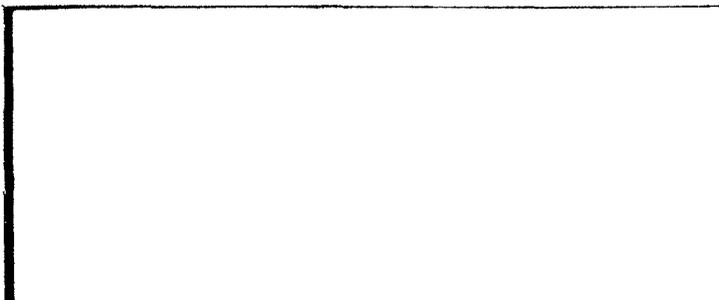


63-3-1

# Refractomet Division

UNIVERSAL-CYCLOPS STEEL CORPORATION

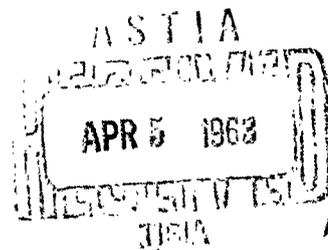
## Technical Report



CATALOGED BY ASTIA  
AD No. 400165



Qualified requesters may obtain copies of this report from ASTIA.



Bridgeville, Pennsylvania

**InFab Use Agreement**

**February 15, 1963**

**Prepared Under Navy, Bureau of Weapons  
Contract NOw 62-0937-u**

**July 1, 1962 to December 31, 1962**

**InFab Use Agreement**  
**February 15, 1963**

**Prepared Under Navy, Bureau of Weapons**  
**Contract NOW 62-0937-u**

**Interim Reports No. 1 & 2**

**Prepared By**  
**W. J. McElhaney**

**Refractomet Division**  
**Universal-Cyclops Steel Corporation**  
**Bridgeville, Pennsylvania**

---

## TABLE OF CONTENTS

	<u>Page</u>
Abstract	i
I. Introduction	1
II. Maintenance July 1, 1962 to October 8, 1962	
A. Argon Purification System	
1. Nitrogen Compressors	1
2. Nash Hytor Argon Compressors	2
3. Low Level Freon Unit	2
4. Distilled Water System	3
5. Catalytic Reactor	3
6. Instrumentation	3
7. Supporting Equipment	3
B. In-Room Equipment	
1. Argon Compressor	4
2. Cooling Fans	4
3. M. G. Sets	4
4. Impacter and Related Items	4
5. Rolling Mill and Related Items	5
III. Operations October 9, 1962 to December 3, 1962	
A. Forging Operations	
1. U. S. A. F. Contract AF33(657)-8495 - TZM	5
2. Bureau of Aeronautics Contract NOa 59-6142-c Molybdenum Sheet Rolling Program	6
3. TZM Carbon Level Study - Project 754	6
4. F-48 - Union Carbide Corporation Material	6
B. Rolling Operations	
1. U. S. A. F. Contract AF33(657)-8495 - TZM	6
2. Bureau of Aeronautics Contract NOa 59-6142-c	13
3. TZM - Carbon Level Study - Project 754	13

## TABLE OF CONTENTS (cont'd)

	<u>Page</u>
C. Other Operations	13
1. Annealing - U. S. A. F. Contract AF33(657)-8495	13
2. In-Room Atmosphere Analysis	13
IV. Modifications and Maintenance - December 3, 1962 to December 31, 1962	
A. Ipsen Furnace Installation	16
B. Mill Table Modifications	16
C. Man-Air System Modifications	16
D. Welding Equipment	16
E. Maintenance Argon Purification System	17
1. Nitrogen Compressors	17
2. Low Level Freon Unit	18
3. Distilled Water System	18
4. Instrumentation	18
5. Instrument Air Supply	18
6. Supporting Equipment	18
F. Maintenance In-Room Equipment	
1. Impacter and Related Items	19
2. Mill Lubrication System	19
G. Maintenance Summary	19

### LIST OF TABLES

I	Forging Details Under Contract AF33(657)-8495	7
II	Forging Details Under Contract NOas 59-6142-c	9
III	Rolling Details Under Contract AF33(657)-8495	14
IV	Rolling Details Under Contract NOas 59-6142-c	15

## ABSTRACT

This report covers the corrective and preventive maintenance as well as all operating conditions of the InFab facility from July 1, 1962 to December 31, 1962. Much of the work described herein must have follow-up and will be reported in subsequent quarterly reports.

## I. Introduction

This report covers all work accomplished in the InFab facility under Contract NOW 62-0937-u during the third and fourth quarters of 1962. The InFab facility was shut down from the start of this period until October 7, 1962. During this shut-down period, major and minor maintenance was performed which will be covered in this report.

The InFab facility was put into operation on October 8, 1962. Operations continued until December 3, 1962, when the facility was shut down in order to initiate installation of the new sheet rolling furnace purchased under Contract NOW 61-0583-u. All material processed during this operating period is summarized in this report. Also, all maintenance work accomplished in the facility during the shut-down period from December 4, 1962 to December 31, 1962 will be reported as well as the status of all new equipment and equipment modifications.

## II. Maintenance July 1, 1962 to October 8, 1962

During this period the InFab facility was not operated and work on this contract was centered around corrective and preventive maintenance. Two InFab operators were used until July 15, along with supervisory personnel to perform this work. In addition, many mill maintenance personnel were utilized to perform maintenance operations where required.

### A. Argon Purification System

The maintenance items performed in the argon purification system are listed below with the description of the service indicated.

#### 1. Nitrogen Compressors

##### a. Check and Clean Force Feed Lubricators

These units were cleaned completely including the sumps. The sight glasses were cleaned and new glycerine carrier fluid was added. The oil filters were changed in the units at the same time.

##### b. Compressor Intercoolers

Intercoolers were removed from both compressors and cleaned. There was no apparent contamination or rusting

so the tubes and shell were wiped clean and the inter-coolers replaced.

c. Nitrogen Compressor Watertanks

These units were removed, sandblasted, and given two coats of water resistant paint to eliminate or minimize the occurrence of heavy scale formation in these tanks. Additional bracing was added to insure rigidity in these tanks while they were removed.

d. Crank Case Oil

The oil was changed in both compressors and both compressor crank cases cleaned during this period.

e. Replace and Repack Valves in System

During this period all valves and dryers and by-pass lines were cleaned and repacked and new seats added where necessary. Two valves required new seats and all valves were in perfect working order with new packing installed.

f. Absorbents

During this period, all activated alumina absorbents were checked and found to be in good condition.

2. Nash Hytor Argon Compressors

Compressor B has been recently rebuilt at the factory. After installation, it was painted with a coat of water-resistant paint. The packing on both compressors has been checked and found to be in good condition.

3. Low Level Freon Unit

An oil leak in the drive end of the freon compressor was repaired by Heagy Refrigeration Company. This required the replacement of the compressor drive end bearing plate and shaft seal.

In addition to the above, the following work was performed:

- a. Clean crank case and replace crank case oil.
- b. Replace condenser water shut-off valve and water control valve.
- c. Recalibrated and cleaned oil separator float valve assembly.
- d. Leak tested and checked entire system.

4. Distilled Water System

The Barnstead water still used in the operation of the argon compressors was given a complete check and cleaning. The condenser and evaporator covers were removed and the interior of the evaporator cleaned of scale. The automatic valves were checked for operation and all drain lines leaving the still were taken apart and cleaned. The distilled water tank has been flushed and refilled with distilled water.

5. Catalytic Reactor

The catalytic reactor is used for the reaction of hydrogen with oxygen for contamination removal. This was cleaned according to manufacturers recommendations and was in excellent condition.

6. Instrumentation

All instruments on the argon purification system were checked and calibrated as found necessary. In general, the instruments were in good condition except for the fact that there was some oil carried over into the instruments by the air lines. It has been recommended that the air supply to the instruments be changed over from plant air to the stand-by air compressor. If the problem still exists with the stand-by air compressor, it will be necessary to install additional filtering units in the air supply lines.

7. Supporting Equipment

All other equipment was in good operating condition and has been frequently inspected and maintained to keep it in operational condition to be ready for start-up.

## B. In-Room Equipment

### 1. Argon Compressor

During this period, the in-room argon compressor was dismantled and all valves, lubricators, filters, and piping were cleaned and checked. The valves were found to be in good condition and only tightening of various bolts was necessary. All lubricators and filters were cleaned and leak checked. The receiver tank and balance tank were drained of any excess oil accumulation.

### 2. Cooling Fans

The cooling fans were cleaned, greased, and test run and found to be in good order. The water cooling system was cleaned and checked and found to be functioning properly.

### 3. M. G. Sets

During this reporting period, the M. G. sets were checked electrically and mechanically. The units were greased and the oil changed at this time.

### 4. Impacter and Related Items

#### a. Oil Precipitators

During this period, the electrostatic oil precipitators were cleaned and repaired. The oil reservoirs were piped to the basement so there will be no oil accumulation in the room. The filters were checked and found to operate satisfactorily in an air atmosphere.

#### b. Pressure Gauges on Impacter Console

The pressure gauges have all been tested and repaired with the exception of the inter-cooler gauge which will be replaced with a new gauge which is on order.

#### c. Oil and Hydraulic Lines

All oil and hydraulic lines were cleaned and connections tightened to eliminate oil leakage from this unit. This oil leakage has always been a problem with the impacter due to the vibration when it is in operation.

## 5. Rolling Mill and Related Items

### a. Rolling Furnace Ram

The furnace ram and all items connected with it have been removed from the enclosure wall. This unit was crated in accordance with Navy specifications for storage of equipment. The wall and floor where this equipment originally was placed has been cleaned up and repainted.

### b. Rolling Mill Gear Reduction Unit

The Unit was cleaned and all sight ports, valves, and piping dismantled, cleaned, tightened, and replaced. The unit was test run to check for leakage, and appeared to be sound.

### c. Accumulator and Hydraulic Unit

The accumulator and hydraulic unit were checked to insure the proper amount of pressure and to find any leaks. At this time, the pressure was at the correct level and there was no leakage.

### d. Sheet Rolls

The sheet rolls for the mill were ground and the chocks and bearings installed. The roll assembly was then installed in the mill in order to be ready for start-up.

### e. Maintenance Summary

All of the equipment and facilities were maintained in satisfactory operating condition by strict adherence to sound preventive maintenance practices. This was done in order that the start-up procedure could proceed smoothly.

## III. Operations October 9, 1962 to December 3, 1962

### A. Forging Operations

#### 1. TZM United States Air Force Contract AF33(657)-8495

During this operating period, a total of eleven forging

billets were forged to sheet bar under Contract AF33(657)-8495. Seven of these billets were 4-1/2" in diameter x 14", extruded forging billets, and four were 5" in diameter x 16" as-cast ingot sections. These sheet bars were then cut up and conditioned for rolling to intermediate gauge strip. The processing on these eleven pieces is summarized in Table I.

2. Bureau of Aeronautics Contract NOa 59-6142-c - Molybdenum Sheet Rolling Program

During this operating period, thirty 4-1/4" diameter x 16" extruded forging billets were forged to 1-1/2" x 4" x R/L sheet bar. The processing on this material is summarized in Table II.

3. TZM Carbon Level Study - Project 754

One 4-1/2" diameter x 16" extruded forging billet was forged to sheet bar for this study. The processing on this piece is as follows:

Heat	Pass No.	Temperature		Size	Condition
		Start	Finish		
KDTZM 797	1	3620	2830		
	2	3130			
	3	2730	2710	1-1/4"	Sound surface and light edge cracks.
	4	3200	2780	Flat	

4. F-48 - Union Carbide Corporation Material

One 5.1" diameter x 19" long piece was forged to 3-3/4" for Union Carbide Corporation. This piece required seven reheats during forging. Initial breakdown was made at 2700°F. The piece cracked severely on the first reduction and was eventually scrapped.

B. Rolling Operations

1. TZM - United States Air Force Contract AF33(657)-8495

Thirty four 1-1/2" sheet bars were rolled to 0.125" intermediate gauge at temperatures from 2000 to 3200°F for the

TABLE I

Forging Details under Contract AF33(657)-8495

Heat No.	Initial Size	Pass	Temperature		Final Size	Condition
			Start	Finish		
KDTZM1098A1	4-1/2" dia. x 14" Extruded Forging Billet	1	3700	3540	1-1/2" flat	Heavy edge bursts
		2	3810	3470		
		3	3710	3420		
		4	3720	3450		
		5	3710	3350		
KDTZM1098A2	"	1	3720	3450	1-3/4" flat	Sound surface with light edge cracking.
		2	3740	3340		
		3	3140	2770		
		4	3150	2770		
KDTZM1098A3	"	1	3810	2400	1-5/8" flat	Sound surface and edges.
		2	2690	2350		
KDTZM1098B1	"	1	3200	3000	1-1/2" flat	Sound surface and edges.
		2	3210	3000		
		3	3220	2990		
		4	3270	3000		
		5	3290	2950		
KDTZM1098B2	"	1	3120	2770	1-1/2" flat	Sound surface and edges.
		2	2780	2300		
		3	2750	2310		
		4	2780	2650		
KDTZM1098B3	"	1	2600	2300	1-5/8" flat	Sound surface and edges.
		2	2600	2310		
		3	2820	2310		
		4	2700	2350		

TABLE I (cont'd) - Forging Details under Contract AF33(657) -8495

Heat No.	Initial Size	Pass	Temperature		Final Size	Condition
			Start	Finish		
KDTZM1098B4	4-1/2" dia. x 14" Extruded Forging Billet	1	2320	2000	1-1/2" flat	Pulled nipple from billet. Sound surface and edges.
		2	2260	2000		
		3	2260	2000		
		4	2290	2240		
		5	2310	1950		
KDTZM1099A	5" dia. x 12" As Cast Ingot Section	1	3700	3350	2" flat	Heavy cracking in top section. Forging stopped due to cracking.
		2	3780	3370		
		3	3600	3350		
		4	3870	3400		
		5	3520	3350		
		6	3650	3250		
		7	3620	3300		
		8	2800	2400		
KDTZM1099B	"	1	3730	3430	1-1/2" flat	Heavy edge cracking, very little usable material.
		2	3730	3380		
		3	3870	3450		
		4	3710	3420		
		5	3630	3350		
		6	3800	3350		
		7	3600	3300		
KDTZM1099C	"	1	3850	3400	1-3/4" flat	Heavy edge cracks, poor surface.
		2	3775	3400		
		3	3700	3350		
		4	3850	3380		
		5	3740	3350		
		6	3100	2770		
		7	3130	2770		
KDTZM1099D	"	1	2710	2540		Broke billet in half on first pass.

TABLE II

## Forging Details under Contract NOas 59-6142-c

Heat No.	Initial Size	Pass	Temperature		Final Size	Condition
			Start	Finish		
KDTZM1096A1	4-1/4" dia. x 16" Extruded Forging Billet	1	3740	2850	1-1/2" x 4"	Very sound surface.
		2	3110	2780		
		3	2950	2800		
KDTZM1096A2	"	1	3720	2820	1-1/2"x4"	Very sound surface.
		2	3130	2770		
		3	3000	2770		
KDTZM1096A3	"	1	3850	2800	1-1/2" x 4"	Edge cracks length of piece.
		2	3210	2770		
		3	3200	2790		
KDTZM1096A4	"	1	3650	2800	1-3/4"x4-1/4"	Surface generally good. Broke upper nipple on last pass.
		2	3120	2870		
		3	3100	2710		
		4	3210	2900		
KDTZM1096A5	"	1	3850	2770	1-1/2"x4"	Very sound surface.
		2	3200	2710		
KDTZM1096B1	"	1	3860	2820	1-1/2" x 4"	Light edge and surface cracks.
		2	2980	2770		
KDTZM1096B2	"	1	3730	2800	1-1/2"x4"	Edge cracks and bursts.
		2	3200	2880		
KDTZM1096B3	"	1	2990	2950	1-5/8" x 4"	Nipple pulled from holder bar on first pass; replaced and completed forging. Light edge bursts.
		2	3250	2750		
		3	3200	2825		
		4	3200	3000		

Table II (cont'd) - Forging Details under Contract NOas 59-6142-c

Heat No.	Initial Size	Pass	Temperature		Final Size	Condition
			Start	Finish		
KDTZM1096B4	4-1/4" dia. x 16" Extruded Forging Billet	1	3800	2820	1-1/2" x 4"	Surface good; light edge cracking.
		2	3300	2820		
		3	3240	2950		
KDTZM1096B5	"	1	3750	2850	1-1/2" x 4"	Heavy edge cracks and edge bursts.
		2	3060	2770		
		3	3160	2880		
KDTZM1097A1	"	1	3850	2800	1-1/2" x 4"	Heavy edge cracks; light surface cracks.
		2	3200	2800		
		3	3210	2770		
		4	3240	2800		
KDTZM1097A2	"	1	3720	2850	1-1/2" x 4"	Light edge cracks.
		2	3150	2800		
		3	3100	2860		
		4	3000	2680		
KDTZM1097A3	"	1	3840	2770	1-1/2" x 4"	Very heavy edge bursts.
		2	3200	2770		
KDTZM1097A4	"	1	3800	2830	1-1/2" x 4"	Very heavy edge bursts.
		2	3120	2890		
		3	3130	2850		
		4	3230	2780		
KDTZM1097B2	"	1	3880	3060	1-1/2" x 4"	Heavy edge bursts.
		2	3060	2800		
		3	3060	2780		
		4	3080	2650		
KDTZM1097B3	"	1	3610	2800	1-1/2" x 4"	Good surface, light edge cracks.
		2	3240	2770		
		3	3350	2770		

Table II (cont'd) - Forging Details under Contract NOas 59-6142-c

Heat No.	Initial Size	Pass	Temperature		Final Size	Condition
			Start	Finish		
KDTZM1097B4	4-1/4" dia. x 16" Extruded Forging Billet	1	3950	2790	1-1/2" x 4"	Edge cracks.
		2	3200	2790		
KDTZM1097B5	"	1	3850	2780	1-1/2" x 4"	Slight edge cracks.
		2	3180	2770		
KDTM1126A4	4-1/4" dia. x 16" Extruded Forging Billet	1	3750	2800	1-1/2" x 4"	Very sound surface and edges.
KDTM1126A5	"	1	3720	2770	1-1/2 x 4	Very sound surface and edges.
		2	2820	2820		
KDTM1126B1	"	1	3850	2820	1-3/4" x 4"	Light surface and edge cracks.
		2	3090	2780		
		3	3170	2650		
KDTM1126B2	"	1	3800	2730	1-1/2" x 4-1/2"	Light edge bursts.
		2	3100	2725		
KDTM1126B3	"	1	3710	2780	1-3/4" x 4"	Very sound surface and edges.
		2	3120	2720		
KDTM1126B4	"	1	3700	2770	1-1/2"x4-1/2"	Very sound surface and edges.
		2	3220	2880		
KDTM1126B5	"	1	3675	2750	1-5/8" x 4-1/4"	Very sound surface and edges.
		2	3100	2775		
		3	3220	2890		
KDTM1127B1	"	1	3720	2780	1-5/8" x 4-1/4"	Very sound surface and edges.
		2	3130	2650		

Table II (cont'd) - Forging Details under Contract NOas 59-6142-c

Heat No.	Initial Size	Pass	Temperature		Final Size	Condition
			Start	Finish		
KDTM1127B2	4-1/4" dia. x 16" Extruded Forging Billet	1	3780	2790	1-1/2" x 4"	Sound surface and edges.
		2	3100	2770		
		3	3250	2760		
KDTM1127B3	"	1	3710	2780	1-1/2" x 4"	Sound surface and edges.
		2	3130	2800		
		3	3130	2780		
KDTM1127B4	"	1	3710	2770	1-5/8" x 4-1/4"	Sound surface and edges.
		2	3100	2770		
		3	3100	2710		
KDTM1127B5	"	1	3860	2710	1-5/8" x 4-1/4"	Sound surface and edges.
		2	3080	2700		

TZM program. A total of twenty-nine pieces of intermediate gauge strip were produced for evaluation. The processing of this material is summarized in Table III.

2. TZM - Bureau of Aeronautics Contract NOas 59-6142-c

Eight pieces of 1-1/2" thick sheet bar were rolled during this operating period for the subject contract. The processing on this material is summarized in Table IV. This material was conditioned sheet bar forged in InFab and reported under forging operations in this report.

3. TZM - Carbon Level Study - Project 754

One piece from KDTZM797 was rolled from 4"x1-1/2"x12" to .066" sheet. The piece was rolled to .268" thick at 2200°F and from .268" to .066" at 1400°F. Rolling required a total of eighty-one passes and twenty-nine reheats.

C. Other Operations

1. Annealing - United States Air Force Contract AF33(657)-8495

Eighteen pieces were annealed under this program. These pieces were annealed in the induction rolling furnace in two loads. They were charged into the furnace with a furnace temperature of 2950°F, brought up to temperature, held ten minutes, and discharged.

2. In-Room Atmosphere Analysis

During the last few days of operation, samples of the room atmosphere were taken for analysis. This was done in an effort to determine what the actual purity level was in the room during operation. Samples were taken at various locations around the room and at various times throughout the operating shift. These samples were sent to Air Products Corporation laboratory and the analysis will be completed by mid-January. These results and conclusions drawn from them will be reported in the next quarterly report.

IV. Modifications and Maintenance - December 3, 1962 to December 31, 1962

The facility was shutdown on December 3, 1962 for major modifications and to allow for personnel vacations. During this shutdown 60% of the contained argon was recovered from the enclosure.

TABLE III

## Rolling Details Under Contract AF33(657)-8495

Heat No.	Initial Size	No. Passes	No. Reheats	Temp. °F	Final Size	Remarks
KDTM1098A1	4-1/2"x1-1/2"x4-1/4"	8	5	3200	.147	
	4-3/4"x1-5/8"x4"	9	1	2800	.151	Alligatored badly.
	4-3/4"x1-1/2"x4-1/8"	14	11	2400	.121	
	4-1/2"x1-3/8"x4"	1	0	2000	-	Alligatored in half, scrapped.
KDTM1098A2	4-1/2"x1-5/8"x5"	13	6	3200	.140	Stuck to roll on tenth pass.
	5" x 1-5/8" x 4-1/2"	26	7	2800	.126	
	4-3/4"x1-1/2"x4-1/2"	1	0	2400	-	Alligatored badly; scrapped.
	5" x 1-1/2" x 4-1/4"	13	12	2000	.124	
KDTM1098A3	4-1/2" x 1-1/2" x 5"	19	6	3200	.138	
	5-3/8" x 1-1/2" x 4-1/2"	26	7	2800	.128	
	4-1/2" x 1-1/2" x 4-3/4"	10	9	2400	.127	
KDTM1098A2	4-1/2"x1-1/2" x 4-5/8"	11	7	2000	.132	
	4-1/4" x 4-5/8" x 5"	9	3	3200	.145	
KDTM1098B1	5-3/4" x 1-1/2" x 4-1/8"	26	7	2800	.127	
	5-1/4" x 1-1/2" x 4-1/4"	11	9	2400	.124	
	5-1/4" x 1-1/2" x 4-1/4"	1	0	2000	-	Alligatored in half; scrapped.
KDTM1098B2	5-1/2" x 1-1/2" x 4-1/2"	9	4	3200	.130	
	5-1/2" x 1-1/2" x 4-3/4"	25	6	2800	.127	
	5" x 1-1/2" x 4-1/2"	11	9	2400	.128	
	1-1/2" flat	12	8	2000	.122	
KDTM1098B3	5" x 1-3/8" x 4-1/2"	9	3	3200	.142	
	4-1/2" x 1-1/2" x 4-1/4"	26	8	2800	.113	
	4-1/4" x 1-1/2" x 4-1/4"	10	8	2400	.123	
	1-1/2" flat	12	6	2000	.124	
KDTM1098B4	5" x 1-5/8" x 4-1/2"	9	4	3200	.140	
	4-3/4" x 1-1/2" x 4-1/2"	25	6	2800	.128	
	4" x 1-1/2" x 4-1/4"	11	8	2400	.120	
	1-1/2" flat	10	8	2000	.120	
	2-1/2" Flat	37	8	2800	.132	
KDTM1099A	6-1/4" x 2-1/4" x 4"	26	5	2400	.131	
	2-1/4" Flat	1	0	2000	-	Alligatored; scrapped.
KDTM1099C	4-1/4" x 1-1/2" x 3-1/4"	25	5	2800	.126	
	4-3/4" x 1-1/2" x 3-7/8"	24	4	2400	.124	
	5" x 1-3/8" x 4-1/2"	11	9	2000	.125	

TABLE IV

Rolling Details Under Contract NOas 59-6142-c

<u>Heat No.</u>	<u>Initial Size</u>	<u>No. Passes</u>	<u>No. Reheats</u>	<u>Temp.</u>	<u>Final Size</u>
KDTZM1096A2	1.625"	9	5	3000°F	.610
B3	1.500	12	5	3000	.575
B3	1.500	9	5	3000	.520
B2	1.50	56	22	2200	.068
B5	1.625	49	16	2400	.068
B5	1.625	52	16	2600	.068
KDTZM1097A4	1.506	48	17	2000	.069
A4	1.500	51	17	1800	.066

Material pack rolled from .097"

#### A. Ipsen Furnace Installation

The installation of the 36" x 96" sheet rolling furnace purchased from Ipsen Industries under Contract NOw 61-0583-u was started at this time. The power feed-through assembly for the induction heated rolling furnace was moved to allow room for both the old and new furnaces in the furnace area. The 2300 volt power circuit and related switch gear installation was initiated. Delivery of the furnace proper is expected in late January, 1963.

#### B. Mill Table Modifications

The front and rear mill tables and the manipulator were crated and shipped to Birdsboro Corporation to be modified in order that they be compatible with the larger heating furnace. When these modifications are complete, it will be possible to either control the entire mill operation from the remote control station or the tables may be moved aside and the mill manually fed by the in-room operators.

#### C. Man-Air System Modifications

A new open loop man-air breathing system purchased under Contract NOa 55-006-c is on order from Firewel Corporation and delivery is expected in late January, 1963. When this system is installed, the in-room operators work cycle time will be appreciably lengthened. This work period time has been a problem in the past because of the limited regenerative capacity of the back pack assembly. The protective suit assemblies were shipped to the David Clark Company to be modified in accordance with this new system. The suit modifications are such that either the open loop system or the regenerative back pack system may be used with a minimum amount of change-over required. Delivery is expected in late January, 1963.

#### D. Welding Equipment

The 36" stake seamer and rotary positioner along with related welding equipment have been ordered from AIRCO Corporation. This equipment was purchased under Contract NOa 55-006-c. Delivery has been scheduled for the latter part of the first quarter in 1963.

## E. Maintenance Argon Purification System

Since it was expected that the facility would be shut-down for two to three months, several major maintenance projects were initiated. These items are summarized below along with expected completion dates.

### 1. Nitrogen Compressors

During this operating period, it became apparent that a problem still existed with respect to the high discharge temperatures in these compressors. A representative of Ingersol-Rand was called in along with an Air Products Corporation representative and the following recommendations were made.

#### a. Lubrication

Lubricant in the compressor cylinders and packings should be changed to a phosphate-ester-synthetic type lubricant. This will decrease the fire hazard involved in operating at the higher temperatures and lessen the carbon build-up in the valve areas. In converting to synthetic lubricant it was necessary to completely clean the cylinder passages, valves, coolers, and piping. It was also necessary to modify the lubricator sight-glasses and seals. Work was initiated to accomplish this change and should be completed by the end of January, 1963.

- b. A sample of the cooling water should be tested for hardness and water treating equipment installed as required.
- c. The outside surfaces of the second and third stage cooling coils were cleaned to remove calcium deposits.
- d. The waterflow to the tank type coolers should be increased to obtain a 20° degree water temperature rise. The water temperature rise in these coolers is now 45°.
- e. The internal surfaces of the first stage cooler tubes were cleaned to increase the heat transfer capacity of these units.
- f. All cylinder water jackers were also chemically cleaned.

g. First and second stage rod packing was inspected and replaced as necessary. All existing pressure and temperature gauges were calibrated and replaced.

All the necessary maintenance on the nitrogen compressors should be completed by the end of January, 1963.

2. Low Level Freon Unit

During the shutdown procedure a knock was detected in the Brunner compressor on the low level freon unit. Heagy Refrigeration Company was called in on this problem and the work initiated. The necessary corrective action will be reported in the next quarterly report.

3. Distilled Water System

The machinery division of Air Products Corporation was consulted on the corrosion problem in the distilled water system. It was recommended that a water treating specialist be contacted for details on the exact concentration of additives to correct this corrosive condition. This work has been initiated and will be completed in the first quarter of 1963.

4. Instrumentation

Arrangements have been made with Air Products Corporation for an instrument specialist to come in during the shutdown period and go over the entire instrumentation system. This work and necessary corrective action will be reported in the next quarterly report.

5. Instrument Air Supply

During the last operating period, it was apparent that oil was still being carried over into the instruments even after the change from the plant air to the stand-by air compressor. Work was initiated to install additional filtering units in the air supply lines to minimize this problem.

6. Supporting Equipment

All other supporting equipment is kept in good operational condition by frequent test running and inspections.

## F. Maintenance In-Room Equipment

### 1. Impacter and Related Items

#### a. Impacter and Manipulator Oil Leakage

During the last operating period, the impacter and manipulator developed several oil and hydraulic leaks. Work has been initiated to replace all defective packings and fittings. Since this leakage has always been a problem with this unit, an attempt will be made to convert to a silicon type lubricant to minimize contamination of the atmosphere. Final action on this will be reported in the next quarterly report.

#### b. Electrostatic Precipitators

The precipitators did not function satisfactorily during the last operating period. Arrangements have been made with the supplier to correct this condition. Recommendations and corrective action will be reported in the next quarterly report.

#### c. Coil Cart

The top of the 8" diameter heating coil was badly damaged during the last operating period. It has been suggested that this top be eliminated. Elimination of the top would also decrease the amount of refractory material which settled onto the buss connections. Corrective action on this item will be reported in the next quarterly report.

### 2. Mill Lubrication System

During the last operating period, a severe oil leak developed around the drive shaft of the mill lubricator pump. The pump has been dismantled and repair parts have been ordered.

## G. Maintenance Summary

During the shut down period in the first quarter of 1963, every attempt will be made to put all of the facility equipment into excellent condition. This will enable the start-up procedure to progress smoothly as soon as the installation and modification work previously mentioned is completed.