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PROCESSES FOR PRODUCTION AND INSPECTION OF 105 MM XM710E1 METAL--ETC(U)
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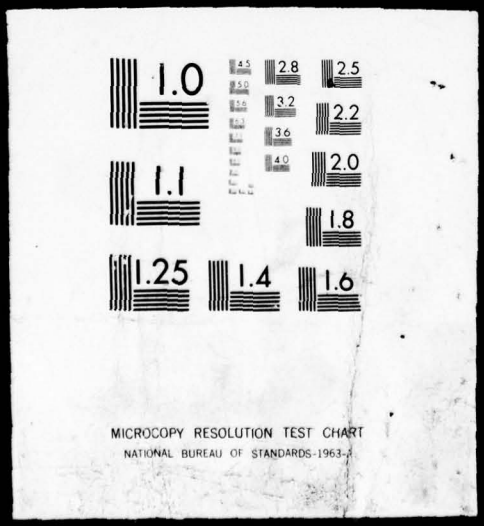

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NATIONAL PRESTO INDUSTRIES, INC.

Eau Claire, Wisconsin 54701

Area Code 715-839-2121

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PROCESSES FOR
PRODUCTION AND INSPECTION OF
105MM XM710E1 MPTS.

CONTRACT DAAK10-78-C-0005

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FINAL TECHNICAL REPORT

CONTRACT DAAK 10-78-C-0005

PROCESSES FOR PRODUCTION AND INSPECTION OF 105 MM. XM 710E1 METAL PARTS ASSEMBLY. (PROJECTILES).

BY

C. W. Krause

NATIONAL PRESTO IND., INC.
EAU CLAIRE - 54701 - WISC.

30 Apr 78

243 p.

243 450

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

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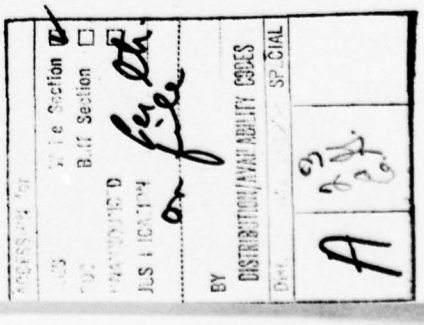

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CONTRACT DAAK10-78-C-0005

TO

COMMANDING OFFICER
PICATINNY ARSENAL
DOVER, NEW JERSEY 07801

ATTENTION

ARRADCOM-DRDAR-LCU-P

FROM

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

SUBJECT

DESIGN PRODUCTION LINE XM710E1
CONTRACT DAAK10-78-C-0005

FINAL TECHNICAL REPORT

1 May 1978

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Final	2. GOVT ACCESSION NO: Unknown
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4. TITLE (and Subtitle): Processes for Production and Inspection of 105MM XM710E1 Metal Parts Assemblies - Projectiles	5. TYPE OF REPORT & PERIOD COVERED: Technical Report - Final
	6. PERFORMING ORG. REPORT NUMBER: Final
7. AUTHOR(s): C. W. Krause	8. CONTRACT OR GRANT NUMBER(s): DAAK10-78-C-0005
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Per contract

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

Per contract

18. SUPPLEMENTARY NOTES

Government Data - As recorded and available.
Page of this report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

HOT CUP-COLD DRAW - HCCD or HoCo

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

National Presto Ind., Inc. began work on this contract 1 November 1977. The contract required paper study and recording of an in theory process and inspection concept deemed capable of producing the 105MM XM710E1 MPTS. These data and related government paper follow as noted.

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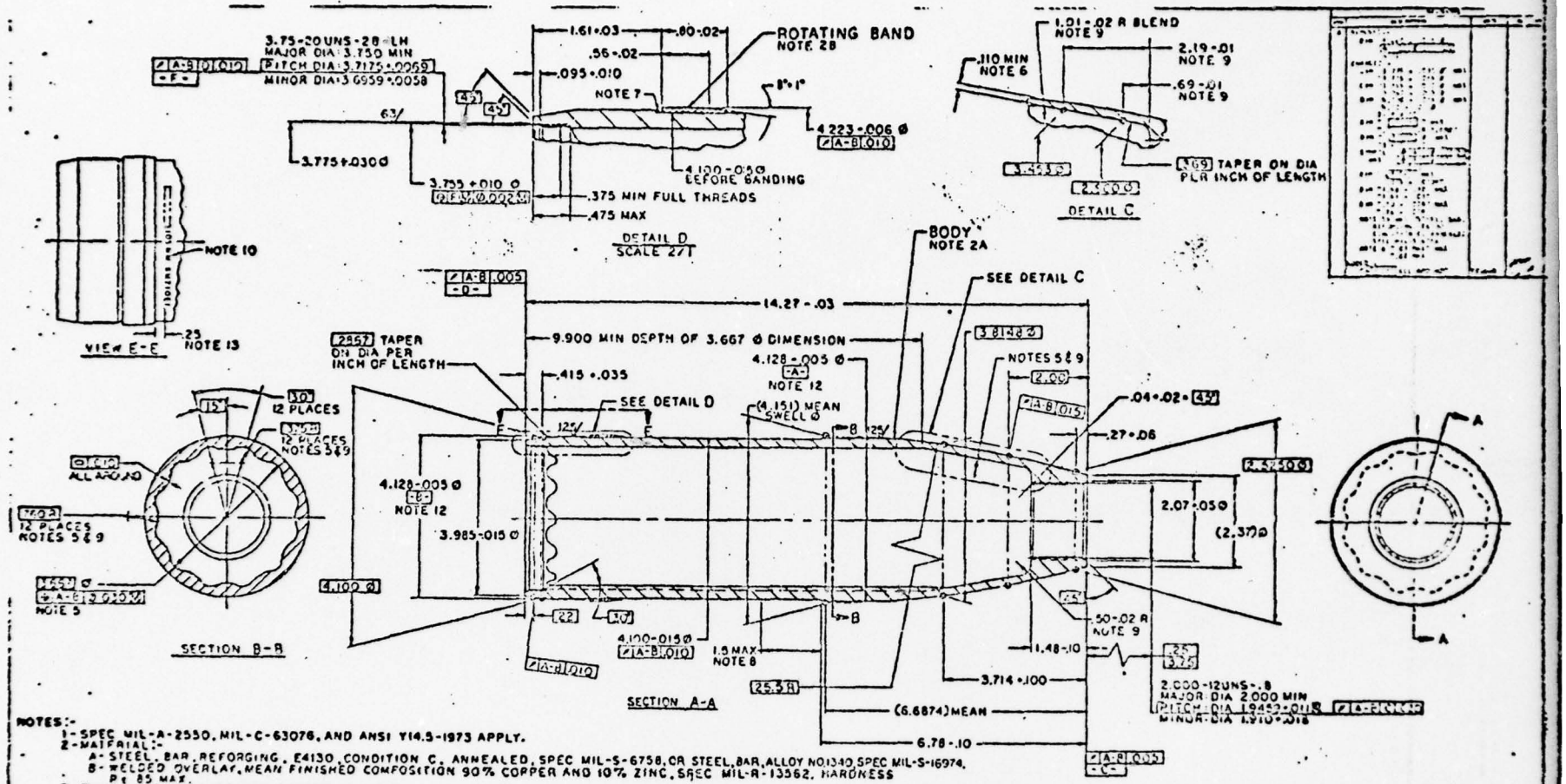
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)



NOTES:-

1- SPEC MIL-A-2550, MIL-C-63078, AND ANSI Y14.5-1973 APPLY.
2- MATERIAL:-
A- STEEL, BAR, REFORGING, E4130, CONDITION C, ANNEALED, SPEC MIL-S-6758, OR STEEL, BAR, ALLOY NO 1340, SPEC MIL-S-16974, PT 85 MAX.
B- WELDED OVERLAY, MEAN FINISHED COMPOSITION 90% COPPER AND 10% ZINC, SPEC MIL-R-13562, HARDNESS
3- FINISH 250 ALL SURFACES, EXCEPT AS NOTED.
4- HEAT TREAT BODY TO OBTAIN YIELD STRENGTH OF 160,000 MINIMUM PSI (0.2% OFFSET) ELONGATION 10% MIN IN ONE INCH.
5- FORGED OR DRAWN FINISH ACCEPTABLE.
6- WALL THICKNESS VARIATION AROUND CIRCUMFERENCE .03 MAX EXCEPT AT INTEGRAL RIBS.
7- MAXIMUM .010 DEEP × .100 WIDE UNDERCUT PERMISSIBLE FWD AND AFT OF ROTATING BAND.
8- WITHIN SPECIFIED LIMITS, REDUCE 4.128-.005 DIAMETER TO 4.10-.01 DIAMETER WITH RADIUS OR TAPER.
9- DIMENSIONS ARE CONTROLLED BY TOOLING AND NEED NOT BE GAGED.
10- STAMP LOT NO., YEAR OF MANUFACTURE, CALIBER AND DESIGNATION OF SHELL WITH LETTERS AND FIGURES .125 HIGH × .01 DEEP.
11- PROTECTIVE FINISH:- FINISH 511 ALL SURFACES FOLLOWED BY FINISH 20.1 OR 20.2 OF MIL-STD-171 COLOR (SEE TABLE) ON EXTERIOR SURFACES ONLY, EXCEPT ROTATING BAND AND END FACES.
12- THE 4.128+.005 BOJARRELET DIAMETERS ALLOWED TO INCREASE TO 4.130 MAX DIAMETER AFTER PAINTING.
13- UNTOLERANCED DIMENSIONS NEED NOT BE GAGED.

PART NO	COLOR, NOTE 11
9298225-1	OLIVE DRAB NO 34087
9298225-2	BLUE NO. 35109

FOR ASSOCIATED LISTS (SEE TABLE)

16 JUL 1976

PART NO (SEE TABLE)

BODY

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CONTRACT DAAK10-78-C-0005

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CONTRACT DAAK10-78-C-0005

DISCLAIMER

This report identifies certain brand names which are used herein since the facility or item represents a product basically oriented to the operations concerned and listed or as currently conceived. The citation relative to the above trade names does not constitute any endorsement or approval for use of these items or facilities related thereto.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
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CONTRACT DAAK10-78-C-0005

INTRODUCTION

Performance of the contract requirements were governed by the terms and conditions oriented to the Scope of Work and the related Technical Data Package. Contract DAAK10-78-C-0005 was formally initiated 1 November 1977 by National Presto Ind., Inc. at the Eau Claire Wisconsin Plant.

The Work Scope covers the requirements for generating process specifications to produce and inspect the 105MM, XM710E1 Projectile according to the contract and MIL-C-63076(AR) dated 15 June 1977 as deemed applicable. The total involvements cover the supporting paper for the production and inspection processes and does not require costing elements, manpower analysis, finalized drawings, technical computations and/or other in depth OSHA support paper.

SPECIAL INFORMATION NOTE:

Data relative to the subject 105MM XM710 Projectile was requested from the Government records but has never been received, hence this report was prepared without benefit of proven documentation developed and in use for manufacture of the 155MM and 8 Inch ICM ammo.

Careful search of Government approved records should be considered in order to avoid duplicate effort of technical data development as well as eliminate costs accumulated therefrom and without benefit.

Proven developments with various other items of this conceptional configuration should be considered for application on this shell and are possibly a part of the following list:

a. 1340 Steel Processing
b. Band/Body Application & Machining
c. Band Weldment Analysis
d. Magnetic Particle Analysis
e. Ultra-sonic Inspection
f. Automated Gaging
g. Any other newer developments applicable.

Incorporation of any of the above would cancel the commensurate or comparable processes though listed or expounded on herein.

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CONTRACT DAAK10-78-C-0005

PRIOR ACTIVITIES

National Presto Industries, Inc. was founded in 1905 and has been actively engaged in metal fabrications of distinction and assemblies of merit thru this date.

Beginning with World War II, "Presto" has continually served the Government in the manufacture and delivery of Aircraft Assemblies and various Ordnance Items, especially fuze, cases and projectile medias.

Active association and participation include the entire phases of research and development as well as the related productions associated therewith.

Production line concepts automated and conveyorized to sustain high rates of quality products have continually maintained efficiency and quality levels unsurpassed. Many of these qualify as "first" in U. S. histories.

Expertise gained from operational and production management, including selection, procurement, and installation of the support facilities related thereto have provided the reasoning for the production and inspection criteria selected and listed herein.

Personnel with multi-year experiences in shell production and engineering have administered to project search and the applications as presented.

Activities related to the subject contract have been limited to data collection and screening for presentation per RFQ-DAAK10-77-0080 requirements. Related topic reviews with government agencies and steel suppliers have been perused for preliminary item concept and feasibility application wherever possible. Cold draw of the part should be envisioned as one of complexity and should be considered for "in depth" operational requirements and sequencing.

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FORWARD

The manuscript as prescribed herein follows the concepts envisioned by the mandates of the contract -- limitations of cost and time adversely affect an in depth study.

The contract, as written, included the body and band overlay and excluded the base plug and its assembly as well as load, assemble and subsequent packing.

Work scope and cost evidences resulted in the selection of AISI-1340 steel as well as cold shearing for shell mult size and weight.

Selection and listing of certain production facilities already government-owned are noted collectively by operation and separately by site or depot.

The Hot Cup-Cold Draw Processes and techniques as developed by National Presto Industries, Inc. for mass production are incorporated wherever possible.

Facilities available for production of the standard 105MM, HE, M1 Projectile can be made available on a "use as is" status or modified to suit the shell characteristic variants. Certain pieces of new equipment are required because of their producibility and overall cost effectiveness.

The various categories making up this report are individually listed for ease of removal should their requirement be desired for use or in aggregate as report presented.

Physical manufacture of parts, machine setup, tooling and/or process proveout were not a part of the overall contract requirements as written.

Progress reports one (1) thru five (5) were issued and forwarded on a monthly basis as contract stipulated.

See Page #7 - "Special Information Note."

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RECOMMENDATIONS

Planning for this item should include an in depth search relative to actual need, performances required and, in general, the real world producibility, cost and effectiveness rationale.

If actual production is envisioned and scheduled, a production line prototype should be considered with metal part fabrication and related processes correlated for a final production line composite. Absence of proven and usable support data for this item strongly indicates the need for further technical and engineering study at the parts fabrication or line production concept level.

The internal configuration, while probably difficult to produce, might be considered for larger calibre use since the design should provide both positive location and definite security for internal stores configurations and/or other LAP medias.

A review of the overall dimensional characteristics is in order for possible relief in tolerancing and general specification limitations. Dimensions fixed by tooling should be expanded to provide for expeditious inspections, improved production modes and, as a result, reduce item cost.

A strong forge and draw tool program should be considered for early effort and proveout. It is felt that these operations could make or break a program of this complexity.

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CONCLUSIONS

The projectile per Contract DAAK10-78-C-0005 and MIL-C-63076(AR) dated 15 June 1977 as well as drawings #92298226 and #92298225 provide for shell components never produced in a line concept mode. The internal configurations make for a complex and complicated item when equated to the overall shell dimensional configurations.

Further engineering and technical study or production efforts should be carefully evaluated for validity and cost effectiveness.

The Hot Cup-Cold Draw Processes generate the fundamental basics for forming the complex rib configurations. However, actual numbered productions are required for verification of the internal size and shape parameters and their subsequent retention in the actual end item part.

Engineering and Technical evaluation of the processes listed herein should be reviewed for commonality or adaptability to the specific vendor operations and concepts or installation subsequent to commitment.

Government information pertaining to projects of related nature should be made available to the Contractor or probable Vendor.

In today's technology, a quality control system could function as follows dependent on funding available.

Partial verification or the hundred percent inspection of dimensional characteristics could be accomplished by automated air/electronic gaging after basic machining of the unit.

Instrumentation could provide visual registration of characteristics being analyzed. Memory circuits feeding the readouts into product control or computer banks could provide storage or playback of the data as required.

Defective work could be handled in several varied modes, all of which distribute or identify the units for disposition, either rework or scrapout as designated.

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PROBLEM AREAS

ANTICIPATED PROBLEM OPERATIONS ASSOCIATED WITH THE 105MM XM710E1 PROJECTILE MANUFACTURING AND INSPECTION REQUIREMENTS.

Problem conditions as written herein may have already been solved by development data currently covered by Government contract or other documentation.

Your attention is again directed toward individual reader concepts of this information which should be dealt with in an open frame of mind, time, place and conditions considered.

PROBLEM AREAS

Problem areas anticipated with the development of the formal production processes and the related quality control criteria for support thereof.

This data will be dealt with in accordance with the operational sequence programming.

FORGE & HOT DRAW - OPERATION #40. See Page #7.

TOOL LIFE - PUNCHES & DIES.

The basic inside contours are cause to envision a major development period for ironing out the prescribed die/punch combination suitable to make and hold the internal configurations.

The situation is delicate but not impossible since the four station Bliss Forge Press System should provide suitable operation progression to produce acceptable parts.

Metal conditioning at this operation could also be a problem because of the proportional work stations and their relation and reaction to the progressional work sequence.

COLD DRAW - OPERATION #90. See Page #7.

Where as this work is basically a size-draw combination, it does lend itself to a complexity of tool design and work load apportionment. Hopefully, Operation #40 will provide the major shaping work load and allow for the predicted percentages of ironing and shaping at this, the final internal cold work operation.

WELD BAND - OPERATION #140. See Page #7.

Machinery used for this operation with the related operator responsibility becomes a major factor of prime concern as related to producibility and quality of this projectile.

WELD BAND - OPERATION #140 (continued)

Technical engineering response to problem expectations at this operation have already been dealt with in detail thru several technical government reports. This expertise is certainly well founded and would serve no purpose being repeated in this report. Titles and dates are not available.

The present weld overlay techniques used and approved for the various 155MM and 8 Inch configurations should serve as a base for project concept. Follow on work would then consist of those requirements necessary for machine selection, familiarization and general production learn curve expectancies.

Weld overlay data listed and current to usable concepts for this item might be available in the 9 May 1973 publication "Process Recommendations for Banding the 4.2 Inch, HE, M329 Projectile," Document No. 11738359 - also listed as Addendum No. 1 dated 1 August 1975.

No further discussion relative to this subject is deemed necessary since a time/place condition exists - data current to date and this procurement could be obsolete at time of actual procurement action for this item.

HEAT TREAT - OPERATION #160. See Page #7.

Heat treatment of this item can be considered as a border line problem area.

Good equipment and a consistent quality part for heat treat could provide the control necessary.

Heat treatment of the item has been envisioned as adaptable to induction or induction scan methods.

Some development will be required for both methods and may require a combination of adjustments and revised thinkings in order to obtain the end item results for mechanical property acceptance.

HEAT TREAT - OPERATION #160 (continued)

Reference to this report operational requirements as listed can be found on the Operation Process Sheets, Operation #160, Section "C" which should further serve for operational familiarization.

GENERAL INFORMATION.

Heat treating of the projectile consists of harden, quench, and temper operations which are essential in developing required mechanical properties.

Furnaces for hardening and tempering are induction type with controlled atmosphere to minimize scale formation. Projectiles are automatically placed in the hardening furnace by a mechanical conveyor system. After the hardening cycle is completed, the projectile is discharged into tanks containing salt quench or another flame-resistant fluid which quickly reduces its temperature. After quenching, the projectile is atuomatically conveyed into the tempering furnace where stabilization of its structure is accomplished. Time and temperature for harden, quench, and temper operations are dependent upon steel chamistry and specified mechanical properties.

MACHINING OPERATIONS - GENERAL.

Whereas the general machining tolerances are considered exceedingly tight, as print viewed, actual production will find the tolerances and dimensions even more so.

Some change requests can be expected in order to provide effective production and cost benefits. Some of these categories will generate from tool and operational concept changes as well as from the benefits of production experiences.

POSITIVE LOCATION.

Particular attention should be given to the concepts of use for establishing positive location points. These points are areas affording positive and continued location areas for as many operations as possible. Developed locations herefrom are secondary and of equal dependence.

Location points.

1. A fixed or final dimension.
2. Use of identical or the same location points for as many operations as possible.
3. Use of developed location points from preceding operation such as those above.

BAND ANALYSIS - OPERATION #147. See Page #7.

PARA. 4.5.3. - BAND CHEMICAL ANALYSIS. MIL-C-63076(AR)

Chemical analysis of the band properties contents must be considered as one of the operations or requirements mandating major concern and invitational to a major revision.

Present specifications indicate a detailed laboratory procedure for band chemical analysis and apportionment of chemical content. Analysis concepts presently used at sites currently in production were not available for study and therefore cannot be commented on. General improvement in procedure and elapsed times involved for processing the band requirements therefore seem in order.

A possible solution for both time and cost seems evident with the Atomic Absorption Spectroscopy Process.

Cost of this installation would be less than $20,000. Time required for a four element readout as contemplated not to exceed one (1) hour. Multi-element incorporation could reduce both time and cost as noted above.

BAND ANALYSIS - OPERATION #147 (continued)

Vendors cognizant of this process and already furnishing comparable equipment are noted as follows:

a. Perkins-Elmer
b. Varian Techtron
c. IL
d. Beckman
e. Unicom

Units of this magnitude are already in use and approved for commercial use in chemical analysis of material common to these band oriented.

PAR. 4.5.2 - MAGNETIC PARTICLE. MIL-C-63076(AR) See Page #7.

Whereas this test is not new, the categories for acceptance or rejection constitute a field of characteristics generally finalized by trial and error thru production, Since this shell has never had experiences for determination of these characteristics, comments regarding same would be of little credence.

With this in mind, the best equipment available should be selected for program use.

Automations covering these facilities are limited, if at all, and therefore could be considered. Several vendors, all commonly known, are available for this type of study. Picatinny has indicated the possibility of some study work already in progress, however, verification of same was not forthcoming.

The progress of Electronic Inspection Concepts for inspection criteria of this nature should be further pursued. This is being done at Picatinny, however, actual progress and results were not available for release at this time.

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3925 N. HASTINGS WAY
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CONTRACT DAAK10-78-C-0005

GENERAL REPORT DATA

The following pages contain the general data information pertaining to the contract, the subject 105MM XM710E1 Projectile, and the related parameters generated for support thereof.

Future use of this data should be closely scrutinized for compatibility to the particular project work scope and all other parameters attributable to the tasks contract oriented.

Incorporation of the complex Engineering, Production and Quality Control factors to a viable producing facility must be considered as a major effort of planning and projection.

The data pages herein are equally apportioned for aggregate review or removable by section for expeditious purposes for single portion use or for report perusal and/or general use.

The sections are generally as follows:

Problem Areas

A. Special Category Items
   1. Steel
   2. Cold Shear
   3. Electronic Gaging
   4. Air Gaging & Other

B. Processes & Operations
   1. Process Flow Chart
   2. Operation Sequence & Equipment
   3. Operational Sequence

C. Operation Process Sheets
   "Raw Material thru Finished Shell"

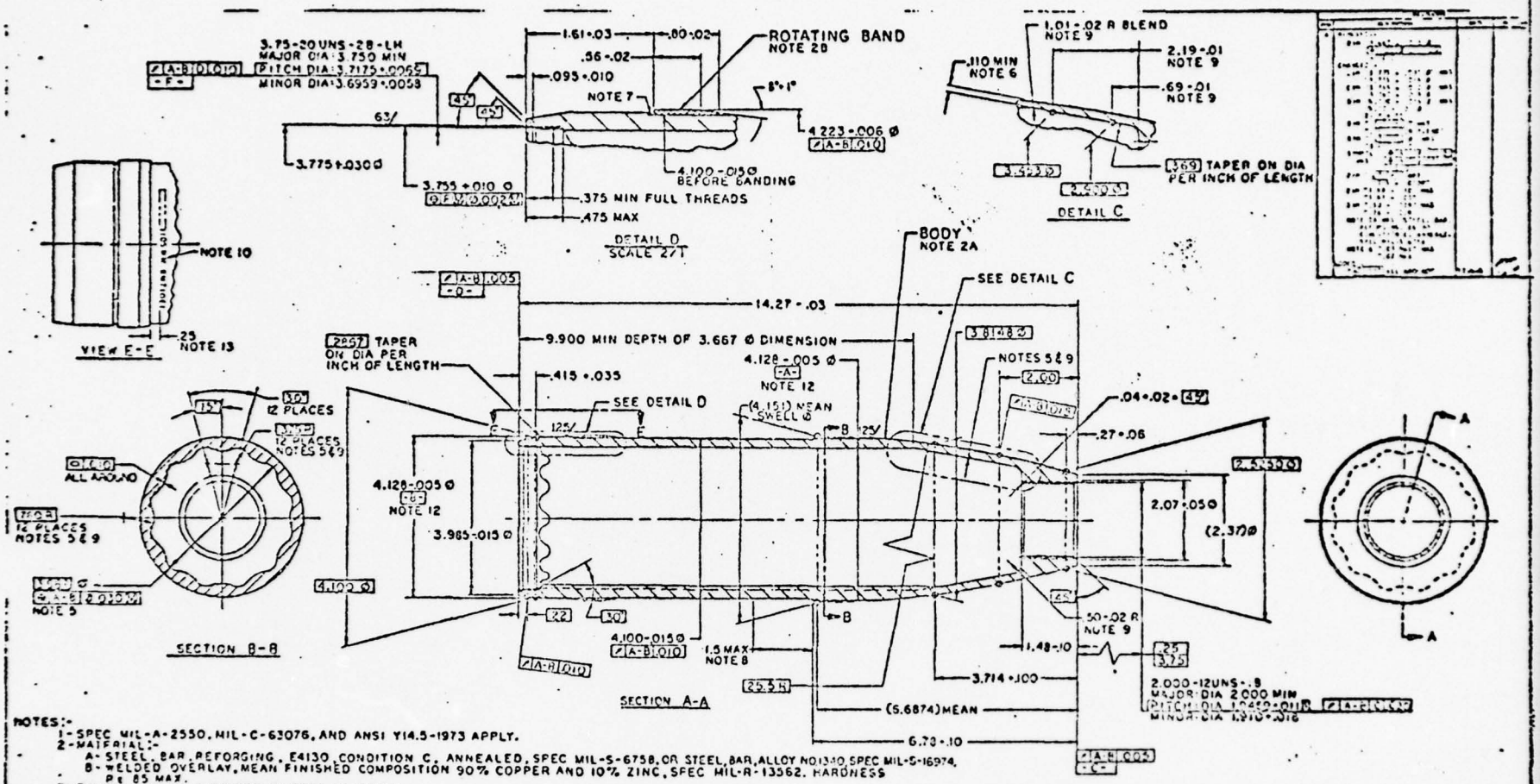
D. Manufacturing - General Description of Operations and Inspections

E. In Process Inspection by Attributes

F. Final Inspection by Attributes

G. Miscellaneous Information
   1. St. Louis Equipment List
   2. St. Louis Equipment Planned for use
   3. New Equipment Required

H. Reference Section



NOTES:-

1- SPEC MIL-A-2550, MIL-C-63076, AND ANSI Y14.5-1973 APPLY.
2- MATERIAL:-
A- STEEL BAR, REFORGING, E4130 CONDITION C, ANNEALED, SPEC MIL-S-6758, OR STEEL BAR, ALLOY NO 1340 SPEC MIL-S-16974, PB 85 MAX.
B- WELDED OVERLAY, MEAN FINISHED COMPOSITION 90% COPPER AND 10% ZINC, SPEC MIL-R-13562. HARDNESS
3- FINISH 250 ALL SURFACES, EXCEPT AS NOTED.
4- HEAT TREAT BODY TO OBTAIN YIELD STRENGTH OF 160,000 MINIMUM PSI (0.2% OFFSET) ELONGATION 10% MIN IN ONE INCH.
5- FORGED OR DRAWN FINISH ACCEPTABLE.
6- WALL THICKNESS VARIATION AROUND CIRCUMFERENCE .03 MAX EXCEPT AT INTEGRAL RIBS.
7- MAXIMUM .010 DEEP × .100 WIDE UNDERCUT PERMISSIBLE FWD AND AFT OF ROTATING BAND
8- WITHIN SPECIFIED LIMITS, REDUCE 4.128-.005 DIAMETER TO 4.10-.01 DIAMETER WITH RADIUS OR TAPER.
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10- STAMP LOT NO., YEAR OF MANUFACTURE, CALIBER AND DESIGNATION OF SHELL WITH LETTERS AND FIGURES .125 HIGH × .01 DEEP.
11- PROTECTIVE FINISH:- FINISH 511 ALL SURFACES FOLLOWED BY FINISH 201 OR 202 OF MIL-STD-171 COLOR (SEE TABLE) ON EXTERIOR SURFACES ONLY, EXCEPT ROTATING BAND AND END FACES.
12- THE 4.128+.005 BOURRELET DIAMETERS ALLOWED TO INCREASE TO 4.130 MAX DIAMETER AFTER PAINTING.
13- UNTOLERANCED DIMENSIONS NEED NOT BE GAGED.

PART NO	COLOR, NOTE 11
9298225-1	OLIVE DRAB NO 34087
9298225-2	BLUE NO 35109

FOR ASSOCIATED LISTS (SEE TABLE)

PART NO (SEE TABLE)

16 JUL 1976

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SECTION "A"

SPECIAL CATEGORIES

CATEGORY #1. STEEL

RAW BAR STOCK

CATEGORY #2. COLD SHEAR

BAR STOCK TO MULT SIZE

CATEGORY #3. ELECTRONIC GAGING

IN PROCESS OR FINAL INSPECTION

CATEGORY #4. AIR GAGING - SEMI OR AUTOMATIC

IN PROCESS OR FINAL

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CATEGORY #1

STEEL - RAW BAR STOCK

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CATEGORY #1. STEEL - RAW BAR STOCK.

Body Material - AISI 1340 and the attributes related to its spectrums for procurement and general information pertaining thereto are as follows:

Material Specifications

AISI - 1340 Steel
MIL-S-16974
Hot Rolled Steel

AISI - 1340 Steel

The above steel was selected primarily because of price differential favoring the 1340 steel by as much as $5.00 per hundred weight.

The 3½" RCS (Round Cornered Square) was selected because of Contractor experience and its compatibility to the forged operational tools, resultant parts, and subsequent shaping operations.

Quoted prices as listed below are of time and place variant and readily subjected to escalations and/or other conditions affecting price. Therefore, the figures as posted are a reference only and should be handled accordingly.

MIL-S-16974 E AISI-1340 Hot Rolled Steel

	3-1/2 RCSQ	4 RCSQ
Base	$19.30	$16.70
Grade	1.25	1.25
Shell Quality C	.50	.75
Cold Shear Quality	1.40	1.40
Size	.80	1.25
	$23.25 CWT	$21.35 CWT

NOTE: Either 3½" or 4" RCS could be used if originally designed and tooled for accordingly.

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CATEGORY #1 - STEEL - RAW BAR STOCK (continued)

MIL-S-6758-A EF AISI-4130 AIRCRAFT QUALITY
VACUUM CARBON DEOXIDED HOT ROLLED STEEL

	3-1/2 RCSQ	4 RCSQ
Base	$19.30	$16.70
Grade	3.40	3.40
Electric Furnace	1.25	1.25
Aircraft Quality	2.00	2.00
Shell Quality C	.50	.75
Cold Shear Quality	--	1.40
Size	.80	1.25
	$27.25 CWT	$26.75 CWT

AISI - 1340 STEEL (continued)

All prices are quoted F.O.B. South Chicago, IL, subject to price in affect at the time of shipment and subject to our Trade Customs and Condition of Sale.

The following specification listing could serve as that information appropriate for procurement action for material purchases.

STEEL SPECIFICATION - 3-1/2" RCS FOR XM710E1 SHELL

MATERIAL: AISI 1340 fine grained, fully killed, non-aging. Must be suitable for hot cup-cold draw process. Material must be in an annealed condition suitable for cold shearing into mults. Final end item will be subjected to 100% magnetic particle inspection. Mechanical properties of the finished projectile are listed as follows:

A. Y.S. - 160,000 psi at 0.2% offset.
B. 10% min. elongation in one inch.

SIZE: 3-1/2" RCS, 1/2" corner radius, diagonal 4.536".

LENGTH: Full bar equal to 20 feet, 9 15/16" minimum and advisory. 15% short bars acceptable with length to be established by user. Both ends to be square and can be hot or cold sawed or machine torch cut.

NOTE: Vendor preference or operations could change above callouts.

CATEGORY #1 - STEEL - RAW BAR STOCK (continued)

STEEL SPECIFICATION (continued)

SPECIFICATIONS: ASTM-A711 and MIL-S-16974.

MACROETCH: MIL-STD-430. Center defects shall not exceed A5; subsurface defects shall not exceed B3; ring defects shall not exceed C8; and miscellaneous defects other than D2 shall not be acceptable. Vendor to furnish the macroetch samples to buyer.

CERTIFICATION: Four (4) notarized copies of Chemical and Macroetch Examination Report qualifying the steel to ASTM-A711 shall be sent to buyer.

SHIPPING INSTRUCTIONS: To be shipped in open gondola cars to permit overhead unloading by magnetic crane. Dunnage required between layers. Heat marker bars are to be marked red (first), white (middle), and blue (last).

OTHER INSTRUCTIONS: The above is applicable as noted unless otherwise ammended by buyer for specific purposes with another specification or change order and approved by Engineering and Purchasing.

Some caution must be used, however, with selection of the vendor and administration of the actual responsibilities for steel extras between supplier and user. These details should be carefully and thoroughly attested to in order to avoid the stigma of the "Who Done It" probabilities and other questionable conditions seemingly arising from material - raw bar stock.

NOTE - STEEL QUALITY - The particular steel and operations attributable thereto have been selected because they were considered processable with our format and procedures for manufacture.

Other vendors could consider other steel grades, different processes and operations and produce equally acceptable end item parts.

NOTE: Consider the above steel for startup purposes - specification changes for price reduction should follow.

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CATEGORY #2

COLD SHEAR - BAR STOCK TO MULT SIZE

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CATEGORY #2 - COLD SHEAR - BAR TO MULT.

A Buffalo #625 Shear with special gaging and auto. length adjustment is envisioned for use. The unit, a "cold shear press" will part 3½" RCS - 1340 Steel to 6.11" length at a rate of twenty-two (22) pieces per minute. Efficiencies of 86 percent can be expected with kerf losses zero (0) and crop losses about 1.4 percent and further reducible to 0.8 percent by salvage saw use for end recovery.

Automatic equipment to unscramble the bar bundles and load/feed the shear constitute about 28 percent of the $337,188.00 unit price.

Cold Shear System Credits follow:

1. Operational independent of forge system to provide inventories and flexibility of system.
2. Stoppages of either forge or shear system will not affect each other for greater efficiencies of both systems.
3. Maintenance more flexible, simplified and more readily planned for.
4. Heat (energy) not wasted in scrap or cropped losses as Hot Shear System.
5. Descalers not required.
6. Bar straightness tolerances can be relaxed for reduced bar tonnage costs.
7. Mult feeding and heating systems already proven - eliminate bar damage factors of Hot Shear Bar Induction Heat System.

1340 Steel as listed for procurement will satisfy the cold shear requirements and not induce problems in subsequent operations.

General Note:

Unless a new installation for this shell - space and funding could become a major factor in the Hot Shearing concepts and adaptations.

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CATEGORY #3

GAGING ELECTRONIC

A. OUTSIDE DIAMETER & ENDS

B. INTERNAL CONFIGURATIONS

C. PRICING ESTIMATES

NOTE: A combination of memories, storage and printout facilities is also available.

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CATEGORY #3 - GAGING ELECTRONIC - 3.667 I.D. x 9.900 Depth

DIMENSIONAL MEASURING/GAGING

The Alina-Pretec Electronic Gaging System is designed to measure a particular dimension or dimensions in comparison to predetermined specifications.

The actual meansurement is taken from the linear variable differential transformer which is used as the measuring sensor or probe. The electronic signal is fed to the basic measuring element called amplifier and from there to the meter for visual display.

The modular gaging system consists of a variety of building block modules - as 10 dimension check would have 10 measuring sensors or probes

10 amplifiers
or ——— 1 multi-station panel meter
or ——— 10 signal light unit (showing undersize / good / oversize)

or analog - graph strip chart recorder
or digital - readout

NOTE: Gaging fixture required for shell will support the measuring sensors or probes as per area or operation performed as per process assurance requirements.

All of the above electronic gaging modules can be directly interfaced with the Hewlett-Packart Programmable Desk Calculator. With basic features:

Digital Display & Alphanumeric Printer

(1) Digital Display on calculator of either
   a. Absolute dimension
   b. Deviation from the nominal

(2) Alphanumeric 16-character thermal printout of either
   a. Absolute dimension
   b. Deviation from the nominal
   c. Operator instructions
   d. Labeled & identified output

The above deals primarily with the outside diameter and open ends and can be arranged in combination to suit multiple customer requirements.

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CATEGORY #3. ELECTRONIC GAGING - INTERNAL CONFIGURATION.

CAVITY - PRETEC PROGRAMMABLE MEASURING SYSTEM.

This system has special head for cavity configuration which is fitted with twelve (12) standard cartridge probes. The pattern of sequence of operation for this system would give a choice of how readings should be taken.

Example - Take 2, 3, 4 or more readings at different depths and have the calculator list each reading and average one.

Head Operation: The inspector would insert head into cavity and push a button at each depth and the scanner would gather in the readings.

Example - Take the TIR reading of each pair of probes and let the calculator list each set of readings.

Head Operation: The inspector would press the foot pedal to erase the Min-Max Unit after the head is in the shell and slide the head into the bottom. When the head has reached the bottom, he would then press the button and the calculator will read the TIR for each pair of probes.

The above unit can be line located and operated without atmospheric or physical restraint to the equipment.

The measuring head or probe will read out the 9.900 minimum depth of 3.667 dimension in its entirety. The number of readouts can be determined by the Contractor to satisfy the Q. A. mode for those concerned. A 100% level is anticipated for the original production and final inspection.

Variations of this head can be used for in process checks deemed necessary.

A final automated concept for shell, in and out feed, is available - funding permitting. Manual concepts for shell handling is contemplated with the quoted equipment.

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CATEGORY #3. ELECTRONIC GAGING - PRICING ESTIMATES.

The following lists some of the facilities available for electronic inspection banks. Pricing current January 1978.

NOTE: The Pretic Internal Groove Checking System requires the following details

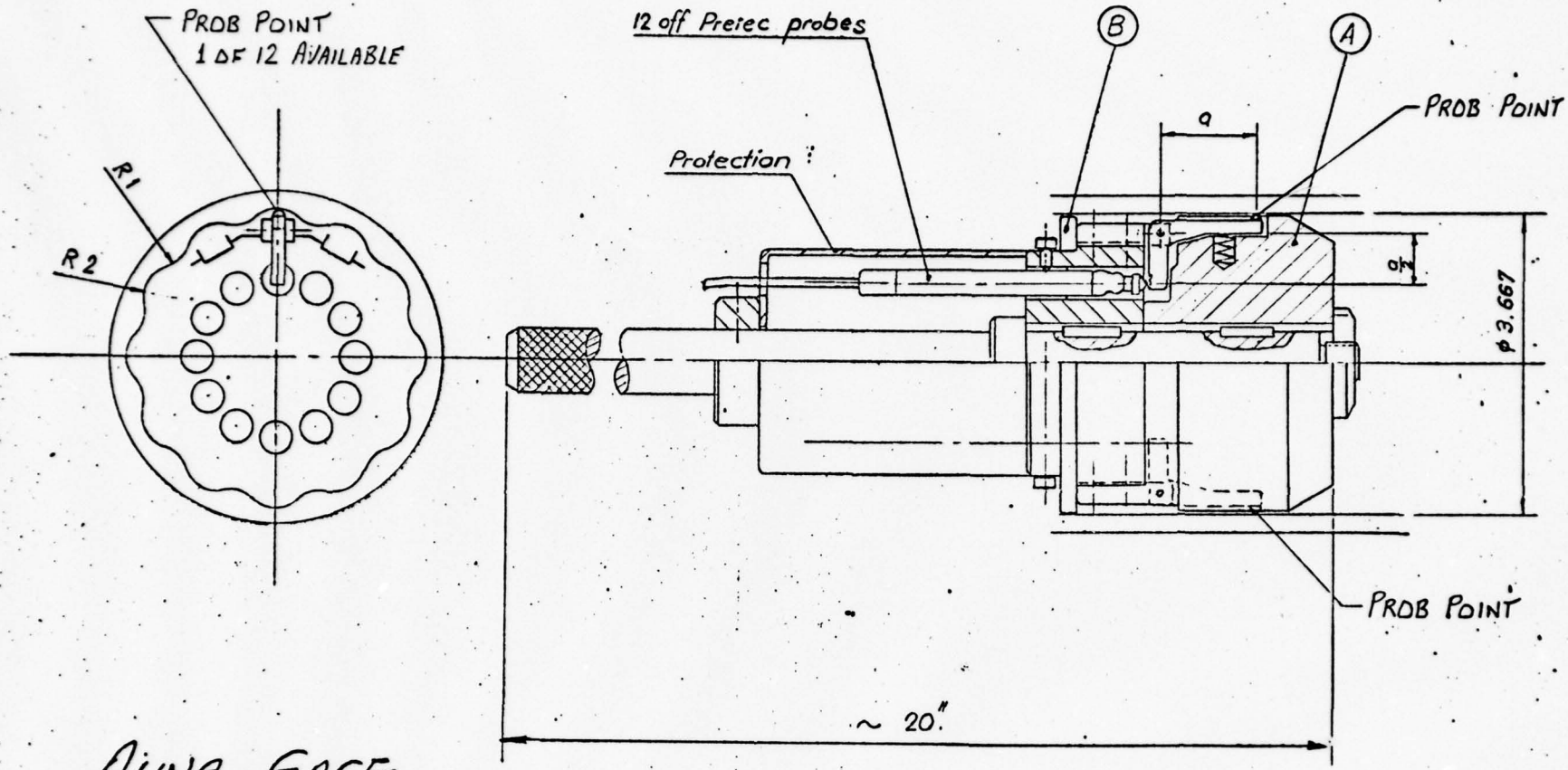
Alina Corporation
175 Sunnyside Blvd.
Plainview, N.Y. 11803

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
1.	1	Fixture per P/N 2-13919	$ 5,340	$ 5,340
2.	1	83 104 110 Simultaneous 10 Station Meter	2,450	2,450
3.	6	83 000 101 Amplifier (Differential)	595	3,570
4.	12	83 100 102 Standard Cartridge Probes	165	1,980
5.	6	83 100 100 Min-Max Memory Unit	495	2,970
6.	1	Foot Pedal to Erase 6 Min-Max Units Simultaneously	125	125
7.	1	Alina Scanner	1,500	1,500
8.	1	Alina Converter	1,500	1,500
9.	1	H-P Calculator with 2008 Step Memory	3,855	3,855
10.	1	H-P Interface Card 98133A	650	650
				$23,940

NOTE: See proposed head on page #31.

NOTE: H-P Calculator with 2008 Step Memory and Fixture P/N 2-13919 used in combination with the other items listed above.

Obs ! probe is indicating ½ value of dimension



ALINA - GAGE
INSIDE FLUTING.

(A) Protection and guide-body in fibre-glass laminated Delrin. Same shape as Inner groves.

(B) Protection Same mat. and shape as Pos. (A)

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CATEGORY #4

AIR GAUGING - SEMI & AUTO

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CATEGORY #4. AIR GAUGING - SEMI & AUTO.

Semi to automatic gaging can be accomplished by use of a Precisionaire type, multiplex air gauge system. This system, already proven, has been used in various commercial and ordnance plants throughout the U.S.A.

The equipment could be installed in a regular line complex without restrictions.

An example of the possibilities are noted as follows using Section "F" as a reference for characteristics.

Operation #205. Inspect following Finish Turn O.D. & Bourrelet.

Eight (8) characteristics could be station gaged in a single readout with failures noted individually.

Complete automation is desired, however, limitations evidenced by operation sequencing, space and funding would vastly change or control methods adopted. Since the above are unknown, no further comment of consequence can be made.

See Final Inspection - Section "F" for AQL's and other data common to regular line inspections.

NOTE: Several companies retain expertise for the design and build requirements of these units. The design criteria are of a nature requiring specific sequencing in order to incorporate the benefits of each individual machine element.

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SECTION "B"

SEQUENCE OF OPERATIONS & FLOW CHART

A. PROCESS FLOW CHART

B. OPERATION SEQUENCE & EQUIPMENT

C. OPERATIONAL SEQUENCE

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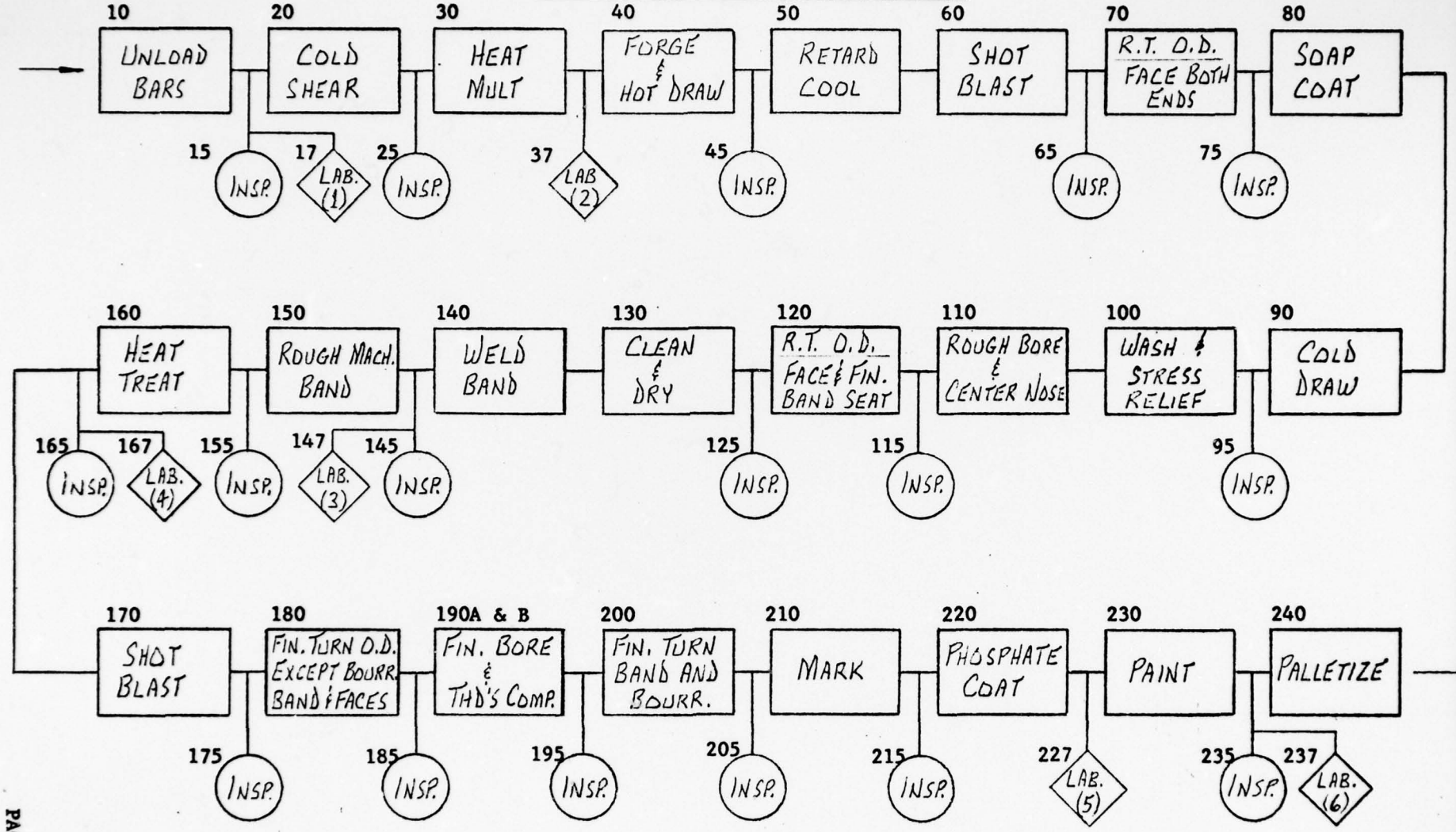
PROCESS FLOW CHART

The attached Process Flow Chart lists the various production, inspection and laboratory stations in order of their manufacturing sequence.

Each should serve to be self-explanatory and will be referenced and noted accordingly throughout this report.

The chart attached, page 36, is separate for removal and use as referenced material.

PROCESS FLOW CHART



LAB. FUNCTION

- LAB. (1) — MACRO
- LAB. (2) — MULT TEMP.
- LAB. (3) — CHEM. ANALYSIS
- LAB. (4) — BAND SEAT & TENSILE TEST
- LAB. (5) — COATING WEIGHT FOR PHOSPHATE
- LAB. (6) — SALT SPRAY TEST

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OPERATIONAL SEQUENCE & EQUIPMENT

The attached sheets, Pages 38 and 39 are separate for expeditious purposes.

The operations in sequence combine the work with the facilities envisioned for use forthwith.

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CONTRACT DAAK10-78-C-0005

105MM XM710E1 MPTS.

OPERATIONAL SEQUENCE & EQUIPMENT

OPER. NO.	LOCATION	OPERATION DESCRIPTION	EQUIPMENT
10	St. Louis	Unload Cars	Overhead Crane
15		Inspect	
17		Lab - Macro	
20	New	Cold Shear	Buffalo Shear No. 625
25		Inspect	
30	New	Heat Mult	Westinghouse 10 Coil Induction 3000 Kw
37		Mult Heat (Lab)	Pyrometer
40	St. Louis	Forge & Hot Draw	E. W. Bliss - 4 stage - mechanical press
45		Inspect	
50	New	Retard Cool	Special Design
60	New	Shotblast	Pangborn/Dust Collectors
65		Inspect	
70	St. Louis	R.T. O.D. Face Both Ends	Wm. K. Stamets Lathe
75		Inspect	
80	New	Soap Coat	Hansen Van Winkle Munning Moore
90	New	Cold Draw	Bliss or equiv. - 600 Ton
95		Inspect	
100	New	Wash & Stress Relieve	Washer & Lindberg Furnace
110	New	Rough Bore & Center Nose	Seneca Falls Mach. Company
115		Inspect	
120	St. Louis	R.T. O.D. Faces & Finish Band Seat	Wm. K. Stamets Lathe
125		Inspect	
130	New	Wash & Dry	Automatic Wash & Dry Equip.
140	New	Weld Band	Taylor Winfield Special
145		Inspect	
150	St. Louis	Rough Machine Band	Arcade Machine & Tool Co.
155		Inspect	

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OPERATIONAL SEQUENCE & EQUIPMENT (continued)

OPER. NO.	LOCATION	OPERATION DESCRIPTION	EQUIPMENT
160	New	Heat Treat	Furnace to suit.
165		Inspect	
167		Lab - Band Seat, Chemical Analysis & Tensile Test	Laboratory - Chemical
170	New	Shotblast	Pangborn/Dust Collectors
175		Inspect	
180	St. Louis	Finish Turn O.D.(Except Bour. Band & Faces)	Jones & Lamson Lathe
185		Inspect	
190 A&B	New	Face Bore & Thd's. Comp.	Seneca Falls Mach. Co.
195		Inspect	
200	St. Louis	Fin. Turn Band & Bour.	Wm. K. Stamets Lathe
205		Inspect	
210		Mark	Matthews Marker
215		Inspect	
220	New	Phosphate Coat	Advanced Curing Systems
227		Lab - Coating Wts. for Phosphate	Laboratory - Chemical
230	New	Paint	Binks
235		Inspect	
237		Lab - Salt Spray Test	
240		Palletize	Conveyor System

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105MM XM710E1 MPTS.
OPERATIONAL SEQUENCE

OPER. NO.	NO. OF SHEETS	OPERATION DESCRIPTION
10	2	Unload Cars
15	2	Inspect
17	2	Lab - Macro
20	3	Cold Shear
25	2	Inspect
30	3	Heat Mult
37	2	Mult Heat (Lab)
40	7	Forge & Hot Draw
45	2	Inspect
50	3	Retard Cool
60	3	Shotblast
65	2	Inspect
70	5	R.T. O.D. Face Both Ends
75	2	Inspect
80	3	Soap Coat
90	3	Cold Draw
95	2	Inspect
100	3	Wash & Stress Relieve
110	5	Rough Bore & Center Nose
115	2	Inspect
120	5	R.T. O.D., Face Open End (Fin. Turn Band Seat)
125	2	Inspect
130	3	Clean & Dry
140	5	Weld Band
145	2	Inspect
147	2	Lab - Band Analysis
150	4	Rough Machine Band
155	2	Inspect

OPERATIONAL SEQUENCE (continued)

OPER. NO.	NO. OF SHEETS	OPERATION DESCRIPTION
160	3	Heat Treat
165	2	Inspect
167	4	Lab - Band Seat, Chemical Analysis & Tensile Test
170	3	Shotblast
175	2	Inspect
180	5	Fin. Turn O.D. Except Bour. Band & Face
185	2	Inspect
190 A&B	6	Fin. Bore & Thd's. Comp.
195	2	Inspect
200	5	Fin. Burn Band & Bour.
205	2	Inspect
210	3	Mark Shell
215	2	Inspect
220	3	Phosphate Coat
227	1	Lab - Coating Weight for Phosphate
230	3	Paint
235	2	Inspect
237	2	Lab - Salt Spray Test
240	1	Palletize
245	2	Inspect

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SECTION "C"

"OPERATION PROCESS SHEETS"

OPERATIONS

RAW MATERIAL THRU FINISHED SHELL -

OPERATIONS #10 - #245 ARE INCLUDED

IN THIS SECTION.

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OPERATION PROCESS SHEETS

The "Operation Process Sheets" progressively generate the word and picture conceptuals conceived for the manufacture and acceptance of the 105MM XM710E1 Projectile.

These sheets basically contain the packaged engineering and technical data developed during the item contract tenure.

The order of these listings follow primarily the aforementioned "Flow Chart" parameters and can be used as a condensed data reference thereof. See Section "B", page 36.

Basic data within each operation frame as presented herein is as follows:

1. Operation Name & Number
2. Conceptual Part Drawing & Dimensions
3. Machine Name & Type
4. Process Concepts
5. Speeds & Feeds
6. Cycle Time & Efficiency
7. Machine Tooling & Costs
8. New Machine - Modernized or Use As Is
9. Operation Inspection Criteria
10. Miscellaneous

NOTE: Inspections on these sheets could be a function of any designated personnel since all are strictly for control purposes.

Laboratory functions are noted and identified with a last digit seven (7).

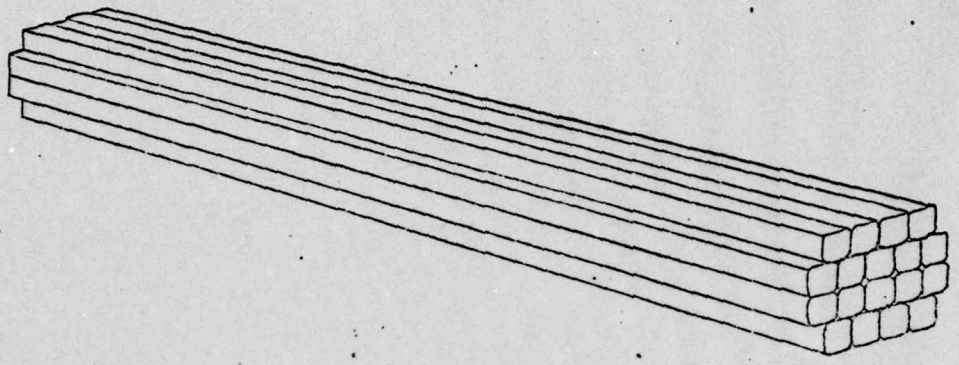
In Process and Final Inspection are listed independently and shown in a corresponding manner on separate lists for expeditious purposes.

The Operation Process Sheets covering the complete phases of manufacture and inspection - Operation #10 thru Operation #240 follow:

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 1 OF 2

MATERIAL: 1340 MACHINE NAME: 12.5 TON OVERHEAD CRANE OR EQUIV. MACHINE NO.: _____



NOTE: SEE UNLOAD CARS SHEET 2 OF 2

	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
	UNLOAD CARS		

NATIONAL PRESTO INDUSTRIES, INC.
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OPER. NO. 10

OPERATION PROCESS SHEET

PART NAME: DUDY PART NO.: 9298225 ISSUE: _____ SHEET: 2 OF 2

MATERIAL: 1340 MACHINE NAME: 12.5 TON OVERHEAD CRANE OR EQUIV. MACHINE NO.: _____

OPERATION: UNLOAD CARS

MACHINE: OVERHEAD CRANE - 12.5 TON CAB - CONTROL TYPE - MOVING CAB OR SUITABLE SIZE.

EQUIPMENT DESCRIPTION: Overhead Rail supported system - bar from rail car to Storage Area to shearing conveyor - Oper. #20 - Cold Shear.

ESTIMATED PRODUCTION RATE/HR. & PERCENT EFFICIENCY: Requirements pending layout of plant.

ESTIMATED COST PER UNIT: Unit costs are not shown hereon since the real time expenditures include too many variables as associated with type of equipment, installations relative to area and steel work required for support and whether rehabilitation or new purchase overall.

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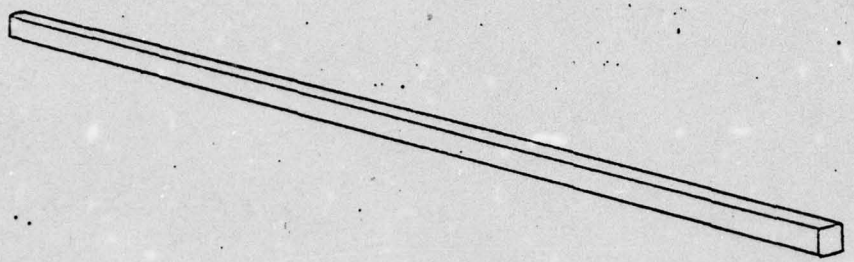
DRAWN BY | CHECKED BY | DATE | OPER. 10

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 1 OF 2

MATERIAL: 1340 MACHINE NAME: BENCH & GAGE MACHINE NO.: _____



NOTE: See Ultrasonic Inspect
Item #6, Page 2 of 2.

	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
	INSPECTION		

NATIONAL PRESTO INDUSTRIES, INC.
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OPER. NO. 15

WAS DATE OFF

OPERATION PROCESS SHEET

PART NAME: DUDY PART NO.: 9250625 ISSUE: _____ SHEET: 2 OF -

MATERIAL: 1340 MACHINE NAME: _____ MACHINE NO.: _____

INSPECTION OPERATION: Following Unload Cars

Steel Bars

1. Check Heat Number
2. Check Bar Length
3. Check Bar Width (Across & Diagonally)
4. Check Chipping & Scarfing
5. Check Straightness
6. Ultrasonic

Bars/Mults - Ultrasonic Inspection Submerged Systems

Submerged Ultrasonic System - Government Oriented scheduled for operational tryout at Louisiana Army Ammo Plant (LAAP) 1 August 1978. This system, already checked in part, is considered as the first major effort for inspection of this magnitude in a line production mode.

The above system, if proven acceptable in use, should be considered for this project.

Elaboration, as required to suit the particular installation, should be a part of the consideration.

The present 155MM XM549 or any other comparable Ultrasonic Inspection System should also be investigated for possible incorporation.

Contractor and vendor commonality of terminology and purchase order requirements should be co-ordinated for mutual understanding of all paper required for:

#1. Inspection
#2. Certification
#3. Record

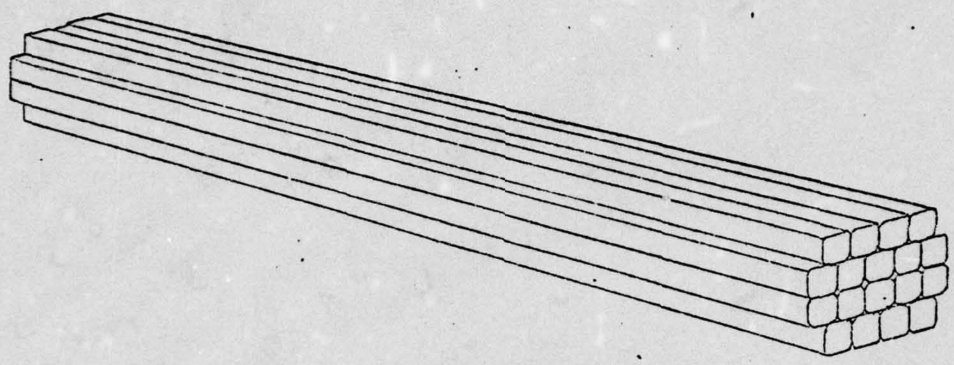
NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN | OPER. NO. 15

DRAWN BY | CHECKED BY | DATE

OPERATION PROCESS SHEET

PART NAME: BODY | PART NO.: 9298225 | ISSUE: | SHEET: 1 OF 2

MATERIAL: 1340 | MACHINE NAME: BENCH | MACHINE NO.:



NOTE: SEE INSPECT METALLURGICAL SHEET 2 OF 2

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
INSPECT METALLURGICAL		

WAS

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

OPER. NO. 17

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: SHEET: 2 OF 2

MATERIAL: 1340 MACHINE NAME: BENCH & LABORATORY MACHINE NO.:

OPERATION: INSPECT METALLURGICAL

MACROS: Furnished by Steel Supplier.
Visual inspect to MIL-STD-430
for compliance of quality required.

BARS: Visual inspect for Mill Acid Pickle
for Scale Removal.

Contractor and vendor commonality of terminology and purchase order requirements should be co-ordinated for mutual understanding of all paper required for:

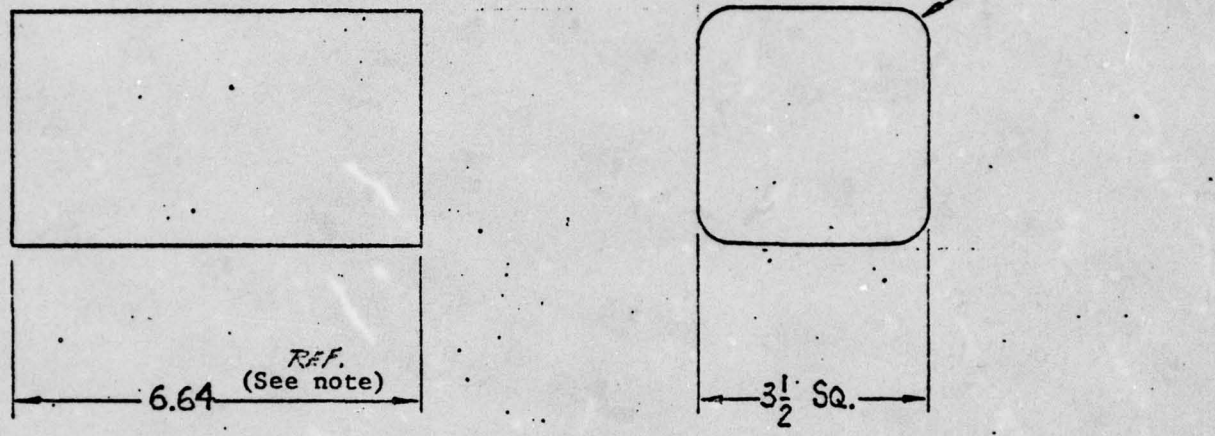
#1. Inspection
#2. Certification
#3. Record

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN
OPER.
DRAWN BY CHECKED BY DATE

OPERATION PROCESS SHEET

PART NAME: SOL. PART NO.: 92[illegible]225 ISSUE: ____ SHEET: 1 OF ____

MATERIAL: 1340 MACHINE NAME: BUFFALO SHEAR NO. 625 MACHINE NO.: NEW



NOTE: 22.66 ±.2 lbs. ---- Pending development as required for forging & hot draw configuration.

(See Cold Shear Sheet 2 of 3)

	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
	COLD SHEAR		

ISS.	CHG NO	WAS	DATE	APP BY

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE

OPER NO. 20

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 2 OF 3

MATERIAL: 1340 MACHINE NAME: BUFFALO SHEAR NO. 265 MACHINE NO.: NEW

OPERATION: COLD SHEAR FOR PARTING BAR INTO MULTS.

MACHINE: Buffalo No. 625 Mult Shear (or equivalent)
equipped with powered bar rack and a roll type feed table and automated
to suit customer requirements.

TIME CYCLE: 2.7 sec/shell = 1320 pcs/hr at 100% eff.
= 1056 pcs/hr at 80% eff.

WEIGHT: 22.66 ±.2 lbs. each mult.

NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN | OPER. NO. 20

DRAWN BY | CHECKED BY | DATE

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298625 ISSUE: _____ SHEET: 3 OF _____

MATERIAL: 1340 MACHINE NAME: _____ MACHINE NO.: _____

OPERATION: COLD SHEAR FOR PARTING BAR INTO MULTS.

		EST. COST DEC. 1975
MACHINE:	BUFFALO NO. 625 - equipped with an air operated retracting back gage incorporating motorized adjustment and electrical control.	$241,167.00
	Power Bar Rack & Power Feed Table	$ 96,021.00
	(1) Set of Shear Blades	$ 2,171.00

Est. Blade Life

Total cuts:

New Blade (8,000 x 2 edges)	= 16,000
Regrind x 6 x 20,000 per edge x 2 edges	=240,000
TOTAL	256,000

Knife breakage is unpredictable, suggested a 50% factor per cut plus grinding cost. = $.01696

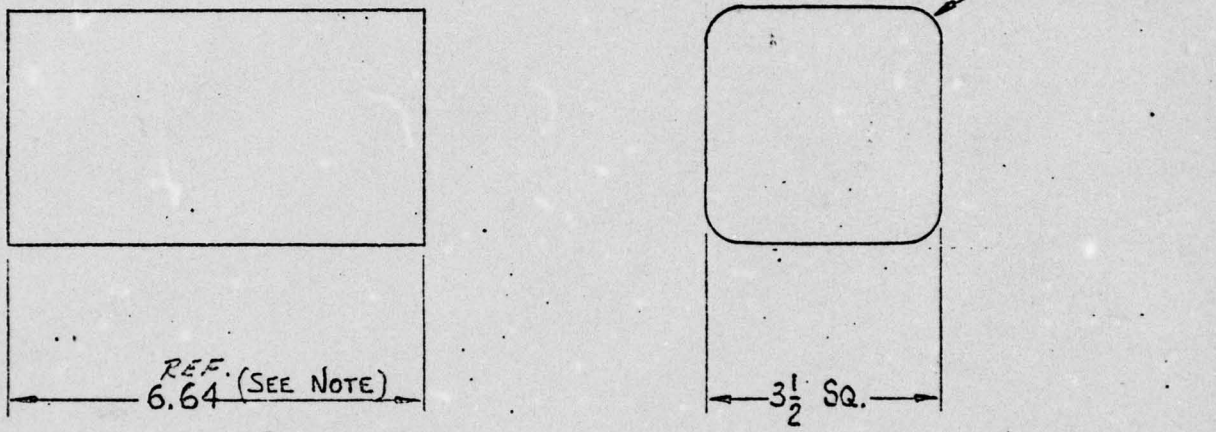
NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE | OPER. 20

OPERATION PROCESS SHEET

PART NAME: BODY | PART NO.: 9298225 | ISSUE: | SHEET: 1 OF 2

MATERIAL: 1340 | MACHINE NAME: BENCH & GAGES | MACHINE NO.:



NOTE: 22.66 ±.2 lbs. -- Pending development as required for forging & hot draw configuration.

	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
	INSPECTION - COLD SHEAR		

CHG | WAS | DATE | APP'D

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

OPER. NO. 25

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 92[illegible]25 ISSUE: Sheet: 2 OF

MATERIAL: 1340 MACHINE NAME: BENCH & GAGES MACHINE NO.:

INSPECTION OPERATION: Following Cold Shear

INSPECT:

COLD SHEAR

1. Check Width
2. Check Length
3. Check Weight
4. Check Right Angle or Shear Cut

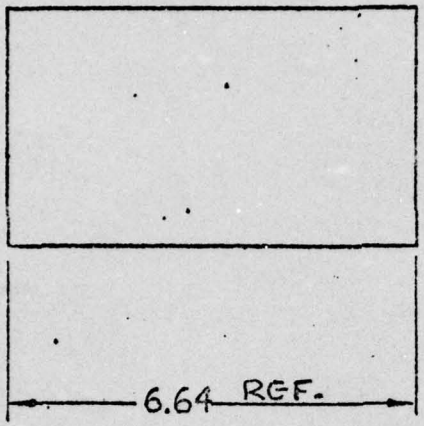
NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

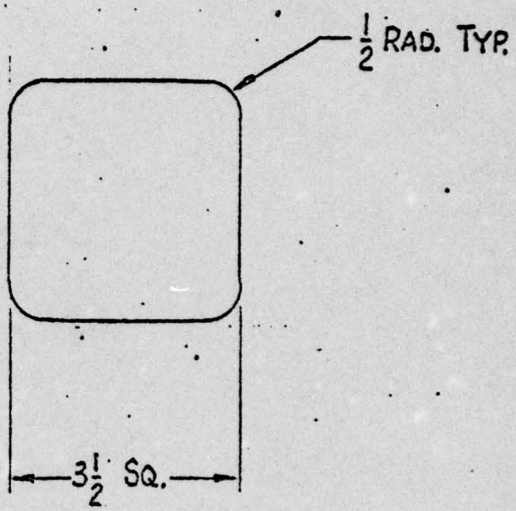
DRAWN BY:	CHECKED BY:	DATE:	OPER. NO.
			25

OPERATION PROCESS SHEET

PART NAME: OD | PART NO.: 920025 | ISSUE | SHEET 1 OF 3

MATERIAL: 1340 | MACHINE NAME: WESTINGHOUSE OR EQUIV. | MACHINE NO.: NEW





Approx. 2000°F. or as vendor specified.

(See Heat Mult Sheet 2 of 3)

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
HEAT MULT		

CS.	CHG NO.	WAS	DATE	APP BY

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | ENGRD BY | DATE

OPER NO. 30

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9290625 ISSUE: _____ SHEET: 2 OF _____

MATERIAL: 1340 MACHINE NAME: WESTINGHOUSE OR EQUIV. MACHINE NO.: NEW

OPERATION: HEAT MULTS TO 2000°F.

MACHINE: Westinghouse Induction Heater System - Automated with push thru transfer System - Load & Unload and Heating sychronized to Oper. #40 - Forge.

EQUIPMENT: Westinghouse Solid State - 10 Coil Inductor 3000 Kw

CYCLE TIME: 5 sec/shell = 720 pcs/hr at 100% eff.
= 576 pcs/hr at 65% eff.

NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN | OPER. NO.

DRAWN BY | CHECKED BY | DATE

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 3 OF 3

MATERIAL: 1340 MACHINE NAME: WESTINGHOUSE OR EQUIV. MACHINE NO.: NEW

OPERATION: Heat Mults to 2000°F.

EQUIPMENT: Westinghouse Solid State
10 Coil Inductor 3000 Kw

EST. COST

$900,000.00 plus installation

CONVEYORS: Pending installation for presses.

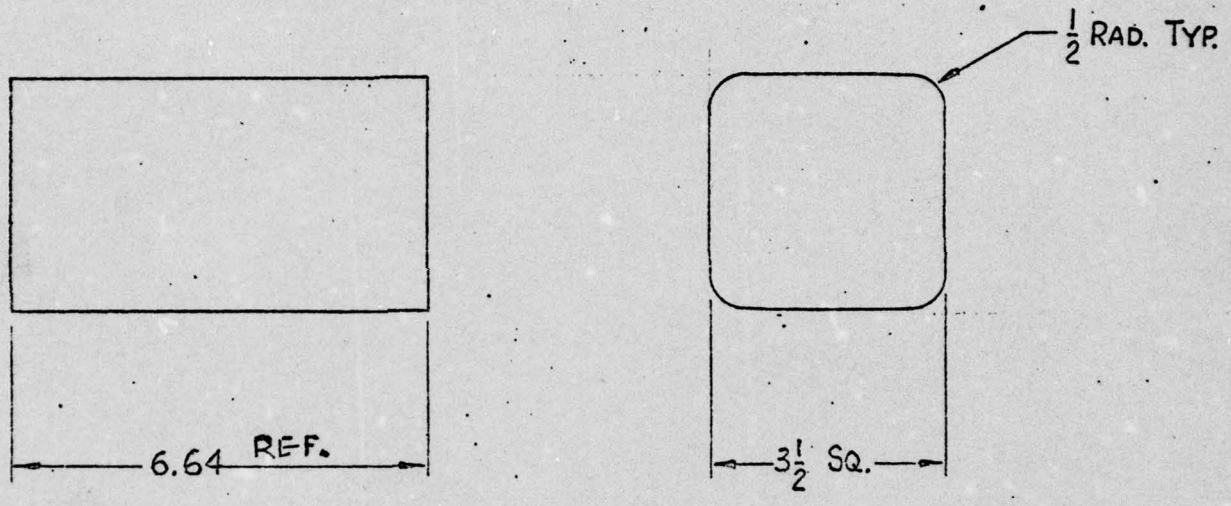
NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE | OPER. NO. 30

OPERATION PROCESS SHEET

PART NAME: BODY | PART NO.: 9298225 | ISSUE: | SHEET: 1 OF 2

MATERIAL: 1340 | MACHINE NAME: WESTINGHOUSE OR EQUIV. | MACHINE NO.: NEW



Approx. 2000°F. or as vendor specified.

(See Lab Check Sheet 2 of 2)

	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
	LAB CHECK		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

OPER. NO. 37

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 298225 ISSUE: SHEET 2 OF 2

MATERIAL: 1340 MACHINE NAME: WESTINGHOUSE OR EQUIV. MACHINE NO.: NEW

LAB CHECK

MULT TEMPERATURE: 2000°F.

INSTRUMENT: Pyrometer or suitable instrument.

MONITOR HOURLY @ EXIT END OF HEATER.

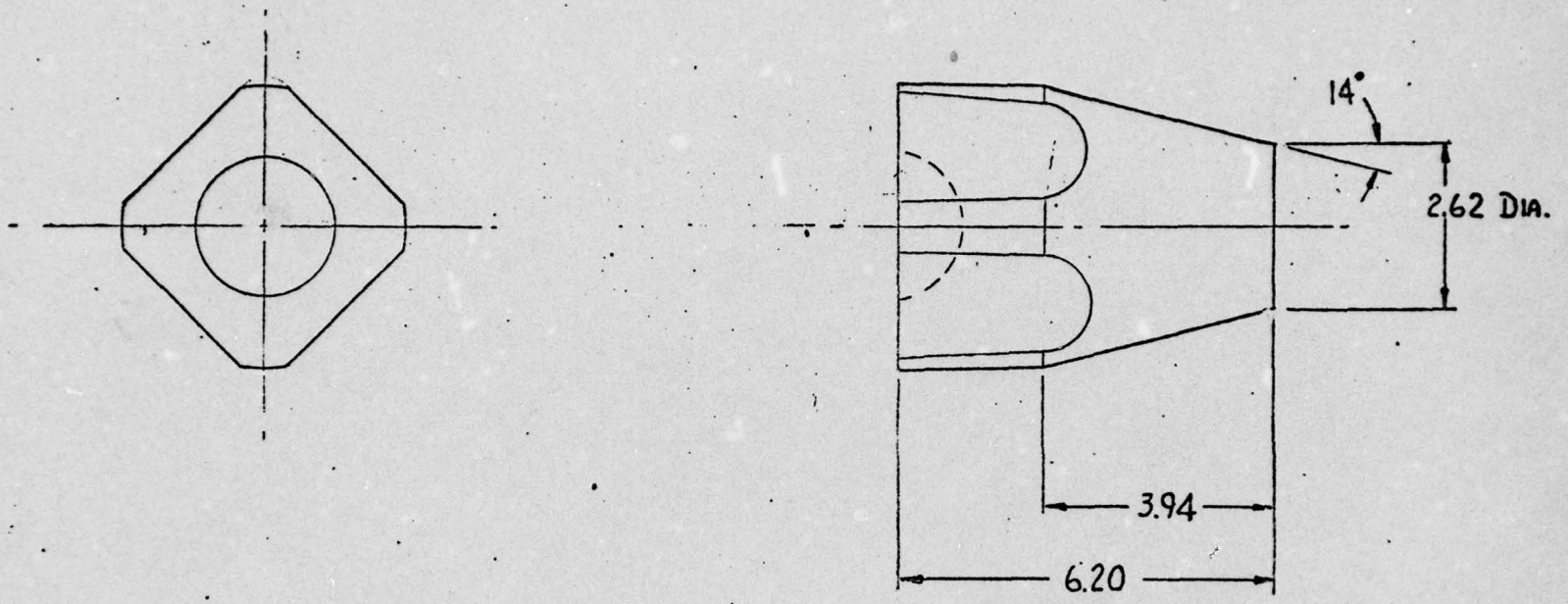
NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN			OPER. NO
DRAWN BY	CHECKED BY	DATE	37

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 929[illegible]25 ISSUE: SHEET 1 OF 2

MATERIAL: 1340 MACHINE NAME: E. W. BLISS COMPANY MACHINE NO.: 1025-40910 Sht. 1 of 2
1025-40344 L-1001
Location-St. Louis

FIRST STAGE



All Dim. are Reference Only..

Develop to obtain dimension shown on Process Sheet 40-4.

(See Forge - Four Stage - Sheet 5 of 7
& Conceptual Tool Layout - Sheet 7 of 7)

ISS.	CHG NO.	WAS	DATE	APP BY	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
					FORGE - SIZE		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE

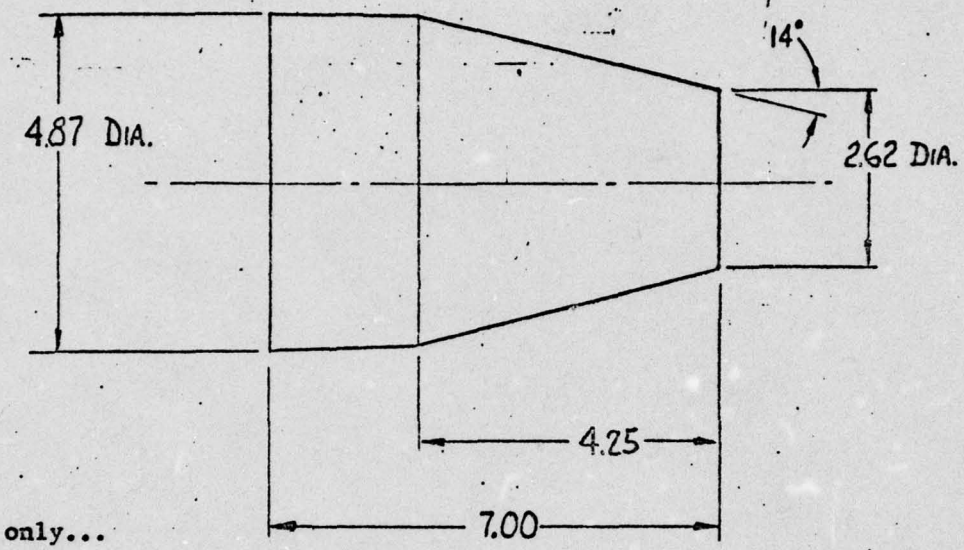
OPER. NO. 40 -

OPERATION PROCESS SHEET

PART NAME: OD | PART NO.: 9[illegible]225 | ISS S 2 OF 7

MATERIAL: 1340 | MACHINE NAME: E. W. BLISS COMPANY | MACHINE NO.: 1025-40910 SHT. 1 OF 2
1025-40344 L-1001
Location - St. Louis

SECOND STAGE



All Dim. are reference only...

Develop to obtain dimensions shown on Process Sheet 40-4.

(See Forge - Four Stage - Sheet 5 of 7
& Conceptual Tool Layout - Sheet 7 of 7)

ISS.	CHG NO.	WAS	DATE	APP BY

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
FORGE - CABBAGE		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY: | CHECKED BY: | DATE:

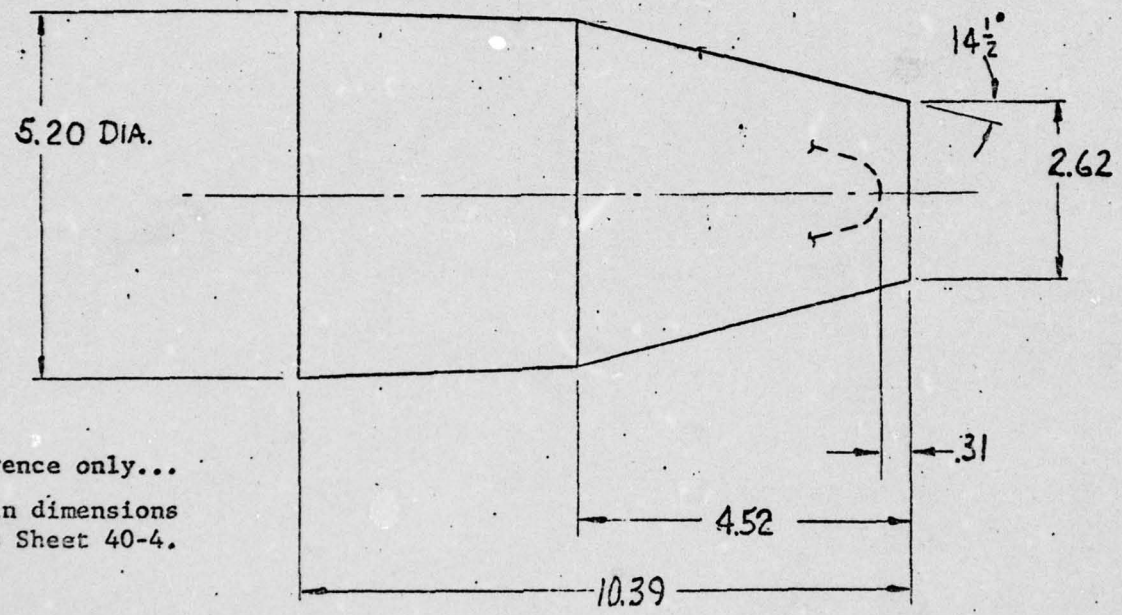
OPER. NO. 40

OPERATION PROCESS SHEET

P. NAME BODY PART 9298225 ISSUE SHEET 3 OF 7

MATERIAL: 1340 MACHINE NAME: E. W. BLISS COMPANY MACHINE NO.: 1025-40344 L-1001 Location - St. Louis

THIRD STAGE



All Dim. are reference only...

Develop to obtain dimensions shown on Process Sheet 40-4.

See Forge-Four Stage Sheet 5 of 7 & Conceptual Tool Layout Sheet 7 of 7.

NOTE: Cavity development required for finish pierce size.

ISS.	CHG NO	WAS	DATE	APP BY
		REVISIONS		

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
FORGE - PIERCE		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY: CHECKED BY: DATE:

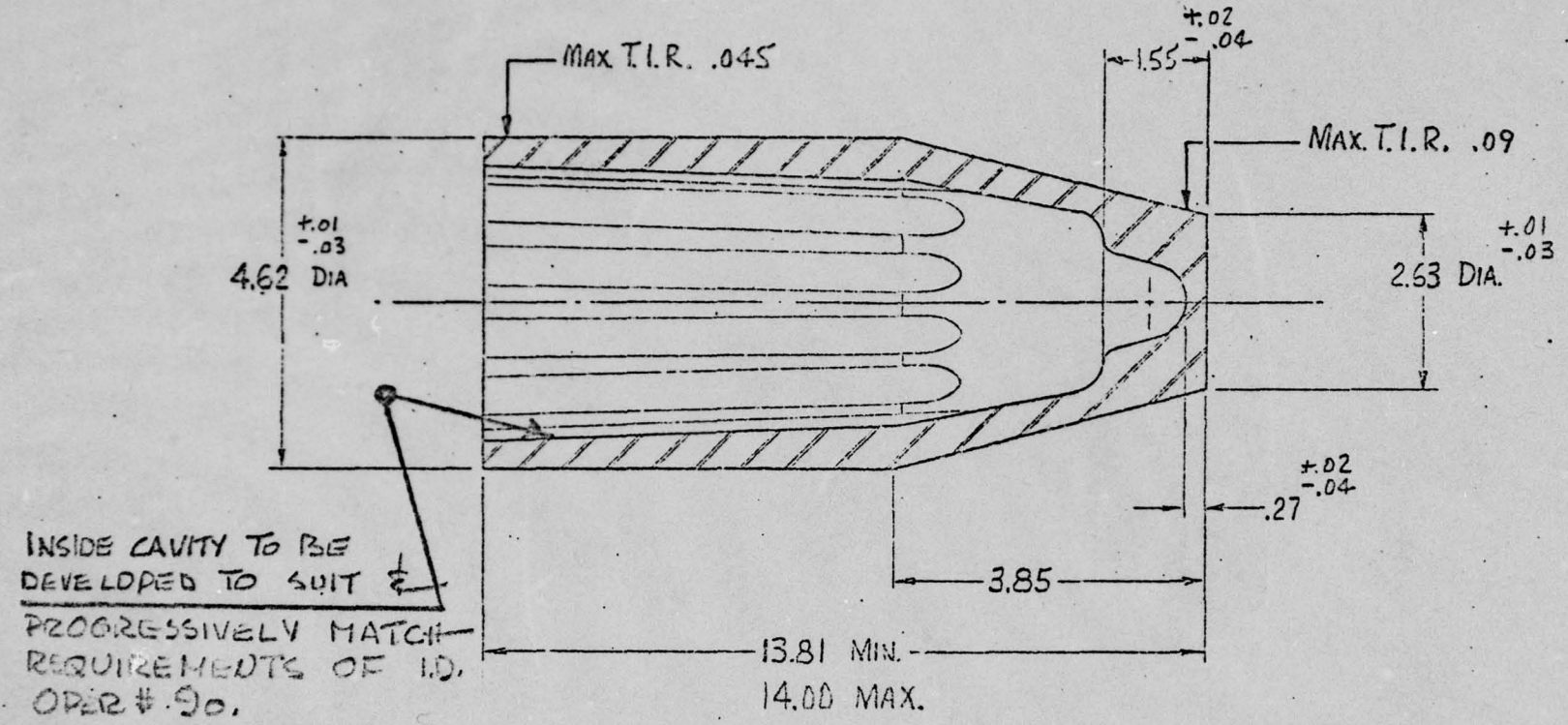
OPER. NO. 40 -

OPERATION PROCESS SHEET

PART NAME: BODY | PART NO.: 929[illegible]25 | ISSUE: | SHEET: | OF:

MATERIAL: 1340 | MACHINE NAME: E. W. BLISS COMPANY | MACHINE NO.: 1025-40910 Sht 1 of 2, 1025-40344 L-1001, Location - St. Louis

FOURTH STAGE



See Forge-Four Stage Sheet 5 of 7 & Conceptual Tool Layout Sheet 7 of 7.

NO.	CHG NO	WAS	DATE	APP BY	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
					HOT DRAW		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE | OPER. NO. 40-4

OPERATION PROCESS SHEET

PART NAME: BODY | PART NO.: 9298225 | ISSUE: | SHEET: 5 OF 7

MATERIAL: 1340 | MACHINE NAME: E. W. BLISS COMPANY | MACHINE NO.: 1025-40910 Sht 1 of 2, 1025-40344 L-1001, Location - St. Louis

OPERATION: FORGE-FOUR STAGE (SIZE-CABBAGE-PIERCE-DRAW)

EQUIPMENT: (St. Louis) E. W. Bliss Company Forge Four-Stage - Automated and transfer sequencing thru all four stages - Auto Load & Unload. See Mfg. Operation #40 Process Description.

PROCESS: Size
Cabbage
Pierce
Draw & Size Nose Thickness

CYCLE TIME: 5 seconds = 720 shell/hr. at 100% eff.
468 shell/hr. at 65% eff.

NOTE: This press in storage - SLAAP - unassembled and as received from E. W. Bliss Company. The units have never been production mode operated or proven out. All this plus the new tooling concepts for this job thus become a major effort for this project.

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE | OPER. NO. 40

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: SHEET 6 OF 7

MATERIAL: 1340 MACHINE NAME: E. W. BLISS COMPANY MACHINE NO.: 1025-40910 Sht 1 of 2
1025-40344 L-1001
Location - St. Louis

OPERATION: FORGE FOUR-STAGE - Size-Cabbage-Pierce-Draw.

MACHINE:	E. W. Bliss Company, Four-Stage Mechanical Press for Hot Size, Cabbage, Pierce & Draw	(REWORK NOT REQUIRED)	$ 0000.00
TOOLING:	*One set of tooling for the four stages.		$90,000.00

*See Following Sheet.

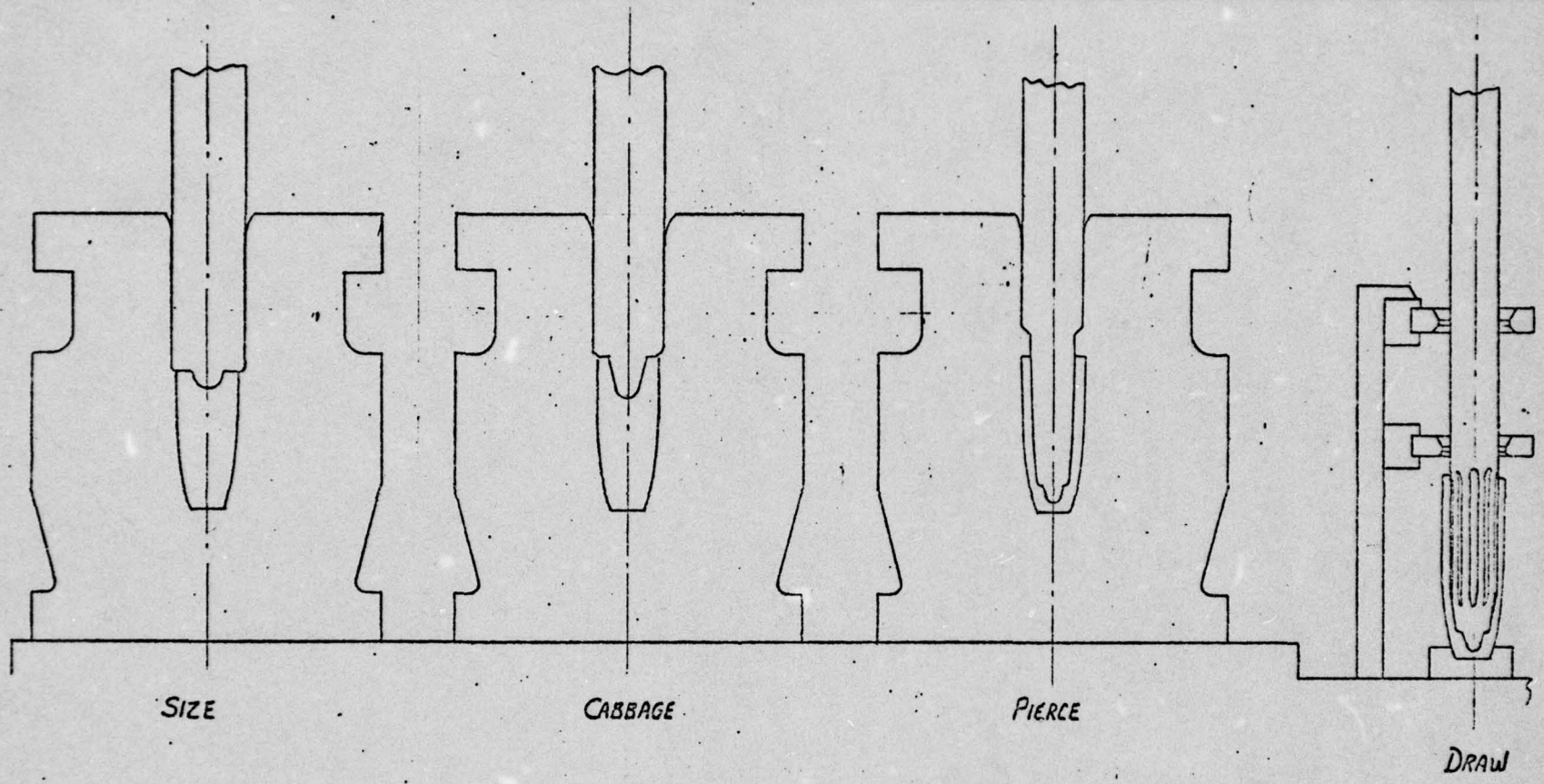
NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY	CHECKED BY	DATE	OPER. NO.
			40

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 1 OF 1

MATERIAL: 1340 MACHINE NAME: _____ MACHINE NO.: _____



CONCEPTUAL TOOL LAYOUT

ISS	CHG NO	WAS	DATE	APP BY

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

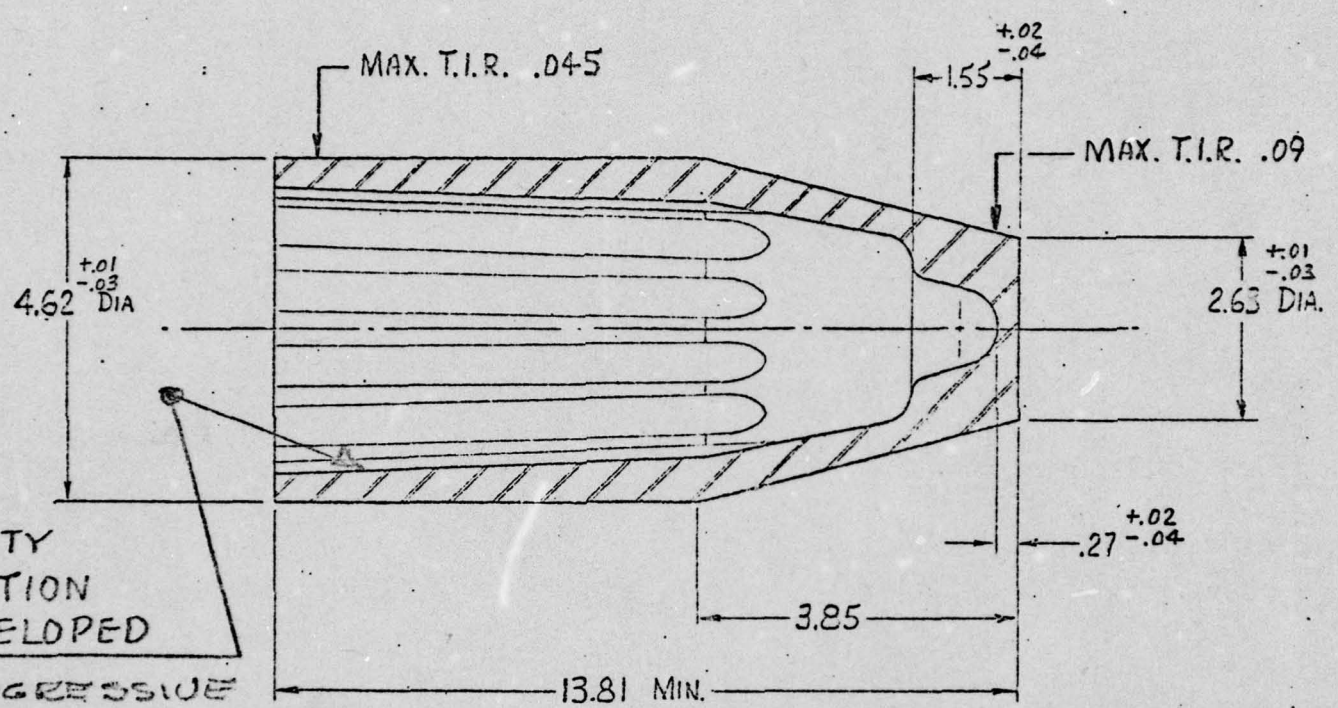
DRAWN BY: CHECKED BY: DATE:

OPER. 40

OPERATION PROCESS SHEET

PART NAME: BODY | PART NO.: 9298225 | ISSUE: | SHEET: | OF:

MATERIAL: 1340 | MACHINE NAME: BENCH & GAGES | MACHINE NO.:



Cool part or H_2O quench and check as noted or as required to suit operation sequence.

SS.	CHG NO.	WAS	DATE	APP BY	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
					HOT DRAW - INSPECTION		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE

OPER 45

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 2 OF 2

MATERIAL: 1340 MACHINE NAME: BENCH & GAGES MACHINE NO.: _____

INSPECTION OPERATION: Following Forge Four-Stage

INSPECT:

Size

1. Tool Control
2. Visual

Cabbage

1. Tool Control
2. Visual

Pierce

1. Tool Control --Control inside contour & scallop.
2. Visual

Draw & Size Nose Thickness

1. Check Overall Length
2. Check Nose Thickness
3. Check Conc. of Open End & Nose End
4. Check Angle (Location & Length)
5. Check Open End Dia.
6. Check Nose End Dia.
*7. Inspect Ribs
8. Inspect Cavity & Outside Surface for Surface Defects.
9. Tool Control

*Special Equipment

Consider workable unit similar to final inspection probe shown in Category #3, Section "A", pages 27, 28, 29, 30 and 31.

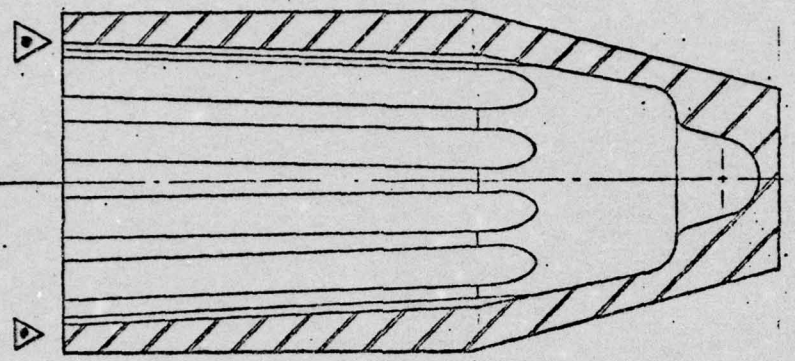
NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN OPER. NO.

DRAWN BY CHECKED BY DATE

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 1 OF 3

MATERIAL: 1340 MACHINE NAME: SPECIAL DESIGN - RETARD COOL MACHINE NO.: NEW



See Retard Cool Sheet 2 of 3.

△ LOCATE

ICS.	CHG. NO.	WAS	DATE	APP. BY	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO
					RETARD COOL		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | APP.

OPER 50

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 929c225 ISSUE: _____ SHEET: 2 OF 3

MATERIAL: 1340 MACHINE NAME: SPECIAL DESIGN - RETARD COOL MACHINE NO.: NEW

OPERATION: RETARD COOL

MACHINE: Special Design - Retard Cool, Automated with Auto Load & Unload. Hold shell vertical, base end down on flat continuous conveyor, thru air chamber to cool below 800°F. and then water spray to cool.

SIZE: 90" wide x 60" high x 30' long

Line of twelve (12) shell on 6" center width and row location.

CONVEYOR SPEED: 55 min. from entry to exit.

TIME CYCLE: 4.6 sec./shell = 785 pcs./hr. at 100% eff.
628 pcs./hr. at 80% eff.

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY	CHECKED BY	DATE	OPER. NO.
			50

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 929c25 ISSUE: _____ SHEET: 3 OF 3

MATERIAL: 1340 MACHINE NAME: SPECIAL DESIGN - RETARD COOL MACHINE NO.: NEW

OPERATION: RETARD COOL

MACHINE: *SPECIAL DESIGN - RETARD COOL (Est. Cost) $ 36,000.00

*Design to fit customer's requirements.

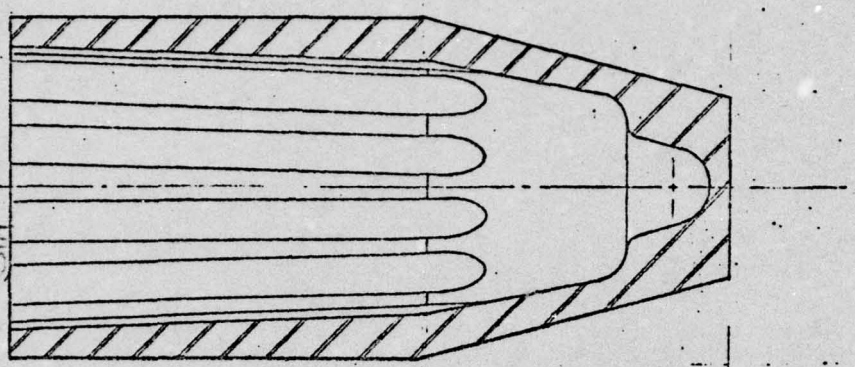
NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE | OPER. NO. 50

OPERATION DOCUMENT SHEET

PART NAME: BODY | PART NO.: 9298225 | ISSUE: | SHEET: 1 OF 3

MATERIAL: 1340 | MACHINE NAME: PANGBORN SHOTBLAST | MACHINE NO.: NEW



NOTE

POSITION OF PART TO BE ESTABLISHED AT TIME OF EQUIPMENT SELECTION

See Descale-Shotblast Sheet 2 of 3.

OS	CHG NO	WAS	DATE	APP BY

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
DESCALE - SHOTBLAST I.D.		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE

OPER. NO. 60

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 2 OF 3

MATERIAL: 1340 MACHINE NAME: PANGBORN SHOTBLAST MACHINE NO.: NEW

OPERATION: SHOTBLAST I.D. - Steel Shot specified. S-390.

MACHINE: PANGBORN with dust collectors. Automated and conveyorized for continous operation with forging in most suitable position for I.D. Shotblast.

SIZE: Suitable to accept forging 16" long 5½" diameter and 3" diameter I.D.

CYCLE TIME: 4 sec. shell = 900 shell/hr. at 100% eff.
720 shell/hr. at 80% eff.

NOTE: This unit could be the same as Oper. #170 Shotblast.

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE | OPER. NO. 60

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 3 OF 3

MATERIAL: 1340 MACHINE NAME: PANGBORN SHOTBLAST MACHINE NO.: NEW

OPERATION: SHOTBLAST I.D.

MACHINE: PANGBORN WITH DUST COLLECTORS $ 75,000.00

or equivalent.

Install unit in most suitable position relative to subsequent operations and incoming forgings.

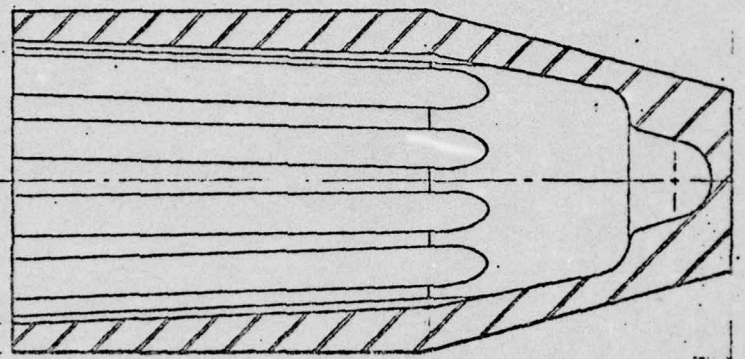
NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY	CHECKED BY	DATE	OPER. NO.
			60

OPERATION PROCESS SHEET

PART NAME: BODY | PART NO.: 9298225 | ISSUE: | SHEET: 1 OF 2

MATERIAL: 1340 | MACHINE NAME: BENCH | MACHINE NO.:



SS	CHG NO	WAS	DATE	APP BY	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO
					DESCALE - INSPECTION		

NATIONAL PRESTO INDUSTRIES, INC
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE

OPER 65

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 929[illegible]25 ISSUE: _____ SHEET: _____ OF _____

MATERIAL: 1340 MACHINE NAME: _____ MACHINE NO.: _____

INSPECTION OPERATION: Following Shotblast I.D.

INSPECT:

SHOTBLAST I.D.

1. Check for Scale or Metal Defects.

NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN OPER. NO.

DRAWN BY | CHECKED BY | DATE

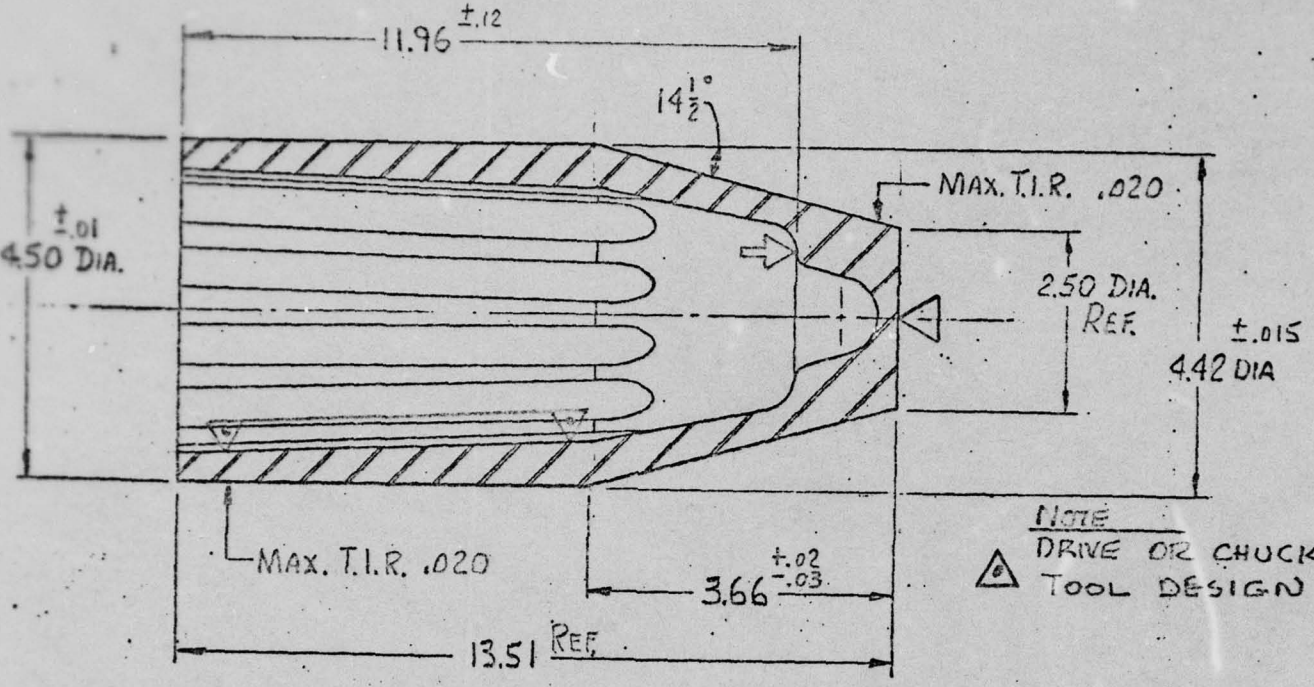
OPERATION PROCESS SHEET

PART NO.: 9298225

MACHINE NAME: WM. K. STAMETS COMPANY

ISSUE: _____ SHEET: 1 OF 5

MACHINE NO.: D 35460 55 38 Location - St. Louis



▽ Centralize

▽ Chuck or Drive

⇨ Workpiece Locator

See Rough Turn & Rough Face Open End Sheet 2 of 5.

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO
ROUGH TURN O.D. & ROUGH FACE OPEN END		

WAS | DATE | APP'D

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY | CHECKED BY | DATE

OPER 70

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 929225 ISSUE: _____ SHEET: 2 OF 5

MATERIAL: 1340 MACHINE NAME: Wm. K. Stamets Company MACHINE NO.: D 35460 55 39 Location - St. Louis

OPERATION: ROUGH TURN O.D. & ROUGH FACE OPEN END.

MACHINE: (St. Louis) Wm. K. Stamets Company, D 35460 55 & 39 - Lathe.

PROCESS: Locate - on ribbed mandrel and bottom of cavity.
4 Tracer Controlled Tools for turning O.D.
2 Facing or cut-off tools - on open ends.

NOTE: Excess material on open end is not cut completely off. A ring is left on and sheared off with a special shear arrangement on machine. (If necessary)

Spindle Speed: 365 RPM 400 S.F.P.M.

	Open End	Body
Feed Rate	.020	.020
Tool Travel	2.37	5.000
Cutting Time	19 sec.	41 sec.
Load & Unload		

CYCLE TIME: 80 sec. = 45 shell/hr. at 100% eff.
36 shell/hr. at 80% eff.

NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN | OPER. NO. 70

DRAWN BY | CHECKED BY | DATE

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 3 OF 5

MATERIAL: 1340 MACHINE NAME: Wm. K. Stamets Company MACHINE NO.: D 35460 55 39 Location - St. Louis

OPERATION: ROUGH TURN O.D. & ROUGH FACE OPEN END.

MACHINE REWORK: Move facing quills 5" towards spindle, tailstock lengthened, rework transfer and handling unit to take shorter shell. $ 25,000.00

TOOLING:

	No. Required	$ Each	$ Total
New Mandrel	1	2,500	$ 2,500.00
Tool holders	6	100	600.00
Templates	4	150	600.00

NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN

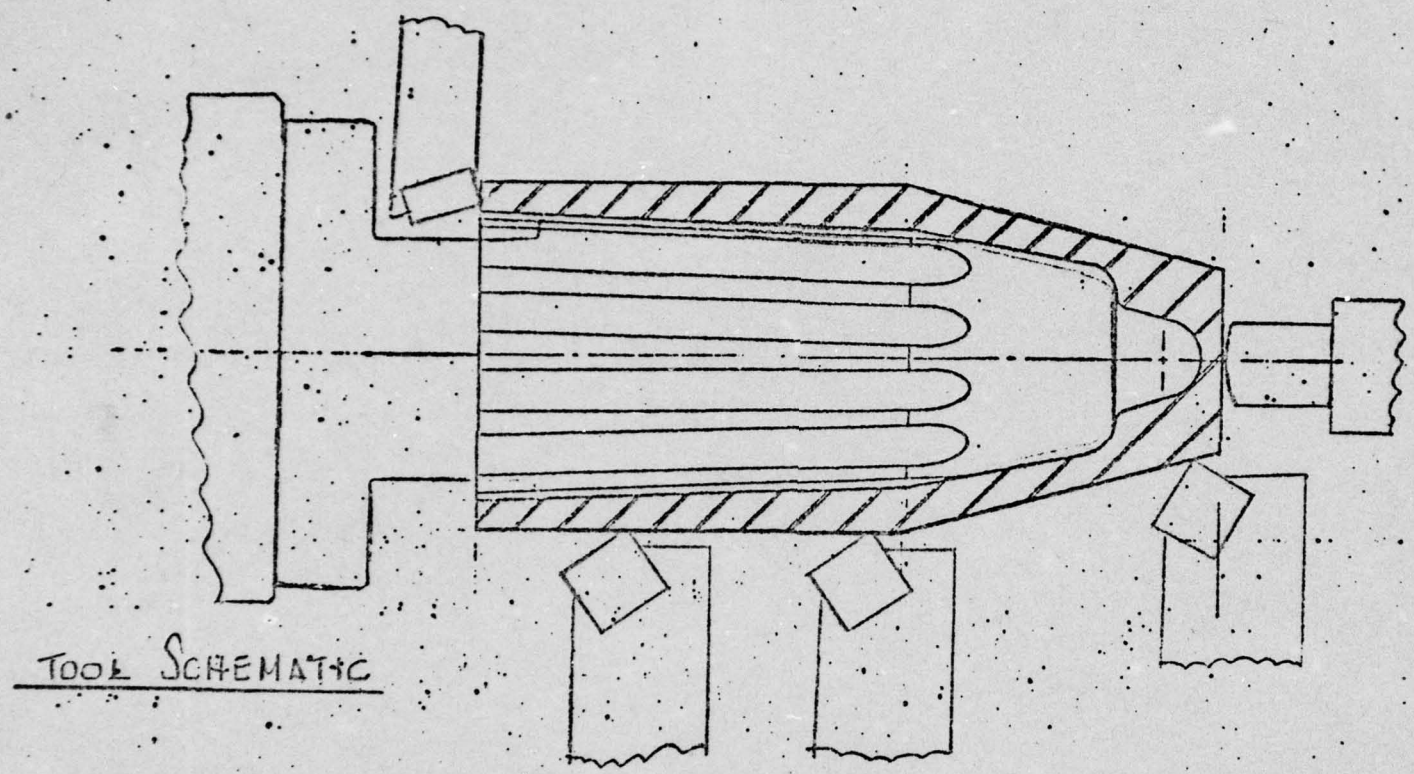
DRAWN BY | CHECKED BY | DATE | OPER. NO. 70

OPERATION PROCESS SHEET

PART NAME: BODY | PART NO.: 9298225 | ISSUE: | SHEET 4 OF 5

MATERIAL: 1340 | MACHINE NAME: WM. K. STAMETS COMPANY | MACHINE NO.: D 35460 D35455 D35439

LOCATION - ST. LOUIS



TOOL SCHEMATIC

SS.	CHG NO	WAS	DATE	APP BY	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
					ROUGH TURN O.D. & ROUGH FACE OPEN END		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY: | CHECKED BY: | DATE:

OPER. 70

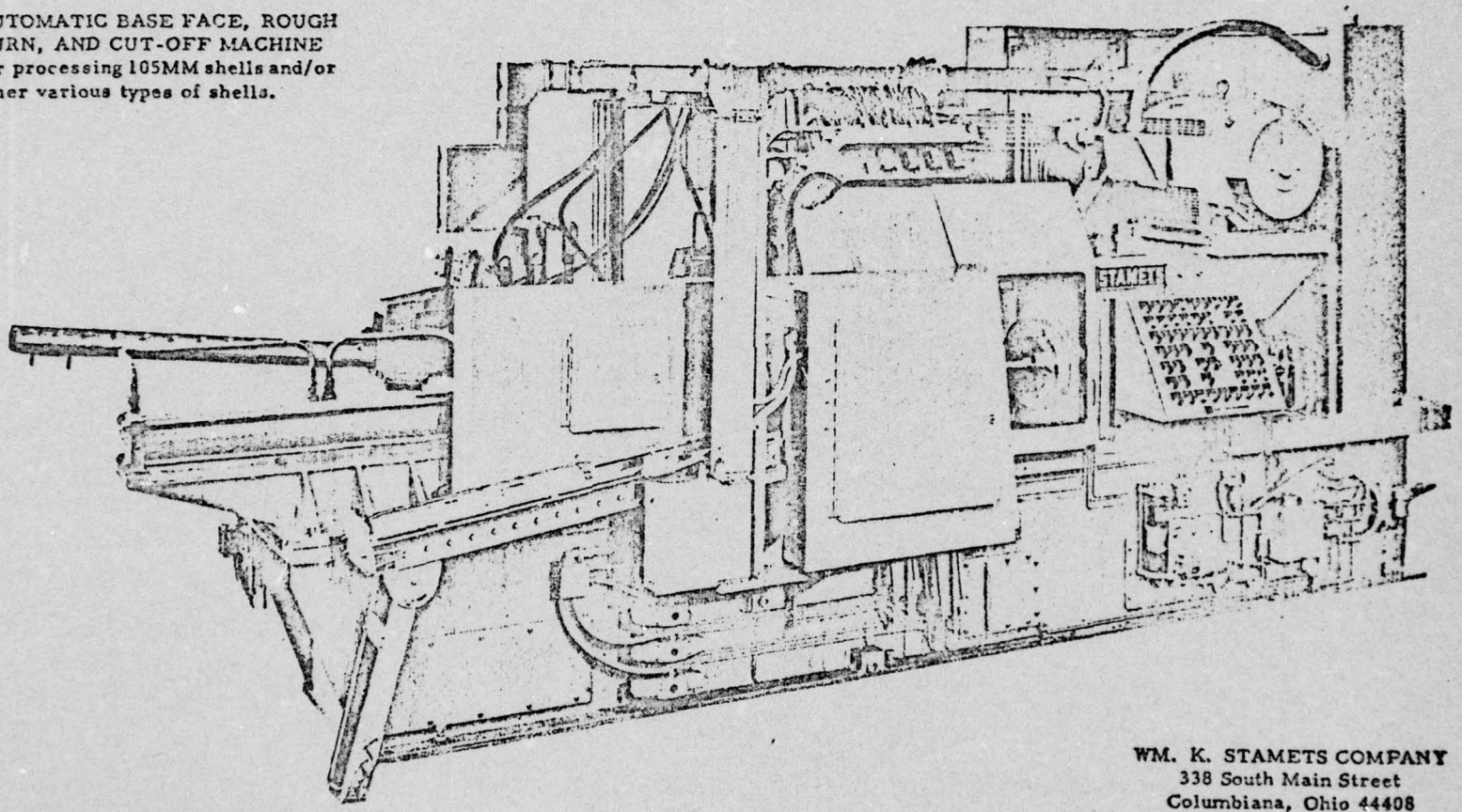
OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 5 OF 5

MATERIAL: 1340 MACHINE NAME: Wm. K. Stamets Company MACHINE NO.: D 35460 55 39 Location - St. Louis

REFERENCE ONLY

STAMETS AUTOMATIC BASE FACE, ROUGH TURN, AND CUT-OFF MACHINE for processing 105MM shells and/or other various types of shells.



WM. K. STAMETS COMPANY
338 South Main Street
Columbiana, Ohio 44408
PHONE: 216-482-3344

Photo No. 7209

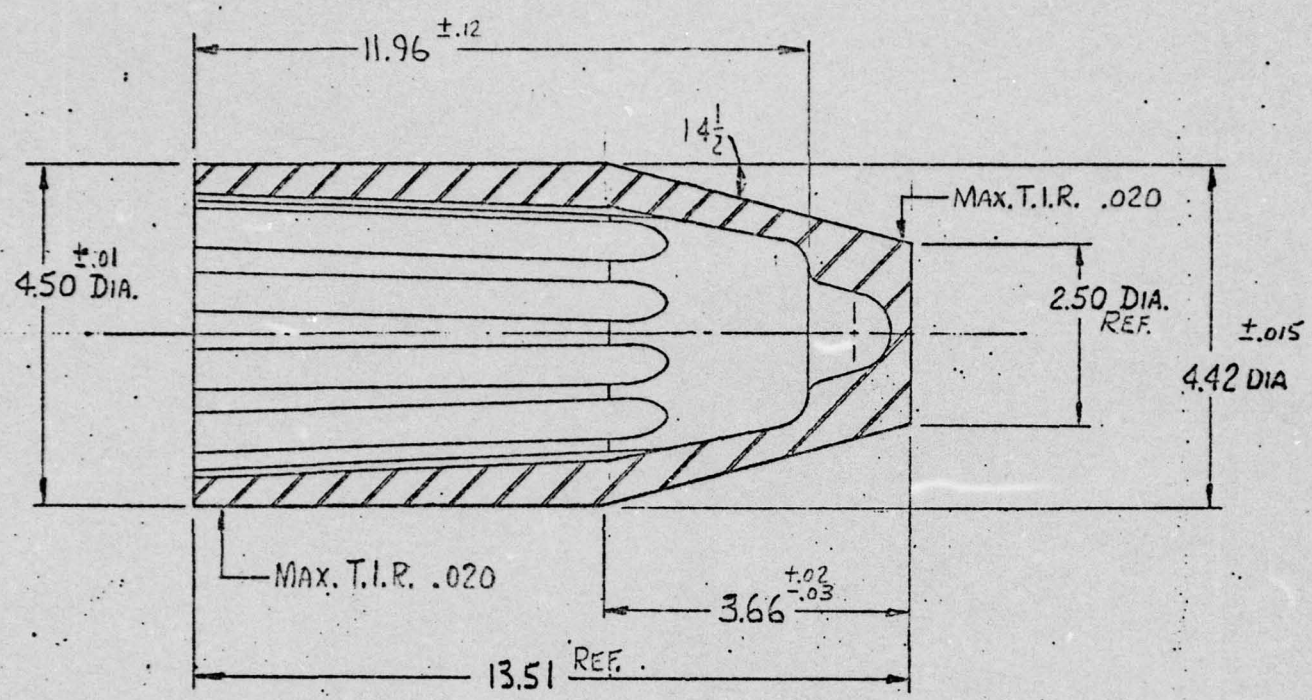
NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN | OPER. 70

DRAWN BY | CHECKED BY | DATE

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 1 OF _____

MATERIAL: 1340 MACHINE NAME: BENCH & GAGES MACHINE NO.: _____



	DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
	ROUGH TURN O.D. & ROUGH FACE OPEN END		
	INSPECTION		

NO.	CHG. NO.		DATE	APP. BY
		WAS		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

OPER. NO. 75

DRAWN BY | CHECKED BY | DATE

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 2 OF 4

MATERIAL: 1340 MACHINE NAME: BENCH & GAGES MACHINE NO.: _____

INSPECTION OPERATION: Following Rough Turn O.D. & Rough Face Open End.

INSPECT:

Rough Turn O.D. & Rough Face Open End

1. Check Conc. of Nose End & Open End.
2. Inspect Cavity & Outside Surface for Surface Defects
3. Check Dia. of Nose
4. Check Weight
5. Check Length & Angle of Nose
6. Check Overall Length
7. Check Dia. of Open End
8. Ultra-sonic Inspect I.D. & O.D.

NOTE!! IF QUANITIES OF THESE PARTS ARE EVER EVIDENT - AUTO GAGING SHOULD BE CONSIDERED.

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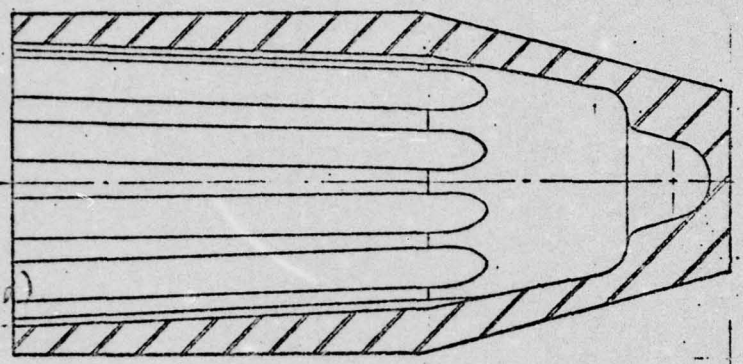
OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 1 OF 3

MATERIAL: 1340 MACHINE NAME: HANSEN VAN WINKLE MUNNING OR EQUIV. MACHINE NO.: NEW

NOTE

△ LOCATE OR HOLD HORIZONTAL OR TO SUIT EQUIPMENT CRITERIA & OPERATIONAL MODE.



See Pickle, Phosphate & Lubricate Sheet 2 of 3.

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL
PICKLE, PHOSPHATE AND LUBRICATE		

CS	CHG NO	WAS	DATE	APP BY

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OPER

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 2 OF 3

MATERIAL: 1340 MACHINE NAME: HANSEN VAN WINKLE MUNNING OR EQUIV. MACHINE NO.: NEW

OPERATION: PICKLE, PHOSPHATE & LUBRICATE.

MACHINE: HANSON VAN WINKLE MUNNING - Automated & conveyorized for continuous operation-

LOCATE:: HOLDING SHELL HORIZONTAL ON RACKS.

PROCESS:

1. Cold Water Rinse
2. Clean Ridoline #73 - Imm.
3. Cold Water Rinse - Imm.
4. Same as Tank #2
5. Hot Water Rinse - Imm.
6. Hot Water Rinse - Imm.
7. Hydrochloric Pickle
8. Cold Water Rinse - Imm.
9. Cold Water Rinse - Imm.
10. Hot Water Rinse - Imm.
11. Phos. Coat Granodraw #1-#10 - Imm.
12. Cold Water Rinse - Imm.
13. Neutralize #7 - Imm.
14. Reactive Lube, Granalube #14 - Imm.

SIZE: 14' Wide x 14'6" High x 54' Long.

CYCLE TIME: 48 seconds = 900 shell/hr. at 100% eff. (12 units/rack)
720 shell/hr. at 80% eff.

NOTE: Chemical compounding or concentration verifications can be assigned to suit contractor methodology.

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OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 3 OF 3

MATERIAL: 1340 MACHINE NAME: HANSEN VAN WINKLE MUNNING OR EQUIV. MACHINE NO.: NEW

OPERATION: PICKLE, PHOSPHATE & LUBRICATE.

MACHINE: HANSEN VAN WINKLE MUNNING or equivalent. $204,511.00 each

COST TO CHARGE PER MACHINE:

TANKS NUMBER	2 -	$ 112.00
"	4 -	112.00
"	7 -	205.00
"	11 -	252.00
"	13 -	1.20
"	14 -	397.50
		$1,077.70

$ 1,077.70

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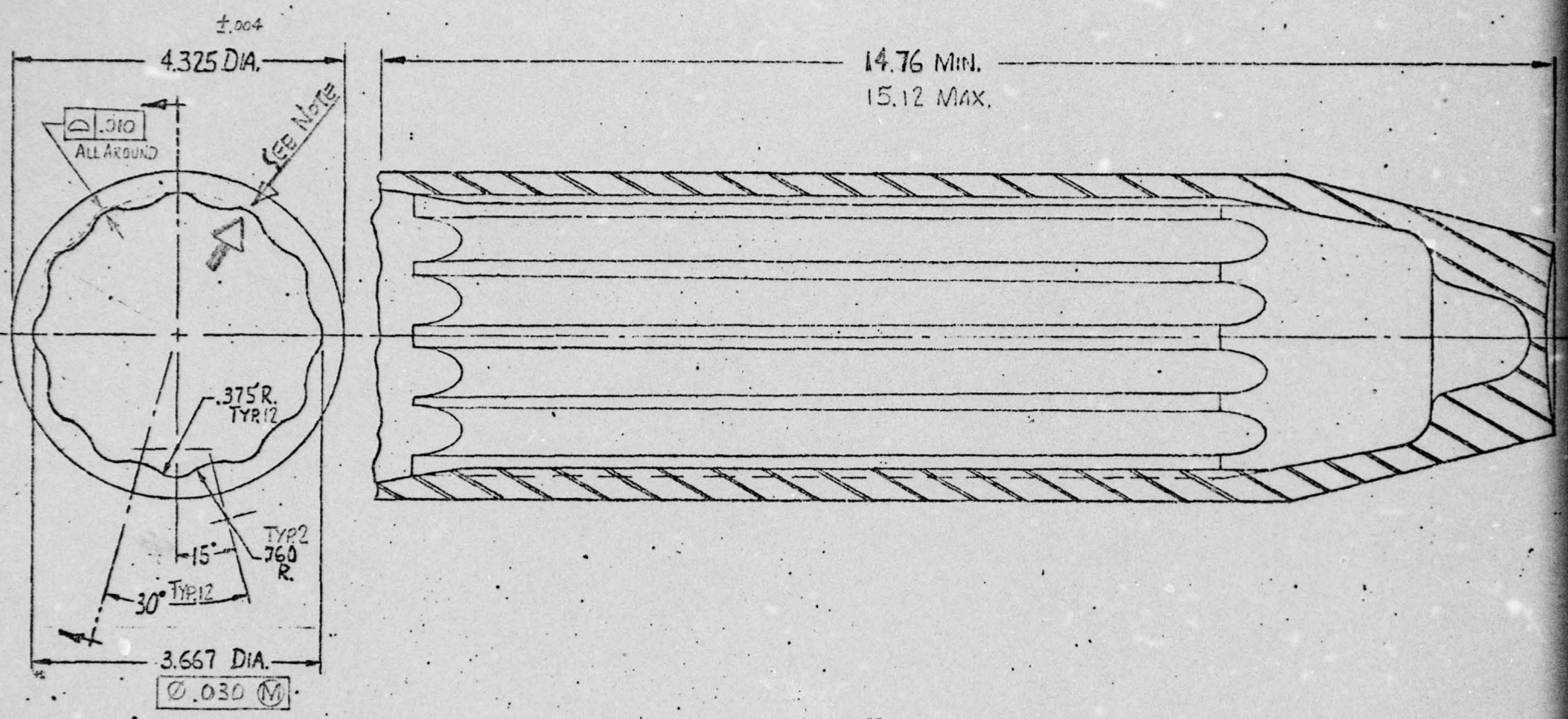
PART NAME: BODY PART NO. 9209225 ISSUE: SHEET 1 OF 3

MATERIAL: 1340 MACHINE NAME: BLISS 400 TON OR EQUIV. MACHINE NO.: NEW



NOTE. ↑ TOOL LOCATION.

See Cold Draw Sheet 2 of 3. - PROCESS PARA.

ISS.	CHG NO	WAS	DATE	APP BY

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
COLD DRAW	DRAW DIE	

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OPER. NO. 90

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: SHEET: 2 OF 3

MATERIAL: 1340 MACHINE NAME: BLISS 400 TON OR EQUIV. MACHINE NO.: NEW

OPERATION: COLD DRAW

MACHINE: Draw Press.

EQUIPMENT: (New) Bliss or equivalent - 400 Ton Horizontal Hyd. 48" Stroke with 48" x 48" Bed.

PROCESS: Push rough turned part thru die with finished size punch, located in forge formed cavity, forming cavity to size and leaving stock for O.D. machining.

CYCLE TIME: 5.2 seconds = 692 pcs./hr. at 100% eff.
554 pcs./hr. at 80% eff.

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DRAWN BY CHECKED BY DATE

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OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: _____ SHEET: 3 OF _____

MATERIAL: 1340 MACHINE NAME: BLISS 400 TON OR EQUIV. MACHINE NO.: NEW

OPERATION: COLD DRAW

EQUIPMENT & ESTIMATED COST - NEW: Bliss or equivalent - 400 Ton Horiz. Hyd. 48" Stroke with 48' x 48' bed. $525,000.00 each

TOOLING:

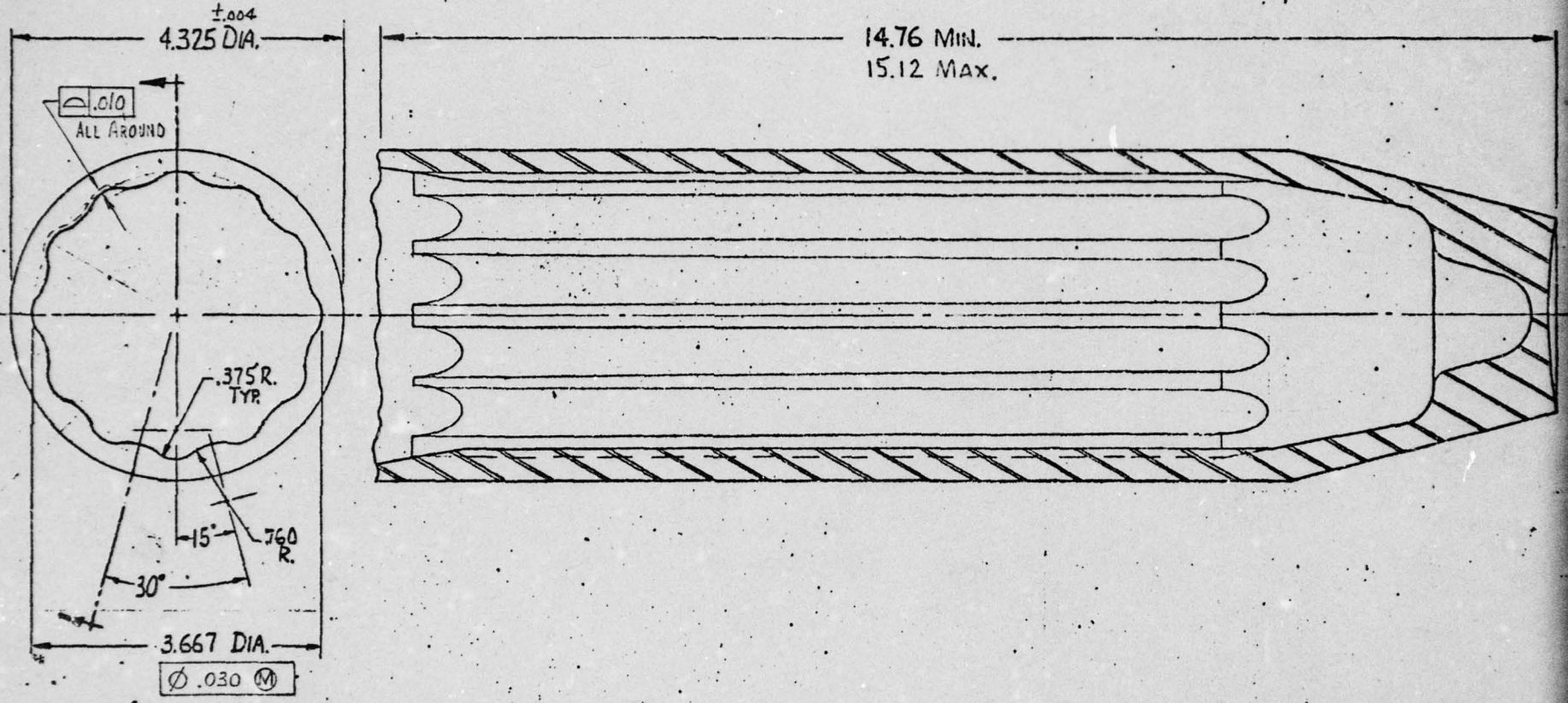
Punch Holder Draw Punch Die Die Plates Stripper & etc.	Set	$ 10,500.00

NATIONAL PRESTO INDUSTRIES, INC. EAU CLAIRE, WISCONSIN OPER. NO.

DRAWN BY | CHECKED BY | DATE

PART NAME: BODY | PART NO: 9[illegible]325 | ISSUE: | SHEET 1 OF 2

MATERIAL: 1340 | MACHINE NAME: BENCH & GAGES | MACHINE NO.:



ISS.	CHG NO	WAS	DATE	APP BY

DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
COLD DRAW - INSPECT		

NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY: | ENGINEER BY: | DATE:

OPER. NO. 95