reading 265
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-13.0	-12.0	-8.0	-10.0	-10.0	-14.0
#2	3.0	2.0	3.0	3.0	3.0	4.0	3.0
#3	4.0	5.0	6.0	2.0	3.0	5.0	4.0
#4	5.0	5.0	5.0	1.0	3.0	3.0	4.0
#5	12.0	12.0	10.0	10.0	9.0	10.0	10.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE [illegible]
Specimen No. 2E313

Hole Manufacturing Conditions and Procedures: REAM WITH [illegible]
SIZE REAMER 1.755 REAM W/ L.H. SPIRAL REAMER
USE MOD L.H. SPIRAL REAMER PUSH-IN YOKES NO REAM
Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 110-120
Protrusion, in. .211
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 291
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-12.0	-12.0	-10.0	-8.0	-10.0	-12.0
#2	5.0	3.0	3.0	2.0	3.0	4.0	4.0
#3	4.0	4.0	4.0	3.0	5.0	5.0	4.0
#4	3.0	4.0	5.0	3.0	4.0	5.0	3.0
#5	11.0	11.0	11.0	11.0	11.0	12.0	11.0

Hole #2

Surface Finish, AA 95-110
Protrusion, in. .217
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading 288
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-14.0	-9.0	-14.0	-13.0	-13.0	-13.0
#2	3.0	3.0	5.0	3.0	3.0	2.0	3.0
#3	3.0	2.0	4.0	3.0	3.0	3.0	3.0
#4	3.0	1.0	2.0	1.0	3.0	4.0	3.0
#5	10.0	10.0	10.0	9.0	9.0	10.0	10.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS - PEAK MAX IN. (CENTER)
Specimen No. 2023

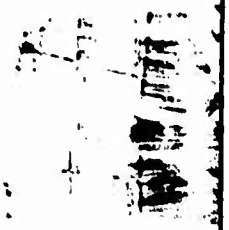
Hole Manufacturing Conditions and Procedures: REAM W/ UNDER-SIZE REAMER 1.25". REAM MOD. WITH SPIRAL REAMER USE A.M. WITH SPIRAL REAMER DRILLED 4 HOLES NO. 1 PRI.
Spindle, rpm 80 Feed: 5 P. I. PRI
Cutting Fluid: OIL Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 110 120
Protrusion, in. .210
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 290
Exit Burr Height, in.

Bluing Pin Rollout

65%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-9.0	-9.0	-10.0	-10	-9.0	-9.0
#2	5.0	2.0	2.0	3.0	4.0	4.0	5.0
#3	3.0	2.0	3.0	3.0	4.0	3.0	2.0
#4	2.0	2.0	4.0	3.0	4.0	5.0	1.0
#5	10.0	10.0	10.0	8.0	10.0	9.0	10.0

Hole #2

Surface Finish, AA 120 - 125
Protrusion, in. .211
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 311
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-14.0	-14.0	-15.0	-14.0	-14.0	-15.0
#2	3.0	2.0	3.0	2.0	4.0	4.0	3.0
#3	3.0	3.0	3.0	2.0	4.0	4.0	3.0
#4	2.0	3.0	1.0	1.0	4.0	3.0	3.0
#5	9.0	10.0	9.0	7.0	10.0	8.0	10.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS, RIFLEY AVG ENT 125 RMS
Specimen No. 3C13

Hole Manufacturing Conditions and Procedures: DRILL WITH UNDER-SIZE REAMER 1.275" REAM M&W L.H. SPIRAL FLUTE REAMER USE M&W L.H. SPIRAL FLUTE REAMER PUSH-IN 400-500 NO. REAM.
Spindle, rpm 60 Feed: .5 IPM
Cutting Fluid: OIL Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 120-125
Protrusion, in. .212
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 301
Exit Burr Height, in.

Bluing Pin Rollout

65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-14.0	-13.0	-11.0	-11.0	-10.0	-12.0
#2	5.0	2.0	3.0	5.0	4.0	4.0	5.0
#3	4.0	3.0	5.0	4.0	4.0	2.0	4.0
#4	3.0	3.0	4.0	4.0	4.0	1.0	3.0
#5	10.0	11.0	11.0	8.0	8.0	13.0	11.0

Hole #2

Surface Finish, AA 110-120
Protrusion, in. .205
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .002
Flush Gage Reading, in. .002
Capacitance Gage Reading 310
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-11.0	-14.0	-12.0	-13.0	-10.0	-12.0
#2	2.0	3.0	3.0	3.0	4.0	4.0	3.0
#3	3.0	3.0	5.0	4.0	4.0	4.0	4.0
#4	1.0	3.0	4.0	4.0	10.0	4.0	4.0
#5	10.0	11.0	9.0	8.0	13.0	11.0	10.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE Roughness - R.Fluey
Specimen No. 2 BIT MAX. 7M² 125 R.M.S

Hole Manufacturing Conditions and Procedures: Ream with Undersize Reamer 1.755" Ream 1.760 with Standard Reamer
Use Mandrel with Standard Reamer Push-in Type No P.C.D.
Spindle, rpm 80 Feed: 55 & 12 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 125
Protrusion, in. .218
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 295
Exit Burr Height, in.

Bluing Pin Rollout

20%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-13.0	-10.0	-12.0	-13.0	-10.0	-12.0
#2	2.0	2.0	3.0	3.0	[illegible]	3.0	3.0
#3	4.0	3.0	4.0	2.0	[illegible]	4.0	4.0
#4	4.0	1.0	2.0	3.0	3.0	3.0	3.0
#5	9.0	11.0	10.0	11.0	10.0	12.0	8.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. .305
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 338
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	—	-15.0	-14.0	-14.0	-14.0	-15.0
#2	2.0	2.0	2.0	3.0	2.0	2.0	2.0
#3	2.0	2.0	2.0	3.0	3.0	3.0	3.0
#4	1.0	1.0	2.0	3.0	3.0	2.0	3.0
#5	8.0	7.0	9.0	11.0	8.0	9.0	7.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS ONLY
Specimen No. 4/63F

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE
REAMED TO SIZE WITH [illegible] USE
SIX FLUTE REAMER, 125 ± 500 IN FROM [illegible]
Spindle, rpm 80 Feed: .55 IPM
Cutting Fluid: OIL Depth: (Ind. Reading) 2.503

Hole #1

Surface Finish, AA 100
Protrusion, in. 125
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0015
Flush Gage Reading, in. 0
Capacitance Gage Reading 272
Exit Burr Height, in.

Bluing Pin Rollout

55%

319
325

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-11.0	-11.0	-6.0	-5.0	-5	-1.0
#2	3.0	4.0	4.0	6.0	7.0	5.0	5.0
#3	5.0	5.0	6.0	7.0	8.0	9.0	6.0
#4	7.0	8.0	10.0	6.0	11.0	12.0	9.0
#5	7.0	10.0	12.0	7.0	11.0	11.0	11.0

Hole #2

Surface Finish, AA 100 125
Protrusion, in. 110
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .002
Flush Gage Reading, in. -.001
Capacitance Gage Reading 279
Exit Burr Height, in.

Bluing Pin Rollout

60%

320
325

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-9.0	-10.0	-11.0	-11.0	-11.0	-9.0
#2	6.0	5.0	5.0	4.0	5.0	4.0	5.0
#3	8.0	7.0	7.0	5.0	5.0	6.0	5.0
#4	6.0	7.0	12.0	5.0	9.0	11.0	9.0
#5	7.0	9.0	12.0	5.0	12.0	11.0	10.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable [illegible]
Specimen No. 4E513 [illegible]

Hole Manufacturing Conditions and Procedures: [illegible]

Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA [illegible]
Protrusion, in. [illegible]
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 255
Exit Burr Height, in.

Bluing Pin Rollout

60%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
#2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
#3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
#4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
#5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Hole #2

Surface Finish, AA [illegible]
Protrusion, in. [illegible]
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. 0
Capacitance Gage Reading 229
Exit Burr Height, in.

Bluing Pin Rollout

65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
#2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
#3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
#4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
#5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable [illegible]
Specimen No. [illegible]

Hole Manufacturing Conditions and Procedures: [illegible]

Spindle, rpm 80 Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA [illegible]
Protrusion, in. .118
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 267
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	[illegible]	-9.0	-9.0	[illegible]	-9.0	[illegible]
#2	5.0	4.0	5.0	5.0	[illegible]	4.0	5.0
#3	5.0	11.0	11.0	6.0	[illegible]	6.0	[illegible]
#4	7.0	13.0	13.0	4.0	[illegible]	[illegible]	[illegible]
#5	9.0	11.0	12.0	4.0	[illegible]	[illegible]	[illegible]

Hole #2

Surface Finish, AA [illegible]
Protrusion, in. .112
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .004
Flush Gage Reading, in. .001
Capacitance Gage Reading 247
Exit Burr Height, in.

Bluing Pin Rollout 65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-6.0	-8.0	-8.0	[illegible]	-3.0	-9.0
#2	6.0	[illegible]	4.0	5.0	[illegible]	11.0	4.0
#3	2.0	[illegible]	6.0	7.0	[illegible]	14.0	6.0
#4	6.0	[illegible]	9.0	8.0	[illegible]	[illegible]	[illegible]
#5	7.0	[illegible]	10.0	7.0	[illegible]	[illegible]	[illegible]

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 2B3T MIN. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
PILOT .175" REAM MED. WITH SPIRAL REAMER USE
STOCK 1100-T6 PLATE =R PILOT .176 ± .001 IN TRANSVERSE DIR.

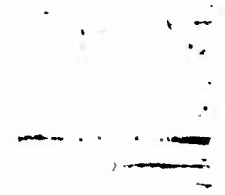
Spindle, rpm 80 Feed: .25 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) .500

Hole #1

Surface Finish, AA 100 - 105
Protrusion, in. .128
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .005
Flush Gage Reading, in. 0
Capacitance Gage Reading 239
Exit Burr Height, in.

70%

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-3.0	-2.0	-4.0	-5.0	-7.0	-9.0
#2	2.0	3.0	4.0	5.0	6.0	7.0	8.0
#3	4.0	9.0	5.0	7.0	8.0	10.0	8.0
#4	5.0	11.0	15.0	6.0	7.0	11.0	6.0
#5	8.0	7.0	12.0	5.0	9.0	11.0	6.0

Hole #2

Surface Finish, AA 115 - 125
Protrusion, in. .110
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .003
Flush Gage Reading, in. 0
Capacitance Gage Reading 310
Exit Burr Height, in.

65%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-11.0	-12.0	-10.0	-15.0	-12.0	-15.0
#2	4.0	4.0	3.0	5.0	5.0	5.0	3.0
#3	4.0	4.0	3.0	4.0	4.0	4.0	3.0
#4	3.0	3.0	7.0	4.0	8.0	9.0	1.0
#5	5.0	9.0	10.0	4.0	10.0	10.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS ONLY
Specimen No. 4B2B

Hole Manufacturing Conditions and Procedures: .1 UNDER SIZE
REAMER 1.755" REM. 1" L.H. SPIRAL REAMER USE
STRAIGHT FLUTE REM. A PLUG .120 ± .001 IN THICK POS.
Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.500

Hole #1

Surface Finish, AA 10 Bluing Pin Rollout
Protrusion, in. .118
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. .001 70%
Capacitance Gage Reading 309
Exit Burr Height, in.

319
324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-10.0	-11.0	-12.0	-12.0	-10.0	-12.0
#2	5.0	5.0	4.0	5.0	5.0	4.0	4.0
#3	5.0	5.0	7.0	4.0	3.0	4.0	4.0
#4	4.0	16.0	11.0	2.0	2.0	7.0	6.0
#5	7.0	11.0	10.0	4.0	6.0	10.0	10.0

Hole #2

Surface Finish, AA 10 Bluing Pin Rollout
Protrusion, in. .119
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0 75%
Capacitance Gage Reading 266
Exit Burr Height, in.

319
326

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-10.0	-11.0	-9.0	-11.0	-9.0	-10.0
#2	3.0	4.0	2.0	4.0	3.0	4.0	4.0
#3	4.0	5.0	8.0	6.0	7.0	8.0	6.0
#4	5.0	13.0	12.0	6.0	11.0	11.0	5.0
#5	6.0	12.0	11.0	7.0	10.0	11.0	7.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS QUALITY
Specimen No. 2E48 19.0 x 1.75 x 1.25

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE REAMED 1.755 REAM 1.800 L.H. SO RH REAMED 45° STRAIGHT FLUTE REAMED AWAY 1.700 ± .005 IN TRANSVERSE DIR.

Spindle, rpm 80 Feed: 5" PER MIN.
Cutting Fluid: DRY Depth: (Ind. Reading) .250

Hole #1

Surface Finish, AA 110
Protrusion, in. .215
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 348
Exit Burr Height, in.

Bluing Pin Rollout

65%

317
.5

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-7.0	-7.0	-5.0	-6.0	-5.0
#2	7.0	10.0	10.0	7.0	8.0	10.0	10.0
#3	12.0	13.0	13.0	9.0	12.0	13.0	13.0
#4	14.0	14.0	14.0	11.0	12.0	15.0	14.0
#5	15.0	14.0	14.0	13.0	12.0	13.0	13.0

Hole #2

Surface Finish, AA 110
Protrusion, in. .211
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .003
Flush Gage Reading, in. 0
Capacitance Gage Reading 348
Exit Burr Height, in.

Bluing Pin Rollout

70%

317
.5

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-8.0	-13.0	-8.0	-4.0	-4.0	-7.0
#2	6.0	8.0	11.0	7.0	11.0	12.0	12.0
#3	9.0	13.0	14.0	8.0	14.0	14.0	13.0
#4	12.0	14.0	15.0	12.0	15.0		15.0
#5	12.0	15.0	15.0	14.0	15.0	15.0	14.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE FINISH AVAILABILITY
Specimen No. 2C1F AFML IN 125 RMS

Hole Manufacturing Conditions and Procedures: REAM 2 HOLES SIZE
REAM W/ 125 [illegible] LE [illegible] REAM W/ 1/8
[illegible] FLUTE REAM & PLUNGE 1200 F.R. 6 IN/[illegible]
Spindle, rpm 80 Feed: [illegible]
Cutting Fluid: OIL Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA 90-95 Bluing Pin Rollout
Protrusion, in. .219
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0015
Flush Gage Reading, in. 0
Capacitance Gage Reading 245
Exit Burr Height, in.

60%

318
323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-6.0	6.0	-5.0	-4.0	-3.0
#2	8.0	11.0	11.0	8.0	10.0	12.0	10.0
#3	13.0	14.0	14.0	12.0	14.0	14.0	13.0
#4	13.0	15.0	15.0	13.0	13.0	15.0	14.0
#5	11.0	12.0	12.0	10.0	12.0	12.0	12.0

Hole #2

Surface Finish, AA 90- Bluing Pin Rollout
Protrusion, in. .230
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .00[illegible]
Flush Gage Reading, in. -.002
Capacitance Gage Reading 239
Exit Burr Height, in.

65%

317
321

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-8.0	-7.0	-5.0	-6.0	-4.0	-3.0
#2	8.0	12.0	10.0	7.0	11.0	13.0	9.0
#3	11.0	13.0	14.0	12.0	14.0	15.0	13.0
#4	14.0	14.0	15.0	13.0	15.0	15.0	14.0
#5	12.0	14.0	14.0	12.0	14.0	14.0	13.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS-OVALITY
Specimen No. 21F3 HOLE TYP. 125/120

Hole Manufacturing Conditions and Procedures: REAM UNDER-SIZE
RUN AT 125 RPM REAM USED WITH SPECIAL REAMER USE
STAINLESS EMULSION PLUNGE FEED TRAVERSE FEED
Spindle, rpm 80 Feed: .5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.382

Hole #1

Surface Finish, AA 95
Protrusion, in. .220
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 232
Exit Burr Height, in.

Bluing Pin Rollout

60%

317
323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-6.0	-5.0	-9.0	4.0	-3.0	-5.0
#2	7.0	12.0	12.0	7.0	11.0	13.0	9.0
#3	12.0	14.0	14.0	7.0	14.0	16.0	13.0
#4	12.0	—		10.0	15.0	14.0	12.0
#5	12.0	12.0	14.0	14.0	12.0	14.0	14.0

Hole #2

Surface Finish, AA 105
Protrusion, in. .226
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .003
Flush Gage Reading, in. 0
Capacitance Gage Reading 251
Exit Burr Height, in.

Bluing Pin Rollout

70%

317
323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-10.0	-7.0	-6.0	-8.0	-4.0	-5.0
#2	7.0	16.0	11.0	7.0	11.0	11.0	9.0
#3	8.0	17.0	14.0	10.0	14.0	14.0	12.0
#4	11.0	15.0	15.0	12.0	14.0	15.0	14.0
#5	13.0	14.0	14.0	12.0	14.0	14.0	12.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS - CRITICAL

Specimen No. 305F

Hole Manufacturing Conditions and Procedures: [illegible]

Spindle, rpm 60 Feed: [illegible]

Cutting Fluid: DRY Depth: (Ind. Reading) .360

Hole #1

Surface Finish, AA 95 — Bluing Pin Rollout

Protrusion, in. .225

Perpendicularity, .001 in./in.

Longitudinal .0015 Transverse .0012

Flush Gage Reading, in. 0

Capacitance Gage Reading 258

Exit Burr Height, in.

55%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-9.0	-4.0	-5.0	[illegible]	-2.0	-5.0
#2	7.0	11.0	11.0	5.0	10.0	[illegible]	10.0
#3	11.0	14.0	14.0	10.0	12.0	15.0	14.0
#4	12.0	15.0	15.0	11.0	15.0	—	13.0
#5	13.0	13.0	15.0	15.0	13.0	14.0	15.0

Hole #2

Surface Finish, AA 105 — Bluing Pin Rollout

Protrusion, in. .228

Perpendicularity, .001 in./in.

Longitudinal 0 Transverse 0

Flush Gage Reading, in. 0

Capacitance Gage Reading 247

Exit Burr Height, in.

70%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-6.0	-9.0	-8.0	-9.0	-8.0	-8.0
#2	5.0	8.0	10.0	7.0	10.0	10.0	5.0
#3	9.0	13.0	13.0	9.0	13.0	13.0	9.0
#4	12.0	13.0	15.0	12.0	15.0	12.0	12.0
#5	13.0	13.0	14.0	13.0	14.0	12.0	15.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 19 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 4B1B MAX. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE REAMED 1.255 REAM NOM. L.H. SQ. OUT PERPEN. USE STRAIGHT FLUTE REAMER PURCHASE 1.200 ± .001 INTERFERENCE FIT
Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) .380

Hole #1

Surface Finish, AA 120
Protrusion, in. .220
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 242
Exit Burr Height, in.

Bluing Pin Rollout

55%

Air Gage Readings (.0001 in.)
Angular Position

318
324

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-9.0	-9.0	-8.0	-5.0	-4.0	-7.0
#2	5.0	-10.0	11.0	6.0	9.0	12.0	11.0
#3	10.0	13.0	13.0	7.0	13.0	14.0	14.0
#4	12.0	13.0	13.0	8.0	13.0	15.0	15.0
#5	13.0	13.0	13.0	13.0	13.0	14.0	15.0

Hole #2

Surface Finish, AA 100-105
Protrusion, in. .214
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 262
Exit Burr Height, in.

Bluing Pin Rollout

65%

Air Gage Readings (.0001 in.)
Angular Position

319
324

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-8.0	-9.0	-7.0	-11.0	-8.0	-9.0
#2	6.0	9.0	10.0	5.0	8.0	[illegible]	5.0
#3	8.0	13.0	13.0	9.0	12.0	[illegible]	11.0
#4	10.0	15.0	14.0	10.5	13.0	14.0	13.0
#5	14.0	14.0	14.0	13.0	12.0	14.0	14.0

INSPECTION SHEETS FOR TEST SERIES 20/21 -

COMBINED VARIABLES, REVERSE DOGBONE SPECIMENS

R RATIO = 0.1

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS 125 RMS
Specimen No. 4D1BC & 6C3BC

Hole Manufacturing Conditions and Procedures: Ream with Undersize Reamer to 1.753" Ream and O.H. Spindle Reduced

Spindle, rpm 80 Feed: .5 8 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2450

Hole #1

Surface Finish, AA 95-100
Protrusion, in. 155
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0005
Flush Gage Reading, in. 1062
Capacitance Gage Reading 327
Exit Burr Height, in.

Bluing Pin Rollout

90%

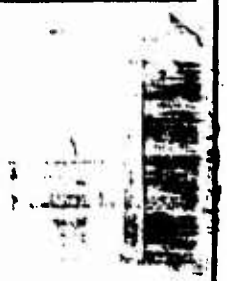
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-3.0	-4.0	-8.0	-11.0	-9.0	-10.0
#2	4.0	4.0	4.0	4.0	3.0	3.0	3.0
#3	3.0	3.0	3.0	3.0	2.0	4.0	4.0
#4	2.0	2.0	2.0	2.0	2.0	3.0	4.0
#5	3.0	2.0	2.0	4.0	4.0	5.0	5.0

Hole #2

Surface Finish, AA 95-110
Protrusion, in. 166
Perpendicularity, .001 in./in.
Longitudinal 10015 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 327
Exit Burr Height, in.

Bluing Pin Rollout



85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-3.0	-3.0	-9.0	-9.0	-8.0	-8.0
#2	4.0	5.0	5.0	3.0	3.0	4.0	3.0
#3	4.0	4.0	4.0	3.0	2.0	3.0	2.0
#4	2.0	1.0	2.0	3.0	3.0	2.0	0
#5	3.0	1.0	2.0	4.0	3.0	3.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 2L Quality Variable _____
Specimen No. 2B2BC L3C2BC

Hole Manufacturing Conditions and Procedures: Ream with Undersize Reamer 1.255. Ream and D.H. Size Ream

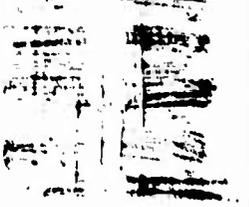
Spindle, rpm 80 Feed: .5 IPRV.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.452

Hole #1

Surface Finish, AA 110-130
Protrusion, in. 174
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .002
Flush Gage Reading, in. .051
Capacitance Gage Reading 275
Exit Burr Height, in. _____

75%

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-3.0	-5.0	-7.0	-6.0	-8.0	-7.0
#2	6.0	2.0	5.0	4.0	4.0	5.0	2.0
#3	5.0	5.0	5.0	5.0	4.0	5.0	6.0
#4	3.0	4.0	3.0	3.0	1.0	3.0	5.0
#5	6.0	5.0	5.0	6.0	3.0	6.0	7.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. 173
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 305
Exit Burr Height, in. _____

85%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-9.0	-4.0	-8.0	-9.0	-10.0	-10.0
#2	3.0	1.0	4.0	3.0	3.0	2.0	1.0
#3	4.0	1.0	4.0	5.0	3.0	2.0	2.0
#4	4.0	0	2.0	1.0	2.0	2.0	2.0
#5	7.0	3.0	4.0	4.0	3.0	4.0	4.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS 125 RMS
Specimen No. LC3T L3C6 TC

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755. REAM WITH MOD. L.H. SPIRAL REAMER

Spindle, rpm 80 Feed: 55 I.P.M.
Cutting Fluid: OIL Depth: (Ind. Reading) 2450

Hole #1

Surface Finish, AA 90-100
Protrusion, in. .162
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 308
Exit Burr Height, in.

Bluing Pin Rollout 90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-2.0	-3.0	-5.0	-7.0	-10.0	-12.0	-8.0
#2	4.0	3.0	4.0	2.0	3.0	2.0	3.0
#3	2.0	2.0	3.0	4.0	3.0	3.0	3.0
#4	1.0	0	0	4.0	4.0	4.0	3.0
#5	2.0	1.0	2.0	6.0	5.0	5.0	4.0

Hole #2

Surface Finish, AA 110-125
Protrusion, in. .166
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading 330
Exit Burr Height, in.

Bluing Pin Rollout 85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-6.0	-9.0	-12.0	-10.0	-10.0
#2	3.0	4.0	4.0	4.0	2.0	2.0	2.0
#3	4.0	2.0	2.0	3.0	4.0	4.0	3.0
#4	2.0	0	1.0	2.0	3.0	2.0	2.0
#5	2.0	1.0	1.0	4.0	4.0	4.0	2.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS 125 RMS
Specimen No. 3C3B3CL6B3B3C

Hole Manufacturing Conditions and Procedures: Ream with UNIQUE-SIZE Reamer 1.750" Dia. 1700 R.P.M. 50 in./min. Feed

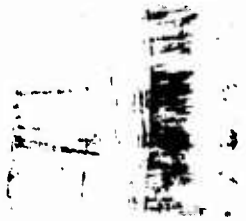
Spindle, rpm 80 Feed: .5 in./min.
Cutting Fluid: DRY Depth: (Ind. Reading) 2450

Hole #1

Surface Finish, AA 90-110
Protrusion, in. .173
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 320
Exit Burr Height, in.

Bluing Pin Rollout

80%



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-5.0	-6.0	-7.0	-12.0	-13.0	-10.0
#2	4.0	6.0	4.0	4.0	3.0	2.0	2.0
#3	3.0	3.0	2.0	4.0	3.0	2.0	2.0
#4	2.0	2.0	2.0	3.0	3.0	3.0	2.0
#5	4.0	2.0	5.0	5.0	5.0	5.0	4.0

Hole #2

Surface Finish, AA 95-105
Protrusion, in. .170
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading 316
Exit Burr Height, in.

Bluing Pin Rollout

90%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-4.0	-5.0	-8.0	-8.0	-13.0	-5.0
#2	5.0	7.0	7.0	6.0	3.0	1.0	5.0
#3	2.0	3.0	5.0	4.0	4.0	2.0	3.0
#4	0	1.0	0	2.0	3.0	3.0	2.0
#5	1.0	2.0	2.0	5.0	6.0	13.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS 125 MICROS
Specimen No. 3C3B2L4L3TC

Hole Manufacturing Conditions and Procedures: REAM WITH UNDERSIZE REAMER 1.255. REAM MED. LIKE SPIRAL REAMER

Spindle, rpm 80 Feed: 55 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2450

Hole #1

Surface Finish, AA 90-100
Protrusion, in. 181
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 328
Exit Burr Height, in.

85%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

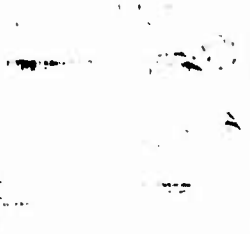
Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-8.0	-8.0	-8.0	-7.0	-11.0	-8.0
#2	4.0	3.0	3.0	3.0	3.0	2.0	3.0
#3	4.0	2.0	2.0	3.0	5.0	3.0	4.0
#4	4.0	4.0	4.0	3.0	5.0	2.0	3.0
#5	5.0	5.0	4.0	2.0	4.0	4.0	4.0

Hole #2

Surface Finish, AA 100-105
Protrusion, in. 182
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 300
Exit Burr Height, in.

80%

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-6.0	-4.0	-7.0	-10.0	-11.0	-10.0
#2	2.0	5.0	4.0	3.0	2.0	2.0	2.0
#3	4.0	4.0	4.0	3.0	4.0	4.0	4.0
#4	3.0	2.0	2.0	4.0	4.0	3.0	2.0
#5	3.0	2.0	2.0	4.0	5.0	4.0	4.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE - FINISH
Specimen No. 6238L21STC MIN. FIN. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE
REAMER 1.75", REAM MOD. 6, FL. SOLID REAMER

Spindle, rpm 50 Feed: 5 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.446

Hole #1

Surface Finish, AA 105
Protrusion, in. .171
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse 0
Flush Gage Reading, in. -.001
Capacitance Gage Reading 310
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-15.0	-15.0	-15.0	-14.0	-15.0	-13.0
#2	3.0	3.0	3.0	2.0	1.0	2.0	2.0
#3	5.0	4.0	4.0	3.0	3.0	3.0	4.0
#4	5.0	4.0	4.0	3.0	3.0	3.0	4.0
#5	5.0	4.0	4.0	2.0	3.0	4.0	4.0

Hole #2

Surface Finish, AA 90
Protrusion, in. .172
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 298
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-15.0	-14.0	—	-14.0	-14.0	-14.0
#2	3.0	2.0	3.0	1.0	3.0	3.0	3.0
#3	5.0	4.0	4.0	2.0	4.0	4.0	4.0
#4	4.0	3.0	4.0	3.0	4.0	4.0	4.0
#5	4.0	4.0	4.0	3.0	3.0	4.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE - PROTRUSION
Specimen No. 3CHTC231STC M.C. STA. 181 AFT

Hole Manufacturing Conditions and Procedures: REAM UNDER .2E
REAM TO 1.75" DIA. STD. HSS REAMER

Spindle, rpm 80 Feed: .2 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 2.442

Hole #1

Surface Finish, AA 110 115
Protrusion, in. .172
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 323
Exit Burr Height, in.

Bluing Pin Rollout 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-14.0	-14.0	-15.0	-14.0	-14.0	-15.0
#2	2.0	3.0	3.0	3.0	2.0	2.0	2.0
#3	4.0	4.0	4.0	4.0	4.0	4.0	4.0
#4	4.0	4.0	3.0	3.0	3.0	3.0	3.0
#5	4.0	4.0	3.0	3.0	3.0	2.0	3.0

Hole #2

Surface Finish, AA 110-115
Protrusion, in. .157
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 276
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-13.0	-12.0	-14.0	-15.0	-15.0	15.0
#2	3.0	3.0	4.0	3.0	2.0	2.0	3.0
#3	5.0	5.0	5.0	4.0	3.0	4.0	4.0
#4	5.0	5.0	5.0	5.0	3.0	3.0	4.0
#5	4.0	5.0	5.0	4.0	3.5	3.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS

Specimen No. 603TC & 2C5TC [illegible]

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE [illegible] EX 1755. REAM [illegible] L.M. SQUARE REAMER

Spindle, rpm 50 Feed: [illegible]

Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 165

Protrusion, in. 163

Perpendicularity, .001 in./in.

Longitudinal 0 Transverse .0015

Flush Gage Reading, in. 0

Capacitance Gage Reading 310

Exit Burr Height, in.

Bluing Pin Rollout 15%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-14.0	-15.0	-14.0	-15.0	-14.0	-14.0
#2	3.0	3.0	2.0	3.0	3.0	3.0	3.0
#3	5.0	5.0	5.0	5.0	4.0	4.0	5.0
#4	5.0	5.0	5.0	4.0	3.0	4.0	4.0
#5	4.0	4.0	4.0	4.0	4.0	4.0	4.0

Hole #2

Surface Finish, AA 100

Protrusion, in. 168

Perpendicularity, .001 in./in.

Longitudinal .0005 Transverse 0

Flush Gage Reading, in. -.002

Capacitance Gage Reading 297

Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	—	—	—	-15.0	—	-14.0
#2	3.0	3.0	3.0	4.0	3.0	3.0	3.0
#3	4.0	4.0	4.0	4.0	4.0	4.0	3.0
#4	4.0	3.0	4.0	3.0	4.0	4.0	3.0
#5	3.0	5.0	4.0	4.0	4.0	4.0	3.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS
Specimen No. 21327C4 36686 [illegible]

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REAMER 1.755, REAM 1.760 WITH [illegible] REAMER

Spindle, rpm 80 Feed: [illegible]
Cutting Fluid: DRY Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA 115 — Bluing Pin Rollout
Protrusion, in. .170
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015 75%
Flush Gage Reading, in. 0
Capacitance Gage Reading 290
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-10.0	-9.0	-10.0	-10.0	-10.0	-9.0
#2	4.0	3.0	3.0	2.0	2.0	3.0	5.0
#3	5.0	4.0	5.0	4.0	3.0	4.0	5.0
#4	5.0	4.0	4.0	5.0	3.0	4.0	4.0
#5	5.0	6.0	6.0	6.0	5.0	6.0	6.0

Hole #2

Surface Finish, AA 90-100 — Bluing Pin Rollout
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0 75%
Flush Gage Reading, in. 0
Capacitance Gage Reading 391
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-11.0	-11.0	-10.0	-11.0	-9.0	-9.0
#2	3.0	3.0	3.0	5.0	3.0	4.0	4.0
#3	4.0	5.0	5.0	4.0	4.0	5.0	5.0
#4	5.0	5.0	5.0	5.0	4.0	5.0	5.0
#5	5.0	6.0	6.0	5.0	5.0	6.0	7.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS MID. INT. 125 RMS
Specimen No. 3E2B2 6B4T

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE REAM W 1.755. REAM MOD. L.H. SPIRAL REAMER.

Spindle, rpm 80 Feed: ~~5~~ 8 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 100
Protrusion, in. 178
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 353
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-15.0	-15.0	-14.0	-14.0	—	-15.0
#2	2.0	2.0	3.0	3.0	2.0	2.0	3.0
#3	2.0	4.0	4.0	4.0	4.0	3.0	4.0
#4	2.0	3.0	4.0	4.0	3.0	3.0	3.0
#5	4.0	4.0	4.0	5.0	3.0	3.0	3.0

Hole #2

Surface Finish, AA 110
Protrusion, in. 176
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 301
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-13.0	-15.0	-15.0	-15.0	-14.0	-14.0
#2	3.0	4.0	3.0	3.0	3.0	3.0	3.0
#3	5.0	5.0	5.0	5.0	4.0	4.0	4.0
#4	5.0	5.0	4.0	3.0	4.0	4.0	4.0
#5	4.0	6.0	4.0	5.0	5.0	4.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable Surface-Roughness Scratch
Specimen No. 2ALFC - 4F6BC M.D-INT. 125 RMS

Hole Manufacturing Conditions and Procedures: Rough with Modified-Size Reamer 1.755" Ream, and Finish Spiral Flute Use Rotary Tool Set .065 Equivalent for Size

Spindle, rpm 80 Feed: .5 & IPM
Cutting Fluid: Oily Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 95-
Protrusion, in. .170
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 235
Exit Burr Height, in.

Bluing Pin Rollout

65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-10.0	-15.0	-7.0	-6.0	-11.0	-9.0
#2	6.0	5.0	2.0	5.0	6.0	4.0	5.0
#3	7.0	6.0	4.0	7.0	6.0	5.0	7.0
#4	8.0	7.0	5.0	8.0	7.0	4.0	7.0
#5	10.0	11.0	10.0	10.0	10.0	6.0	10.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. .188
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 238
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-6.0	-8.0	-6.0	-5.0	-9.0	-11.0
#2	6.0	5.0	3.0	4.0	2.0	4.0	5.0
#3	7.0	6.0	4.0	6.0	2.0	6.0	6.0
#4	9.0	8.0	5.0	6.0	8.0	5.0	5.0
#5	12.0	12.0	12.0	12.0	12.0	10.0	8.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE - ROUGHNESS - SCRATCH
Specimen No. 6B2B - 606T AT. 0 - 1 NT. 125 M.M.S

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.255". REAM MOD. L.H. SPIRAL REAMER USE Balax TOOL SET 1005 & PULL OUT FOR SCRATCH
Spindle, rpm 80 Feed: 55 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 95 - 105
Protrusion, in. .174
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0005
Flush Gage Reading, in. .001
Capacitance Gage Reading 231
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-10.0	-11.0	-10.0	-9.0	-9.0	-8.0
#2	5.0	5.0	4.0	7.0	7.0	6.0	5.0
#3	7.0	7.0	6.0	5.0	6.0	5.0	7.0
#4	8.0	7.0	5.0	4.0	7.0	5.0	7.0
#5	11.0	11.0	9.0	7.0	8.0	6.0	9.0

Hole #2

Surface Finish, AA 110 - 120
Protrusion, in. .188
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 251
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-8.0	-9.0	-8.0	-6.0	-9.0	-7.0
#2	4.0	4.0	3.0	5.0	5.0	5.0	5.0
#3	7.0	6.0	4.0	7.0	7.0	6.0	6.0
#4	7.0	6.0	4.0	8.0	8.0	6.0	6.0
#5	12.0	12.0	12.0	11.0	12.0	12.0	12.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS-SECOND
Specimen No. CCSTC-21-7C MID-INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.255" REAM MOD L.H. SPIRAL REAMER USE BUSHING TOOL SET WAS LAID OUT FOR SCRIBE
Spindle, rpm 80 Feed: 5 8.F.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 100-105
Protrusion, in. .188
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 224
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-8.0	-11.0	-9.0	-5.0	-8.0	-7.0
#2	5.0	5.0	4.0	5.0	7.0	5.0	5.0
#3	6.0	7.0	6.0	7.0	8.0	7.0	7.0
#4	9.0	8.0	9.0	8.0	8.0	7.0	9.0
#5	12.0	12.0	12.0	13.0	12.0	9.0	13.0

Hole #2

Surface Finish, AA 95
Protrusion, in. .179
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0015
Flush Gage Reading, in. .002
Capacitance Gage Reading 227
Exit Burr Height, in.

Bluing Pin Rollout

85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-8.0	-8.0	-8.0	-5.0	-8.0	-5.0
#2	7.0	6.0	5.0	5.0	6.0	7.0	6.0
#3	10.0	8.0	7.0	5.0	8.0	7.0	7.0
#4	11.0	9.0	7.0	12.0	8.0	7.0	9.0
#5	12.0	12.0	12.0	13.0	11.0	14.0	12.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS - SCRATCH
Specimen No. 206BC-685T AI.U. INT. 125 MIN

Hole Manufacturing Conditions and Procedures: REAM WITH HAND HELD SIZE REAMER 1.235" REAM AND C'H. SPECIAL REAMER USE BORING TOOL SET .005 & PULL OUT FOR SCRATCH
Spindle, rpm 80 Feed: 55 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 110 Bluing Pin Rollout
Protrusion, in. .174
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .001 65%
Capacitance Gage Reading 245
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-9.0	-9.0	-7.0	-8.0	-11.0	-11.0
#2	5.0	4.0	4.0	6.0	5.0	4.0	5.0
#3	7.0	3.0	4.0	7.0	8.0	7.0	7.0
#4	8.0	2.0	3.0	5.0	7.0	6.0	7.0
#5	10.0	8.0	7.0	7.0	7.0	6.0	7.0

Hole #2

Surface Finish, AA 125 Bluing Pin Rollout
Protrusion, in. .186
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .002
Flush Gage Reading, in. 0 85%
Capacitance Gage Reading 250
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-9.0	-13.0	-7.0	-5.0	-6.0	-8.0
#2	4.0	3.0	3.0	4.0	5.0	5.0	4.0
#3	6.0	6.0	3.0	5.0	7.0	7.0	5.0
#4	8.0	6.0	5.0	7.0	7.0	7.0	4.0
#5	10.0	8.0	9.0	12.0	9.0	9.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE FINISH SCRATCH
Specimen No. 2A3LC-6C13 AA 8 TO 12 SCRATCH

Hole Manufacturing Conditions and Procedures: DRY WITH HAND-
SIZE REAMER, 1753" REAM, AND L.H. SPIRAL FLUTE
USE BORING TOOL SET .005 + ROLL OUT FOR FINISH
Spindle, rpm 45 Feed: 55 SFPM
Cutting Fluid: DRY Depth: (Ind. Reading) .540

Hole #1

Surface Finish, AA 120-125
Protrusion, in. .185
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. .0
Capacitance Gage Reading 220
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-4.0	-7.0	-7.0	-7.0	-4.0	-6.0
#2	6.0	6.0	4.0	2.0	6.0	5.0	4.0
#3	8.0	8.0	6.0	3.0	6.0	5.0	5.0
#4	9.0	9.0	8.0	4.0	7.0	5.0	5.0
#5	15.0	13.0	13.0	13.0	11.0	12.0	9.0

Hole #2

Surface Finish, AA 100
Protrusion, in. .185
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0005
Flush Gage Reading, in. .001
Capacitance Gage Reading 228
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-7.0	-8.0	-3.0	-4.0	-5.0	-7.0
#2	4.0	2.0	3.0	4.0	2.0	2.0	4.0
#3	6.0	6.0	6.0	7.0	5.0	8.0	6.0
#4	6.0	6.0	5.0	6.0	9.0	9.0	7.0
#5	12.0	12.0	12.0	11.0	10.0	12.0	12.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS- SCRATCH
Specimen No. 306PC & 403PC MIDINT. 125 RMS

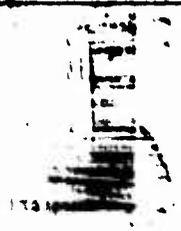
Hole Manufacturing Conditions and Procedures: REAM WITH .125
REAMER 1255 REAM W/ LM SPECIAL REAMER
USE BOTH CUTTING SETS & WALL OUT FOR SCRATCH
Spindle, rpm 50 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 100
Protrusion, in. 184
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0025
Flush Gage Reading, in. -.001
Capacitance Gage Reading 240
Exit Burr Height, in.

85%

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-12.0	-13.0	-14.0	-12.0	-12.0	-13.0
#2	4.0	3.0	2.0	3.0	4.0	4.0	3.0
#3	6.0	5.0	5.0	5.0	5.0	4.0	5.0
#4	6.0	5.0	5.0	5.0	5.0	4.0	4.0
#5	7.0	6.0	6.0	7.0	6.0	5.0	5.0

Hole #2

Surface Finish, AA 100
Protrusion, in. 163
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. -.002
Capacitance Gage Reading 241
Exit Burr Height, in.

85%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-13.0	-13.0	-13.0	-14.0	-8.0	-7.0
#2	4.0	4.0	3.0	3.0	3.0	3.0	4.0
#3	6.0	6.0	5.0	4.0	5.0	3.0	4.0
#4	6.0	5.0	5.0	4.0	4.0	3.0	4.0
#5	7.0	6.0	6.0	4.0	4.0	6.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable [illegible]
Specimen No. [illegible]

Hole Manufacturing Conditions and Procedures: [illegible]

Spindle, rpm 80 Feed: [illegible]
Cutting Fluid: DRY Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA 100
Protrusion, in. 182
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 254
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-13.0	-12.0	[illegible]	-13.0	-12.0	-11.0
#2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
#3	5.0	5.0	4.0	4.0	5.0	5.0	4.0
#4	5.0	5.0	4.0	4.0	4.0	5.0	3.0
#5	7.0	7.0	7.0	7.0	6.0	6.0	6.0

Hole #2

Surface Finish, AA 120
Protrusion, in. 172
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. -.001
Capacitance Gage Reading 243
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-15.0	[illegible]	-13.0	-11.0	-13.0	-11.0
#2	3.0	2.0	2.0	3.0	4.0	3.0	3.0
#3	4.0	4.0	4.0	5.0	5.0	4.0	4.0
#4	[illegible]	4.0	4.0	5.0	5.0	4.0	3.0
#5	5.0	6.0	5.0	6.0	6.0	5.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE FINISH SCRATCH

Specimen No. 6-15-6653 MATERIAL 12% NiCo

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE

[illegible] REAM [illegible] DRILL FOR SCRATCH

Spindle, rpm 80 Feed: .002 IPR

Cutting Fluid: DRY Depth: (Ind. Reading) .400

Hole #1

Surface Finish, AA 100

Protrusion, in. .183

Perpendicularity, .001 in./in.

Longitudinal .002 Transverse .0015

Flush Gage Reading, in. 0

Capacitance Gage Reading 2.5

Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	10.0	-8.0	-9.0	-7.0	-10.0	-11.0	-13.0
#2	3.0	3.0	2.0	3.0	3.0	2.0	2.0
#3	5.0	4.0	4.0	4.0	4.0	4.0	4.0
#4	4.0	4.0	4.0	4.0	3.0	3.0	4.0
#5	7.0	5.0	7.0	7.0	7.0	5.0	5.0

Hole #2

Surface Finish, AA 110

Protrusion, in. .175

Perpendicularity, .001 in./in.

Longitudinal .002 Transverse .0015

Flush Gage Reading, in. -.001

Capacitance Gage Reading 2.1

Exit Burr Height, in.

Bluing Pin Rollout

85%

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-10.0	-8.0	-7.0	-9.0	-11.0	-12.0
#2	1.0	1.0	3.0	3.0	4.0	2.0	1.0
#3	5.0	4.0	4.0	3.0	4.0	4.0	4.0
#4	5.0	4.0	4.0	2.0	4.0	4.0	4.0
#5	7.0	6.0	7.0	6.0	6.0	5.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable [illegible]
Specimen No. [illegible]

Hole Manufacturing Conditions and Procedures: [illegible]

Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) .442

Hole #1

Surface Finish, AA [illegible]
Protrusion, in. .168
Perpendicularity, .001 in./in.
Longitudinal .005 Transverse .005
Flush Gage Reading, in. 0
Capacitance Gage Reading 226
Exit Burr Height, in.

Bluing Pin Rollout 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-13.0	-13.0	-13.0	-13.0	-12.0	-14.0
#2	2.0	3.0	4.0	3.0	3.0	2.0	3.0
#3	5.0	5.0	5.0	4.0	4.0	5.0	5.0
#4	5.0	5.0	5.0	5.0	4.0	4.0	4.0
#5	6.0	6.0	6.0	5.0	5.0	5.0	6.0

Hole #2

Surface Finish, AA [illegible]
Protrusion, in. .171
Perpendicularity, .001 in./in.
Longitudinal .005 Transverse .005
Flush Gage Reading, in. [illegible]
Capacitance Gage Reading 238
Exit Burr Height, in.

Bluing Pin Rollout 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-14.0	-12.0	-11.0	[illegible]	[illegible]	-14.0
#2	3.0	[illegible]	2.0	3.0	4.0	[illegible]	3.0
#3	5.0	5.0	4.0	4.0	5.0	[illegible]	5.0
#4	5.0	4.0	3.0	4.0	[illegible]	5.0	5.0
#5	6.0	6.0	5.0	[illegible]	[illegible]	[illegible]	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE FINISH - SCRATCH
Specimen No. 202FL2M3FC MAX 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE
REAMER 1.435 REAM NO. 1 L.H. SPIRAL REAMER
USE B.A.M. TOOL SET .005 DRILL CUT FOR SPINDLE
Spindle, rpm 80 Feed: 25 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 110
Protrusion, in. 175
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 233
Exit Burr Height, in.

Bluing Pin Rollout

-75%

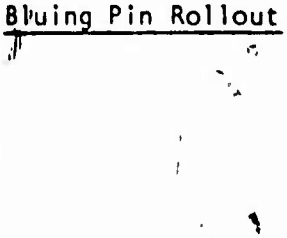
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-14.0	-13.0	-13.0	-12.0	-13.0	-13.0
#2	4.0	3.0	3.0	3.0	3.0	4.0	4.0
#3	5.0	5.0	4.0	5.0	4.0	5.0	5.0
#4	5.0	5.0	3.0	4.0	4.0	5.0	5.0
#5	6.0	6.0	6.0	6.0	6.0	6.0	6.0

Hole #2

Surface Finish, AA 95 (CC)
Protrusion, in. 181
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 258
Exit Burr Height, in.

Bluing Pin Rollout



70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-13.0	-13.0	-15.0	-13.0	-13.0	-11.0
#2	3.0	3.0	2.0	3.0	4.0	4.0	4.0
#3	5.0	5.0	5.0	4.0	5.0	4.0	5.0
#4	5.0	5.0	4.0	4.0	5.0	4.0	5.0
#5	6.0	5.0	6.0	5.0	6.0	5.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE FINISH, MICRO INCH
Specimen No. 4NC2-601C AT 0 INT. 125 AA

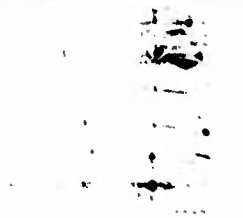
Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.755 REG. MOD. K.M. STANDARD REG. FOR USE CARBIDE STANDARD REG. AS REQUIRED TO SIZE NO REAM

Spindle, rpm 80 Feed: .5 IPM
Cutting Fluid: OIL Depth: (Ind. Reading) .442

Hole #1

Surface Finish, AA 110-120
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 288
Exit Burr Height, in.

Bluing Pin Rollout



15%

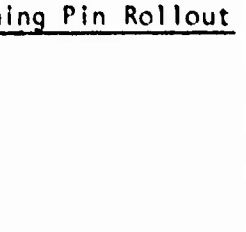
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-8.0	-10.0	-10.0	-9.0	-6.0	-10.0
#2	7.0	6.0	7.0	4.0	5.0	7.0	7.0
#3	7.0	7.0	7.0	4.0	5.0	7.0	7.0
#4	7.0	7.0	7.0	2.0	5.0	6.0	6.0
#5	8.0	8.0	7.0	4.0	6.0	7.0	7.0

Hole #2

Surface Finish, AA 110
Protrusion, in. .160
Perpendicularity, .001 in./in.
Longitudinal .005 Transverse .005
Flush Gage Reading, in. 0
Capacitance Gage Reading 280
Exit Burr Height, in.

Bluing Pin Rollout



70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-8.0	-6.0	-11.0	-9.0	-8.0	-10.0
#2	6.0	6.0	7.0	5.0	7.0	8.0	8.0
#3	7.0	6.0	7.0	5.0	7.0	9.0	7.0
#4	4.0	5.0	6.0	4.0	7.0	8.0	7.0
#5	6.0	7.0	8.0	7.0	8.0	9.0	8.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE-ROUGHNESS-R.FLEY
Specimen No. 3A216-2H5-3C M.U.I. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.253" REAM 1.500 L.H. SPIRAL REAMER USE 1.500 L.H. SPIRAL REAMER PUSH-IN 400 RPM
Spindle, rpm 80 Feed: .5 IPM
Cutting Fluid: OIL Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 120 Bluing Pin Rollout
Protrusion, in. .168
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 247
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.2	-5.0	-7.0	-10.6	-12.0	-9.0	-10.0
#2	3.0	5.0	7.0	4.0	3.0	5.0	5.0
#3	6.0	7.0	8.6	7.0	8.5	6.0	8.6
#4	5.2	7.0	9.6	7.0	7.6	8.6	9.6
#5	6.0	8.0	9.6	7.0	7.6	8.6	9.6

Hole #2

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .174
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 312
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-12.0	-10.0	-12.2	-9.0	-9.0	-11.0
#2	6.0	6.0	4.0	5.0	6.0	5.0	5.0
#3	4.0	5.0	5.0	4.0	5.0	3.0	5.0
#4	4.0	5.0	4.0	3.0	4.0	3.0	5.0
#5	5.0	3.0	6.0	5.0	5.0	4.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS-RELIEF
Specimen No. 2038C-316T APPLIED AT 12 KSI

Hole Manufacturing Conditions and Procedures: REAM WITH UNCLAD-SIDE BLADE AT 125 RPM. AFTER FINAL REAM USE CLAD SIDE BLADE AT 80 RPM
Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .174
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .003
Flush Gage Reading, In. 0 80%
Capacitance Gage Reading 274
Exit Burr Height, In.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-11.0	-4.0	-5.0	-11.0	-10.0	-8.0
#2	5.0	5.0	7.0	4.0	4.0	6.0	6.0
#3	5.0	5.0	8.0	3.0	3.0	6.0	6.0
#4	5.0	6.0	6.0	4.0	1.0	6.0	6.0
#5	6.0	7.0	7.0	3.0	2.0	7.0	7.0

Hole #2

Surface Finish, AA 100 Bluing Pin Rollout
Protrusion, in. .168
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse 0 70%
Flush Gage Reading, In. .002
Capacitance Gage Reading 290
Exit Burr Height, In.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-9.0	-8.0	-10.0	-11.0	-7.0	-10.0
#2	5.0	6.0	6.0	3.0	4.0	5.0	5.0
#3	5.0	6.0	7.0	3.0	4.0	5.0	7.0
#4	5.0	6.0	6.0	3.0	4.0	6.0	6.0
#5	6.0	7.0	7.0	4.0	3.0	6.0	7.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS - REF. #9
Specimen No. 3C1FC-6B13 MID-INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM W/ 5th UNDER-SIZE REAMER-1.175" REAM MID. L.H. SPIRAL REAMER USE MID L.H. SPIRAL REAMER PUSH IN 400-500 PSI RPM.
Spindle, rpm 80 Feed: 5.8 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 100
Protrusion, in. 165
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. -.002
Capacitance Gage Reading 268
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-10.0	-7.0	-10.0	-9.0	-6.0	-8.0
#2	6.0	4.0	7.0	5.0	7.0	6.0	7.0
#3	7.0	6.0	5.0	5.0	7.0	7.0	7.0
#4	7.0	5.0	4.0	4.0	7.0	7.0	8.0
#5	7.0	6.0	4.0	5.0	7.0	7.0	8.0

Hole #2

Surface Finish, AA 100-105
Protrusion, in. 163
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0025
Flush Gage Reading, in. 0
Capacitance Gage Reading 297
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-11.0	-10.0	-9.0	-11.0	-7.0	-10.0
#2	6.0	6.0	6.0	6.0	6.0	8.0	7.0
#3	6.0	6.0	7.0	6.0	6.0	7.0	6.0
#4	6.0	6.0	7.0	5.0	5.0	6.0	6.0
#5	8.0	7.0	8.0	5.0	5.0	7.0	7.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURF. FIN. (MICRO-INCHES - R.M.S.)
Specimen No. 406 406SC M.O SURF. 125 R.M.S.

Hole Manufacturing Conditions and Procedures: REAM W/ H.S. REAMER. SIZE REAM. BY 1.75" REAM AND BURNISH REAMER. USE ACID & OIL SOLUTION ON REAMER. NO LUBE

Spindle, rpm 80 Feed: .8 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.452

Hole #1

Surface Finish, AA 100-105 Bluing Pin Rollout
Protrusion, in. 174
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 292
Exit Burr Height, in.

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-8.0	-6.0	-8.0	-4.0	-7.0
#2	7.0	8.0	7.0	5.0	6.0	9.0	8.0
#3	8.0	8.0	8.0	7.0	6.0	8.0	5.0
#4	8.0	8.0	7.0	7.0	5.0	7.0	7.0
#5	10.0	10.0	10.0	6.0	7.0	7.0	10.0

Hole #2

Surface Finish, AA 125 Bluing Pin Rollout
Protrusion, in. 167
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. .001
Capacitance Gage Reading 297
Exit Burr Height, in.

85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-8.0	-7.0	-7.0	-7.0	-5.0	-7.0
#2	6.0	6.0	8.0	6.0	8.0	8.0	7.0
#3	5.0	5.0	7.0	5.0	7.0	7.0	7.0
#4	3.0	3.0	5.0	6.0	8.0	10.0	6.0
#5	5.0	5.0	6.0	9.0	10.0	10.0	8.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS Ra (AA)
Specimen No. 4C31C4304BC

Hole Manufacturing Conditions and Procedures: [illegible]

Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 100
Protrusion, in. 176
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 293
Exit Burr Height, in.

Bluing Pin Rollout

75°

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-11.0	-13.0	-13.0	[illegible]	[illegible]	[illegible]
#2	4.0	4.0	4.0	[illegible]	3.0	4.0	4.0
#3	5.0	5.0	6.0	5.0	4.0	6.0	[illegible]
#4	5.0	5.0	5.0	4.0	3.0	[illegible]	[illegible]
#5	5.0	5.0	5.0	4.0	3.0	4.0	[illegible]

Hole #2

Surface Finish, AA 110
Protrusion, in. 170
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0005
Flush Gage Reading, in. .001
Capacitance Gage Reading 265
Exit Burr Height, in.

Bluing Pin Rollout

85°

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-9.0	-12.0	-8.0	-11.0	-12.0	-11.0
#2	4.0	3.0	4.0	3.0	3.0	4.0	4.0
#3	5.0	5.0	6.0	4.0	4.0	5.0	5.0
#4	5.0	5.0	4.0	4.0	4.0	4.0	4.0
#5	5.0	5.0	4.0	4.0	4.0	4.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable Surface Roughness R.M.S.
Specimen No. 66616-13353 Al. Ti-6-4 125 Ksi

Hole Manufacturing Conditions and Procedures: REAM WORN SIZE REAMER 1255. REAM MACHINE CENTER BEHIND USE WORN CARBIDE REAMER 1255 NO LUBE

Spindle, rpm 80 Feed: .002 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) .442

Hole #1

Surface Finish, AA 95 120
Protrusion, in. .160
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 295
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-15.0	-14.0	-15.0	-14.0	-10.0	-13.0
#2	3.0	3	3.0	3.0	3.0	3.0	3.0
#3	3.0	5.0	4.0	4.0	4.0	4.0	5.0
#4	4.0	4.0	5.0	4.0	3.0	4.0	5.0
#5	4.0	4.0	4.0	4.0	3.0	3.0	4.0

Hole #2

Surface Finish, AA 90 120
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .021
Capacitance Gage Reading 305
Exit Burr Height, in.

Bluing Pin Rollout 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-13.0	-13.0	-12.0	-13.0	-12.0	-12.0
#2	3.0	3.0	4.0	3.0	3.0	4.0	4.0
#3	5.0	5.0	6.0	4.0	4.0	5.0	5.0
#4	4.0	5.0	6.0	3.0	4.0	5.0	5.0
#5	4.0	4.0	5.0	4.0	5.0	5.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE-ROUGHNESS-BLUING MIC-ENT. 125 [illegible]
Specimen No. [illegible]

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE REAM W/ 1.75° REAM AND L.H. SPIRAL FLUTE. USE 1200 RPM SPINDLE REAM IN PLASTIC VISE AND RUN
Spindle, rpm 800 Feed: [illegible]
Cutting Fluid: DRY Depth: (Ind. Reading) 2440

Hole #1

Surface Finish, AA [illegible]
Protrusion, in. .173
Perpendicularity, .001 in./in.
Longitudinal .251 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 304
Exit Burr Height, in.

Bluing Pin Rollout 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-12.0	-14.0	-14.0	-14.0	-13.0	-14.0
#2	4.0	3.0	3.0	2.0	2.0	4.0	3.0
#3	4.0	5.0	5.0	4.0	4.0	5.0	4.0
#4	4.0	4.0	6.0	4.0	3.0	[illegible]	3.0
#5	4.0	4.0	5.0	4.0	4.0	4.0	4.0

Hole #2

Surface Finish, AA 11[illegible]-12[illegible]
Protrusion, in. .160
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 302
Exit Burr Height, in.

Bluing Pin Rollout 85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	—	-14.0	-14.0	—	-10.0	-14.0
#2	4.0	4.0	4.0	4.0	3.0	5.0	4.0
#3	5.0	5.0	6.0	4.0	4.0	5.0	4.0
#4	4.0	4.0	5.0	4.0	3.0	3.0	3.0
#5	3.0	3.0	[illegible].0	4.0	3.0	3.0	3.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS (FINISH)
Specimen No. SURFACE 6C NO CUT-IN STRAIN

Hole Manufacturing Conditions and Procedures: REF. UNDER USE
REAMER 1.755 REAM AND L.H. SPIRAL [illegible] USE
[illegible] L.H. SPIRAL REAMER TO REMOVE [illegible]
Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: DRY Depth: (Ind. Reading) .220

Hole #1

Surface Finish, AA 90
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse [illegible]
Flush Gage Reading, in. 0
Capacitance Gage Reading 290
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-12.0	-12.0	-14.0	-14.0	-13.0	-14.0
#2	3.0	3.0	4.0	2.0	2.0	3.0	3.0
#3	4.0	4.0	4.0	4.0	3.0	4.0	4.0
#4	3.0	3.0	4.0	3.0	3.0	3.0	3.0
#5	4.0	4.0	4.0	3.0	3.0	3.0	4.0

Hole #2

Surface Finish, AA 100
Protrusion, in. .158
Perpendicularity, .001 in./in.
Longitudinal .015 Transverse .002
Flush Gage Reading, in. 0
Capacitance Gage Reading 298
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-13.0	-14.0	-14.0	-14.0	-13.0	-14.0
#2	4.0	4.0	4.0	2.0	3.0	4.0	4.0
#3	4.0	4.0	5.0	5.0	5.0	4.0	4.0
#4	3.0	4.0	5.0	5.0	5.0	5.0	4.0
#5	3.0	5.0	5.0	4.0	4.0	4.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS, R.H.R.
Specimen No. 3E6B-664F MID INT. 125 R.H.R.

Hole Manufacturing Conditions and Procedures: REAM WALL & SIDE REAM & 1.D. REAM LOW LH SPIRAL REAMER USE M104 LH SPIRAL REAMER PUSH-IN MOTOR NO RUN
Spindle, rpm 80 Feed: 5" PER MIN
Cutting Fluid: DRY Depth: (Ind. Reading) .440

Hole #1

Surface Finish, AA 160
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. .001
Capacitance Gage Reading 292
Exit Burr Height, in.

Bluing Pin Rollout

85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-12.0	-12.0	-12.0	-12.0	-13.0	-12.0
#2	2.0	2.0	4.0	4.0	4.0	3.0	3.0
#3	4.0	4.0	4.0	5.0	4.0	4.0	4.0
#4	3.0	3.0	3.0	5.0	4.0	4.0	3.0
#5	4.0	3.0	3.0	5.0	5.0	5.0	3.0

Hole #2

Surface Finish, AA 100
Protrusion, in. .163
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 300
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-13.0	-12.0	-13.0	-11.0	-13.0	-16.0
#2	2.0	2.0	3.0	3.0	3.0	3.0	3.0
#3	4.0	4.0	5.0	4.0	4.0	4.0	5.0
#4	4.0	3.0	3.0	4.0	4.0	4.0	4.0
#5	4.0	3.0	3.0	4.0	4.0	4.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 3E6BC-6B3TC M.O.I. #1 12 SPEC

Hole Manufacturing Conditions and Procedures: REAM WITH S.21
REAM W/ 1.25 REAM W/ L.H. SPIRAL REAMER: USE
STRAIGHT FLUTE REAMER PURGE WITH .06 in TRANSFER LBS.
Spindle, rpm 80 Feed: 55 IPR
Cutting Fluid: OIL Depth: (Ind. Reading) 2.442

Hole #1

Surface Finish, AA 120
Protrusion, in. 164
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse 0
Flush Gage Reading, in. -.001
Capacitance Gage Reading 234
Exit Burr Height, in.

Bluing Pin Rollout

66%

325/319

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-7.0	-7.0	-8.0	-7.0	-9.0	-9.0
#2	8.0	9.0	11.0	6.0	8.0	11.0	8.0
#3	9.0	13.0	13.0	5.0	12.0	14.0	12.0
#4	11.0	15.0	15.0	4.0	13.0	15.0	14.0
#5	11.0	13.0	13.0	11.0	12.0	13.0	11.0

Hole #2

Surface Finish, AA 100-105
Protrusion, in. 160
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. -.001
Capacitance Gage Reading 231
Exit Burr Height, in.

Bluing Pin Rollout

75%

325/319

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-7.0	-7.0	-9.0	-8.0	-9.0	-10.0
#2	6.0	5.0	11.0	6.0	11.0	10.0	6.0
#3	8.0	13.0	14.0	6.0	14.0	13.0	10.0
#4	10.0	13.0	15.0	5.0	15.0	15.0	13.0
#5	12.0	11.0	13.0	12.0	12.0	10.0	12.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE-ROUGHNESS-QUALITY
Specimen No. 3E2BC-486TC M.W. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER-SIZE REAMED 1.755" REAM 1900 L.H. SPIRAL REAMER USE STRAIGHT FLUTE REAMER PILOTED 1.702 ± .006 IN TRANSVERSE PASS
Spindle, rpm 80 Feed: [illegible]
Cutting Fluid: OIL Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 125 Bluing Pin Rollout
Protrusion, in. .177
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. -.001 70%
Capacitance Gage Reading 220
Exit Burr Height, in.

319/325

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-5.0	-7.0	-8.0	-5.0	-8.0	-6.0
#2	7.0	11.0	11.0	5.0	7.0	10.0	8.0
#3	8.0	14.0	14.0	4.0	13.0	13.0	11.0
#4	12.0	14.0	14.0	8.0	14.0	13.0	14.0
#5	13.0	14.0	14.0	13.0	14.0	11.0	14.0

Hole #2

Surface Finish, AA 110 Bluing Pin Rollout
Protrusion, in. .178
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. -.001 65%
Capacitance Gage Reading 254
Exit Burr Height, in.

319/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-8.0	-6.0	-10.0	-7.0	-8.0	-7.0
#2	8.0	8.0	8.0	6.0	8.0	8.0	7.0
#3	9.0	13.0	13.0	5.0	12.0	13.0	11.0
#4	12.0	15.0	14.0	5.0	13.0	13.0	12.0
#5	11.0	12.0	13.0	11.0	11.0	12.0	13.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. SEI+-6-102 M.I.D. INT. 125 RI-5

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE REAM W 1.755 REAM MACH SPECIAL REAMER USE SPECIAL REAMER PLUNGE 1.700 I.D. 6 IN TRANSVERSE POS.
Spindle, rpm 85 Feed: .008 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) .442

Hole #1

Surface Finish, AA 96-100
Protrusion, in. 168
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 237
Exit Burr Height, in.

Bluing Pin Rollout

60%

322/319

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-5.0	-7.0	-7.0	-6.0	-5.0	-6.0
#2	7.0	8.0	9.0	3.0	7.0	9.0	7.0
#3	8.0	12.0	13.0	3.0	13.0	13.0	9.0
#4	9.0	13.0	13.0	3.0	[illegible]	15.0	13.0
#5	12.0	13.0	11.0	13.0	13.0	10.0	13.0

Hole #2

Surface Finish, AA 110
Protrusion, in. 128
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .000
Flush Gage Reading, in. 0
Capacitance Gage Reading 226
Exit Burr Height, in.

Bluing Pin Rollout

60%

322/318

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-8.0	-9.0	-6.0	-4.0	-6.0	-6.0
#2	7.0	8.0	11.0	6.0	0	11.0	7.0
#3	9.0	13.0	14.0	7.0	9.0	14.0	12.0
#4	12.0	14.0	15.0	9.0	13.0	14.0	14.0
#5	11.0	14.0	14.0	13.0	14.0	13.0	13.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 3C5BC-2C3BC MIL 0.3 P. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REAMER 1.755 REAM 1700 L.H. SP. RAI REAM 11 - USC
SIN. 9AT FINISH REAMER DIAM. 1.760 ± .006 IN TRAVERSE DOS
Spindle, rpm 80 Feed: 55 & I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 110
Protrusion, in. .158
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 283
Exit Burr Height, in.

Bluing Pin Rollout 65%

Air Gage Readings (.0001 in.)
Angular Position

31-
32-

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-8.0	-10.0	-10.0	-11.0	-1[illegible]	-8.0
#2	5.0	6.[illegible]	5.0	4.0	[illegible].0	6.[illegible]	6.[illegible]
#3	7.0	9.0	11.0	5	[illegible].0	10.0	[illegible].[illegible]
#4	6.0	15.0	13.0	2.0	[illegible].0	1[illegible].0	1[illegible]
#5	9.0	1[illegible].0	13.0	3.0	[illegible].0	10.0	[illegible].0

Hole #2

Surface Finish, AA 100-105
Protrusion, in. .178
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 328
Exit Burr Height, in.

Bluing Pin Rollout 60%

Air Gage Readings (.0001 in.)
Angular Position

319
326

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-7.0	-6.0	-6.0	-7.0	-10.0	-11.0
#2	7.0	9.0	11.0	5.0	8.0	7.0	6.0
#3	8.0	13.0	14.0	4.0	11.0	13.0	11.0
#4	11.0	14.0	15.0	5.0	12.0	14.0	13.0
#5	15.0	11.0	13.0	13.0	12.0	12.0	13.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS - OVALITY
Specimen No. 3D2BC-3E2T MIC INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER-SIZE REAMER 1755 REAM NO. 6 4 FL SPIRAL REAMER - USE STRAIGHT FLUTE REAMER PLUNGE 1700 F.O.6 IN THRU SURFACE POS.
Spindle, rpm 80 Feed: .8 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 110
Protrusion, in. .168
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 228
Exit Burr Height, in.

Bluing Pin Rollout

70%

325
317

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-6.0	-5.0	-9.0	-7.0	-6.0	-5.0
#2	7.0	10.0	11.0	6.0	9.0	11.0	9.0
#3	7.0	13.0	13.0	7.0	12.0	14.0	13.0
#4	10.0	15.0	14.0	6.0	13.0	14.0	14.0
#5	13.0	13.0	14.0	12.0	12.0	12.0	14.0

Hole #2

Surface Finish, AA 95-100
Protrusion, in. .171
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. .001
Capacitance Gage Reading 236
Exit Burr Height, in.

Bluing Pin Rollout

60%

324
317

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-10.0	-8.0	-10.0	-9.0	-8.0	-8.0
#2	6.0	9.0	11.0	5.0	9.0	9.0	7.0
#3	7.0	13.0	14.0	6.0	13.0	14.0	12.0
#4	10.0	14.0	15.0	7.0	12.0	15.0	12.0
#5	13.0	13.0	13.0	9.0	11.0	12.0	11.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 6045C 23B5-8C MID. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER 3 21
REAMER 1755. REAM IRON 6 H. SP. [illegible] REAMED USE
STANDARD FINE REAMING KNOWLEDGE 1701 Z.OIL IN THREADS. NCS.
Spindle, rpm 80 Feed: 5 IPM.
Cutting Fluid: OIL Depth: (Ind. Reading) 2440

Hole #1

Surface Finish, AA 110
Protrusion, in. 168
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0005
Flush Gage Reading, in. .001
Capacitance Gage Reading 249
Exit Burr Height, in.

Bluing Pin Rollout

656

318
-321

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-1.0	-7.0	-6.0	-6.0	-6.0	-6.0
#2	4.0	3.0	7.0	7.0	8.0	9.0	8.0
#3	5.0	8.0	12.0	10.0	12.0	13.0	11.0
#4	7.0	11.0	14.0	11.0	13.0	13.0	13.0
#5	12.0	13.0	14.0	—	14.0	13.0	13.0

Hole #2

Surface Finish, AA 100
Protrusion, in. 164
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0011
Flush Gage Reading, in. 0
Capacitance Gage Reading 229
Exit Burr Height, in.

Bluing Pin Rollout

556

319
-323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-5.0	-5.0	-6.0	-9.0	-9.0	-9.0
#2	8.0	11.0	12.0	7.0	6.0	9.0	9.0
#3	10.0	14.0	15.0	6.0	11.0	13.0	16.0
#4	15.0	15.0	—	8.0	11.0	15.0	15.0
#5	14.0	13.0	14.0	1.0	11.0	15.0	14.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 3HLS-463B- AVG ENT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNTIL .125
REAM TO 1.755 REAM FULL LENGTH OF HOLE REAMER USE
SOLID CARB. PILOT REAMER DIA. 1.706 ± .006 IN TUNGSTEN POS
Spindle, rpm 60 Feed: .5 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) .440

Hole #1

Surface Finish, AA 71.25
Protrusion, in. .126
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading 253
Exit Burr Height, in.

Bluing Pin Rollout

60%

318/321

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-5.0	-4.0	-5.0	-5.0	-5.0	-6.0
#2	2.0	6.0	2.0	3.0	0	2.0	0
#3	6.0	10.0	10.0	3.0	7.0	10.0	6.0
#4	8.0	11.0	12.0	4.0	9.0	12.0	9.0
#5	11.0	12.0	12.0	11.0	12.0	12.0	11.0

Hole #2

Surface Finish, AA 100
Protrusion, in. .162
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 265
Exit Burr Height, in.

Bluing Pin Rollout

70%

318/321

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-5.0	-5.0	-7.0	-6.0	-8.0	-6.0
#2	3.0	2.0	2.0	0	1.0	1.0	1.0
#3	4.0	4.0	6.0	3.0	5.0	7.0	5.0
#4	3.0	8.0	10.0	3.0	9.0	9.0	9.0
#5	7.0	10.0	10.0	6.0	10.0	10.0	10.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 606F-L2A-FC M.C. IM. 125.4/.5

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REAM @ 175". REAM #10 L.H. SPIRAL FLUTE - USE
SHARP FLUTE REAM & REAM @ 176" FOR INTERFERENCE FOS
Spindle, rpm 80 Feed: .2" PER MIN.
Cutting Fluid: DRY Depth: (Ind. Reading) .462

Hole #1

Surface Finish, AA 100
Protrusion, in. 171
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. .002
Capacitance Gage Reading 251
Exit Burr Height, in.

Bluing Pin Rollout

60%

Air Gage Readings (.0001 in.)
Angular Position

317/324

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-6.0	-5.0	-6.0	-8.0	-7.0
#2	1.0	2.0	4.0	1.0	0	4.0	2.0
#3	4.0	6.0	8.0	1.0	5.0	9.0	7.0
#4	4.0	10.0	11.0	0	9.0	10.0	6.0
#5	9.0	10.0	11.0	7.0	10.0	11.0	10.0

Hole #2

Surface Finish, AA 110
Protrusion, in. 171
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 281
Exit Burr Height, in.

Bluing Pin Rollout

65%

Air Gage Readings (.0001 in.)
Angular Position

317/323

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-8.0	-5.0	-6.0	-8.0	-9.0	-7.0
#2	1.0	4.0	3.0	3.0	-1.0	3.0	2.0
#3	3.0	4.0	6.0	3.0	7.0	9.0	6.0
#4	4.0	9.0	10.0	5.0	10.0	11.0	9.0
#5	9.0	9.0	10.0	7.0	11.0	12.0	9.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE ROUGHNESS-QUALITY
Specimen No. 3C3TC 43T4TC

Hole Manufacturing Conditions and Procedures: REAM UNDER-SIZE
[illegible] SO COAT [illegible] USE
SP. 100 FLUTE REAM & PLUNGE [illegible]
Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 112
Protrusion, in. 171
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 250
Exit Burr Height, in.

Bluing Pin Rollout 65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-12.0	-8.0	-5.0	-5.0	-6.0	-10.0
#2	6.0	8.0	9.0	6.0	5.0	5.0	2.0
#3	7.0	12.0	13.0	5.0	11.0	12.0	10.0
#4	9.0	13.0	14.0	7.0	13.0	13.0	12.0
#5	11.0	13.0	13.0	12.0	11.0	13.0	11.0

Hole #2

Surface Finish, AA 110
Protrusion, in. 170
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .0015
Flush Gage Reading, in. [illegible]
Capacitance Gage Reading 247
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-8.0	-9.0	-7.0	-9.0	-7.0	-9.0
#2	5.0	6.0	7.0	5.0	6.0	9.0	7.0
#3	8.0	11.0	12.0	5.0	11.0	13.0	11.0
#4	10.0	13.0	14.0	5.0	12.0	14.0	13.0
#5	10.0	13.0	13.0	11.0	11.0	13.0	12.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 21 Quality Variable SURFACE FINISH QUALITY
Specimen No. 6132C6384SC 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REAMED 1.25". REAM 2 C & H. SPINDLE CLEANED OUT
5/8" FLUTE REAMER. REAMED 1" SHANK IN THIS HOLE

Spindle, rpm 50 Feed: 50 IPM
Cutting Fluid: CRC Depth: (Ind. Reading) .242

Hole #1

Surface Finish, AA 110
Protrusion, in. .128
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 258
Exit Burr Height, in.

Bluing Pin Rollout

5 5/8

Air Gage Readings (.0001 in.)
Angular Position

312/322

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-4.0	-3.0	-5.0	-6.0	-9.0	-6.0
#2	1.0	0	2.0	3.0	2.0	2.0	1.0
#3	4.0	4.0	7.0	3.0	5.0	8.0	5.0
#4	5.0	7.0	10.0	4.0	10.0	11.0	3.0
#5	11.0	12.0	12.0	10.0	11.0	12.0	10.0

Hole #2

Surface Finish, AA 95 100
Protrusion, in. .169
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .0
Flush Gage Reading, in. 0
Capacitance Gage Reading 245
Exit Burr Height, in.

Bluing Pin Rollout

6 5/8

Air Gage Readings (.0001 in.)
Angular Position

317/324

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-5.0	-2.0	-6.0	-8.0	-7.0	-5.0
#2	2.0	3.0	3.0	4.0	4.0	6.0	3.0
#3	4.0	8.0	8.0	3.0	8.0	10.0	7.0
#4	7.0	10.0	10.0	3.0	10.0	11.0	10.0
#5	10.0	11.0	11.0	10.0	11.0	11.0	11.0

INSPECTION SHEETS FOR TEST SERIES 22 -

COMBINED VARIABLES, REVERSE DOGBONE SPECIMENS

R RATIO = -0.33

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS (RMS)
Specimen No. 603BL6 05TC

Hole Manufacturing Conditions and Procedures: REAM WITH UNDERSIZE REAMER 1755 REAM [illegible] WITH SAME REAMER

Spindle, rpm [illegible] Feed: [illegible] IPR
Cutting Fluid: [illegible] Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA 110-125
Protrusion, in. 16.5
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 297
Exit Burr Height, in.

Bluing Pin Rollout

65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-9.0	-11.0	-6.0	-6.0	-7.0	-9.0
#2	3.0	2.0	1.0	4.0	3.0	4.0	4.0
#3	6.0	4.0	3.0	3.0	3.0	4.0	5.0
#4	4.0	2.0	1.0	2.0	2.0	3.0	3.0
#5	6.0	5.0	4.0	4.0	2.0	4.0	5.0

Hole #2

Surface Finish, AA 95-105
Protrusion, in. 182
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 316
Exit Burr Height, in.

Bluing Pin Rollout

85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-5.0	-5.0	-9.0	-10.0	-10.0	-8.0
#2	3.0	3.0	3.0	1.0	1.0	1.0	3.0
#3	4.0	4.0	3.0	2.0	2.0	2.0	4.0
#4	1.0	3.0	0	3.0	4.0	2.0	3.0
#5	2.0	2.0	1.0	5.0	4.0	4.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS 125 Max
Specimen No. 3D3BCL3H4TC

Hole Manufacturing Conditions and Procedures: Ream with Undercut Size Ream in 125 Max Mach. H. Surface Ream

Spindle, rpm 80 Feed: 5 8 IPM
Cutting Fluid: Oil Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 95-105
Protrusion, in. 170
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0015
Flush Gage Reading, in. .001
Capacitance Gage Reading 277
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-5.0	-8.0	-6.0	-5.0	-2.0	-6.0
#2	3.0	2.0	3.0	4.0	6.0	5.0	6.0
#3	2.0	3.0	4.0	5.0	4.0	4.0	4.0
#4	4.0	4.0	3.0	3.0	1.0	3.0	3.0
#5	6.0	7.0	6.0	5.0	2.0	3.0	5.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. 179
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 291
Exit Burr Height, in.

Bluing Pin Rollout

85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-3.0	-5.0	-6.0	-10.0	-7.0	-7.0
#2	2.0	5.0	4.0	3.0	3.0	1.0	1.0
#3	4.0	5.0	4.0	3.0	3.0	2.0	0
#4	3.0	3.0	1.0	2.0	4.0	3.0	0
#5	4.0	4.0	1.0	5.0	6.0	5.0	2.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 2E Quality Variable SURFACE ROUGHNESS 125 AA
Specimen No. 4B1TCL2136BC

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.225" REAMED W.D. H.S.S. 031 REAMER
Spindle, rpm 80 Feed: 5 8, I.P.R.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.430

Hole #1

Surface Finish, AA 110-115
Protrusion, in. .177
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 281
Exit Burr Height, in.

Bluing Pin Rollout 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-4.0	-6.0	-8.0	-8.0	-7.0	-6.0	-5.0
#2	4.0	4.0	3.0	4.0	4.0	3.0	2.0
#3	5.0	4.0	2.0	5.0	4.0	4.0	4.0
#4	3.0	3.0	2.0	4.0	2.0	2.0	3.0
#5	5.0	4.0	3.0	5.0	3.0	4.0	5.0

Hole #2

Surface Finish, AA 95-105
Protrusion, in. .172
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 312
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-9.0	-9.0	-7.0	-8.0	-6.0	-5.0
#2	4.0	2.0	2.0	4.0	4.0	5.0	4.0
#3	4.0	4.0	3.0	4.0	4.0	4.0	2.0
#4	3.0	2.0	2.0	4.0	5.0	3.0	2.0
#5	5.0	4.0	3.0	3.0	5.0	5.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable Surface Roughness 125 RMS
Specimen No. 2E38C-3B3TC

Hole Manufacturing Conditions and Procedures: Ream with Undersize Reamer at 1752 RPM Ream with Sandvik Reamer

Spindle, rpm 80 Feed: 55 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2450

Hole #1

Surface Finish, AA 100
Protrusion, in. 165
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .001
Capacitance Gage Reading 318
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-6.0	-7.0	-9.0	-9.0	-10.0	-8.0
#2	5.0	4.0	5.0	3.0	4.0	4.0	5.0
#3	4.0	2.0	3.0	2.0	2.0	2.0	4.0
#4	2.0	1.0	3.0	1.0	2.0	2.0	3.0
#5	2.0	4.0	4.0	4.0	3.0	3.0	4.0

Hole #2

Surface Finish, AA 100-110
Protrusion, in. 158
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 309
Exit Burr Height, in.

Bluing Pin Rollout 85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-7.0	-8.0	-7.0	-8.0	-9.0	-5.0
#2	4.0	4.0	4.0	4.0	4.0	4.0	2.0
#3	4.0	4.0	4.0	3.0	3.0	4.0	2.0
#4	4.0	3.0	2.0	1.0	4.0	2.0	2.0
#5	5.0	4.0	4.0	3.0	4.0	4.0	3.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE FINISH, AA

Specimen No. 4CIIC +60, -2

Hole Manufacturing Conditions and Procedures: Ream with undersize Reamer A 1753. Ream and L.H. Spiral Reamer B

Spindle, rpm 80 Feed: 5 IPM

Cutting Fluid: Dry Depth: (Ind. Reading) 2452

Hole #1

Surface Finish, AA 100-110

Protrusion, in. 170

Perpendicularity, .001 in./in.

Longitudinal 0 Transverse .0015

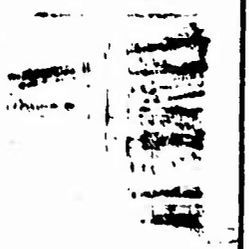
Flush Gage Reading, in. .001

Capacitance Gage Reading 283

Exit Burr Height, in.

Bluing Pin Rollout

80%



Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-1.0	-3.0	-5.0	-12.0	-9.0	-5.0
#2	7.0	8.0	7.0	5.0	6.0	5.0	6.0
#3	6.0	6.0	5.0	4.0	4.0	4.0	5.0
#4	5.0	3.0	2.0	3.0	5.0	5.0	4.0
#5	6.0	4.0	3.0	4.0	7.0	6.0	6.0

Hole #2

Surface Finish, AA 100

Protrusion, in. 164

Perpendicularity, .001 in./in.

Longitudinal .0025 Transverse 0

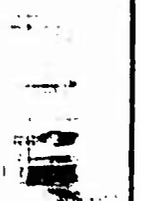
Flush Gage Reading, in. 0

Capacitance Gage Reading 319

Exit Burr Height, in.

Bluing Pin Rollout

90%



Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-4.0	-6.0	-9.0	-9.0	-x.0	-7.0
#2	4.0	4.0	3.0	3.0	3.0	3.0	3.0
#3	4.0	4.0	2.0	4.0	3.0	3.0	3.0
#4	2.0	1.0	0	5.0	5.0	3.0	3.0
#5	3.0	0	2.0	5.0	6.0	4.0	2.0

Figure 14 - Sample Manufacturing Report: Tapered Holes

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE-ROUGHNESS
Specimen No. 605764 6C4C A.A. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER-SIZE REAMER 1755 REAM AS A LH SPIRAL REAMER.

Spindle, rpm 80 Feed: .58 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 110
Protrusion, in. .176
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 265
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-10.0	-7.0	-7.0	-6.0	-7.0	-6.0
#2	3.0	3.0	3.0	2.0	1.0	2.0	2.0
#3	5.0	5.0	4.0	2.0	1.0	1.0	2.0
#4	4.0	5.0	3.0	1.0	1.0	2.0	2.0
#5	6.0	6.0	6.0	6.0	5.0	6.0	7.0

Hole #2

Surface Finish, AA 100
Protrusion, in. .182
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .001
Flush Gage Reading, in. .001
Capacitance Gage Reading 313
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-7.0	-7.0	-8.0	-7.0	-6.0	-7.0
#2	2.0	-1.0	-4.0	1.0	0	1.0	2.0
#3	2.0	3.0	3.0	2.0	1.0	0	0
#4	1.0	3.0	2.0	2.0	0	0	-1.0
#5	6.0	8.0	8.0	7.0	5.0	7.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE - ROUGHNESS
Specimen No. LR2BCL4C18C AVG END 12 READS

Hole Manufacturing Conditions and Procedures: REAM- UNDER SIZE
BORE & LAST REAM WITH SPIRAL REAMER

Spindle, rpm 80 Feed: 2.8 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 95
Protrusion, in. .158
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 322
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-13.0	-14.0	-12.0	-12.0	-12.0	-12.0
#2	3.0	3.0	2.0	3.0	4.0	4.0	3.0
#3	5.0	5.0	4.0	4.0	5.0	5.0	5.0
#4	5.0	5.0	3.0	5.0	5.0	5.0	5.0
#5	5.0	5.0	3.0	4.0	6.0	6.0	5.0

Hole #2

Surface Finish, AA 90
Protrusion, in. .171
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0015
Flush Gage Reading, in. 0
Capacitance Gage Reading 303
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-13.0	-14.0	-8.0	-7.0	-8.0	-14.0
#2	4.0	4.0	4.0	2.0	4.0	3.0	3.0
#3	5.0	5.0	5.0	3.0	3.0	3.0	5.0
#4	5.0	5.0	4.0	4.0	1.0	2.0	4.0
#5	6.0	5.0	4.0	5.0	6.0	5.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS
Specimen No. 46TC2603T

Hole Manufacturing Conditions and Procedures: REAM
BENDIX 1.755 REAM [illegible]

Spindle, rpm 85 Feed: 5 IPM
Cutting Fluid: Wet Depth: (Ind. Reading) .446

Hole #1

Surface Finish, AA 95
Protrusion, in. .190
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 278
Exit Burr Height, in.

Bluing Pin Rollout 85%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-10.0	-9.0	-8.0	-11.0	-11.0	-9.0
#2	2.0	2.0	3.0	2.0	2.0	3.0	3.5
#3	2.0	3.0	4.0	4.0	3.0	2.0	3.0
#4	2.0	3.0	4.0	4.0	3.0	2.0	3.0
#5	6.0	7.0	6.0	8.0	6.0	6.0	8.0

Hole #2

Surface Finish, AA 105
Protrusion, in. .180
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 308
Exit Burr Height, in.

Bluing Pin Rollout 80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-8.0	-7.0	-8.0	-8.0	-8.0	-9.0
#2	2.0	3.0	4.0	3.0	3.0	3.0	3.0
#3	3.0	4.0	4.0	5.0	5.0	4.0	3.0
#4	2.0	4.0	6.0	5.0	5.0	5.0	2.0
#5	5.0	7.0	9.0	8.0	8.0	7.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS
Specimen No. 6CSBL 3135TC ANGLE 125 RMS

Hole Manufacturing Conditions and Procedures: [illegible]
REAM @ 1755 RPM CYL. B.S. REAMER

Spindle, rpm 60 Feed: .2 & .5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.446

Hole #1

Surface Finish, AA 115 Bluing Pin Rollout
Protrusion, in. .176
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. 0 85%
Capacitance Gage Reading 307
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-9.0	[illegible]	-6.0	[illegible]	[illegible]	-7.0
#2	0	[illegible]	1.0	3.0	[illegible]	1.0	3.0
#3	3.0	[illegible]	3.0	3.0	[illegible]	[illegible]	3.0
#4	3.0	[illegible]	[illegible]	1.0	[illegible]	3.0	3.0
#5	6.0	5.0	5.0	5.0	6.0	6.0	6.0

Hole #2

Surface Finish, AA 110 Bluing Pin Rollout
Protrusion, in. .183
Perpendicularity, .001 in./in.
Longitudinal .0012 Transverse .0035
Flush Gage Reading, in. .021 85%
Capacitance Gage Reading 308
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-6.0	-6.0	-4.0	-7.0	-5.0	-5.0
#2	1.0	4.0	4.0	[illegible]	2.0	-1.0	0
#3	2.0	3.0	3.0	3.0	3.0	3.0	4.0
#4	3.0	3.0	[illegible]	[illegible]	3.0	3.0	4.0
#5	[illegible]	7.0	[illegible]	[illegible]	5.0	5.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS
Specimen No. 3C216 3[illegible] [illegible]

Hole Manufacturing Conditions and Procedures: [illegible]
[illegible]

Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: DRY Depth: (Ind. Reading) .442

Hole #1

Surface Finish, AA 9
Protrusion, in. 167
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 318
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-11.0	-10.0	-10.0	-9.0	-10.0	-10.0
#2	2.0	2.0	2.0	3.0	3.0	3.0	3.0
#3	4.0	5.0	5.0	3.0	2.0	4.0	4.0
#4	4.0	4.0	4.0	4.0	0	4.0	4
#5	5.0	4.0	5.0	4.0	3.0	5.0	5.0

Hole #2

Surface Finish, AA 110
Protrusion, in. 173
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 299
Exit Burr Height, in.

Bluing Pin Rollout

25%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-12.0	-12.0	-13.0	-12.0	-13.0	-14.0
#2	3.0	3.0	3.0	4.0	3.0	3.0	3.0
#3	5.0	6.0	6.0	5.0	5.0	5.0	5.0
#4	5.0	6.0	5.0	5.0	5.0	5.0	5.0
#5	6.0	7.0	7.0	6.0	5.0	6.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - SCRATCH
Specimen No. 306BC-3C413C M.I.D. INT 125 RMS

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.255" REAM 1904 L.H. SPIRAL REAMER USE BORING TOOL SET HOLES & RUN OUT FOR SCRATCH
Spindle, rpm 80 Feed: 55 & E.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.455-0

Hole #1

Surface Finish, AA 115-120
Protrusion, in. 174
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. -.001
Capacitance Gage Reading 348
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-8.0	-11.0	-2.0	-4.0	-11.0	-8.0
#2	6.0	5.0	5.0	4.0	7.0	4.0	2.0
#3	9.0	7.0	5.0	5.0	8.0	5.0	8.0
#4	10.0	8.0	5.0	3.0	8.0	5.0	8.0
#5	10.0	11.0	9.0	8.0	8.0	5.0	8.0

Hole #2

Surface Finish, AA 95-100
Protrusion, in. 178
Perpendicularity, .001 in./in.
Longitudinal .0 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 231
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-8.0	-9.0	-5.0	-5.0	-10.0	-8.0
#2	6.0	6.0	4.0	4.0	6.0	6.0	2.0
#3	8.0	7.0	6.0	5.0	7.0	7.0	8.0
#4	8.0	6.0	5.0	4.0	7.0	7.0	8.0
#5	12.0	10.0	9.0	10.0	10.0	9.0	8.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - SCRATCH
Specimen No. LB4TC-2E4TC M.D. INT. 125 R.M.S.

Hole Manufacturing Conditions and Procedures: REAM WITH HAND SIZE REAM @ 1.255". REAM M.D. WITH SD CARBIDE USE BALL END TOOL SET .005" UNDERCUT FOR SCRATCH
Spindle, rpm 40 Feed: 5 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 110-120
Protrusion, in. .174
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0001
Flush Gage Reading, in. .002
Capacitance Gage Reading .238
Exit Burr Height, in.

Bluing Pin Rollout

65°

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-10.0	-11.0	-7.0	-3.0	-7.0	-9.0
#2	6.0	6.0	5.0	6.0	7.0	5.0	5.0
#3	8.0	6.0	6.0	6.0	7.0	7.0	7.0
#4	7.0	6.0	4.0	4.0	7.0	6.0	7.0
#5	9.0	8.0	7.0	7.0	8.0	7.0	8.0

Hole #2

Surface Finish, AA 85-95
Protrusion, in. .176
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 225
Exit Burr Height, in.

Bluing Pin Rollout

75°

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-3.0	-5.0	-7.0	-5.0	-3.0	-5.0	-4.0
#2	9.0	8.0	7.0	6.0	8.0	7.0	8.0
#3	10.0	9.0	8.0	7.0	9.0	7.0	7.0
#4	11.0	10.0	8.0	4.0	8.0	7.0	9.0
#5	13.0	11.0	11.0	10.0	10.0	11.0	11.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS-SCRATCH
Specimen No. 3E6TC-2E2TC MID-INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.755. REAM W/ L.H. SPIRAL REAMER USE BORING TOOL SET OFF & PULL OUT FOR SCRATCH
Spindle, rpm [illegible] Feed: [illegible] IPR
Cutting Fluid: OIL Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA 100
Protrusion, in. .172
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 225
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-6.0	-7.0	-7.0	-5.0	-8.0	-6.0
#2	7.0	5.0	4.0	5.0	[illegible]	6.0	7.0
#3	9.0	7.0	6.0	7.0	[illegible]	8.0	9.0
#4	9.0	8.0	7.0	6.0	[illegible]	[illegible]	[illegible]
#5	10.0	10.0	9.0	7.0	[illegible]	[illegible]	[illegible]

Hole #2

Surface Finish, AA 100
Protrusion, in. .168
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0015
Flush Gage Reading, in. -.001
Capacitance Gage Reading 225
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-5.0	-8.0	-7.0	-5.0	-10.0	-9.0
#2	6.0	5.0	3.0	6.0	8.0	8.0	9.0
#3	7.0	7.0	5.0	7.0	8.0	7.0	8.0
#4	8.0	9.0	5.0	5.0	8.0	[illegible]	8.0
#5	9.0	9.0	7.0	5.0	7.0	6.0	1.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - SCRATCH
Specimen No. 3B3B-12B3TC AND INT. 125 MAX

Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1755 REAM NEW LIL SPIRAL REAMER USE BORING TOOL SET 1005 PULL OUT FOR SCRATCH
Spindle, rpm 80 Feed: 55 S.I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 95-100
Protrusion, in. .177
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. -.002
Capacitance Gage Reading 286
Exit Burr Height, in.

Bluing Pin Rollout

65%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-8.0	-9.0	-6.0	-6.0	-7.0	-8.0
#2	5.0	6.0	6.0	7.0	7.0	7.0	5.0
#3	7.0	7.0	8.0	9.0	7.0	8.0	6.0
#4	8.0	8.0	7.0	9.0	9.0	8.0	4.0
#5	10.0	11.0	11.0	11.0	11.0	9.0	10.0

Hole #2

Surface Finish, AA 115
Protrusion, in. .185
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. .002
Capacitance Gage Reading 232
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-6.0	-6.0	-7.0	-5.0	-4.0	-9.0	-9.0
#2	6.0	5.0	5.0	5.0	6.0	5.0	5.0
#3	8.0	8.0	7.0	7.0	8.0	6.0	7.0
#4	9.0	8.0	8.0	5.0	7.0	5.0	6.0
#5	11.0	11.0	11.0	9.0	10.0	6.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - SCRATCH
Specimen No. 2B1B6-6B3B

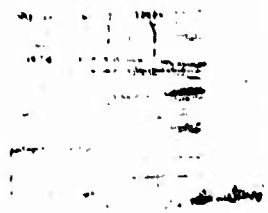
Hole Manufacturing Conditions and Procedures: REAM WITH UNDER-SIZE REAMER 1.955 REAM NOW L.H. SPIRAL FLUTE R. USE BALLING TOOL SET .005 PULL OUT FOR SCRATCH
Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.450

Hole #1

Surface Finish, AA 100
Protrusion, in. .188
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. -.001
Capacitance Gage Reading 213
Exit Burr Height, in.

80%

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-9.0	-6.0	-5.0	-4.0	-7.0	-7.0
#2	8.0	5.0	4.0	5.0	6.0	5.0	7.0
#3	9.0	7.0	7.0	7.0	8.0	8.0	8.0
#4	9.0	8.0	7.0	7.0	7.0	8.0	9.0
#5	13.0	10.0	10.0	10.0	12.0	9.0	11.0

Hole #2

Surface Finish, AA 100
Protrusion, in. .184
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0025
Flush Gage Reading, in. 0
Capacitance Gage Reading 239
Exit Burr Height, in.

80%

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-8.0	-8.0	-6.0	-4.0	-9.0	-9.0
#2	6.0	4.0	5.0	7.0	8.0	7.0	6.0
#3	7.0	6.0	6.0	8.0	9.0	8.0	7.0
#4	8.0	7.0	6.0	9.0	9.0	6.0	7.0
#5	11.0	12.0	12.0	11.0	10.0	9.0	8.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable [illegible]
Specimen No. 6466 - 6645C

Hole Manufacturing Conditions and Procedures: [illegible]
[illegible] USE Boring Tool SET 1005 [illegible]
Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) ~.440

Hole #1

Surface Finish, AA 100
Protrusion, in. .182
Perpendicularity, .001 in./in.
Longitudinal .002 Transverse .0025
Flush Gage Reading, in. 0
Capacitance Gage Reading 237
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-10.0	-10.0	-10.0	-8.0	-11.0	-11.0
#2	2.0	1.0	2.0	3.0	4.0	3.0	3.0
#3	5.0	4.0	4.0	4.0	4.0	3.0	4.0
#4	5.0	3.0	3.0	4.0	3.0	3.0	4.0
#5	6.0	7.0	6.0	6.0	7.0	6.0	5.0

Hole #2

Surface Finish, AA 110
Protrusion, in. .174
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. -.002
Capacitance Gage Reading 218
Exit Burr Height, in.

Bluing Pin Rollout

70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-11.0	-11.0	-9.0	-8.0	-11.0	-10.0
#2	3.0	1.0	1.0	3.0	4.0	3.0	3.0
#3	5.0	5.0	4.0	4.0	4.0	3.0	5.0
#4	6.0	4.0	3.0	6.0	4.0	3.0	5.0
#5	7.0	7.0	6.0	7.0	7.0	5.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - SCRATCH
Specimen No. 3134BC - 4A1BC NOT AT 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REAM WITH 6 H SPECIAL REAMER
USE BLUING TO SEE IF SCRATCH

Spindle, rpm 6[illegible] Feed: [illegible]
Cutting Fluid: OIL Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 110
Protrusion, in. .166
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse 0
Flush Gage Reading, in. -.001
Capacitance Gage Reading 243
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-13.0	-9.0	-7.0	-4.0	-7.0	-9.0
#2	2.0	3.0	2.0	2.0	0	2.0	2.0
#3	3.0	3.0	2.0	3.0	2.0	3.0	3.0
#4	2.0	1.0	1.0	3.0	2.0	3.0	3.0
#5	3.0	3.0	4.0	4.0	5.0	5.0	6.0

Hole #2

Surface Finish, AA 100
Protrusion, in. .176
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. -.002
Capacitance Gage Reading 254
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-7.0	-7.0	-8.0	-6.0	-5.0	-5.0
#2	[illegible]	2.0	1.0	1.0	2.0	3.0	3.0
#3	3.0	2.0	2.0	3.0	4.0	4.0	4.0
#4	3.0	2.0	1.0	4.0	4.0	4.0	5.0
#5	10.0	9.0	8.0	9.0	8.0	9.0	9.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE FINISH - SCRATCH
Specimen No. 6DST66BC

Hole Manufacturing Conditions and Procedures: [illegible]
Spindle, rpm 80 Feed: [illegible]
Cutting Fluid: DRY Depth: (Ind. Reading) .040

Hole #1

Surface Finish, AA 90
Protrusion, in. .174
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. -.001
Capacitance Gage Reading 243
Exit Burr Height, in.

Bluing Pin Rollout: —

10%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-13.0	-14.0	-13.0	-14.0	-14.0	-14.0
#2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
#3	5.0	5.0	5.0	4.0	5.0	5.0	5.0
#4	5.0	5.0	4.0	4.0	4.0	4.0	5.0
#5	5.0	5.0	4.0	4.0	4.0	5.0	5.0

Hole #2

Surface Finish, AA 100 - 85
Protrusion, in. .166
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading -18
Exit Burr Height, in.

Bluing Pin Rollout: —

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-14.0	-12.0	-14.0	-14.0	-12.0	-14.0
#2	3.0	3.0	3.0	4.0	3.0	3.0	3.0
#3	6.0	5.0	4.0	5.0	5.0	5.0	5.0
#4	5.0	4.0	3.0	5.0	5.0	5.0	5.0
#5	5.0	5.0	5.0	6.0	5.0	5.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - SCRATCH
Specimen No. 6233264195136 MAX 5 PT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER-SIZE
REAMER 1.375 REMM MOD. L.H. SPIRAL REAMER
USE BOX TYPE TOOL STEADY AND ALIGN FOR SPINDLE
Spindle, rpm 40 Feed: 5 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 100
Protrusion, in. 171
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. .0
Capacitance Gage Reading 248
Exit Burr Height, in.

Bluing Pin Rollout

15%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-14.0	-14.0	-13.0	-13.0	-13.0	-14.0
#2	2.0	1.0	2.0	3.0	4.0	3.0	3.0
#3	5.0	4.0	4.0	4.0	5.0	4.0	5.0
#4	4.0	3.0	3.0	4.0	4.0	4.0	5.0
#5	5.0	4.0	4.0	5.0	6.0	4.0	5.0

Hole #2

Surface Finish, AA 110
Protrusion, in. 174
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. -.001
Capacitance Gage Reading 228
Exit Burr Height, in.

Bluing Pin Rollout

80%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-12.0	-12.0	-12.0	-11.0	-12.0	-12.0
#2	3.0	3.0	2.0	3.0	3.0	3.0	4.0
#3	5.0	4.0	4.0	4.0	4.0	5.0	5.0
#4	5.0	3.0	3.0	4.0	4.0	5.0	5.0
#5	5.0	4.0	5.0	5.0	5.0	4.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable [illegible]
Specimen No. [illegible]

Hole Manufacturing Conditions and Procedures: [illegible]

Spindle, rpm [illegible] Feed: [illegible]
Cutting Fluid: [illegible] Depth: (Ind. Reading) [illegible]

Hole #1

Surface Finish, AA 115
Protrusion, in. 1.5
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 242
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-10.0	-11.0	-11.0	-10.0	-11.0	-11.0
#2	3.0	3.0	2.0	2.0	3.0	3.0	3.0
#3	4.0	4.0	4.0	5.0	5.0	4.0	5.0
#4	5.0	4.0	3.0	4.0	5.0	4.0	5.0
#5	6.0	8.0	8.0	8.0	9.0	7.0	6.0

Hole #2

Surface Finish, AA 105
Protrusion, in. 1.7
Perpendicularity, .001 in./in.
Longitudinal .021 Transverse 0
Flush Gage Reading, in. -.001
Capacitance Gage Reading 244
Exit Burr Height, in.

Bluing Pin Rollout

75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-13.0	-13.0	-14.0	-13.0	-14.0	-13.0
#2	3.0	3.0	3.0	3.0	3.0	2.0	3.0
#3	5.0	4.0	4.0	5.0	5.0	4.0	5.0
#4	5.0	3.0	3.0	3.0	3.0	3.0	5.0
#5	6.0	5.0	3.0	5.0	6.0	4.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS-QUALITY
Specimen No. 4A1K-6C6K M.O. INT 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REMER. 1.725" REAM M.U.L.H. STANDARD REMMER USE
STRAIGHT FLUTE REMMER PLUNGE 1.722 ± .006 IN TRANSVERSE POS

Spindle, rpm 80 Feed: 5" P.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 110
Protrusion, in. .178
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .002
Flush Gage Reading, in. -.002
Capacitance Gage Reading 251
Exit Burr Height, in.

Bluing Pin Rollout 70%

319/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-7.0	-8.0	-10.0	-8.0	-9.0	-9.0
#2	6.0	9.0	10.0	4.0	12.0	8.0	5.0
#3	8.0	13.0	13.0	4.0	14.0	12.0	8.0
#4	10.0	15.0	15.0	5.0	14.0	13.0	10.0
#5	11.0	12.0	13.0	10.0	—	11.0	12.0

Hole #2

Surface Finish, AA 100
Protrusion, in. .158
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .002
Flush Gage Reading, in. -.001
Capacitance Gage Reading 251
Exit Burr Height, in.

Bluing Pin Rollout 60%

319/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-11.0	-11.0	-10.0	-9.0	-8.0	-8.0
#2	6.0	6.0	8.0	5.0	7.0	10.0	7.0
#3	8.0	11.0	12.0	6.0	11.0	13.0	10.0
#4	11.0	13.0	14.0	9.0	11.0	12.0	13.0
#5	10.0	10.0	10.0	8.0	12.0	12.0	13.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE-ROUGHNESS OVAL 44
Specimen No. 4B13C-3C4TC MID INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE REAMER 1.755" REAM MOD. L.H. SPIRAL REAMER USE STR. SHK. FLUTE REAMER PLUNGE 1.706 2.06L IN TRANSVERSE DIR
Spindle, rpm 80 Feed: 55 8.I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 100 16
Protrusion, in. 160
Perpendicularity, .001 in./in.
Longitudinal .0015" Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 280
Exit Burr Height, in.

Bluing Pin Rollout

75%

318/3-4

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-10.0	-12.0	-10.0	-8.0	-9.0	-10.0
#2	6.0	6.0	6.0	5.0	7.0	7.0	6.0
#3	10.2	10.0	11.0	3.0	11.0	12.0	9.0
#4	8.2	13.0	13.0	1.0	11.0	14.0	11.0
#5	10.0	12.0	12.0	9.0	13.0	10.0	10.0

Hole #2

Surface Finish, AA 100-105
Protrusion, in. 164
Perpendicularity, .001 in./in.
Longitudinal .0065" Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 260
Exit Burr Height, in.

Bluing Pin Rollout

65%

317/3-4

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-10.0	-10.0	-8.0	-8.0	-8.0	8.0
#2	7.0	9.0	9.0	7.0	9.0	9.0	8.0
#3	8.3	12.0	12.0	7.0	12.0	12.0	9.0
#4	8.2	14.0	14.0	7.0	13.0	14.0	11.0
#5	10.2	10.0	13.0	11.0	12.0	12.0	10.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE-ROUGHNESS- OVALITY
Specimen No. 4E286-3E4T M.O.S-T. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER-SIZE
PENNSYLVANIA 1.755 REAM MOD 6 H. SPIRAL REAMER USE
SPIRAL FLUTE REAMER PLUNGE 1.700 Each IN TRANSVERSE POS.
Spindle, rpm 80 Feed: 55 R.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 100 - 110
Protrusion, in. 174
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse 0
Flush Gage Reading, in. -.001
Capacitance Gage Reading 259
Exit Burr Height, in.

Bluing Pin Rollout

65%

318/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-10.0	-8.0	-6.0	-5.0	-5.0	-5.0
#2	6.0	6.0	6.0	5.0	7.0	8.0	7.0
#3	8.0	12.0	12.0	7.0	12.0	13.0	10.0
#4	9.0	13.0	13.0	8.0	13.0	14.0	12.0
#5	13.0	11.0	13.0	10.0	13.0	11.0	12.0

Hole #2

Surface Finish, AA 100
Protrusion, in. 162
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 279
Exit Burr Height, in.

Bluing Pin Rollout

55%

318/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-9.0	-11.0	-11.0	-8.0	-8.0	-10.0
#2	5.0	6.0	5.0	4.0	6.0	7.0	5.0
#3	7.0	11.0	12.0	5.0	11.0	12.0	5.0
#4	9.0	13.0	13.0	5.0	12.0	13.0	10.0
#5	11.0	11.0	12.0	11.0	10.0	10.0	10.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 2853-6650L MAXIMUM 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REMOVE .1755" PILOT MOD. 6.4 SP. CPI REAMER USE STD.
FLUTE REAMER THROUGH .1750 ± .006 IN TRANSVERSE POS.
Spindle, rpm 60 Feed: 5" PER MIN.
Cutting Fluid: DRY Depth: (Ind. Reading) .446

Hole #1

Surface Finish, AA 100
Protrusion, in. .185"
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. -.001
Capacitance Gage Reading 267
Exit Burr Height, in.

Bluing Pin Rollout 60%

317/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-9.0	-9.0	-8.0	-6.0	-7.0	-6.0	-8.0
#2	6.0	7.0	7.0	5.0	5.0	10.0	7.0
#3	7.0	12.0	12.0	4.0	11.0	13.0	12.0
#4	10.0	14.0	14.0	4.0	13.0	13.0	13.0
#5	13.0	11.0	13.0	10.0	13.0	12.0	13.0

Hole #2

Surface Finish, AA 125
Protrusion, in. .165"
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. -.001
Capacitance Gage Reading 245
Exit Burr Height, in.

Bluing Pin Rollout 65%

317/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-7.0	-10.0	-8.0	-7.0	-8.0	-7.0
#2	7.0	9.0	8.0	8.0	7.0	9.0	7.0
#3	9.0	12.0	12.0	6.0	12.0	13.0	12.0
#4	10.0	14.0	14.0	5.0	13.0	14.0	13.0
#5	15.0	13.0	11.0	11.0	10.0	11.0	15.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE-ROUGHNESS-QUALITY
Specimen No. 6C6BC-6132 TC MID. INT 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REAM W 1755 REMA M100 L.H. SPIRAL REAMER USE STRIGHT
FLUTE REMA W DIA GE 1900 T.OC6 IN TITANIUM DGS.
Spindle, rpm 80 Feed: 5 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 110
Protrusion, in. 180
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. -.003
Capacitance Gage Reading 250
Exit Burr Height, in.

Bluing Pin Rollout

60°6

318/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-8.0	-5.0	-7.0	-5.0	-5.0	-6.0	-7.0
#2	6.0	6.0	6.0	5.0	7.0	9.0	8.0
#3	8.0	12.0	12.0	5.0	11.0	13.0	11.0
#4	11.0	14.0	13.0	5.0	13.0	12.0	13.0
#5	13.0	13.0	13.0	11.0	13.0	11.0	13.0

Hole #2

Surface Finish, AA 110
Protrusion, in. 177
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0015
Flush Gage Reading, in. -.002
Capacitance Gage Reading 258
Exit Burr Height, in.

Bluing Pin Rollout

5°6

317/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-6.0	-7.0	-8.0	-5.0	-4.0	-4.0
#2	6.0	6.0	8.0	4.0	7.0	11.0	7.0
#3	8.0	12.0	13.0	6.0	11.0	14.0	12.0
#4	9.0	15.0	14.0	5.0	14.0	15.0	13.0
#5	11.0	13.0	13.0	12.0	15.0	15.0	14.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 12 Quality Variable SURF. FINISH ROUGHNESS AVG
Specimen No. CC48L3A5TC MIC INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REAM W 1.75" REAMER MOD L.H. SPIRAL FLUTE E. USE
STRAIGHT FLUTE REAMER DIAM 1.76" T.006 IN TRANSVERSE POS
Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) .440

Hole #1

Surface Finish, AA 160
Protrusion, in. 160
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .002
Flush Gage Reading, in. .001
Capacitance Gage Reading 254
Exit Burr Height, in.

Bluing Pin Rollout 65%

318/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-13.0	-14.0	-14.0	—	-15.0	—
#2	3.0	3.0	4.0	2.0	4.0	5.0	3.0
#3	5.0	8.0	8.0	4.0	6.0	7.0	6.0
#4	6.0	8.0	10.0	5.0	8.0	8.0	6.0
#5	6.0	8.0	7.0	10.0	8.0	7.0	7.0

Hole #2

Surface Finish, AA 110
Protrusion, in. 173
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. 0
Capacitance Gage Reading 258
Exit Burr Height, in.

Bluing Pin Rollout 70%

318/335

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-13.0	-15.0	-14.0	-14.0	-15.0	-14.0
#2	4.0	2.0	2.0	2.0	3.0	4.0	4.0
#3	4.0	6.0	7.0	4.0	5.0	7.0	6.0
#4	5.0	7.0	9.0	5.0	6.0	8.0	7.0
#5	6.0	7.0	8.0	6.0	7.0	8.0	8.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - OVERALL
Specimen No. 605BL + 206TC MID INT 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER-SIZE
REAM @ 1.755. REAM MOD. L.H. SPIRAL REAMER USE
STD. SHOP FLUTE REAMER PLUS .001 FOR TRIGONOMETRIC BOS
Spindle, rpm 82 Feed: [illegible] IPR
Cutting Fluid: OIL Depth: (Ind. Reading) ~.140

Hole #1

Surface Finish, AA 110
Protrusion, in. 165
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0025
Flush Gage Reading, in. -.001
Capacitance Gage Reading 254
Exit Burr Height, in.

Bluing Pin Rollout 75%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-12.0	-14.0	-14.0	-13.0	-12.0	-15.0
#2	3.0	4.0	4.0	2.0	1.0	4.0	3.0
#3	5.0	7.0	7.0	3.0	6.0	7.0	6.0
#4	5.0	8.0	8.0	4.0	8.0	7.0	7.0
#5	5.0	8.0	8.0	5.0	7.0	7.0	7.0

Hole #2

Surface Finish, AA 90
Protrusion, in. 160
Perpendicularity, .001 in./in.
Longitudinal .000 Transverse .001
Flush Gage Reading, in. -.001
Capacitance Gage Reading 250
Exit Burr Height, in.

Bluing Pin Rollout 70%

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-13.0	-13.0	-15.0	-13.0	-14.0	-15.0
#2	3.0	4.0	4.0	2.0	1.0	5.0	3.0
#3	4.0	7.0	7.0	5.0	6.0	8.0	5.0
#4	6.0	[illegible]	9.0	5.0	7.0	8.0	6.0
#5	6.0	[illegible]	8.0	5.0	7.0	8.0	7.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 3RIBCL4E3L2C M.I.D. INT. 125 N.I.S.

Hole Manufacturing Conditions and Procedures: REAM UNDER-SIZE REAMER 1755 REAM MOD. L.H. SPIRAL REAMER USE SPEED-FEED REAMER PLATE 1200 T.C.I. INTERMEDIATE RPS.
Spindle, rpm 80 Feed: 55 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 100 — Bluing Pin Rollout
Protrusion, in. .172
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse .0015
Flush Gage Reading, in. -.002 25%
Capacitance Gage Reading 248
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

318 / 325

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-13.0	-14.0	-14.0	-15.0	-14.0	-13.0
#2	4.0	4.0	4.0	3.0	5.0	4.0	4.0
#3	5.0	7.0	8.0	4.0	5.0	8.0	5.0
#4	6.0	8.0	9.0	4.0	8.0	8.0	7.0
#5	6.0	8.0	8.0	5.0	8.0	9.0	8.0

Hole #2

Surface Finish, AA 100 — Bluing Pin Rollout
Protrusion, in. .171
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse 0
Flush Gage Reading, in. 0 65%
Capacitance Gage Reading 238
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

317 / 325

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-14.0	-15.0	-14.0	-14.0	-12.0	-13.0
#2	3.0	5.0	5.0	2.0	4.0	5.0	4.0
#3	4.0	8.0	8.0	4.0	6.0	8.0	7.0
#4	5.0	8.0	10.0	6.0	7.0	9.0	8.0
#5	7.0	9.0	9.0	6.0	7.0	8.0	8.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS QUALITY
Specimen No. 4C6B2C4 2C2B2C M.D. ENT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDER 2E
REAMER 1.755" REMA MFG. L.H. SPIRAL 12 FLUTE USE
SPINDLE FLUTE REMA ST PILOT # 1700 ± .006 IN TRANSVERSE DIR
Spindle, rpm 80 Feed: .5 IPR
Cutting Fluid: DRY Depth: (Ind. Reading) 2.475

Hole #1

Surface Finish, AA 105
Protrusion, in. .162
Perpendicularity, .001 in./in.
Longitudinal 0 Transverse 0
Flush Gage Reading, in. .002
Capacitance Gage Reading 255
Exit Burr Height, in.

Bluing Pin Rollout

66%

317/323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-12.0	-12.0	-14.0	-15.0	-15.0	-15.0
#2	3.0	4.0	4.0	2.0	3.0	4.0	3.0
#3	6.0	7.0	8.0	4.0	7.0	7.0	7.0
#4	6.0	8.0	9.0	5.0	7.0	8.0	7.0
#5	6.0	7.0	8.0	6.0	7.0	8.0	7.0

Hole #2

Surface Finish, AA 100
Protrusion, in. .168
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 252
Exit Burr Height, in.

Bluing Pin Rollout

65%

314/324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-14.0	—	-15.0	-13.0	-13.0	-13.0
#2	3.0	4.0	4.0	3.0	2.0	5.0	4.0
#3	5.0	6.0	7.0	4.0	6.0	8.0	7.0
#4	6.0	7.0	8.0	5.0	8.0	9.0	7.0
#5	5.0	8.0	9.0	6.0	7.0	7.0	8.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 22 Quality Variable SURFACE ROUGHNESS - QUALITY
Specimen No. 486BC4C4BC A.O.I.M. 12 STRIPS

Hole Manufacturing Conditions and Procedures: REAM UNDER SIZE
REAMER 1.755 [illegible] L.H. SPIRAL REAMER MSC
STRAIGHT FLUTE REAM @ 1111, 1722 .006 IN TRANSLATIONAL POS.
Spindle, rpm 80 Feed: SFPR
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 90
Protrusion, in. 16.0
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse 0
Flush Gage Reading, in. -.001
Capacitance Gage Reading 229
Exit Burr Height, in.

65°

Bluing Pin Rollout

318
524

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-7.0	-7.0	-5.0	-2.0	-5.0	-7.0	-6.0
#2	0	4.0	8.0	3.0	-2.0	1.0	-2.0
#3	4.0	9.0	11.0	2.0	5.0	8.0	2.0
#4	6.0	11.0	12.0	6.0	9.0	10.0	6.0
#5	11.0	12.0	12.0	12.0	11.0	13.0	11.0

Hole #2

Surface Finish, AA 90
Protrusion, in. 174
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 278
Exit Burr Height, in.

60°

Bluing Pin Rollout

314
123

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-5.0	-7.0	-9.0	-13.0	-13.0	-13.0	-14.0
#2	0	1.0	0	3.0	4.0	5.0	3.0
#3	2.0	5.0	2.0	4.0	8.0	8.0	6.0
#4	2.0	9.0	10.0	5.0	8.0	9.0	8.0
#5	10.0	11.0	11.0	5.0	9.0	8.0	8.0

INSPECTION SHEETS FOR TEST SERIES 23

COMBINED VARIABLES

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURFACE RGH., 125 RMS, MID INT.
Specimen No. 3APTC & 305TC

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZED REAMER 1.755 REAM MOD L.H. SPIRAL REAMER

Spindle, rpm 80 Feed: 55 & 1 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 95-100
Protrusion, in. .165
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. .0000
Capacitance Gage Reading 302
Exit Burr Height, in.

Bluing Pin Rollout

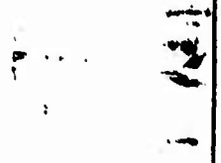
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-13.0	-14.0	-13.0	-12.0	-11.0	-12.0
#2	1.0	1.0	0	2.0	2.0	1.0	1.0
#3	2.0	2.0	2.0	3.0	3.0	3.0	2.0
#4	2.0	2.0	2.0	3.0	3.0	3.0	1.0
#5	3.0	4.0	4.0	4.0	5.0	4.0	5.0

Hole #2

Surface Finish, AA 100-125
Protrusion, in. .171
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0010
Flush Gage Reading, in. -.0020
Capacitance Gage Reading 304
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-14.0	-12.0	-12.0	-13.0	-15.0	-14.0
#2	1.0	1.0	1.0	1.0	1.0	0	1.0
#3	3.0	2.0	2.0	2.0	2.0	2.0	2.0
#4	2.0	2.0	2.0	1.0	0	1.0	2.0
#5	5.0	4.0	4.0	5.0	4.0	3.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURFACE RGH. 125 RMS, MID. INT
Specimen No. 2B6TC & 3C5TC

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZED REAMER 1.755 REAM MOD. L.H. SPIRAL REAMER

Spindle, rpm 80 Feed: 55 & 1PM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 100-125
Protrusion, in. .179
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. 0
Capacitance Gage Reading 298
Exit Burr Height, in.

Bluing Pin Rollout

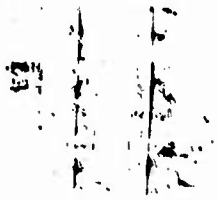
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-12.0	-12.0	-9.0	-9.0	-10.0	-13.0
#2	0	0	2.0	1.0	1.0	2.0	1.0
#3	2.0	2.0	2.0	1.0	2.0	3.0	3.0
#4	2.0	2.0	0.	2.0	2.0	2.0	3.0
#5	3.0	5.0	4.0	5.0	5.0	5.0	5.0

Hole #2

Surface Finish, AA 95-100
Protrusion, in. .165
Perpendicularity, .001 in./in.
Longitudinal .0010 Transverse .0005
Flush Gage Reading, in. -.002
Capacitance Gage Reading 339
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-14.0	-14.0	-13.0	-13.0	-14.0	-15.0
#2	2.0	2.0	3.0	2.0	2.0	2.0	2.0
#3	2.0	3.0	2.0	2.0	2.0	2.0	2.0
#4	1.0	2.0	0	0	0	0	1.0
#5	2.0	2.0	2.0	0	0	1.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURF. RGH. 125 RMS MID. INT.
Specimen No. 3D1TC & 3BCTC

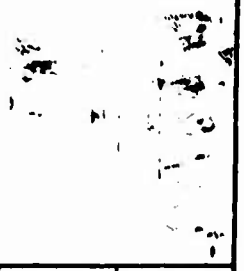
Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755 REAM MOD. L.H. SPIRAL REAMER

Spindle, rpm 80 Feed: 33.81 I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 95-100
Protrusion, in. .177
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0005
Flush Gage Reading, in. -.003
Capacitance Gage Reading 294
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-11.0	-13.0	-14.0	-12.0	-9.0	-10.0
#2	2.0	2.0	1.0	1.0	2.0	2.0	2.0
#3	3.0	3.0	3.0	1.0	2.0	2.0	2.0
#4	3.0	3.0	3.0	2.0	0	1.0	2.0
#5	4.0	5.0	5.0	4.0	4.0	3.0	4.0

Hole #2

Surface Finish, AA 100-125
Protrusion, in. .160
Perpendicularity, .001 in./in.
Longitudinal .0000 Transverse .0000
Flush Gage Reading, in. +.002
Capacitance Gage Reading 391
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-13.0	-14.0	-10.0	-12.0	-12.0	-11.0
#2	0	0	0	0	0	0	0
#3	1.0	1.0	0	0	0	0	0
#4	1.0	0	0	-1.0	-1.0	-1.0	-1.0
#5	0	0	-1.0	-1.0	0	-1.0	-1.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURFACE ROUGHNESS 125 RMS
Specimen No. 3E5T&4836C MID INTERFERENCE

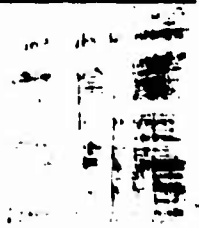
Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER
.755 REAM MOD. L.H. SPIRAL REAMER

Spindle, rpm 80 Feed: 80 IPM.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 95-105
Protrusion, in. .176
Perpendicularity, .001 in./in.
Longitudinal .001 Transverse .0005
Flush Gage Reading, in. -.003
Capacitance Gage Reading 308
Exit Burr Height, in.

Bluing Pin Rollout



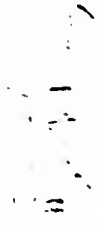
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-14.0	-15.0	-14.0	-15.0	-15.0	-14.0
#2	1.0	1.0	0	0	0	1.0	1.0
#3	3.0	2.0	1.0	1.0	2.0	2.0	2.0
#4	2.0	2.0	0	0	2.0	2.0	2.0
#5	3.0	3.0	2.0	3.0	3.0	1.0	3.0

Hole #2

Surface Finish, AA 90-100
Protrusion, in. .165
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0015
Flush Gage Reading, in. -.001
Capacitance Gage Reading 299
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-15.0	-15.0	-15.0	-15.0	-15.0	-15.0
#2	1.0	0	0	0	0	0	1.0
#3	3.0	3.0	3.0	2.0	2.0	2.0	3.0
#4	3.0	3.0	2.0	1.0	1.0	1.0	3.0
#5	3.0	2.0	2.0	3.0	3.0	3.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURFACE ROUGHNESS 12.5 RMS MID. INT.
Specimen No. 2A6BC & 6B1TC

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755 REAM MOD. L.H. SPIRAL REAMER

Spindle, rpm 80 Feed: 55.81 IPM.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .178
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. -.001
Capacitance Gage Reading 280
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-15.0	-15.0	-14.0	-15.0	-15.0	-15.0
#2	0	1.0	1.0	1.0	1.0	1.0	1.0
#3	2.0	2.0	3.0	3.0	2.0	3.0	2.0
#4	2.0	2.0	3.0	3.0	1.0	2.0	2.0
#5	2.0	2.0	3.0	4.0	5.0	4.0	4.0

Hole #2

Surface Finish, AA 100-110 Bluing Pin Rollout
Protrusion, in. .177
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .001
Flush Gage Reading, in. 0
Capacitance Gage Reading 313
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-15.0	-15.0	-14.0	-14.0	-13.0	-15.0
#2	0	1.0	1.0	1.0	1.0	2.0	0
#3	3.0	2.0	2.0	1.0	1.0	2.0	2.0
#4	3.0	2.0	0	0	1.0	2.0	2.0
#5	4.0	2.0	1.0	4.0	4.0	4.0	3.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURFACE ROUGHNESS-RIFLING
Specimen No. 4E2TC & 3E4BC MID. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER .1755 MOD. L.H. SPIRAL REAMER. USING MOD. L.H. SPIRAL REAMER PUSH IN" .400-.500 DEEP, NO RPM.
Spindle, rpm 80 Feed: 55 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .172
Perpendicularity, .001 in./in.
Longitudinal .0010 Transverse .0005
Flush Gage Reading, in. -.002
Capacitance Gage Reading 332
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-15.0	-13.0	-15.0	-15.0	-15.0	-14.0
#2	1.0	0	1.0	1.0	1.0	1.0	2.0
#3	3.0	3.0	2.0	2.0	2.0	2.0	3.0
#4	2.0	2.0	1.0	0	0	0	1.0
#5	2.0	2.0	0	0	1.0	1.0	2.0

Hole #2

Surface Finish, AA 100-125 Bluing Pin Rollout
Protrusion, in. .173
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0010
Flush Gage Reading, in. -.0020
Capacitance Gage Reading 279
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-13.0	-15.0	-14.0	-13.0	-15.0	-13.0
#2	1.0	2.0	2.0	1.0	1.0	1.0	2.0
#3	2.0	3.0	4.0	2.0	2.0	2.0	2.0
#4	3.0	3.0	3.0	1.0	2.0	2.0	2.0
#5	4.0	2.0	3.0	2.0	1.0	2.0	1.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURFACE ROUGHNESS - RIFLING MID. INT. 125 RMS
Specimen No. 3E1B&2A2BC

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER .1755 REAM MOD. L.H. SPIRAL REAMER. USING MOD. L.H. SPIRAL REAMER PUSH IN .400-.500 DEEP, NO R.P.M.

Spindle, rpm 80 Feed: 33 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 100-125 Bluing Pin Rollout
Protrusion, in. .170
Perpendicularity, .001 in./in.
Longitudinal .0010 Transverse .0010
Flush Gage Reading, in. -.0050
Capacitance Gage Reading 357
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-15.0	-15.0	-15.0	-14.0	-14.0	-15.0
#2	1.0	1.0	0	0	1.0	1.0	0
#3	2.0	2.0	2.0	1.0	2.0	3.0	2.0
#4	1.0	1.0	1.0	0	1.0	2.0	0
#5	1.0	1.0	1.0	2.0	1.0	2.0	0

Hole #2

Surface Finish, AA 100-125 Bluing Pin Rollout
Protrusion, in. .174
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0015
Flush Gage Reading, in. -.0020
Capacitance Gage Reading 312
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-12.0	-13.0	-13.0	-14.0	-12.0	-15.0
#2	1.0	0	2.0	1.0	1.0	2.0	1.0
#3	3.0	2.0	4.0	1.0	2.0	4.0	2.0
#4	3.0	2.0	3.0	3.0	2.0	4.0	1.0
#5	5.0	5.0	4.0	4.0	4.0	3.0	3.0

MANUFACTURING REPORT: TAPERED HOLES

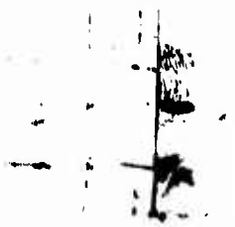
Test Series 23 Quality Variable SURFACE ROUGHNESS - RIPLING MID. INT. 125 RMS
Specimen No. GBGB 23C3T

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZED REAMER 1.755 REAM MOD. L.H. SPIRAL REAMER. USING MOD. L.H. SPIRAL REAMER "PUSH IN" .400-.500 NO R.P.M.
Spindle, rpm 80 Feed: 55 & IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 25-100
Protrusion, in. .158
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0010
Flush Gage Reading, in. -.002
Capacitance Gage Reading 335
Exit Burr Height, in.

Bluing Pin Rollout



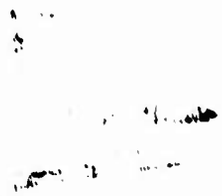
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-13.0	-14.0	-15.0	-15.0	-14.0	-15.0	-15.0
#2	0	0	1.0	1.0	2.0	0	0
#3	2.0	2.0	2.0	3.0	3.0	2.0	2.0
#4	1.0	1.0	1.0	1.0	1.0	2.0	0
#5	1.0	0	0	1.0	0	2.0	0

Hole #2

Surface Finish, AA 25-100
Protrusion, in. .167
Perpendicularity, .001 in./in.
Longitudinal .0010 Transverse .0010
Flush Gage Reading, in. -.002
Capacitance Gage Reading 332
Exit Burr Height, in.

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-11.0	-14.0	-15.0	-15.0	-13.0	-15.0
#2	0	1.0	2.0	2.0	1.0	2.0	0
#3	2.0	3.0	4.0	2.0	2.0	4.0	3.0
#4	1.0	2.0	2.0	1.0	1.0	3.0	2.0
#5	1.0	1.0	1.0	0	1.0	1.0	1.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURFACE ROUGHNESS - RIFLING MID. INT. 125 RMS
Specimen No. 3E2TC & 4E6TC

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER .755 REAM MOD. L.H. SPIRAL REAMER, USE MOD L.H. SPIRAL REAMER "PUSH IN" .400-.500 NO R.P.M.
Spindle, rpm 80 Feed: 95 G.I.P.M.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .170
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. .0000
Capacitance Gage Reading 337
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-14.0	-15.0	-15.0	-15.0	-15.0	-14.0	-15.0
#2	0	0	2.0	0	1.0	1.0	1.0
#3	0	2.0	3.0	1.0	1.0	2.0	2.0
#4	1.0	2.0	3.0	0	1.0	1.0	1.0
#5	2.0	2.0	2.0	1.0	1.0	1.0	1.0

Hole #2

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .168
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. .0000
Capacitance Gage Reading 308
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-14.0	-14.0	-15.0	-14.0	-15.0	-15.0
#2	1.0	1.0	2.0	0	1.0	0	1.0
#3	2.0	3.0	3.0	1.0	2.0	1.0	2.0
#4	2.0	3.0	3.0	0	1.0	2.0	0
#5	1.0	2.0	1.0	0	1.0	3.0	1.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURFACE ROUGHNESS - RIFLING
Specimen No. 2E5TC & 4E18C MID. INT. 125 RMS

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755 REAM MOD L.H. SPIRAL REAMER USE MOD L.H. SPIRAL REAMER "PUSH IN" 400-500 NO R.P.M.
Spindle, rpm 80 Feed: 9.5 IPM.
Cutting Fluid: DRY Depth: (Ind. Reading) 2.440

Hole #1

Surface Finish, AA
Protrusion, in. .160
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. +.003
Capacitance Gage Reading 324
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-13.0	-9.0	-13.0	-12.0	-12.0	-14.0
#2	0	1.0	2.0	1.0	1.0	2.0	1.0
#3	1.0	2.0	4.0	1.0	2.0	4.0	2.0
#4	1.0	2.0	3.0	0	0	3.0	0
#5	1.0	1.0	2.0	0	0	3.0	1.0

Hole #2

Surface Finish, AA
Protrusion, in. .170
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0000
Flush Gage Reading, in. +.0005
Capacitance Gage Reading 319
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-15.0	-15.0	-14.0	-15.0	-15.0	-15.	-15.0
#2	0	0	1.0	0	2.0	2.0	2.0
#3	1.0	1.0	3.0	2.	2.0	4.0	2.0
#4	1.0	2	3.0	0	0	4.0	2.0
#5	1.0	2	3.0	0	0	3.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURF. RGH., BARRELLING
Specimen No. _____

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER TO 1.755 DEPTH. MOD. LH. SPIRAL REAMER, USE BORING TOOL TO .645 DEEP
Spindle, rpm 80 Feed: 5 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.390

Hole #1

Surface Finish, AA 100-125
Protrusion, in. .180
Perpendicularity, .001 in./in.
Longitudinal .0000 Transverse .0000
Flush Gage Reading, in. .0000
Capacitance Gage Reading 262
Exit Burr Height, in. _____

Bluing Pin Rollout

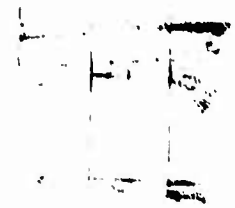
Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-10.0	-10.0	-10.0	-11.0	-10.0	-9.0
#2	6.0	5.0	5.0	3.0	5.0	4.0	5.0
#3	5.0	5.0	5.0	5.0	5.0	5.0	6.0
#4	4.0	4.0	4.0	2.0	2.0	4.0	4.0
#5	3.0	4.0	4.0	2.0	2.0	3.0	3.0

Hole #2

Surface Finish, AA 95-100
Protrusion, in. .185
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. .0000
Capacitance Gage Reading 289
Exit Burr Height, in. _____

Bluing Pin Rollout



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0
#2	5.0	4.0	4.0	5.0	5.0	5.0	4.0
#3	5.0	5.0	5.0	5.0	5.0	6.0	6.0
#4	4.0	3.0	2.0	2.0	4.0	4.0	4.0
#5	0	0	0	0	1.0	0	1.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURF. ROH. - BARRELLING MID. INT. 125 RMS

Specimen No. 2D4BC & 3D2TC

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755, REAM MOD. LH SPIRAL REAMER, USE BORING TOOL, BORE TO DEPTH 645

Spindle, rpm 80 Feed: 95 SIPM

Cutting Fluid: DRY Depth: (Ind. Reading) 2.430

Hole #1

Surface Finish, AA 100-120

Protrusion, in. .160

Perpendicularity, .001 in./in.

Longitudinal .0000 Transverse .0000

Flush Gage Reading, in. .0000

Capacitance Gage Reading 223

Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-10.0	-11.0	-10.0	-10.0	-9.0	-10.0
#2	4.0	3.0	3.0	4.0	5.0	5.0	6.0
#3	6.0	6.0	6.0	6.0	6.0	6.0	7.0
#4	6.0	6.0	5.0	5.0	5.0	5.0	6.0
#5	4.0	5.0	3.0	3.0	5.0	5.0	4.0

Hole #2

Surface Finish, AA 110-125

Protrusion, in. .180

Perpendicularity, .001 in./in.

Longitudinal .0000 Transverse .0000

Flush Gage Reading, in. .0000

Capacitance Gage Reading 262

Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)

Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-10.0	-11.0	-10.0	-11.0	-11.0	-10.0	-11.0
#2	4.0	4.0	3.0	3.0	4.0	3.0	5.0
#3	5.0	5.0	5.0	4.0	4.0	5.0	5.0
#4	4.0	4.0	2.0	3.0	2.0	3.0	3.0
#5	2.0	2.0	3.0	2.0	3.0	2.0	2.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURF. RGH. - BARRELLING
Specimen No. 2AITC46C5T MID. INT. 125 RMS.

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755, REAM MOD. L.H. SPIRAL REAMER, USE BORING TOOL, TO DEPTH .645

Spindle, rpm 80 Feed: 55 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.390

Hole #1

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .0010 Transverse .0000
Flush Gage Reading, in. .0000
Capacitance Gage Reading 280
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-10.0	-11.0	-11.0	-10.0	-11.0	-11.0
#2	4.0	5.0	3.0	4.0	5.0	5.0	5.0
#3	5.0	5.0	5.0	5.0	5.0	6.0	5.0
#4	3.0	3.0	3.0	3.0	3.0	4.0	4.0
#5	0	0	0	0	0	0	0

Hole #2

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .180
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0000
Flush Gage Reading, in. -.0020
Capacitance Gage Reading 207
Exit Burr Height, in.

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-11.0	-12.0	-11.0	-11.0	-11.0	-11.0
#2	5.0	5.0	5.0	4.0	5.0	6.0	4.0
#3	6.0	5.0	5.0	5.0	6.0	6.0	6.0
#4	5.0	5.0	4.0	3.0	5.0	5.0	3.0
#5	3.0	3.0	5.0	3.0	3.0	3.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

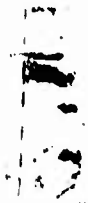
Test Series 23 Quality Variable SURF. RGH. BARRELLING
Specimen No. 6D2T&6B4B

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755, MOD. LH SPIRAL REAMER, USE BORING TOOL TO .645 DEEP

Spindle, rpm 80 Feed: 35 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.390

Hole #1

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .170
Perpendicularity, .001 in./in.
Longitudinal .0000 Transverse .0000
Flush Gage Reading, in. -.0002
Capacitance Gage Reading 263
Exit Burr Height, in.

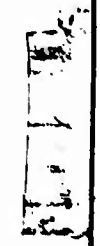


Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0
#2	5.0	5.0	3.0	5.0	5.0	5.0	5.0
#3	5.0	4.0	4.0	5.0	5.0	5.0	3.0
#4	3.0	4.0	2.0	1.0	3.0	4.0	3.0
#5	0	0	0	0	0	0	0

Hole #2

Surface Finish, AA 95-120 Bluing Pin Rollout
Protrusion, in. .165
Perpendicularity, .001 in./in.
Longitudinal .0010 Transverse .0010
Flush Gage Reading, in. .0000
Capacitance Gage Reading 268
Exit Burr Height, in.



Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-10.0	-11.0	-11.0	-11.0	-11.0	-11.0
#2	5.0	4.0	4.0	4.0	3.0	5.0	5.0
#3	5.0	4.0	5.0	5.0	5.0	5.0	5.0
#4	2.0	2.0	1.0	3.0	3.0	2.0	3.0
#5	0	0	0	0	0	0	0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURF. RGH. - BARRELLING
Specimen No. 6C6T & 6D5B

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER TO 1.755 DEPTH MOD. L.H. SPIRAL REAMER, USE BORING TO .645 DP.

Spindle, rpm 80 Feed: 22 81PM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.390

Hole #1

Surface Finish, AA 95-100
Protrusion, in. .190
Perpendicularity, .001 in./in.
Longitudinal .0010 Transverse .0005
Flush Gage Reading, in. .0000
Capacitance Gage Reading 292
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-12.0	-11.0	-11.0	-11.0	-11.0	-10.0	-11.0
#2	5.0	4.0	5.0	3.0	5.0	5.0	4.0
#3	5.0	4.0	5.0	5.0	5.0	6.0	5.0
#4	3.0	1.0	1.0	2.0	2.0	4.0	3.0
#5	2.0	3.0	2.0	5.0	3.0	3.0	2.0

Hole #2

Surface Finish, AA 90-95
Protrusion, in. .180
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0005
Flush Gage Reading, in. .0000
Capacitance Gage Reading 250
Exit Burr Height, in.

Bluing Pin Rollout

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	-11.0	-11.0	-10.0	-10.0	-11.0	-11.0	-11.0
#2	5.0	5.0	4.0	5.0	3.0	4.0	5.0
#3	5.0	5.0	5.0	6.0	5.0	5.0	5.0
#4	3.0	3.0	3.0	5.0	4.0	4.0	5.0
#5	3.0	2.0	2.0	2.0	3.0	4.0	4.0

MANUFACTURING REPORT: TAPERED HOLES

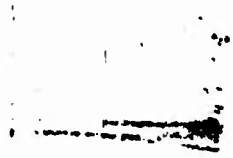
Test Series 23 Quality Variable SURF. RGH. OVALITY
Specimen No. 3D4TC & 3A6BC MID. INT.

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755 DR REAM MOD. L.H. SPIRAL REAMER, USE STR. FLUTE REAMER PLUNGE 1.700 +/- .006 IN TRANSVERSE POS.
Spindle, rpm 80 Feed: 55 81PM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 95-100
Protrusion, in. .180
Perpendicularity, .001 in./in.
Longitudinal .0010 Transverse .0005
Flush Gage Reading, in. -.003
Capacitance Gage Reading 288
Exit Burr Height, in.

Bluing Pin Rollout



.318
.321

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	1.0	2.0	3.0	1.0	1.0	1.0	2.0
#3	3.0	6.0	6.0	3.0	4.0	6.0	5.0
#4	4.0	7.0	7.0	3.0	5.0	6.0	6.0
#5	5.0	6.0	6.0	3.0	4.0	5.0	6.0

Hole #2

Surface Finish, AA 90-100
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .0005 Transverse .0010
Flush Gage Reading, in. -.003
Capacitance Gage Reading 295
Exit Burr Height, in.

Bluing Pin Rollout

.317
.324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	1.0	2.0	3.0	0	3.0	2.0	2.0
#3	3.0	5.0	6.0	1.0	4.0	5.0	5.0
#4	4.0	7.0	8.0	1.0	5.0	7.0	6.0
#5	3.0	6.0	7.0	2.0	5.0	5.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURF. RGH. OVALITY
Specimen No. 4D6TC & 2C3TC MID. INT.

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.7550 DP, REAM MOD. L.H. SPIRAL REAMER, USE STR. FLUTE REAMER PLUNGE 1.700 +/- .006 IN TRANSVERSE POS.
Spindle, rpm 80 Feed: 50 BIPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 95-100
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .0000 Transverse .0005
Flush Gage Reading, in. .000
Capacitance Gage Reading 287
Exit Burr Height, in.

Bluing Pin Rollout

.317
.323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	1.0	2.0	3.0	0	1.0	3.0	2.0
#3	4.0	5.0	8.0	2.0	5.0	6.0	6.0
#4	5.0	5.0	7.0	2.0	6.0	7.0	7.0
#5	4.0	6.0	6.0	3.0	6.0	6.0	5.0

Hole #2

Surface Finish, AA 95-100
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .0000 Transverse .0010
Flush Gage Reading, in. .000
Capacitance Gage Reading 309
Exit Burr Height, in.

Bluing Pin Rollout

.317
.322

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	-15.0
#2	0	0	2.0	0	1.0	1.0	3.0
#3	2.0	5.0	6.0	1.0	4.0	5.0	6.0
#4	2.0	6.0	6.0	1.0	5.0	7.0	8.0
#5	2.0	5.0	6.0	3.0	5.0	5.0	6.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURF. RGH. OVALITY
Specimen No. 6D1BC & 3E5TC MID. INT.

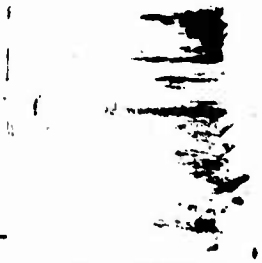
Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755 DP, REAM MOD. LH SPIRAL REAMER, USE STR. FLUTE REAMER PLUNGE 1.700 +/- .006 IN TRANSVERSE POS.

Spindle, rpm 80 Feed: 55 SIPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 95-100
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .0015 Transverse .0005
Flush Gage Reading, in. -.001
Capacitance Gage Reading 256
Exit Burr Height, in.

Bluing Pin Rollout



.316 / .323

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	0	0	1.0	0	2.0	4.0	1.0
#3	2.0	4.0	5.0	2.0	5.0	6.0	6.0
#4	2.0	6.0	5.0	1.0	6.0	8.0	6.0
#5	3.0	5.0	5.0	2.0	6.0	5.0	6.0

Hole #2

Surface Finish, AA 90-95
Protrusion, in. .170
Perpendicularity, .001 in./in.
Longitudinal .0010 Transverse .0000
Flush Gage Reading, in. -.001
Capacitance Gage Reading 273
Exit Burr Height, in.

Bluing Pin Rollout

.316 / .324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	1.0	0	0	0	2.0	3.0	2.0
#3	3.0	3.0	5.0	2.0	5.0	6.0	5.0
#4	4.0	4.0	5.0	0	6.0	7.0	6.0
#5	4.0	4.0	5.0	2.0	5.0	6.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

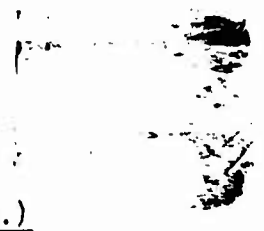
Test Series 23 Quality Variable SURF. RGH. MID. INT. OVALITY
Specimen No. 3C3TC & 433TC

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE REAMER 1.755 DP., REAM MOD L.H. SPIRAL REAMER, USE STR FLUTE REAMER PLUNGE 1.700 +/- .006 IN TRANSVERSE POS.
Spindle, rpm 80 Feed: 55 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.400

Hole #1

Surface Finish, AA 95-100
Protrusion, in. .175
Perpendicularity, .001 in./in.
Longitudinal .0000 Transverse .0005
Flush Gage Reading, in. .0000
Capacitance Gage Reading 268
Exit Burr Height, in.

Bluing Pin Rollout



.324
.317

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	-15.0	—
#2	1.0	3.0	3.0	1.0	2.0	3.0	5.0
#3	4.0	6.0	6.0	3.0	6.0	6.0	7.0
#4	5.0	7.0	8.0	4.0	6.0	8.0	5.0
#5	4.0	6.0	6.0	4.0	5.0	6.0	9.0

Hole #2

Surface Finish, AA 95-100
Protrusion, in. .177
Perpendicularity, .001 in./in.
Longitudinal .0000 Transverse .0015
Flush Gage Reading, in. .0000
Capacitance Gage Reading 294
Exit Burr Height, in.

Bluing Pin Rollout

.323
.318

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	—	—
#2	1.0	2.0	3.0	0	1.0	3.0	2.0
#3	3.0	5.0	6.0	2.0	5.0	6.0	6.0
#4	3.0	5.0	8.0	4.0	5.0	8.0	7.0
#5	3.0	6.0	6.0	3.0	5.0	5.0	5.0

MANUFACTURING REPORT: TAPERED HOLES

Test Series 23 Quality Variable SURF. RGH. MID. INT. OVALITY
Specimen No. GD2B24DITC

Hole Manufacturing Conditions and Procedures: REAM UNDERSIZE. REAMER 1.755, REAM MOD L.H. SPIRAL REAMER. USE STR. FLUTE REAMER PLUNGE 1.700 ± .006 IN TRANSVERSE POS.

Spindle, rpm 80 Feed: SS 8 IPM
Cutting Fluid: DRY Depth: (Ind. Reading) 2.390

Hole #1

Surface Finish, AA 90-95 Bluing Pin Rollout
Protrusion, in. .180
Perpendicularity, .001 in./in.
Longitudinal .0000 Transverse .0010
Flush Gage Reading, in. .0000
Capacitance Gage Reading 280
Exit Burr Height, in.

.322/.318

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	—	—	-15.0	—
#2	1.0	2.0	3.0	1.0	3.0	3.0	3.0
#3	4.0	6.0	6.0	3.0	6.0	7.0	7.0
#4	4.0	7.0	8.0	4.0	8.0	8.0	5.0
#5	5.0	6.0	6.0	4.0	6.0	7.0	8.0

Hole #2

Surface Finish, AA 95-100 Bluing Pin Rollout
Protrusion, in. .180
Perpendicularity, .001 in./in.
Longitudinal .0000 Transverse .0005
Flush Gage Reading, in. .0000
Capacitance Gage Reading 281
Exit Burr Height, in.

.331/.324

Air Gage Readings (.0001 in.)
Angular Position

Axial Position	0°	45°	90°	180°	225°	270°	315°
Bottom #1	—	—	—	-14.0	—	—	—
#2	0	0	2.0	1.0	1.0	3.0	1.0
#3	1.0	3.0	5.0	2.0	4.0	6.0	5.0
#4	0	4.0	6.0	3.0	5.0	8.0	5.0
#5	3.0	4.0	5.0	3.0	5.0	5.0	6.0

*U.S.Government Printing Office: 1978 — 757-080/11