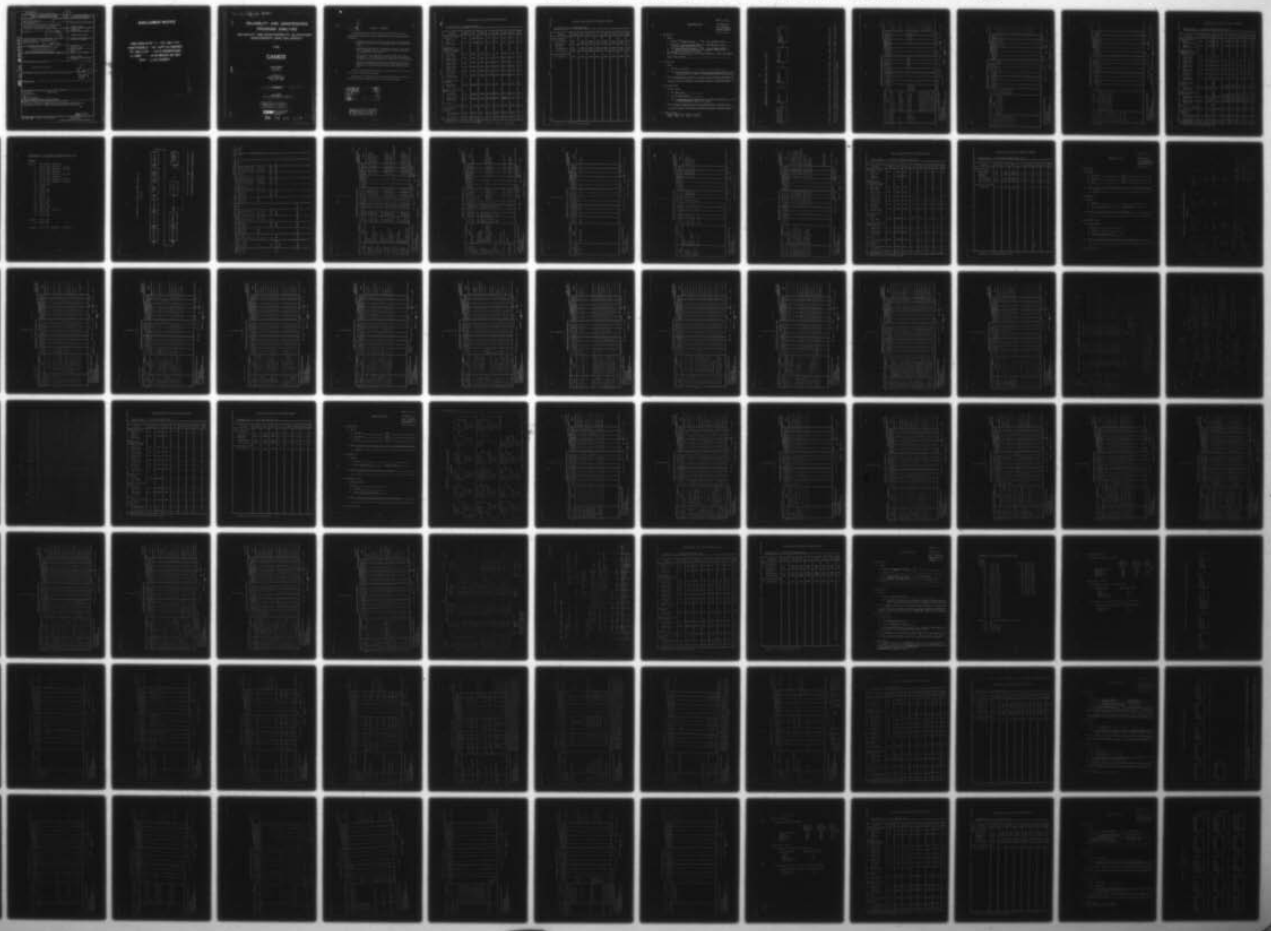
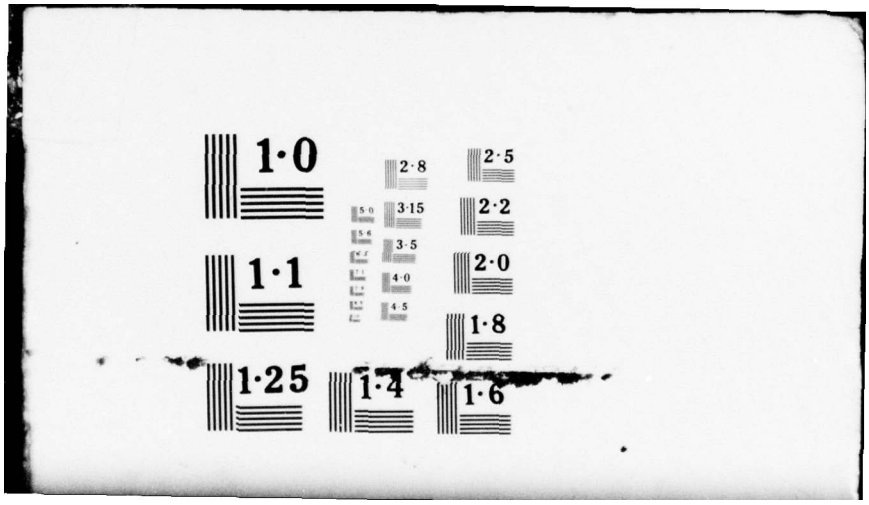
AD-A062 401 TRW/ENVIRONMENTAL ENGINEERING DIV REDONDO BEACH CA F/G 14/4
RELIABILITY AND MAINTENANCE PROGRAM ANALYSIS RELIABILITY AND MA--ETC(U)
APR 76 DAAG49-75-C-0135
UNCLASSIFIED DRCPM-DR-D-CR-76009-VOL-2 NL

1 OF 4
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Maintainability
Data
Demilitarization
Chemical Agent/Munitions Disposal System
Spare Parts

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

This volume contains background data used to generate the results and conclusions of Volume I (CAMDS Maintenance Resource Assessment).

410979

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DRCPM-DAD-CR-76009-VOL-2

RELIABILITY AND MAINTENANCE PROGRAM ANALYSIS

RELIABILITY AND MAINTAINABILITY ALLOCATIONS ASSESSMENTS ANALYSIS REPORT

FOR

CAMDS

FINAL REPORT
VOLUME II

Submitted to
TOOELE ARMY DEPOT
Tooele, Utah 84074

APRIL 23, 1976

Prepared under
Contract No. DAAG-49-75-C-0135

APPROVED FOR PUBLIC RELEASE
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TRW/ ENVIRONMENTAL ENGINEERING DIVISION

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VOLUME II – ADDENDUM

Contained within this addendum volume are the following items of essentially background data used to generate the results and conclusions of Volume I:

- o A summary of the results (failure rates, MTBF, Maintainability, MTTR, and Availability) for each Munition for a given Building Block.
- o Supplemental Data sheet(s) indicating the source of the description of equipment used (e.g., drawings), and the failure rate and maintainability data sources.
- o A flow chart of the subsystems of each Building Block used in the analysis. This flow chart merely identifies the subsystem considered, and is not necessarily a functional or logic diagram.
- o Equipment Information and Failure/Maintainability Data sheets. These are the fundamental working level raw data sheets used to generate the sum total failure rate and Maintainability final data.

The above items are grouped together by Building Block and are listed in the order of Building Block number.

Inasmuch as this volume basically contains working level information, no further attempt was made to make this a formal data package.

THE VIEWS, OPI[illegible] NDINGS
CONTAINED IN [illegible] THOSE
OF THE AUTHOR[illegible] OT BE
CONSTRUED AS [illegible] NT
OF THE [illegible] OR
DECISION [illegible] D BY
OTHER DOCUMENT

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BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #1 UNPACK AREA (UPA)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL ABIL
*M55 ROCKET, GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	NEG	N/A	NEG	N/A	≈1.0
Rocket, 115mm, M55	VX	Comp B	M28	NEG	N/A	NEG	N/A	≈1.0
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	NEG	N/A	NEG	N/A	≈1.0
Projectile, 155mm, M121A1	GB	None	None	241.039	4149	584.843	2.43	.999
Projectile, 155mm, M121	GB	None	None	241.039	4149	584.843	2.43	.999
Projectile, 155mm, M122	GB	None	None	241.039	4149	584.843	2.43	.999
Projectile, 8", M426	GB	None	None	153.506	6514	371.709	2.42	.999
Projectile, 155mm, M121A1	VX	None	None	241.039	4149	584.843	2.43	.999
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	NEG	N/A	NEG	N/A	≈1.0
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	241.039	4149	584.843	2.43	.999
Projectile, 155mm, M104	HD	Tetrytol	None	241.039	4149	584.843	2.43	.999
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None	NEG	N/A	NEG	N/A	≈1.0
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6	NEG	N/A	NEG	N/A	≈1.0
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M5	NEG	N/A	NEG	N/A	≈1.0

*MUNITION DEMILITARIZATION PROCESS FLOW

78 12 12 227

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #1 UNPACK AREA (UPA)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	N/A	N/A	N/A	N/A	N/
Tank,Spray, TMU-28/B	VX	None	None	N/A	N/A	N/A	N/A	N/
Ton Container	GB	None	None	N/A	N/A	N/A	N/A	N/
Tone Container	VX	None	None	N/A	N/A	N/A	N/A	N/
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	N/A	N/A	N/A	N/A	N/

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK #10 UNPACK AREA (UPA)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO.* TCDS-01-422 DATE: 31 JANUARY 1974

b. DOCUMENT NO. CAMDS REPAIR PARTS (INVENTORY CONTROL SYSTEM) DATE: 29 AUGUST 1975

c. OTHER TRW GENERATED FMEA DATE: 2 OCTOBER 1975

d. DISCUSSION WITH TEAD (R. SCHNORENBERG) 21 OCTOBER 1975

e. COMPONENT SUPPLIER CATALOGS

2. NOTES *THE DRAWING LISTS SHOW ONE DRAWING FOR THE UNPACK AREA EQUIPMENT.

B. FAILURE DATA

1. SOURCE

a. CUSTOMER SEE NOTE

b. OTHER RADC-TR-74-268, FINAL REPORT, OCTOBER 1974, "REVISION OF NONELECTRONIC RELIABILITY NOTEBOOK" (RADC-TR-59-458, SECTION

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM THE TWO PRIME SOURCE (1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERATIONAL/TEST D.

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA SEE NOTE

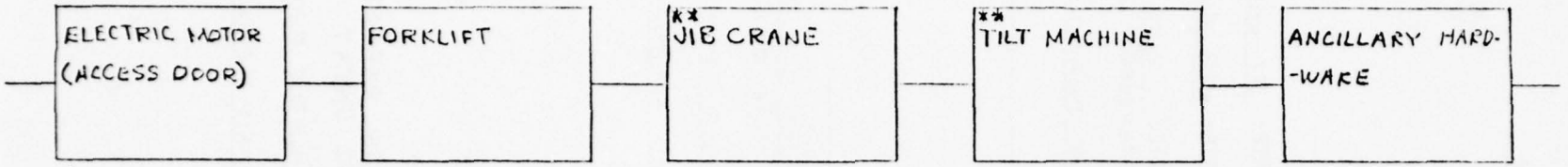
b. TEAD/EA SEE NOTE

c. OTHER RADC-TDR-64-373, VOL II FINAL REPORT, DECEMBER 1964, "AN OF MAINTENANCE TASK TIME DATA"

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM THE TWO PRIME SO (1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERATIONAL/TEST D.

D. GENERAL REMARKS
FIRST SUBMITTAL DATE: 11-20-75
SECOND SUBMITTAL DATE: 12-30-75

BUILDING BLOCK NO.1 - UNPACK AREA (UPA) FLOW CHART*



** THE JIB CRANE AND TILT MACHINE ARE USED FOR THE 155MM AND 8 INCH PROJECTILES ONLY.

* FLOW CHART ADDRESSES HARDWARE ITEMS ONLY. THIS BUILDING BLOCK CONTAINS MANY HUMAN ELEMENTS. REFER TO THE CAMDS FMEA FOR A DISCUSSION OF THOSE ELEMENTS.

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 2

BUILDING BLOCK NO. 1 UNPACK AREA

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	FAILURE DATA: RATE λ (X10^{-6}/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10^{-6})	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
1-1.1	ELECTRIC MOTOR	POWERS ACCESS DOOR TO THE UNPACK AREA.			1	*	3	-	-	-	-	-	-	-	-	-	DOOR CAN BE OP... MANUALLY IF REQ...
1-1.2	FORKLIFT	PLACES PALLETS OF MUNITIONS WITHIN THE UNPACK AREA AND REMOVES DUNNAGE.			1	*	3	-	-	-	-	-	-	-	-	-	AN ALTERNATE ... FORKLIFT WILL BE A...
1-1.3	5-T CRANE (INC. AIR POWERED ROLLER CHAIN HOIST AND TROLLEY)	LIFTS 155 MM AND 8 INCH PROJECTILES AND LOWERS THEM ONTO A TILT MACHINE.	- 7719 D (AIR HOIST) 7702 (TROLLEY)	-	1	*	2	11.562 + 54.798[4]	P18,17, 27,30	11.562 + 54.798[4]				2 (HOIST) 3 (TROLLEY)	15.564 + 109.596[4] 11.352	EST SEE NOTE IN FUNCTIONAL SEQUENCE	λ HOIST = 5.7 + 5.8 + λ[4] ROTARY ... MOTOR (1 ENTRY ... POWER = 2.2 ... ME HAS ... ENTRY ... BONDED ... BRAKE, ... + λ ... + λ ... GEARING (3 ... 1.15) + λ ... (3 BEARINGS, EA... 6.622) λ TROLLEY = 3.98 λ TROLLEY (3 ... EA... x 1 = 3.72)
		MAINTAINABILITY ESTIMATE: THE MAINTAINABILITY ESTIMATE IS BASED ON AN EXAMINATION OF THE HARDWARE AND ITS APPLICATION. THE HOIST WEIGHTS LESS THAN 37# IS ACCESSIBLE, AND CAN BE REMOVED FROM THE TROLLY EASILY (REMOVE/REPLACE OF THE UNIT IS ASSUMED). THEREFORE THE MINIMUM MAINTENANCE TIME (2 MHS) IS ASSIGNED. IT WOULD LIKELY BE NECESSARY TO REMOVE THE HOIST IN ORDER TO REPAIR OR REMOVE/REPLACE THE TROLLY (2 MHS + 1 HR = 3 MHS).														

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = $\frac{\quad}{\quad}$ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

[4] CYCLE ITEM

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 2 OF 3

BUILDING BLOCK NO. 1 (MAJOR ITEM)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
1.1	TILT MACHINE (PROJECTILE LAY-DOWN TABLE ASSEMBLY. ASSEMBLY INCLUDES AN ACTUATION CYLINDER, TWO FLANGE BEARING AND NUMEROUS STRUCTURAL COMPONENTS).	REPOSITIONS 155MM AND 8 INCH PROJECTILES FROM A VERTICAL TO A HORIZONTAL POSITION.	- SHEFFER STYLE TF [MTI] (CYLINDER). NF1618-9, BOSTON GEAR (BEARING FLANGE)	-	1	4.2.2	2	1.892 + 15.228	P 13,16	1.892 + 15.228				2 (EQUAL INS) 4 (CYLIN. ER)	3.784 60.912	EST P-234	λ TILT MACHINE (E... X CYLINDER (... LINEAR, ... = 15.228) + ... BEARINGS (... BALL X 2 = 1.892) MAINTAINABILITY ... THE MAINTA... ESTIMATE IS BA... AN EXAMINATION OF... DRAWINGS AND T... MAINTENANCE ... THE FLANGE BE... ARE ASSUMED ... CAN BE MADE ... THE TILT MACH... BASICS. T... THE MINIMUM ... CHANGE TIME IS ASSIGNED.

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

**Fail... Consequence Code

1 - ...astrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 8 OF 8

BUILDING BLOCK N.J [illegible]

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	FAILURE DATA: RATE λ (X10^{-6}/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10^{-6})	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
H.5	AUXILIARY HARDWARE: •SCRAP HOPPERS •WORK TABLE •[illegible] •PERSONNEL DOOR •PNEUMATIC VISE •FRESH WATER FAUCET •OBSERVATION WINDOW •FOOTBATH •TOOL STORAGE AREA •OVERHEAD RAIL MONET TO THE ECC.	THESE ITEMS ARE UNPACK AREA HARDWARE WHOSE FAILURE MODES ARE OF MINOR CONSEQUENCE AND/OR WHOSE FAILURE RATES ARE SO SMALL THAT THEY CAN BE CONSIDERED NEGLIGIBLE.	—	—	—	—	3	NEGLIGIBLE	—	—	—	—	—	—	—	—	—

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = $\frac{\text{____}}{\text{____}}$ = ____ HRS

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

		$N\lambda_E$ +	$N\lambda_{E+A}$ +	$\Sigma N\lambda$	MTBF
COND	A	13.459	70.026	N/A	N/A
COND	1	13.459	70.026	N/A	N/A

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100%

	$N\lambda_E$ +	$N\lambda_{E+A}$ =	$\Sigma N\lambda$	MTBF	$\Sigma N\lambda TM$	MTTR	AVAILABILITY
COND A	13.459	70.026	N/A	N/A	170.508	N/A	N/A
COND 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #2 EXPLOSIVE CONTAINMENT CUBICLE (ECC)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVA ABI
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55 20/HR	GB	Comp B	M28	510.129	1960.29	61257.3732	12.01	9
Rocket, 115mm, M55 20/HR	VX	Comp B	M28	510.129	1960.29	61257.3732	12.01	9
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M121A1	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M121	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M122	GB	None	None	NA	NA	NA	NA	
Projectile, 8", M426	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M121A1	VX	None	None	NA	NA	NA	NA	
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	1138.286	878.514	13344.327	11.72	9
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	796.688	1255.20	9337.2514	11.72	9
Projectile, 155mm, M104	HD	Tetrytol	None	796.688	1255.20	9337.2514	11.72	9
*M23 MINE, VX 40/HR								
Mine, 2 gallon,M23	VX	Comp B	None	862.240	1246.32	9502.234	11.81	9
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1 50/HR	HD	Tetryl	M6	1074.292	930.85	12250.705	11.50	9
Cartridge,Mortar, 4.2",M2/M2A1	HT	Tetryl	M6	1074.292	930.85	12250.705	11.50	9

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #2 EXPLOSIVE CONTAINMENT CUBICLE (ECC)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	NA	NA	NA	NA	N
Tank,Spray, TMU-28/B	VX	None	None	NA	NA	NA	NA	N
Ton Container	GB	None	None	NA	NA	NA	NA	N
Tone Container	VX	None	None	NA	NA	NA	NA	N
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	NA	NA	NA	NA	N

*MUNITION DEMILITARIZATION PROCESS FLOW

SUPPLEMENTAL DATA

BUILDING BLOCK #2 EXPLOSIVE CONTAINMENT CUBICLE

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. SEE ATTACHED DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES _____

_____

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER _____ _____

2. NOTES _____

_____

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER _____

2. NOTES _____

_____

D. GENERAL REMARKS: FAILURE RATES AND MAINTENANCE TIMES FOR DOOR CYLINDERS INCLUDE ASSOCIATED MECHANISMS

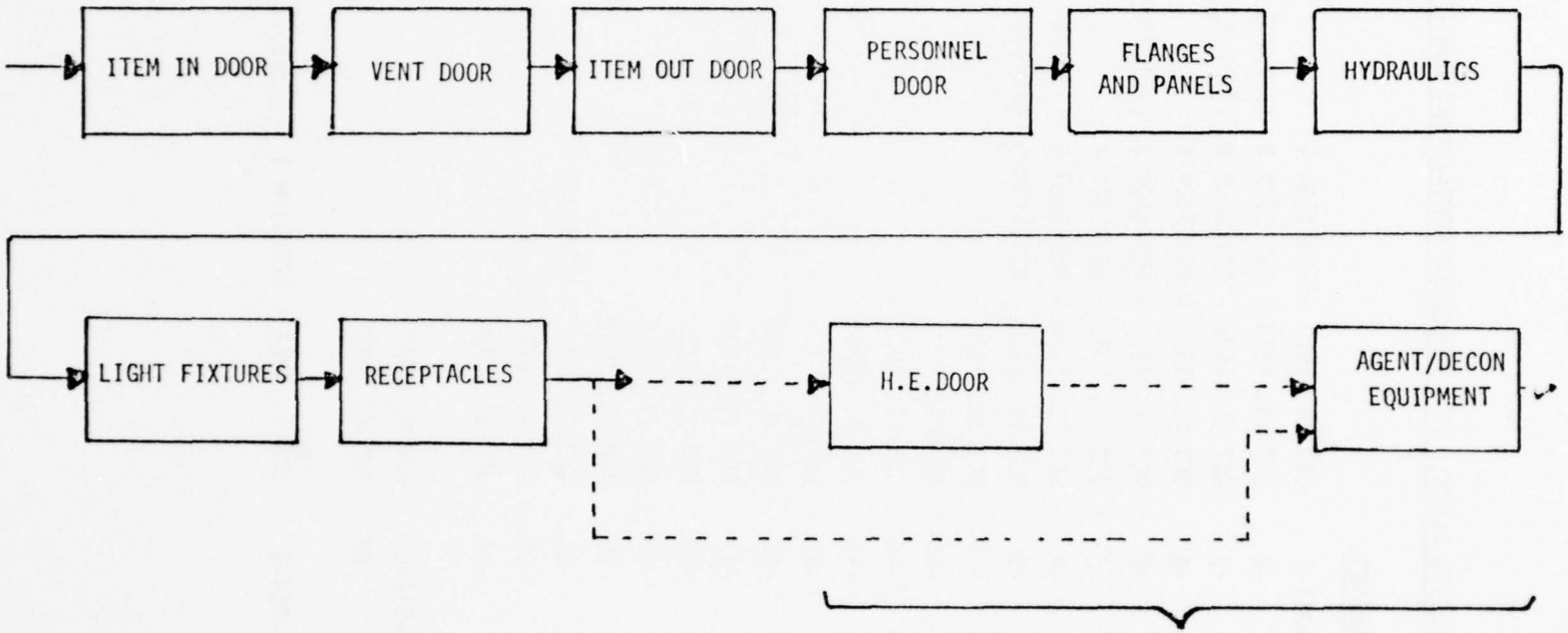
BUILDING BLOCK: #2 EXPLOSIVE CONTAINMENT CUBICLE (ECC)

DRAWINGS:

02-311-1	OCT 16, 1970 - REVISION 4	
-2	OCT 16, 1970 - REVISION 3	(7/7/73)
-3	OCT 16, 1970 - REVISION 2	(7/17/73)
-4	OCT 16, 1970 - REVISION 4	
-6	OCT 16, 1970 - REVISION 3	(7/17/73)
-7	OCT 16, 1970 - REVISION 4	
-8	OCT 16, 1970 - REVISION 5	(4/5/74)
-9	OCT 16, 1970 - REVISION 5	(11/5/74)
-14	OCT 30, 1974	
-15	NO DATE	
-16	JUN 29, 1972	
-19	JUN 9, 1973	
-21	NO DATE	
-26	MAY 10, 1975	
-27	APR 25, 1972	
-28	MAY 3, 1972	
-29	APR 27, 1972	
-30	APR 20, 1972	
-31	APR 7, 1972 - REVISION 1	
-32	APR 4, 1974	
-34	JUN 27, 1974	
02-512-01	MAY 8, 1975	
-02	JUN 6, 1975	
02-706-6	OCT 1, 1973 - REVISION 1	(12/21/73)

BUILDING BLOCK #2 EXPLOSIVE CONTAINMENT CUBICLE (ECC)

FLOW CHART



Sect Nos	Item Nos	Pipe Size Inch	ΔENR2 Btu/lbm	ENR2 (x10⁻⁶)	MITRE Prod. Factor	NR2 (x10⁻⁶)	ΔENR1TH Btu/lbm	ENR1TH (x10⁻⁶)	MITRE Prod. Factor	ENR1TH (x10⁻⁶)	Loading Factor	NR1TH (x10⁻⁶)	
, 3	2-1 thru 9	20	146.116	78.297	X2	370.529	571.7744	300.1126	X 2	144.711	X 3	1331.134	✓
		32.5			X3.25	513.194			X3.25	2150.429	X 3	6475.288	
		40			X4	662.761			X4	2587.260	X 3	7761.781	
		50			X5	828.877			X5	3159.035	X 3	9477.104	
	2-10	32.5	49.083	—	X3.25	159.520	191.5754	—	X 3.25	622.614	X3	1867.941	
		40			X4	196.332			X4	766.2934	X 3	2298.881	
		50			X5	245.415			X5	957.867	X3	2873.601	
	2-11	ALL	—	119.579	X1	119.579	—	448.6132	X1	448.6132	X 3X1⅓	1794.453	
-14- ☐	2-11 Detail ONLY	ALL		63.994		63.994		240.5556	X1	240.5556	X3X1⅓	994.222	

☐ EQUIP USED FOR DETAIL OPERATIONS

☐ 12/15/75 Rev

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 5

#2 EXPLOSIVE CONTAINMENT

BUILDING BLOCK CUBICLE (ECC)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	
	ITEM IN DOOR				(311)											
CYLINDER	SWING	HTI	MILWAUKEE	1	15/16/26	2	15.229	P15	15.229				4.0	60.912	P15	PART LN HYD GND
CYLINDER	CLOSE	SLSCC	SHEFFER	1	19/26	2	15.229	P15	15.229				4.0	60.912	P15	PART LN HYD GND
CYLINDER	PIN	LH 42-LR	MILWAUKEE	1	21/26	2	15.229	P15	15.229				4.0	60.912	P15	PART LN HYD GND
SWITCH	SWING POSITION OPEN	LSDIA	MICRO	1	30	2	1.133	P37	1.133				2.6	2.9458	P37	SW SEN GND
SWITCH	CLOSE POSITION	LSFIA	MICRO	1	29	2	1.133	P37	1.133				2.6	2.9458	P37	SW SEN GND
SWITCH	PIN POSITION	MICRO 7711	MICRO	1	31/09	2	1.133	P37	1.133				2.6	2.9458	P37	SW SEN GND
DOOR HINGE				2	09	2	NEG									
SEAL				1	09	3										
BEARING	DOOR CLOSURE	CYRSAFTRON	MAGNA	1	19	2	NEG									
	VENT DOOR															
CYLINDER	SWING	HTI	MILWAUKEE	1	16/26	2	15.228	P15	15.228				4.0	60.912	P15	PART LN HYD GND
CYLINDER	CLOSE	SLSCC	SHEFFER	1	19/26	2	15.229	P15	15.229				4.0	60.912	P15	PART LN HYD GND
CYLINDER	PIN	LH 42-LR	MILWAUKEE	1	21/26	2	15.229	P15	15.229				4.0	60.912	P15	PART LN HYD GND
SWITCH	SWING POSITION OPEN	LSDIA	MICRO	1	30	2	1.133	P37	1.133				2.6	2.9458	P37	SW SEN GND
SWITCH	CLOSE POSITION	LSFIA	MICRO	1	29	2	1.133	P37	1.133				2.6	2.9458	P37	SW SEN GND
SWITCH	PIN POSITION	NJ211-EG	HONEYWELL	1	01/21	2	11.949	P26	11.949	.5	2.0	.5	3.0	53.847	EST	WITH DOOR WELDING, INDUCTION GND
DOOR HINGE				2	09	2	NEG									
SEAL				1	09	3										
BEARING	DOOR CLOSURE	CYRSAFTRON		1	19	2	NEG									
	ITEM ON DOOR															
CYLINDER	SWING	HTI	MILWAUKEE	1	14/16/26	2	15.228	P15	15.228				4.0	60.912	P15	PART LN HYD GND
CYLINDER	CLOSE	SLSCC	SHEFFER	1	19/26	2	15.229	P15	15.229				4.0	60.912	P15	PART LN HYD GND
CYLINDER	PIN	LH 42 LR	MILWAUKEE	1	21/26	2	15.229	P15	15.229				4.0	60.912	P15	PART LN HYD GND
SWITCH	SWING POSITION OPEN	LSDIA	MICRO	1	30	2	1.133	P37	1.133				2.6	2.9458	P37	SW SEN GND
SWITCH	CLOSE POSITION	LSFIA	MICRO	1	29	2	1.133	P37	1.133				2.6	2.9458	P37	SW SEN GND

ΣNλ = 12.774 x 10⁻⁶/HR

ΣNλTM = 53.847 x 10⁻⁶

ΣN2 = 194.732 x 10⁻⁶

ΣN2TM2 = 563.820 x 10⁻⁶

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

▲ CYCLE ITEM

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 2 OF 5

#2 EXPLOSIVE CONTAINMENT CUBICLE (ECC)

BUILDING BLOCK

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (x10^{-6})	SOURCE (*)	REMARKS
SWITCH	PIN POSITION	MC0177II	MICRO	1	(311) 01/05	2	1.135	P57	1.135				2.6	2.945Z	P37	SW SER GND
DOOR HINGES				2	09	2	NCG									
SEAL				1	09	3										
BEARING	DOOR CLOSURE PERSONNEL DOOR	CER3AF10N	McGILL	1	17	2	NCG									
CYLINDER	LOCKING - EXTERNAL	3/4 MHFBLOCK	05287	4	3207/26	3										
CYLINDER	SWING	J 3618	MILLER	2	14/16	3										
CYLINDER	PINS	LH 12 LR	MILLER	3	31/26	3										
SWITCH	UPPER HOUSING LOCK POSITION	NT2-1166	KENNEDY	1	01/03/31	2	17.949	P26	17.949	.5	3.0	.5	4.0	71.796	EST	INDICATES GAP WITH 2CM RANGE ACCURACY 2%
SWITCH	MIDDLE HOUSING LOCK POSITION	NT2-1166	KENNEDY	1	01/03/31	2	17.949	P26	17.949	.5	3.0	.5	4.0	71.796	EST	DISTINCT TO REMAIN SENSORS
SWITCH	BOTTOM HOUSING LOCK POSITION	3GLIMCO7711	MICRO	1	01/05	2	1.135	P57	1.135				2.6	2.945Z	P37	SW SER GND
SWITCH	CLOSED POSITION	LSYPC1A	HYDAC	1	27	2	1.135	P57	1.135				2.6	2.945Z	P37	SW SER GND
SEAL		20CSEALAIRPAC	CEFI	1	07/63	3										
DOOR HINGES				3	03/09	3										
SHOCK ABSORBER	DOOR STOP	SAHS	ACE	1	21	3										
BEARING		CYRIV2	McGILL	1	21	3										
GASKETS	FLANGES & PANELS			4	04	3										
BLAST SENSORS	SENSE OVERPRESSURE			2		2	2.092	P36	4.184	.5	1.0	.5	2.0	8.368	P36	SW PRES GEN GND
	HYDRAULICS															
MECH VALVES FOR ONE EQUIVALENT VALVE SYSTEM				8	2601	2	3.014	P41	24.112	.5	1.0	.5	2.0	48.224	P41	SYSTEM CIR GND
				8	26-2	2	1.276	P72	10.208				2.5	25.52	P42	VALVE FUEL SOL

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = 76.469 \times 10^{-6}$/HR ✓
$\Delta \Sigma N\lambda = 1.135 \times 10^{-6}$ ✓

$\Sigma N\lambda TM = 231.5952 \times 10^{-6}$ ✓
$\Delta \Sigma N\lambda TM = 2.945\overline{8} \times 10^{-6}$ ✓

MTBF = $\frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad = \quad$ HRS

AVAILABILITY = $\frac{1}{MTTR} \times 100\% = \quad \%$

✓ p 17/4

SHEET 5 OF 5

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

#2 EXPLOSIVE CONTAINMENT

BUILDING BLOCK CUBICLE (ECC)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
LIGHT FIXTURES				8	(7324) 06	2	MIL									
RECEPTACLES	ELECTRICAL FEED THRU	SERIES 101	17476	9	(311) 14-2	2	.480	P20	3.63	1.0	2.0	1.0	4.0	14.72	EST	CONC CR GND

17

$\Sigma N\lambda$ = 7.63 x 10^{-6}/HR ✓ $\Sigma N\lambda TM$ = 14.72 x 10^{-6} ✓

*Information is detailed in Supplemental Data Sheet

**Failure Sequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = _____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 4 OF 5

#2 EXPLOSIVE CONTAINMENT

BUILDING BLOCK CUBICLE (ECC)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ. (**)	RATE λ X10^{-6}HR	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	H.E. Door				(311)											
Cylinder	▲Swing	H71	Dynamic	1	11/26	2	15.228	p15	▲15.228				40	▲60.912	p15	Hor Ln Hyd Gnd
Cylinder	▲Close	SL5CC	Enerpac	1	11/26	2	15.228	p15	▲15.228				40	▲60.912	p15	Ret Ln Hyd Gnd
Cylinder	▲Pin	LH42 UR	Dynamic	1	11/26	2	15.228	p15	▲15.228				40	▲60.912	p15	Ret Ln Hyd Gnd
Switch	▲Position Swing Open	LSDIA	Micro	1	30	2	1.133	p37	▲1.133				2.6	▲2.945	p37	Sw Sen Gnd
Switch	▲Position Close	LSYFC1A	Micro	1		2	1.133	p37	▲1.133				2.6	▲2.945	p37	Sw Sen Gnd
Switch	▲Position Pin	MICO7111	Micro	1	01/03	2	1.133	p37	▲1.133				2.6	▲2.945	p37	Sw Sen Gnd
Door Hinges	▲			2	09	2	NEG									
Seal	▲			1	09	3										
Bearing	▲Door Closure	CYR3AF5MR	Nalco	1	19	2	NEG									

▲ΣNλ = 49.083 x 10^{-6}/HR ✓ ▲ΣNλTM = 71.754 10^{-6} ✓

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 5 OF 5

BUILDING BLOCK #2 EXPLOSIVE CONTAINMENT CUBICLE (ECC)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ. (**)	RATE λ (X10^{-6}HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	AGENT/DECON EQUIP.															
SOL VALVE W SWITCH	AGENT - INSIDE ECC			1		2	2.407	P42,37	2.407		1		2.6	6.2634	P37	SW SENS GND + FUEL SOL GND
SOL VALVE W SWITCH	AGENT - OUTSIDE ECC			1		2	2.409	P42,37	2.409				2.6	6.2634	P37	SW SENS GND + FUEL SOL GND
SOL VALVE W SWITCH	DECON INPUT - INSIDE ECC			1		2	2.409	P42,37	2.409				2.6	6.2634	P37	SW SENS GND + FUEL SOL GND
SOL VALVE W SWITCH	DECON INPUT - OUTSIDE ECC			1		2	2.409	P42,37	2.409				2.6	6.2634	P37	SW SENS GND + FUEL SOL GND
SOL VALVE W SWITCH	DECON OUTPUT - INSIDE ECC			1		2	2.409	P42,37	2.409				2.6	6.2634	P37	SW SENS GND + FUEL SOL GND
SOL VALVE W SWITCH	DECON OUTPUT - OUTSIDE ECC			1		2	2.409	P42,37	2.409				2.6	6.2634	P37	SW SENS GND + FUEL SOL GND
CYLINDER, AIR	OPERATE ISOLATION VALVES			6		2	12.104	P15	72.624	1/2			4.0	29.496	P15	λ=ACT, LIN, PROV 10 YRS, TM=ACT, LIN, ATR
TANK, HOLDING	DECON			1		2	NEG									
LEVEL SENSOR	DECON LEVEL			1		2	5.922	P36	5.922				3.0	17.964	EST	λ=SW, SENS, LOW LEVEL
PUMP, DIAPHRAM, AIR	PUMP DECON TO ETS			1		2	12.055	P30	12.055				5.0	60.27	P30	PUMP CENTRIFUGAL
VALVE, CHECK	AGENT DRAIN TO AOS			1		2	3.014	P41	3.014				2.0	6.028	P41	VALVE CHECK
VALVE, CHECK AIR	AIR LINE TO PUMP AGENT			1		2	1.205	P44	1.205				2.0	2.41	EST	VALVE, PROV CHECK
VALVE, AIR	PUMP AGENT			1		2	10.252	P45	10.252				3.3	33.844	P45	VALVE 1 WAY SOL

☐ EQUIP USED FOR DECON OPERATIONS

*Information is detailed in Supplemental Data Sheet

**Failure Sequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = 119.549 \times 10^{-6}$/HR

☐ $\Sigma N2 = 63.799 \times 10^{-6}$

$\Sigma N\lambda TM = 548.6732 \times 10^{-6}$

☐ $\Sigma N2TM = 248.5554 \times 10^{-6}$

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad = \quad$ HRS

$AVAILABILITY = \frac{1}{1 + MTTR} \times 100\% = \quad \%$

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #4 DEACTIVATION FURNACE SYSTEM (DFS)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL ABIL
*M55 ROCKET, GB/VX Rocket, 115mm, M55	GB	Comp B	M28	2520.1	396.8	174173	6.91	.98
Rocket, 115mm, M55	VX	Comp B	M28					
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	—	—	—	—	—
Projectile, 155mm, M121A1	GB	None	None	—	—	—	—	—
Projectile, 155mm, M121	GB	None	None	—	—	—	—	—
Projectile, 155mm, M122	GB	None	None	—	—	—	—	—
Projectile, 8", M426	GB	None	None	—	—	—	—	—
Projectile, 155mm, M121A1	VX	None	None	—	—	—	—	—
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	2520.1	396.8	174173	6.91	.98
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None					
Projectile, 155mm, M104	HD	Tetrytol	None					
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None					
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6					
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6					

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #4 DEACTIVATION FURNACE SYSTEM (DFS)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	—	—	—	—	—
Tank,Spray, TMU-28/B	VX	None	None	—	—	—	—	—
Ton Container	GB	None	None	—	—	—	—	—
Tone Container	VX	None	None	—	—	—	—	—
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	—	—	—	—	—

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. _____ DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES Drawing No's are referenced on failure rate and maintainability data sheets

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER RADC-TR-74-268 RADC-TR-69-458

2. NOTES Estimates were made where data not available

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

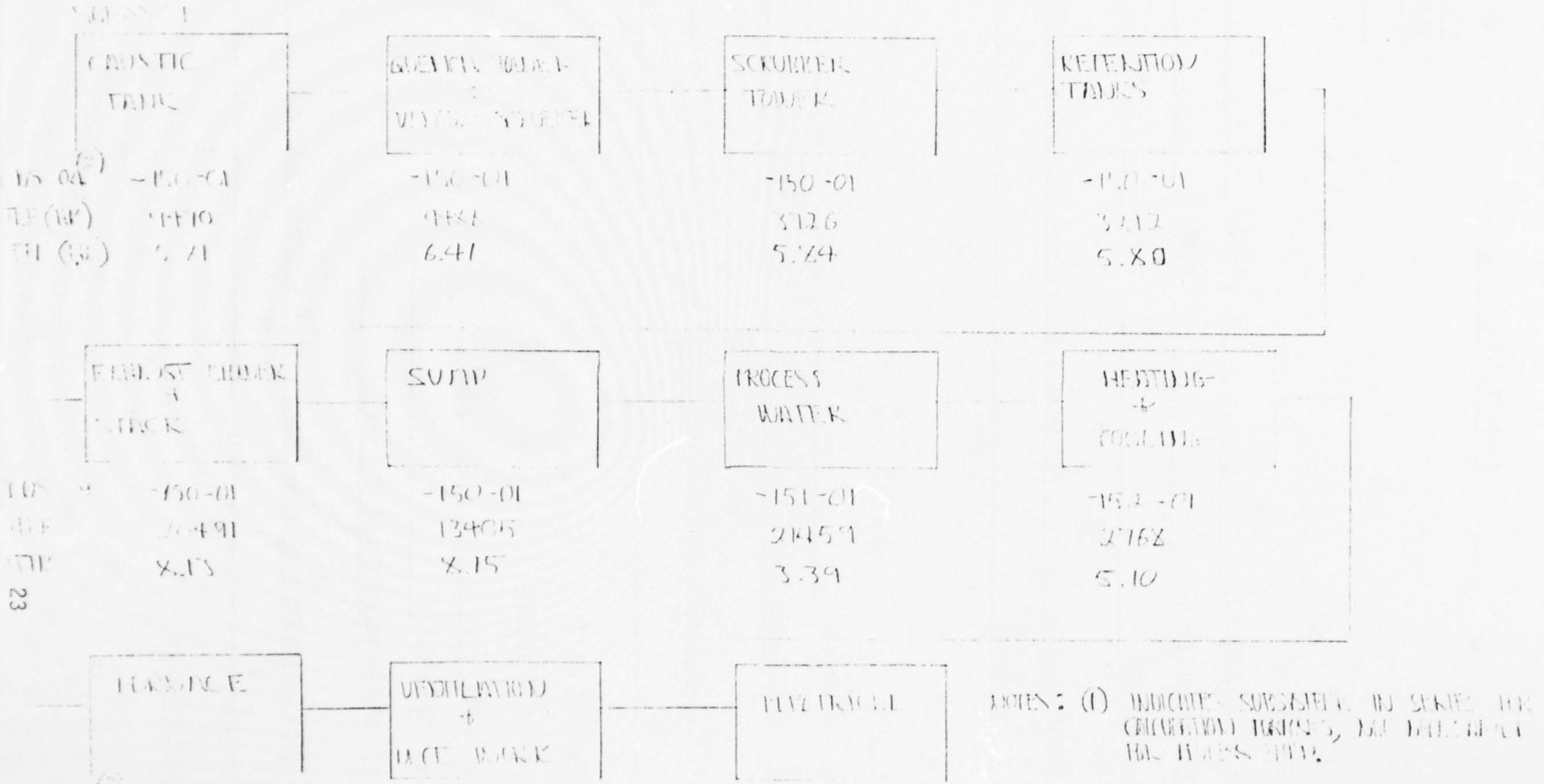
c. OTHER RADC-TDR-64-373 Vol II

2. NOTES Estimates were made where actual data not available

D. GENERAL REMARKS

BUILDING BLOCK: #4 DEACTIVATION FURNACE SYSTEM (DFS)

FLOW CHART



NOTES: (1) INDICATES SUBSYSTEMS TO SERIES FOR CALCULATIONAL PURPOSES, NOT NECESSARILY REAL PROCESS STEPS.

(2) HEATING FUEL BURNER EQUIPMENT FAILURE WAS MEAN.

(3) INCLUDES ALL MISC. ITEMS NOT INCLUDED IN ~150-01 & 350-01 THAT WERE NOT HEATED EQUIPMENT (E.G. SCRUBBER, FUEL VESSEL, ETC.)

A/P Control
#1 Caustic Tank

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 11

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO. (SAE ID No)	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10^{-6}/HR)	FAILURE DATA: SOURCE (*) PARA	FAILURE DATA: Nλ	MAINTAINABILITY DATA /X: DIAGN. TIME (HR)	MAINTAINABILITY DATA /X: REPAIR TIME (HR)	MAINTAINABILITY DATA /X: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA /X: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA /X: NλTM (X10^{-6})	MAINTAINABILITY DATA /X: SOURCE (*) b	REMARKS
1	TANK	CAUSTIC SUPPLY TANK	D 655		1	a-01	2	3.035	P39		0.5	12.5	1.0	14.0		P39	TANK-MET-316 GRD N1
1.1	VALVE, HAND	MISC S/O	—		7	"	2	2.451	P45		0.5	1.0	0.5	2.0		P45	VLV-MANUAL-GRD N1
	"	"	—		3	"	3	—		NA	-	—	—		NA	—	
1.2	VALVE	BLOCK VALVE R070	R070		1	"	2	2.515	P41		0.5	1.4	0.5	2.4		P41	VLV-CONTROL-MANUAL
1.3	LEVEL GAGE	TANK LEVEL LG LOCAL	LG		1	"	3	—	-	NA	—	—	—	—	NA	—	
1.4	LEVEL IND CONTROLLER	" LOST IC	LOST IC		1	"	2	11.905	P25		0.5	1.0	0.5	2.0		P25	IND-LVL-LOC GRD
1.5	LEVEL ALARM	ALARM ASSOC W 1.4 AND LA PSH DIS of PUMP (PROT)	—		2	"	2	3.742	P25		0.5	1.0	0.5	2.0		P25	IND-CON-GRD
1.6	TEMPERATURE	TEMP IND LOCAL TANK	51		1	"	3	—	-	NA	—	—	—	—	NA	—	
1.7	PRESSURE	PRESS IND LOCAL PUMP DIS	51		1	"	3	—	—	NA	—	—	—	—	NA	—	
1.8	FLOW	FLOW IND TO RET TANKS	FO55		1	"	2	29.975	P40		0.5	1.5	0.5	2.5		P40	VDIC-FLUID FLO ANALG
1.9	PUMP	CAUSTIC PUMP (TO S.T.)	P-360		1	"	2	12.058	P30		0.5	3.5	1.0	5.0		P30	PUMP-CENTR-GRD
1.10	MOTOR	MOTOR FOR PUMP 3 HP	—		1	"	2	1.206	P29		0.5	2.0	0.5	3.0		P29	MOT-GRD 3 HP
1.11	VALVE	CHECK VALVE	—		2	"	2	3.014	P41		0.5	1.0	0.5	2.0		P41	VLV-CHK-GRD

a. ECOSOM-150
b. NAVSEA FAIL. RATE & MAINT. REF. FOLDER

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

A/P System

A-2 Quench Tower, Venturi Scrubber

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 2 OF 11

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA /X: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
2.1	Quench Tower		T651		1	A-01	2	3.035	P39		0.5	12.5	1.0	14.0		P39	Tank-Mech-Std Grad Ht
2.2	Venturi Scrubber		V651		1	"	2	3.035	P39		0.5	12.5	1.0	14.0		P39	Tank-Mech-Std Grad Ht
2.3	Hand Valve -8"-	Misc S/O b c d e	—		14	"	2	2.483	P45		0.5	1.0	0.5	2.0		P45	Vlv-Manual-Gate Ht
2.4	Valve, Control	Block Valve d e	R071, 072		2	"	2	10.515	P41		0.5	1.4	0.5	2.4		P41	Vlv-Control-Air Op S
2.5	"	Control Valve c d	F054, 051, 053, R054		4	"	2	10.515	P41		0.5	1.4	0.5	2.4		P41	Vlv-Control-Air Op S
2.6	Controller	Recorder Controller	F054, F055 Panel		4	"	2	2.246	P33		0.5	1.0	0.5	2.0		P34	Pg Panel Grd Mounted
2.7	Alarm	DP Alarm, Flow Alarm, Press Alarm Temp	PSH, FSH, F055, P055		6	"	2	1.124	P25		0.5	1.0	0.5	2.0		P25	Ind-Cont-Grd
25	Temperature	Temp Ind Local	57		1	4	3	—	—	NA	—	—	—	—	NA	—	
	Switch	Temp Switch	T071, T072		2	"	2	2.511	P33		0.5	1.0	0.5	2.0		P33	Sw-Transistor-Grd
	Positioner	Position Venturi Throat	X051		1	"	2	15.231	P15		0.5	2.5	1.0	4.0		P15	Act-Elec-Hyd-Grd
	Valve	Check Valve d	—		2	"	2	3.014	P41		0.5	1.0	0.5	2.0		P41	Vlv-Check-Grd

a. ECDS14-150-

b. 1HV in par w. 2HV

c. 2HV + BV in par w. Same

d. 1HV, CHK VLV, EV in par w. 2HV, CHK VLV AV.

e. 1HV in par w. 2HV + BV.

f. CHAOS FTA Folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = $ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\quad}{\quad} = $ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = $ ____ %

AIP Control System

4-3 Scrubber Tower

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO. OR ID NO	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
3	Scrubber Tower				1	A-01	2	3.035	P39		0.5	12.5	0.5	14.0		P39	Tank mod DG grd m
3.1	Manual Valve -M-	Misc S/D c	—	—	40	A-01	2	2.443	P45		0.5	1.0	0.5	2.0		P45	Vlv works grd m
	"	"	—	—	10	"	3	—	—	NA	—	—	—	—	NA	—	
3.2	Valve ⊡ BV	Block Valve c	N-51	—	3	"	2	16.515	P41		0.5	1.4	0.5	2.4		P41	Valve Control elec/65
3.3	Valve ⊡ CV	Control Valve c	PH051, P052, L054	—	3	"	2	16.515	P41		0.5	1.4	0.5	2.4		P41	"
3.4	Controller	Recorder Controller 3 IND Rdg Control	F052, P052, D051, L054, F052, 054	—	6	"	2	3.702	P32		0.5	1.0	0.5	2.0		P32	Reg Press grd Module mc
3.5	Temperature	Local Temp Ind	53, 54	—	2	"	3	—	—	NA	—	—	—	—	NA	—	
3.6	Press.	Local Press Ind	52, 53, 54	—	3	"	3	—	—	NA	—	—	—	—	NA	—	
3.7	Pump	Slurry, Caustic Liquor, Acid, Air	P052, P53, 051, 061	—	4	"	2	17.038	P30		0.5	3.5	1.0	5.0		P30	Pump Motor grd
3.8	Motor	Motor For 3.7 15 HP 15HP 3HP 1HP	—	—	4	"	2	1.206	P18 24		0.5	3.0	0.5	4.0		P24	Mot elec 3, 10, 20 HP
3.9	Alarms	Press, PH, Flow, ΔP		—	10	"	2	3.742	P25		0.5	1.0	0.5	2.0		P25	Instr grd
3.10	Valve	Check Valve, Misc		—	6	"	2	3.014	P41		0.5	1.0	0.5	2.0		P41	Vlv check grd.
11	Level Gauge	Local Level Reading	LG	—	1	"	3	—	—	NA	—	—	—	—	NA	—	
12	Tank	Caustic Liquor Tank	—	—	1	"	2	3.015	P39		0.5	12.5	0.5	14.0		P39	Tank mod DG grd mc

a. Edison-150-

b. See Cards From folder

c. 2 Hr + Control in Pace w 1 Hr — 3 Pcs

*Information is detailed in Supplemental Data Sheet (if any exist)

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

A/P Control System

4-4 Retention Tanks

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*) b	REMARKS
4	TANK	RETENTION TANK	D651 652 653	—	3	(a - 5) 8-13-75	2	3.035	P35		0.5	12.5	0.5	14.0		P25	Tank Met Stn Grd
4.1	HAND VALVE -M-	MISC S/S.	—	—	16	"	2	2.481	P45		0.5	1.0	0.5	2.0		P45	Valve-Man-Gate-st.
	"	"	—	-	15	"	3	—	—	NA	—	—	—	—	NA	—	
4.2	VALVE	BLOCK VALVE	2042, 43, 48 49, 50, 54 55, 56, 57		9	"	2	16.515	P41		0.5	1.4	0.5	2.4		P41	Valve Control air/e.s
4.3	TEMP	LOCAL TEMP IND	TI 55, 56, 57	—	3	"	3	—	—	NA	—	—	—	—	NA	—	
4.4	PRESS	LOCAL PRESS. IND	PI 55, 56, 57	—	3	"	3	—	—	NA	—	—	—	—	NA	—	
4.5	LEVEL GAUGE	LOCAL TANK LEVEL	LG	—	3	"	3	—	—	NA	—	—	—	—	NA	—	
4.6	LEVEL IND	TANK LEVEL	LI 54, 57, 60	—	3	"	2	11.905	P25		0.5	1.0	0.5	2.0		P25	Ind Tk Lev Grd
4.7	ALARM	ALARM ASSOC W. 4.6	LHA LLA	—	3	"	2	3.742	P25		0.5	1.0	0.5	2.0		P25	Ind Gen Grd
4.8	PUMP	RECIRC PUMPS	P 356 357 358	-	3	"	2	12.058	P30		0.5	3.5	1.0	5.0		P30	Pump Cent Grd
4.9	MOTOR	MOTOR FOR -4.8 3HP	—	—	3	"	2	1.206	P28		0.5	2.0	0.5	3.0		P28	Mot 3 HP
4.10	CHECK VALVE	MISC	—	—	9	"	2	3.014	P41		0.5	1.0	0.5	2.0		P41	Valve check grd

a. EDISON 150 - See Chart File Folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

H/P Control Systems

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 5 OF 11

Exhaust Blower & Stack : Sump

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO. OR I.D. NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: NA	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*) b	REMARKS
3	Blower	Moves Effluent	HL-374	–	1	a-01	2	1.867	P17		0.5	3.6	0.5	4.6		P-17	Blw-Cover-Grd Ni
4	Motor	Motor For 5.1 200/50 HP	–	–	1	"	2	5.724	P29		0.5	6.0	0.5	7.0		EST	Mot 200 HP Ni
9	Hand Valve 6-7	Misc	–	–	2	"	2	2.483	P45		0.5	1.0	0.5	2.0		P45	Vlv-H₂O-Grd-Ni
14	Stack		–	–	1	"	2	3.035	P39		0.5	12.5	1.0	14.0		P31	Tank Mnt Stn Grd Ni
5	Damper	Blr Inlet	–	–	1	"	2	.789	P41		0.5	1.5	0.5	2.5		EIT	Valve-Butterfly Grd Ni
6	Positioner	Damper Position	V052	–	1	"	2	15.225	P15		0.5	2.5	1.0	4.0		P15	Act-Lin-H₂O-Grd
7	Recorder, Controller	Differential Pressure	P052	–	1	"	2	2.246	P32		0.5	1.0	0.5	2.0		P32	Rec Press Grd M
8	Alarm	Alarm For 5.7	HI HA PA LA	–	1	"	2	3.742	P25		0.5	1.0	0.5	2.0		P25	Ind-Gen-Grd
28	Detector	Alarm Sensor			3	"	2	3.742	P25		0.5	1.0	0.5	2.0		P25	Ind Gen Grd
1	Sump	Toxic & Abrasive Sump	–	–	2	a-01	2	3.035	P39		0.5	12.5	1.0	14.0		P39	Tank Mnt Stn Grd Ni
2	Pump	Sump Pump	P362 P365	–	2	"	2	12.053	P30		0.5	3.5	1.0	5.0		P30	Pump Cntrf Grd
3	Motor	Motor For 6.2 5HP 7.5HP	–	–	2	"	2	4.825	P18		0.5	2.0	0.5	3.0		P28	Mot 5HP
4	Level Controller	Lig Level Controller	LLC	–	2	"	2	11.925	P25		0.5	1.0	0.5	2.0		P25	Ind Lin Lev Grd
5	Hand Valve 6-7	Misc 3/0	–	–	2	"	2	2.483	P45		0.5	1.0	0.5	2.0		P45	Valve H₂O grd Ni
12	Check Valve	Misc	–	–	2	"	2	3.014	P41		0.5	1.0	0.5	2.0		P41	Valve Check grd

a. E CIS 01A-1507

b See DAWNS F&M folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 6 OF 11

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

PROCESS WATER (SOME COMPONENTS HAVE BEEN INCLUDED IN HPS SYST.)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ X10⁻⁶HR	SOURCE (*)	Nλ	MAINTAINABILITY DATA / N: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
7.1	TANK	WATER HOLD TANK	D671	—	1	[illegible]	1	1.616	P39		0.5	12.5	1.0	14.0		P-39	TANK PART STR. CARB
7.2	HAND VALVE (M...)	MISC	—	—	19	"	2	1.766	P45		0.5	1.0	0.5	2.0		P-45	VALVE - H₂O CARB
7.3	PUMP	WATER PUMP	P 348	—	1	"	2	12.050	P30		0.5	3.5	1.0	5.0		P-30	PUMP CENT. CARB
7.4	MOTOR	MOTOR FOR 7.3	—	—	1	"	2	1.206	P29		0.5	3.0	0.5	4.0		P-29	ELEC MOTOR
7.5	VALVE, CONTROL	LEVEL CONTROL IN TANK	L3622	—	1	"	2	16.515	P41		0.5	1.4	0.5	2.4		P41	VALVE CONTROL AIR/ELS
7.6	LEVEL, IND	TANK LEVEL	L3622 C	—	1	"	2	11.905	P25		0.5	1.0	0.5	2.0		P25	IND REG ELEC GAGE
7.7	LEVEL, GAGE	" LOCAL	LG	-	1	"	3	—	—	N/A	—	—	—	—	N/A	—	
29	MERCAP	PRESS, LEVEL ALARM	L3622A P3622A	—	2	"	2	3.742	P25		0.5	1.0	0.5	2.0		P25	IND GEN GAGE
7.7	FILTER	H2O PUMP 10µ	—	—	1	"	2	2.897	P21		0.5	1.4	0.5	2.4		P21	FILTER ELEC GAGE
7.10	PRESS IND	WATER SUPPLY PRESS.	P955	—	1	"	2	6.020	P25		0.5	1.0	0.5	2.0		P25	IND GEN PRESS GAGE
7.11	CONTROLLER, LEVEL	DEADBAND CONTROLLER (IND-CONTR)	[illegible]	—	1	"	2	3.742	P25		0.5	1.0	0.5	2.0		P25	IND GEN GAGE

a. EC USOM-151 — (REV 10/15/75)

b. SEE CANDS SYSTEM FOLDER

2HV, CHKV, CONTROL PAR W. SAME 4 H₂ IN PAR.

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - [illegible]strophic Failure
2 - [illegible]duction Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 7 OF 11

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

Heating & Cooling

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA If: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
8.1	Heating Valve - DF	Misc.	—	—	34	2-01 & 2-02	2	1.726	P45		0.5	1.0	0.5	2.0		P45	Valve mfg gpd
	"	"	—	—	17	"	3	—	—	NA	—	—	—	—	NA	—	—
8.2	Tank	Glycol - Water Tank	D672	—	1	"	2	1.616	P37		0.5	12.5	1.0	14.0		P37	Tank mat'l gpd
8.3	Tank Heater	Misc Tanks; Heat (Glycol Rec)	—	—	4	"	2	2.534	P24		0.5	3.2	0.5	4.2		P24	Tank htr gpd
8.4	Heating Coil w/ Blower	Various Area (See Dwg)	—	—	7	"	2	3.677	See Remark		0.5	3.0	1.0	4.5		E5T	Heating coil gpd + Blower + Motor λ = 1.971 + 1.706
8.5	Control Valve	Steam, Temp Control Valves (Glycol Water)			5	"	2	16.515	P41		0.5	2.0	1.0	3.5		E5T	Valve Control mfg/6.5
8.6	Temp 2ND Controller		T463, 464, 465, 466, 467		5	"	2	15.880	P26		0.5	2.0	1.0	3.5		P26	Dual Temp con/6.5
8.7	Temp Controller		T460, 461, 462, 463, 464, 465, 466, 467, 468		9	"	2	15.880	P26		0.5	2.0	1.0	3.5		P26	"
8.8	Liq Lev Contr	Level Glycol-Water Tank	L458		1	"	2	11.905	P25		0.5	1.0	0.5	2.0		P25	Dual liq lev gpd
8.9	Switch	Temp Switch	T460, 463		2	"	2	2.511	P37		0.5	1.0	0.5	2.0		P37	Dual Thermostat gpd
8.10	Cooler Fan	Glycol Water Cooler	ISE 377, 378		2	"	2	2.485	See Remark		0.5	2.5	1.0	4.0		E5T	Blo + Mot λ = 2.485
8.11	Alarm	Temp, Level	T468 L458		2	"	2	3.742	P25		0.5	1.0	0.5	2.0		P25	Dual gpd
8.12	Temp 2ND	Local Temp Reading	See Dwg		4	"	3	—	—	NA	—	—	—	—	NA	—	—
8.13	Pump	Glycol - Water Pump	P363	—	1	"	2	12.058	P30		0.5	3.5	1.0	5.0		P30	Pump Centr gpd
8.14	Motor	Motor For Pump 15 HP	—	—	1	"	2	1.206	P29		0.5	4.0	0.5	5.0		P29	Motor 20 HP
8.15	Press Ind	Local Press Gauge, Misc.	PI-See Dwg	—	14	"	3	—	—	NA	—	—	—	—	NA	—	—
8.16	Check Valve	Misc Check Valve	—	—	6	"	2	3.04	P41		0.5	1.0	0.5	2.0		P41	Valve mfg gpd

a. ECDS-74-152 (R&D 10/18/75)
b. See Claims File folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

See Calc Sheet for parallel items

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 7 OF 11

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

HEATING & COOLING CONTD.

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
8.17	COOLING COIL	CHILLED COOLING	MS-459,460		2	a-01 a/s/n/r	2	1.244	P24		0.5	3.2	0.5	4.2		T24	HEAT EXCH 9/8
8.18	BLOWER, FAN	"	PK-375,376	—	2	"	2	2.435	SEE REMARKS		0.5	2.5	1.0	4.0		EST	BLOWER MOT
8.19	VENT VALVE	SOLENOID S/O VENT VALVE	PURE IV	—	1	"	2	10.256	P45		0.5	2.5	0.5	4.0		EST	VALVE BODY SOL 9/8 ~
9.1	FURNACE											9					
9.2	RETORT	REFRAC. LINED COMB CHAM	-0201 -0202	—	1	b-01	2	24.333	P39		1.0	22.0	4.0	28		EST	FURN FUEL COIL 8/2/76.8 N.
9.3	DRIVE, ASSY	DEACT FURNACE DRIVE ASSY	#	—	1	c-04	2	62.375#	#		1.0	6.0	1.0	8		EST	#
9.4	AFTER BURNER	SLAGGING A/B "HOUSING"	-357-01	—	1	d-01	2	3.035	P39		1.0	25	2.0	28		P39	FURN MFT STD GUARD N.
9.5	BURNER	BURNER FOR AFTERBURNER	—	—	2	d-01	2	6.465	P24		1.0	3.0	1.0	5.0		P24	ILLUSTR, GEN A/R 1/65
9.6	THERMOCOUPLE	T.C. FOR A/B	—	—	4	d-04 d-06 d-01	2	62.229	P39		1.0	2.0	1.0	4.0		P39	TC CHAM GUARD
9.7	CONVEYOR DRIVE	DISCHARGE ASSY DRIVE ASSY	—	—	1	e-02	2	77.580#	#		1.0	6.0	1.0	8		EST	5
9.8	HEATER	DISCHARGE CONVEYOR HEATER	—	—	6	e-03 e-01	2	2.151	P24		1.0	5.4	2.0	8.4		P24	HTR ELEC 9/8
9.9	CONVEYOR	DISCHARGE CONVEYOR			1	e-01	2										

a. ECLIPSE-132 — c. -336 — e. -451 — # See Code Sheet 9.2.3

b. ECLIPSE-350 — d. -357 — f. See Comds Eqpt Folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

SHEET 9 OF 11

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

MISC. ITEMS WHICH HAVE NO PWRS FOR BIT ARE REFRIGERANT OR FUEL OIL[b] OR PROCESS FLOW SCHEMATIC[a]

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
.01	PUMP, LUBE OIL		—	—	1	b	2	11.219	P-50		1.0	7.0	2.0	10.0		d P-49	PUMP GEN grd
.02	MOTOR	MOTOR FOR .01 7.5HP	—	—	1	b	2	1.206	P-29		1.0	6.0	1.0	8.0		d P-29	MOT 10HP
.03	FUEL OIL PUMP		—	—	2	b	2	12.501	P-50		0.5	3.5	1.0	5.0		d P-50	PUMP CENTR grd.
.04	MOTOR	MOTOR FOR 1.3 1.5HP	—	—	2	b	2	2.418	P-48		0.5	1.5	0.5	2.5		d P-28	DUST 2 HP
.05	LUBE OIL COOLER		—	—	1	b	2	1.242	P-24		1.0	6.4	1.0	8.4		d P-24	HEAT EXCH grd
.06	MOTOR	MOTOR FOR 1.5 7.5HP	—	—	1	b	2	1.206	P-29		1.0	6.0	1.0	8.0		d P-29	MOT 10 hp
.07	BLOWER	FURNANCE F A/B BL 371,372	BL-371 372	—	2	a b	2	1.229	P-17		1.0	7.2	1.0	9.2		d P-17	AIR CENTR grd
.08 .09	MOTOR	MOTOR FOR 1.7 25HP 15HP	—	—	2	b	2	1.206	P-29		1.0	6.0	1.0	8.0		d P-29	MOT grd 10 hp
.10	FAN	BARRIER COOLING COIL FAN	—	—	2	b	2	1.229	P-17		1.0	7.2	1.0	9.2		d P-17	AIR CENTR grd
.11	MOTOR	MOTOR FOR 1.9 5HP 10HP	—	—	2	b	2	3.016	P-28 P-29		1.0	5.0	1.0	7.0		c P-28/29	MOT grd 5,10 HP
.12	TANK	FUEL OIL TANK	—	—	1	a	2	2.567	P-39		0.5	6.5	1.0	8.0		c P-39	TANK 0.1 grd TK
.13	DUCT	BLAST AIR/N DUCT	—	—	1	a	2	15	EST		1.0	25	2.0	28		d EST	
.14	CYCLONE		—	—	1	a	2	3.035	P-34		1.0	25	2.0	29		d P-39	TANK BLAST SYS grd MT
.15	VALVE	AIR LOCK VALVE, CYCLONE	—	—	1	a	2	15	EST		1.0	5.0	1.0	7.0		EST	
.16	VALVE	DOUBLE TIPPING VALVE	—	—	1	a	2	15	EST		1.0	10.0	1.0	12.0		EST	

a. ACUSON-120-01
b. CCUS 04 550-02
c. CARUS FLM heater
d. ZN
e. IN

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA.

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

MISC - CONTD

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
10.16	VALVE	DISCHARGE CONVEYOR TRICKLE VALVE (EXT)	—	—	1	a	2	10	EST		1.0	5.0	1.0	7.0		EST	
10.17	CONVEYOR	SCRAP CONVEYOR	—	—	1	a	2	70	EST		1.0	6.0	1.0	8.0		EST	
		CONTD ON PAGE 10A →															
11.1	VENTILATION & DUCT WORK																
11.2	MOTOR	7½ HP	—	—	2	b-01	2	1.206	P19		c 0.75	c 4.5	c 0.75	c 6.0		c P19	Heat recy
11.3	CONTROL DAMPER			52249	1	b-01	2	16.515	P41		c 0.75	c 2.1	c 0.75	c 3.6		c P41	Fresh Control damper
11.4	AIR CONDITIONER			66935	2	b-01	2	8.058	See Remarks		1.0	4.0	1.0	6.0		EST	Heat recy Hi & heat recy #1 2.324 5.734
11.5	ROOF VENTILATOR			02013	3	b-01	2	1.242	P24		c 0.75	c 4.8	c 0.75	c 6.3		c P24	Heat recovery grd
11.6	FAN	VENTILATION FAN		30191	1	b-01	2	2.318	P17		c 0.75	c 5.4	c 0.75	c 6.9		c P17	Fan and grd in
11.7	MOTOR	MOTOR FOR FAN FRAME HP	—	—	1	b-01	2	7.532	P18		c 0.75	c 1.5	c 0.75	c 3.0		c P18	Motor Fan & grd in
11.8	AIR FILTER		MODEL 5700	01767	6	b-01	2	1.201	P21		c 0.75	c 1.5	c 0.75	c 3.0		P21	Fan and grd
11.9	AIR HANDLER				2	b-01	2	3.52	See Remarks		0.75 c	5.0 c	0.75 c	6.5 c		EST	Fans & heat exchgr 2.20 1.242

a ECDS04-160-01 c. TRW
b ECDS04-352-

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - [illegible]strophic Failure
2 - [illegible]uction Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA 12/11/75

#4 DEACTIVATION FURNACE SYSTEM (DFS) BUILDING BLOCK ____

MISC - (CONTD) {NOTE: THESE ITEMS NOT FOUND ON DWGS AVAIL @ TRW, BUT TAKEN FROM SIMILAR COMB FIRED REPORT (1)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA Σx						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
CHUTE	FEED & DISCHG CHUTES			2	(1)	2	10	EST					8		EST	
VALVE ASSY	RELIEF OP MAIN BLOCK VLV ASSY (OIL)			1	"	2	16.515	P-41					4.8		P41	VLV CONTROL AIR/G.S
"	SUPPLY (OIL) TANK INLET VALVE ASSY			1	"	2	4.219	P-44					4		EST	VLV OIL GRD
FILTER	DUAL OIL FILTERS			2 (2)	"	2	2.487	P21					6.4		P21	OIL-LIQ-GRD
VALVES	FILTER SELECTOR VALVES			2 (2)	"	2	4.219	P44					4		EST	VLV OIL GRD
REGULATOR	OIL PRESSURE REGULATOR			1	"	2	2.249	P32					5.8		P32	REG-PR-GRD/A
VALVE	BRANCH BLOCK OIL VLV			1	"	2	16.515	P-41					4.8		P41	VLV CONTROL AIR/G.S
"	SAFETY SHUTOFF VLV (OIL)			1	"	2	16.515	"					4.8		P41	"
VALVE ASSY	AIR-OIL CONTROL VLV ASSY			1	"	2	16.515	"					4.8		"	"
VALVE	RATIO ADJUSTING OIL VALVE			1	"	2	16.515	"					4.8		"	"
DETECTOR	UV FLAME DETECTOR			1	"	2	3.742	P25					4.0		P25	IND/CON GRD
VALVE ASSY	IN & BURNER INTL AIR CONTROL VALVE			2	"	2	16.515	P41					4.8		P41	VLV CONTROL AIR/G.S
CONTROLLER	TEMP RECORDING CONTROLLER			1	"	2	4.338	P32					9.0		P32 1 X EST	REC TEMP GRD
VALVE	MANUAL BLOCKING VALVE (OIL)			1	"	2	4.219	P44					4		EST	VLV OIL GRD
"	SAFETY S/O VLV AIR			1	"	2	16.515	P-41					4.8		P41	VLV CONTROL AIR/G.S
CONTROLLER	TEMP CONTROLLER, DISCHG CONVEYOR			1	"	2	4.338	P32					9.0		P32 1 X EST	REC TEMP GRD
SENSOR	TEMP SENSOR, DISCHG CONVEYOR			1	"	2	25.692	P40					6.0		P40	THERMO-TEMP GRD

(1) REPORT APPARENTLY EXISTED IN AUG 1975, BUT REC'D @ TRW WEEK OF 8 DEC 1975

(2) ASSUMED

(3) SEE CLARIFY EQPT FOLDER

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda$ = 215.3 x 10^{-6}/HR

$\Sigma N\lambda TM$ = 1160.2 x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

11-1 Elec Components From Single Line Diagram ECDS04-550-02

BUILDING BLOCK #4 DEACTIVATION FURNACE SYSTEM (DFS)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
2.1	SWITCH	MISC	—	—	20	A 4-7-75	2	0.548	P37		0.5	1.0	0.5	2.0		P37	Sw Toggle Gard
2.2	FUSE	"	—	—	20	"	2	2.101	P18		0.5	1.0	0.5	2.0		P18	Fuse (6 failures)
2.3	HEATER	"	—	—	2	"	2	2.151	P34		0.5	3.5	0.5	4.5		P34	Htr elec gen grd
2.4	RELAY	"	—	—	26	"	2	.166	P33		0.5	1.0	0.5	2.0		P33	Relay gen grd
2.5	CKT BREAKER	"	—	—	100	"	2	2.197	P19		0.5	1.0	0.5	2.0		P19	Circuit Brkr grd m
2.6	TRANSFORMER	"	—	—	2	"	2	3	EST		0.5	1.0	0.5	2.0		EST	P to Drum grd = 1.384 Sec = 89744
2.7	CAPACITOR	"	—	—	9	"	2	3	EST		0.5	1.0	0.5	2.0		EST	Elec from Book

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

SUMMARY - BUILDING BLOCK: #4 DEACTIVATION FURNACE SYSTEM (DFS)

SUB SYSTEM	ITEM No	$\Sigma N\lambda$ $\times 10^{-6}$	$\Sigma N\lambda_m$ $\times 10^{-6}$ (1)	MAINT FACTOR (1)	$\Sigma N\lambda_m$ $\times 10^{-6}$ (2)	MAINT FACTOR (2)	
Cooling Tank	4.1	105.6 ✓	306.4 ✓	1X	603.2 ✓	2X	
Inert Gas	4.2	106.4 ✓	332.7 ✓	1X	675.4 ✓	2X	
Purge Tower	4.3	268.4 ✓	783.7 ✓	1X	1567.4 ✓	2X	
Wet Tanks	4.4	311.3 ✓	903.5 ✓	1X	1807.0 ✓	2X	
Low Pressure	4.5	48.8 ✓	198.4 ✓	1X	396.8 ✓	2X	
Steam	4.6	74.6 ✓	304.1 ✓	1X	608.2 ✓	2X	
Process Water	4.7	46.6 ✓	158.1 ✓	1X	158.1 ✓	1X	
Handling & Cooling	4.8	361.3 ✓	1227.6 ✓	1X	1841.4 ✓	1.5X	
Furnace	4.9	442.1 ✓	3054.7 ✓	2X	4582.1 ✓	3X	
MISC	4.10	378.4 (4) ✓	2818.8 (4) ✓	2X	4228.2 (4) ✓	3X	2457.9
Vent Duct Work	4.11	62.9 ✓	300.6 ✓	1.5X	300.6 ✓	1.5X	
Elec.	4.12	314.7 ✓	636.9 ✓	1X	638.9 ✓	1X	
Σ		2520.1 (4) ✓			17417.3 (4) ✓		
		$\times 10^{-6}$			$\times 10^{-6}$		

(4) $A = .9829$ ✓
$MTBF = 396.8$ ✓
$MTTR = 6.91$ ✓

(1) AS LISTED ON RAW DATA SHEETS
(2) FINAL "DB" NO'S
(3) INCLUDE TOGETHER AS FURNACE
(4) CHANGED 12/11/75 A of page 10A

DES Treatment of Gates in Parallel

$\Delta_1 = \Delta N\lambda$

$\Delta_2 = \Delta N\lambda\tau_M$

1-2 Q Tower 9 V. Series.

1. 1HV in Par w 2HV ... 2.483 x 2 = 4.966. $\left[\frac{1}{2.483\times10^{-6}} + \frac{1}{4.966} - \frac{1}{(2.483+4.966)10^{-6}}\right]^{-1}$ = 2.128 x10⁻⁶

$N\lambda$ was 2.483 x 3 = 7.449x10⁻⁶ Now 2.128 Δ_1 = 5.321 x10⁻⁶

$N\lambda\tau_M$ was 7.449 x 2 = 14.898 x10⁻⁶ Now 4.256 Δ_2 = 10.642 x10⁻⁶

2. 2HV + Contr Valve in Par w. Same ... 2x2.483 + 16.515 = 21.481 $\frac{2}{3}\lambda$ = 14.321 x10⁻⁶

$N\lambda$ was 2.483 x4 + 16.515 x2 = 42.962 Δ_1 42.962 - 14.321 = 28.641

$N\lambda\tau_M$ was 2.483x4x2 + 16.95x2x2.4 = 99.136 Δ_2 99.136 - 33.045 = 66.091

2.483 x2 x2 + 16.515 x2.4 = 49.566 New $N\lambda\tau_M = \frac{2}{3}\times 49.566 = 33.044$ x10⁻⁶

3. 2HV, chk v, Contr valve in Par w. 2HV, chk v, Contr v

$\left[2.483\times2\times(2) + 3.014\times2\times(2) \quad 16.515\times1\times2.4\right]$ $\frac{2}{3}(2.483\times2+3.014\times2+16.515)$

Same $= 18,339\times10^{-6}$ = new $N\lambda$

$\Delta_1 = 55.018 - 18.339 = 36.679$

$\Delta_2 = 111.192 - 37.064 = 74.128$

4. 1HV in Par w. 2HV + Contr V $\left[\frac{2.483\times1\times(2)}{2.483\times2\times(2) + 16.515\times1\times2.4}\right]$

$\Delta_1 = 23.964 - 2.454 = 21.51\times10^{-6}$

$\Delta_2 = 54.534 - 4.921 = 49.613\times10^{-6}$

For this page:

$\Sigma\Delta_1 = 5.321 + 28.641 + 36.679 + 21.51 = 92.2$

$\Sigma\Delta_2 = 10.6 + 66.091 + 74.128 + 49.643 = 200.5$

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DFS PARALLEL ITEMS (CONTD).

4-3 SCRUBBER TOWER

1. 2 HV + CONTR. VALVE IN PAR. W. 1 HV (3 PLACES)

$$\begin{bmatrix} 2.483 \times 2 \times (2) + 16.515 \times 1 \times (2.4) \\ 2.483 \times 1 \times (2) \end{bmatrix}$$

$\Delta_1 = 21.51 \times 10^{-6}$ } SEE QT'S V. SCRUB.
$\Delta_2 = 49.613$

FOR TOWER $\Delta_1 = 3 \times 21.51 = 64.53 \times 10^{-6}$ 64.5

$\Delta_2 = 3 \times 49.613 = 148.839 \times 10^{-6}$ 148.8

4-7 PROCESS WATER

1. 2 HV, CHK V, CONTR V IN PAR W. SAME

$\Delta_1 = 36.679$ } SEE Q.T. & V. SCRUB.
$\Delta_2 = 74.128$

2. 4 H.V IN PAR $\lambda = \left[\frac{1}{\lambda} + \frac{1}{2\lambda} + \frac{1}{3\lambda} + \frac{1}{4\lambda} \right]^{-1} = 1.192$

$\Delta_1 = 2.483 \times 4 - 1.192$
$= 8.74$

$\Delta_2 = 2.483 \times 8 - 2.382$
$= 17.48$

DFS PARALLEL ITEMS (CONTD)

$\Delta_1 = \Delta N\lambda$
$\Delta_2 = \Delta N\lambda T_m$

4-E HEATING & COOLING

1. HV in Pipe w. 2HV & CONTR VALVE - $\Delta_1 = 21.51 \times 10^{-6}$
$\Delta_2 = 49.613$

2. SCRUBBER AREA HEATING
$N\lambda$ (2HV + FAN + MOTOR + HEAL COIL + TEMP CONTROLLER) 3 IN PARALLEL
2X1.766 + 1.279 + 1.206 + 1.342 + 15.880 = 23.089 $23.089 \times \frac{6}{11} = 12.594$
3.677
$\Delta_1 = 23.089 \times 3 - 12.594$
$= 56.7$
$N\lambda T_m$ (2X1.766X2 + 3.677 X4.5 + 15.880 X3.5) = 79.1905 $\frac{6}{11} \times 79.1905 = 43.195$
$\Delta_2 = 79.1905 \times 3 - 43.195 = 194.4$

3. RETENTION TANK AREA HEATING
$N\lambda$ (2HV + FAN + MOT + HEAL COIL + TEMP CONTROLLER) 2 in PARALLEL
(2X1.766 + 3.677 + 15.880) = 23.089 $23.089 \times \frac{2}{3} = 15.393$
$\Delta_1 = 23.089 \times 2 - 15.393 = 30.785$
$N\lambda T_m = 79.1905 \times \frac{2}{3} = 52.794$
$\Delta_2 = 79.19 \times 2 - 52.794 = 105.6$

4. DEAL BARRIER
$N\lambda$ (2 HV + FAN + MOT + COILING COIL) 2 IN PARALLEL
(2X1.766 + 3.677) = 7.209 $7.209 \times \frac{2}{3} = 4.806$ $\Delta_1 = 7.209 \times 2 - 4.806 = 9.612$
$N\lambda T_m$ 2X1.766 X2 + 2.435 X4 + 1.242 X4.2 = 22.020 $22.020 \times \frac{2}{3} = 14.68$ $\Delta_2 = 22.02 \times 2 - 14.68 = 29.4$
FAN+MOT COIL

HEATING & COOLING $\leq A = 21.5 + 56.7 + 30.8 + 9.1 = 118.1$

DFS Fuel Cell ITEMS.

A-10 MISC. ITEMS

b. (Fuel Oil Pump + Motor) taken off main, PARAL. (ACTUALLY 2ND PUMP IN STANDBY)

W_d 12.058 + 1.206 = 13.264 $\frac{2}{3} \times 13.264 = 8.843$ $\Delta_1 = 13.264 \times 2 - 8.843 = 17.685$

$W_{T_{cm}}$ 12.058 × 5 + 1.206 × 8 = 69.938 $\frac{2}{3} \times 69.938 = 46.625$ $\Delta_2 = 69.938 \times 2 - 46.625 = 93.251$

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BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #5 METAL PARTS FURNACE (MPF)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL ABIL
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	—	—	—	—	—
Rocket, 115mm, M55	VX	Comp B	M28	—	—	—	—	—
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	[illegible]	220.2	[illegible]	8.77	[illegible]
Projectile, 155mm, M121A1	GB	None	None					
Projectile, 155mm, M121	GB	None	None					
Projectile, 155mm, M122	GB	None	None					
Projectile, 8", M426	GB	None	None					
Projectile, 155mm, M121A1	VX	None	None					
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1					
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None					
Projectile, 155mm, M104	HD	Tetrytol	None	7	7	7	1	
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None	—	—	—	—	—
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1	HD	Tetryl	M6	[illegible]		[illegible]		
Cartridge,Mortar, 4.2",M2/M2A1	HT	Tetryl	M6	"	"	"	"	"

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #5 METAL PARTS FURNACE (MPF)

MUNITION	AGENT	EXP.	PROP.	$N\dot{\lambda}$	MTBF	$N\lambda TM$	MTTR	AVAILABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	4369.3	228.8	5.394	5.4	.9
Tank,Spray, TMU-28/B	VX	None	None					
Ton Container	GB	None	None					
Tone Container	VX	None	None					
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None					

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK # 5 METAL PART FURNACE (MPF)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. _____ DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES Drawing No's are referenced on failure rate and maintainability data sheets

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER RADC-TR-74-268 RADC-TR-69-458

2. NOTES Estimates were made where data not available

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

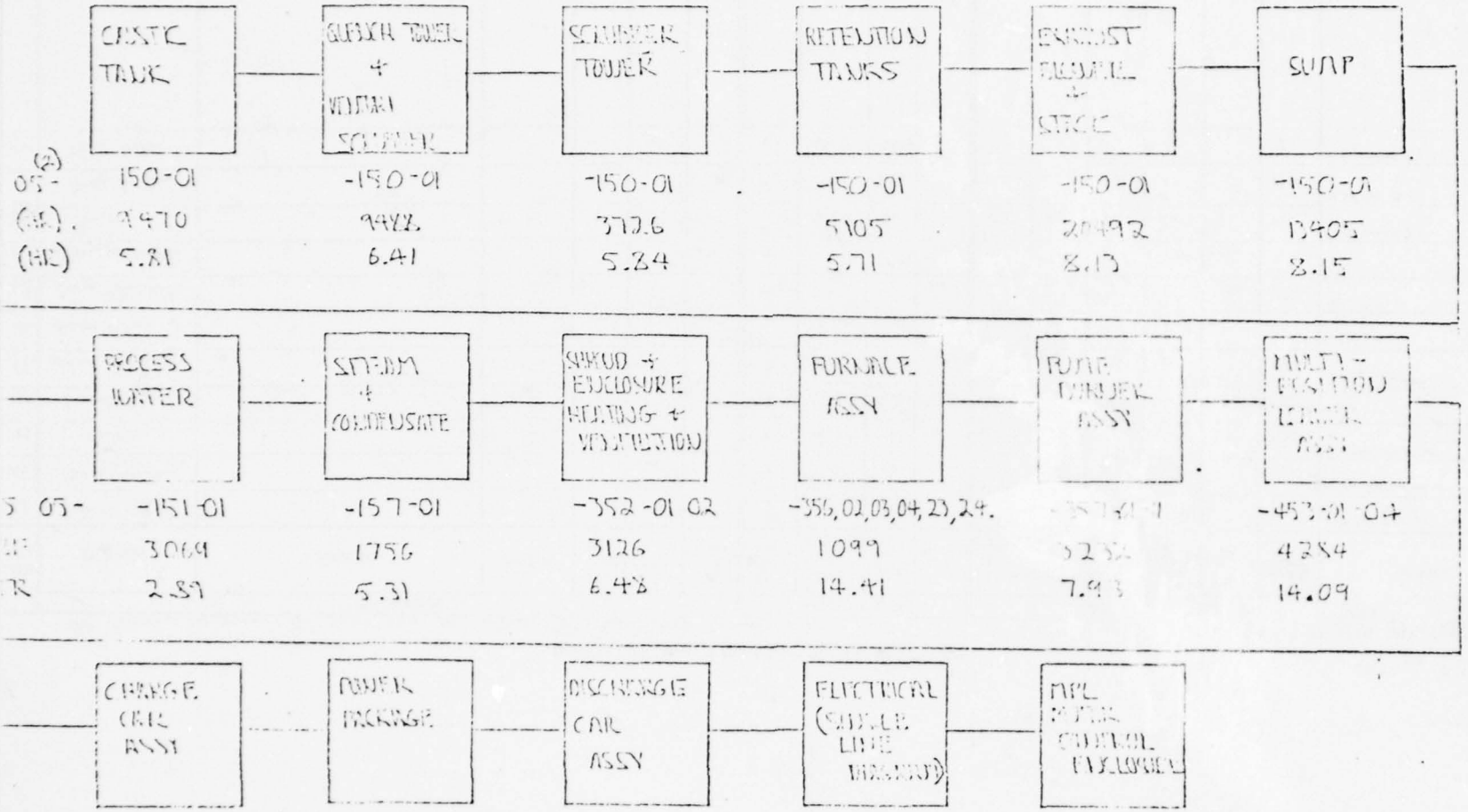
c. OTHER RADC-TDR-64-373 Vol II

2. NOTES Estimates were made where actual data not available

D. GENERAL REMARKS

BUILDING BLOCK: #5 METAL PARTS FURNACE (MPF)

FLOW CHART



(2) 05-	150-01	-150-01	-150-01	-150-01	-150-01	-150-01
(LB).	9470	9988	3726	5105	20492	13405
(HR)	5.81	6.41	5.84	5.71	8.13	8.15

05-	-151-01	-157-01	-352-01 02	-356, 02, 03, 04, 23, 24.	[illegible]	-453-01 -04
	3069	1756	3126	1099	[illegible]	4384
	2.89	5.31	6.48	14.41	[illegible]	14.09

05-	454-01	656-02	455-01	550-02	562-04, 06
	5912	32557	5893	5206	13193
	15.58	8.41	15.54	2.16	3.62

NOTES: (1) SHADE ITEMS CONSIDERED IN SERIES - NOT [illegible]

11-14-75

SHEET 1 OF 13

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

A/P CONTROL SYSTEM - USE SYST FOR DES EXCEPT [SUBTRACT] THE FOLLOWING ITEMS

BUILDING BLOCK #5 METAL PARTS FURNACE (MFP)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*) Nelex	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) 1.	REMARKS
1.1	HAND VALVE		—	—	10	a	2	2.453	P45		0.5	1.0	0.5	2.0		P45	Valve H2O gen grd ss
1.2	Check Assem Valve		—	—	3	"	2	16.515	P41		0.5	1.4	0.5	2.8		P41	Valve Control Assy Gr 5
1.3	Tank		—	—	1	"	2	3.005	P37		0.5	12.5	1.0	14.0		P37	Tank Mtd Stor grd ss
1.4	Level Gage		—	—	1	"	3	11.405	L25	NA	0.5	1	0.5	2	NA	P25	
1.5	Level Indicator		—	—	1	"	2	11.405	P25		0.5	1	0.5	2		P25	Ind Lg Lev grd
1.6	Level Alarm		—	—	1	"	2	3.742	P25		0.5	1	0.5	2		P25	Ind mo grd
1.7	Temp. Indicator		—	—	1	"	3	—	—	NA	—	—	—	—	NA	—	
1.8	Pressure Indicator		—	—	1	"	3	—	—	NA	—	—	—	—	NA	—	
1.9	Pump		—	—	1	"	2	12.058	P30		0.5	3.5	1.0	5.0		P30	Pump Centr grd
1.10	Motor for Pump 3HP		—	—	1	"	2	1.206	P28		0.5	2	0.5	3		P28	Motor 3hp grd
1.11	Check valve		—	—	3	"	2	3.04	P41		0.5	1.0	0.5	2.0		P41	Valve check grd

a. ECDS05-150-01 b. See Cannels Folder in my folder

*Information is detailed in Supplemental Data Sheet

**Fail Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

Process Water

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*) a,b,c	NA	MAINTAINABILITY DATA /X: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*) b	REMARKS
2.1	Hand Valve Diff	Water	—	—	38	a-c	2	1.766	P45		0.5	1.0	0.5	2		P45	valve #50 gen grd
	"	"	—	—	7	"	3			NA	—	—	—	—	NA	—	
2.2	Valve	Bleed Control Valve	see Dwg	—	9	"	2	16.515	P41		0.5	1.4	0.5	2.4		P41	Valve Control Assb 5
2.3	Valve	Control valve	see Dwg	—	3	"	2	16.515	P41		0.5	1.4	0.5	2.4		P41	"
2.4	Temp	Local Temperature Indicator	T1 13,17,15 16,17,18	-	6	"	3	—	—	NA	—	—	—	—	NA	—	
2.5	Pressure	Local Pressure Indicator	—	-	2	"	3	—	—	NA	—	—	—	—	NA	—	
2.6	Temperature Control		FS16 FS32	—	2	"	2	15.880	P36		0.5	2	1	3.5		P36	Inst Temp Assy 16.5
2.7	Pressure Indicator		PS35 Dwg	—	1	"	2	3.465	P40		0.5	1.5	1	3		P40	Trans press grd
2.8	Pressure Switch		PS35 PS31	-	2	"	2	2.095	P36		0.5	1	0.5	2		136	Stat press sw grd
2.9	Check valve	Water	—	—	2	"	2	3.014	P41		0.5	1	0.5	2		P41	Valve check grd
2.10	Level Controller		LS12 LS2	—	2	"	2	11.905	P25		0.5	1	0.5	2		P25	Level Reg Test grd
2.11	Level Gage	Local Level Level gage	46	-	1	"	3	—	—	NA	—	—	—	—	NA	—	
2.12	Pump	Cooling and Demister Water pumps	P319 P320	—	2	"	2	12.058	P30		0.5	3.5	1	5		P30	Pump Motor grd
2.13	Motor	Motor for 1.12 3HP	—	—	2	"	2	1.206	P28		0.5	2	0.5	3		P28	Motor 3 hp grd
2.14	Flow Sensor Switch		F307, 313 314	-	3	"	2	1.133	P37		0.5	1.6	0.5	2.6		P37	Flow Sens grd
2.15	Water Cooler		MS-430	—	1	"	1	1.24W	P24		0.5	3.2	0.5	4.2		P24	Heat exch gen grd
2.16	Fan for Water Cooler		—	-	1	"	2	2.311	P17		0.5	3.6	0.5	4.6		P17	Fan Assy grd

a. EK05-151-

b. See Cmds FTM ref folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1+MTTR}$ x 100% = ____ %

11-17-75

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

Process Water (Cont'd)

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA / X: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
2.17	Tank	Emergency Tower Water tank	—	—	1	A-01	2	1.616	P41		0.5	12.5	1.0	14		P39	Tank near Sta grd
2.18	Alarm	Tank Level Alarm	LSH-10	—	1	"	2	3.74	P25		0.5	1	0.5	2		P25	Ind pan grd
2.19	Tank	Cooling Water tank	D622	—	1	"	2	1.616	P39		0.5	12.5	1	14		P39	Tank near Sta grd
2.20	Water Softener		D-623	—	1	"	2	3.035	P39		0.5	12.5	1	14		P39	Tank near Sta grd by
2.21	filter		—	—	2	"	2	2.987	P21		0.5	1.4	0.5	2.8		P21	Filter by grd

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a CADOF-151-
b See Cavalls Folder

*Information is detailed in Supplemental Data Sheet

**Fail Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

SHEET 1 OF 13

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

Steam and Condensate

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA /X: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
3.1	Hand Valve [M-	Manual	—	-	66	A-01 10-7-71	2	1.766	P15		0.5	1	0.5	2		P45	Valve hand for grd.
	"	"	—	-	21	"	3	—	—	NA			—	—	NA		
3.2	Check Valve	"	—	-	30	"	2	3.014	P41		0.5	1	0.5	2		P41	Valve check grd
3.3	Control valve		—	—	10	"	2	16.515	P41		0.5	1.4	0.5	2.4		P41	Valve control air/0.5
3.4	Heater		—	-	26	"	2	1.242	P24		0.5	3.2	0.5	4.2		P24	Heat exch gr grd
3.5	fan for ?		—	-	18	"	2	2.318	P17		0.5	3.6	0.5	4.6		P17	Fan axial grd
3.6	motor for ?	316	—	-	18	"	2	1.206	P25		0.5	2	0.5	3		P28	Heat 316 grd
3.7	Controller	T C	—	-	24	"	2	4.348	P34		1	7	1	9		P34	Dig temp grd
3.8	flow meas	FE	—	—	3	"	2	24.975	P40		0.5	1.5	1	3		P40	Vacuum gland flow air/0.5
3.9	Press meas	Local Pressure meas	—	—	13	"	1	—	—	NA	—	—	—	—	NA	—	
3.10	Temp meas	Local Temp meas	—	—	2	"	3	—	—	NA	—	—	—	—	NA	—	
3.11	Press. Switch		—	—	2	"	2	3.425	P40		0.5	1.5	1	3		P40	Frame press grd.
3.12	Press switch		—	—	2	"	2	2.095	P34		0.5	1	0.5	2		P34	Slow press sw grd

a. ECOS 05-157
b. See Cause Eff Anl failure

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + MTTR}$ x 100% = ____ %

11-17-75

SHEET 5 OF 13

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHIELD HEATING & VENTILATING

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ X10⁻⁶/HR	SOURCE (*)	Nλ	MAINTAINABILITY DATA /x: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
4.1	SWITCH	PRESSURE SWITCH	MAD PA-1152	—	5	A-01 9-11-75	2	2.095	P26		0.5	1	.5	2		P26	Sail pressure gen grd
4.2	MOTORIZED DAMPER	VARIOUS SIZES - CONTROL AIR FLOW	SEE DWG FOR EA	—	5	"	2	8.541	See Remarks		0.5	2	.5	3		EST	Heat Exch HP + VEN @ Hg Hr 7.552 .789
4.3	FILTER	AIR FILTER	MODEL 5700	—	20	"	2	1.201	P21		0.5	1	.5	2		P21	Fil cas grd
4.4	HEATER	DUCT HEATER STM COIL	MODEL TYPE A	—	3	"	2	2.334	P24		0.5	3.2	0.5	4.2		P24	Heat Exch gen Grd Hr
	ENCLOSED HEATING & VENTILATION PLAN																
5.1	RAIN LOUVER		—	—	1	A-02 12-10-75	3	—	—	NA	—	—	—	—	NA	—	
5.2	FAN	VENTILATION FAN	—	—	2	"	2	2.318	P17		0.5	3.6	0.5	4.6		P17	TWO AXIAL GRD
5.3	MOTOR	MOTOR FOR FAN 1/3 HP 1/80	—	—	2	"	2	7.552	P28		0.5	1.0	0.5	2		P28	HEM from HP Grd Hr
5.4	AIR CONDITIONER		—	—	2	"	2	8.058	See Remarks		0.5	3	0.5	4		EST	Heat Exch Hr + Heat 10HP Hr
5.5	THERMOSTAT		—	—	11	"	2	4.338	P32		1	7	1	9		P32	Reg Temp grd
5.6	HEATER	STM HEATER MOTOR COIL	—	—	19	"	2	8.058	See Remarks		0.5	3	0.5	4		EST	Heat Exch Hr + Heat 10HP Hr 2.334 5.724

& EED505-352 —

*Information is detailed in Supplemental Data Sheet

**Fai Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \text{MTTR}}$ x 100% = ____ %

11-17-71

SHEET 6 OF 13

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #5 METAL PARTS FURNACE (RPF)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA 1X: DIAGN. TIME (HR)	MAINTAINABILITY DATA 1X: REPAIR TIME (HR)	MAINTAINABILITY DATA 1X: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA 1X: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA 1X: NλTM (X10⁻⁶)	MAINTAINABILITY DATA 1X: SOURCE (*)	REMARKS
	PUNCH CHAMBER ASSY																
6.1	ELECTRIC EYE	SENSE WORK FLOW Light Path Thru Work Chamber	CHICON INC 720-E31TH	—	2	A-02 9-18-75	2	3.742	P25		0.5	1	0.5	2		P25	Ind from Grd
6.2	HOSE	4" HOSE — ACCESS EXIT FROM PUNCH AREA	—	—	2	"	2	.240	P24		0.5	1	0.5	2		P24	Hose from grd to
6.3	HYD. CYLINDER	ACTUATOR (HORIZONTAL)	—		1	"	2	15.228	P15		0.5	2.5	1.0	4		P15	ACT LIN HYD GRD
6.4	SWITCH	LIMIT SWITCH ON PUNCH	LSA1A	91929	9	"	2	1.133	P37		0.5	1.6	0.5	2.6		P37	SW SENS GRD
6.5	GASKET	BUTYL RUBBER GASKET SEAL	-8205 -8206	—	4	"	2	2.178	P22		0.5	6	0.5	7		EST	GASKET SEAL ON DOOR
6.6	STUFFING DOOR	SEAL ASSY	12209/9	—	2	"	2	2.178	P22		0.5	6	0.5	7		EST	"
6.7	DOOR ASSY	PUNCH CHARGE DOOR ASSY	-1501	-	1	"	2	31.911	See Calc Sheet		0.5	5	0.5	6		EST	See Calc Sheet
6.8	ROLL ASSY	PUNCH ROLL ASSY	-1401	—	15	"	2	.506	P16		0.5	7	0.5	8		P6	Turning roller grd to
6.9	ELEVATOR	RAISE LOWER BACK BLOCKS	-0601	-	1	"	2	20	EST		0.5	7	0.5	8		EST	ACT LIN HYD GRD +
6.10	PUNCH ASSY	HYD PUNCH CONTAINER	-0501	-	2	"	2	21.141	Calc Sheet		0.5	10	0.5	11		EST	See Calc Sheet

Q ECO505-352 -

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + MTTR}$ x 100% = ____ %

11-17-75

SHEET 7 OF 13

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA /X: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
	VOLTILIZATION CHAMBER ASSY																
7.1	THERMOCOUPLE	HI LIMIT & CONTROL T.C's	-	91161	2	A-03 9-11-75	2	62.229	P39		0.5	1	0.5	2		P39	T.C GEN GRD
7.2	SWITCH	LIMIT SWITCH ASSY	-2001	-	2	"	2	1.133	P37		0.5	1.6	0.5	2.6		P37	SW TONS GRD
7.3	DOOR ASSY	VOL CHARGE & DISCHARGE DOOR ASSY	-1601 -1701	-	2	"	2	33.271	See Calc Sheet		0.5	5	0.5	6		EST	See Calc Sheet
7.4	BURNER		M10D2070 2-01-045C	60592	8	"	2	6.465	P24		0.5	1.5	0.5	2.5		P24	Ignitor and 6.5
7.5	ROLL ASSY	CHAMBER ROLLER BEARINGS	1301, 1201 1101, 1001		16	"	2	.506	P16		0.5	7	0.5	8		P16	Bearing roller grd M
	BURNOUT	CHAMBER ASSY															
8.1	THERMOCOUPLE	HI LIMIT & CONTROL T.C's		91161	2	A-04 9-16-75	2	62.229	P39		0.5	1	0.5	2		P39	TC GEN GRD
8.2	SWITCH	LIMIT SWITCH ASSY	-2001	-	2	"	2	1.133	P37		0.5	1.6	0.5	2.6		P37	SW SONS GRD
8.3	BURNER		M10D 3011	60592	4	"	2	6.465	P24		0.5	1.5	0.5	2.5		P24	Ignitor Airpt 6.5
8.4	ROLL ASSY		1301, 1201 1101, 1001	-	16	"	2	0.506	P16		0.5	7	0.5	8		P16	Bearing roller grd M
8.5	DOOR ASSY	BURNOUT DISCHARGE DOOR	-1001	-	1	"	2	33.271	EST 5-73		0.5	5	0.5	6		EST	See Calc Sheet

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a. ECD105-352 -
b. See OAMDS File rib folder

*Information is detailed in Supplemental Data Sheet

**Fai Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

11-17-75

SHEET 8 OF 13

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA IX: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
	PLENUM DRIVE SUB ASSY																
9.1	MOTOR	DRIVE MOTOR 1HP W. INTERNAL BRAKE		01411	1	a-23 9-22-75	2	7.552	P16		0.5	1	0.5	2		P16	MOT DRAC HP GRD M
9.2	BEARING	MISC BEARING		71116	6	"	"	0.496	P6		0.5	4	0.5	5		EST	BEARING BALL GRD
9.3	CHAIN	DRIVE CHAIN		71176	3	"	2	5.634	P27		0.5	3	0.5	4		EST	FAN BELT GRD M
9.3	SHEAVE			71176	2	"	2	31.247	P28		0.5	2.5	0.5	3.5		EST	PULLEY GRD M LO
9.4	SHAFT		5301 5302 5303		3	"	2	1.237	P25		0.5	3	0.5	4		EST	SHAFT GRD
9.5	SPROCKET			71176	4	"	2	2.498	P28		0.5	4.5	0.5	3.5		EST	SPROCKET GRD M
9	REDUCER	6:1 100:1	SERIES 600 CTD-6	55200	2	"	2	11.726	P27		0.5	4.5	1	6		P27	GEARBOX GRD M.
9	MECH. DISENGAGE		WC52W	79137	1	"	2	4.662	P27		0.5	2.5	0.5	3.5		EST	COUPLING GRD
9.8	CLUTCH	ELEC. CLUTCH ASSY	1527646	58530	1	"	2	7.525	P27		0.5	3	0.5	4		EST	CLUTCH MAG GRD M
9.9	V-BELTS		3V355	71176	2	"	2	4.007	P27		0.5	2	0.5	3		EST	FAN BELT GRD
	FURNACE	DRIVE SUB ASSY															
10.1	MOTOR	1HP		01411	1	a-24 9-22-75	2	7.552	P28		0.5	1	0.5	2		P28	MOT DRAC 1HP GRD M
10.2	CHAIN			71176	4	"	2	5.634	P27		0.5	3	0.5	4		EST	FAN BELT GRD M
10.3	V-BELTS			"	2	"	2	4.007	P27		0.5	2	0.5	3		EST	FAN BELT GRD
10.4	SHEAVE			"	2	"	2	31.247	P28		0.5	2.5	0.5	3.5		EST	PULLEY GRD M LO
10.5	BEARING			"	8	"	2	0.496	P6		0.5	4	0.5	5		EST	BEARING BALL GRD

a. ECDS 05-356-

b. See CARDS FILM ref folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \text{MTTR}}$ x 100% = ____ %

11-17-75 ~

SHEET 5 OF 13

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

Furnace Drive Sub Assy (cont'd)

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
9	SHAFT		5201 F201 S2W3	—	3	4-24 7-11-75	2	1.237	P15		0.5	3	0.5	4		EST	Chain grd
10.7	SPROCKET			71176	4	"	2	2.452	P15		0.5	2.5	0.5	3.5		EST	Sprocket grd Tm
10.8	REDUCER	5:1 100:1	Textrol Assy Q20:6	55300	2	"	2	11.726	P27		0.5	4.5	1	6		P27	Gearbox grd Tm.
10.9	AUTOM DISENGAGE		W95ZW	24137	1	"	2	4.662	P27		0.5	2.5	0.5	3.5		EST	Coupling grd
10.10	CLUTCH	ELEC. CLUTCH ASSY	15276 Y-C 5-C	55588	2	"	2	7.525	P27		0.5	3	0.5	4		EST	Clutch mg Grd Tm
	FLAME BURNER ASSY																
11	VALVE	6" JAMESBURY Auto Act(?)	CAT DISC 2 KIT	—	1	6-01 8-4-75	2	10.751	P45		0.5	3	0.5	4		EST	Valve pneu s/o au/c s
11.1	FLAME ARRESTER		A5966	—	1	"	2	2.334	P24		0.5	3	0.5	4		EST	Heat exchanger grd.
11.3	BURNER		4-04-058-C	60532	4	6-02 -04	2	6.145	P24		0.5	1.5	0.5	2.5		P 24	Ignitor au/c s
11.4	THERMOCOUPLE	—	—	-	4	6-06 -07 -08	2	62.224	P39		0.5	1	0.5	2		P39	TC grd grd
11.5	VALVE	TYPE T VALVE 12" 1" IN " SPHERICAL ELEC ACTUATOR	GRANCO DIST THE	—	2	6-10 6-11	2	10.751	P45		0.5	3	0.5	4		EST	Valve pneu s/o au/c s

a. EC0505-356-
b. EC0505-357-

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

Multidisc Tool Loader Assy

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
12.1	Hose Assy		—	—	3	CK-01 9-16-75	2	.24	P24		0.5	1	0.5	2		P24	Hose gen grade
12.2	Clutch		M10 H03	—	1	"	2	7.525	P27		0.5	3	0.5	4		EST	Clutch mag grd 4e
12.3	Pressure Switch	5 LIMIT SWITCH	836T-T-25A	—	3	"	2	1.133	P37		0.5	1.6	0.5	2.6		P37	Sw Sens grd
12.4	Solenoid Valve		CCS11.37	—	1	"	2	1.276	P42		0.5	1.5	0.5	2.5		P42	Valve solenoid fluid grd
12.5	Regulator/Filter	5 REG/FILTER/LUB			2	"	2	5.236	See Remarks		0.5	3	0.5	4		EST	Reg Stress grd for filter reg 2.248 + 2.988
12.6	Pinion Gear		H2 RL 1-Sem	—	1	"	2	3.742	P25		0.5	1	0.5	2		P25	Ind gen grd
12.7	Chain, Roller		—	—	10	"	2	5.634	P27		0.5	3	0.5	4		EST	Fan belt grd 4e
12.8	Sprocket		—	—	12	"	2	2.458	P18		0.5	2.5	0.5	3.5		EST	Sprocket grd 4e
12.9	Motor	2HP	—	—	1	"	2	2.413	P28		0.5	1.5	0.5	2.5		P28	Ind 2HP grd
12.10	Gear Reducer				1	"	2	11.226	P27		0.5	4.5	1	6		P27	Reducer grd 4e
12.11	Roll	Roll Bearing	—	—	11	"	2	.506	P6		0.5	7	0.5	8		P6	Bearing roller grd 4e
12.12	Limit Switch		LSA 4-A-2A	—	3	CK-01 9-24-75	2	1.133	P37		0.5	1.6	0.5	2.6		P37	Sw Sens grd
12.13	Hyd Cylinder		6-HA-2-2.00		3	CK-01	2	15.228	P15		0.5	2.5	1.0	4		P15	Act Sm Hyd grd
12.14	Rotoswitch		11-25-0 100		2	CK-01 9-26-75	2	1.329	P37		1.0	1.5	.5	3		P37	Sw Rot grd.
12.15	Timing Belt				3	"	2	4.007	P21		0.5	2	0.5	3		EST	Fan belt grd
12.16	Sprocket				8	"	2	2.458	P18		0.5	2.5	0.5	3.5		EST	sprocket grd 4e
12.17	Chain, Roller				1	"	2	5.634	P27		0.5	3	0.5	4		EST	Fan belt grd 4e

& ECUS 05-453-

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS.

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

	DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA (X)						
	ITEM NAME	FUNCTION OR CON INFO	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6} HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
13	SPEED REDUCER		—	—	1	C-04 9/24/71	2	11.726	P27		0.5	4.5	1	6		P27	Gearbox grid m
	CHARGE	OVEN ASSY															
13.1	SPROCKET IDLER		—	—	2	C-04 9/24/71	2	.250	P16		0.5	7	0.5	8		P16	Bearing roller grid.
13.2	SPROCKET				16	"	2	2.458	P28		0.5	2.5	0.5	3.5		EST	Sprocket grid m
13.3	BEARING	ROLLER	—	—	35	"	2	.280	P16		0.5	7	0.5	8		P16	Bearing roller grid
13.4	LIMIT SWITCH				7	"	2	1.133	P37		0.5	1.6	0.5	2.6		P37	Limit switch grid.
13.5	SHAFT				2	"	2	1.237	P29		0.5	3	0.5	4		EST	Shaft grid.
13	CHAIN				14	"	2	5.634	P27		0.5	3	0.5	4		EST	Gear belt grid m
13	REDUCER	100:1 1 HP MOTOR			2	"	2	11.726	P27		0.5	4.5	1	6		P27	reducer grid m
13	ROLL	ROLLER BEARING			13	"	2	.280	P16		0.5	7	0.5	8		P16	Bearing roller grid
	POWER PACKAGE																
14.1	PRESS. SWITCH		F356102200	62483	1	C-02 7-24-71	2	1.015	P36		0.5	1	0.5	2		P36	Switch pressure grid
14.2	CHECK VALVE	ANGLE CHECK	F3C2-1920	61983	1	"	2	3.014	P41		0.5	1	0.5	2		P41	Valve check grid
14.3	GAUGE	3000 PSI GAGE	—	38608	1	"	2	1.020	P25		0.5	1	0.5	2		P25	Ind air press grid m
14.4	VALVE	GLOBE - PLUG TYPE	SB431 1/4" M	63220	2	"	2	2.481	P45		0.5	1	0.5	2		P45	Valve H2O gas grid m
14.5	PUMP	HAND PUMP	2000-B-6	47241	1	"	2	2.857	P30		0.5	1.5	0.5	2.5		EST	Valve gas grid m
14.6	VALVE	4 WAY VALVE, 2, 3 POSN (ETHANOL) CHOICE (3)	F3C0655NC-	62483	8	"	2	76.803	P44		0.5	4	0.5	5		EST	Valve hyd spool 4 Way Anlst

A. EC0605-433 - C. EC0505-656 -
B. EC0505-481 - D. See Ordering F&A at ref folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

11-11-15

SHEET 12 OF 13

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

Power Package (cont'd)

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

ITEM	DESCRIPTION: ITEM NAME	FUNCTION OR INFO	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA (X): DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
4.7	MULTI PANEL	SEE CALC SHEET	—	—	1	A-02 7-24-15	2	34.772	P35		1.0	4	1.0	6.0		EST	see calc sheet
4.8	STRAINER	WATER STRAINER (FILTER)	F3CST-1-4	62413	1	"	2	2.487	P21		0.5	1.4	0.5	2.4		P21	Fail by grd
4.9	VALVE	TEMP CONTROL VALVE BULB	F3CAV-1-05 -15	"	1	"	2	16.338	P32		1	7	1	9		P32	Eq. Temp grd
4.10	ACCUMULATOR	3000 PSI 10 GAL	F3ACC1004	01643	1	"	2	14.793	P14		0.5	3	0.5	4		EST	Accum. grd mt.
4.11	VALVE	AIR BLEED	F3AAT-03-40	62983	1	"	2	1.514	P41		0.5	1	0.5	2		P41	Valve Relief grd
4.12	FILTER	OIL FILTER 10 μm	F3OFM202-1	"	1	"	2	2.487	P21		0.5	1.4	0.5	2.4		P21	Fail by grd
4.13	OIL COOLER	SHELL & TUBE	F3OCW4-10	"	1	"	2	1.344	P34		0.5	3.7	0.5	4.2		P34	Heat Xchgr grd
5	POWER UNIT	SEE CALC SHEET			1	"	2	17.677	see calc sheet		1.0	15	1.0	17		EST	see calc sheet
	DISCHARGE CAR ASSY																
5.1	DRIVE TUMBLER	(ROLLER BEAR.)		71176	2	b-01 9-16-15	2	0.280	P16		0.5	7	0.5	8		P16	Bearing Roller grd
5.2	SPROCKET IDLER			"	2	"	2	0.280	P16		0.5	7	0.5	8		P16	Bearing Roller grd
5.3	SPROCKET	MISC LOC.	—	"	16	"	2	2.456	P28		0.5	2.5	0.5	3.5		EST	Sprocket grd mt
5.4	BEARING	" ROLLER CHAIN		19882	3.3	"	2	0.280	P16		0.5	7	0.5	8		P16	Bearing Roller grd
5.5	LIMIT SWITCH		—	91929	9	"	2	1.137	P37		0.6	1.6	0.5	2.6		P37	Lim Switch grd
5.6	SHAFT		—	—	2	"	2	1.137	P28		0.5	3	0.5	4		EST	Shafts grd
5.7	CHAINS			71176	14	"	2	5.684	P27		0.5	3	0.5	4		EST	Fan belt grd mt
5.8	REDUCER	INT. BRAKE 1 HP MOTOR 100:1	—	55210	2	"	2	11.776	P27		0.5	4.5	1	6		P27	gearbox grd mt
5.9	IDLER	W UHW COLLAR (ROLL BEAR)	-0403 -0401	—	13	"	2	0.280	P16		0.5	7	0.5	8		P16	Bearing Roller grd

a. ECDS05-656 -
b. ECDS05-455 -

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 13 OF 13

SINGLE LINE DIAGRAM MOTOR CONTROL CONTROLS [a]

BUILDING BLOCK #5 METAL PARTS FURNACE (MPF)

M NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) c	REMARKS
16.1	SWITCH				30	a-05 9-2-15	2	1.133	P37		0.5	1.6	0.5	2.6		P37	Switches grd
16.2	FUSE				24	"	1	2.101	P18		0.5	1	0.5	2		P18	Fuse grd
16.3	RELAY				48	"	1	.166	P33		0.5	1	0.5	2		P33	Relay gen grd
16.4	BREAKER				12	"	2	0.692	P19		0.5	1	0.5	2		P19	Ckt breaker 3 pole
16.5	TRANSFORMER				3	"	2	1	EST		0.5	1	0.5	2		EST	Ac Armstrong
16.6	CONTACTOR				9	"	2	1	EST		0.5	1	0.5	2		EST	EST
16.7	HEATER				2	"	2	2.151	P34		0.5	3.2	0.5	4.2		P34	Heater elec grd.
	ASSY - ASSY LADDER MOTOR CONTROL ENCLOSURE ASSY																
17.1	CARRIAGE DC DRIVE SYSTEM	1 HP DC MOTOR ELEC BRAKE			1	b-04 9-2-15	2	19.528	Calculated		1.0	6	1	8		EST	Mot Elec HP + elec brake = 7.552 + 11.976
17.2	POTENTIOMETER	SHIELD			1	"	2	3.915	P40		0.5	1	0.5	2		P40	DC Mechanical grd
17.3	LOGIC DC DRIVE				1	"	2	4.575	P28		0.5	2	0.5	3		P28	Mot Shp grd
17.4	TRANSFORMER		6436-2511		2	" 1-06	2	1	EST		0.5	1	0.5	2		EST	EST
17.5	FUSE		—	—	19	"	2	2.101	P18		0.5	1	0.5	2		P18	Fuse grd
17.6	RELAY		7110-N-[illegible]		15	"	2	.166	P33		0.5	1	0.5	2		P33	Relay gen grd
17.7	MOTOR STARTER		10FK-B40		2	"	2	1.013	P33		0.5	1	0.5	2		P33	Relay, Contactor grd
17.8	DISCONNECT SWITCH		145FF-NF30	01121	1	"	2	1.133	P37		0.5	1.6	0.5	2.6		P37	Swit Sens grd

a. Fission - EST -
b. Calcor - SEI -
c. See Carlos Files red folder

*Information is detailed in Supplemental Data Sheet

**Fa Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

ΣNλ = ____ x 10^{-6}/HR ΣNλTM = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{\Sigma N\lambda TM}{\Sigma N\lambda}}$ x 100% = ____ %

MATH CHECKED 12-4-15

SUMMARY - BUILDING BLOCK: 15 METAL PARTS FURNACE (MPF)

SUB SYSTEM	ITEM NO	λ_{ND} (1),(2) $\times 10^{-6}$	$\lambda_{ND} N_{D_1}$ (1) $\times 10^{-6}$	MAINT. FACTOR (1)	$\lambda_{ND} N_{D_1} \pi_M$ $\times 10^{-6}$	MAINT FACTOR		λ_{ND} MAINT $\times 10^{-6}$	MAINT FACTOR	
QUENCH TANK	5.1	105.6 ✓	306.6 ✓	1X	613.2 ✓	2X	(2)			
[illegible]	5.2	105.4 ✓	337.7 ✓	1X	675.4 ✓	2X				
[illegible]	5.3	263.4 ✓	783.7 ✓	1X	1567.4 ✓	2X				
[illegible]	5.4	195.9 ✓	559.3 ✓	1X	1118.6	2X				
[illegible]	5.5	48.8 ✓	198.4 ✓	1X	396.8 ✓	2X				
[illegible]	5.6	74.6 ✓	304.1 ✓	1X	608.2 ✓	2X				
[illegible]	5.7	325.8 ✓	940.1 ✓	1X	940.1 ✓	1X				
[illegible]	5.8	569.5 ✓	2015. ✓	1X	3022.5 ✓	1.5X				
[illegible]	5.9	319.9 ✓	1381.4 ✓	1X	2072.1 ✓	1.5X				
[illegible]	5.10	148.2 ✓	1072.1 ✓	1X	3216.3 ✓	3X	FURNACE ASSY	3752.4 ✓	3.5	(2), (3)
[illegible]	5.11	253.1 ✓	848.1 ✓	1X	2544.3 ✓	3X		2968.4 ✓	3.5	
[illegible]	5.12	194.0 ✓	583.9 ✓	1X	1751.7 ✓	3X		2043.7 ✓	3.5	
[illegible]	5.13	149.9 ✓	590.6 ✓	1X	1771.8 ✓	3X		2067.1 ✓	3.5	
[illegible]	5.14	165.0 ✓	652.7 ✓	1X	1958.1 ✓	3X		2284.5 ✓	3.5	
[illegible]	5.15	307.4 ✓	700.8 ✓	1X	2102.4 ✓	3X		2452.8 ✓	3.5	
[illegible]	5.16	233.4 ✓	937.6 ✓	1X	2618.8 ✓	3X		3288.6 ✓	3.5	
[illegible]	5.17	166.9 ✓	743.0 ✓	1X	2229.0 ✓	3X		2600.5 ✓	3.5	
[illegible]	5.18	308.9 ✓	1732.2 ✓	1X	2598.3 ✓	1.5	(2)			
[illegible]	5.19	169.7 ✓	753.4 ✓	1X	2260.2	3X		2634.9 ✓	3.5	(2), (3)
[illegible]	5.20	192.1 ✓	414.1 ✓	1X	414.1 ✓	1X	(2)			
[illegible]	5.21	75.8 ✓	274.4 ✓	1X	274.4 ✓	1X				
Σ		4380.3 ✓ $\bar{\lambda} = 204.6$ $\bar{\pi} = 117.9$ $\times 10^{-6}$			38716.0 (3) ✓ $\times 10^{-6}$			MTBF = 228.3 ✓		
								MTTR = 8.77 ✓		
								A = .9630 ✓		

(1) FROM RAW DATA SHEETS.

(2) ADDED FOR FINAL CALC.

MPF Parallel Items Summary

For A/P Control System, See DFS

5.2 Process Water

1. 2 HV + Contr V in par w. 1 HV — $\Delta_1 = 21.5 \times 10^{-6}$, $\Delta_2 = 49.6$ " } See DFS QT's/S.

2. 2 HV + Contr V + Chk V in par w. Sump — $\Delta_1 = 36.6$?, $\Delta_2 = 74.2$? } See DFS QT's/S.

$\Sigma\Delta_1 = 58.2$ $\Sigma\Delta_2 = 123.7$

5.3 Steam & Condensate

1. Enclosure Heater 409

#12 (2 HV + 2 CK V + Htr Coil + Fan + Motor + Temp Controller)

$2 \times 1.766 + 3.014 + 1.242 + 2.858 + 1.206 + 4.338 = 15.65$, $\times \frac{2}{5} = 10.433$

$\Delta_1 = 15.65 \times 2 - 10.433 = 20.9$

$N\lambda_{TH}$ $(2 \times 1.766 \times 2 + 3.014 \times 2 + 1.242 \times 4.2 + 2.858 \times 4 + 1.206 \times 3.4 + 4.338 \times 4) = 71.631$, $\times \frac{2}{3} = 47.8$

$\Delta_2 = 71.8 \times 2 - 47.8 = 95.6$

2. Encl Htr 413, 413, 414 in Parallel $15.65 \times \frac{2}{11} = 8.536$ $\Delta_1 = 15.65 \times 3 - 8.536 = 38.4$

$\Delta_2 = 71.8 \times 3 - 71.8 \times \frac{2}{11} = 195.7$

3. Encl Htr 417, 418 $\Delta_1 = 20.9$, $\Delta_2 = 95.6$

4. 2 HV + Contr Valve in par w. 1 HV $\Delta_1 = 21.5$ $\Delta_2 = 49.6$

5. MPF Shroud Htr 419 2 Htr coil in par $1.242 \times \frac{2}{3} = 0.828$ $\Delta_1 = 1.242 \times 2 - 0.828 = 1.656$

$\Delta_2 = 1.242 \times 4.6 \times 2 - 1.242 \times 4.6 \times \frac{2}{5} = 7.6$

$\Sigma\Delta_1 = 103.$

$\Sigma\Delta_2 = 423.7$

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #6 ROCKET DEMIL MACHINE (RDM)

MUNITION	AGENT	EXP.	PROP.	Nx	MTBF	NxTM	MTTR	AVAI ABIL
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	2654.534	377	32442.332	12.30	.96
Rocket, 115mm, M55	VX	Comp B	M28	2654.534	377	32442.332	12.30	.96
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 155mm, M121A1	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 155mm, M121	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 155mm, M122	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 8", M426	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 155mm, M121A1	VX	None	None	N/A	N/A	N/A	N/A	N/
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	N/A	N/A	N/A	N/A	N/
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	N/A	N/A	N/A	N/A	N/
Projectile, 155mm, M104	HD	Tetrytol	None	N/A	N/A	N/A	N/A	N/
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None	N/A	N/A	N/A	N/A	N/
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1	HD	Tetryl	M6	N/A	N/A	N/A	N/A	N/
Cartridge,Mortar, 4.2",M2/M2A1	HT	Tetryl	M6	N/A	N/A	N/A	N/A	N/

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #6 ROCKET DEMIL MACHINE (RDM)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAI ABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	N/A	N/A	N/A	N/A	N/
Tank,Spray, TMU-28/B	VX	None	None	N/A	N/A	N/A	N/A	N/
Ton Container	GB	None	None	N/A	N/A	N/A	N/A	N/
Tone Container	VX	None	None	N/A	N/A	N/A	N/A	N/
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	N/A	N/A	N/A	N/A	N/

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK
#6 ROCKET
DEMIL MACHINE
(RDM)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. REFERENCE ATTACHED LIST DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER DRAFT DEMIL PLAN FOR CAMDS VOLUMES I AND 2 DATE: AUGUST 1975

d. DISCUSSIONS WITH TEAD (LT. W. SEEGLITZ) 21 OCTOBER 1975

2. NOTES _____

B. FAILURE DATA

1. SOURCE

a. CUSTOMER REFERENCE NOTE _____

b. OTHER RADC-TR-74-268, FINAL REPORT, OCTOBER 1974, "REVISION OF RADC NONELECTRONIC RELIABILITY NOTEBOOK" (RADC-TR-67-458, SE

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM THE TWO PRIME SOURCES

*(1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERATIONAL/TEST DATA
*LIMITED SAW BLADE TEST DATA WAS AVAILABLE AND WAS CONSIDERED

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA REFERENCE NOTE

b. TEAD/EA REFERENCE NOTE

c. OTHER RADC-TDR-64-373, VOL II FINAL REPORT, DECEMBER 1964. "ANALYSIS OF MAINTENANCE TASK TIME DATA".

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM THE TWO PRIME SOURC

(1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERATIONAL/TEST DAT

D. GENERAL REMARKS

FIRST SUBMITTAL DATE: 12-1-75 PRELIMINARY COPY OF WORK SHEETS GIVEN TO CUSTOMER (R. ROUX) FOR PURPOSES OF DEMONSTRATING METHODOLOGY USED.
SECOND SUBMITTAL DATE: 12-9-75 PRELIMINARY FOR MSS ROCKET PROCESS FLO PRELIMINARY AVAILABILITY ESTIMATION.
THIRD SUBMITTAL DATE: 12-30-75

BUILDING BLOCK: #6 ROCKET DEMIL MACHINE (RDM)

DRAWINGS

06-205-02	NOV 7, 1974
-306-06	JAN 8, 1974
-07	JAN 8, 1974
-08	JAN 9, 1974
-17	JAN 10, 1974
-19	JAN 15, 1974
-25	JAN 24, 1974
-27	MAR 14, 1975
-28	MAR 24, 1975
-29	MAY 15, 1975
-30	APR 8, 1975
-31 1/4	APR 4, 1975
-31 2/4	APR 10, 1975
-32	FEB 1, 1974
-33	FEB 4, 1974
-34	JAN 23, 1974
-35	JAN 25, 1973
-42	JAN 29, 1974
-45	JUL 1, 1974
-46	MAR 14, 1975
-49	MAR 24, 1975
-50	JUL 25, 1975
06-526-1/4	AUG 2, 1972 - REVISION 1 (7/16/74)
-2/4	AUG 6
-3/4	AUG 15, 1972
-4/4	AUG 10, 1972
-06	APR 10, 1975

06-527-01	OCT 22, 1975
-02	NOV 3, 1975
-03	NOV 3, 1975
-04	JUL 19, 1975
-05	JUL 26, 1975
-06	JUL 29, 1975
-07	JUL 21, 1975
-08	JUL 17, 1975
-09	OCT 22, 1975
-10	JUL 18, 1975
-11	JUL 29, 1975
-12	AUG 15, 1975
-13	AUG 14, 1975

FAILURE RATE FACTORS:

HIGH CYCLIC APPLICATION FACTOR:

	MUNITION PROCESSING RATE (DA)	MUNITION PROCESSING RATE (HR)	FAILURE RATE FACTOR
CONDITION A (BASE)	N/A	N/A	1 (BASE)
CONDITION 1	400	20	2
CONDITION 2	650	32.5	3.25
CONDITION 3	800	40	4
CONDITION 4	1000	50	5

MAINTAINABILITY FACTORS:

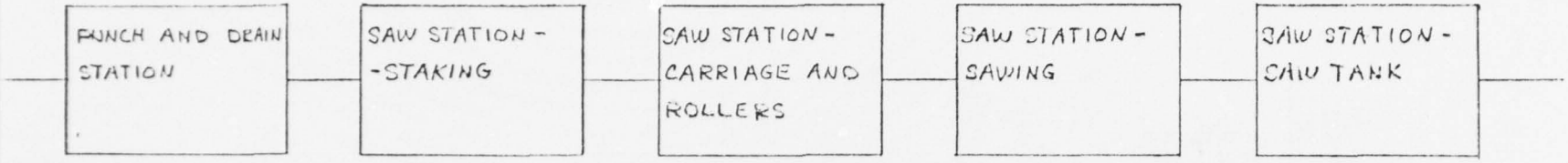
MAINTAINABILITY FACTOR (SUIT REQUIREMENT):

SUIT REQUIREMENT	CONDITION B FACTOR
STREET	1
GLOVES	1.5
MASK AND GLOVES	2
PRESSURIZED SUIT	3

MAINTAINABILITY FACTOR (ACCESSIBILITY/SPACE LIMITATIONS)

ACCESSIBILITY/SPACE LIMITATION	CONDITION C FACTOR
NO LIMITATION	1
LIMITATION	1.33

BUILDING BLOCK NO. 6 - ROCKET DEMIL MACHINE (RDM) FLOW CHART



EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. G SYSTEM: SPACE MISSILE

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
PUNCH AND DRAIN STATION	PUNCH AND DRAIN ROCKET				(506)											
O-RING (4 PORTS)	PROVIDES LOADING ON PACKING	—	—	2	0812	2	0.100	EST	0.200	—	—	—	2.0	0.400	EST	MAN TM FROM SEC 2.2 E.3
PACKING (TEFLON)	PROVIDES AIR TIGHT SEAL DURING DRAINING	1222	71724	2	0813	2	13.396	P22	26.792	—	—	—	2.0	53.584	(507, 508, 509, 510, 511, 512, 513, 514)	SEE NOTE AND CALCULATION SHEET FOR MTBF AND MTTR USED.
HOSE ASSY	AGENT DRAIN HOSE	—	85002	1	0815	2	0.240	P24	0.240	—	—	—	2.0	0.480	EST	
PUNCH	PUNCH HOLE IN ROCKET TO DRAIN AGENT	—	—	2	2501	2	2.0	EST	4.0	—	—	—	2.0	8.0	EST	
ACTUATOR, HYD	PUNCH ACTUATOR	2K-HA-SC-06-CC-K	05283	2	3201	2	15.228	P15	30.456	—	—	—	4.0	121.824	P234	
CLAMP, HYD	PUNCH AND DRAIN STATION CLAMP	C-HA-RF-04-CC	05283	1	3202	2	15.228	P15	15.228	—	—	—	4.0	60.912	P234	
PRESSURE REGULATOR	REGULATES AIR PRESSURE DURING DRAINING	5420R	53471	1	3203	2	2.249	P32	2.249	—	—	—	2.9	6.522	P175	
VALVE, SOL.	AIR LINE TO CLAMP AIR PRESSURE CONTROL DURING DRAINING	8210093	04349	1	3204	2	2.404	P42	2.404	—	—	—	2.5	6.010	P198	

$\Sigma N\lambda$ = _____ x 10^{-6}/HR $\Sigma N\lambda TM$ = _____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{_____}}$ = _____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = _____ = _____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = _____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

all CYCLE ITEM

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 2 ROCKET DEMIL MACHINE

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
PUNCH AND DRAIN ACTION (CONT'D)																
HOSE ASSY	AIR LINE TO CLAMP	—		1	3205	2	0.240	P24	0.240	—	—	—	2.0	0.480	EST	
HOSE ASSY	HYDRAULIC LINE	3000 SERIES	85757	2	3215	2	0.240	P24	0.480	—	—	—	2.0	0.960	EST	
HOSE ASSY	HYDRAULIC LINE	3003 SERIES	85757	2	3211	2	0.240	P24	0.480	—	—	—	2.0	0.960	EST	
SWITCH (LS6)	PUNCH CLAMP ACTUATED			1	50	2	1.133▲	P37	1.133▲	—	—	—	2.6	2.946▲	P165	
SWITCH (LS7, LS8)	PUNCHES RETRACTED			2	50	2	1.133▲	P37	2.266▲	—	—	—	2.6	5.892▲	P165	
SOLENOID SW (PS1)	ROCKET DRAINED			1	50	2	2.095▲	P36	2.095▲	—	—	—	2.0	4.190▲	EST	
SWITCH, FLOAT (FS4)	AGENT TANK EMPTY	501	SENSAL	1	50	2	1.133▲	P37	1.133▲	—	—	—	2.6	2.946▲	P165	
PRESSURE SW (PS2)	LOW DRAIN AIR PRESSURE			1	50	2	2.095▲	P36	2.095▲	—	—	—	2.0	4.190▲	EST	
BUSHING	PUNCH BEARING	S-88-48	99105	2	0814	2	2.180	P23	4.360	—	—	—	2.3	10.028	P234	λ=AIRBORNE/6.5, REMOVE AND REPLACE: 4 HR 2 INC = 2.3 HR/INC
PRESSURE SW (ΔP)	ROCKET DRAINED			1		2	2.095▲	P36	2.095▲	—	—	—	2.0	4.190▲	EST	
VALVE, 2WAY SOL		8211 B26		1	(526) 1,24	2	16.559▲	P43	16.559▲	—	—	—	3.3	54.645▲	P158 P43 P234	λ=AIRBORNE/6.5, REMOVE REPLACE: 65 THRU 72 = 2.3 HRS/INC

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} \times$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. & ROCKET DEMIL MANUAL S

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (x10⁻⁶/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (x10⁻⁶)	SOURCE (*)	
[illegible] AND DRAIN FATION (CONT'D)																
[illegible] CLAMP JAWS				2		2	NEG	–	–	–	–	–	–	–	–	
[illegible] CATCH TANK		–	–	1	4401-4402	2	NEG	–	–	–	–	–	–	–	–	REMAIN AGENT DRAIN [illegible] (CONTINUED) INCLUDES [illegible] (REC) PLANNING

ΣNλ = ____ x 10^{-6}/HR ΣNλTM = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 11 OF 16

BUILDING BLOCK NO. 6 ROCKET [illegible]

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ. (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
STAKING STATION (DAF-M2)	STAKING				(306)											
CYLINDER, HYD	POSITIONING CLAMP ACTUATION	1⅛ AN-FF-3	05283	1	3213	2	15.228▲	P15	15.228▲	-	-	-	4.0	60.912▲	P234	
CYLINDER, HYD	STAKER ACTUATION	2½ AN-FF-1¼	05283	2	3214	2	15.228▲	P15	30.456▲	-	-	-	4.0	121.824▲	P234	
[illegible]MING		-	99105	2	0603	2	2.180	P23	4.360	-	-	-	2.3	10.028	P234	λ=AIRBORNE/A.C
[illegible]		-	-	2	1209	2	NEG	-	-	-	-	-	-	-	-	
JAW	HOLDS ROCKET FOR STAKING	-	-	2	1910	2	NEG	-	-	-	-	-	-	-	-	

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$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK AGC ROCKET P.C.U. MK-11A

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
ASSOCIATION (CARRIAGE AND ROLLER)	ROCKET POSITIONING				(306)											
ROLLER WITH BEARINGS (2)	CARRIAGE IDLER ROLLERS	290	38911	5	1709	2	2.059	P16	20.590	–	–	–	2.0	41.180	EST	FAILURE RATE BASED ON [illegible] AND TAKE A HABITAT OF [illegible] MEAN OF A [illegible] REMOVE AND REPLACE CLEANING R&R TIME HR [illegible] TALKEFORD MAINTA [illegible]
ROLLER WITH BEARINGS (4)	TANK ROLLER	482	01509	1	3011	2	2.059	P16	4.118	–	–	–	2.0	8.236	EST	R&R PER ABOVE
CYLINDER, HYD	ROLLER RETRACT + EXTEND	1½-NH-FF-2-00-0	05283	5	3501	2	15.228▲	P15	76.140▲	–	–	–	4.0	304.560▲	P234	
CYLINDER, HYD	ROLLER RETRACT + EXTEND	1½-MH-RF-24-66-0	05283	1	3502	2	15.228▲	P15	15.228▲	–	–	–	4.0	60.912▲	P234	
ANGLE	GUIDES	A352	75223	2	2010	2	NEG	–	–	–	–	–	–	–	–	

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = _____ x 10^{-6}/HR $\Sigma N\lambda TM$ = _____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\text{_____}} = \text{_____}$ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\text{_____}}{\text{_____}} = \text{_____}$ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = \text{_____}\%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 6 OF 22

BUILDING BLOCK NO. 2 ASSEMBLY NO. 2.1 NOMENCLATURE [illegible]

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
SAW STATION (CARRIAGE AND ROLLERS) (CON'T)																
CYLINDER, HYD	RETRACT-EXTEND CARRIAGE	3¼-MH-FP-11-00-0	05283	2	3321	2	15.228	P15	30.456	–	–	–	4.0	121.824	P234	
FLOW DIVIDER	RETRACT PIPING	P307	20977	1	3323	2	16.559	P43	16.559	–	–	–	3.3	54.645	P158 (1), 194, 223, 224, 259, 325	NO AP 2 ASSEMBLY FLOW TO A 2-WAY SOLENOID (REFERENCE ENTRY 6-1
VALVE, 2WAY SOL		1728	37239	1	8518	2	16.559	P43	16.559	–	–	–	3.3	54.645	P158 (1), 194, 223, 224, 259, 325	REPAIRING/L.S, REPLACE: 90 MAN/29 IN = 3.3 MAN/INC
SWITCH, LS9	ROCKET IN SAW POSITION			1	50	2	1.133	P37	1.133	–	–	–	2.6	2.946	P165	
SWITCH, LS10	CARRIAGE UP			1	50	2	1.133	P37	1.133	–	–	–	2.6	2.946	P165	
SWITCH, LS11	CARRIAGE DOWN			1	50	2	1.133	P37	1.133	–	–	–	2.6	2.946	P165	
MOTOR				1	50	2	1.206	P29	1.206	–	–	–	7.6	9.166	P181, 115	
BEARINGS				1		2	NEG	–	–	–	–	–	–	–	–	

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$\Sigma N\lambda$ = _____ x 10^{-6}/HR $\Sigma N\lambda TM$ = _____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\text{_____}} =$ _____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ _____ = _____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ _____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 5 ROCKET PLANT MAINTENANCE

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	Nλ TM (X10^{-6})	SOURCE (*)	
SAW STATION (SAW-1/2/3)	ROCKET SAWING				(306)											
HOSE, HYD	SAW CLAMPS	3003 SERIES	85757	26	3212	2	0.240	P24	6.240	–	–	–	2.0	12.480	EST	
CYLINDER, HYD	SAW EXTEND & RETRACT	1½-NH-FF-7-00-0	05283	6	3324	2	15.228 ▲	P24	91.368 ▲	–	–	–	4.0	365.472 ▲	P234	
FLOW CONTROLLER W/ CHECK VALVE	CYLINDER HYDRAULICS FLOW CONTROL	PCCM-B00-S	09990	6	3326	2	18.502 ▲	P43	111.012 ▲	–	–	–	3.3	366.340 ▲	P198, 199, 228, 241, 284, 285	λ=(λ CHECK VALVE + λ FLOW CONTROL) AS PER REF'S 198, 199 AND ELEMENTS 28 INCH FEED MECHANISM
CYLINDER, HYD	CLAMP ROCKET	3¼-NH-FF-3-00-K	05283	2	3401	2	15.228 ▲	P24	30.456 ▲	–	–	–	4.0	121.824 ▲	P234	
CYLINDER, HYD	CLAMP ROCKET	3¼-NH-FF-4-00-0	05283	12	3402	2	15.228 ▲	P24	182.736 ▲	–	–	–	4.0	730.944 ▲	P234	
SAW BLADE (SAW STATION 1, 2, 3, 5)	SECTION ROCKET		98118 (1,2,3) 07990 (5)	4	4501 (1,2,3) 4502 (5)	2	20.0 ▲	EST (TEST DATA WAS EXTRAPOLATED)	80.0 ▲	–	–	–	2.0	160.000 ▲	EST	ROM SAW BLADE FAILURE RATE RATIONALE: 44 BLADE CYCLES (SECTIONING OF M61 ROCKETS AT ROM STATIONS 1, 2, 3, AND 5) WITH NO FAILURES DEMONSTRATES A UPPER 50% CONFIDENCE LEVEL FAILURE RATE OF 152.24 X10^{-6} F/C (λ = 1522.4 X10^{-6} F/HR @ 10 C/HR). SIX FAILURES IN 2276 BLADE CYCLES (SECTIONING OF M61 ROCKETS AT ROM STATIONS 1, 2, 3, AND 5) WITH SIX FAILURES DEMONSTRATES A UPPER 50% CONFIDENCE LEVEL FAILURE RATE OF 2930.14 X10^{-6} F/C (λ = 29301.4 X10^{-6} F/HR @ 10 C/HR). THESE FAILURE RATES ARE LIMITED IN APPROPRIATENESS TO THIS ANALYSIS BY THE NUMBER OF TESTS RUN, THE NUMBER OF FAILURES, AND BY THE NON-APPLICABILITY OF THE TESTS TO THE PROJECTED PRODUCTION SITUATION (THROUGH THE TEST PROGRAM IT WAS FOUND THAT A REDUCTION IN CUTTING SPEED REDUCED BLADE BREAKAGE AND EXTENDED BLADE LIFE). BECAUSE OF THESE LIMITATIONS TH (DISCUSSION CONTINUED ON NEXT PAGE)

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NOX ROCKET [illegible]

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL. CONSEQ (**)	RATE λ ($\times 10^{-6}$/HR)	SOURCE (*)	NλN	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM ($\times 10^{-6}$)	SOURCE (*)	
SAW STATION (SAWING) (CONT)																
SAW BLADE (SAW STATION 4,5)	SECTION ROCKET		54940	2	4502	2	200.0	EST (TEST DATA WAS CONSIDERED)	1100.0	–	–	–	2.0	600.0	EST	RDM SAW BLADE FAILURE RATE RATIONALE TO BEGIN ON PAGE 7 AND CONTINUED ON PAGE 7
SAW MOTOR	POWERS SAW		–	4	0205	2	2.413	P28	9.652	–	–	–	7.6	73.355	EST	TM MTR EST & TM PUMP
SAW MOTOR	POWERS SAW		–	2	0221	2	2.413	P28	4.826	–	–	–	7.6	36.678	EST	TM MTR EST & TM PUMP
SWITCH LS12-17	SAWS UP MONITOR			6	50	2	1.133	P37	6.798	–	–	–	2.6	17.675	P165	
SWITCH LS18-23	SAWS DOWN MONITOR			6	50	2	1.133	P37	6.798	–	–	–	2.6	17.675	P165	
SOLENOID VALVES DBL ACT OPERATED	HOLDS SAWS & CARRIAGE UP			3	–	2	3.014	P41	9.042	–	–	–	2.0	18.084	EST	
ELECTRICAL CONN	RDM FUNCTIONS		TYB	30	(522) 1,29-32	2	0.460	P20	13.800	–	–	–	2.0	27.600	EST	

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

RDM SAW BLADE FAILURE RATE RATIONALE (CONTINUED FROM PREVIOUS PAGE)
DEMONSTRATED FAILURE RATES BASED ON THIS DEVELOPMENT TEST DATA IS NOT APPLIED IN THIS ANAL
WHICH IS INTENDED TO REPRESENT THE MATURE SYSTEM (CONSTANT FAILURE RATE) PRODUCTION R
ESTIMATED FAILURE RATES BELIEVED TO BE CONSISTENT WITH THE REDUCED OPERATIONAL BLA
SPEED, PERIODIC MAINTENANCE PLAN (REGULAR SHARPENING WITH A NEWLY PURCHASED SAW BLADE
SHARPENING MACHINE), AND A MATURE SYSTEM CONSTANT FAILURE RATE. USED THROUGHOUT THIS ANALYSIS
ARE USED HEREIN. A FAILURE RATE OF 20×10^{-6} F/HR, WHICH REPRESENTS ONE OF THE LARGEST COMPONENT FA

(DISCUSSION CONTINUED ON NEXT PAGE)

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK/SRB ROCKET MOTOR ASSEMBLE (

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TH (HR)	MλTM (X10^{-6})	SOURCE (*)	REMARKS
AW STATION (SAWING) (CONT)																
SAWS (7 SETS)	SECURE ROCKET/ROCKET SEGMENTS			14		2	NEG	–	–	–	–	–	–	–	–	
AW STATION (SAW ANA)	DECON RESERVOIR															
PUMP, DIAPHRAGM	CIRCULATE DECON DURING CUTTING		06428	1	3503	2	4.219▲	P30	4.219▲	–	–	–	7.6	32.064▲	P183,195	
PIPING	DECON PIPING	V124	30327	1	3508	2	0.240	P24	0.240	–	–	–	2.0	0.480	EST	
VALVE, 2 WAY	CONTROL FLOW	8211A30	34845	1	3513	2	16.559▲	P43	16.559▲	–	–	–	3.3	54.645▲	P159,163, 171,179, 184,191	SEE AIR DRAWING/E.S. [illegible]

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

RDM SAW BLADE FAILURE RATE RATIONALE (CONTINUED FROM PREVIOUS PAGE)
RATES USED IN THIS ANALYSIS, IS USED FOR BLADES AT RDM STATIONS 1, 2, 3, AND 6. A FAILURE RATE OF 200 X10^{-6} F/HR, WHICH REPRESENTS THE LARGEST COMPONENT FAILURE RATE USED IN THIS ANALYSIS IS USED FOR BLADES AT RDM STATIONS 4 AND 5 WHICH HAVE BEEN SHOWN TO BE THE RDM SAW STATIONS WHERE THE DUTY CYCLE IS MOST SEVERE.

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. EXHIBIT ATTN: MAINT. (S)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
AM STATION (SAW A/A)(CONT)																
FLOAT SW FS1-3	TANK LEVEL SENSING	501	SUCALL	3	50	3	—	—	—	—	—	—	—	—	—	REDUNDANT FLOATS TO FLOAT PREVENTS A FAILURE CAUSES LOSS
SWITCH	SLUDGE VALVE CIRCULATE/DRAIN POSITION			4	50	2	1.133	P37	1.133	—	—	—	2.6	2.946	P165	
VALVE, SOLENOID	DECON AIR PUMP			2	50	2	16.559	P43	33.118	—	—	—	3.3	109.269	P170, 176, 177, 179, 224, 241, 254, 255	REMOVE/REPLACE 4.3 HR/EA 3.3 HR/INC
TANK	SAW TANK	3101-3110	—	1	31	2	NEG	EST	—	—	—	—	—	—	—	

$\Sigma N\lambda$ = _____ x 10^{-6}/HR ΣNA_iTM = _____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = _____ HRS

	NA_C	+ NA_{CA}	= $\Sigma N\lambda$	MTBF
COND A	59.118	1297.693	N/A	N/A
COND 1	59.118	2595.386	2654.534	377
COND 2	N/A	N/A	N/A	N/A
COND 3	N/A	N/A	N/A	N/A
COND 4	N/A	N/A	N/A	

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100%

MTTR = $\frac{\Sigma NA_iTM}{\Sigma N\lambda}$ = $\frac{\quad}{\quad}$ = _____ HRS

	NA_CTM	+ $NA_{CA}TM$	= ΣNA_iTM	COND $\bar{A}$	COND $\bar{A}H$	COND ΣNA_iTM	MTTR
COND A	120.912	4032.068	N/A	N/A	N/A	N/A	N/A
COND 1	120.912	8465.136	8186.048	3	1.13	32[illegible]	[illegible]
COND 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
COND 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A
COND 4	N/A	N/A	N/A	N/A		N/A	N/A

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #8 UTILITIES (UTL)

MUNITION	AGENT	EXP.	PROP.	NA	MTBF	NATM	MTTR	AVAIL ABILI
*M55 ROCKET, GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	NEG	N/A	NEG	N/A	≈1.0
Rocket, 115mm, M55	VX	Comp B	M28	NEG	N/A	NEG	N/A	≈1.0
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	4328.879	2.81	43193.236	9.98	0.95
Projectile, 155mm, M121A1	GB	None	None	2874.761	348	28797.522	10.02	0.97
Projectile, 155mm, M121	GB	None	None	2874.761	348	28797.522	10.02	0.97
Projectile, 155mm, M122	GB	None	None	2874.761	348	28797.522	10.02	0.97
"Projectile, 8", M426	GB	None	None	1836.106	545	19514.633	10.08	0.981
Projectile, 155mm, M121A1	VX	None	None	2874.761	348	28797.522	10.02	0.972
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	4328.879	2.81	43193.236	9.99	0.95
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	2874.761	348	28797.522	10.02	0.97
Projectile, 155mm, M104	HD	Tetrytol	None	2874.761	348	28797.522	10.02	0.97
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None	NEG	N/A	NEG	N/A	≈1.0
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6	4328.879	2.81	43193.236	9.98	0.95
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6	4328.879	2.81	43193.236	9.98	0.95

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #8 UTILITIES (UTL)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*BULK ITEMS, GB/VX								
Bomb, 750#, MC-1	GB	None	None	NEG	N/A	NEG	N/A	≈1.0
Tank, Spray, TMU-28/B	VX	None	None	NEG	N/A	NEG	N/A	≈1.0
Ton Container	GB	None	None	NEG	N/A	NEG	N/A	≈1.0
Tone Container	VX	None	None	NEG	N/A	NEG	N/A	≈1.0
*TON CONTAINER, MUSTARD								
Ton Container	HD	None	None	NEG	N/A	NEG	N/A	≈1.0

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK
#8.0 UTILITIES (U

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. TCDS 08-308-02 DATE: 1 MAY 1975
TCDS 08-217-01 18 APRIL 1975

b. DOCUMENT NO. CAMDS REPAIR PARTS (INVENTORY CONTROL SYSTEM) DATE: 29 AUGUST 1975

c. OTHER TRW GENERATED FMEA DATE: 2 OCTOBER 1975

d. DISCUSSION WITH TEAD (T. THOMAS - HYDRAULIC UNIT) 21 OCTOBER 1975

e. DISCUSSION WITH TEAD (R. SCHNORENBERG - UTILITIES) 21 OCTOBER 1975

2. NOTES UTILITIES DRAWINGS (OTHER THAN THE HYDRAULICS UNIT) LIMITED IN NUMBER. THIS PREVENTED A COMPONENT LEVEL ANALYSIS (ANAL WAS DONE AT THE MAJOR UNIT LEVEL (EXCEPT THE HYDRAULICS UN

B. FAILURE DATA

1. SOURCE

a. CUSTOMER SEE NOTE

b. OTHER RADC-TR-74-263 FINAL REPORT, OCTOBER 1974, "REVISION OF NONELECTRONIC RELIABILITY NOTEBOOK" (RADC-TR-69-458, SECTION 2

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM THE TWO PRIME SOUR

(1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERATIONAL/TEST DA

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA SEE NOTE

b. TEAD/EA SEE NOTE

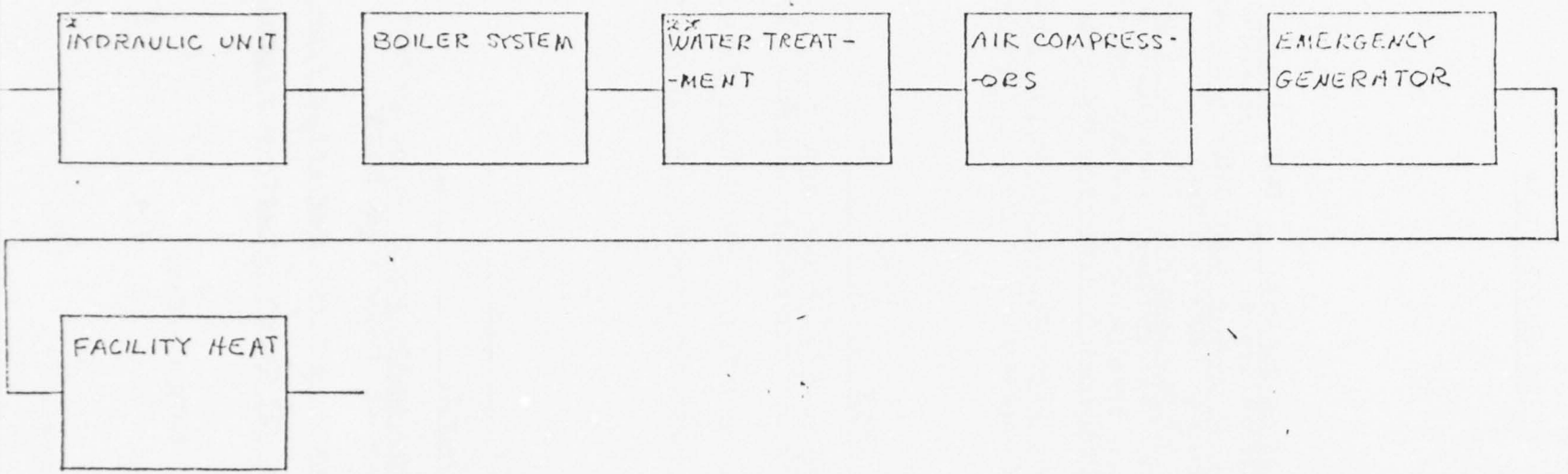
c. OTHER RADC-TDR-64-373, VOL II FINAL REPORT, DECEMBER 1964, "ANAL OF MAINTENANCE TASK TIME DATA"

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM TWO PRIME SOURCES:

(1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERATIONAL/TEST

D. GENERAL REMARKS
FIRST SUBMITTAL DATE: 1-5-76

BUILDING BLOCK: #8 UTILITIES (UTL) FLOW CHART



** ADDITIONAL WATER SOFTENERS (PRINCIPAL UNIT IS IN THE BOILER SYSTEM) - ONE EACH SERVICING ADS AND MPF REQUIREMENTS.

* HYDRAULIC UNIT APPLIES TO THE FOLLOWING DEMIL PROCESS FLOWS ONLY: PROJECTILES/CARTRIDGES 40MM WITHOUT FUZES; PROJECTILES/CARTRIDGES 40MM WITH FUZES; PROJECTILES

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 8 UTILITIES (UTL)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS

UTILITIES

BASIS OF ANALYSIS:

THE UTILITIES BUILDING BLOCK CONSISTS OF THOSE ITEMS OUTLINED ON DRAWING TCDS-08-217-01 AND A HYDRAULIC UNIT. DRAWING TCDS-08-217-01 LISTS BOILERS #1 AND #2, BOILER CONTROLS, AIR COMPRESSORS #1 AND #2, WATER TREATMENT, EMERGENCY GENERATOR, AND CONTROL PANEL. THESE UNITS HAVE GENERAL APPLICATION TO ALL DEMIL PROCESS FLOWS BUT ARE NOT YET WELL DEFINED AT THE COMPONENT LEVEL. HENCE IT IS NOT POSSIBLE TO DO A COMPONENT BASED AVAILABILITY ANALYSIS ON THIS PORTION OF THE UTILITIES BUILDING BLOCK. HOWEVER, FROM DISCUSSIONS WITH TEAD PERSONNEL, IT WAS FELT DETERMINED THAT THESE UNITS HAVE SUFFICIENT REDUNDANCY AT THE UNIT LEVEL THAT A SINGLE FAILURE WOULD LIKELY RESULT IN A FAILURE CONSEQUENCE OF NO MORE THAN CODE #3 (MINOR FAILURE-REPAIR DURING MAINTENANCE PERIOD. THE HYDRAULIC UNIT (SIMILAR IN CONFIGURATION TO THE ECC HYDRAULIC UNIT) SATISFIES THE HYDRAULIC REQUIREMENTS OF THE PPD DURING OPERATIONS IN THE FOLLOWING DEMIL PROCESS FLOWS: PROJECTILES/CARTRIDGES GB/VX WITHOUT BURSTERS, PROJECTILES/CARTRIDGES GB/VX WITH BURSTERS, PROJECTILES MUSTARD WITH BURSTERS, AND 4.2" MORTARS MUSTARD. THIS UNIT ALSO SATISFIES THE LIMITED HYDRAULIC REQUIREMENTS OF THE BIF. THE HYDRAULIC UNIT IS WELL DEFINED AT THE COMPONENT LEVEL, HAS NO UNIT LEVEL REDUNDANCY, AND IS SUCH THAT A FAILURE WOULD LIKELY RESULT IN A FAILURE CONSEQUENCE OF CODE #2 (PRODUCTION LINE SHUTDOWN FAILURE).

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = _____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 8 UTILITIES (UTIL)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ. (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
HYDRAULIC UNIT	SATISFIES END REQ OF PPD	–	–	1	2-338 (10-4)											
RESERVOIR ASSEMBLY	CONTAINS THE HYDRAULICS SUPPLY	"T-100	62783	1	0214	2	6.623	P37	6.623				9.0	59.607	P187,E8	REMOVE AND REPLACE 8.0 HR/CYCLE 9.2 HR
FILTER	PUMP INTAKE - FILTERS HYDRAULIC FLUID BEFORE IT IS PUMPED THROUGH THE SYSTEM.	"30FC-2F-10	62783	1	0210	2	2.987	P21	2.987				3.2	9.558	P186,E8 P70,E8	REMOVE AND REPLACE 0.8 HR /CLEAN EVERY 100
FILTER	RESERVOIR RETURN LINE - FILTERS HYDRAULIC FLUID THAT HAS BEEN PUMPED THROUGH THE SYSTEM.	"FM-2004	62783	1	0211	2	2.987	P21	2.987				3.2	9.558	P186,E8 P70,E8	REMOVE AND REPLACE 0.8 HR /CLEAN EVERY 100
LIQUID LEVEL SENSOR/FLOAT	UPPER AND LOWER RESERVOIR LEVELS - DETECTS LARGE SCALE HYDRAULIC FLUID LOSS.	"LS-500	04013	2	0216	3	–	–	–	–	–	–	–	–	–	NO REMOVAL AT 1ST ACTION COUNT
HYDRAULIC PUMP (DRIVES SYSTEM AT NORMAL PUMP OUTPUT WITH ONE PUMP IN STANDBY)	CIRCULATES HYDRAULIC FLUID AT 1000 PSI FROM THE RESERVOIR THROUGH THE SYSTEM.	"FV820-FLSFW-20CMC-11	62983	1	0212	2	17.570	P31	17.570				7.6	133.532	P189,E8	λ PUMP = 17.570 λ PUMP, HYDRAULIC FAILURE (FOR RECOVERY 87.8% REMOVE AND REPLACE 23.0 HR*/CYCLE

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\quad}{\quad} = \quad$ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = \quad\%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 8 UTILITIES (UTL)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (SIG)	NλTM (X10^{-6})	SOURCE (*)	
HYDRAULIC UNIT	(CONT'D)															
ELECTRIC MOTOR (1.5 HP, 1800 RPM, 3 PH, 60 CPS)	POWERS THE HYDRAULIC PUMP	-	62983	1	0213	2	1.206	P23	1.206				7.6	9.165	4, P	[illegible]
RELIEF VALVE	PROVIDES PROTECTION FOR THE HYDRAULIC SYSTEM IN THE EVENT OF AN OVERPRESSURE CONDITION.	*CTS-050A-B-60	62983	1	0207	2	1.514	P48	1.514				3.0	5.4600	[illegible] 10,2 [illegible]	[illegible]
PRESSURE SWITCH	PROVIDES DATA FOR REMOTE COMPUTER MONITORING OF THE SYSTEM	*CLTC-1-21	62983	1	0207	3	-	-	-	-	-	-	-	-	-	INSTRUMENTATION FUNCTION ONLY
CHECK VALVE	PREVENTS OIL FROM BACKFLOWING INTO THE PUMP	*C2-820	62983	1	0207	3	-	-	-	-	-	-	-	-	-	-

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = $\frac{\quad}{\quad}$ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 8 UTILITIES (CONT.)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
HYDRAULIC UNIT (CON'T)																
[illegible]	ASSURES A STEADY STATE HYDRAULIC OUTPUT FROM THE HYDRAULICS SYSTEM AT VARIOUS LOAD DEMANDS.	"A120 Q-20	62948	1	0213	2	7.351	P14	7.351				2.0	14.702	P14	[illegible]
PRESSURE RELIEVE VALVES	MANUALLY OPERATED VALVES THAT ARE USED TO LOWER THE SYSTEM PRESSURE TO VALVES (AND OPERATING UNITS) IMMEDIATELY DOWNSTREAM.	"AT-06-B20	62706	2	0203	3	—	—	—	—	—	—	—	—	—	VALVE ELIMINATION [illegible]
[illegible] VALVES	MANUALLY OPERATED VALVES THAT PROVIDE THE CAPABILITY TO INHIBIT FLOW IN CERTAIN LINES.	"AT-06-A[illegible]	62938	2	0202	3	—	—	—	—	—	—	—	—	—	THOSE VALVES [illegible] AT FULL [illegible]

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO 8 UTILITIES (WIL)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
HYDRAULIC UNIT	(CONT)															
							26.804									

SHT 1 OF 3

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. & UTILITIES AREA

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (x10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (x10^{-6})	SOURCE (*)	REMARKS
BOILER SYSTEM. TWO OF THE FOUR UNITS CONTAINED IN THE [illegible] INCLUDE:	PROVIDES STEAM SUPPLY FOR THE CAMPS FACILITY.	-	-	1	217-01 AND *	3										
BOILERS #1 AND #2 (EACH INCLUDES BURNER MOTOR, RELIEF VALVES, CHEMICAL FEED PUMPS, ETC)		CLEAVER BROOKS MODEL 600	-	2	*	3										THE BOILERS ARE SUCH THAT THE SITE O FUNCTION WITH ONE BOILER OPERATING BOILERS HAVE BEEN MT 125 PSI. [illegible] SURE IS UP TO 100 PSI
DEARATOR	SYSTEM OXYGEN REMOVAL	CLEAVER BROOKS MODEL SM 450		1	*	3										ONE-TANK UNIT. OPER AT 5-15 PSI
WATER SOFTENER	SOFTENS WATER	CULLIGAN MODEL HA-450	-	1	*	3										TWO UNIT BOILER FEE RATED AT 20 GPM CO INOUS RATE.
BLOWDOWN SEPARATOR	REMOVES HEAVY LIQUID FROM THE BOILER	CLEAVER BROOKS MODEL AS4B	-	1	*	3										ONE UNIT FOR THE SYST USES A MODEL AS AS AFTER COOLER.

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = $\frac{\text{____}}{\text{____}}$ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION / FAILURE/MAINTAINABILITY DATA

SHEET 7 OF 8

BUILDING BLOCK NO. B [illegible] S (MTI)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
BOILER SYSTEM (CONTINUED)																
AUTOMATIC CONTROLS	CONTROLS FIRING RATE OF BOILERS, MAIN CONTROL PANEL, DRAFT GAUGES, SMOKE MONITOR, STACK MONITOR, LOW WATER CUTOFF, HIGH WATER CUTOFF (WITH ALARM), STEAM GAGE, STEAM FLOW METER, SMOKE ALARM INDICATOR & RECORDER, FEED WATER TEMPERATURE & PRESSURE RECORDER, OXYGEN INDICATOR & RECORDER, AUTOMATIC CONTROLS FOR BOILERS (MONITOR EQUIPMENT - FLAME GUARD CONTROLS ETC ARE SUPPLIED WITH THE BOILERS).	—	-	1	*	3										
FUEL OIL TANKS AND PUMPS	SUPPLY FUEL OIL FOR BOILERS AND THE REST OF THE SITE	— (PUMPS - VIKING 310 SERIES)	-	3	*	3										THE TANKS ARE EACH 50,000 GAL CAPACITY THERE IS 2 OUT OF 3 REDUNDANCY AMONG THE PUMPS

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 8 UTILITIES (W.)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
	WATER TREATMENT (WATER SOFTENER)	THIS EQUIPMENT IS IN ADDITION TO THE BOILER WATER SOFTENER. THERE ARE TWO SOFTENERS CONSIDERED HERE AS FOLLOWS:															
		ADS WATER SOFTENER	CULLIGAN MODEL HA-450	–	1	*	3										TWO UNIT BOILER RATED AT 20 GPM STEAM RATE.
		MPF WATER SOFTENER	–	–	1	*	3										A SMALL HOUSEHOLD UNIT WITH BOILER CAPABILITY.
	AIR COMPRESSOR	PROVIDES COMPRESSED AIR FOR PUMPS, CYLINDERS, PLANT AIR ETC.	LE-KOI (DRESSER) MODEL 5062 KAHN CORP (UNIT INTEGRATOR)	–	2	*	3										(SECONDARY COMPRESSOR FOR A REQUIRED 50% LOAD SUPPLY AIR FOR THE UNITS BUT FREON PLANS DO NOT REQUIRE THIS.
	EMERGENCY GENERATOR	THE EMERGENCY GENERATOR PROVIDES POWER FOR CONTROLLED SHUTDOWN IN THE EVENT OF FAILURE TO THE PRIME POWER SOURCE. THERE ARE NO PLANS TO OPERATE A NORMAL CHEMICAL PROCESS LINE ON EMERGENCY POWER.	SUPERIOR	–	1	*	3										

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NON-UTILITIES (U.T.)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
FACILITY HEAT	SUPPLIES STEAM HEAT FOR TEMPERATURE CONTROL IN THE VARIOUS BUILDINGS.	-	-	1	*	3										THE ABLET CHANGE NOT ECONOMICAL TO THAT 70°F MUST BE MAINTA IN THAT REGS. IAW NAVE 43-3AA-04 IC NOT TO RELEASED.

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code:

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

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FAILURE RATE FACTORS:

HIGH CYCLIC APPLICATION FACTOR:

	MUNITION PROCESSING RATE (DA)	MUNITION PROCESSING RATE (HR)	FAILURE RATE FACTOR
CONDITION A (BASE)	N/A	N/A	1 (BASE)
CONDITION 1	400	20	2
CONDITION 2	650	32.5	3.25
CONDITION 3	800	40	4
CONDITION 4	1000	50	5

MAINTAINABILITY FACTORS:

MAINTAINABILITY FACTOR (SUIT REQUIREMENT):

SUIT REQUIREMENT	CONDITION B FACTOR
STREET	1
GLOVES	1.5
MASK AND GLOVES	2
PRESSURIZED SUIT	3

MAINTAINABILITY FACTOR (ACCESSIBILITY/SPACE LIMITATIONS)

ACCESSIBILITY/SPACE LIMITATION	CONDITION C FACTOR
NO LIMITATION	1
LIMITATION	1.33

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #9 ECC HYDRAULICS (EHM)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVA ABI
*M55 ROCKET, GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	1836.106	545	18514.839	10.08	.981
Rocket, 115mm, M55	VX	Comp B	M28	1836.106	545	18514.839	10.08	.981
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 155mm, M121A1	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 155mm, M121	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 155mm, M122	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 8", M426	GB	None	None	N/A	N/A	N/A	N/A	N/
Projectile, 155mm, M121A1	VX	None	None	N/A	N/A	N/A	N/A	N/
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	4328.373	231	43193.280	9.98	.95
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	2874.761	348	28797.533	10.02	.97
Projectile, 155mm, M104	HD	Tetrytol	None	2874.761	348	28797.533	10.02	.97
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None	3497.954	286	11655.711	10.00	.96
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6	4328.373	231	43193.280	9.98	.95
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6	4328.373	231	43193.280	9.98	.95

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #9 ECC HYDRAULICS (EHM)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVA ABI
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	N/A	N/A	N/A	N/A	N/
Tank,Spray, TMU-28/B	VX	None	None	N/A	N/A	N/A	N/A	N/
Ton Container	GB	None	None	N/A	N/A	N/A	N/A	N/
Tone Container	VX	None	None	N/A	N/A	N/A	N/A	N/
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	N/A	N/A	N/A	N/A	N/

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK #V0.9 ECC HYD--RAULICS (EHM)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. TCDS 08-308-02 DATE: 1 MAY 1975

b. DOCUMENT NO. CAMDS REPAIR PARTS (INVENTORY CONTROL SYSTEM) DATE: 29 AUGUST 1975

c. OTHER TRW GENERATED FMEA DATE: 2 OCTOBER 1975

d. DISCUSSION WITH TEAD (T. THOMAS) 21 OCTOBER 1975

e. COMPONENT SUPPLIER CATALOGS

2. NOTES

B. FAILURE DATA

1. SOURCE

a. CUSTOMER SEE NOTE

b. OTHER RADC-TR-74-268, FINAL REPORT, OCTOBER 1974, "REVISION OF RAT NONELECTRONIC RELIABILITY NOTEBOOK" (RADC-TR-69-458; SECTIO

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM THE TWO PRIME SOURCE

(1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERATIONAL/TEST DATA

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA SEE NOTE

b. TEAD/EA SEE NOTE

c. OTHER RADC-TDR-64-373, VOL II FINAL REPORT, DECEMBER 1964, "ANALY OF MAINTENANCE TASK TIME DATA"

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM THE TWO PRIME SOURCES

(1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERATIONAL/TEST DATA.

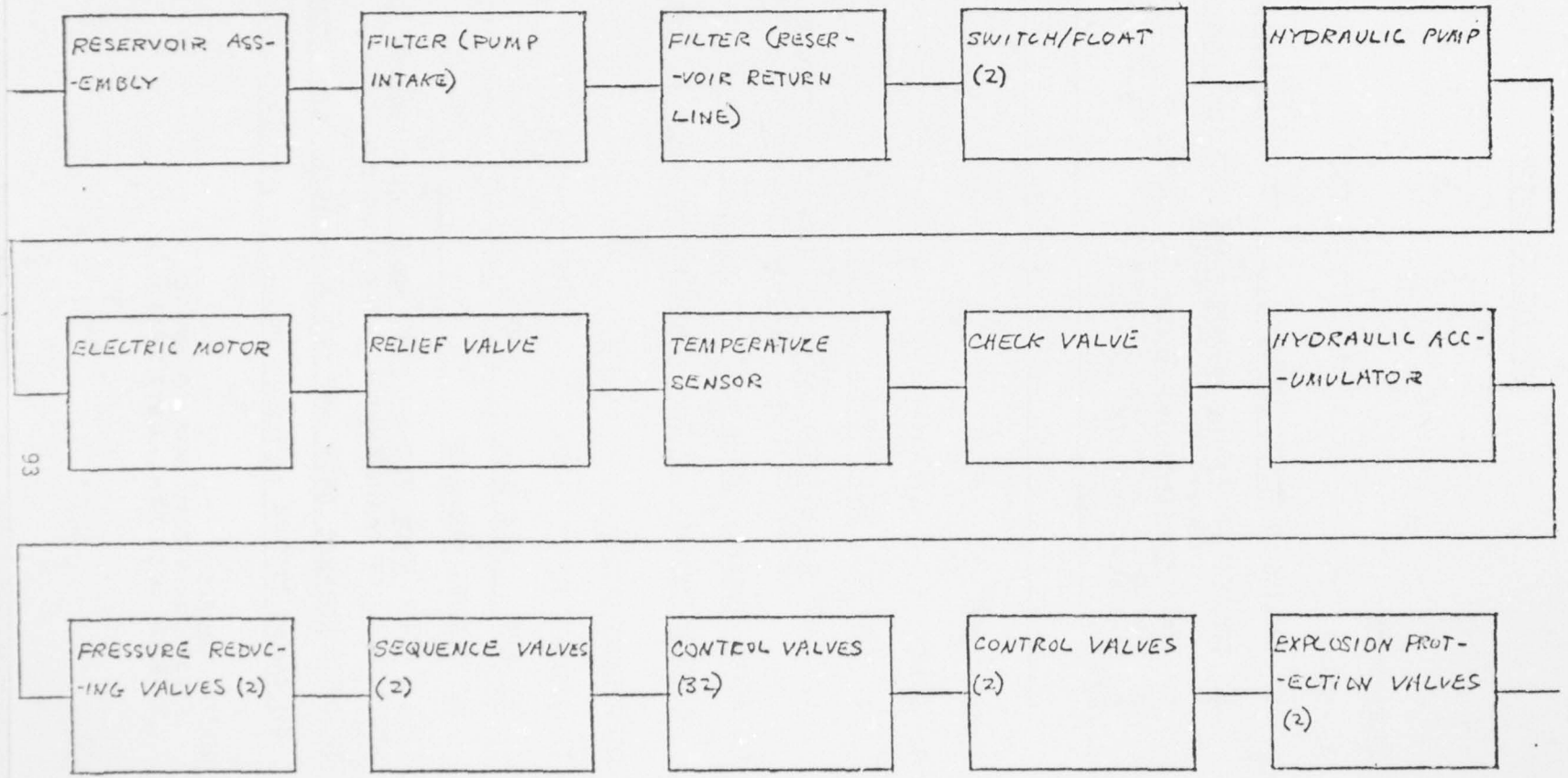
D. GENERAL REMARKS

FIRST SUBMITTAL DATE: 11-20-75

SECOND SUBMITTAL DATE: 12-30-75

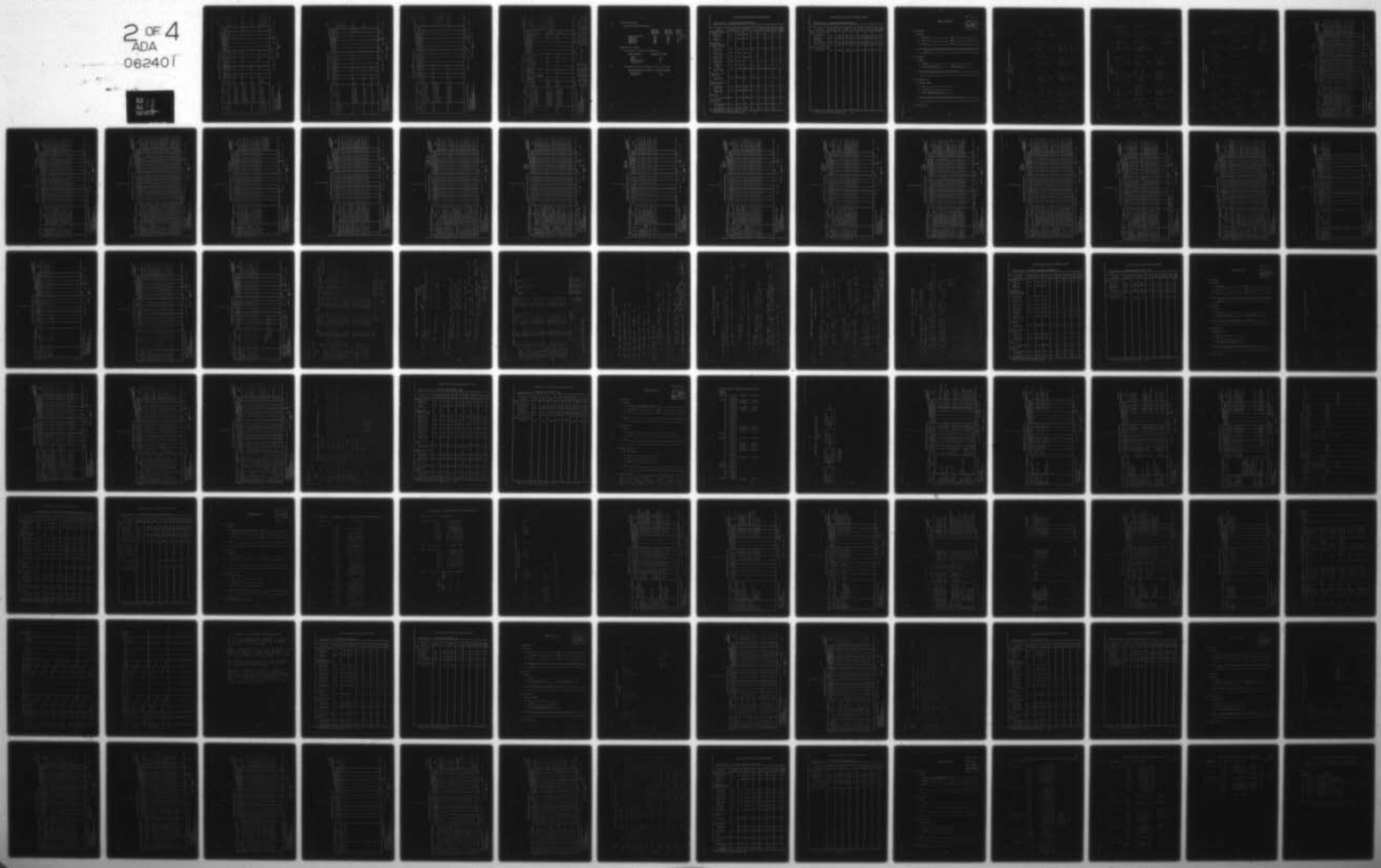
BUILDING BLOCK: #9 ECC HYDRAULICS (EHM)

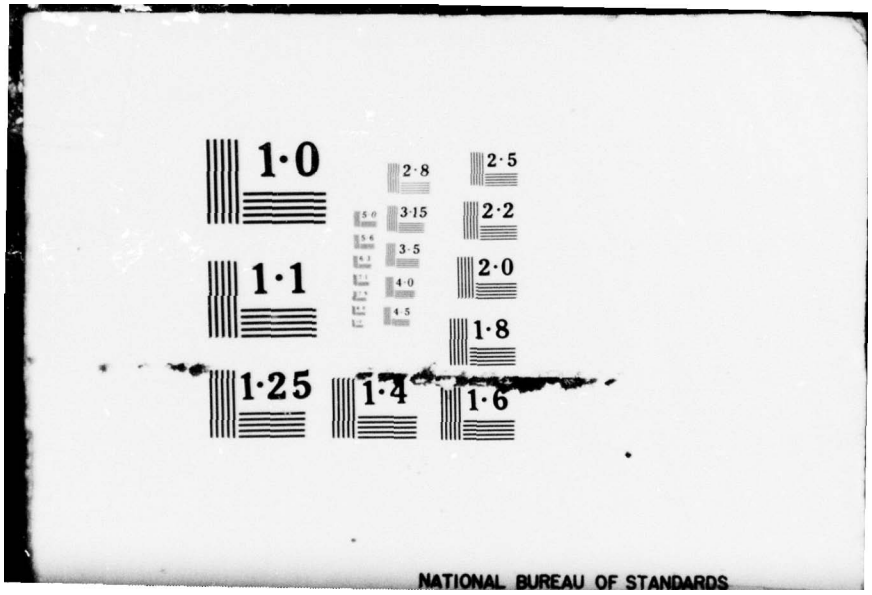
FLOW CHART



AD-A062 401 TRW/ENVIRONMENTAL ENGINEERING DIV REDONDO BEACH CA F/G 14/4
RELIABILITY AND MAINTENANCE PROGRAM ANALYSIS RELIABILITY AND MA--ETC(U)
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NATIONAL BUREAU OF STANDARDS

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 4

BUILDING BLOCK NO. 9 ECC HYDRAULICS

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
RESERVOIR ASSEMBLY	CONTAINS THE HYDRAULICS SUPPLY.	"T-100	62483	1	(30 0) 0214	2	6.623	P31	6.623				9.0	59.607	P167,21	REMOVE AND REPLACE: 45 HR/SYSTEM
FILTER	PUMP INTAKE - FILTERS HYDRAULIC FLUID BEFORE IT IS PUMPED THROUGH THE SYSTEM.	"50FC-2F-10	62183	1	0210	2	2.987	P21	2.987				3.2	9.558	P169,192 206,23	REMOVE AND REPLACE: 3.2 HRS/ASSEMBLY = 32 MR/M
FILTER	RESERVOIR RETURN LINE - FILTERS HYDRAULIC FLUID THAT HAS BEEN PUMPED THROUGH THE SYSTEM.	"DFM-3001D	62983	1	0211	2	2.987	P21	2.987				3.2	9.558	P169,19 206,230	REMOVE AND REPLACE: 3.2 HRS/ASSEMBLY = 32 MR/M
SWITCH/FLOAT	UPPER AND LOWER RESERVOIR LEVELS - DETECTS LARGE SCALE HYDRAULIC FLUID LOSS.	"LS-800	04039	2	0216	3	—	—	—	—	—	—	—	—	—	INSTRUMENTATION FUNCTION ONLY.
HYDRAULIC PUMP (VARIABLE DISPLACEMENT PISTON PUMP, INLINE TYPE WITH SPUR GEAR COMPENSATOR)	CIRCULATES HYDRAULIC FLUID AT 1000 PSI FROM THE RESERVOIR THROUGH THE SYSTEM.	"PVB20-FLSFW-20CMC-11	62983	1	0212	2	17.570	P31	17.570				7.6	133.532	P169,192	λ PUMP = 17.570 λ PUMP, HYDRAULIC VARIABLE DELIVERY 17.570 REMOVE AND REPLACE: 3.0 HRS/ASSEMBLY = 30 MR/M

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 2 OF 4

BUILDING BLOCK NO 9 ECC [illegible]

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
ELECTRIC MOTOR (15 HP, 1800 RPM, 3PH, 60 CYC)*	POWERS THE HYDRAULIC PUMP	-	62993	1	0213	2	1.206	P29	1.206				7.6	9.1656	EST	REMOVE AND REPLACE PITCH MOTOR ASSY / 1 MAN/1.5 HRS, MAN-HR IS BELIEVED HIGH FOR THIS APPLICATION. THE PUMP REMOVAL AND REPLACE TIME IS USED
RELIEF VALVE	PROVIDES PROTECTION FOR THE HYDRAULIC SYSTEM IN THE EVENT OF AN OVERPRESSURE CONDITION.	"CTS-060A--B-SO	62983	1	0209	2	1.514	P41	1.514				3.6	5.4504	P163,172, 198, 193, 210, 211, 225, 229, 241	REMOVE AND REPLACE / 6.0 HRS/1 MAN OF PLANT INC.
TEMPERATURE SENSOR	PROVIDES DATA FOR REMOTE COMPUTOR MONITORING OF THE SYSTEM.	"OCTC-1-21	62983	1	0207	3	-	-	-	-	-	-	-	-	-	INSTRUMENTATION FUNCTION ONLY
CHECK VALVE	PREVENTS OIL FROM BACKFLOWING INTO THE PUMP	"C2-820	62983	1	0205	3	-	-	-	-	-	-	-	-	-	-

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Ca[illegible]ophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = $\frac{\quad}{\quad}$ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET ___ OF ___

BUILDING BLOCK NO. 9 ESC INTERFACE

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	
HYDRAULIC ACCUMULATOR	ASSURES A STEADY STATE HYDRAULIC OUTPUT FROM THE HYDRAULICS SYSTEM AT VARIOUS LOAD DEMANDS.	"A12050-20	62983	1	0215	2	7.351	P14	7.351				2.5	18.3775	P191	REMOVE AND REPLACE IN 10 MAN-HOURS
PRESSURE REDUCING VALVES	MANUALLY OPERATED VALVES THAT ARE USED TO LOWER THE SYSTEM PRESSURE TO VALVES (AND OPERATING UNITS) IMMEDIATELY DOWNSTREAM.	"XT-06-B-20	62983	2	0203	3	—	—	—	—	—	—	—	—	—	VALVE LOCATION (TO WHAT TO A MANUALLY CONTROLLED VARIABLE ORIFICE) WHERE THE EXPECTED FAILURE MODE AMOUNT OF ACCEPTANCE AND A CONSEQUENCE
SEQUENCE VALVES	MANUALLY OPERATED VALVES THAT PROVIDE THE CAPABILITY TO INHIBIT FLOW IN CERTAIN LINES.	"RT-06-A2-22	62983	2	0202	3	—	—	—	—	—	—	—	—	—	THESE VALVES WILL BE SET AT FULL FLOW.

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 4 OF 4

BUILDING BLOCK NO. 9 EGC HYDRAULICS (SYS A)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
[illegible] VALVES	ELECTRO-MECHANICAL VALVES THAT ARE USED TO CONTROL HYDRAULIC FLUID FLOW TO DOWN-STREAM OPERATING UNITS.	"PBDG-45YL--012C-50	62983	32 (2 N/A ARE HIGH CYCLE APPLICATION)	0206	2	26.804 ▲ 26.804	EST	772.3 ▲ 857.412				3.3	2565.03 ▲ 2829.3	FIGS, [illegible] 117, 118, 238, 241, 254, 255	Δ CONTROL VALVE [illegible] (1 HR), Δ VALVE [illegible] APPLICATION. [illegible] OF HYDRAULIC SYSTEM BY HEAT EXCHANGER. MTBF [illegible] FROM THE SAME [illegible] 95%. THE [illegible] AIRBORNE BY 80%. FOR [illegible] WOULD BE 3 MAN-HRS. REMOVE AND REPLACE: 20.5 HRS/23 ACT = 3.2 HR/ITEM (INCLUDES MANIFOLD, SHUTTLE AND SOLENOID VALVES).
[illegible] CONTROL VALVES	ELECTRO-MECHANICAL VALVES THAT ARE USED TO CONTROL HYDRAULIC FLUID FLOW TO DOWN-STREAM OPERATING UNITS.	"PBDG-53YL--062-C-51	62983	2	0201	2	26.804 ▲	EST	53.608 ▲				3.3	176.906 ▲	FIGS, [illegible] 117, 118, 238, 241, 254, 255	
[illegible] FLOW PROTECT-[illegible] VALVES	ELECTRO-MECHANICAL VALVES THAT ARE USED TO PROTECT THE HYDRAULIC SYSTEM FROM THE EFFECTS OF AN EXPLOSION.	"PBEG-45ZL--012A-50	62983	2	0204	2	26.804	EST	53.608				3.3	176.906	FIGS, [illegible] 117, 118, 238, 241, 254, 255	

Δ CYCLE ITEM

$\Sigma N\lambda$ = _____ x 10^{-6}/HR $\Sigma N\lambda TM$ = _____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\text{_____}} \times \text{_____ HRS}$

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\text{_____}}{\text{_____}} = \text{_____ HRS}$

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\%$

	$N\lambda_C$	+	$N\lambda_{C-A}$	= $\Sigma N\lambda$	MTBF
COND A	174.258		830.424	N/A	N/A
COND 1	174.258		1661.848	1836.106	545
COND 2	174.258		2700.503	2874.761	348
COND 3	174.258		3323.696	3497.954	286
COND 4	174.258		4154.620	4328.878	231

	$N\lambda_C TM_C$	+	$N\lambda_{C-A} TM_{C-A}$	= $\Sigma N\lambda TM$	MTTR	AVAIL
COND A	687.5145		2054.535	2742.049	N/A	N/A
COND 1	687.5145		5484.076	6171.591	3	15[illegible]
COND 2	687.5145		8911.654	9599.174	3	26[illegible]
COND 3	687.5145		10968.196	11655.711	3	[illegible]
COND 4	687.5145		13710.245	14397.760	3	[illegible]

FAILURE RATE FACTORS:

HIGH CYCLIC APPLICATION FACTOR:

	MUNITION PROCESSING RATE (DA)	MUNITION PROCESSING RATE (HR)	FAILURE RATE FACTOR
CONDITION A (BASE)	N/A	N/A	1 (BASE)
CONDITION 1	400	20	2
CONDITION 2	650	32.5	3.25
CONDITION 3	800	40	4
CONDITION 4	1000	50	5

MAINTAINABILITY FACTORS:

MAINTAINABILITY FACTOR (SUIT REQUIREMENT):

SUIT REQUIREMENT	CONDITION B FACTOR
STREET	1
GLOVES	1.5
MASK AND GLOVES	2
PRESSURIZED SUIT	3

MAINTAINABILITY FACTOR (ACCESSIBILITY/SPACE LIMITATIONS)

ACCESSIBILITY/SPACE LIMITATION	CONDITION C FACTOR
NO LIMITATION	1
LIMITATION	1.33

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #13 AGENT DESTRUCTION SYSTEM (ADS)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL ABIL
*M55 ROCKET, GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	3397.2	214.4	23765.3	7.00	.97
Rocket, 115mm, M55	VX	Comp B	M28	4769.1	209.7	35493	7.55	.96
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	3397.2	214.4	23765.3	7.00	.97
Projectile, 155mm, M121A1	GB	None	None	"	"	"	"	"
Projectile, 155mm, M121	GB	None	None	"	"	"	"	"
Projectile, 155mm, M122	GB	None	None	"	"	"	"	"
Projectile, 8", M426	GB	None	None	"	"	"	"	"
Projectile, 155mm, M121A1	VX	None	None	4769.1	209.7	35493	7.55	.96
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	3397.2	214.4	23765.3	7.00	.97
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	2247.3	214.4	14482.4	6.44	.96
Projectile, 155mm, M104	HD	Tetrytol	None	"	"	"	"	"
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None	4769.1	209.7	35493	7.55	.96
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6	2248.3	444.7	14483.4	6.44	.97
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6	"	"	"	"	"

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #13 AGENT DESTRUCTION SYSTEM (ADS)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	3397.2	294.4	23765.9	7.00	.97
Tank,Spray, TMU-28/B	VX	None	None	4769.1	209.7	35993	7.55	.96
Ton Container	GB	None	None	3397.2	294.4	23765.9	7.00	.97
Tone Container	VX	None	None	4769.1	209.7	35993	7.55	.96
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	2241.3	446.8	14483.4	6.44	.98

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK # 13 AGENT DESTRUCT SYSTEM (ADS)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. _____ DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES Drawing No's are referenced on failure rate and maintainability data sheets

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____

b. OTHER RADC-TR-74-268 RADC-TR-69-458

2. NOTES Estimates were made where data not available

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

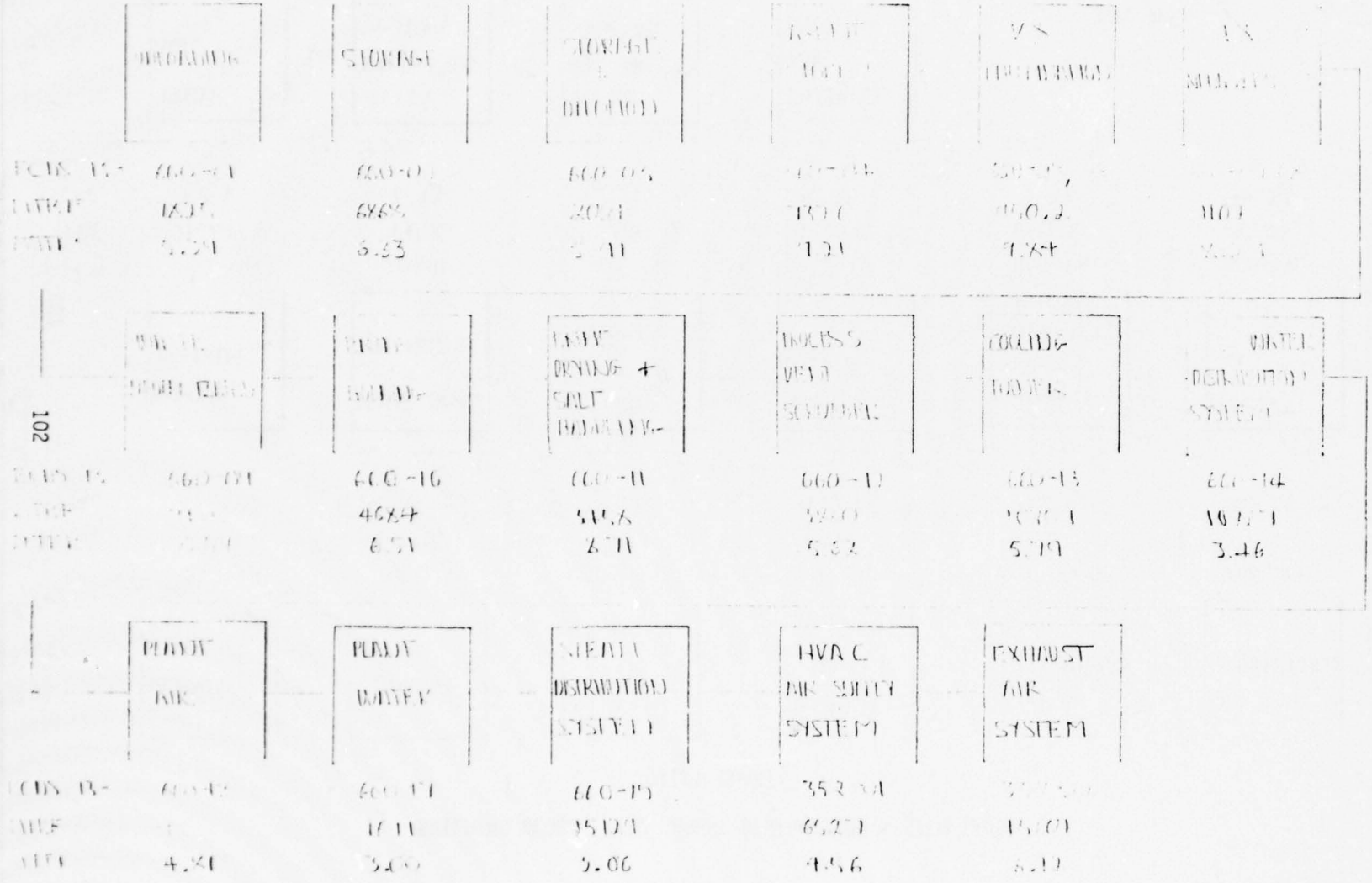
c. OTHER RADC-TDR-64-373 Vol II

2. NOTES Estimates were made where actual data not available.

D. GENERAL REMARKS

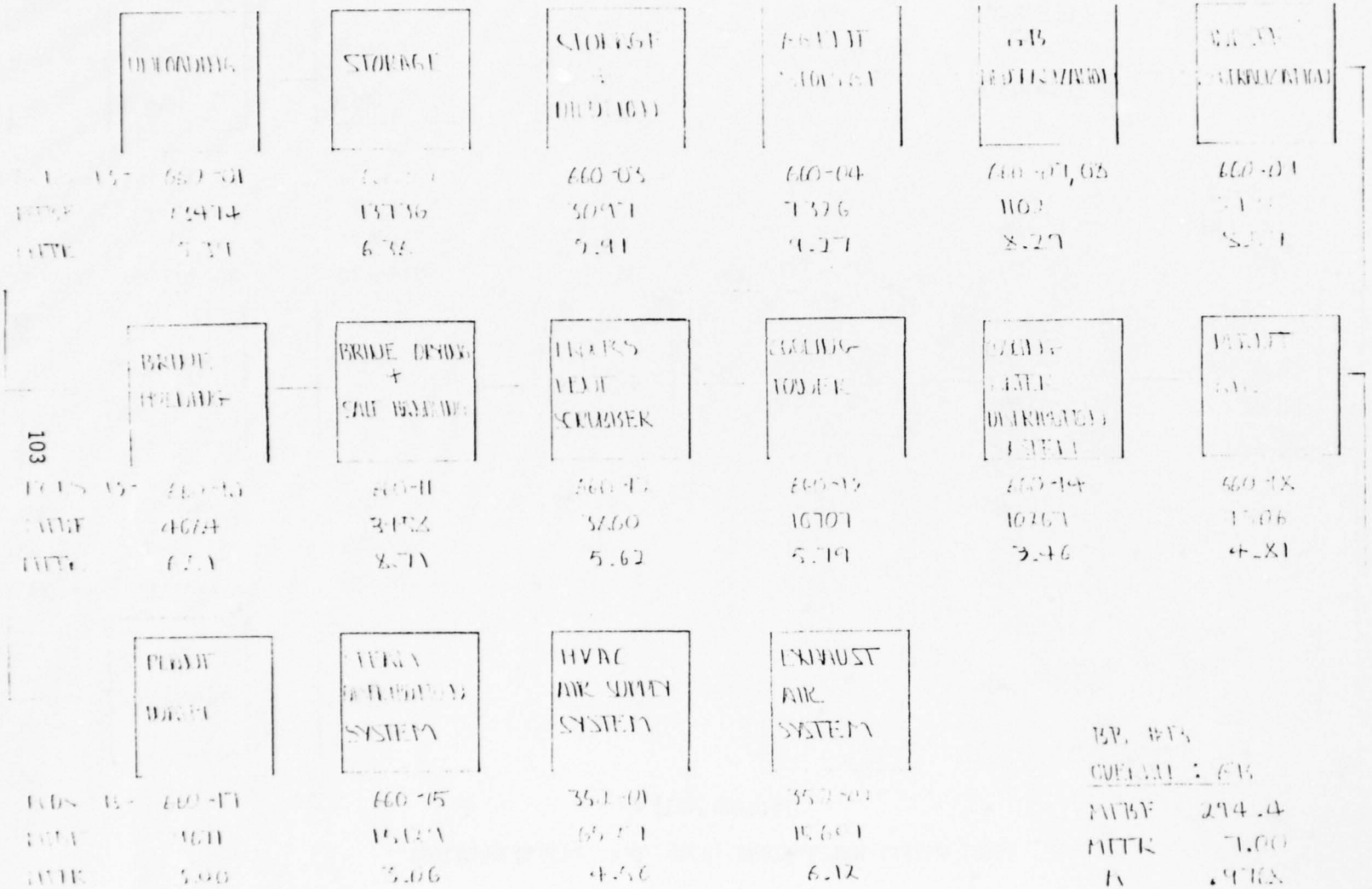
BUILDING BLOCK: #13 AGENT DESTRUCTION SYSTEM (ADS)

FLOW CHART



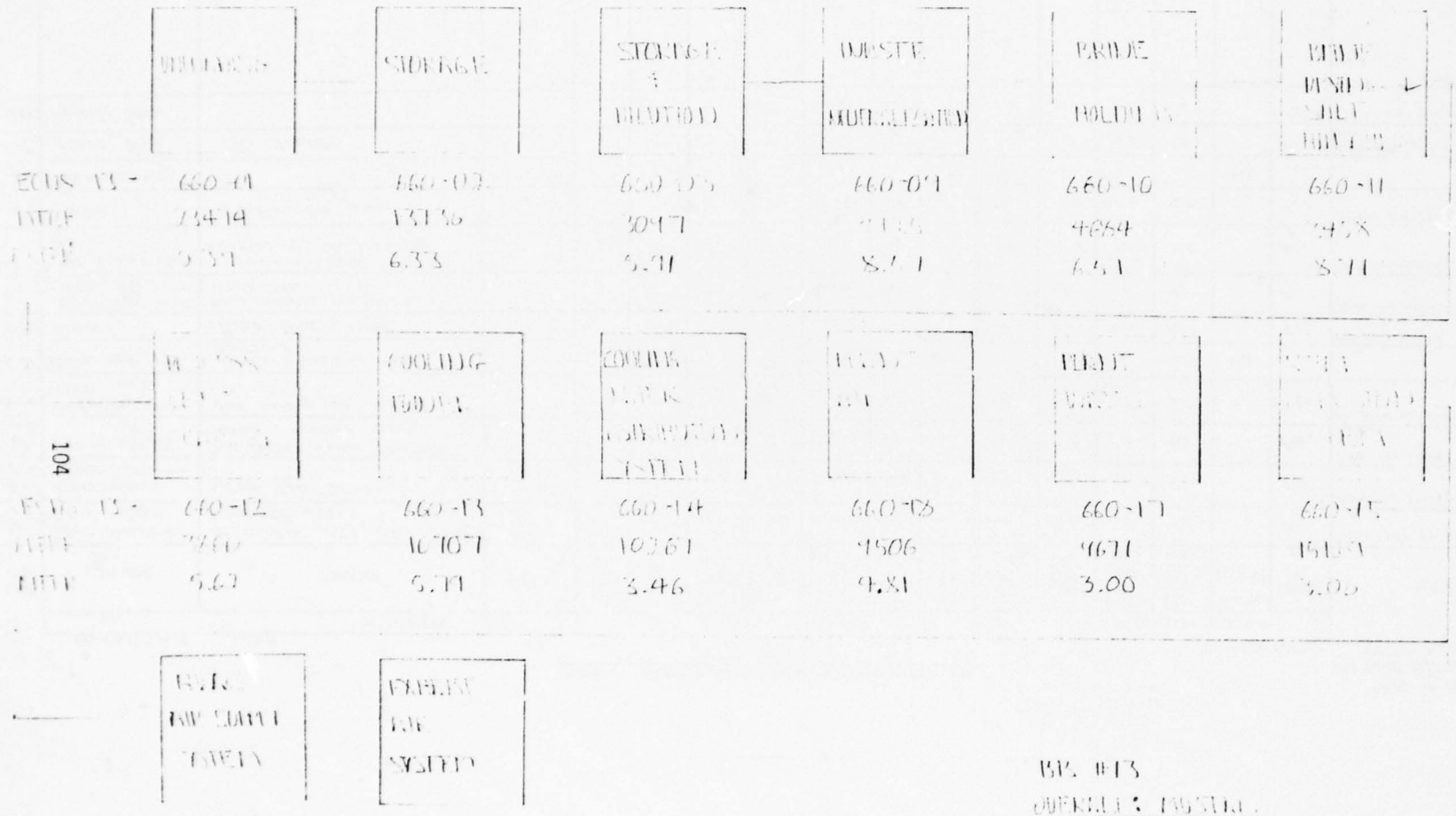
BUILDING BLOCK: #13 AGENT DESTRUCTION SYSTEM (ADS)

FLOW CHART



BUILDING BLOCK: #13 AGENT DESTRUCTION SYSTEM (ADS)

FLOW CHART



4-7-75

✓ UPGRADE TO 10-1-75 DWG.

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 18

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

UNLOADING AREA

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶HR)	FAILURE DATA: SOURCE (*) MADC	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*) b	REMARKS
3-1.1	HAND VALVE - GATE —[X]—	MISC AIR, HCl, Cl₂, STM, NaOH SERVICE c			10 ✓	a -01	2	2.483 ✓	P15		1.0	2.0	1.0	4.0		P45	Valve valve gen grd Mc
3-1.2	HAND VALVE GLOBE —[X]—	NaOH CAR DRAIN c			6 ✓	"	2	2.483 ✓	P15		1.0	2.0	1.0	4.0		P45	Valve valve gen grd Mc
3-1.3	CHECK VALVE	TO DIRECT FLOW TOWARD BATCH & STORAGE TANKS			5 ✓	"	2	3.014 ✓	P41		1.0	2.0	1.0	4.0		P41	Valve check grd
3-14	DIAPHRAGM GATE VALVE	AIR SUPPLY LINE PRV c			2 ✓	"	2	3.302 ✓	P32		1.0	3.8	1.0	5.8		P32	Reg press grd mobile Mc
3-15	PRESS. IND PI	MISC PRESS. (LOCAL) READINGS			7 ✓	"	3	(1.020)	—	NA	—	—	—	—	NA	—	
2-1.6	PUMP	PUMP HCl & NaOH			2 ✓	"	2	17.058 ✓	P30		1.0	2.0	2.0	10.0		P30	Pump Decon grd
3-1	SOL OPER FLOW CONTROL VALVE	FLOW CONTROL AIR TO Cl₂ TANK CAR			1 ✓	"	2	16.515 ✓	P41		1.0	2.8	1.0	4.8		P41	Valve control air/GS
3-1.8	SV RELIEF VALVE	RELIEVE PRESS IN AIR LINE(2) & Cl₂ LINE(1)			2 ✓	"	2	1.514 ✓	P41		1.0	2.0	1.0	4.0		P41	Valve relief grd
1.9	Motor	Motor for pump			2 ✓	"	2	4.825 ✓	P28		1.0	4.0	1.0	6.0		P28	Motor SNP grd ~assumed
1.10	STRAINER	c			2 ✓	"	3	—	—	NA	—	—	—	—	NA	—	
1.11	VALVE, PLUG	S/O VALVE			6 ✓	"	2	2.483 ✓	P15		1.0	2.0	1.0	4.0		P45	Valve water grd Mc
1.12	VALVE, BALL				5 ✓	"	2	3.027 ✓	P41		1.0	2.0	1.0	4.0		P41	Valve, ball grd Mc Mc

a. P&ID EC2513-660-

b. See Chrons F&M Mfg folder

c. CLOSE VLV IN VAR. W 2 NU, 1 STNR, 1 DIA GAGE - 2 PLACES

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

11-7-78

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

✓ Updated to 10-10-75 w/B. Cy.

SHEET 2 OF 18

#13 AGENT DESTRUCTION SYSTEM (ADS)

BUILDING BLOCK

Storage

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	NA	MAINTAINABILITY DATA 2 N: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) b	REMARKS
3-2.1	HAND VALVE, PLUG	MISC NaOH AND HCl SERVICE			9 ✓	a -02	2	2.493	P46		1.0	2.0	1.0	4.0		P46	Valve with grid in
3-2.2	HAND VALVE BALL	RECYCLE NaOH BACK TO TANK			11 ✓	"	2	3.027	P41		1.0	2.0	1.0	4.0		P41	Valve ball grid in th
3-2.3	CHECK VALVE	D/S OF EA. PUMP(1) & HCl TANK O.H. VENT			4 ✓	"	2	3.014	P41		1.0	2.0	1.0	4.0		P41	Valve check grid
3-2.4	PRESS IND.	LOCAL PRESS. D/S EA. PUMP			4 ✓	"	3	21.070	—	NA	—	—	—	—	NA	—	
3-2.5	PUMP	MAIN HCl TO DIL. TANK " NaOH " " & BATCH TANKS			2 ✓	"	2	12.058	P30		1.0	7.0	2.0	10.0		P30	Pump Centr grid
3-2.6	LEVEL IND LT	TANK LEVERS			2 ✓	"	2	11.905	P15		1.0	2.0	1.0	4.0		P15	Tank Top Lever grid
3-2.7	ALARM	ALARM ASSOC. W. 13-2.6			2 ✓	"	2	3.742	P25		1.0	2.0	1.0	4.0		P25	Tank gen grid.
3-2.8	TANK	HCl (32%) & NaOH (50%) STORAGE			2 ✓	"	2	3.035	P39		1.0	25	2.0	28		P39	Tank Mod Ledged Ht
3-2.9	HEATER	HEATER ASSOC. W. NaOH			1 ✓	"	2	6.774	P24		1.0	6.4	1.0	8.4		P24	Heater Mod ground gen Ht
3-2.10	MOTOR	HEATER for pump			2 ✓	"	2	4.825	P28		1.0	4.0	1.0	6.0		P28	Motor gen EMP Assembly
3-2.11	SENS. TEMP	LOCAL HEATER TEMP			1 ✓	"	3	—	—	NA	—	—	—	—	NA	—	—

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a ECDS13-660 - b. per Cards "failure and Maint folder"

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

11-7-11

✓ upgraded to 10-10-75 Dwgs.

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 3 OF 18

#13 AGENT DESTRUCTION SYSTEM (ADS)

BUILDING BLOCK

STORAGE & DILUTION

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*) BACK	Nλ	MAINTAINABILITY DATA [1]: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) C	REMARKS
3-3.1	HAND VALVE, PLUG,	MISC NaOH & HCl SERVICE			7 ✓	a -03	2	2.483	P15		1.0	2.0	1.0	4.0		P15	Valve Water gen. grd Hz
3-3.2	CHECK VALVE	D/S EA PUMP(H), D/S IN LINE, & NaOH LINE b			7 ✓	"	2	3.014	P11		1.0	2.0	1.0	4.0		P11	Valve steel grd.
3-3.3	PUMP	PUMP HCl & NaOH b			4 ✓	"	2	12.058	P30		1.0	7.0	2.0	10.0		P30	NOTE PUMP, 2 HV & CHECK ARE IN PKG.
3-3.4	PRESS. IND.	LOCAL PRESS @ PUMP DISCH			8 ✓	"	3	(1.030)	—	NA	—	—	—	—	NA	—	
3-3.5	MOTOR FOR MANUAL VALVE	CONTROL HCl FROM STORAGE, NaOH " H2O BATCH CONTROL			3 ✓	"	2	16.515	P41		1.0	2.9	1.0	4.9		P41	Valve Actuator Gen/6.5
3-3.6	LEVEL IND.	LEVEL IND EA. 3 TANKS			3 ✓	"	2	11.905	P25		1.0	2.0	1.0	4.0		P25	Sect Dg Sen. grd
3-3.7	ALARM	ALARM ASSOC. W. 13-3.6			3 ✓	"	2	3.746	P25		1.0	2.0	1.0	4.0		P25	Sect gen grd.
107	TANK	HCl DIL. TANK, NaOH DIL & STORAGE TANKS			3 ✓	"	2	3.035	P39		1.0	25	2.0	28		P39	Tank steel Stn grd Hz
	HEATER	HEATERS FOR 13-3.8			3 ✓	"	2	6.771	P14		1.0	6.4	1.0	8.4		P14	Heater elec gen grd Hz
3-3.10	AGITATOR	TANK AGITATOR (DIL. TANKS)			2 ✓	"	2	8.528	P18		1.0	2.0	1.0	4.0		P29	Mot frac Hp grd Hz
3-3.11	TEMP	TANK TEMP (DIL. TANKS)			2 ✓	"	2	25.692	P40		1.0	3.0	2.0	6.0		P40	Transmitter Temp ground
3.11	Motor	Motors for pump b			4 ✓	"	2	4.825	P28		1.0	2.0	1.0	6.0		P28	Motor 3 HP grd Commercial
3.13	SENS, TEMP	TEMP SENS LOCAL HEATERS	LINE		5 ✓	"	3	—	—	NA	—	—	—	—	NA	—	
3.14	COOLER	NaOH RECIRC COOLER			1 ✓	"	2	3.677	P11		1.0	6.0	2.0	9.0		—	Ref Section 4-3.4
3.15	VALVE, BALL	MISC NaOH SERVICE b			31 ✓	"	2	3.027	P11		1.0	2.0	1.0	4.0		P11	Valve Steel grd Hz
3.16	MIXER	NaOH DILUTION IN TK MIXER			1 ✓	"	2	7.552	P28		1.0	2.0	1.0	4.0		P29	Motor 3 HP grd
3.17	[illegible]	PRV			1 ✓	"	2	3.332	P32		1.0	3.8	1.0	5.8		P32	Hp Motor grd Hz
3.18	Flow element	Flow sensing			4 ✓	"	2	23.415	P40		1.0	3.0	2.0	6.0		P40	Flow Trans Temp grd Hz

a. EC13-660-

b. 4 ball vlv, 1 pump, 1 CHK in per w. same.

c. See Remarks F/M ref folder

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

THIS DWG WAS NOT UPGRADED 6/10/75 ONLY DATE

#13 AGENT DESTRUCTION SYSTEM (ADS)

BUILDING BLOCK

AGENT STORAGE

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	NA	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) b	REMARKS
3-4.1	HAND VALVE GATE	TANK OUT & O.H. VENT			4	a -04	2	2.483	P45		1.0	2.0	1.0	4.0		P45	Valve Water tow grd Hi
3-4.2	CHECK VALVE VI	FLOW DIRECT TOWARD BATCH TANKS			4	"	2	3.014	P41		1.0	2.0	1.0	4.0		141	Valve check grd
3-4.3	PRESS XDUCR	TANK OUT PRESS			2	"	2	3.435	P40		1.0	3.0	2.0	6.0		P40	Transmitter press grd
3-4.4	PUMP	PUMP AGENT TO BATCH TANK (PUMP SUBMERGED)			2	"	2	13.29	P30		1.0	7.0	2.0	10.0		P30	Pump Centrifugal Hi (Submerged)
3-4.5	MOTOR FLOW CONTR VALVE (GATE)	CONTROL AGENT FLOW			6	"	2	16.515	P41		1.0	2.8	1.0	4.8		P41	Valve Contr air/o.s
3-4.6	LEVEL IND., LT	TANK LEVEL			2	"	2	11.905	P25		1.0	2.0	1.0	4.0		P25	Level Ind Tow grd
3-4.7	TANKS	GB STORAGE, VX STORAGE			2	"	2	3.035	P34		1.0	25	2.0	28		P39	Tank Mist Stor grd Hi
3-4.8	AGITATOR	MIX TANKS			2	"	2	8.328	P48		1.0	2.0	1.0	4.0		P38	Mixer Prop Mix grd Hi
3-4.9	TANK TEMP	TEMP MEAS - REMOTE			2	"	2	25.692	P50		1.0	3.0	2.0	6.0		P40	Transmitter Temp Grd
3-4.10	Motor	for pump			2	"	2	4.825	P48		1.0	4.0	1.0	6.0		P38	Mist 5 Hp (Submerged)

NOTE: EITHER GB OR VX (OR NEITHER IF MUSTARD PROCESSED) IS USED BUT NOT BOTH @ SAME TIME

a. ECDS 13-660-

b. See Comments Form ref folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

as of WX of 10/13/75
This Dwg Set
Remain 6/12/75

M-7-1

SHEET 5 OF 18

Vx ACID CHLORINATION - 1

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM ADS)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
13-5.1	HAND VALVE GATE —⋈—	MISC Cl_2, Vx, HCl/H_2O SERVICE			5	2. -05	2	2.453	P45		1.0	2.0	1.0	4.0		P45	Valve Hand gen grd Ha
13-5.2	CHECK VALVE ⋈	D/S Cl_2 DRAIN VALVE			1	"	2	3.014	P41		1.0	2.0	1.0	4.0		P41	Valve Check grd
13-5.3	DIAPHRAGM GATE VALVE —⋈—	STM PRV			1	"	2	3.302	P32		1.0	3.8	1.0	5.8		P32	Reg Press grd Ha Ha
13-5.4	PRESS IND	Cl_2 TANK PRESS.			1	"	2	3.425	P40		1.0	3.0	2.0	6.0		P40	Transmitter press grd
13-5.5	ALARM	ALARM ASSOC. W. 13-5.4			1	"	2	3.744	P25		1.0	2.0	1.0	4.0		P25	Ind gen grd
13-5.6	MOTOR FLOW CONTROL VALVE (GATE) —⋈—	FLOW CONTROL Cl_2, Vx, HCl(6%) PW, & STM.			5	"	2	16.515	P41		1.0	2.9	1.0	4.8		P41	Valve Control Grp/ha.5
13-5.7	LEVEL IND.	TANK LEVEL			3	"	2	11.905	P25		1.0	2.0	1.0	4.0		P25	Ind Lig Ser grd.
13-5.8	ALARM	ALARM ASSOC. W. 13-5.7			3	"	2	3.744	P25		1.0	2.0	1.0	4.0		P25	Ind gen grd
13-5.9	TANK	Cl_2, Vx, & HCl/H_2O BATCH			3	"	2	3.035	P39		1.0	25	2.0	28		P39	Tank Vessel SG grd Ha
13-5.10	TEMP IND	Cl_2 TANK TEMP.			1	"	2	25.674	P40		1.0	3.0	2.0	6.0		P40	Transmitter Temp grd.
13-5.11	WEIGHT IND.	WEIGHT OF TANK & CONTENTS			3	"	2	16.153	P43		1.0	3.0	2.0	6.0		P40	VDIR Gen grd
13-5.12	PSV RV	RELEASE Cl_2 VAP TO PROCESS VENT SCRUBBER			1	"	2	2.271	P41		1.0	2.0	1.0	4.0		P41	Valve Relief grd Ha
13-5.13	ALARM	ALARM FOR 13-5.11			3	"	2	3.744	P25		1.0	2.0	1.0	4.0		P25	Ind Gen grd

a. EC05.3-660-

b. See Cmds F&M Ref folder

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

Catastrophic Failure
Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

WE 1 10/15/71 Tom Dunn Upgraded data — see Bill 6/75

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 6 OF 18

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

Vx ACID CHLORINATION - 2

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	NA	MAINTAINABILITY DATA ?✓: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NA TM (X10⁻⁶)	SOURCE (*)	REMARKS
3-6.1	HAND VALVE GATE —⋈—	MISC			25	a —.06.	2	2.413	P45		1.0	2.0	1.0	4.0		P45	Valve H₂O gen grd Ha
3-6.2	HAND VALVE GLOBE —▷◁—	DIS of Pumps			4	"	2	2.453	P45		1.0	2.0	1.0	4.0		P45	Valve H₂O gen grd Ha
3-6.3	CHECK VALVE —▷|	" Between pump and Globe valves			4	"	2	3.014	P41		1.0	2.0	1.0	4.0		P41	Valve check grd
3-6.4	DIAPHRAGM GATE VALVE —⋈—	PAD near reactor pumps and PAD tanks			4	"	2	3.302	P32		1.0	3.8	1.0	5.8		P32	Dry Fluid grd Ha
3-6.5	Press Indicator	Jacket heater lines			2	"	3	(1.070)	—	NA	—	—	—	—	NA	—	
3-6.6	Press. XDucer	Reactor pressure			2	"	2	3.425	P40		1.0	3.0	2.0	6.0		P40	Transmitter press grd.
3-6.7	Pump	Pumps Vx acid and Coolant/ heated jacket water			4	"	2	12.058	P30		1.0	7.0	2.0	10.0		P30	Pump Centr grd
3-6.8	Flow Control Valve (Globe)	Misc flow control functions Cl₂, HCl, agat H₂O etc.			17	"	2	16.515	P41		1.0	2.8	1.0	4.8		P41	Valve control Air/GS
3-6.9	Alarm	Alarms for Weight and Temp Tanks.			5	"	2	3.74	P35		1.0	2.0	1.0	4.0		P35	Ind gen grd
3-6.10	Tank	Reactor tanks			2	"	2	3.035	P39		1.0	25	2.0	28		P39	Tank Mod Stl grd Ha
3-6.11	Tank	PAD tanks			2	"	2	21.276	P35		1.0	25	2.0	28		P35	Tank Comp gen Air/GS
3-6.12	Agitator	Tank agitator			2	"	2	8.528	P21		1.0	2.0	1.0	4.0		P21	Mot Explo Hp Ltr m Ha
3-6.13	Temperature	Tank Temperature			8	"	2	25.642	P40		1.0	3.0	2.0	6.0		P40	Transmit temp grd
3-6.14	Weight Indicator	Tank Weight (contents level)			2	"	2	16.153	P40		1.0	3.0	2.0	6.0		P40	VDCR gen grd
3-6.15	PSV	Vent(?) Valves PAD & Coolant heater Water			4	"	2	2.271	P41		1.0	2.0	1.0	4.0		P41	Valve relief grd Ha
3-6.16	Heater Flow Control Valve (Globe)	Controls inlet Cl₂ to both Reactors			1	"	2	16.515	P41		1.0	2.8	1.0	4.8		P41	Valve control Air/GS
3-6.17	pump Motor	Motor for pumps 13-6.7			4	"	2	4.825	P35		1.0	4.0	1.0	6.0		P35	Mot 3 Hp grd

a. P&ID ECDS 13-660-

b. See Remarks

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period ← NOT INCl in ΣNλ
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 7 OF 18

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

GB/Vx Caustic Neutralization Loop 1 of 2 next page

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
13-7.1	Hand valve gate	NaOH and GB Batch tank outlet			2	a. -07	2	2.483	P15		1.0	2.0	1.0	4.0		P45	Valve hand gate grid 11a
13-7.2	Hand valve globe	TO O.H. Condenser			1	"	2	2.483	P15		1.0	2.0	1.0	4.0		P45	Valve hand gate grid 11a
13-7.3	Check valve	TO O.H. Condenser			1	"	2	3.014	P41		1.0	2.0	1.0	4.0		P41	Valve check grid
13-7.4	Mydon flow control valve	NaOH and GB flow control inlet and outlet (Batch tanks)			5	"	2	16.515	P41		1.0	2.8	1.0	4.8		P41	Valve control Auto/6.5
13-7.5	Level Indication	Tank level			2	"	2	11.495	P25		1.0	2.0	1.0	4.0		P25	Ind Mfg Loop grid
13-7.6	Weight Indication	Tank (Caustic) Weight			2	"	2	16.153	P40		1.0	3.0	2.0	6.0		P40	Weight gen grid
13-7.7	Alarm	Alarms Assoc W. level and Weight indicators			14	"	2	7.714	P25		1.0	2.0	1.0	4.0		P25	Ind gen grid
13-7.8	Tanks	NaOH and GB Batch tanks T-10 T-12			2	"	2	3.015	P39		1.0	25	2.0	28		P39	Tank Steel SS grid 4h
13-7.9	Hand valve gate	Reuse deter reactor service			7	a. -05	2	2.483	P15		1.0	2.0	1.0	4.0		P45	Valve Water gen grid 4h
13-7.10	Hand valve globe	o/s and o/s of pumps and 2.2d reuse cooler line			7	"	2	2.483	P15		1.0	2.0	1.0	4.0		P45	Valve Water gen grid 4h
13-7.11	check valve	Reuse service (o/s pumps w/s reactor)			5	"	2	3.014	P41		1.0	2.0	1.0	4.0		P41	Valve check grid
13-7.12	Press xDUCR	Reactor pressures			4	"	2	3.425	P40		1.0	3.0	2.0	6.0		P40	Transmitter press grid
13-7.13	Pumps	Reactor outlet pumps			2	"	2	12.052	P30		1.0	7.0	2.0	10.0		P30	Pump Power 4Hz
13-7.14	Water flow control valve	Reuse flow control			13	"	2	16.515	P41		1.0	2.8	1.0	4.8		P41	Valve Contr Auto/6.5
13-7.15	Level Indication	Tank level			2	"	2	11.495	P25		1.0	2.0	1.0	4.0		P25	Ind Mfg Loop grid
13-7.16	Temp Indication	Tank temperature			4	"	2	25.412	P40		1.0	3.0	2.0	6.0		P40	Thermocouple Temp grid
13-7.17	PH Indicator	Measure & recorder PH			2	"	2	11.905	P25		1.0	2.0	1.0	4.0		P25	Ind Mfg Loop grid

Could n. next page

a ECDS13-660- closed no. shown in Columns b. See Comds Fsm ref folder

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

Wk of 10/13 Lester Dwg dated 6/5/75

SHEET 8 OF 18

GB/Vx Canister Neutralization - Liquid

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

DESCRIPTION							FAILURE DATA				MAINTAINABILITY DATA [a]						
ITEM NO.	ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*) [b]	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*) [b]	REMARKS
13-7.15	alarm	alarms for level, Temp and pH.			7	a. -GB	2	3.774	P35		1.0	2.0	1.0	4.0		P35	Incl gen grd
13-7.19	Tanks	GB detox reactor			2	"	2	3.315	P39		1.0	2.5	2.0	2.5		P39	Tank mat SS grd Mt
13-7.20	Agitator	Tank agitator			2	"	2	8.531	P43		1.0	2.0	1.0	4.0		P43	mot frm HP grdm Mt
13-7.21	Condenser	Overhead Condenser			2	"	2	2.334	P24		1.0	6.4	1.0	8.4		P24	Heat Xchgr grd Mt
13-7.22	Motor flow control valve Globe [51]	flow control O.H Condenser and recirc cooler			4	"	2	16.515	P41		1.0	2.5	1.0	4.5		P41	Valve Control elec/MS
13-7.23	Cooler	Recirc. Cooler - cool contents of reactor			2	"	2	2.334	P24		1.0	6.4	1.0	8.4		P24	Heat Xchangr grd Mt
13-7.24	flowmeter	Measr flow recirc loop and GB/Vx Cooler water flow			5	"	2	29.415	P40		1.0	3.0	2.0	6.0		P40	Reduce flow dp elec/MS
13-7.25	Pump Motor	for pumps 13-7.17			2	"	2	4.815	P45		1.0	4.0	1.0	6.0		P39	Motor 5 HP grd mounted

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a. ECDS13-660-

b. See Camils F&M ref folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA.

10/13/75 Lecture Dwg in 6/75

SHEET 9 OF 18

Waste Caustic Neutralization.

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR.)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: Nλ TM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
13-8.1	Hand valve gate	Waste spent liquid service			11	2, -09	2	2.455	P45		1.0	2.0	1.0	4.0		P45	Valve M.O gen grd lit
13-8.2	Check valve	Waste - to drain flow			7	"	2	3.017	P41		1.0	2.0	1.0	4.0		P41	Valve Check grd
13-8.3	Press Indicator PI	Waste Location - Local readout			6	"	3	(4.004)	—	NA	—	—	—	—	NA	—	
13-8.4	Pump	Pump Waste to hold tank (2) Pump pump to storage tanks (2)			4	"	2	12.058	P30		1.0	7.0	2.0	10.0		P30	Pump Centr grd.
13-8.5	Pump Motor	Motor for 13-8.4			4	"	2	11.825	P28		1.0	4/.	1.0	6		P28	Motor GRD grd (not assumed)
13-8.6	Motor flow control valve (gate)	Control process flow			12	"	2	16.515	P41		1.0	2.8	1.0	4.8		P41	Valve Control Gate/6.5
13-8.7	Level Ind. LT	Tank level remote			3	"	2	11.905	P25		1.0	2.0	1.0	4.0		P25	Ind Lg Low grd
13-8	Ind.	Meas pH			3	"	2	11.905	P25		1.0	2.0	1.0	4.0		P25	Ind Lg Low grd
	Temp Ind	Meas Waste Neut. Tank Temp.			2	"	2	25.697	P40		1.0	3.0	2.0	6.0		P40	Transmitter Temp Cont
13-8.10	Alarm	alarm for 13-8.7 & 13-8.8			2	"	2	3.714	P25		1.0	2.0	1.0	4.0		P25	Ind gen grd
13-8.11	Tank	Waste tanks (2) Sump tank (1)			3	"	2	3.015	P39		1.0	25	2	28		P39	Tank Mist Eli grd lit
13-8.12	Agitator	Stir tanks			2	"	2	8.511	P28		1.0	2.0	1.0	4		P28	Mist free HP grd motor

a. ECUS13-660.-
b. See Circuit Diagram Ref Folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

10/13/75 Added Dwg data jc 7/11/75

#13 AGENT DESTRUCTION SYSTEM (ADS)

BUILDING BLOCK

Brine Holding

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	NA	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
13-9.1	Hand valve gate -[x]-	Misc brine service			20	a. -10	2	2.483	P45		1.0	2.0	1.0	4		P45	Valve thru you grid thr
13-9.2	Hand valve globe -[o]-	1 ea. D/S of pumps			3	"	2	2.483	P45		1.0	2.0	1.	4		P45	"
13-93	Check valve ⊳|	D/S of ea pump in direct of brine drains. (1 in pit sump)			4	"	2	3.014	P41		1	2	1	4		P41	Valve check grid
13-9.4	Press. Ind.	Local press reading @ pump discharge			3	"	3	(——)	—	NA	—	—	—	—	NA	—	
13-95	Level Ind.	Tank level - remote reading			3	"	2	11.905	P25		1	2	1	4		P25	Tank brine level grid
13-96	Temp Ind.	Local tank temp			3	"	3	-25,442	P40	NA	1	3	1	6	NA	P40	Thermometer Temp grid
13-97	Alarm	Tank level alarms			3	"	2	3.742	P15		1	2	1	4		P15	Tank you grid
13-9.8	Pump	pumps by brine drains (3) Sump pumps (1)			4	"	2	12.053	P30		1	7	2	10		P30	Pump Center grid
13-99	Motor	assoc w. pumps 13-98			3	"	2	1.815	P22		1	4	1	6		P25	Motor S of grid (assumed P4)
13-9 10	Tank	Brine holding tanks			3	"	2	1.035	P39		1	25	2	28		P39	Tank tank SE grid ce
13-9.11	Agitator	Assoc w. brine tanks			3	"	2	8.528	P35		1	2	1	4		P25	Motor from NW grid on the

a. ECDS13-660-

b. See item list data sheet for NDS

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ——— = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

10-13-75 latest Dwg we have

SHEET 11 OF 18

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

Brine drying and salt handling

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	NA	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
13-10.1	Hand valve gate —⋈—	Move brine and recycle brine service			10	a, 11	2	2.483	P15		1	2	1	4		P45	Valve Hdw gen grd oil
13-10.2	Check Valve ⊣↑	DIS recycle pumps			2	"	2	3.014	P41		1	2	1	4		P41	Valve check grd
13-10.3	pump	Recycle pumps			2	"	2	17.058	P30		1	7	2	10		P30	Pump Centr grd.
13-10.4	Motor	pump Motors for 13-10.3			2	"	2	1.625	P28		1	2	1	4		P15	Mot 5 hp grd - assume HP
13-10.5	Temp Ind	Local Temp Ind			4	"	3	(12.229)	—	NA	—	—	—	—	NA	—	
13-10.6	Press Ind	Local press Ind.			2	"	3	(4.032)	—	NA	—	—	—	—	NA	—	
13-10.7	Drum dryer	Dry brine			2	"	2	1.403	See remarks		1	5	2	8		EST	Elec Mot + Elec Heat 1.143 + 0.125 + 0.135
13-10.8	Sensor LS	? level sensor for drum dryer			2	"	2	11.905	P25		1	2	1	4		P25	Ind hg level grd
13-10.9	Alarm	Alarm for 13-10.8			2	"	2	3.74	P25		1	2	1	4		P25	Ind gen grd
13-10.10	Speed element	Speed of drum dryers & remote indication			2	"	2	17.919	P26		1	2	1	4		P26	Ind tach grd m
13-10.11	elevator	bucket elevator dried brine TO LIVE BIN (1) & compacted to Bins			2	"	2	24.831	See calc sht		2	8	2	12		EST	See Calc sheet
13-10.12	Bins	Take brine and brine (compacted)			2	"	2	3.055	P39		1	25	2	28		P35	Vert Mot Sto grd
13-10.13	Compactor	Compact dried brine			1	"	2	15.228	P15		1	3	2	6		P15	Ref Sm Hyd grd
13-10.14	Conveyor	convey dried brine			2	"	2	24.831	See 13-10.11		2	8	2	12		EST	Same as 13-10.11 - assumed

a. PID EC0513-660-

b. See Equip data sheet for ADS

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - [illegible]strophic Failure
2 - [illegible]uction Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

10/13/75
Select Proj
Date 6/5/75

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 12 OF 18
#13 AGENT DESTRUCTION SYSTEM (ADS)

BUILDING BLOCK

Process Vent Scrubber.

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION/LOCATION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) C	REMARKS
3-11.1	Hand Valve Gate -⋈-	Isolate pump 1 on either side b			4	a. -12	2	7.183	P15		1	2	1	4		P15	Valve H2O from grd ht
3-11.2	Check Valve CV	Misc locations b			9	"	2	3.014	P11		1	2	1	4		P11	Valve check grd
3-11.3	Pump	Pump spent NaOH to Waste Neut. tank b			2	"	2	12.058	P30		1	7	2	10		P30	Pump Centr grd
3-11.4	Motor	Motor for pumps 13-11.3 b			2	"	2	4.825	P28		1	4	1	6		P28	Motor 5 HP grd.
3-11.5	Press Gaul. PI	Local press. readings			4	"	3	(1.020)	—	NA.	—	—	—	—	NA	—	
3-11.6	Press xmtr PT	press transmit w. remote readout			4	"	2	3.415	P10		1	3	2	6		P10	Transmitter press grd.
3-11.7	Level Gaul LT	Scrubber level Gaul			1	"	2	11.705	P25		1	2	1	4		P25	Ind Mtg Level grd
3-11.8	H Gaul	pH reading and remote recording			1	"	2	11.905	"		1	2	1	4		P35	"
3-11.9	alarm	alarms assoc w. 13-11.7 & 8			2	"	2	3.142	P15		1	2	1	4		P25	Ind Mtn grd
3-11.10	motor flow control valve (gate) -⋈-	NaOH flow control			2	"	2	16.515	P41		1.0	2.8	1	4.8		P41	Valve control Air/6.5
3-11.11	motor flow control valve (gate) -⋈-	Flow control NaOH (fresh), UPW, and recycle NaOH.			3	"	2	16.515	"		1	2.8	1	4.8		"	"
3-11.12	Temp Gaul.	Temp to filter syst and outlet of pumps Temp.			2	"	2	25.692	P40		1	3	2	6		P40	Transmitter temp grd
3-11.13	flow meas.	NaOH flow leaving pumps			1	"	2	24.415	P40		1	3	2	6		P40	Over flow flow switch
3-11.14	Fan	Centr. fans in parallel b			2	"	2	1.219	P17		1	7.2	1	9.2		P17	Scr Cross grd
3-11.15	Motor	Motors for fans (in para) Standby		Same as 3-11.3	4	"	2	4.825	P28		1	4	1	6		P28	Motor 5 HP grd (in common)
3-11.16	dampers	dampers for room air in and to filter plenum			2	"	2	0.798	P41		1	2	1	4		P41	Valve 6 flg grd ht
3-11.17	Process Vent Scrubber	Scrubber itself			1	"	2	21.817	P24		1	20	2	23		EST	Value H2O in & Heat recov in 2.455 3.917

a. P&ID EC0513-660 — b. NOTE 2 HRS, CHK/SUMPS IN PAIR W. SAME. c. See OAHOS F&M Ref Table

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

✓ upgraded to Day sheet 10-10-75

✓ 12-10-7

SHEET 13 OF 18

#13 AGENT DESTRUCTION SYSTEM (ADS)

BUILDING BLOCK

Cooling Tower

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION/Location	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	NA	MAINTAINABILITY DATA 2/: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
13-12-1	Hand valve gate —[X]—	Misc b			7 ✓	9 —13	2	2.483	P45		1	2	1	4		P45	Valve H₂O gen grd fr
13-12-2	Check valve ⊽	D/S pumps b			2 ✓	"	2	3.014	P11		1	2	1	4		P11	Valve check grd
13-12-3	Pump	pump Lig from Cooling tower surge basin b			2 ✓	"	2	12.058	P30		1	7	2	10		P30	Pump Centr grd
13-12-4	Motor	Motor assoc w. 13-12-3 b			2 ✓	"	2	4.525	P29		1	4	1	6		P29	Meet 5 HP grd
13-12-5	Motor Elgar Control Valve gate —[X]—	Control cooling water supply with "make up" water			2 ✓	"	2	15.525		—					—		
13-12-6	Press Ind	Local press @ pumps 2			2 ✓	"	3	(1.020)	—	NA	—	—	—	—	NA	—	
13-12-7	Press Ind	press w/ remote readout			2 ✓	"	2	3.475		—					—		
13-12-8	Temp Ind	Temp " " "			1 ✓	"	2	25.69	P40		1	3	2	6		P40	Transmitter temp grd
13-12-9	Level Ind.	basin — float			1 ✓	"	2	11.905	P25		1	2	1	4		P25	Ind Tgt Lev grd
13-12-10	speed Ind	cooling tower fan speed			1 ✓	"	2	17.947	P26		1	2	1	4		P26	Ind tach grd m
13-12-11	Alarm	Alarms for 13-12-7-8-9-10			2 ✓	"	2	3.714	P25		1	2	1	4		P25	Ind gen grd
13-12-12	Tower	Cooling Tower			1 ✓	"	2	2.338	P24		1	6.4	1	8.4		P24	Heat exchanger grd Hr
13-12-13	fan	Cooling tower fan			1 ✓	"	2	2.318	P17		1	7.2	1	9.2		P17	Fan axial grd
13-12-14	Basin (TANK)	Cooling tower, basin			1 ✓	"	2	1.616	P39		1	25	2	28		P39	Tank steel Sta grd.

a. P320 ECDS13-660-

b. NOTE: 4HV + 2 VALVES, 5 PUMP + M 100 GAL. W. SAME See Order on SHT 12

c. See CARDS FILED AT FLEW

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 tastrophic Failure
2 oduction Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

✓ upgraded & Dwg Dated 10-10-75

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

Cooling Water Distribution System and Plant Air Pressurizing systems

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA (1N): DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
3-13.1	Hand Valve gate -⋈-	Misc Water Service			20 ✓	a. -14	2	1.766	P45		0.5	1.0	0.5	2		P45	Valve H2O gen prd
3-13.2	Hand Valve globe	"			14 ✓	"	2	1.766	"		0.5	1	0.5	2		P45	"
13.3	Check Valve	"			2 ✓	"	2	1.822	P45		0.5	1	0.5	2		P45	Valve water check prd.
13.4	Sonic Flow	Flow Sens & Transmit			7 ✓	"	2	3.937	P40		0.5	1.5	1	3		P40	Trans flow flow sen/tr
13.5	Alarm for above				1	"	2	3.742	P25		0.5	1	0.5	2		P25	Ind gen prd
3-14.1	Hand valve gate -⋈-	Misc a b c			23 ✓	a -8	2	1.766	P45		0.5	1	0.5	2		P45	Valve H2O gen prd.
3-14.2	filter	pre and after filters to Pressure air supply b			4 ✓	"	2	1.201	P21		0.5	1	0.5	2		P21	Filter gas prd
3-14.3	Press Gual	Local press Gual.			7 ✓	"	3	(1x10)	—	NA	—	—	—	—		—	
3-14.4	Check Valve	misc			5 ✓	"	2	3.014	P41		0.5	1	0.5	2		P41	Valve check prd.
3-14.5	Pressure Sensor	Compressed and dryer press & Return			4 ✓	"	2	3.425	P40		0.5	1.5	1	3		P40	Transmit press prd
3-14.6	Hand Valve globe [⋈]	Bypass 13-14.5 c			5 ✓	"	2	1.766	P45		0.5	1	0.5	2		P45	Valve H2O gen prd
3-14.7	Headless Dryers	Air dryers			2 ✓	"	2	1.611	P39		0.5	12.5	1	14		P39	Tank Mat Std prd
13-14.8	Vent Valve PSV	Vent to Atmos			1 ✓	"	2	1.514	P41		0.5	1	0.5	2		P41	Valve relief prd.
3-14.9	Alarm	Alarm - Hi Moisture & Air Comp Control			2 ✓	"	2	3.742	P25		0.5	1	0.5	2		P25	Ind gen prd.
3-14.10	Pachago Air Compressor	Tank			1 ✓	"	2	1.616	P39		0.5	1	0.5	2		P39	Tank mat Std prd.
.11	"	Compressor			1 ✓	"	2	42.63	P32		0.5	3.5	1	5		P32	Pump Sec drawer
.12	"	Filter/Silencer			1 ✓	"	2	1.201	P21		0.5	1	0.5	2		P21	Filter gas prd
.13	"	After Cooler			1 ✓	"	2	1.242	P39		0.5	3.2	0.5	4 ✓		P39	Ind Vessel gen prd
.14	"	Moisture Separator			1 ✓	"	2	1.242	"		0.5	3.2	0.5	4.2		P39	"
.15	"	Air Comp Control			1 ✓	"	2	4.334	P32		1	7	1	9		P32	Reg Temp prd
.16	Temp Indicator	Local temp. Monitor			3 ✓	"	3	—	—	NA	—	—	—	—		—	
.17	Temp Sensor	Sensitive Temp			1 ✓	"	2	2.113	P40		0.5	1.5	1	3		P40	Water Temp prd

a. MSID EC1S13-660-

b. Filter with Z11v as per w. SPARE(2)

c. Globe Valve in Par w. ZHV + PRV

A. Start Air Pro Syst

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA ✓ upgrade to 10-10-75 Dwg.

SHEET 15 OF 18

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

Process Water Distribution System

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
3-15.1	Hand Valve gate -⋈-	misc			31	a. -17	2	1.766	P45		0.5	1	0.5	2		P45	Valve Hwy gen grd.
.2	Check Valve -⋈-	misc			5	"	2	3.014	P41		0.5	1	0.5	2		P41	Valve check grd.
15.2	Hand valve gate	"			19	"	2	1.766	P45		0.5	1	0.5	2		P45	Valve Hwy gen grd.

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a. ED1513-660 -

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK # 13 AGENT DESTRUCTION SYSTEM (ADS)

STEAM DISTRIBUTION SYSTEM

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*) b	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA N: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) b	REMARKS
13.16.	HAND GATE VALVE [N]	MISC	—	[illegible]	64	Q-15	2	2.483	P45		0.5	1.0	0.5	2.		P45	Valve data for gate va
-16.1	HAND GLOBE VALVE [N]	"			26	Q-15	"	2.483	P45		0.5	1.	0.5	2		P45	"
-16.3	CHECK VALVE [N]	"			15	Q-15	"	3.014	P41		0.5	1	0.5	2		P41	Valve check gat
-16.4	DIAPHRAGM GATE VALVE	"			16	Q-15	2	3.302	P32		0.5	1.9	0.5	2.9		P32	Eq Data for va
	HAND VALVE	MISC		[illegible]	32	"	3	N/a	N/a	—	—	—	—	—	—	—	

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a. RCDS IS-660- no data on chart
b. See CHAOS Fact ref folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

HVAC Supply Air System

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA (M): DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
12.1	HAND VALVE GATE				5	a	2	1.766	P45		0.5	1.0	0.5	2.0		P45	Valve H₂O gen grd
12.2	CONTROL VALVE M				3	"	2	16.515	P41		0.5	1.4	0.5	2.4		P41	Valve Control Air/GS
12.3	DAMPER 2 SPD ACTUATOR				5	"	2	3,302	P32		0.5	1.9	0.5	2.9		P32	Reg press grd mtr
12.4	MODULATING CONTROLLED BLADE DAMPER				4	"	2	4.991	See remarks		0.5	2	0.5	3		EST	Valve Mfg + Mtr & SHP .166 4.825
12.5	OPPOSED BLADE DAMPER				2	"	2	.166	P41		0.5	1	0.5	2		P41	Valve C'fly grd
12.6	FILTER				1	"	2	1.201	P21		0.5	1	0.5	2		P21	Fil gen grd
12.7	CONDENSOR				1	"	2	1.242	P24		0.5	3.2	0.5	4.2		P24	Heat exch gen grd.
12.8	COMPRESSOR				1	"	2	20.630	P32		0.5	3.5	1	5		P32	Pump elec. driven
12.9	121 END BELL				2	"	2	2.417	P40		0.5	1.5	1	3		P40	Vapor Temp grd
12.10	END SENSOR				1	"	2	2.415	P40		0.5	1.5	1	3		P40	"
12.11	SIGHT GLASS				1	"	2	3.742	P35		0.5	1.0	0.5	2.0		P35	Ind gen grd
12.12	FAN				3	"	2	2.718	P17		0.5	3.6	0.5	4.6		P17	Fan axial grd + Mtr SHP
12.13	2 STAGE THERMOSTAT				1	a	2	2.511	P37		0.5	1.0	0.5	2.0			Sur thermostatic grd
12.14	Knobs for Fan				3	"	2	4.515	P28		0.5	2	0.5	3.0		P28	Mtr SHP

a. ECDS 13-352 - DWG DATED 9/17/75 NOT FINAL SCHEDULE

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

AGENT DESTRUCTION SYSTEM

EXHAUST AIR SYSTEM

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

11-11-75

SHEET 15 OF 18

BUILDING BLOCK #13 AGENT DESTRUCTION SYSTEM (ADS)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*) b	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10^{-6}/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA /N: DIAGN. TIME (HR)	MAINTAINABILITY DATA /N: REPAIR TIME (HR)	MAINTAINABILITY DATA /N: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA /N: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA /N: NλTM (X10^{-6})	MAINTAINABILITY DATA /N: SOURCE (*) d	REMARKS
13.1	MOTORIZED DAMPER BLADE DAMPERS	c			6	a-02	2	4.991	See 13.2.4		0.5	2	0.5	3		See 13.2.4	Value B/fg grd + mot stat
13.2	DAMPER BLADE DAMPERS	c g			11	a-02	2	.166	P41		0.5	1	0.5	2		P41	Value B/fg grd
13.3	FAN	c b			7	a-02	2	1.221	P17		0.5	3.6	0.5	4.6		P17	Bea Center grd
13.4	FAN MOTOR	c b			7	a-02	2	4.525	P18		0.5	2	0.5	3		P18	Mot Stat
13.5	BAGHOUSE				1	a-02	2	7.255	See remark		1	10	2	13		EST	Fil + Mot + Fans 1.201 4.525 1.529
13.6	FILTERS	b			10	a-02	2	1.201	P21		0.5	1	0.5	2		P21	fan gen grd
13.7	MANIFOLD				1	a-02	2	3.742	P25		0.5	1	0.5	2		P25	fan gen grd

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ASSUMPTION

THE FIL SYSTEM BD # 23

IS IN ADDITION TO THE ABOVE

a. ECOM 18-352 - Dated 9-22-75

b. 5 filters, 1 ea, motor, 1 & 2 dampers as per W same

c. fan + motorized damper as per W same - 2 times

d. see CANOS P/N ref folder

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

Units blocked in [illegible]

SUMMARY - BUILDING BLOCK: #13 AGENT DESTRUCTION SYSTEM (ADS) PARALLEL ITEMS INTO QUES.

SUBSYSTEM	ITEM NO.	$\Sigma N\lambda$ $\times 10^{-6}$	$\Sigma N\lambda_{TM}$ (1) $\times 10^{-6}$	MAINT (2) FACTOR	$\Sigma N\lambda_{TM}$ (1) $\times 10^{-6}$	MAINT. FACTOR	AGENT FACTOR HLLS	GB	VX	ΔS FROM CHILD SHEET FOR ITEMS SUMMARY
UNLOADING	13.1	127.8 ✓	689.1 ✓	2X	689.1 ✓	2X	1/3	1/3	1	
STORAGE	13.2	145.6 ✓	921.9 ✓	2X	921.9 ✓	2X	1/2	1/2	1	
STORAGE & DILUTION	13.3	434.4 ✓	2865.2 ✓	2X	2865.2 ✓	2X	2/3	2/3	1	
AGENT STORAGE	13.4	273.0 ✓	1675.7 ✓	2X	2513.6 ✓	3X	0	1/2	1/2	
VX CHLOR -1	13.5	252.2 ✓	1454.3 ✓	2X	2181.5 ✓	3X	0	0	1	}
VX CHLOR -2	13.6	800.2 ✓	5446.8 ✓	2X	8170.2 ✓	3X	0	0	1	}
GB/VX NEUT	13.7	907.2 ✓	5013.14	2X	7519.7 ✓	3X	0	1	1	
WASTE NEUT.	13.8	470.6 ✓	2690.2 ✓	2X	4035.3 ✓	3X	1	1	1	
BRINE HOLD.	13.9	213.5 ✓	1370.9 ✓	2X	1392.9 ✓	2X	1	1	1	
BRINE DRY'G	13.10	289.2 ✓	2518.9 ✓	2X	2518.9 ✓	2X	1	1	1	
SALT HNDLG										
PROCESS WATER SYSTS	13.11	259.1 ✓	1456.4 ✓	2X	1456.4 ✓	2X	1	1	1	
COOLING TOWER	13.12	93.4 ✓	540.5 ✓	2X	540.5 ✓	2X	1	1	1	
POT WATER DIST SYS	13.13	97.4 ✓	224.8 ✓	1X	337.2 ✓	1.5X	1	1	1	
PLANT AIR	13.14	105.2 ✓	337.3 ✓	1X	506.0 ✓	1.5X	0	1	1	
PLANT WATER	13.15	103.4 ✓	206.7 ✓	1X	310.1 ✓	1.5X	1	1	1	
STEAM DIST SYST.	13.16	66.1 ✓	134.9 ✓	1X	202.4 ✓	1.5X	1	1	1	
HVAC SUPPLY AIR	13.17	153.2 ✓	465.7 ✓	1X	698.6 ✓	1.5X	1	1	1	
EXH. AIR SYSTEM	13.18	64.1 ✓	261.5 ✓	1X	392.3 ✓	1.5X	1	1	1	
	Σ	4905.6 ✓	$\Sigma N\lambda_{TM}$ =				14483.4 ✓	23765.9 ✓	35993.0 ✓	$\times 10^{-6}$
			$\Sigma N\lambda$ =				2248.3 ✓	3397.2 ✓	4969.1 ✓	$\times 10^{-6}$
						A	.9359 ✓	.9768 ✓	.9653 ✓	
						MTBF	444.8 ✓	294.4 ✓	209.9 ✓	
						MTR	6.44 ✓	7.00 ✓	7.55 ✓	

1) AS LISTED ON PARA DATA SHEETS

2) USE THE 'MAINT' CHAR.

SUMMARY - BUILDING BLOCK: #1 AGENT DESTRUCTION SYSTEM (ADS)

$\Delta_1 = \Delta N\lambda$

$\Delta_2 = \Delta N\lambda T_m$

13.1 - UNLOADING AREA

1. 1 GLV Valve in Par. W. 2 PLACES and 1 Graph gate valve

$N\lambda$ 2.483

$2.483 \times 2 + 5.302 = 8.268$

$\lambda = \left[\frac{1}{2.483} + \frac{1}{8.268} + \frac{1}{2.483 + 8.268} \right]^{-1} = 2.32$

$\Delta_1 = 2.483 + 5.302 - 2.32 = 8.431 \times 2 = 16.9$

$N\lambda T_m$ $2.483 \times 4 = 9.932$

$2.483 \times 2 \times 4 + 3.302 \times 5.8 = 39.0$

$\left[\frac{1}{9.932} + \frac{1}{39} - \frac{1}{9.932 + 39} \right]^{-1} = 9.4$

$\Delta_2 = 9.932 + 39 - 9.4 = 39.5 \times 2 = 11$

13.2 STORAGE - No Parallel items

13.3 STORAGE and DILUTION -

1. 2 Ball valves, 1 check valve, pump, motor in parallel w/ same

$2 \times 3.027 + 3.014 + 12.053 + .4825 = 25.951$ $\frac{2}{3} \times 25.951 = 17.3$

$\Delta_1 = 25.951 \times 2 - 17.3 = 34.6$

$2 \times 3.027 \times 4 + 3.014 \times 4 \times 12.053 \times 10 + .4825 \times 6 = 185.802$ $\times \frac{2}{3} = 123.9$

$\Delta_2 = 185.802 \times 2 - 123.9 = 247.7$

2. 1 Ball valve in par w. 2 Ball valves + Graph gate valve.

$N\lambda$ 3.027

$3.027 \times 2 + 3.302 = 9.356$

$\lambda = \left[\frac{1}{3.027} + \frac{1}{9.356} + \frac{1}{3.027 + 9.356} \right]^{-1} = 2.8 \times 10^{-6}$

$\Delta_1 = 3.027 + 9.356 - 2.8 = 9.6$

$N\lambda T_m$ $3.027 \times 4 = 12.108$

$3.027 \times 2 \times 4 + 3.302 \times 5.8 = 43.368$

$\lambda = \left[\frac{1}{12.108} + \frac{1}{43.368} + \frac{1}{12.108 + 43.368} \right]^{-1} = 11.4$

$\Delta_2 = 12.108 + 43.368 - 11.4 = 44.1$

STOR & DIL	$\Sigma\Delta_1 = 44.2$	✓
	$\Sigma\Delta_2 = 291.8$	

SUMMARY - BUILDING BLOCK: #13 AGENT DESTRUCTION SYSTEM (ADS)

SUBSYSTEM	ITEM NO.	$\Sigma N\lambda$ $\times 10^{-6}$	$\Sigma N\lambda_M$ [1] $\times 10^{-6}$	MAINT. FACTOR	$\Sigma N\lambda_M$ [1] $\times 10^{-6}$	MAINT. FACTOR	AGENT FACTOR MUSTARD	AGENT FACTOR GB	AGENT FACTOR VX	Δ's FROM CALC. SHEETS FOR ITEMS SHOWN
UNLOADING	13.1	127.8 ✓	689.1 ✓	2X	689.1	2X	1/3	1/3	1	
STORAGE	13.2	145.6 ✓	921.9 ✓	2X	921.9	2X	1/2	1/2	1	
STORAGE & DILUTION	13.3	454.4 ✓	2865.2 ✓	2X	2865.2	2X	2/3	2/3	1	
AGENT STORAGE	13.4	273.0 ✓	1675.1 ✓	2X	2513.6	3X	0	1/2	1/2	
VX CHLOR -1	13.5	252.2 ✓	1454.3 ✓	2X	2181.5	3X	0	0	1	
VX CHLOR -2	13.6	800.2 ✓	5446.8 ✓	2X	8170.2	3X	0	0	1	
GB/VX NEUT	13.7	407.2 ✓	5013.1 ✓	2X	7519.7	3X	0	1	1	
MUSTARD NEUT.	13.8	470.6 ✓	2690.2 ✓	2X	4035.3	3X	1	1	1	
BRINE HOLD.	13.9	213.5 ✓	1370.9 ✓	2X	1390.9	2X	1	1	1	
BRINE DRYG	13.10	289.2 ✓	2518.9 ✓	2X	2518.9	2X	1	1	1	
SALT HANDLG										
PROCESS WASH SCRUB	13.11	259.1 ✓	1456.4 ✓	2X	1456.4	2X	1	1		
COOLING TOWER	13.12	93.4 ✓	540.5 ✓	2X	540.5	2X	1	1	1	
SUP. WATER DIST SYS	13.13	97.4 ✓	224.8 ✓	1X	337.2	1.5X	1	1	1	
PLANT AIR	13.14	105.2 ✓	337.3 ✓	1X	506.0 ✓	1.5X	0	1	1	
PLANT WATER	13.15	103.4 ✓	206.7 ✓	1X	310.1 ✓	1.5X	1	1	1	
STEAM DIST SYST.	13.16	66.1 ✓	134.9 ✓	1X	202.4 ✓	1.5X	1	1	1	
HVAC SUPPLY AIR	13.17	153.2 ✓	465.7 ✓	1X	698.6	1.5X	1	1	1	
EXH. AIR SYSTEM	13.18	64.1 ✓	261.5 ✓	1X	392.3 ✓	1.5X	1	1	1	
	Σ	4905.6 ✓	$\Sigma N\lambda_M$ =				14483.4 ✓	23765.9 ✓	35993.0 ✓	$\times 10^{-6}$
			$\Sigma N\lambda$ =				7248.3 ✓	3397.2 ✓	1769.1 ✓	$\times 10^{-6}$
						A	.9857 ✓	.9768 ✓	.9653 ✓	
						MTBF	444.8 ✓	294.4 ✓	209.7 ✓	
						MTR	6.44 ✓	7.00 ✓	7.55 ✓	

(1) AS LISTED ON FOR DATA SHEETS

SUMMARY - BUILDING BLOCK: #13 AGENT DESTRUCTION SYSTEM (ADS)

PARALLEL ITEMS

13.4 - AGENT STORAGE - NO PARALLEL ITEMS

13.5 - VX ACID CHLORINATION - 1 - NO PARALLEL ITEMS.

13.6 - VX ACID CHLORINATION - 2 - NO PARALLEL ITEMS

13.7 GB/VX CAUSTIC NEUT. - NO PARALLEL ITEMS.

13.8 WISTE CAUSTIC NEUT. - NO PARALLEL ITEMS

13.9 BRINE HOLDING - NO PARALLEL ITEMS

13.10 BRINE DRYING & SALT HANDLING - NO PARALLEL ITEMS (ASSUME MAIN = 1 NOT INC

13.11 PROCESS VENT SCRUBBER

1 (FAN + MOTOR + MOUNTING PLATES) 2 IN PARALLEL

$N\lambda$ (1.229 + 4.825 x 2 + .798) = 11.677 $11.677 \times \frac{2}{3} = 7.78$

$\Delta_1 = 11.677 \times 2 - 7.78 = 15.6$

$N\lambda_m$ {1.229 x 9.2 + 4.825 x 2 x 6 + .798 x 4} = 72.4 $\times \frac{2}{3} = 48.3$

$\Delta_2 = 72.4 \times 2 - 48.3 = 96.5$

2 (2HV + CHKV + PUMP + MOT) 2 IN PAR.

$N\lambda$ (2 x 2.483 + 3.014 + 12.058 + 4.825) = 24.863 $\times \frac{2}{3} = 16.575$

$\Delta_1 = 24.863 \times 2 - 16.575 = 33.2$

$N\lambda_m$ (2 x 2.483 x 4 + 3.014 x 4 + 12.058 x 10 + 4.825 x 6) = 181.45 $\times \frac{2}{3} = 120.97$ $\Sigma\Delta_1 = 48.8$

$\Delta = 181.45 \times 2 - 120.97 = 241.9$

SUMMARY - BUILDING BLOCK: #1. AGENT DESTRUCTION SYSTEM (ADS)

PARALLEL ITEMS (cont.)

13.12 COOLING TOWER -

1. (Pump + Motor + Hx + 5 Valves) 2 in Parallel

$N\lambda$ (12.058 + 4.825 + 2.483 + 3.014) = 22.38 , $\times \frac{2}{3}$ = 14.9 $\quad \Delta_1 = 22.38 \times 2 - 14.9 = 29.8$

$N\lambda T_{ft}$ = (12.058 × 10 + 4.825 × 6 + 2.483 × 4 + 3.014 × 4) = 171.52 , $\times \frac{2}{3}$ = 114.34 . Δ_2 = 171.52 × 2 − 114.34 = 228.7

2. 2 Hx in Parallel

$N\lambda$ 2.483 $\times \frac{2}{3}$ = 1.655 $\quad \Delta_1 = 2.483 \times 2 - 1.655 = 3.3$ $\quad \Sigma\Delta_1 = 33.1$

$\Delta_2 = 2.483 \times 4 \times 2 - 2.483 \times 4 \times \frac{2}{3} = 13.2$ $\quad \Sigma\Delta_2 = 241.9$

13.13 Cooling Water Distr System - No Parallel Items

13.14 Plant Air

1. (Heatless Dryer + 2 Chk V) 2 in Parallel

$N\lambda$ 1.616 + 2 × 3.014 = 7.644 , $\quad \Delta_1 = 7.644 \times 2 - 7.644 \times \frac{2}{3} = 10.192$

$N\lambda_6$ 1.616 × 14 + 2 × 3.014 × 2 = 34.68 $\quad \Delta_2 = 34.68 \times 2 - 34.68 \times \frac{2}{3} = 46.2$

2. (2 Hx + filter) 2 in Parallel 2 places $\quad \Sigma\Delta_1 = 22.8$

$N\lambda$ 1.766 × 2 + 1.201 = 4.733 $\quad \Delta_1 = \{4.733 \times 2 - 4.733 \times \frac{2}{3}\} \times 2 = 12.6$ $\quad \Sigma\Delta_2 = 71.4$

$N\lambda T_{ft}$ 1.766 × 2 × 2 + 1.201 × 2 = 9.466 $\quad \Delta_2 = \{9.466 \times 2 - 9.466 \times \frac{2}{3}\} \times 2 = 25.2$

13.15 Plant Water - No Parallel Items

SUMMARY - BUILDING BLOCK: #1 AGENT DESTRUCTION SYSTEM (ADS)

PARALLEL ITEMS (cont.)

13-16 STEAM DISTRIB. SYSTEM

1. GLOBE VALVE IN PIPE w 2 HV + DIAPHRAGM GATE VALVE — 16 places

$N\lambda$ — 2.483

2.483 x 2 + 3.302 = 8.268 — $\lambda = \left[\frac{1}{2.483} + \frac{1}{5.268} - \frac{1}{2.483+8.268}\right]^{-1} = 2.32$

$\Delta_1 = (2.483 + 8.268 - 2.32) \times 13 = 109.6$

$N\lambda_{11}$ — 2.483 x 2 = 4.966

2.483 x 2 x 2 + 3.302 x 2.9 = 19.508 — $\lambda = \left[\frac{1}{4.966} + \frac{1}{19.508} - \frac{1}{4.966+19.508}\right]^{-1} = 4.72$

$\Delta_2 = (4.966 + 19.508 - 4.72) 13 = 256.8$

2. GLOBE VALVE in Parallel w 2 HV & CHK V. — 4 Places

$N\lambda$ — 2.483

2.483 x 2 + 3.014 = 7.98 — $\lambda = \left[\frac{1}{2.483} + \frac{1}{7.98} - \frac{1}{2.483+7.98}\right]^{-1} = 2.31$

$\Delta_1 = [2.483 + 7.98 - 2.31] \times 13 = 106.0$

$N\lambda_{11}$ — 2.483 x 2 = 4.966

2.483 x 4 + 3.014 x 2 = 15.96 — $\lambda = \left[\frac{1}{4.966} + \frac{1}{15.96} - \frac{1}{4.966+15.96}\right]^{-1} = 4.62$

$\Delta_2 = (4.966 + 15.96 - 4.62) \times 13 = 212.0$

3. (HV + CHK VLV) 2 in Parallel

$N\lambda$ — 2.483 + 3.014 = 5.497 — $\Delta_1 = 5.497 \times 2 - 5.497 \times \frac{2}{7} = 7.3$

$N\lambda_{11}$ — 2.483 x 2 + 3.014 x 2 = — $\Delta_2 = 14.6$

4. (4 HV + Digest Valve) 3 in parallel

$N\lambda$ — 4 x 2.483 + 3.302 = 13.234 — $\Delta_1 = 13.234 \times 3 - 13.234 \times \frac{6}{11} = 32.5$

$N\lambda_{11}$ — 4 x 2.483 x 2 + 3.302 x 2.9 = 29.44 — $\Delta_2 = 29.44 \times 3 = 29.44 \times \frac{6}{11} = 72.3$

$\Sigma \Delta_1 = 255.4$

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SUMMARY - BUILDING BLOCK: #13 GENT DESTRUCTION SYSTEM (ADS)

PARALLEL ITEMS (cont.)

13.17 - HVAC Supply Air System - No Parallel Items

13.18 - EXHAUST AIR SYSTEM

1 (5 FILTERS, FAN, MOTOR & 2 DAMPERS) 2 IN PARALLEL

$N\Delta$ (5X1.201 + 1.229 + 4.825 + 2X.166) = 12.391 $\Delta_1 = 12.391 \times 2 - 12.391 \times \frac{2}{3} = 16.52$

$N\Delta_m$ (5X1.201X2 + 1.229X4.6 + 4.825X3 + 2X.166X2) = 32.52 $\Delta_2 = 32.6 \times 2 - 32.6 \times \frac{2}{3} = 43.1$

2 (FAN + MOT. DAMPER) 2 IN PARALLEL 2 PLACES

$N\Delta$ (1.229 + 4.991) = 6.22 $\Delta_1 = [6.22 \times 2 - 6.22 \times \frac{2}{3}] \times 2 = 16.6$

$N\Delta_m$ (1.229X4.6 + 4.991X3) = 20.63 $\Delta_2 = [20.63 \times 2 - 20.63 \times \frac{2}{3}] \times 2 = 55.0$

$\Sigma\Delta_1 = 53.1$

$\Sigma\Delta_2 = 98.1$

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #14 EXPLOSIVE TREATMENT SYSTEM ~~(EBT)~~ ETS

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*M55 ROCKET, GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	393.2	2538.7	2246.8	5.70	.99
Rocket, 115mm, M55	VX	Comp B	M28	"	"	"	"	"
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None					
Projectile, 155mm, M121A1	GB	None	None					
Projectile, 155mm, M121	GB	None	None					
Projectile, 155mm, M122	GB	None	None					
Projectile, 8", M426	GB	None	None					
Projectile, 155mm, M121A1	VX	None	None					
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	393.0	2538.7	2246.8	5.70	.99
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	"	"	"	"	"
Projectile, 155mm, M104	HD	Tetrytol	None	"	"	"	"	"
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None					
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6					
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6					

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #14 EXPLOSIVE TREATMENT SYSTEM (EB)

MUNITION	AGENT	EXP.	PROP.	$N\dot{\lambda}$	MTBF	$N\lambda TM$	MTTR	AVAILABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None					
Tank,Spray, TMU-28/B	VX	None	None					
Ton Container	GB	None	None					
Tone Container	VX	None	None					
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None					

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK # 14 EXPLOSIVE TRE SYSTEM (ETS)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. _____ DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES Drawing No's are referenced on failure rate and maintainability data sheets

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER RADC-TR-74-268 RADC-TR-69-458

2. NOTES Estimates were made where data not available

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

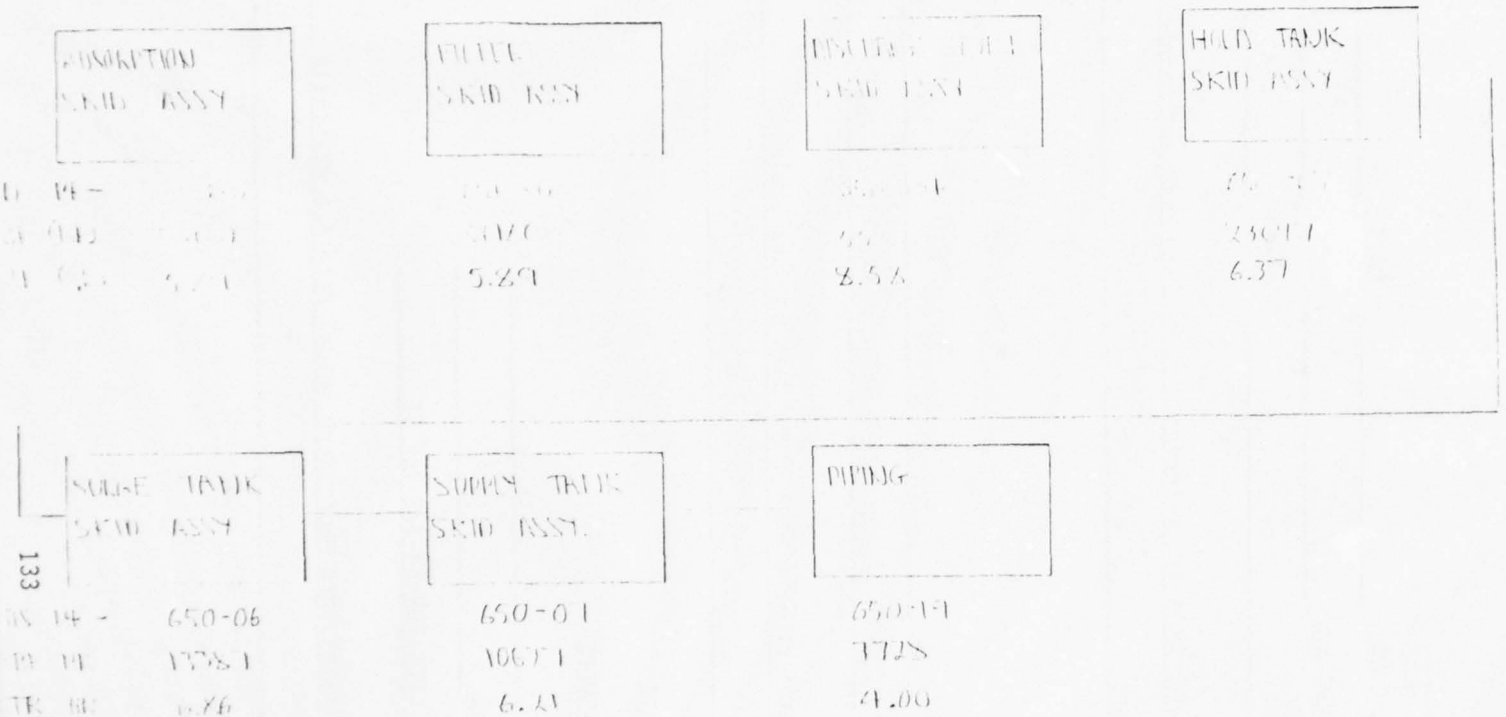
c. OTHER RADC-TDR-64-373 Vol II

2. NOTES Estimates were made where actual data not available

D. GENERAL REMARKS

BUILDING BLOCK: #14 EXPLOSIVE TREATMENT SYSTEM (ETS)

FLOW CHART



REVISED 11/13/75

SHEET 1 OF 3

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #14 EXPLOSIVE TREATMENT SYSTEM (EB)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA Σx: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
1	ADSORPTION SKID ASSY	ADSORPTION COLUMN & SUPPORT								X					X		
1.1	GAGE, PRESS	0-15 PSI GAGE, LINE PR TO 3 AD. COLUMN	—	61349	3	2-02 9/30/75	2	1.020	P-25		1.0	2.0	1.0	4.0		P-25	IND AIR PR. GRD
1.2	COLUMN, ADSORPTION	ADSORB DISSOLVED EXPLO & AGENT CONTAM.	-0901	—	3 b	2-02	2	3.945	P-21		1.0	2.8	1.0	4.8		P21	FILTER-LIQ GRD (WI)
1.3	VALVE, ACTUATOR	AUTO VALVE ALLOW SPENT DECON TO PASS TO AGS	-1699	—	1	2-02	2	6.839	P44		1.0	5.0	2.0	8.0		P44	VALVE OUT GRD
2	FILTER SKID ASSY	MECH COLUMN & SUPPORT								X					X		
2.1	GAGE, PRESS	SAME AS 1.1	—	61349	3	2-03 10-2-75	2	1.020	P-25		1.0	2.0	1.0	4.0		P-25	IND AIR PR. GRD
	FILTER & BAG	FILTER SLUDGE AND LARGE PART. "MECH" FILTER	MODEL RSI (FILTER) PART RS (BAG)	80717	2	2-03	2	3.945	P-21		1.0	2.8	1.0	4.8		P21	FIL LIQ. GRD (WI)
134	VALVE, ACTUATOR	SAME AS 1.3 - DECON TO SURGE TANK	-1699	—	1	2-03	2	6.839	P44		1.0	5.0	2.0	8.0		P44	
2.3	DISCHARGE PUMP SKID ASSY	SUPPORT DISCHARGE PUMP								X					X		
3.1	PUMP, CENTR.	PUMP SPENT DECAN/AGENT	—	76717	1	2-04 10-2-75	2	12.058	P-30		1.0	7	2	10		P-30	PUMP-CENTR-GRD
3.2	GAGE, PRESS	PUMP DISCHG PRESS - LOCAL	-1199	—	1	2-04	2	1.020	P-25		1	2	1	4		P-25	IND AIR-PR GRD
3.3	MOTOR	MOTOR FOR PUMP	—	—	1	—	2	4.815	P-28		1.0	4.0	1.0	6		P-28	SHIP DATA USED

b. ONLY 2 COLUMNS IN OPERATION @ ONE TIME

$\Sigma N\lambda = 53.172 \times 10^{-6}$/HR SN = 16

$\Sigma N\lambda TM = 253.21 \times 10^{-6}$ $\Sigma N T_M = 57.75$

*Information is detailed in Supplemental Data Sheet (IF NOT HERE) a. EC/S 14-650 —

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = ____$ HRS

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\quad}{\quad} = ____$ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = ____ \%$

REVISED 11/15/75

SHEET 2 OF 3

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #14 EXPLOSIVE TREATMENT SYSTEM (EB)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA 2 σ: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
-4	HOLD TANK SKID ASSY	HOLD TANK SUPPORT								X					X		
-4.1	AGITATOR	STIR TANK 1/3 HP MOTOR	FRH-2C	80423	1	Q-05 9-24-75	2	3.528*	P-23		1	2	1	4		P28	ELT FRACTN EQUIP(HS)
-4.2	VALVE, ACTUATOR	SAME AS 14-1.3	-1699	—	1	Q-05	2	6.835*	P47		1	5	2	8		P-44	SOL VLV 4TH
-4.3	PROBE, LEVEL	TANK LIQ LEVEL SENS.	-1599	—	1	Q-05	2	11.905*	P-25		1	2	1	4		P-25	INT LVL+FLV GRD
-4.4	OVERFILL, PROBE	LEVEL OVERFILL	-1299	—	1	Q-05	2	11.905*	P-25		1	2	1	4		P-25	"
-4.5	TANK	HOLD TANK	-1701	—	1	Q-05	2	3.495*	P37		1.0	25	2.0	28		P-39	TANK NOT STD GRD MT & REPAIR
-5	SURGE TANK SKID ASSY	SURGE TANK SUPPORT								X					X		
-5	PUMP, CENTR	PUMP SPENT DECON) ACID	—	96717	1	Q-06 Q-1-75	2	12.058*	P-30		1	7	2	10		P30	PUMP-CENTR-GRD
-5.1	AGITATOR	STIR TANK 1/3 HP	FRG-2C	80293	1	Q-06	2	8.528*	P-23		1	2	1	4		P28	SEE 4.1
-5.2	FLOW INDICATOR	ROTAMETER & INDICATOR	SEE Q-06	91552	1	Q-06	2	10.178*	P40		1	3	2	6		P40	TRANS-FLO-GRD LO
-5.3	VALVE, ACTUATOR	SAME AS 14-1.3	-1699	—	1	Q-06	2	6.835*	P-44		1	5	2	8		P-44	SOL-VLV 4TH
-5.5	PROBE, LEVEL	TANK LEVEL SENS.	-1598	—	1	Q-06	2	11.905*	P-25		1	2	1	4		P25	INT LVL+FLV GRD
-5.6	PROBE, OVERFILL	OVERFILL LEVEL	-1299	—	1	Q-06	2	11.905*	P-25		1	2	1	4		P25	"
-5.7	TANK	SURGE TANK	-1801	—	1	Q-06	2	3.495*	P39		1	25	2	28		P39	SEE 4.5
-5.8	MOTOR	MOTOR FOR PUMPS -5.1 & -5.2	—	—	2	—	2	4.875*	P-28		1	4	1	6		P28	STD

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet (IF NOT ON THIS SHEET) (R.E. 15-14-6.50) — ◊ See Chilton Failure Rate Maint Report

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

revised 11/18/75

SHEET 3 OF 7

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #14 EXPLOSIVE TREATMENT SYSTEM (ED)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO. (OR DWG)	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	NλTM	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
6	SUPPLY TANK SKID ASSY	SUPPLY TANK SUPPORT							FAIL								
6.1	PUMP, CENTR	SUPPLY PUMP DECON	—	96717	1	A-07 12-32	2	12.058	P-30		1	7	2	10.		P-30	TEMP CON GRD
6.2	AGITATOR	SITE TANK	FRG-2C	80093	1	A-07	2	8.528	P-28		1	2	1.0	4		P-28	SEE 4.1
6.3	VALVE, ACTUATOR	SAME AS 14-1.3	-1699	—	1	A-07	2	6.539	P-44		1	5	2	8		P-44	I.V. OIL grd
6.4	PROBE, LEVEL	TANK LIQ LEVEL	-1598	—	1	A-07	2	11.905	P-25		.1	.2	1	4		P-25	IND LIQ LEV GRD
6.5	PROBE, PH	PH PROBE	-1499	-	1	A-07	2	11.905	P-25		.1	.2	1	.4.		P-25	"
6.6	PROBE, TEMP	TEMP. MEAS.	-1399	—	1	A-07	2	11.905	P-25		1	2	1	4		P-25	"
6.7	HOPPER	DRY FEED HOPPER	-1299	—	1	A-07	2	12.689	CALC		1.0	3.0	2	6		EST	CALC
6.8	136 VOL, OVERFILL	OVERFILL LEVEL	-1299	—	1	A-07	2	11.905	P-25		1	2	1	4		P-25	IND LIQ LEV GRD
6.9	GAUGE, PRESS	PUMP DISCHARGE GAUGE	-1199	—	1	A-07	2	1.020	P-35		1	2	1	4		P-25	Ind air press grd
6.10	HEATER	IMMERSION HEATER FOR TANK	-0899	—	1	A-07	2	2.334	P-24		1	6.4	1	8.4		P-24	HEATER GRD (H)
6.11	TANK	SUPPLY (DECON) TANK	-1801	—	1	A-07	2	3.035	P-39		1	25	2	28		P-39	SEE 4.5
7	PIPING																
7.1	VALVE, SQUEEZE	VALVE, RISING STEM S/O	2SV100	06660	2	A-19 B-30-35	2	2.488	P-45		1	2	1	4		P-45	I.V. Water gen grd.
7.2	SIGHT GAUGE	GLASS SIGHT FLOW	SEE A-19	96717	6	A-19	2	3	EST		1	2	1	4		EST	
7.3	JOINT EXPANSION	EXPANSION CONNECTION	"	"	9	A-19	2	3	EST		1	2.0	1	4		EST	
7.4	VALVE, PLUG	S/O VALVE	"	"	32	A-19	2	2.483	P-46		1	2	1	4		P-41	VLV

ΣNλ = ____ x 10^{-6}/HR ΣNλTM = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet (IF NOT ON THIS SHT)
a. ECDS 14-650 — b. CHNDS F&M FOLDER

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

Math ch 12-1-75

SUMMARY - BUILDING BLOCK: #14 EXPLOSIVE TREATMENT SYSTEM (ETS)

SUB SYSTEM	ITEM	$\Sigma N\lambda$ $\times 10^{-6}$	$\Sigma N\lambda T_M$ $\times 10^{-6}$	MAINT FACTOR
ADSORPTION SKID ASSY	1	17.8	104.8	2X
FILTER SKID ASSY	2	17.8	104.8	2X
INCINERATOR SKID ASSY	3	17.9	153.6	2X
OLD TANK SKID ASSY	4	42.2	269.0	2X
SURGE TANK SKID ASSY	5	74.7	512.2	2X
SUPPLY TANK SKID ASSY	6	94.1	584.7	2X
PIPING	7	129.4	517.7	2X
	Σ	393.9	2246.8	

MTBF 2538.7
MTTR 5.70
A .9978

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #15 PROJECTILE DEMIL MACHINE (PDM)

MUNITION	AGENT	EXP.	PROP.	MA	MTBF	MATM	MTTR	AVAIL ABILITY
*M55 ROCKET, GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	NA	NA	NA	NA	NA
Rocket, 115mm, M55	VX	Comp B	M28	NA	NA	NA	NA	NA
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	NA	NA	NA	NA	NA
Projectile, 155mm, M121A1	GB	None	None	NA	NA	NA	NA	NA
Projectile, 155mm, M121	GB	None	None	NA	NA	NA	NA	NA
Projectile, 155mm, M122	GB	None	None	NA	NA	NA	NA	NA
Projectile, 8", M426	GB	None	None	NA	NA	NA	NA	NA
Projectile, 155mm, M121A1	VX	None	None	NA	NA	NA	NA	NA
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	4470.142	228.71	36605.34	12.65	94.7
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	2013.0135	139.21	22280.54	12.64	94.1
Projectile, 155mm, M104	HD	Tetrytol	None	2948.0135	339.21	22280.54	12.64	96.4
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None	NA	NA	NA	NA	NA
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6	NA	NA	NA	NA	NA
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6	NA	NA	NA	NA	NA

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #15 PROJECTILE DEMIL MACHINE (PDM)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL.
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	NA	NA	NA	NA	
Tank,Spray, TMU-28/B	VX	None	None	NA	NA	NA	NA	
Ton Container	GB	None	None	NA	NA	NA	NA	
Tone Container	VX	None	None	NA	NA	NA	NA	
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	NA	NA	NA	NA	

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF ___

SUPPLEMENTAL DATA

BUILDING BLOCK
#15 PROJECTILE
DEMIL MACHINE
(PDM)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. See Attached DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES _____

_____

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER _____ _____

2. NOTES _____

_____

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER _____

2. NOTES _____

_____

D. GENERAL REMARKS

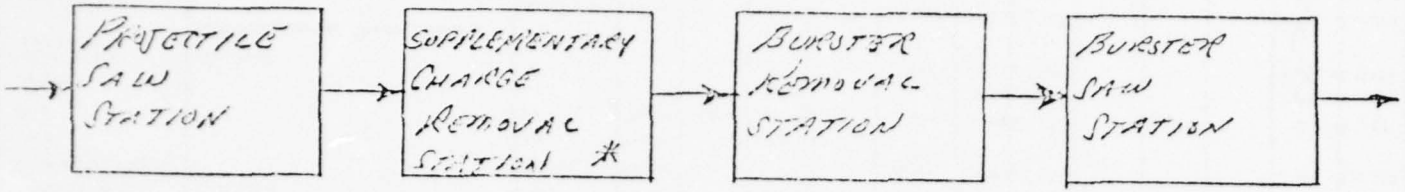
- Failure rate for blades (20 x 10⁻⁶ for Projectile saw & 4 saws for Nosing saw) is based on saws rotated as used for 12" & 6" rounds. Mean T.T.R. est is minimum time.
- Supplemental charges [illegible]

BUILDING BLOCK #15 PROJECTILE DEMIL MACHINE (PDM)

DRAWINGS:

15-205-04	27 FEB 73	REVISION	3	9 JUN 75
05	27 DEC 74			
15-302-01	24 MAY 75	REVISION	3	11 APR 75
-02	24 MAY 75	REVISION	2	23 JUN 75
-08	24 MAY 75			
-11	24 MAY 75	REVISION	1	5 SEP 73
-12	3 JAN 74	REVISION	2	9 DEC 74
-13	21 FEB 74			
-14	28 JAN 74			
-15	12 FEB 74			
-16	29 JUL 74			
-18	18 OCT 74			
-19	12 MAY 75			
-03	24 MAY 75	REVISION	3	1 AUG 75
-04	24 MAY 75	REVISION	6	26 JUN 75
-05	24 MAY 75	REVISION	3	10 JAN 75
15-303-01	31 MAY 75			
-06	31 MAY 75			
15-304-01	15 NOV 72	REVISION	6	11 SEP 75
-10	23 AUG 72			
-11	4 NOV 72	REVISION	2	9 AUG 75
-12	13 NOV 72	REVISION	2	19 APR 74
-15	15 NOV 72	REVISION	1	9 NOV 73
-20	12 NOV 72	REVISION	2	23 APR 74
-23	20 FEB 73			
-24	8 MAR 73			
-25	15 JAN 73	REVISION	2	11 SEP 73
-27	6 NOV 72			
-30	4 JUN 75			
15-532-1/1	30 JUN 73			
15-533-1/5	29 JAN 73			
-2/5	29 JAN 73			
-3/5	30 JAN 73			
-4/5	9 AUG 73			
-5/5	9 AUG 73			
15-607-03	3 FEB 75	REVISION	1	11 FEB 75

BUILDING BLOCK #15 PROJECTILE DEMIL MACHINE (PDM)
FLOW CHART



* NOT USED AT TEAD

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 4

#15 PROJECTILE DEMIL

BUILDING BLOCK MACHINE (PDM)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10⁻⁶HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	
	PROJECTILE SAW & PUMP				(302)											
SAW		379	K-LINE	1	0101	-										
MOTOR 3HP				1		2	1.200	P28	1.206				3.0	3.618	P28	MOTOR 3HP AC GND
GEAR UNIT				1		2	11.726	P27	11.726				3.0	35.178	EST	MECH, POWER TRANS, GEARS & GEARING
PUMP ASSM	PUMP ASSMY	1P801	GRANGER	1	0102	-										
CENTRIFICAL PUMP				1		2	12.850	P30	12.850				5.0	60.29	P30	PUMP CENT GND
MOTOR 7½HP				1		2	7.552	P26	7.552				2.0	15.104	P26	MOTOR, FRACT HP AC GND ABLE
CYLINDER, HYD	PASS SAW	R2K	HYDRO LINE	1	0103	2	15.228	P15	15.228				4.0	60.912	P15	ACT, LIN HYD GND
CYLINDER, HYD	PASS SAW JAW	3L	HANNIFIN	1	0201	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
CLEVIS, ROD		50942	HANNIFIN	1	0204	2	NER									
PIN, PIVOT		68369	HANNIFIN	1	0205	2	NER									
INDEX, HYD	PASS SAW JAW	C3L-1-4	HANNIFIN	1	0218	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
ARMS, TEFLON	SAW VISE	1620-8	BOSTON	2	0305	2	2.059	P16	4.118				2.0	8.236	P16	BEARING, GEN, GND
VALVE, HYD, PRES REDUC.		PR60051	VICKERS	1	1101	2	8.416	P43	8.416				2.0	16.832	P43	VALVE, HYD PRES REG GND MOB
BASE		115	VIKING	1	1102	3										
HOSE		421-8	PARKER	12FT	1106	2	.240	P24	.240				2.0	.48	P24	HOSE GND MOB
BLADE				1	1701/02	2	200	*	200				2.0	400	*	
VALVE, BALL — SEE SHEET #4	COOLANT SUPPLEMENTAL CHARGE REMOVAL			1		2	1.441	P41	1.441				3.0	4.323	P41	VALVE, BALL GND MOB
																NOT USED AT TCAD
CYLINDER, HYD		1½-HVBX-6MCC	SHEFFER	1	1209	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
CYLINDER, HYD		4" HNTF 2½ C	SHEFFER	1	1210	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
BEARING, SLEEVE		B014-4	BOSTON	4	1212	2	2.059	P16	8.236				2.0	16.472	P16	BEARING, GEN GND
BEARING, SLEEVE		FP1014-2	BOSTON	2	1213	2	2.059	P16	4.118				2.0	8.236	P16	BEARING, GEN GND
BEARING, SLEEVE		FP1014-8	BOSTON	2	1214	2	2.059	P16	4.118				2.0	8.236	P16	BEARING, GEN GND
MAGNET		CE 3/4	GRADER	2	1305	2	NER									
HOSE		421	HANNIFIN	12FT	1906	2	.240	P24	.240				2.0	.480	P24	HOSE GND MOB

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

Item 1 Σ Nλ = 272.441 x 10⁻⁶/HR Item 1 Σ NλTM = 735.213 x 10⁻⁶ ✓

Item 2 Σ Nλ = 47.168 x 10⁻⁶ ✓ Item 2 Σ NλTM = 151.248 x 10⁻⁶ ✓

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{Item 2}}$ = _____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = _____ = _____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = _____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #15 PROJECTILE DEMIL MACHINE (PDM)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
	ΔP Clamp				(303)											
Conveyor, Rollers		31BKS, 150	WAMCO	4	0105	3										
Cylinder, Hyd		2MNFF 27/CC	SHEFFER	1	0106	2	15.228	p15	15.228				4.0	60.912	p15	Act Cyl Hyd Grd
Cylinder, Hyd	ΔP Holding Jaws	2MNFF 2CC	SHEFFER	2	0107	2	15.228	p15	30.456				4.0	121.824	p15	Act Cyl Hyd Grd
Gauge		115	MARSH	1	0001	3										
Valve, Hyd, Pressreg		PR 600-9-1	DENISON	1	0602	2	8.416	p48	8.416				3.0	25.248	p45	Valve Hyd Press Reg Grd Mob
Hose		421-6	HANNAY	3½FT	3604	2	.240	p24	.240				2.0	.480	p24	Hose Grd Mob
Hose		421-8	HANNAY	14FT	0605	2	.240	p24	.240				2.0	.480	p24	Hose Grd Mob
Seals	Establish ΔP			2	PLAN	3										
Valve, Press, Sol	Air Supply for ΔP 114.7 psi			1	PLAN	2	19.699	p45	17.699				3.3	65.604	p45	Valve Press Sol Air

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ΔΣNλ = 74.468 x 10^{-6}/HR ✓ ΔΣNλTM = 2745744 x 10^{-6} ✓

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

SHEET 3 OF 4

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #15 PROJECTILE DEMIL MACHINE (PDM)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
0		BURSTER PULL & SAW				(3)(4)	-										
1	CYLINDER, HYD	BURSTER SAW JAW #1		WORAK	2	0160	2	15.228	p16	30.456				4.0	121.824	p15	ACT LIN HYD GND
2	CYLINDER, HYD	BURSTER SAW JAW #2		WORAK	2	0161	2	15.228	p15	30.456				4.0	121.824	p15	ACT LIN HYD GND
3	CYLINDER, HYD	CARRIAGE VERT		WORAK	2	0122	2	15.228	p15	30.456				4.0	121.824	p15	ACT LIN HYD GND
4	CYLINDER, HYD	CARRIAGE HORZ		WORAK	2	0123	2	15.228	p15	30.456				4.0	121.824	p15	ACT LIN HYD GND
5	BALL BUSHING		A324-964	THOMSON	12	0124	2	2.059	p16	24.708				2.0	41.416	p16	BEARING GEN GND
6	SEAL, BALL BUSHING		S 2000	THOMSON	12	0125	2	NEG									
7	SCRAPER RING		S11085-21-1	CHAMPION	12	0126	3										
8	PIN, CYL MTG			WORAK	2	0127	2	NEG									
9	PUMP ASSEMBLY	PUMP ASSEMBLY	117801	16727	1	0129	-										
10	INTERNAL PUMP				1		2	12.059	p30	12.059				5.0	60.29	p30	PUMP CENTR GND
11	MOTOR 5 HP				1		2	7.552	p29	7.552				2.0	15.104	p29	MOTOR STATOR HP GND MTR
12	CYLINDER HYD	SAW PUSHER, BURSTER		WORAK	1	0108	2	15.228	p15	15.228				4.0	60.912	p15	ACT LIN HYD GND
13	SAW ASSEMBLY	SAW ASSEMBLY	778	K-LINE	1	0107	-										
14	MOTOR 2HP				1		2	2.413	p28	2.413				2.5	6.0325	p28	MOTOR 2HP GND
15	GEAR BOX				1		2	11.726	p27	11.726				2.5	29.315	EST	MTR, POWER TRAN, BEARING GEN MTR
16	BLADE				1	300 X/01	2	20	*	20				2.0	40	*	
17		BURSTER REMOVAL ASSEMBLY					—										
18	CYLINDER HYD	BURSTER PULL		SHEFFER	1	1101	2	15.228	p15	15.228				4.0	60.912	p15	ACT LIN HYD GND
19	CYLINDER HYD	SAW HEAD STROKE		SHEFFER	2	1102	2	15.228	p15	30.456				4.0	121.824	p15	ACT LIN HYD GND
20	SCRAPER RING		S-11025-7-1	CHAMPION	4	1104	2	NEG									
21	CYLINDER, HYD	BURSTER LOCK	S/A 25-1-XA1	CYLINDAIR	1	1105	2	15.228	p15	15.228				4.0	60.912	p15	ACT LIN HYD GND
22	BEARING TEFLON		P1014-8	GLACIER	4	1207	2	2.059	p16	8.236				2.0	16.472	p16	BEARING GEN GND
23	CYLINDER, HYD			CYLINDAIR	1	1535	2	15.228	p15	15.228				4.0	60.912	p15	ACT LIN HYD GND

ΔΣNλ = 277.835 x 10⁻⁶/HR ✓ ΔΣNλTM = 1069.3925 x 10⁻⁶ ✓

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK 15 PROJECTILE DEMIL MACHINE (PDM)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
HOSE		421-6	PARKER	20FT	(334) 2319	2	.240	P24	.24				2.0	.48	P24	HOSE GND MODS
VALVE HYD PRES REG		PR600-51	PARKER	2	2401	2	8.416	P45	16.832				3.0	50.496	P43	VALVE HYD PRES REG GND MODS
GAGE		115	MARSH	2	2402	3										
HOSE		421-8	PARKER	25FT	2405	2	.240	P24	.24				2.0	.48	P24	HOSE GND MODS
VALVE, SEQ & CHK, HYD		RCT 03D2	VICKERS	2	2518	2	19.573	P43/45	39.146				3.5	137.011	P40/43	VALVE HYD CONTROL AIR ÷ 6.5 H VALVE GND
FLOW DIVIDER		PM16	VOLSTA	1	2519	2	16.559	P40	16.559				3.5	57.9565	P40	VALVE HYD CONTROL AIR ÷ 6.5
FLOW DIVIDER		PM12	VOLSTA	1	2520	2	16.559	P40	16.559				3.5	57.9565	P40	VALVE HYD CONTROL AIR ÷ 6.5
VALVE, HYD CHK, PILOT		1608-3	PARKER	1	2521	2	3.014	P41	3.014				2.0	6.028	P41	VALVE, CHK GND
VALVE, HYD FLOW CONTROL		PCM 6008	PARKER	3	2522	2	16.559	P45	49.677				3.5	173.8495	P43	VALVE HYD CONTROL AIR ÷ 6.5
LISTINGS	PROJECTILE SAW UP & DN DP CLAMP PULLER POSITION DN PROJECTILE STOP OUT & PRESENT CARRIAGE DN UP OVER BACK BURSTER SAW RETURN BURSTER PRESENT DP POSITION STOP FOR SAW DP HEAD FORWARD BURSTER PULL			14		2	1.133	P37	15.862				2.6	41.2412	P37	SWITCH SEN GND
FLOW SENSORS	COOLANT			2		2	60.606	P40	121.212				20	243.636	P40	TRANSMITTERS, FLOW GND
LEVEL SENSORS	COOLANT TANK LEVEL FOR FILLING ONLY			2		3										
VALVE, FLOW CONTROL	PROT SAW			1		2	16.559	P45	16.559				3.5	57.9565	P43	VALVE HYD CONTROL AIR ÷ 6.5
PRES REG HYD	PROT SAW			1		2	8.416	P45	8.416				3.0	25.248	P43	VALVE HYD PRES REG GND MODS
VALVE, PNEU, SOL	AIR SET TO KNOCK OFF BURSTER END			1	DEMIL PLAN	2	19.998	P43	19.998				3.3	65.8734	P45	VALVE PNEU SOL AIR

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = 121.212 \times 10^{-6}$/HR ✓
$\Delta 2N\lambda = 202.992 \times 10^{-6}$ ✓

$\Sigma NTM = \frac{363.636}{674.1356} \times 10^{-6}$ ✓
$\Delta \Sigma NTM = 674.1356 \times 10^{-6}$ ✓

MTBF = $\frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + MTTR} \times 100\% =$ ____ %

CALCULATIONS BUILDING BLOCK #15 PROJECTILE DEMIL MACHINE

1ST ITEM NO	FEED RATE #/HR	DENR lb/HR	MTSF ENR ×10⁻⁶	PROD FACTOR	ENR ×10⁻⁶	DENRTM lb/HR	ENRTM ×10⁻⁶	PROD FACTOR	ENRTM ×10⁻⁶	CUSTM. FACTOR	ENRTM ×10⁻⁶		1ST ITEM NO
1		292.941	—			745.215	—						
3		74.168	—			277.574	—						
4		299.885	—			1059.3375	—						
1, 4		702.974	121.212			674.558	363.636						
SUBTOTAL		869.786	121.212			2753.5385	363.636						
	32.5			×3.25	2978.0165			×3.25	9312.6361	×3×1 1/3	37250.544		
	50			×5	4470.142			×5	14131.328	×3×1 1/3	56525.312		
2		47.168	—			155.248						REFER TO NOTES	

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #18 PROJECTILE PULL AND DRAIN MACHINE (PPD)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL ABIL
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	NA	NA	NA	NA	NA
Rocket, 115mm, M55	VX	Comp B	M28	NA	NA	NA	NA	NA
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360 50/HR	GB	None	None	5133.993	194.78	53120.02	10.35	.949
Projectile, 155mm, M121A1 525/HR	GB	None	None	3537.6852	282.51	36571.318	10.33	.964
Projectile, 155mm, M121 525/HR	GB	None	None	3539.6852	282.51	36571.318	10.33	.964
Projectile, 155mm, M122 525/HR	GB	None	None	3539.6852	282.51	36571.318	10.33	.964
Projectile, 8", M426 20/HR	GB	None	None	2400.992	416.51	24760.522	10.31	.959
Projectile, 155mm, M121A1 525/HR	VX	None	None	3539.6852	282.51	36571.318	10.33	.964
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360 50/HR	GB	Tetrytol	M1	5133.993	194.78	53120.02	10.35	.949
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110 525/HR	H	Tetrytol	None	3025.5177	330.54	31681.545	10.47	.969
Projectile, 155mm, M104 525/HR	HD	Tetrytol	None	3025.5177	330.54	31681.545	10.47	.969
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None	NA	NA	NA	NA	NA
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1 525/HR	HD	Tetryl	M6	4542.653	250.27	45546.522	10.44	.956
Cartridge,Mortar, 4.2",M2/M2A1 525/HR	HT	Tetryl	M6	4342.453	250.27	45546.522	10.44	.956

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #18 PROJECTILE PULL AND DRAIN MACHINE (PPD)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAI ABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	NA	NA	NA	NA	N
Tank,Spray, TMU-28/B	VX	None	None	NA	NA	NA	NA	N
Ton Container	GB	None	None	NA	NA	NA	NA	N
Tone Container	VX	None	None	NA	NA	NA	NA	N
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	NA	NA	NA	NA	N
PROJECTILE/ CARTRIDGES, GB WITHOUT BURSTERS WITH WELDED BODY/WALLS								
Projectile 155mm M121; 9Kg 32.5/HR	GB			3903.4993	256.18	99707.94	10.17	.96
Cartridge 105mm M360, 7Kg 50/HR	GB			5993.613	175.64	99745.65	10.18	.94

SHEET 1 OF 3

SUPPLEMENTAL DATA

BUILDING BLOCK
7 1PPD

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. See Attached DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES _____

_____

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER _____ _____

2. NOTES _____

_____

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER _____

2. NOTES _____

_____

D. GENERAL REMARKS
See Attached Sheet

DRAWINGS BUILDING BLOCK: #18 PROJECTILE PULL AND DRAIN MACHINE (PPD)

18-202	APRIS
18-307-01	74
-02	NOT LEGIBLE
-03	" "
-04	3 MAY 74
-05	NOT LEGIBLE
-06	25 MAY 74
-07	1 JUL 74
-08	15 JUL 74
-09	NOT LEGIBLE
-10	17 JUL 74
-11	18 JUL 74
-12	22 JUL 74
-13	15 OCT 71
-14	19 OCT 71
-15	5 OCT 71
-16	31 JUL 74
-17	1 AUG 74
-18	17 JUN 74
-19	18 JUN 74
-20	13 AUG 74
-21	14 AUG 74
-22	74
-23	5 JUL 74
-24	4 SEP 74
-25	21 AUG 74
-26	23 AUG 74
-27	3 SEP 74
-28	13 SEP 74
-29	15 SEP 74
-30	31 OCT 74
-31	29 OCT 74
-32	31 OCT 74
-33	23 JAN 75
-34	24 JAN
-35	27 JAN 75

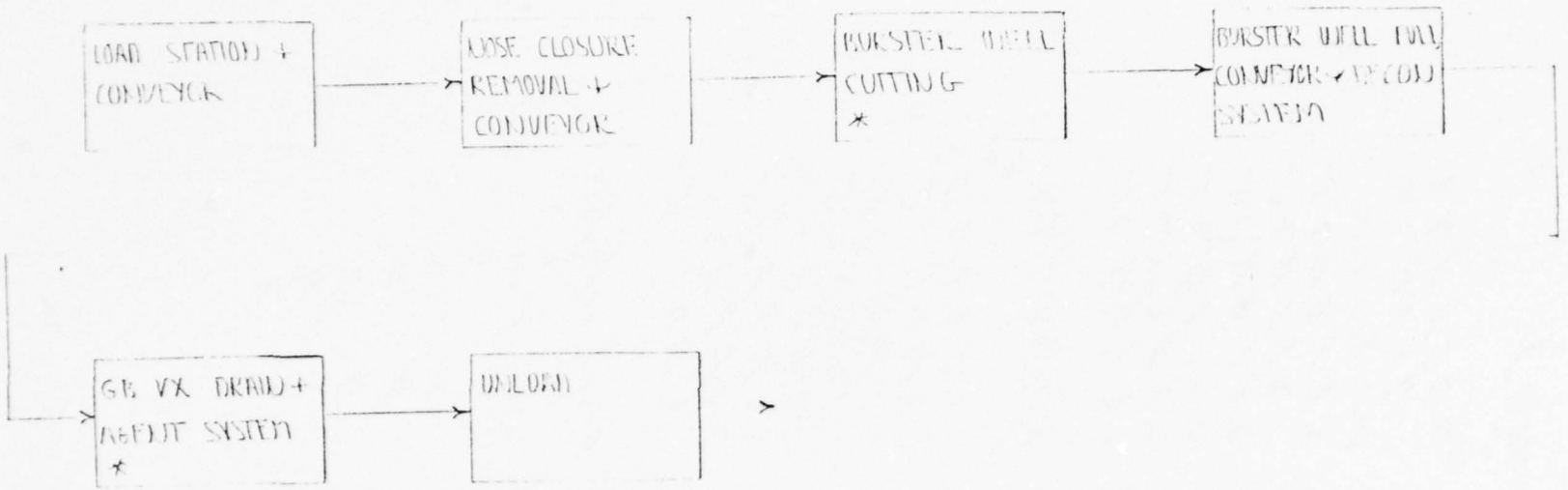
BUILDING BLOCK: #18 PROJECTILE PULL AND DRAIN MACHINE (PPD)

Drawings (Continued):

18-307-	36	27JAN74
	37	4FEB74
	38	Not Legible
	39	8FEB75
	40	2FEB75
	41	20FEB75
	42	26FEB75
	43	27FEB75
	44	28FEB75
18-361-	1/1	11DEC74
18-534-	01	2MAY75
	02	2MAY75
	03	1MAY75
	04	1MAY75
	05	28APR75
	06	29APR75
	07	30APR75
	08	6MAY75
18-651-	01 1/4	Recvd 12/20/75
	2/4	" "
	3/4	" "
	4/4	" "
	03	" "
	04	" "
	05 1/2	" "
	2/2	" "
	10	" "

BUILDING BLOCK: #18 PROJECTILE PULL AND DRAIN MACHINE (PPD)

OPERATIONAL FLOW CHART



* STATIONS ACTIVATED FOR APPROPRIATE PROJECTILES

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #18 PROJECTILE PULL AND DRAIN (PPD)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ ▲	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6}) ▲	SOURCE (*)	REMARKS
	LOAD STATION & CONVEYOR				(SEE)											ALL 181 ITEMS CONSIDERED CRITICAL
CYLINDER, HYD	CONVEYOR INTERMITTENT MOTION	J618	MILLER	1	0107	2	15.228	P15	15.228				4.0	60.912	P15	ACT, LIN, HYD, GND
BALL BEARING	CONVEYOR TAKE UP	TAS 224-8	LINBAL	2	0105	2	.948	P16	1.896				8.0	15.136	P16	BEARING, BALL, GND
CYLINDER, HYD	CONVEYOR INDEX	J3L19	34561	3	0201	2	15.228	P15	45.684				4.0	182.736	P15	ACT, LIN, HYD, GND
BEARING, BALL		2149507	43364	1	0207	2	.948	P16	.948				8.0	7.584	P16	BEARING, BALL, GND
CLUTCH, CAM		RT 30	76474	1	0208	2	15.806	P27	15.806				2.0	31.612	P27	MECH, ROT TRANS, CAM, AIR/GAS
SPROCKET			03420	4	0209	2	2.452	P23	9.808				2.0	19.648	EST	MECH ROT TRANS GEAR/SPROCKET
BEARING, BALL			92420	2	0212	2	.948	P16	1.896				8.0	15.136	P16	BEARING BALL GND
CHAIN			92420	2	0219	2	NEG									
CYLINDER, HYD	CONVEYOR INDEX	KJ3619	34561	1	0223	2	15.228	P15	15.228				4.0	60.912	P15	ACT, LIN, HYD, GND
CYLINDER, HYD		NFI-PN	WABCO	1	0503	2	15.228	P15	15.228				4.0	60.912	P15	ACT, LIN, HYD, GND
BEARING, CYLINDER		BB12-6	BOSTON	6	0703	2	2.059	P16	12.354				2.0	24.708	P16	BEARING, BEN, GND
GEAR, SPUR		CB530	35880	1	1002	2	.289	P27	.289				6.0	1.734	P27	MECH ROT TRANS, GEAR GND
BEARING, CYLINDER		B2226-20	71041	1	1003	2	2.059	P16	2.059				2.0	4.118	P16	BEARING, BEN, GND
RACK	CONVEYOR INCREMENTAL MOTION	8 RT	01635	1	1105	2	.289	P27	.289				6.0	1.734	P27	MECH ROT TRANS GEAR GND
SPRING, COMPRESSION	HOLDING JAW CLOSED			24	1301	2	NEG									
BEARING, CYLINDRICAL		412-20	BOSTON	4/8	1304	2	2.059	P16	98.832				2.0	197.664	P16	BEARING, BEN, GND
SPRING, COIL TENSION	HOLDING JAW CATCH	LC 0636 P	LEE	12	1305	2	NEG									
BRAKE, AIR OPER	STOP CONVEYOR MOTION			1		2	4274	P17	4274				4.0	170.96	EST	BRAKE GEN GND N X10
SWITCH	CLAMP RELEASED			1		2	1.133	P37	1.133				2.6	2.946	P37	SW, SEN, GND

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▲ΣNλ = 279.424 x 10^{-6}/HR ✓ ▲ΣNλTM = 838.476 x 10^{-6} ✓

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

▲ CYCLE ITEM

AVAILABILITY = $\frac{1}{MTTR}$ x 100% = ____ %

SHEET 2 OF 7

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #18 PROJECTILE PULL AND DRAIN (PPD)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	NOZ CLOSURE REMOVAL STATION															
CYLINDER, HYD	HORIZONTAL CARRIAGE SHIFT			1		2	15.225	P15	15.225				4.0	60.912	P15	ACT, LIN, GND, HYD
BEARING, SLEEVE	SHAFT FOR CARRIAGE			4		2	2.059	P16	8.236				2.0	16.472	P16	BEARING, GEN GND
CYLINDER, HYD	RAM/LOWER HEAD			1		2	121.04	P15	121.04				4.0	484.16	EST	ACT, LIN, PNEU, GND ~ X10
CYLINDER, HYD	RAISE/LOWER SHAFT FOR BURSTER ACT			1		2	15.225	P15	15.225				4.0	60.912	P15	ACT, LIN, GND, HYD
IMPACT WRENCH, AIR	REMOVE CLOSURE			1		2	26.48	P15	26.48				4.0	105.92	EST	ROT, ROT GEN AIR / 6.5
THRUST BEARINGS, SLEEVE	SHAFT - REMOVE CLOSURE			2		2	2.059	P16	4.118				2.0	8.236	P16	BEARING GEN GND
SPRING	SHAFT			1		2	NEG									
CYLINDER, HYD	CLAMP			1		2	121.04	P15	121.04				4.0	484.16	EST	ACT LIN PNEU GND ~ X10
CAM FOLLOWER, ROLLER				2		2	15.806	P27	31.612				2.0	63.224	P27	MTR, PWR TRANS, CAM, ROL / 6.5
ACTUATOR, LINEAR				3		3										
MOTOR, START, AIR	NOZ CLOSURE CONVEYOR			1		2	7.552	P20	7.552				2.0	15.104	P20	MOTOR, ELEC, START, HYD GND MOBILE
SWITCH	CLAMP ACTUATED			1		2	1.133	P37	1.133				2.6	2.946	P37	SW SEN GND
SWITCH	HEAD UP			1		2	1.133	P37	1.133				2.6	2.946	P37	SW SEN GND
SWITCH	CARRIAGE SHIFT			1		2	1.133	P37	1.133				2.6	2.946	P37	SW SEN GND
SWITCH	PROBE DOWN			1		2	1.133	P37	1.133				2.6	2.946	P37	SW SEN GND

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*Information is detailed in Supplemental Data Sheet

**Failure Sequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = \frac{7552}{\blacktriangle\ 34759} \times 10^{-6}$/HR ✓

MTBF = $\frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS

$\Sigma N\lambda TM = \frac{15104}{\blacktriangle\ 1275.78} \times 10^{-6}$ ✓

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad = \quad$ HRS

AVAILABILITY = $\frac{1}{MTBF + MTTR} \times 100\% = \quad \%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 3 OF 7

BUILDING BLOCK 18 PROJECTILE PULL AND DRAIN (PPD)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ ($\times 10^{-6}$/HR)	SOURCE (*)	Nλ ▲	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM ($\times 10^{-6}$) ▲	SOURCE (*)	
	BUCKSTAY WELL CUTTING STATION				(307)											ALL 18-3 ITEMS CONSIDERED CRITICAL
MAIN HEAD 10HP WITH		LC & WEG1100	78137	1	2101	2	1.206	p 29	1.206				4.0	4.824	p 29	MOTOR, ELE, 10HP GND
FEED CYLINDER, HYD				1		2	15.228	p15	15.228				4.0	60.912	p15	ACT, LIN, HYD GND
SWITCHES				2		2	1.133	p 37	2.266				2.6	5.892	p37	SW, SEN, GND
HEAD, RIGHT ANGLE	CUT WELD	6	78137	1	2402	2	50	EST	50.				2.0	100	EST	1 FAILURE/20000 HRS
CYLINDER, HYD	POSITION MILLING HEAD	3"X4"S1101200	05277	1	2403	2	15.228	p15	15.228				4.0	60.912	p15	ACT LIN HYD GND
BEARING, CYLINDRICAL	GUIDE FOR ASSEMBLY	B2428-16	71041	4	2703	2	2.059	p16	8.236				2.0	16.472	p16	BEARING, GEN GND
CYLINDER	HOLDING SAW OPERATION			1	2903	2	15.228	p15	15.228				4.0	60.912	p15	ACT, LIN, HYD, GND
SWITCH	CLAMP ENGAGED			1		2	1.133	p37	1.133				2.6	2.946	p37	SW SEN GND
SWITCH	MILL HEAD POSITION			3		2	1.133	p37	3.399				2.6	8.837	p37	SW SEN GND

▲$\Sigma N\lambda$ = 111.924 x 10^{-6}/HR ▲$\Sigma N\lambda TM$ = 321.707 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE MAINTAINABILITY DATA

SHEET 4 OF 7

BUILDING BLOCK #18 PROJECTILE PULL AND DRAIN (PPD)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	PART SCORE (*)	FAILURE CODE (**)	λ	SOURCE (*)	λN	REPAIR TIME (MR)	REMAIN TIME (MR)	CHECK OUT TIME (MR)	TOTAL MAINT TIME TM (HR)	N λ TM (x10⁻⁶)	SOURCE (*)	REMARKS
	BURSTER WELL PULL STATION				(307)											
HOUSING, HYD	▲ RISER/LOWER ASSEMBLY	MS24LS13	SOUTHCO	2	1903	2	15.228	P15	▲ 30.456				4.0	121.824	▲ P15	HOT LN HYD GND
HOUSING, HYD	▲ LOCKING/RINSE PULLER ASSEMBLY	MS24LS13	SOUTHCO	1	1907	2	15.228	P15	▲ 15.228				4.0	60.912	▲ P15	HOT LN HYD GND
HOUSING, HYD	▲ LOWER/RAISE PULLER	T3619	OTTO	1	1911	2	15.228	P15	▲ 15.228				4.0	60.912	▲ P15	HOT LN HYD GND
BUSHING, BALL	▲ GUIDE FOR RISER/LOWER ASSEMBLY	A42 7296	THOMPSON	4	1914	2	.996	P16	▲ 3.984				8.0	30.272	▲ P16	BEARING, BALL, GND
BURSTER WELL PULLER	▲			1	22123	2	NEG									
HOUSING, HYD	▲ POSITION BURSTER WELL CHUTE	MS24LS13	SOUTHCO	1	3301	2	15.228	P15	▲ 15.228				4.0	60.912	▲ P15	HOT LN HYD GND
BEARING, BRONZE	▲ CHUTE ASSEMBLY	68A620-2	71041	2	3302	2	2.058	P16	▲ 4.116				2.0	8.232	▲ P16	BEARING, CON, GND
MOTOR					38											
GEAR				2 EA	3902	2	NEG									
MOTOR W/GEAR RED. 1/6 HP				1	(651)	2	A278	P27.78	19.278				2.0	38.556	P28	NON REDUNDANT MOTOR/GEAR RED
157 PUMP	PUMP SUMP (AIR OPER DRAIN TYPE)	M833	WILDEN	1	0401	2	12.058	P30	12.058				5.0	60.29	P30	PUMP, CENTRI, GND
BALL 2" VII	TANK DRAIN TO SUMP	TV4	CHEMTROL	1	01(14)	2	1.766	P45	1.766				2.0	3.532	P45	VALVE, MTR, GEN, GND
LEVEL ELECTR	SUMP & DECON TANK MONITOR	117418	LFN	2	ITEM 25	2	11.915	P25	23.81				2.0	47.62	P25	INSTR, LIQ LEV GND
HI ELECTD	SUMP & DECON TANK MONITOR	117390	LFN	2	SAME TO	2	11.915	P25	23.81				2.0	47.62	P25	INSTR LIQ LEV GND
LOW ELECTD	SUMP & DECON TANK MONITOR	117392	LFN	2	SAME AS	2	11.915	P25	23.81				2.0	47.62	P25	INSTR LIQ LEV GND
VALVE V7 SV 115V	PUMP AIR SUPPLY	8211C87	ASCO	1	(EVI) 0417	2	102.56	P45	102.56				3.3	338.45	P45	VALVE, PNEU, SOL, GND ~ X10
VALVE V6 2 WAY	TO SAMPLG STATION OR HDS			1	01(14)	2	1.766	P45	1.766				2.0	3.532	P45	VALVE, MTR GEN GND
VALVE V4	OUTLET TO HDS			1		2	1.766	P45	1.766				2.0	3.532	P45	VALVE, MTR GEN GND
VALVE V5	WATER/DECON SUPPLY TO PUMP OUTLET			1		2	1.766	P45	1.766				2.0	3.532	P45	VALVE, MTR GEN GND
VALVE V1 SV				1	01(14)	2	102.56	P45	102.56				3.3	338.45	P45	VALVE, PNEU, SOL, GND ~ X10
VALVE V3	WATER/DECON SUPPLY			1		2	1.766	P45	1.766				2.0	3.532	P45	VALVE, MTR GEN GND
VALVE V16	FRESH DECON SUPPLY			1		2	1.766	P45	1.766				2.0	3.532	P45	VALVE MTR GEN GND
CHK VALVE	FRESH DECON SUPPLY			1		2	1.827	P45	1.827				2.0	3.654	P45	VALVE, MTR, CHK GND
VALVE V15	FRESH WATER SUPPLY			1		2	1.766	P45	1.766				2.0	3.532	P45	VALVE MTR GEN GND
CHK VALVE	FRESH WATER SUPPLY			1		2	1.827	P45	1.827				2.0	3.654	P45	VALVE, MTR, CHK GND

λ_{SYS} = 323.902 10^{-6}/HR ✓ SYS N λTM = 950.678 x 10^{-6} ✓

▲ λ_{N2} = 84.042 x 10^{-6} ✓ ▲ $\Sigma N_2 \lambda_{TM}$ = 343.068 x 10^{-6} ✓

* Information to be Entered in Supplemental Data Sheet

** Failure Code

1 - Catastrophic Failure
2 - Partial Operation Failure

MTBR = $\frac{1}{\lambda_{SYS}}$ = ____ HRS MDTR = $\frac{\text{DRAIN TIME}}{\text{SUM}}$ = ____ HRS

SYSTEM AVAILABILITY = $\frac{\text{MTBR}}{\text{MTBR} + \text{MDTR}}$ x 100% = ____ %

BUILDING BLOCK #18 PROJECTILE PULL AND DRAIN (PPD)

DESCRIPTION						RELIABILITY DATA						
I.D. NO.	FUNCTION	PART NO.	CAT. NO.	QTY (n)	SCHEM. NO.	QTY (n)	λ_{op}	λ_{dorm}	λ_{total}	DORM. DUTY FACTOR	TOTAL DUTY FACTOR	λ_{AVG} ($\times 10^{-6}$)	SOURCE (*)	REMARKS
	VALVE, CHK	DETON PUMP OUTLET		1	(6511) 01(4/4)	2	1.827	ρ45	1.827		2.0	3.654	ρ45	VALVE, WIR, CHK, GND
	FILTER	PUMP AIR OUTLET	25241-000	ARO	1	0410	2	1.201	ρ21	1.201		2.0	2.402	ρ21	FILTER, GAS, GND
	PNEU ACT SPARTN	OPERATE VS	PAS18	CHRYSLER	2	0820	2	121.04	ρ15	242.08		4.0	968.32	EST	ACT, LIN PNEU, GND ~ X10
	SWITCH SHUT 10A	MONITOR VS			2	0421	2	1.133	ρ37	2.266		2.6	5.892	ρ37	SW SEN GND
	SWITCH	▲CARRIAGE UP			1		2	1.133	ρ37	▲1.133		2.6	▲2.946	ρ37	SW SEN GND
	SWITCH	▲CARRIAGE DOWN			1		2	1.133	ρ37	▲1.133		2.6	▲2.946	ρ37	SW SEN GND
	SWITCH	▲PULL MECH UP			1		2	1.133	ρ37	▲1.133		2.6	▲2.946	ρ37	SW SEN GND
	SWITCH	▲PULL MECH DOWN			1		2	1.133	ρ37	▲1.133		2.6	▲2.946	ρ37	SW SEN GND
	PHOTOCELL	▲BURSTER WELL LOCATION			2		2	1.133	ρ37	▲2.266		2.6	▲5.892	ρ37	SW SEN GND
	SWITCH	▲CHUTE LOCATION			1		2	1.133	ρ37	▲1.133		2.6	▲2.946	ρ37	SW SEN GND

$\Sigma\lambda = 247.374 \times 10^{-6}$ ✓ SYSTEM 980.268×10^{-6} ✓

$\blacktriangle\Sigma\lambda = 7.931 \times 10^{-6}$ ✓ $\blacktriangle\Sigma\lambda_{TOT} = 20.621 \times 10^{-6}$ ✓

*Information is detailed in Supplemental Data Sheet

**Abbreviation Code

1 Failure

2 Non-Detection Failure

WITH ___ HRS

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EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 6 OF 7

BUILDING BLOCK 18 PROJECTILE PULL AND DRAIN (PPD)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ Δ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6}) Δ	SOURCE (*)	
	DRAIN STATION				(307)											ALL K.S. ITEMS CONSIDERED CRITICAL
CYLINDER, HYD	LOWER/RAISE STRUCTURE	1184477-2CCL	05281	1	3001	2	15.228	P45	15.228				4.0	60.912	P15	NOT CK HYD GND
BUSHING, BALL	GUIDES	A324664		2	3008 (351)	2	.996	P16	1.992				8.0	15.936	P16	BEARING BALL GND
AGENT DRAIN HEAD				1	0117Y4 (351)	2	NEG									
BALL CHECK VALVE				1	0507 (351)	2	1.827	P45	1.827				2.0	3.654	P45	VALVE WHR CHK GND
AGENT RMD ASSM	AGENT TO ADS/AURORA DRAIN RMD	MC55	WILCOX	1	(351) 0301 (351)	2	12.058	P30	12.058				5.0	60.29	P30	P, RMD CENTER GND
VALVE V1 CV 1158	AIR SUPPLY TO PUMP	6211C27	ASCO	1	0318	2	102.56	P45	102.56				3.7	378.45	P45	VALVE, PNEU SOL GND W X10
VALVE V2	AGENT VALVE TO ADS			1	0117Y4	2	1.766	P45	1.766				2.0	3.532	P45	VALVE WHR GEN GND
VALVE V3	AGENT VALVE TO SUMP			1		2	1.766	P45	1.766				2.0	3.532	P45	VALVE WHR GEN GND
VALVE V8	WATER RINSE			1		2	1.766	P45	1.766				2.0	3.532	P45	VALVE WHR GEN GND
FILTER	EXHAUST AIR	25741-0000	ARO	1	(351) 0312	2	1.201	P21	1.201				2.0	2.402	P21	FILTER, GAS, GND
150 VA VALVE 1"		EH	EBW	1	0334	2	1.766	P45	1.766				2.0	3.532	P45	VALVE WHR GEN GND
ULTRA SPOT SW		1567	MICRO	2	0140	2	1.133	P37	2.266				2.6	5.892	P37	SW SEN GND
SWITCH	CARRIAGE UP			1		2	1.133	P37	1.133				2.6	2.946	P37	SW SEN GND
SWITCH	CARRIAGE DOWN			1		2	1.133	P37	1.133				2.6	2.946	P37	SW SEN GND
ELECTRONICS	AGENT LEVEL SENSOR			1		2	11.905	P25	11.905				2.0	23.81	P25	INSIDE LIQUID GND

Δ $N\lambda = 158.267 \times 10^{-6}$/HR Δ $\Sigma N\lambda TM = 530.136 \times 10^{-6}$

*Information is detailed in Supplemental Data Sheet

**Failure Sequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = _____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + MTTR}$ x 100% = ____ %

SHEET 7 OF 7

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #18 PROJECTILE PULL AND DRAIN) (PPD)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ ▲	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6}) ▲	SOURCE (*)	REMARKS
	UNLOAD STATION				(NOT)											ALL B-L CONNECTED CIRCUITRY
CHINOOK, HYD	OPEN HOLDING JAWS	P 36-2-5 4-4	84321	2	1602	2	16.228	p 15	30.456				40	121.824	p 15	ACT LIN HYD GND
SWITCH	CLAMP UNLOCKED			1		2	1.133	p 37	1.133				2.6	2.946	p 37	SW SEN GND
PHOTO CELL	PROJECTILE REMOVED			1		2	1.133	p 37	1.133				2.6	2.946	p 37	SW SEN GND
SWITCH	PLATTEN POSITION			1		2	1.133	p 37	1.133				2.6	2.946	p 37	SW SEN GND

▲ $\Sigma N\lambda$ = 33.855 x 10^{-6}/HR ✓ ▲ $\Sigma N\lambda TM$ = 130.661 x 10^{-6} ✓

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

160

CALCULATIONS - BUILDING BLOCK: #18 PROJECTILE PULL AND DRAIN MACHINE (PPD)

SET	ITEM NO.	FORCE	ΔENR	STRESS	NOZZLE FACTOR	NR (x10⁻⁶)	NOTES	SENSOR 10/psi	EXPOSURE (x10⁻⁶)	NOZZLE FACTOR	NR (x10⁻⁶)	CUSHION FACTOR	NR (x10⁻⁶)	NOTES	Area - Volume Ratio	12/14/75 Date
		NR	10/psi	(x10⁻⁶)											Ts	
	18-1	20	279.924	—	x 2	559.848 ✓		853.436 ✓	—	x 2		x 3	5150.616 ✓			
		32.5			x 3.25	908.128 ✓				x 3.25		x 3	8369.751 ✓			
		50			x 5	1397.12 ✓				x 5		x 3	12871.654 ✓			
	18-2	20	349.514	7.552	x 2	702.58 ✓		1275.78	.5 x 10⁻⁴	x 2	2606.664	x 3	7819.992 ✓			
		32.5			x 3.25	1136.9725 ✓				x 3.25	4226.389	x 3	12679.167 ✓			
		50			x 5	1745.122 ✓				x 5	6494.004	x 3	19482.012 ✓			
	18-3		111.924	—	x 2	223.848 ✓		321.707 ✓	—	x 2		x 3	1930.242 ✓			
					x 3.25	363.753 ✓				x 3.25		x 3	3136.645 ✓			
					x 5	559.62 ✓				x 5		x 3	4825.105 ✓			
4/5	18-4	20	91.973	571.276	x 2	755.222 ✓		363.689	1930.906	x 2	2658.284	x 3	7974.852 ✓			
		32.5			x 3.25	870.1882 ✓				x 3.25	3112.8925	x 3	9338.686 ✓			
161		50			x 5	1031.141 ✓				x 5	3749.556	x 3	11248.053 ✓			
	18-5	20	158.257	—	x 2	316.534 ✓		503.566	—	x 2		x 3	3021.396 ✓			
		32.5			x 3.25	514.36725 ✓				x 3.25		x 3	4909.769 ✓			
		50			x 5	791.335 ✓				x 5		x 3	7553.49 ✓			
7	18-6	20	33.855	—	x 2	67.71 ✓		133.661	—	x 2		x 3	783.966 ✓			
		32.5			x 3.25	110.0287 ✓				x 3.25		x 3	1273.9145 ✓			
		50			x 5	169.275 ✓				x 5		x 3	1959.915 ✓			

CALCULATIONS - BUILDING BLOCK: #18 PROJECTILE PULL AND DRAIN MACHINE (PPD)

Load	Item No.	Yield Rate lbs/hr	Joints - N2 (x10^-6)			Joints (x10^6)		Nitrile - N2 Tin (x10^6)			Nitrile (x10^6)		Nitrile - Ethylene Propylene	
54	18-1	20	508.875					5150.614						
8732		32.5		738.12					6269.751					
H		50			1077.12					12816.54				
	18-2	20	702.53					7019.992						
		32.5		1036.9725					9279.167					
		50			1745.122					19432.012				
	18-4	20	755.22					7974.652						
		32.5		070.18925					9338.686					
		50			1031.141					11248 053				
	18-6	20	67.71					783.966						
		32.5		110.029					1273.945					
		50			169.275					1959.915				
	TOTAL	20	2084.358					21779.426						
		32.5		3025.3117					31661.549					
		50			4342.658					45566.522				
40	18-5	20	316.584					3021.576						
1/4		32.5		514.36725					4469.769					
		50			781.335					1553.119				
	TOTAL	20	2420.842					24750.842						
	(1/4 Mfg)	32.5		3539.6085					36591.38					

BUILDING BLOCK: #18 PROJECTILE PULL AND DRAIN MACHINE (PPD)

3/3

-10,H 1820	18-5	20	223.848						1930.242							
		32.5		363.753						3130.643						
		50			559.62						4825.605					
	TOTAL (1,4,5,4,6)	20	2308.206						23659.668							
		32.5		2389.0707						34198.191						
		50			4702.278						60392.127					
5 cm 1/16 1820	18-3	20	223.842						1930.242							
		32.5		363.753						3130.643						
		50			559.62						4825.605					
	TOTAL (1,2,3,4,5,6)	20	2624.740						26681.064							
		32.5		3705.4300						39707.961						
		50			5698.613						57945.619					

BUILDING BLOCK: #18 PROJECTILE PULL AND DRAIN MACHINE (PPD)

- A HOIST FOR MAINTENANCE PURPOSES IS ASSUMED TO BE AVAILABLE AT THE PPD FOR THE MAINTAINANCE TIMES SHOWN

- PIPING COMPONENTS ON THE DECON AND AIR SIDE WERE LIMITED TO THOSE USED IN THE PRODUCTION PROCESS. DECON STATIONS AND THEIR COMPONENTS WERE NOT INCLUDED

- THE PPD IS ASSUMED TO BE FULLY UTILIZED (IE ONE PROJECTILE OR MORTAR PER POSITION) FOR THE PURPOSE OF THIS STUDY

- THE IMPACT WRENCH AND ASSOCIATED HARDWARE FOR REMOVAL OF THE NOSE CLOSURES IS INCLUDED IN ALL SYSTEMS APPLICATIONS. EXTRACTION OF THESE COMPONENTS FOR SPECIFIC APPLICATIONS HAS A NEGLIGIBLE IMPACT ON THE RESULTING SYSTEM PERFORMANCE CALCULATIONS.

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #19 CENTRAL DECON SYSTEM (CDS)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIABIL
*M55 ROCKET, GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	258.7	3395.6	1169.2	4.55	.99
Rocket, 115mm, M55	VX	Comp B	M28	"	"	"	"	"
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None					
Projectile, 155mm, M121A1	GB	None	None					
Projectile, 155mm, M121	GB	None	None					
Projectile, 155mm, M122	GB	None	None					
Projectile, 8", M426	GB	None	None					
Projectile, 155mm, M121A1	VX	None	None					
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1					
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None					
Projectile, 155mm, M104	HD	Tetrytol	None					
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None					
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6					
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6					

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #19 CENTRAL DECON SYSTEM (CDS)

MUNITION	AGENT	EXP.	PROP.	$N\dot{\lambda}$	MTBF	$N\lambda TM$	MTTR	AVAILABILITY
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	25.7	3835.2	1162.2	4.55	.99
Tank,Spray, TMU-28/B	VX	None	None	"	"	"	"	"
Ton Container	GB	None	None	"	"	"	"	"
Tone Container	VX	None	None	"	"	"	"	"
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None					

*MUNITION DEMILITARIZATION PROCESS FLOW

SUPPLEMENTAL DATA

BUILDING BLOCK # 19 CENTRAL CON SYSTEM (CDS)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. _____ DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES Drawing No's are referenced on failure rate and maintainability data sheets

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____

b. OTHER RADC-TR-74-268 RADC-TR-69-458

2. NOTES Estimates were made where data not available

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER RADC-TDR-64-373 Vol II

2. NOTES Estimates were made where actual data not available

D. GENERAL REMARKS

BUILDING BLOCK: #19 CENTRAL DECON SYSTEM (CDS)

FLOW CHART



ECNS 19	650-02	650-03	650-04	650-07
MTBF	17986	20161	9453	41662
MTTR	5.04	4.26	5.01	3.00

BUILDING BLOCK #19

MTBF 3295.6 HR

MTTR 4.55 HR

A .9985

Revised 11/18/65

SHEET 1 OF 2

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #19 CENTRAL DECON SYSTEM (CDS)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO. or Dwg No	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)a	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)a	FAILURE DATA: Nλ	MAINTAINABILITY DATA (X): DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)b	REMARKS
1-1	HOLD TANK A SKID ASSY																
1-1.1	PUMP, CENTR	PUMP DECON SOLN	–	96717	1	a-02	2	12.058	P-30		0.5	3.5	1.0	5.0		P-30	Pump Curve - Fig 6
1.2	AGITATOR	STIR HOLD TANK W3 HP MOT	FRG-2C	80193	1	a-02	2	8.521	P-21		0.5	1	0.5	2		E5	MOT-Flow-Pr-grafen 4h
1.3	PROBE, TEMP	TANK TEMP	-1399	–	1	a-02	2	11.905	P-25		0.5	1.0	0.5	2.0		P-25	Div by Level grd
1.4	PROBE, OVERFILL	TANK LIQ LEVEL, HIGH	-1299	–	1	a-02	2	11.905	P-25		0.5	1.0	0.5	2.0		P-25	Div by Level grd
1.5	GAGE, PRESSURE	PUMP DISCHG PRESS MEAS	-1199	–	1	a-02	2	1.020	P-25		0.5	1.0	0.5	2.0		P-25	Div - Air Pr Grd
1.6	HEATER, IMMERSION	TANK HEATER	-0899	–	1	a-02	2	2.394	P-24		0.5	3.2	0.5	4.2		P-24	Heat Ex grd 4h
1.7	TANK	HOLD TANK DECON, A	-0601	–	1	a-02	2	3.035	P-39		0.5	12.5	1.0	14.0		P-39	Tank Mat - Sto - grd 4h
1.8	MOTOR	MOTOR FOR PUMP 1.1	–	–	1		2	4.825	P-28		0.5	2.0	0.5	3.0		P-24	Interpolation AC 500
19-2	HOLD TANK B SKID ASSY																
2.1	AGITATOR	STIR HOLD TANK	FRG-2C	80193	1	a-03	2	8.528	P-21		0.5	1	0.5	2		E5	MOT FLOW HP CURVE 4h
2.2	PROBE, OVERFILL	TANK LIQ LEVEL, HIGH	-1299	–	1	a-03	2	11.905	P-25		0.5	1.0	0.5	2.0		P-25	END LIQ LEV GRD
2.3	PROBE, LEVEL	TANK LIQ LEVEL	-1598	–	1	a-03	2	11.905	P-25		0.5	1.0	0.5	2.0		"	
2.3	PROBE, TEMP	TANK TEMPERATURE	-1399	–	1	a-03	2	11.905	P-25		0.5	1.0	0.5	2.0		"	"
2.4	HEATER, IMMERSION	TANK HEATER	-0899	–	1	a-03	2	2.394	P-24		0.5	3.2	0.5	4.2		P-24	HEAT EX GRD 4h
2.5	TANK	HOLD TANK DECON, B	-0601	–	1	a-03	2	3.035	P-39		0.5	12.5	1.0	14.0		P-39	Tank Mat Sto grd 4h

ΣNλ = ____ x 10^{-6}/HR ΣNλTM = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet (IF NOT ON THIS SHT)
a. RCDS 19-650-
b. See Comb failure rate and maint folder

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

revised 11/14/75

SHEET 2 OF 2

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

#19 CENTRAL DECON SYSTEM (CDS)

BUILDING BLOCK

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10^{-6}/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA /X: DIAGN. TIME (HR)	MAINTAINABILITY DATA /X: REPAIR TIME (HR)	MAINTAINABILITY DATA /X: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA /X: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA /X: NλTM (X10^{-6})	MAINTAINABILITY DATA /X: SOURCE (*)	REMARKS
3.3	SLURRY TANK SKID ASSY							D								C	
3.1	PUMP, CENTR	PUMP DECON	—	96717	1	A-04 9/23/75	2	12.058	P-30		0.5	3.5	1.0	5.0		P-30	Pump Contr grd.
3.2	MOTOR	MOTOR FOR PUMP	—		1	A-04	2	1.525	P-28		0.5	2.0	0.5	3.0		P-28	Inst Man AC SNP
3.3	AGITATOR	STIR DECON TANK 1/2 HP	—	80298	1	A-04	2	8.548	P-28		0.5	1	0.5	2		P-28	Inst from HP Sys Mn
3.4	GAGE, PRESS	PUMP DISCHG PRESS.	-1199	—	1	A-04	2	1.020	P-25		0.5	1.0	0.5	2.0		P-25	Inst - Air Pr - grd
3.5	VALVE, ACTUATOR	ON OFF DECON SUPPLY	-1699	—	2	A-04	2	6.839	P-4		0.5	2.5	1.0	4.0		P44	Inst On grd
3.6	HOPPER, DRY FEED	FEED DECON POWD TO TANK	-1299	—	1	A-04	2	12.697	CALC		0.5	3.0	1.0	4.5		EST	See Calc.
3.	170 BE, TEMP.	TANK TEMP.	-1398	—	1	A-04	2	11.905	P-25		0.5	1.0	0.5	2.0		P-25	Inst-Eng Lev Grd
3.	SE, LEVEL	TANK LEVEL	-1597	—	1	A-04	2	11.905	P-25		0.5	1.0	0.5	2.0		P-25	"
3.9	PROBE, PH	PH IN TANK	-1498	—	1	A-04	2	11.905	P-25		0.5	1.0	0.5	2.0		P-25	"
3.10	NOSE, OVERFILL	TANK LEVEL, HIGH	-1299	—	1	A-04	2	11.905	P-25		0.5	1.0	0.5	2.0		P-25	"
3.11	HEATER, IMMERSION	TANK HEATER	-0198	—	1	A-04	2	2.314	P-24		0.5	3.2	0.5	4.2		P-24	Heat Exch Mn
3.12	TANK	SLURRY TANK	-0501	—	1	A-04	2	3.047	P-39		0.5	12.5	1.0	14.0		P-39	Tank Inst Sys Grd Mn
3.4	PIPING																
	VALVE, PLUG	S/O VALVE, HAND	SEE A-07	96717	16	A-07	2	2.457	P45		0.5	1.0	0.5	2.0		P-45	Valve Pr - grn grd Mn
	EXPANSION JOINT	EXPANSION	SEE A-07	96717	2	A-07	2	3	EST		0.5	1.0	0.5	2.0			EST

b. RADC
c. Counts last rate and Maint folder

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet
a. C-CDS19-650—

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

SUMMARY - BUILDING BLOCK: #19 CENTRAL DECON SYSTEM (CDS)

MAINT ACTIVITY: 2-75

ITEM		$\Sigma N\lambda$ $\times 10^{-6}$	$\Sigma N\lambda T_M$ $\times 10^{-6}$	MAINT FACTOR	$\Sigma N\lambda T_M$ $\times 10^{-6}$	MAINT FACTOR
SOLN TANK A SKID ASSY	1	35.6	193.8	1X	290.7	1.5X
SOLN TANK B SKID ASSY	2	49.6	140.8	1X	211.2	1.5X
WASH TANK SKID ASSY	3	105.8	353.3	1X	530.0	1.5X
PIPING	4	45.7	91.5	1X	137.3	1.5X
	Σ	256.7			1169.2	

MTBF = 3895.6

MTTR = 4.55

A = .9988

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #21 BULK ITEM FACILITY (BIF)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL ABIL
*M55 ROCKET, GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28					
Rocket, 115mm, M55	VX	Comp B	M28					
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None					
Projectile, 155mm, M121A1	GB	None	None					
Projectile, 155mm, M121	GB	None	None					
Projectile, 155mm, M122	GB	None	None					
Projectile, 8", M426	GB	None	None					
Projectile, 155mm, M121A1	VX	None	None					
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1					
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None					
Projectile, 155mm, M104	HD	Tetrytol	None					
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None					
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6					
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6					

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #21 BULK ITEM FACILITY (BIF)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*BULK ITEMS, GB/VX								
Bomb, 750#, MC-1	GB	None	None	462.9	260.3	3979.8	8.60	.99
Tank, Spray, TMU-28/B	VX	None	None	587.4	1702.4	5644.2	9.61	.99
Ton Container	GB	None	None	486.6	2055.1	4562.8	9.38	.99
Tone Container	VX	None	None	"	"	"	"	"
MK 94 Bomb	GB	"	"	560.4	1784.4	3826.7	8.97	.99
*TON CONTAINER, MUSTARD								
Ton Container	HD	None	None	—	—	—	—	—

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK
21 BULK ITEMS
FACILITY (BIF)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. _____ DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES Drawing No's are referenced on failure rate and maintainability data sheets

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER RADC-TR-74-268 RADC-TR-69-458

2. NOTES Estimates were made where data not available

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

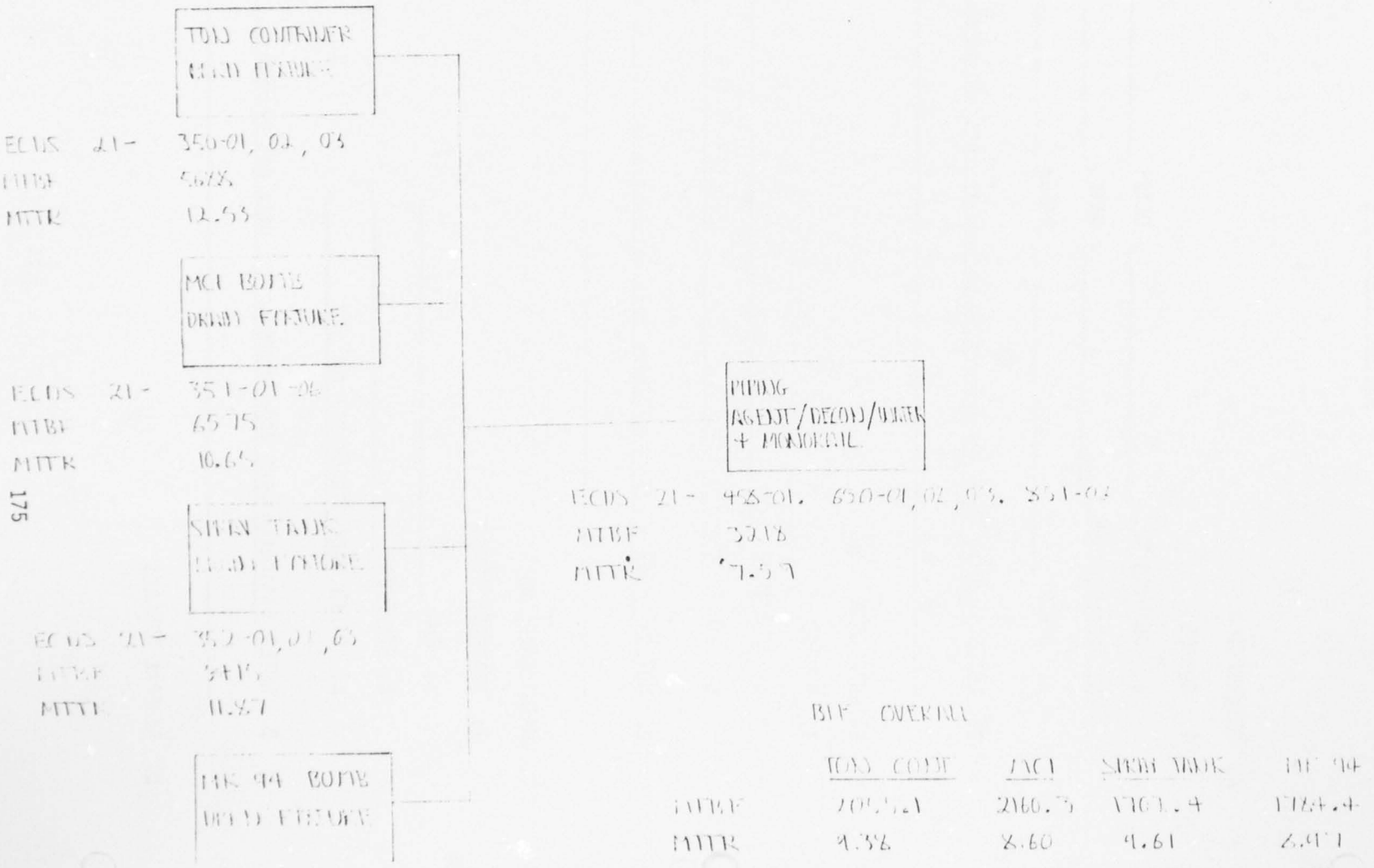
c. OTHER RADC-TDR-64-373 Vol II

2. NOTES Estimates were made where actual data not available

D. GENERAL REMARKS

BUILDING BLOCK: #21 BULK ITEM FACILITY (BIF)

FLOW CHART



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BIF OVERALL

	TOAD CONT	MCI	SPIN TRUE	MK 94
MTBF	2027.1	2160.3	1961.4	1784.4
MTTR	9.56	8.60	9.61	8.97
R	.9955	.9960	.9944	.9949

Norton 11/13/75

SHEET 1 OF 6

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

TON CONTAINER DRAIN FIXTURE ASSY

BUILDING BLOCK #21 BULK ITEM FACILITY (BIF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA 3X: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) b	REMARKS
1.1	GAGE PRESS	LOCAL READING OF PRESSURE - AGENT DRAIN & MAC SUPPLY (ITEM 17, 20)	-1443, 1447		2	A-01	2	1.020	P-25	2.04	1.5	3	1.5	5.5		P-25	Incl air pr gage
1.2	VALVE ASSY	VALVE HYDRAULIC ITEM 68	-1299		3	"	2	6.831	P-49		1.5	7.5	3	11.5		P-44	Valve Dir Cntl HC
1.3	SWITCH	SWITCH ASSOC W. Z1-1.2 HYDRAULIC SWITCHES 7 ROSN7 (37) WE-28	LSF7C 2R16-2EN		3	"	2	1.133	P37	3.399	1.5	4.8	1.5	7.8		P-37	Sw Sens grd
1.4	JUNCTION BOX	ELEC JUNCTION BOX (35)	Model 308		1	"	2		P-19	.515							
1.5	OUTLET BOX	ELEC OUTLET BOX (37)	CRFX174		1	"	2			.515							Acft
1.6	CYLINDER	HYDRAULIC CYLINDER ASSY (11) - TILT FRAME	0477		1	"	2	15.228	P-15	15.228	1.5	7.5	3	11.5		P-15	Act Lin Hyd Grd
1.7	GEAR BOX	3 WAY GEAR BOX (16) (17)	SK26558		2	A-09	2	11.726	P-27	23.451	1.5	13.5	3	18		P-27	Gear box ext Ma
	MOTOR	HYDRAULIC MOTOR (3) RAISE & LOWER FRAME	AA?	96151	1	"	2	22.840	P-29	22.840	1.5	9.0	1.5	12.0		P-29	Inst Hyd Dr Air/16.5
	LOAD CELL & JACK ASSY	WT. TON CONTAINER (4)	-0498		4	"	2	16.153	P40	64.61	1.5	9.0	1.5	12.0		EST P-40	Rot Gen Air/16.5
1.10	LOCATING ROLLER ASSY	END STOP FOR TON CONT. (5)	-0499		1	"	3	(.280)		NA	—	—	—	—	NA	—	
1.11	IDLER ROLLER ASSY	PASSIVE ROLLER SCRAPER FOR TON CONTAINER (6)	-0298		2	"	2	.280	P-16	.560	1.5	7.0	1.5	10.0		P-16 EST	Bearing roller grd
1.12	DRIVE ROLLER ASSY	TO ROTATE TON CONTAINER (9)	-0349		1	"	2	.730	P-16	.280	1.5	7.0	1.5	10.0		P-16 EST	"
1.13	MOTOR HYD	DRIVE ITEM 1.12 (10)	-0310	96151	1	A-03	2	22.840	P-29	22.840	1.5	4.0	1.5	12.0		P-29	Inst Hyd Dr Air/16.5
	HOSE							LOCAL									

a ECOS 21-350-

b. CAMDS FAILURE RATE

ΣNλ = _____ x 10⁻⁶/HR AVERAGED = 18.58 ΣNλTM = _____ x 10⁻⁶

*Information is detailed in Supplemental Data Sheet

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Revised 11/12/75 ✓

SHEET 2 OF 6

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

MCI BOMB DRAIN FIXTURE ASSY

BUILDING BLOCK #23 BULK ITEM FACILITY (BIF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ X10^{-6}HR	SOURCE (*)	Nλ	MAINTAINABILITY DATA 3X: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
2.1	VALVE ASSY	HYD. VALVE - HYD FLUID TO ACTUATOR	-0403		1	A-01 TO -06	2	6.834	P44		1.5	7.5	3	11.5		P44	Valve ball grd HC
2.2	SWITCH	POSN SWITCHES ELEC	LSA2R LSA2L LSA3R	97149	5	"	2	1.133	P37		1.5	4.8	1.5	7.8		P37	2w Sensi grd
2.3	HYD CYLINDER	MISC ACTUATE, MOVE BOMB & HOLD BOMB	LSM-SIZE	60266	5	"	2	15.288	P15		1.5	7.5	3	11.5		P15	Ict lin hydgrd
2.4	JUNCTION BOX	ELEC JUNCTION	A10D 308 T=0701	03089	2	"	2	.515	Mfg.								
2.5	DRILL MOTOR	DRIVE DRILL HP?			1	"	2	4.815	P29		1.5	6.0	1.5	9.0		P28	Mot 5HP grd
2.6	DRILL 4 WAY AIR VALVE	AIR SUPPLY FOR DRILL	V-500R	24047	1	"	2	10.751	P45		1.5	3.0	1.5	6.0		P45	Valve press 90 air/6.5
2.7	ROLLER	BOMB SUPPORT (IN DRILL ASSY)	-2103		1	"	2	.280	P16		1.5	7.0	1.5	10.0		EST	Bearing roller grd
2.8	AIR FEED DRILL	DRILL BOMB			1	"	2	15.479	P28		1.5	6.0	1.5	9.0		P28	Mot gm grd ns HC
2.9	SOLENOID VALVE	ASSOC W. 2.1-2.6	MS22231125	81996	2	"	2	1.376	P42		1.5	4.5	1.5	7.5		P42	Valve fuel Sol grd
2.10	LOAD CELL ASSY	WT BOMB 351-02	-0301		1	"	2	16.153	P40		1.5	9.0	1.5	12.0		EST	ATK A GEN AIR/6.5
2.11	ROLLER	SUPPORT BOMB 351-02	-2503		4	"	2	.280	P16		1.5	7.0	1.5	10		EST	Bearing roller grd
2.12	BRAKE	ELECTRO BRAKE - STOP BOMB MOTION 351-02	EB-375	63810	1	"	2	11.976	P18		1.5	9	1.5	12.0		P18	Brake elec grd NC

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a ECOSLI-351-

b. CHANG'S FAIL RATE & MAINT ANAL.

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

Revised 11/6/75 ✓

SHEET 3 OF 6

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SPRAY TANK DRAIN FIXTURE ASSY

BUILDING BLOCK #21 BULK ITEM FACILITY (BIF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*) a	Nλ	MAINTAINABILITY DATA 3X: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) b	REMARKS
3.1	VALVE-SOLENOID	HYD FLUID SHUT OFF (56)	V5D8250	SMITH	2	a-01	2	1.276	P42		1.5	4.5	1.5	7.5		P42	Valve fuel S.I 4nd.
3.2	JUNCTION BOX	ELEC CONNECT JUNCTION (66) (63)	MOD 208 T-1701	03084	2	"	2	.575	Engr								
3.3	SWITCH	MONITOR (LIMIT) ROD (-1504) TRAVEL (59)	B2VG-ZR051	91929	2	"	2	1.133	P37		1.5	4.8	1.5	7.8		P37	Siw Sens grd
3.4	JACTUATOR	MODEL 2501 ACTUATOR FOR YOKE & LOAD CELL (62)	2501	18740	4	"	2	15.228	P15		1.5	7.5	3.0	11.5		P15	act lin hyd grd
3.5	LOAD CELL	WT TANK TYPE C3P1	206175 CAT. #	03084	4	"	2	16.153	P40		1.5	9.0	1.5	12.0		EST	XDCR gen air/6.5
3.6	GEAR BOX	— 3 WAY 4 WAY (61) (64)	SK 2455-8 " 2717-8	18740 "	2	"	2	11.726	P27		1.5	13.5	3	18		P27	Gear box grd mi
3.7	MOTOR, HYDRAULIC	ROTATE DRIVE (31)	A17 ?	96151	1	"	2	12.84	P29		1.5	9	1.5	12		P29	mot Hyd Dc air/6.5
3.8	CYLINDER, HYDRAULIC	ACTUATOR (13) (14)	LSM3X5M "	60285 "	2	"	2	15.228	P15		1.5	7.5	3.0	11.5		P15	act lin hyd grd
3.9	"	" (RA)	LSMX "	60285 "	2	a-02	2	15.228	P15		1.5	7.5	3.0	11.5		P15	"
3.10	SWITCH	LIMIT SWITCH ON SWING FIXTURE (67) (69)	LSH3K-2C " "	91929 " "	3	"	2	1.133	P37		1.5	4.8	1.5	7.8		P37	Siw Sens grd
3.11	HYDRAULIC CHECK ASSY	ASSOC W. DRILL UNIT (21)	40591-4	02990	1	a-03	2	1.943	P43		1.5	5.1	1.5	8.1		P43	Valve hyd chk air/6.5
3.12	DRILL	SELF FEED DRILL UNIT (65) - DRILL SPRAY TANK	8265-6-1	03970	1	"	2	15.479	P28		1.5	6	1.5	9		P28	Mist gen grd we ms
3.13	HYD CYLINDER	ASSOC WITH VACUUM (1) & FILL TUBE ASSY	LSM2K5120	60285	1	"	2	15.228	P15		1.5	7.5	3.0	11.5		P15	act lin hyd grd
3.14	VALVE	PILOT BLEEDER ASSOC W. 2.12 (37)	9600	03970	2	"	2	1.514	P41		1.5	3	1.5	6		P41	Valve relief grd

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a. ECDS 21-35L-
b. SEE OMOS FAIL RATE & MAINT. BLACK FOLDER

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

Revised 11/13/75

SHEET 4 OF 6

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

HOIST MONORAIL SYSTEM

BUILDING BLOCK #21 BULK ITEM FACILITY (BIF)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	FAILURE DATA: RATE λ (X10^{-6}HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA 3x: DIAGN. TIME (HR)	MAINTAINABILITY DATA 3x: REPAIR TIME (HR)	MAINTAINABILITY DATA 3x: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA 3x: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA 3x: NλTM (X10^{-6})	MAINTAINABILITY DATA 3x: SOURCE (*)	REMARKS
41	HOIST CARRIER TROLLEY	CONTAINER TRANSPORT	?	?	1	A-01	2	5.714	P24	5.714	1.5	9	1.5	12		A29	MOT 10 HP 1R
42	CARRIER DRIVE	MOTOR & DRIVE FOR Z4-41			1	"	2	7.600	P24	7.600	1.5	4.5	1.5	7.5		P24	MOT 2 HP GRD 1R

a. ECOS 21-715-
b. CAROS FAIL. RATE & MAINT. REF (BLACK FOLDER

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

revised 11/14/75 ✓

SHEET 5 OF 6

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

PIPING, AGENT/DECON/WATER.

BUILDING BLOCK #21 BUCK ITEM FACILITY (BIF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*) λ Indic	Nλ	MAINTAINABILITY DATA 3.x: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*) b	REMARKS
5.1	PUMP	DECON & AGENT PUMPS (23) (30)	-1396 -1395		2	a-04	2	12.056	P30		1.5	10.5	3.0	15.		P-30	
5.2	VALVE ASSY (SOLENOID OPER ACTUATED)	DRAIN & AGENT PUMP (25) (24)	-1401 -1801	—	2	"	2	7.736	P43		1.5	6.9	1.5	9.9		P-47	SEE ECOS 21-650-04, 15 CURTISS ASSY VLV MYO SOL 81-24.5 HL
5.3	VALVE	MISC - AIR ACTUATED THERMOPLASTIC BALL VALVE (21)	TLV SERIES	14007	16	"	2	10.751	P45		1.5	3	1.5	6		45	VALVE PNEU S/S 316/6.5
5.4	VALVE	1" MANUAL - THERMOPLASTIC BALL VALVE (22)	"	14007	2	"	2	1.441	P41		1.5	3	1.5	6		41	VLV BALL GRD 4A
5.5	SPRAY GUN	DECON HAND SPRAY (2)	-1398	—	3	"	2	2.483	P45		1.5	3	1.5	6		45	VLV MAN GUN GRD 4A
5.6	LEVEL IND	LEVEL (TANK) PROBE (5)	-1319	—	1	"	2	11.905	P25		1.5	3	1.5	6		25	PROBE LVL IND GRD 4A
5.7	TANK	DECON SUPPLY, SUMP (1) (7)	-0201 -0301	—	2	"	2	3.035	P39		1.5	25	3	29.5		ESS 39	TANK MISC SEA GRD 4A
5.8	AGITATOR	DECON SUPPLY TANK (11) AGITATOR ½ HP	F/RH-3	90293	1	a-02	2	9.528	P21		1.5	3	1.5	6		26	MOT PNEU HP GRD 4A
5.9	PROBE	LEVEL INDICATOR PROBE (15) - DECON TANK	5718-03		1	"	2	—			—	—	—		—	—	SAME AS 5.6 ? DIF PART, DIFF ASSUME STAINLESS STEEL
5.10	PROBE	pH PROBE - DECON TANK (17)	7773-3-2-00-0-0000	31922	1	"	2	11.905	P25		1.5	3	1.5	6		25	
5.11	TANK	DECON SUPPLY TANK (1)	-0201	—	1	"	2	—			—	—	—	0	—	—	SAME AS 5.7 ? DIF PART, DIFF
5.12	JUNCTION BOX	ELEC. JUNCTION BOX (12) DECON TANK	352107	31922	1	"	2	.515	Jxpl							20	
5.13	PROBE	LEVEL IND PROBE (19) SUMP TANK	5718-03	31922	1	a-07	2	11.905	P25		1.5	3	1.5	6		25	
5.14	JUNCTION BOX	ELEC JUNCTION BOX (14) SUMP TANK	352107	31922	1	"	2	.515	Jxpl							20	
5.15	pH PROBE	ANEMS pH SUMP TANK (10)	7773-3-2-00-0-0000	31922	1	"	2	11.905	P25		1.5	3	1.5	6		25	
5.16	TANK	SUMP TANK (1)	-0501	—	1	"	2	—			—	—	—	0	—	—	SAME AS 5.7 ? DIF PART, DIFF
5.17	DIGITAL IND ASSY	IND TANK LVL (3)	551-1001	03084	1	C-01	2	5.742			1.5	3	1.5	6		25	IND GRD 4A
5.18	MOTOR	MOTOR FOR PUMP			2	a-01	2	4.035	P28		1.5	6	1.5	9		28	TNP ASSUMED

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

a. ECOS 21-650
b. See CHARTS ALPHINE'S RDT FD-DER + CALC SHEETS
C. ECOS 851-

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

REVISED 11/14/75

SHEET 6 OF 6

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

MK 96 BOMB DRAIN FIXTURE

BUILDING BLOCK #21 BULK ITEM FACILITY (BIF)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA 3X: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
1.1	HOSE ASSY	FLUID TRANSFER	AGG6000-	06624	4	A-01 10-10-75	2	0.245	b P24		1.5	3	1.5	6		b P24	HYD SERVICE
1.2	CYLINDER, OIL	MISC CLAMP & POSN BOMB	LSM1-32E	60285	3	A-01	2	15.225	b P15		1.5	7.5	3	11.5		b P15	ACT. LIN. HYD GRD
1.3	SWITCH	LIMIT SWITCH - BOMB POSN	LS-MTN ASS. NSN 5930-00-889-9929	91929	7	A-01	2	1.173	P37		1.5	4.8	1.5	7.8		P37	SW. SERVO GRD
1.4	JUNCTION BOX	ELEC. CONN.	AN3057-3 -3731	05089	2	A-01	2	.191									
1.5	ACTUATOR	HYD ACTUATOR - HOLD BOMB	-2097	-	1	A-01	2	15.225	P15		1.5	7.5	3	11.5		P15	ACT. LIN. HYD GRD
1.6	VALVE	S/O HYD VALVES HYD FLUID CONTROL	-2799 -0467	-	7	A-01	2	4.219	P44		1.5	7.5	3.0	12		P43	VLV. D.I. 9GR
1.7	DRILL FIXTURE ASSY	DRILL BOMB	-0599	-	1	A-01	2	SEE REMARKS			2.3	THRU 2.7					
1.8	ROLLER	BOMB SUPPORT	-2503	-	4	A-02	2	0.285	P16		1.5	7	1.5	10		EST	BOMB ROLLER GRD
1.9	BRAKE	ELECT. BRAKE - STOP BOMB MOTION	EB-375	63810	1	A-02	2	11.976	P18		1.5	9	1.5	12		P1	BRAKE ELEC. GRD
2.0	LOAD CELL	BOMB WEIGHT	-0199	-	1	A-02	2	16.153	P40		1.5	9.0	1.5	12		EST	WEIGHT SYSTEM AVIONICS
2.1	VALVE	HYD'LY AIR BLEED	V-500R	24047	1	A-04	2	10.751	P45		1.5	3	1.5	6		P45	VLV. PNEU S/O AVIONICS
2.2	VALVE	SOLENOID S/O VALVE	V52DB1125	81479	2	A-04	2	1.276	P41		1.5	4.5	1.5	7.5		P42	VLV. HYD. SOL. GRD
2.4	HYD CYLINDER	ACT. CYLINDER	LSM-0402X	60285 (95514)	4	A-05	2	15.225	P15		1.5	7.5	3	11.5		P15	ACT. LIN. HYD GRD
2.4	SWITCH	LIMIT SWITCH	LSM-31K	91929	1	A-05	2	1.173	P37		1.5	4.8	1.5	7.8		P37	SW. SERVO GRD
2.5	DRILL	DRILL BOMB (DRILL BIT)	-1203	-	1	A-05	2	15	EST		1.5	3	1.5	6		EST	-
2.6	ACTUATOR	HYD ACTUATOR	-2803	-	2	A-05	2	15.225	P15		1.5	7.5	3	11.5		P15	ACT. LIN. HYD GRD
2.7	AIR FEED DRILL	POWERS DRILL	9210-	24047	1	A-05	2	5.034	P39		1.5	6.0	1.5	9		P39	MOT. GEAR GRD MOT

A. ECDS 21-257 — (week of 10-13-75)

B. NAVE & CAMS failure rate and source data

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\quad \Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $\quad MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

SUMMARY - BUILDING BLOCK: 21 BULK ITEM FACILITY (BIF)

(2-75)

SUB ASSY	ITEM NO	λ_{SA} $\times 10^{-6}$	λ_{ENDITM} $\times 10^{-6}$	MAINT FACTOR
TON CONT. VESSEL	1	175.8	2202.8	3X
M121 BOMB "	2	152.1	1619.8	3X
STORAGE TANK "	3	276.6	3284.2	3X
M44 BOMB "	4	249.6	2668.7	3X
HOIST MONORAIL	5	13.3	125.7	3X
TRANSFER SYSTEM	6	297.5	2231.3	3X

TOGETHER ON "BLOCK" DIAGRAM

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	λ_{SA} $\times 10^{-6}$	λ_{ENDITM} $\times 10^{-6}$	MTBF	MTTR	A
PROCESSING					
A. TON CONT. VESSEL 1, 5, 6	486.6	4562.8	2055.1	9.38	.9955
B. M121 BOMB 2, 2, 5, 6	462.9	3979.8	2160.3	8.60	.9960
C. STORAGE TANK 3, 5, 6	537.4	5644.2	1702.4	9.61	.9944
D. M44 BOMB 4, 5, 6	560.4	5028.7	1784.4	8.97	.9950

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #22 MATERIAL HANDLING EQUIPMENT (MHE)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAI ABIL
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	4601.7576	217.31	53437.995	11.61	94.
Rocket, 115mm, M55	VX	Comp B	M28	4601.7576	217.31	53437.995	11.61	94.
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	1920.0517	520.82	17048.666	8.88	98.
Projectile, 155mm, M121A1	GB	None	None	1386.5883	721.19	11925.633	8.60	98.
Projectile, 155mm, M121	GB	None	None	1386.5883	721.19	11925.633	8.60	98.
Projectile, 155mm, M122	GB	None	None	1386.5883	721.19	11925.633	8.60	98.
Projectile, 8", M426	GB	None	None	1005.544	994.49	8266.3236	8.22	99.
Projectile, 155mm, M121A1	VX	None	None	1386.5883	721.19	11925.633	8.60	98.
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	5426.815	184.27	43942.101	8.10	95.
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	3688.244	271.13	30547.389	8.28	97.
Projectile, 155mm, M104	HD	Tetrytol	None	3688.244	271.13	30547.389	8.28	97.
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None	59.5858	16782.522	361.1343	6.06	99.
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1	HD	Tetryl	M6	3303.338	302.72	33099.942	10.02	96.
Cartridge,Mortar, 4.2",M2/M2A1	HT	Tetryl	M6	3303.338		33099.942		96.

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #22 MATERIAL HANDLING EQUIPMENT (MHE)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NxTM	MTTR	AVAI LABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None					
Tank,Spray, TMU-28/B	VX	None	None					
Ton Container	GB	None	None					
Tone Container	VX	None	None					
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None					

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 9

SUPPLEMENTAL DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. SEE ATTACHED DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES _____

_____

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER _____ _____

2. NOTES _____

_____

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER _____

2. NOTES _____

_____

D. GENERAL REMARKS

SEE NOTES ON ATTACHED SHEETS

BUILDING BLOCK: #22 MATERIAL HANDLING EQUIPMENT (MHE) 2/12/75 Rev.

Drawings:

22-400-	01	13 MAR 75	
	02	20 MAR 75	
	03	21 APR 75	
	04	22 APR 75	
	05	22 APR 75	
	06	24 APR 75	
	07	10 MAR 75	
	08	11 MAR 75	
22-401-	01	3 MAR 75	
	02	28 APR 75	
	03	4 MAR 75	
	04	29 APR 75	
	05	30 APR 75	
	06	25 MAY 75	
	07	31 MAY 75	
	08	1 JUN 75	
	09	6 JUN 75	
	10	24 JUN 75	
	11	8 JUL 75	
22-402-	01	23 SEP 74	REV 1
22-402-	02	12 MAR 75	REV 2
	05	2 MAR 75	REV 1
	07	2 MAR 75	REV 1
	08	12 MAR 75	REV 3
	09	14 MAR 75	REV 1
22-403-	14	8 JUN 75	
	20/20	24 AUG 71	
	22	1 MAR 74	
	23	5 MAR 74	
22-404-	02	11 OCT 74	
	03	17 OCT 74	
	04	OCT 22 74	
	05	24 OCT 74	
	06	24 OCT 74	
	07	12 SEP 74	

BUILDING BLOCK: #22 MATERIAL HANDLING EQUIPMENT (MHE)

3/9
12/12/75 kw

DRAWINGS (CONTINUED):

22-404-08	16 DEC 74		
09	11 DEC 74		
10	12 DEC 74		
11	DATE OFF SHEET		
12	17 DEC 74		
13	19 DEC 74		
14	23 DEC 74		
15	17 JAN 75		
16	20 JAN 75		
17	27 JAN 75		
18	4 FEB 75		
22-410-01	25 OCT 74	REV	1
05	21 NOV 74	REV	1
22-411-1/2	18 JUL 74	REV	2
-3/4	26 JUL 74	REV	1
22-412-01	9 NOV 74	REV	2
02	11/19/74	REV	3
06	19 NOV 74	REV	2
07	19 NOV 74	REV	2
08	11/20/74	REV	2
09	8 NOV 74		
22-414-01	20 FEB 75	REV	1
03	19 FEB 75	REV	1
05	31 MAR 75		
07	21 MAR 75		
22-415-07	27 DEC 75		
22-416-1/1	11 MAY 74	REV	1
-7/8	29 JAN 74		
-9/8	1 FEB 74		

4/9
12/12 to 12/16

DRAWINGS (CONTINUED):

22-419-02	12JUN74	REV	1
04	5JUL74	REV	2
05	31JAN73		
06	19JUL74	REV	2
22-420-01	30JAN75	REV	3
22-421-01	30JAN75	REV	2
02	30JAN75	REV	2
03	9JAN75	REV	1
05	30DEC74		
22-304-09	30OCT73		

BUILDING BLOCK: #22 MATERIAL HANDLING EQUIPMENT (MHE)

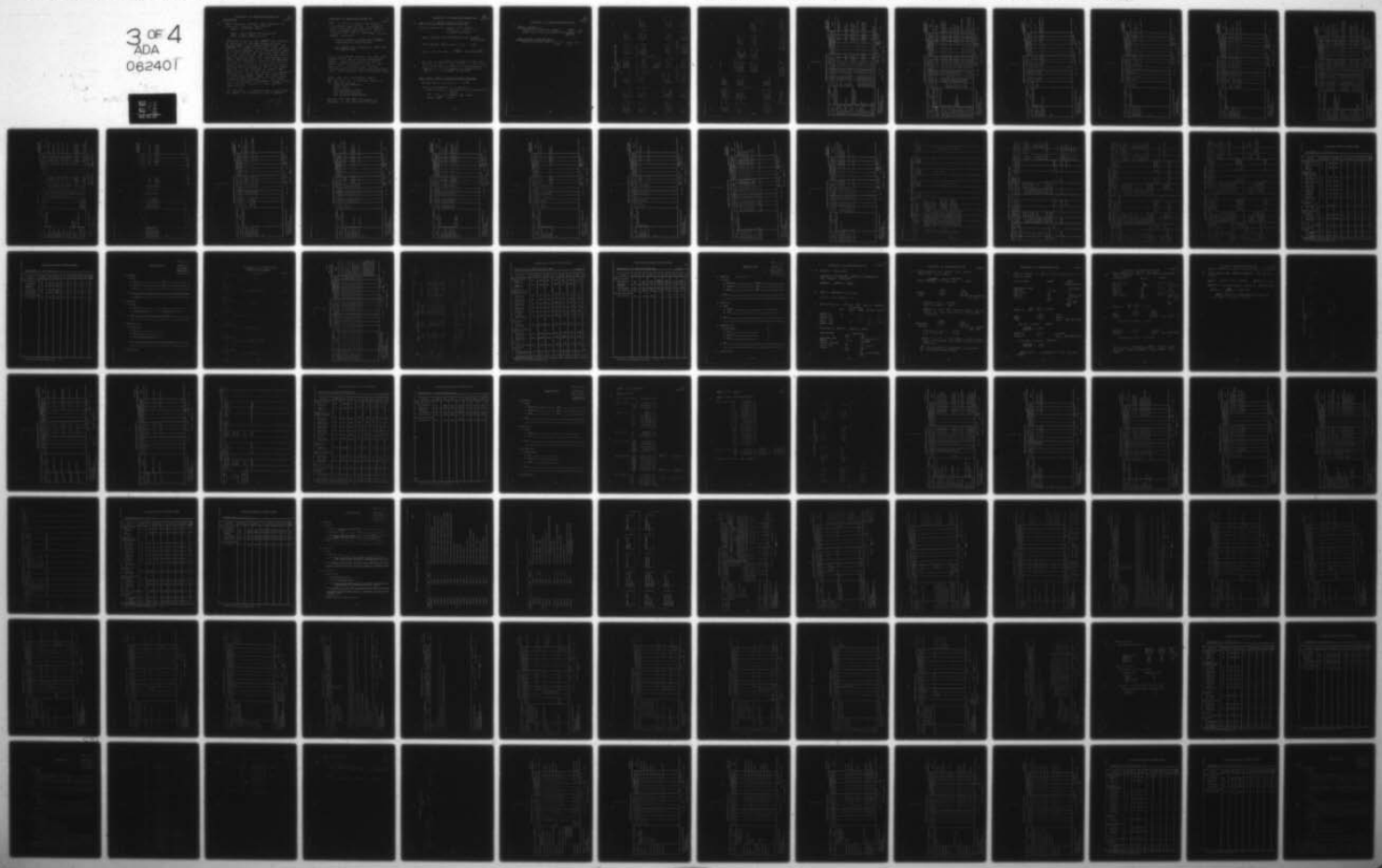
DRAWINGS (CONTINUED): SEATECH ENGINEERING, INC 5/9
JOB NO. 75-340 AUTOMATED CONVEYOR SYSTEM 12/12/75

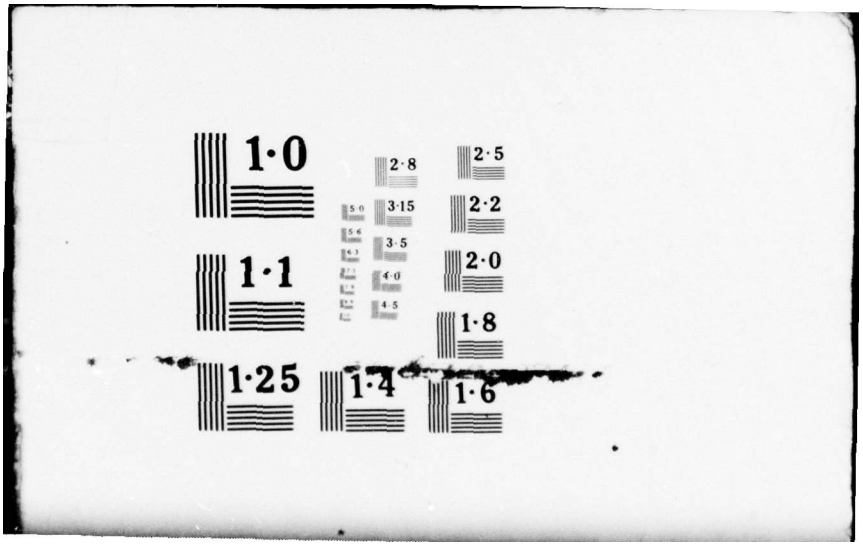
DRAWING NO	DATE	TITLE
L1	7-22-75	CONVEYOR PATH
L2	7-28-75	CONVEYOR SECTION A-A
L3	7-29-75	CONVEYOR SECTION E-E
L4	7-29-75	CONVEYOR SECTION B-B, D-D, CC
L5	8-1-75	LIFT TABLE (MPL)
→ L6	8-13-75	TRANSFER DEVICE (MPL)
L7	8-14-75	LIFT TABLE (PDR)
→ L8	10-13-75	TRANSFER DEVICE (PDR)
L9	10-13-75	TRANSFER DEVICE (PDR)

LETTER SEATECH ENGINEERING INC TO SURFACE COMBUSTION DIVISION, MIDLAND ROSS CORP
REF# JOB PX-1295, AUGUST 29, 1975

AD-A062 401 TRW/ENVIRONMENTAL ENGINEERING DIV REDONDO BEACH CA F/G 14/4
RELIABILITY AND MAINTENANCE PROGRAM ANALYSIS RELIABILITY AND MA--ETC(U)
APR 76 DAAG49-75-C-0135
UNCLASSIFIED DRCPM-DR-D-CR-76009-VOL-2 NL

3 OF 4
ADA
062401




1·0
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2·5
2·8
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3·5
4·0
4·5
5·0

BUILDING BLOCK: #22 MATERIAL HANDLING EQUIPMENT (MHE)

6/7
12/14/75 ltr

GENERAL

- THE FOLLOWING CONVEYORS ARE ANALYSED AS CONTINUOUS OPERATING EQUIPMENT:
  DEAC FURNACE INPUT

  MDE INPUT (EXCEPT FOR ACCUMULATOR
  MDE OUTPUT (PORTIONS ONLY)

- BEARINGS USED IN THE MHE ARE ASSIGNED AS CATEGORY 2 FAILURE CONSEQ. AND GIVEN FAILURE RATES FROM RADC-TR-69-458. THIS APPROACH IS ULTRA CONSERVATIVE SINCE FAILURE OF A SINGLE BEARING IN A STUCK/BINDING MODE WILL NOT PREVENT THE MUNITION FROM MOVING TO THE NEXT ROLLER. IF IT SHOULD, THE NEXT MUNITION WILL PUSH THE STOPPED ITEM CLEAR AND PRODUCTION WILL NOT BE HALTED. A CHANGE TO CATEGORY 3 IGNORES THE IMPACT OF SELECTED BEARINGS HAVING A CATEGORY 2 IMPACT. A CONSERVATIVE ESTIMATE OF 1/10 OF THE BEARINGS MAY BE OF THE CATEGORY 2 IMPACT. AN ADJUSTMENT BY A 90% REDUCTION ALL BEARINGS INVOLVED WAS MADE DURING THE CALCULATION OF NR AND NRTM. ITEMS AND CALCULATIONS INVOLVED ARE INDICATED "0". THIS RESULTS IN A CONSERVATIVE APPLICATION OF DATA WITHOUT TIME CONSUMING ANALYSIS OF EACH BEARING APPLICATION.

- ALL EQUIPMENT IS ASSUMED TO BE CONTAMINATED BY AGENT FOR ASSIGNMENT OF CLOTHING FACTORS

per sheet 7/15

BUILDING BLOCK: #22 MATERIAL HANDLING EQUIPMENT (MHE)

7,
12/17/75

- THE MATERIAL HANDLING EQUIPMENT INCLUDED IN THIS ANALYSIS IS LIMITED TO THOSE IDENTIFIED IN THE LIST "BB #22 MHE CONVEYOR APPLICATIONS". OTHER CONVEYORS ARE PART OF EQUIPMENT BUILDING BLOCKS. EXAMPLES:

  INTEGRAL CONVEYORS IN BB #5 MPF, #6 RDM, #15 PDM, #18 PPD, #24 MOF

  INPUT AND/OR OUTPUT CONVEYORS FOR BB #4 DES, #5 MPF, #25 MIN

- TITLES FOR CONVEYORS SHOWN ON FLOW CHARTS WERE OBTAINED FROM AN OUTLINE LIST OBTAINED FROM TOOELE. TITLES SHOWN ON THE LIST "BB #22 MHE CONVEYOR APPLICATIONS" AND ON THE "EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA" SHEETS WERE OBTAINED FROM THE DRAWINGS LISTED ON THE ENCLOSED SHEETS.

- DATA FOR THE 4.2" MORTAR PROCESS ARE BASED ON USE OF CONVEYORS SIMILAR TO OR ARE THE FOLLOWING:
  - INPUT CONVEYOR PROJECTILE
  - PSM INPUT
  - PROJECTILE BURSTER OUTPUT
  - ECC PROJECTILE DISCHARGE
  - HE DISCHARGE & SEGREGATING

- EQUIPMENT FOR THE PDF ACCUMULATOR IS INCLUDED IN THE PDF INPUT CONVEYOR

12/11=75 %

ITEM 22-3 POF OUTPUT CONVEYOR

- ROLLERS - ESTIMATED: 80 FT TOTAL LENGTH
  1 ROLLER/6" = 160 ROLLERS
  2 BEARINGS/ROLLER

FR = BEARING GENERAL GROUND p16 2.059 ea
4.118 / ROLLER

TM = BEARING GENERAL GROUND p16 2 HRS

SPLIT 3 ITEM NOS = 160/5 = 32 ROLLERS/ITEM

- ONE SET OF MOTOR/DRIVE CHAIN/ROLLERS AND ALL CYLINDERS ASSUMED TO BE CYCLICAL IN APPLICATION WITH RATE EQUAL TO MUNITIONS PRODUCTION RATE (i.e. REMOVAL OF PROJECTILE/CARTRIDGE FROM PID AND PLACING IT ON CONVEYOR TO MHPE).

ITEM 22-4 DEAC FURNACE INPUT CONVEYOR

CONVEYOR LENGTH 4½ + 17½ + 4½ = 25½ FT

ASSUME SHAFT ROLLERS ON 6" CENTERS -
TOTAL BEARINGS = 2/ROLLER × 2 × 25½ × 2 (ROUNDTRIP).
= 204 ea
FR = 2.059 p16 BEARING GEN GRND
TOTAL RATE = 529.31

9/9
12/14/75.

BUILDING BLOCK: #22 MATERIAL HANDLING EQUIPMENT (MHE)

RATIO MOTOR

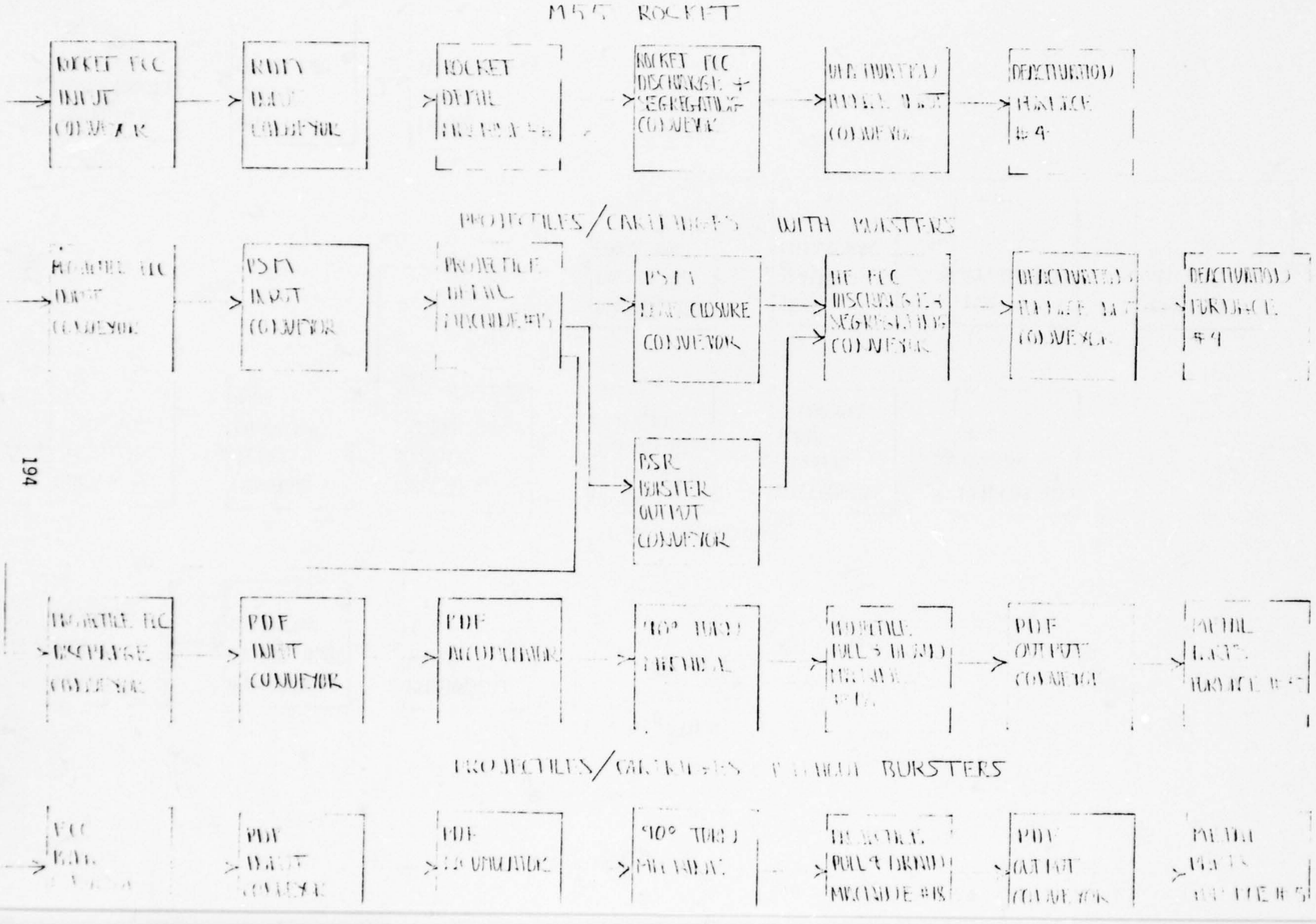
FRACTIONAL HP AC, GND MOBILE	7.552	p 28
MECH, POWER TRANSMITTING, GENERAL PURPOSE	8.799	p 27
	16.351	

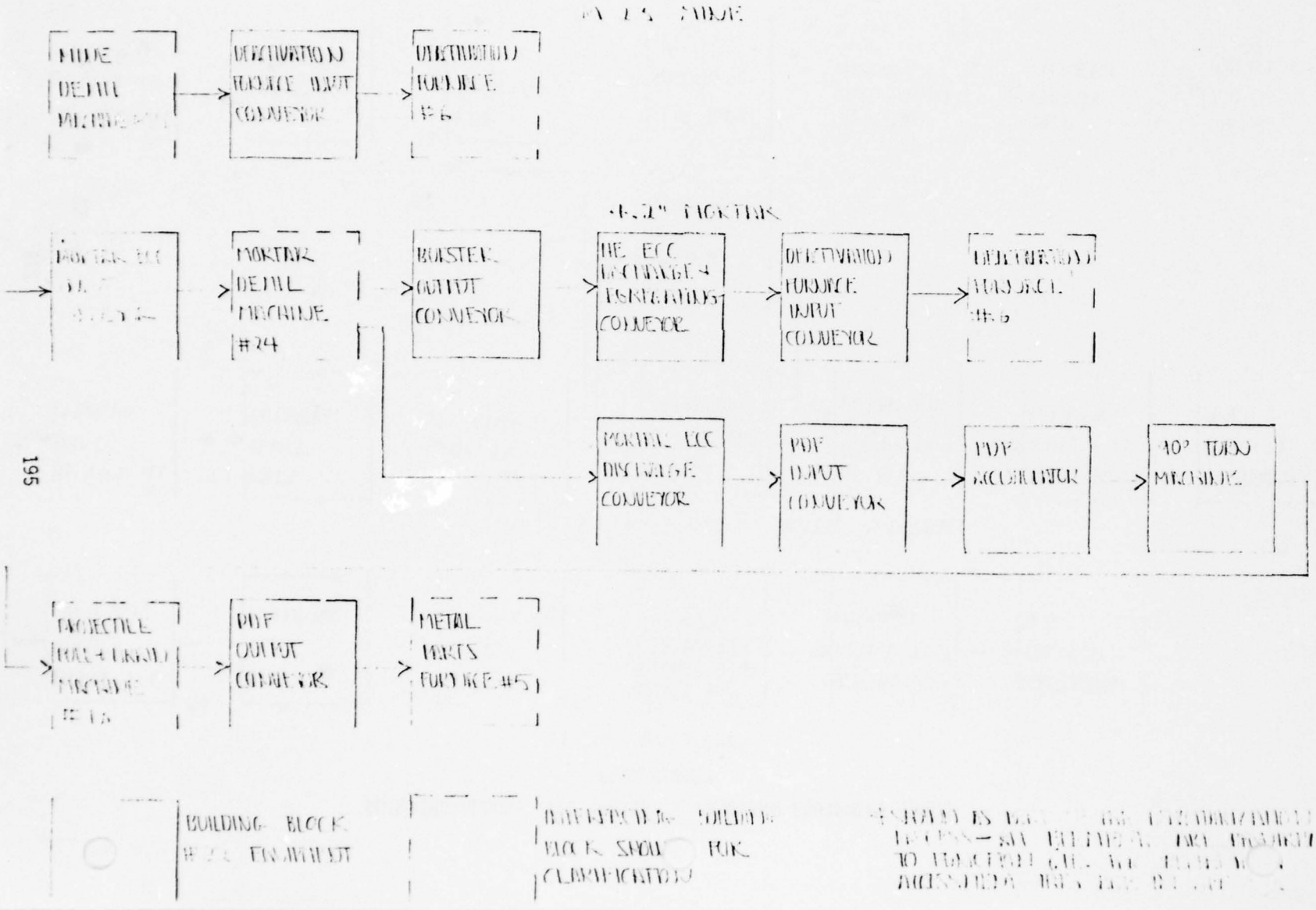
TURN TABLE ROLLER CONVEYOR

BEARINGS, GENERAL GND - ASSEMBLIES	2.059	p 16
TOTAL	20.59	

BUILDING BLOCK: #22 *MATER .L HANDLING EQUIPMENT (MHE)

FLOW CHART*




MIXER
DEBRIS
MACHINE
DEBRIS/MORTAR
REJECT OUTPUT
CONVEYOR
DEBRIS/MORTAR
REJECT
#6
MORTAR
DEBRIS
MACHINE
#24
BOASTER
OUTPUT
CONVEYOR
HE ECC
DISCHARGE &
DISINTEGRATOR
CONVEYOR
DEBRIS/MORTAR
INPUT
CONVEYOR
MORTAR ECC
DISCHARGE
CONVEYOR
PDF
OUTPUT
CONVEYOR
PDF
ACCELERATOR
40° TURN
MACHINE
PROJECTILE
REJECT UNLOAD
MACHINE
#16
PDF
OUTPUT
CONVEYOR
METAL
PARTS
FURNACE #5
BUILDING BLOCK
#24 ENVIRONMENT
BUILDING BLOCK SYMBOL FOR
CLASSIFICATION

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 15

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: Nλ TM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
0		ROCKET ECC INPUT CONVEYOR				(100)											
1	CYLINDER, CABLE	▲INSERT CONVEYOR INTO ECC	E100-150	26455	1	0101	2	22.842	p15	▲22.842	.5	2.5	1.0	4.0	▲11.350	p15	LIN HYD X 1% RELIANCE MECH
2	RATIO MOTOR HP	▲		71041	1	0102	2	16.351	"	▲16.351	.5	1.0	.5	2.0	▲2.702	p15	FRONT HP AC GRD
3	SPROCKET, CHAIN	▲	40B32	71171	1	0103	2	Neg									
4	ROLLER CHAIN	▲	RC40-4.5*	92420	3	0104	2	Neg									
5	CASTOR	▲		21672	4	0105	2	Neg									
6	BEARING, CAM ROLLER	▲	CF-1	92503	30	0106	2	.280	p16	▲8.4 •	.5	1.0	.5	2.0	▲16.8 •	Est	ROLLER GRD
7	WORM, SPECIFICATION, CAST	OPERATES▲	D-600-10	09990	2	0201	2	8.416	p45	▲16.832				3.0	▲50.496	p49	HYD, STEEL RG
8	SPROCKET	▲	N. 40	71041	19	0601,2	2	Neg									
9	ROLLER	▲	HB 68	15310	10	0601,2	3										
10	BALL, TRANSFER LOAD	▲	HB 68	15310	20	0605	2	2.059	p16	▲41.18 •				2.0	▲82.36 •	p16	BEARING GEN GRD
11	LS1 - SWITCH	▲INDICATE ROCKET ON CONVEYOR			1		2	1.133	p37	▲1.133				2.6	▲2.945	p37	SENSITIVE, GRD
12	LS2 - SWITCH	▲INDICATE CONVEYOR OUT OF ECC			1		2	1.133	p37	▲1.133				2.6	▲2.945	p37	SENSITIVE, GRD
13		POM INPUT CONVEYOR				(401)											
14	RATIO MOTOR ½ HP	▲	[illegible]B	71041	1	0101	2	16.351	"	▲16.351	.5	1.0	.5	2.0	▲2.702	p28	FRONT HP, GRD MOBILE
15	SPROCKET	▲	HKSB18-2	71041	1	0102	2	Neg									
16	ROLLER, CHAIN	▲	40H2	19389	2	0103	2	Neg									
17	CYLINDER, HYD	▲SWING	CLH D2	05283	2	0104	2	15.223	p15	▲30.452	.5	2.5	.5	4.0	▲121.824	p15	ACTUATOR, LIN, HYD
18	BEARING, THRUST	▲	TB 1228	71041	6	0114	3	2.059	p16	▲12.354 •				2.0	▲24.708 •	p16	SPACING GRD GRD
19	CYLINDER, HYD	▲PUSH	4707-1269	04375	1	0117	2	15.222	p15	▲15.223	.5	2.5	.5	4.0	▲60.912	p15	ACTUATOR, LIN, HYD
20	ROLLER	▲	HB 68	15310	1	0201	3										
21	SPROCKET	▲	PKSB31-1	71041	1	0201	2	Neg									
22	ROLLER	▲	HB 68	15310	11	0202	3										
23	SPROCKET	▲	PKSB32-1	71041	22	0202	2	Neg									
24	BEARING, CYLINDRICAL	▲▲	B1216-12	71041	2	0403	2	2.059	p16	▲4.118 •	.5	1.0	.5	2.0	▲8.236 •	p16	GEN, GRD
25	BEARING, CYLINDRICAL	▲▲	B 710-4	71041	2	0408	2	2.059	p16	▲4.118 •	.5	1.0	.5	2.0	▲8.236 •	p16	GEN, GRD

▲ΣNλ = 190.42 x 10⁻⁶/HR ✓ • ▲ΣNλ = 70.11 x 10⁻⁶ ✓

▲ΣNλTM = 536.2356 x 10⁻⁶ ✓ • ▲ΣNλTM = 140.34 x 10⁻⁶ ✓

MTBF = $\frac{1}{\Sigma N\lambda}$ = ——— = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ——— = ____ HRS

AVAILABILITY = $\frac{1}{MTTR}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

▲ CYCLE ITEM

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	XDM INPUT CONVEYOR (CONTINUED)				(401)											
HOSE, HYDRAULIC		313-3-08-5X8-T	S.Manuf	2	0914	2	.140	p24	.48	.5	1.0	.5	2.0	.96	p24	Hose Gnd Mob
SWITCH LS 3,4,5	ICON CONV IN, ITEM ON INSIDE LOW. CYL ACT			3	(406-506) 508	2	1.133	p37	3.399				2.0	6.798	p37	sw Sens Gnd
	ROUND ECC DISCHARGE & SEGREGATING				(403)											
CYLINDER HYD		26455	1	0101	2	15.228	p15	15.228	.5	2.5	.5	4.0	60.912	p15	Actuator, Lin, Hyd, Gnd	
CYLINDER AIR		05283	7	0102	2	12.404	p15	84.728	.5	2.5	.5	4.0	338.912	p15	Act Lin Pneu Gnd ~ X10	
LIMIT SWITCH		05283	7	0102	2	1.133	p37	7.931	.5	2.5	.5	4.0	31.724	ES	PART OF CYLINDER	
BEARING CAM FOLL.		09563	20	0103	2	2.059	p16	57.652	.5	1.0	.5	2.0	115.304	p16	Gen Gnd	
WHEEL		1150	30	0104	2	Neg										
BEARING THRUST		TB 1016	71041	28	0105	2	2.059	p16	57.652	.5	1.0	.5	2.0	115.304	p16	Gen Gnd
BEARING THRUST		TB 410	71041	30	0106	2	2.059	p16	61.77	.5	1.0	.5	2.0	123.54	p16	Gen Gnd
S. KNOCKOUT			GRAYBAR	13	0117	3										
V. DECELERATION		DF 600-10	09990	2	0202	2	8.416	p41	16.832				3.0	50.496	p41	Hyd, Press Reg
LIMIT SWITCH	TRAY IN	LSF1A	91929	1	0209	2	1.133	p37	1.133				2.6	2.9458	p37	Sensitive, Gnd
LIMIT SWITCH	POCKET SEGMENTS	LSK1A-2A	91929	7	0210	2	1.133	p37	7.931				2.6	20.6206	p37	Sensitive, Gnd
LIMIT SWITCH	TRAY OUT	LSD1A	91929	1	0211	2	1.133	p37	1.133				2.6	2.9458	p37	Sensitive, Gnd
CONVEYOR W BELT			92420	1	0301	2	Neg									
REDUCER, SPEED		1ADF1	LINK BELT	1		2	8.799	p27	8.799	.5	2.0	.5	3.0	26.397	p27	Mech, Power Trans, Gearbox Airborne
MOTOR 1HP			TENV	1		2	2.413	p23	2.413	.5	1.5	.5	2.5	6.0325	p23	2NPAC
ROLLER CHAIN		RC 50	LINK BELT	1		2	Neg									
BEARINGS		FSU219H	LINK BELT	2		2	2.059	p16	4.118	.5	1.0	.5	2.0	8.236	p16	Gen. Gnd.
CYLINDER AIR			7	13	2	12.404	p15	84.728	.5	2.5	.5	4.0	338.912	p15	Actuator, Linear, Pneu, Gnd ~ X10	
SOLENOID VALVE			7	13	2	44.483	p42	303.931	.5	2.5	.5	4.0	1215.724	ES	PART OF CYLINDER, Hyd or S.L/Air	
BEARING THRUST				29	4	2	2.059	p16	57.652	.5	1.0	.5	2.0	115.304	p16	Gen Gnd
BEARING THRUST				30	√	2	2.059	p16	61.77	.5	1.0	.5	2.0	123.54	p16	Gen Gnd

*Information is detailed in Supplemental Data Sheet

**Failure sequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda$ = 2371.834 X 10^{-6}/HR

$\bullet\blacktriangle \Sigma N\lambda$ = 300.614 X 10^{-6}

$\Sigma N\lambda TM$ = 8854.8631 X 10^{-6}

$\bullet\blacktriangle \Sigma N\lambda TM$ = 601.228 X 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{MTTR}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
	ROBOT ELC DISCHARGE & SEGREGATING	(CONTINUED)			(YOU)											
CONVEYOR, BOX W SLIDE ▲				1		2	Neg.									
GEAR MOTOR 1HP ▲		1ADF1	92800	1	2201	2	16.391	*	16.391	.5	1.5	.5	2.5	40.975	p 25	2HP AC Gnd
CHAIN ROLLER ▲		RC50	92800	1	2202	2	Neg									
SPROCKET ▲			92800	2	2203,4	2	Neg									
CYLINDER, CABLE ▲			Tolomatic	1	2114	2	22.842	p15	22.842	.5	2.5	1.0	4.0	91.368	p 15	Unit Hd 1½ Bore Cable Mech
VALVE, SOLENOID H_2O	TRAY WASH ▲			1	—	2	1.276	p42	1.276	.5	2.3	.5	3.3	4.2108	p 42	Valve Fuel Sol Gnd
MOTION SENSOR				1	—	2	3.925	p40	3.925	.5	1.0	.5	2.0	7.85	p 40	Transducer, Motion Gnd

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda = \frac{39.25}{\blacktriangle 2N\lambda = 40.499} \times 10^{-6}$/HR ✓ ✓

$\Sigma N\lambda TM = \frac{7.85}{\blacktriangle 136.5113} \times 10^{-6}$ ✓ ✓

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\blacktriangle 2N\lambda}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\%$ = 99.65 %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK # 22 MATERIAL HANDLING EQUIPMENT (MHE)

M.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
0		DEAC FURNACE INPUT				(4/11)											
1	ASSEMBLY, BELT CONVEYOR		US 241	05319	1	0105	2	528.36	A	528.36				2.0	1057.72	Est	
2	BEARING, FLANGE		LT 1000	71984	2	0109	2	2.059	p16	4.118	.5	1.0	.5	2.0	8.236	p16	Gen Grad
3	MOTOR 1HP				1	01	2	2.413	p23	2.413	.5	1.5	.5	2.5	6.0325	p23	2HP AC Grad
4	SPROCKET, TORQUE LIMIT				1	01	2	Neg									
5	CHAIN				1	01	2	Neg									
6	MOTION SENSOR				1	—	2	3.925	p40	3.925	.5	1.0	.5	2.0	7.85	p40	Transducer Motion / Grad

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*Information is detailed in Supplemental Data Sheet

**Failur sequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda = 538.216 \times 10^{-6}$/HR ✓
•$\Sigma N\lambda = 532.472 \times 10^{-6}$ ✓

$\Sigma N\lambda TM = 1072.825 \times 10^{-6}$ ✓
•$\Sigma N\lambda TM = 1064.956 \times 10^{-6}$ ✓

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS.

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\%$ = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ ▲	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	Nλ TM (X10^{-6}) ▲	SOURCE (*)	
▲ECC BYPASS					(412)											STOP TO LOAD
END ROLLER ASSM			15310	1	0101	2	Neg									
BEARING		20708		1	0101	2	2.059	P16	2.059•	.5	1.0	.5	2.0	4.118•	P16	Gen Grnd
IDLER		C734-8		1	0101	2	Neg									
ROLLER W BEARING			15310	80	0103	2	2.059/HR	P16	329.44•	.5	1.0	.5	2.0	658.88•	Est	Gen Grnd Bearings
ROLLER ASSM		C736	15310	4	0107	2	Neg									
BEARING		424		4	0107	2	2.059	P16	8.236•	.5	1.0	.5	2.0	16.472•	P16	Gen Grnd
DRIVE MOTOR 7½HP		C711	15310	1	0110	2	7.552	P20	7.552	.5	1.0	.5	2.0	15.104	P20	Fract HP AC Gnd Mtd
IDLER		1401-14	Similar to 15310	12	0201	2	Neg									
MOTION SENSOR		M100	Similar to 80307	1	0807	2	3.925	P40	3.925	.5	1.0	.5	2.0	7.85	P40	Transducer, Pulse/Rev Grnd

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

▲$\Sigma N\lambda$ = 351.214 x 10^{-6}/HR ✓
•▲$\Sigma N\lambda$ = 337.735 x 10^{-6} ✓

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

▲$\Sigma N\lambda TM$ = 702.924 x 10^{-6} ✓
•▲$\Sigma N\lambda TM$ = 679.97 x 10^{-6} ✓

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = $\frac{\quad}{\quad}$ = ____ HRS

AVAILABILITY = $\frac{1}{MTBF + MTTR}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

M.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
		PDF INPUT & ACCUMULATOR				(410)											
	END ASSY W BEARING		C734-8	15310	1	0101	2	2.059/HR	P16	4.118	.5	1.0	.5	2.0	8.236	EST	Gen Grnd Bearings
	ROLLER W BEARINGS		424	15310	104	0110	2	2.059/HR	P16	428.27	.5	1.0	.5	2.0	856.544	EST	Gen Grnd Bearings
	RET ROLL ASSY W BEARINGS		C736-424	15310	6	0111	2	2.059/HR	P16	24.708	.5	1.0	.5	2.0	49.416	EST	Gen Grnd Bearings
	IDLER		1401-14	22000		0501	2	Neg									
	DRIVE ASSY ½ HP		C711-8	15310	1	0502	2	16.351	*	16.351	.5	1.0	.5	2.0	32.702	P 28	Fract HP AC Gnd Mot
	MOTION SENSOR	INPUT & ACCUMULATOR	MI100	ELECTRO SENSE	2	0503	2	3.925	P40	7.85	.5	1.0	.5	2.0	15.7	P40	Transducer, Motion, Grd.
	LIMIT SWITCH	LINE FULL, RELEASE MECH			2		2	1.133	P37	2.266				2.6	5.896	P37	Lim Sen Grd
	MOTOR 3/4 HP	ACCUMULATOR			1		2	7.552	P28	7.552	.5	1.0	.5	2.0	15.104	P28	Fract HP AC Gnd Moto
	CYLINDER HYD	ACCUMULATOR			1		2	15.228	P15	15.228				4.0	60.912	P15	Act, Lin Hyd, Grd
		PDF 90 TURN STATION				(414)											
201	½ TABLE, ROLLER CHAIN		C 90	P1509	1	0701	2	20.59	*	20.59	.5	2.0	.5	3.0	61.77	EST	
	CHAIN W 2 BEARING		42 L	04503	6	0703	2	2.059/HR	P16	24.708	.5	1.0	.5	2.0	49.416	EST	Gen Grnd Bearings
	MOTOR ½ HP		F31TA56CU	71041	1	0706	2	16.351	*	16.351	.5	1.0	.5	2.0	32.702	P 28	Fract Panel HPAC Gnd Motor
	CLUTCH, ELECTRIC		EC 375	63810	1	0707	2	3.251	P27	3.251	.5	2.0	.5	3.0	9.753	P27	Mech, Power Trans, Clutch Pneumatic
	SPROCKET		MR50T24-2	71041	1	0708	2	Neg									
	SPROCKET		MR50T10-2	71041	2	0709	2	Neg									
	CHAIN			71041	2	0710	2	Neg									
	CYLINDER HYD			05293	1	0711	2	15.228	P15	15.228	.5	2.5	1.0	4.0	60.912	P15	Actuator, Lin, Hyd, Grd
	CONSTR W BEARINGS			15310	1	0501-1	2	2.059/HR	P16	4.118	.5	1.0	.5	2.0	8.236	EST	Gen, Grnd, Bearings
	SPROCKET		PRSB25-1	71041	2	0302	2	Neg									
	BEARING, FLANGED		5327		2	0304	2	2.059	P16	4.118	.5	1.0	.5	2.0	8.236	P16	Gen Grnd, Bearings
	MOTOR HYD W GEAR SLICE		MR3	96151	1	0101	2	10.474	P31	20.948				7.8	81.6972	P31	Pump, Hyde, Gear Fixed Displ Gear Motor
	PUMP SLICE W BEARINGS BALL		06784-3T	71041	4	0305	2	2.059/HR	P16	16.472	.5	1.0	.5	2.0	32.944	EST	Gen, Grnd. Bearings
	PUMP SLICE		PB-10-A	32105	4	0306	3										
	CHAIN																
	LIMIT SWITCH	CLAMP, UNLOAD, RAISE FOR RETRACT, PUSH ON	3204051-T	71041	2	0109	2	Neg									
					5	-	2	1.133	P37	5.665				2.6	14.729	P37	Sensitive, Grd

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda = 481.241 \times 10^{-6}$/HR ✓
$\Delta\Sigma N\lambda = 146.059 \times 10^{-6}$ ✓

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = ____$ HRS

• $\Sigma N\lambda = 467.098 \times 10^{-6}$ ✓
• $\Delta\Sigma N\lambda = 45.298 \times 10^{-6}$ ✓

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = ____\%$

$\Sigma N\lambda TM = 962.598 \times 10^{-6}$ ✓
$\Delta\Sigma N\lambda TM = 442.416 \times 10^{-6}$ ✓

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\quad}{\quad} = ____$ HRS

• $\Sigma N\lambda TM = 519.146 \times 10^{-6}$ ✓
• $\Delta\Sigma N\lambda TM = 111.186 \times 10^{-6}$ ✓

EQUIPMENT INFORMATION AND RELIABILITY/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE).

	DESCRIPTION						RELIABILITY DATA				MAINTAINABILITY DATA						
	ITEM NAME	FUNCTION	PART NO.	REPL CODE NO.	QTY (N)	FAIL CONSEQ (**)	λ (10^{-6})	SOURCE (*)	λN		DISASS TIME (MP)	ALIGN TIME (MR)	CHECK-OUT TIME (MR)	TOTAL MAINT TIME (MR)	NλTM ($\times 10^{-6}$)	SOURCE (*)	REMARKS
3.0		PDF Output Conveyor				(15-54)											
3.1	Motor				2	L2	2	2.413	P 25	4.826				2.5	12.065	P 25	Motor 2½ HP GND
3.2	Drive Chain				2	L2	2	NEG									
3.3	Rollers				32	L2	2	4.118	*	131.776				2.0	263.552	*	
3.4	Motor				2	L3	2	2.413	P 25	4.826				2.5	12.065	P 25	Motor 2½ HP GND
3.5	Drive Chain				2	L3	2	NEG									
3.6	Rollers				32	L3	2	4.118	*	131.776				2.0	263.552	*	
3.7	Motor				2	L4	2	2.413	P 25	4.826				2.5	12.065	P 25	Motor 2½ HP GND
3.8	Drive Chain				2	L4	2	NEG									
3.9	Rollers				32	L4	2	4.118	*	131.776				2.0	263.552	*	
3.10	Motor				2	L4	2	2.413	P 25	4.826				2.5	12.065	P 25	Motor 2½ HP GND
3.11	Drive Chain				2	L4	2	NEG									
3.12	Rollers				32	L4	2	4.118	*	131.776				2.0	263.552	*	
3.13	Motor				2	L4	2	2.413	P 25	4.826				2.5	12.065	P 25	Motor 2½ HP GND
3.14	Drive Chain				2	L4	2	NEG									
3.15	Rollers				32	L4	2	4.118	*	131.776				2.0	263.552	*	
3.16	Pickup Device					(4.5) or (25-54)	2	NEG									
3.17		Lift Table															
3.18	Actuator	Horizontal			1	L5	2	15.229	P 15	15.229				4.0	60.912	P 15	Act Ln Hyd Gnd
3.19	Actuator	Vertical			1	L5	2	15.229	P 15	15.229				4.0	60.912	P 15	Act Ln Hyd Gnd
3.20	Motor				1	L5	2	2.413	P 25	2.413				2.5	12.065	P 25	Motor 2½ HP GND
3.21		Transfer Device (MHE)				L6											
3.22	Actuating Arm, Sw		3A3 4005	Gibson	1	L6	2	NEG									
3.23	Sw Assy, Act Hyd		CM15.9243-12		1	L6	2	NEG									
3.24	Cylinder, Hyd		DT333-A-1	Mosier	1	L6	2	15.229	P 15	15.229				4.0	60.912	P 15	Act Ln Hyd Gnd
3.25	Cylinder, Hyd		DT3455-0-1	Mosier	1	L6	2	15.229	P 15	15.229				4.0	60.912	P 15	Act Ln Hyd Gnd

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 = Catastrophic Failure

2 = Production Line Shutdown Failure

λ_{SYS} = 556.404 × 10^{-6}/HR ✓

$\Sigma N\lambda$ = 198.727 × 10^{-6} ✓

MTBF = $\frac{1}{\lambda_{SYS}}$ = ____ HRS

$N\lambda TM$ = 1102.408 × 10^{-6} ✓

$\Sigma N\lambda TM$ = 525.2935 × 10^{-6} ✓

MTTR = $\frac{N\lambda TM}{\Sigma N\lambda}$ = ____ HRS

• $\Sigma N\lambda$ = 527.104 × 10^{-6} ✓

• $\Delta\Sigma N\lambda$ = 131.776 × 10^{-6} ✓

• $\Sigma N\lambda TM$ = 1054.208 × 10^{-6} ✓

• $\Delta\Sigma N\lambda TM$ = 263.552 × 10^{-6} ✓

MAINT = $\frac{\Delta\Sigma N\lambda TM}{\Delta\Sigma N\lambda}$ × 100% = ____ %

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#22 MATERIAL HANDLING EQUIPMENT (MHE)

BUILDING BLOCK

ITEM NO.	DESCRIPTION: FUNCTION	PART NO.	MFR CODE NO.	QTY	MAINTAINABILITY DATA: ACTIVE REPAIR TIME (HRS)						MEAN CORR MAINT TIME (HRS)	TOTAL CORR MAINT TIME (HRS)	λ x 10⁻⁶/HR	SOURCE (*)	REMARKS
					75-390										
5	Actuating Assmy Sw	SAS 5005	Stilson	1	LB	2	Neg								
6	Sw Bkt Act Misc	CM6 9293-12		1	LB	2	Neg								
7	Cylinder, Hyd	DS 333 A1	Mosier	1	LB	2	15.228	P15	▲15.228			4.0	▲60.912	P15	Act, Lin, Hyd, Gnd
8	Cyl Rod Guider	FC 9167	Stilson	1	LB	2	Neg								
9	Cyl Rod Adapter	FCA 9173	Stilson	1	LB	2	Neg								
10	Sig Leg Plate	CL 3 SPL	Carlake	4	LB	2	Neg								
11	Cylinder Hyd	MT/LCC 250	Nanna	1	LB	2	15.228	P15	▲15.228			4.0	▲60.912	P15	Act Lin Hyd Gnd
12	Cylinder Hyd	DS 3105 D1	Mosier	1	LB	2	15.229	P15	▲15.229			4.0	▲60.912	P15	Act Lin Hyd Gnd
13	Motor Vane	1310AT	Reliance	1	LL	2	2.413	P23	2.413			2.5	6.0325	P23	Motor 2HP Gnd

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▲ $\Sigma\lambda_2$ = 45.684 x 10⁻⁶ ✓

▲ $\Sigma\lambda_{ATTM}$ = 102.736 x 10⁻⁶ ✓

*Information is entered on Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ X10^{-6}HR	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	PDF OUTPUT CONVCTOR (CONT)															
MOTOR 1½HP DC		1810 A7		1	LETTER	2	2.413	p28	2.413	.5	1.5	.5	2.5	6.0325	p29	2HPAC Grd
DIST BOARD, ELE	▲			1	LETTER	2	3.239	p27	▲3.239	.5	2.0	.5	3.0	▲9.717	p27	Brkr, Inverters, Cable, Rly, Grd
CONTROLLER				1	LETTER	2	1.013	p33	1.013	.5	1.0	.5	2.0	2.026	p33	Relay, Contactor, Grnd
ACC/MOTOR KIT		18C340	IR	1	LETTER	3										
POTENTIOMETER		9CY2	Reliance	1	LETTER	2	NEG									
SHAFT ENCODER		702	Kinetics	2	LETTER	2	17.949	p24	35.898	.5	1.0	.5	2.0	71.796	p26	Tachometer, Grd Module
FREQ COUNTER		CPM603	Analex	1	LETTER	2	212.21	Est	212.21	.5	1.0	.5	2.0	424.42	Est	FR-½ Computer FR-AA-55
SPROCKET				2	LETTER	2	Neg									
LIMIT SWITCH	▲			21	LETTER	2	1.133	p37	21.793				2.6	▲61.8618	p37	

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda = 251.534 \times 10^{-6}$/HR ✓
▲$\Sigma N\lambda = 27.082 \times 10^{-6}$ ✓

$\Sigma N\lambda TM = 304.3745 \times 10^{-6}$ ✓
▲$\Sigma N\lambda TM = 71.7688 \times 10^{-6}$ ✓

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad = \quad$ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = \quad \%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	INPUT CONVEYOR PROJECTILE				(1410)											
CYLINDER HYD CABLE	▲	964	26455	1	0101	2	22.342	p15	▲22.342	.5	2.5	1.0	4.0	▲71.368	p15	Ln, Hyd Lift for Cable Mech
MOTOR MOTOR W/HP	▲	F312-70	71041	1	0102	2	16.357	"	▲16.357	.5	1.0	.5	2.0	▲32.702	p15	Front HP A/C Grid
SPROCKET	▲	40832	71176	1	0103	2	Neg									
ROLLER CHAIN	▲	40119	92420	5	0104	2	Neg									
CASTER	▲		85704	2	0105	2	Neg									
BEARING ANTIFRICTION	▲	CF1	92563	20	0106	2	2.059	p16	41.77*	.5	1.0	.5	2.0	▲123.54*	p16	Gen Grid
VALVE DECELERATION	WITH FLOW CONTROL▲		09990	2	0311	2	12.762	p43	▲39.524	1.0	1.0	1.0	3.0	▲118.572	p43	Hyd, Restrictor, Air.
ROLLER W/BEARINGS	▲		15310	17	07-	2	.280/ft	p16	10.64*	.5	1.0	.5	2.0	▲21.28*	Est	Roller Grid
SPROCKET	▲		71041	37	0701	2	Neg									
BOLT TRANSFER	▲		15310	20	0704	2	Neg									
LIMIT SWITCH	RETRACT POSITION▲			1	-	2	1.133	p37	▲1.133				2.6	▲2.945	p37	Sensor Grid

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▲ ΣNλ = 152.32 x 10^{-6}/HR ✓
●▲ ΣN2 = 72.41 x10^{-6} ✓

▲ ΣNλTM = 370.520 x 10^{-6} ✓
●▲ Σ NλTM = 144.82 x10^{-6} ✓

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
	PSM INPUT				(4/9)											
BEARING, CAM		B1216-14	BOSTON	4	0402,3	2	2.059	p16	8.236•	.5	1.0	.5	2.0	16.472•	p16	Gen Grnd
SPROCKET		SD827	LK BELT	25	0332,3	2	Neg									
ROLLER W BEARING		HRC8	MARBORO	17	0302,3	2	2.059/Rev	p16	53.534•	.5	1.0	.5	2.0	70.206•	Est	Gen Grnd
ARTOR MOTOR ½HP		5323B 3033 FVR	BOSTON	1	0601	2	16.351	*	16.351	.5	1.0	.5	2.0	32.702	p15	Fract HP AC Grnd
SPROCKET		HKSC 24-2	BOSTON	1	0602	2	Neg									
CHAIN DRIVE		RC 50	LK BELT	3	0603	2	Neg									
CYLINDER HYD		371-H	AIRCRAFT	7	0614	2	15.229	p15	106.62•	.5	2.5	.5	3.5	159.994	p15	Actuator, Lin Hyd
CYLINDER HYD		MH	SHEFFER	2	0614,7	2	15.228	p15	30.456	.5	2.5	.5	3.5	106.596	p15	Actuator, Lin Hyd
BEARING, THRUST		NTI117	BOSTON	4	0619	2	2.059	p16	8.236•	.5	1.0	.5	2.0	16.472•	p16	Gen Grnd
LIMIT SWITCH	CONV POSITION, PUSH CAM ACT			3	—	2	1137	p37	3.411				2.6	8.8574	p77	Sensitive Grnd
PHOTO CELL	PROJECTILE POSITION			1	-	2	3.925	p40	3.925	.5	1.0	.5	2.0	7.85	p40	Transducer, Mitronel Grnd

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = 3.925 \times 10^{-6}$/HR

▲ $\Sigma N\lambda = 165.894 \times 10^{-6}$

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS

•▲ $\Sigma N\lambda = 70.006 \times 10^{-6}$

$\Sigma N\lambda TM = 7.85 \times 10^{-6}$

▲ $\Sigma N\lambda TM = 440.0414 \times 10^{-6}$

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad = \quad$ HRS

•▲ $\Sigma N\lambda TM = 140.012 \times 10^{-6}$

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = \quad \%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	PSM Nose Closure Conveyor				(4.0)											
Gear Motor ½HP	Δ	3139 79 G1	71041	1	0103	2	16.351	*	Δ16.351	.5	1.0	.5	2.0	Δ32.702	p 15	Front HP/AC Cond
SPROCKET	Δ	32TXB 3585	19857	1	0109	2	NEG									
CHAIN	Δ	35	71041	1	0110	2	NEG									
SPROCKET	Δ	35 16	71176	1	0112	2	NEG									
SPROCKET	Δ			4	0301	2	NEG									
BELT	Δ			1	0304	2	NEG									
BEARING	Δ			8	0309.9	2	2.059	p 16	Δ16.472*	.5	1.0	.5	2.0	Δ32.944*	p 16	Gen, Cond
LIMIT SWITCH	Δ			1	—	2	1.133	p 37	Δ 1.133				2.6	Δ 2.943	p 37	Sensing Cond

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

ΔΣNλ = 33.956 x 10^{-6}/HR ✓
•ΔΣNλ = 16.912 x 10^{-6} ✓

ΔΣNλTM = 60.5918 x 10^{-6} ✓
•ΔΣNλTM = 32.944 ✓

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = _____ = ____ HRS

AVAILABILITY = $\frac{1}{\quad}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

	DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
M.	ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
2.0		Variable Buster Output				(421)											
1	Bearing		P1216-E	71041	8	0155,6	2	2.059	p16	16.472	.5	1.0	.5	2.0	32.944	p16	Gen Grd
2	Motor 1½HP Vari-		F3X3-3044	71041	1	0304	2	16.351	X	16.351	.5	1.0	.5	2.0	32.702	p15	Fact HP Grd
3	Sprocket		35T2	71174	1	0305	2	NEG									
4	Sprocket		35T30	71174	1	0306	2	NEG									
5	Belt - Russian Cord			78730	1	0101	2	NEG									
6	Chain				1	03-	2	NEG									
7	Limit Switch				2	-	2	1133	.337	.1133				2.6	2.9453	p37	Sensitive Grd

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

▲ΣNλ = 32.954 x 10^{-6}/HR ✓
●▲ΣNλ = 16.472 x 10^{-6} ✓

▲ΣNλTM = 68.5918 x 10^{-6} ✓
●▲ΣNλTM = 32.944 x 10^{-6} ✓

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = $\frac{\quad}{\quad}$ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 14 OF 15

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6} HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	Nλ TM (X10^{-6})	SOURCE (*)	REMARKS
	ECC PROJECTILE DISCHARGE				(4.3.2)											
CYLINDER, CAGE		100-150	26455	1	0101	2	22.842	p15	22.842	.5	2.5	1.0	4.0	91.368	p15	Lin Hyd Wt for Cable Mech
CYLINDER, HYD		1½MHF500	05277	1	0110	2	15.228	p15	15.228	.5	2.5	1.0	4.0	60.912	p15	Actuator Lin Hyd Grd
MOTORIZE SCRAPER		CF1½S	82567	29	0114	2	2.059	p16	57.652	.5	1.0	.5	2.0	115.304	p16	Gen, Grd
CYLINDER, HYD		1½MHC500	05277	1	0119	2	15.228	p15	15.228	.5	2.5	1.0	4.0	60.912	p15	Actuator Lin Hyd Grd
BEARING OIL IMP		FB 9/16A	71041	2	0122	2	2.059	p16	4.118	.5	1.0	.5	2.0	8.236	p16	Gen Grd
BEARING		FB 9/16-4	71041	2	0502	2	2.059	p16	4.118	.5	1.0	.5	2.0	8.236	p16	Gen Grd
BEARING PLAIN		BB10-6	71041	1	0504	2	2.059	p16	2.059	.5	1.0	.5	2.0	4.118	p16	Gen Grd
BEARING OIL SEAL		FHB10-4	71041	2	0704	2	2.059	p16	4.118	.5	1.0	.5	2.0	8.236	p16	Gen Grd
TRACKS		1401-14	82000	5	1502	3										
BEARING		299605-J	92561	6	0901	2	2.059	p16	12.354	.5	1.0	.5	2.0	24.708	p16	Gen Grd
LIMIT SWITCH				1	- (304)	2	1.133	p37	1.133				2.6	2.945	p31	Sensitive Grd
MOTOR, TURRET CONVEY		3205	28911	2	2906	2	NEG									
ROLLER CONVEYOR			78911	1	2907	3										
CYLINDER HYD		1½MS2.5-4C	05277	1	2910	2	15.228	p15	15.228	.5	2.5	1.0	4.0	60.912	p15	Actuator Lin Hyd Grd

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

ΔΣNλ = 154.078 x 10^{-6} /HR ✓
●ΔΣN2 = 84.419 x 10^{-6} ✓

ΔΣNλTM = 445.5938 x 10^{-6} ✓
●ΔΣN2TM = 168.838 x 10^{-6} ✓

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad = \quad$ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = \quad \%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ. (**)	RATE λ X10^{-6}/HR	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	Nλ TM (X10^{-6})	SOURCE (*)	REMARKS
	ME DISCHARGE & SEGREGATING				(4.4)											
CYLINDER, CABLE	Δ		26455	1	0201	2	22.842	μ15	Δ22.842	.5	2.5	1.0	4.0	Δ91.368	μ15	Ind Hyd x Wkr for Cable Mech
CYLINDER, MISC	Δ	SY012	SMF	3	0203	2	121.04	μ15	Δ363.12	.5	2.5	1.0	4.0	Δ1452.5	μ15	Act, Ln, Prov, Cntl ~ X10
VALVE, REGULATING	Δ Flow Control ▲	DF 600-10	07990	2	0204	2	8.416	μ43	Δ16.832				2.0	Δ50.496	μ43	Hyd pressure Regulator
BEARING CAM FOL	Δ	CFI	72523	20	0205	2	2.059	μ16	Δ41.18	.5	1.0	.5	2.0	Δ82.36	μ16	Gen, Gnd
WHEEL W/ B BEARING	Δ	115	01509	22	0206	2	.346/inch	μ16	Δ11.621	.5	2.0	.5	3.0	Δ33.252	μ16	Gnd, BALL
CONVEYOR CHAIN	Δ	UC 2469-7	19389	1	0701	2	NEG									
SPROCKET	Δ	UC 2469-12	19389	6	0702	2	NEG									
RATIO MOTOR	Δ	FWC 726(4M)	BOMN	1	0703	2	16.351	X	Δ16.351	.5	1.0	.5	2.0	Δ32.702	μ15	Fract HP AC Gnd
TORQUE LIMITER	Δ	ASD 950 2SK	STAMM	1	0704	3										
IN	Δ	SD		1	0705	2	NEG									
210 TE BEARING	Δ	FB 22420-H	19982	10	0706	2	.280	μ16	Δ2.8 •	.5	2.0	.5	3.0	Δ22.4 •	μ16	Gnd
CACT	Δ			2	0707, 2	2	NEG									

▲ΣNλ = 504.749 X 10^{-6}/HR ✓
•ΔΣNλ = 85.604 X 10^{-6} ✓

ΔΣNλTM = 2064.798 x 10^{-6} ✓
•ΔΣNλTM = 437.752 x 10^{-6} ✓

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{MTTR}$ x 100% = ____ %

BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE) CONVEYOR APPLICATIONS

DWG Sheet No	DRAWING IDENTIFICATION	N655 Rocket	P805 W Bus	P807 X10/Bus	N723 Mine	9.2" Missile
1	Rocket ECC Input Conveyor	✓				
1, 2	PDM Input Conveyor	✓				
2, 3	Rocket ECC Discharge & Segregating Conveyor	✓				
4	VERC Furnace Input	✓	✓		✓	✓
5	ECC Bypass			✓		
6	PDF Input		✓	✓		✓
6	PDF to Turn Station		✓	✓		✓
7, 8, 9	PDF Output Conveyor		✓	✓		✓
10	Input Conveyor Missile		✓			✓
11	PSM Input		✓			✓
12	PSM Nose Closure Conveyor		✓			
13	Missile Burster Output		✓			✓
14	ECC Missile Discharge		✓			✓
15	HE Discharge & Segregating		✓			✓

CALCULATIONS - BUILDING BLOCK #22 ,TERIAL HANDLING EQUIPMENT (MHE)

ET	ITEM	FEW		NITRF					NITT					BARRIER	TOTAL	
S	NOS	RATE	ΣEN2	ΣEN2	FEW	ΣEN2		ΣEN2TM	ΣEN2TM	FEW	ΣEN2TM	OTHER	ΣEN2TM	ΣEN2	ΣEN2	ΣEN2
		/HR	ON/HR	(X10⁻⁶)	FACTOR	(X10⁻⁶)		ON/HR	X10⁻⁶	FACTOR	X10⁻⁶	FACTORS	X10⁻⁶	X10⁻⁶	X10⁻⁶	X10⁻⁶
12"	WORKING															
4	4		-	538.816				---	1078.8395					-	552.478	1078.8395
6	6,7		146.059	481.299				142.4165	962.598					45.298	457.098	911.196 / 914.156
7	8		199.927	546.405				525.2975	1102.468					131.776	557.104	263.55 / 1054.20
8	8		45.684	2.413				182.736	6.0325					-	-	- -
9	8		27.082	251.534				71.7288	554.2745					-	-	- -
10	9		152.32	-				390.5075	-					72.41	-	144.82
11	10		165.376	3.925				448.0414	7.85					70.006	-	140.012 -
13	12		33.956	-				63.5918	-					16.472	-	32.944 -
14	13		154.079	-				448.9316	-					84.419	-	168.838 -
15	14		504.749	-				2064.798	-					85.604	-	437.752 -
HISTORIC			1429.751	1824.395				4640.0851	3662.0615					505.985	1516.68	299.104 / 3057.36
WING ADJUSTMENT			455.3865	365.012				1189.1930	2730.024							
ATI 212			914.3645	459.383				3470.8923	932.0375							
		50			X5	5351.2055				X5		X3	54859.494			
ALL	9,13,14		811.147	—	2.5	2027.8675		2901.2736		X2.5		X3	21759.552	ADJUSTMENT FOR CONVEYORS WHICH OPERATE AT 1/2 THE CYCLE RATE DUE TO LOADING 2 ea MINUTES AT A TIME		
						3303.353							33099.742			

CALCULATIONS - BUILDING BLOCK #22 MATERIAL HANDLING EQUIPMENT (MHE)

CODE	ITEM NO.	PROD RATE UPE	NITROGEN					EARTH					Pesticide Totals		
			ENR (kg/hr)	ENR (kg/hr)	PROD FACTOR	NR ($\times 10^{-6}$)		ENRTH (kg/hr)	ENRTH ($\times 10^{-6}$)	PROD FACTOR	ENRTH ($\times 10^{-6}$)	OPER FACT	NRTH ($\times 10^{-6}$)	ENR $\times 10^{-6}$	ENR $\times 10^{-6}$	ERTH $\times 10^{-6}$
PROJECTILES / CAR			TRUCKS		WATER		TRUCKS									
4	4		—	538.316				—	1078.8305					—	532.478	1064.956
6	6,7		146.059	484.299				442.9463	982.578					45.298	457.092	111.186 / 944.198
7	8		171.927	546.408				525.2175	1102.425					131.776	527.104	263.552 / 1054.208
8	8		45.624	2.412				151.731	6.0325					—	—	— —
9	3		27.082	251.534				71.7238	504.2745					—	—	— —
10	9		152.32	-				530.5978						72.41	—	144.82 —
11	10		16.5696	3.925				442.0444	7.85					70.006	—	140.012 —
12	11		33.956	-				68.5718	—					16.472	—	32.944 —
13	12		33.956	-				68.5718	—					16.472	—	32.944 —
14	13		154.078	-				447.3378	—					84.419	—	168.838 —
15	14		504.749	-				2054.793	—					85.604	-	137.752 —
SUBTOTAL			1463.707	1384.395				4720.6777	3862.0615					522.457	1516.66	2387.004 / 1928.452
GRAND TOTAL 213	ASSESSMENT		970.2113	1365.012				2157.3036	1771.5636							
TOTAL			973.4957	459.383				2551.3141	1890.4979							
		325			X3.25	3688.244				X3.25		X3	30547.389			
		50			X5	5426.8615				X5		X3	43942.101			
MINE																
4	4	40	—	538.316				—	1078.8305					—	532.478	— 1064.956
GRAND TOTAL	ASSESSMENT			479.2302					958.4604							
TOTAL				59.5858	NA	59.5858			120.3721	NA	120.3721	X3	361.1343			

CALCULATIONS - BUILDING BLOCK #22 . .TERIAL HANDLING EQUIPMENT (MHE)

ASS	Type	Prod Rate	ΣN2	MTBF ΣN2	Prod	N2		ΣN1	MTTR ΣN1TH	Prod	ΣN3TH	OTHER	NRTH	Backlog Times ΣN2	Times N2	ΣΣNATIVE ESN3TH
		/HR	ON/HR	(X10⁻⁶)	FACTOR	(X10⁻⁶)		ON/HR	(X10⁻⁶)	FACTOR	(X10⁻⁶)	FACTOR	(X10⁻⁶)	X10⁻⁶	X10⁻⁶	X10⁻⁶
DETECTABLE/	CARTRIDGES		WITHOUT				ASSESS FOR									
5	5		351.212	—				702.424	—					337.735	—	679.47
6	6,7		146.059	481.299				442.458	962.598					45.298	157.079	911.186 914.196
7	8		199.927	546.468				525.2175	1102.468					131.776	527.104	263.552 1054.208
8	8		45.684	2.413				122.736	6.0325					—	—	— —
9	8		27.082	251.534				71.7288	504.2185					—	—	— —
SUB TOTAL			769.964	1281.654				1984.623	2575.373					516.809	784.202	1054.208 1768.401
BEARING ADJUSTMENT			455.129	885.7878				998.7072	1771.5634							
TOTAL			304.8359	395.8722				985.8158	803.8049							
		20			X2	1006.544				X2		X3	8266.3236			
		32.5			X3.25	1386.5868				X3.25		X3	11925.633			
		50			X5	1720.0517				X5		X3	17048.666			
755	ROCKET															
1	1, 2		180.496	—				536.2356	—					70.17	—	140.34 —
2	2, 3		2371.834					8836.8651	—					300.614	—	601.228 —
3	3		40.499	3.925				136.5313	7.85					—	—	— —
4	4		—	538.816				—	1078.8385					—	532.478	— 1064.956
TOTAL			2602.829	542.741				9507.63	1086.6885					370.784	532.478	741.565 1064.78
BEARING ADJUSTMENT			333.7056	479.2302				667.4112	958.4604							
TOTAL			2269.1234	63.5108				8842.218	128.2281							
		20			X2	1601.7576				X2		X3	53432.975			

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #23 FILTER SYSTEM (FIL)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*M55 ROCKET, GB/VX 333 1000 3000 6000 (2S) (2P) 15000								
Rocket, 115mm, M55	GB	Comp B	M28	636.5	1571.2	4512.6	7.09	.99
Rocket, 115mm, M55	VX	Comp B	M28	"	"	"	"	
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360 333 2000 3000 4000 6000 8000 (2P) 15000	GB	None	None	636.4	1571.4	4512.6	7.09	.99
Projectile, 155mm, M121A1 (2P)	GB	None	None					
Projectile, 155mm, M121	GB	None	None					
Projectile, 155mm, M122	GB	None	None					
Projectile, 8", M426	GB	None	None					
Projectile, 155mm, M121A1	VX	None	None					
*P/C, GB/VX WITH BURSTERS 333 (2S) 2000 3000 4000 6000 8000 (2P) 15000								
Cartridge, 105mm, M360	GB	Tetrytol	M1	970.3	1030.6	6879.4	7.09	.99
*PROJECTILES, MUSTARD WITH BURSTERS 333 (2S) 2000 3000 4000 6000 (2P) 15000								
Projectile, 155mm, M110	H	Tetrytol	None					
Projectile, 155mm, M104	HD	Tetrytol	None					
*M23 MINE, VX 333, 3000, 6000 (2S), 15000 (2P)								
Mine, 2 gallon, M23	VX	Comp B	None	553.2	1207.7	3925.4	7.10	.99
*4.2" MORTAR, MUSTARD 333 2000, 3000, 4000 6000 (2S) 8000, 15000 (2P)								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6	869.0	1127.4	6291.3	7.09	.99
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6	"	"	"	"	

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #23 FILTER SYSTEM (FIL)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL ABIL
*BULK ITEMS, GB/VX 338, 3500, 4500, 8000, 15000(2 P)								
Bomb, 750#, MC-1	GB	None	None	553.1	1808.0	3925.0	7.10	.99
Tank, Spray, TMU-28/B	VX	None	None	"	"	"	"	"
Ton Container	GB	None	None	"	"	"	"	"
Tone Container	VX	None	None	"	"	"	"	"
*TON CONTAINER, MUSTARD MK4 4 Cons 333, 4500, 8000, 15000 (4)				"	"	"	"	"
Ton Container	HD	None	None	459.3	2177.2	3261.9	7.10	.99

*MUNITION DEMILITARIZATION PROCESS FLOW

SUPPLEMENTAL DATA

BUILDING BLOCK # 23 FILTER SYSTEM (FIL)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. _____ DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES Drawing No's are referenced on failure rate and maintainability data sheets

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER RADC-TR-74-268 RADC-TR-69-458

2. NOTES Estimates were made where data not available

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

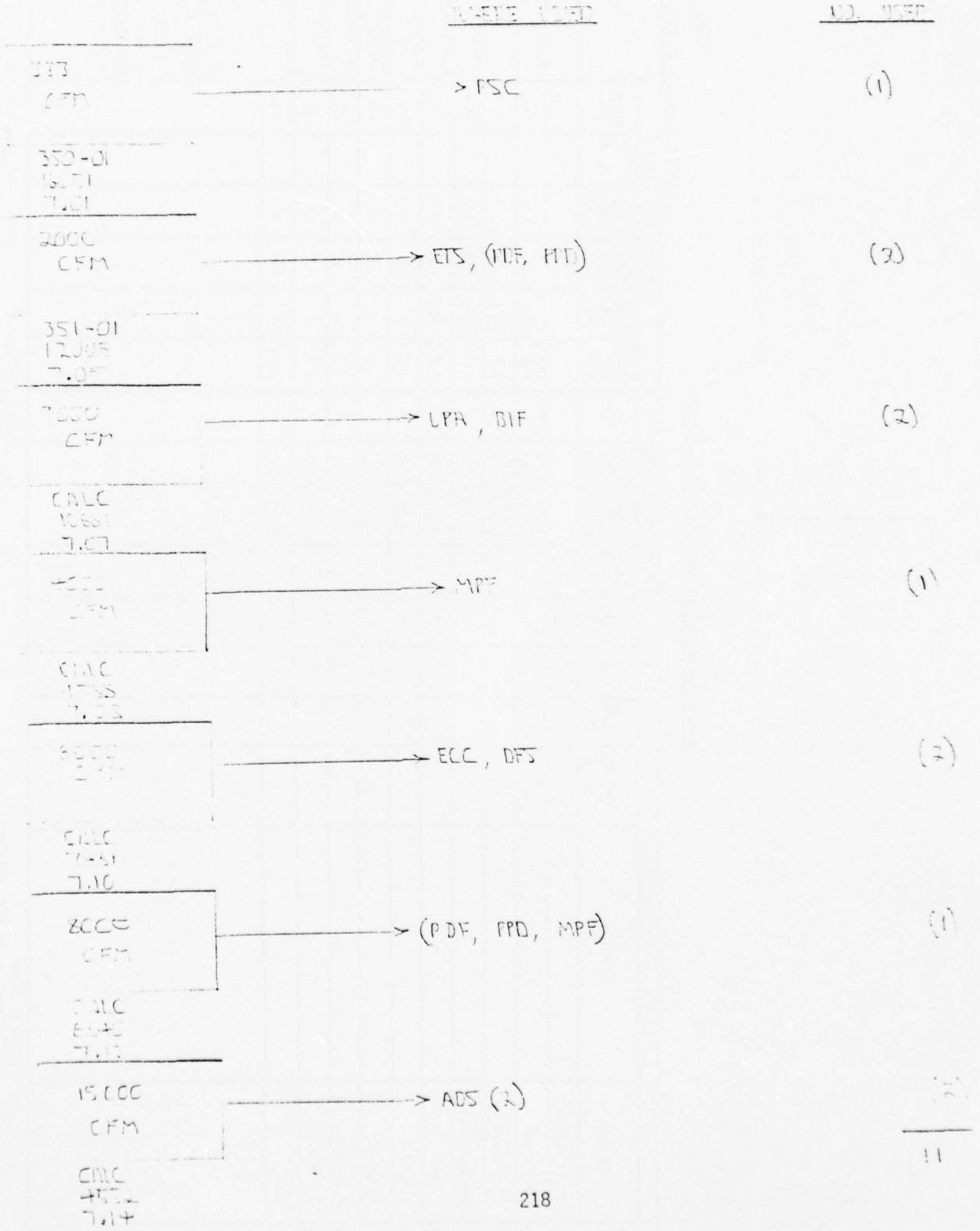
c. OTHER RADC-TDR-64-373 Vol II

2. NOTES Estimates were mace where actual data not available

D. GENERAL REMARKS

BUILDING BLOCK: #23 FILTER SYSTEM (FIL)

CAPACITY UTILIZATION DIAGRAM



11/14/75 ✓

SHEET 1 OF 1

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK 123 FILTER SYSTEM (FIL)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA X3: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
1	333 CFM FILTER					Q-01											
1	PRE FILTER				1	"		2.937	P21		1.5	4.2	1.5	7.2		P21	FIL-LIG-grd
2	HEPA FILTER				2	"		2.987	P21		1.5	4.2	1.5	7.2		P21	"
3	CHARCOAL FILTER				2	"		1.201	P21		1.5	4.2	1.5	7.2		EST SAME AS 1,2	FIL-GAS-grd 2
4	FAN				1	"		1.279	P17		1.5	10.8	1.5	13.8		P17	FAN CENTR grd
5	MOTOR				1	"		4.825	P28		1.5	6	1.5	9		P28	MOT SHP
6	DAMPER				1	"		8.341	See Remarks		1.5	6	1.5	9		EST	MOT FAIL Hp + VALVE & KEY AS 7.552 + .789
7	GAGES				6	"		.527	P25		1.5	3	1.5	6		P25	INSTR MOTOR grd MO
8	FLOW				1	"		24.975	P40		1.5	3	1.5	6		P40	VIBR MECH FLOW 65
9	ΔP				1	"		3.425	P40		1.5	3	1.5	6		P40	VIBR PRESS grd
																	THE 2000 CFM FILTER IS SIMILAR TO ABOVE EXCEPT FOR NO. OF PRE, HEPA, & CHARCOAL FILTERS THE OTHER SIZE FILTER SYSTEMS (TO 15000 CFM) ARE SCALED FROM THE 333 & 2000 CFM SYSTEM

a. ECDS 23-550-
b. See CAMDS FSAA REF FOLDER

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda = 62.32 \times 10^{-6}$/HR (11/14/75) $\quad \Sigma N\lambda TM = 436.64 \times 10^{-6}$

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS $\quad MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad$ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = \quad \%$

SUMMARY - BUILDING BLOCK: #23 FILTER SYSTEM (FIL)

WHERE USED	ITEM	QAP CFM	$\Sigma N\lambda$ $\times 10^{-6}$	$\Sigma N\lambda T_M$ $\times 10^{-6}$	MAINT FACTOR	MTBF	MTTR	A
PSC	1	333	62.3 (1)	436.6 (1)	3X	16051	7.01	.9996
EC {PDF, PPD}	2	2000	83.3 (1)	587.6 (1)	3X	12035	7.05	.9994
MCP, DIF	3	3000	93.8 (2a)	663.1 (2a)	3X	10661	7.07	.9993
DIF	4	4000	104.3 (2a)	738.6 (2a)	3X	9538	7.08	.9992
EC DFS	5	6000	125.3 (2a)	889.6 (2a)	3X	7981	7.10	.9991
EC {PD, PPD}	6	800	146.2 (2a)	1040.6 (2a)	3X	6840	7.12	.9990
ADS (2)	7	1500	219.7 (2a)	1569.1 (2a)	3X	4552	7.17	.9984

NOTES: (1) CALC FROM DWG ECDS 73-350-01

(2) CALC FROM ITEMS 1 & 2 USING FOLLOWING RELATIONSHIPS

a. $\Sigma N\lambda = 62.32 + \frac{3.492}{333} \times CFM$ WHERE $3.492 = 20.971 \times \frac{333}{2000}$

$\Sigma' 20.971 = 83.29 - 62.32$

b. $\Sigma N\lambda T_M = 436.64 + \frac{25.140}{333} \times CFM$ WHERE $25.140 = 150.991 \times \frac{333}{2000}$

$\Sigma' 150.991 = 587.631 - 436.64$

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BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #24 MORTAR DEMIL MACHINE (MOR)

12/31/85

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABILITY
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	NA	NA	NA	NA	
Rocket, 115mm, M55	VX	Comp B	M28	NA	NA	NA	NA	
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M121A1	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M121	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M122	GB	None	None	NA	NA	NA	NA	
Projectile, 8", M426	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M121A1	VX	None	None	NA	NA	NA	NA	
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	NA	NA	NA	NA	
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	NA	NA	NA	NA	
Projectile, 155mm, M104	HD	Tetrytol	None	NA	NA	NA	NA	
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None	NA	NA	NA	NA	
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1 50/yr	HD	Tetryl	M6	922.4	1084.08	1000.7	14.12	93.
Cartridge,Mortar, 4.2",M2/M2A1 50/yr	HT	Tetryl	M6	922.44	1084.08	1000.7	14.12	93.

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #24 MORTAR DEMIL MACHINE (MOR) 12/31/75

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVA ABI
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	NA	NA	NA	NA	
Tank,Spray, TMU-28/B	VX	None	None	NA	NA	NA	NA	
Ton Container	GB	None	None	NA	NA	NA	NA	
Tone Container	VX	None	None	NA	NA	NA	NA	
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	NA	NA	NA	NA	

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET ___ OF ___

SUPPLEMENTAL DATA

BUILDING BLOCK

#24 MIXER

A. DESCRIPTION SEE ATTACHMENT

1. SOURCE

a. DRAWING NO. _____ DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES _____

_____

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER _____ _____

2. NOTES _____

_____

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER _____

2. NOTES _____

_____

D. GENERAL REMARKS

BUILDING BLOCK: #24 MORTAR DEMIL MACHINE (MOR)

- DATA SOURCES

  VERBAL & DRAFT SKETCHES OBTAINED AT TOOELE 10/21/75

  DRAFT DEMIL PLAN

- MISSING ELEMENTS INCLUDE:

  ROLLERS, MECHANISMS, ETC

- DEVELOPMENT OF FACTOR FOR MISSING ELEMENTS

	FUNCTIONS				
	SAW	PUNCH	DRAIN	UNSCREW	CONVEYORS
RDM #6	✓	✓	✓		✓
PDM #15	✓			✓	✓
PPD #18			✓	✓	✓
MIN #25		✓	✓	✓	✓ (SEPAR
MOR #24				✓	

COMPARISON ANALYSIS MOR TO MIN

COMPONENTS	QUANITY MOR	QUANITY MIN
CYLINDERS HYD	6	20 (2 ea FOR PUNCH)
MOTORS	1 HYD	3 HYD/EL
SWITCHES ALL TYPES	10	17
PUMPS DA	0	2] DRAIN
VALVES	0	4]
	17 ea	46
		- 8 PUNCH & DRAIN
		38 ea

BUILDING BLOCK: #24 MORTAR DEMIL MACHINE (MOR) 12/31/75

* DEVELOPMENT OF FACTOR FOR MISSING ELEMENTS (CONTINUED)

$$\text{FACTOR} = \frac{17(\text{MOR})}{46(\text{MIN})} \times \frac{38 \text{ MIN APPL PARTS}}{46 \text{ MIN TOTAL}} = .305$$

	MOR	MIN	
Δ ΣNλ	122.992	669.2666	
ΣNλ	0	98.888	NOT APPLICABLE FOR MOR

669.2666 × .305 = 204.126
204.126 ÷ 122.992 = 1.660

REDUCE TO 1.5 IN CONSIDERING OTHER CYCLICAL ITEMS NOT LISTED BUT PART OF PUNCH, DRAIN OPERATIONS

	MOR	MIN	
Δ ΣNλTM	521.108	2338.5826	
ΣNλTM	0	335.496	NOT APPLI. FOR MOR

2338.5824 × 1,305 = 713.268
713.268 ÷ 521.108 = 1.369

REDUCE TO 1.25 IN CONSIDERING OTHER CYCLICAL ITEMS NOT LISTED BUT PART OF PUNCH DRAIN OPERATIONS

A CONSERVATIVE ESTIMATE OF IMPACT OF NON IDENTIFIED PARTS

BUILDING BLOCK: #24 MORTAR DEMIL MACHINE (MOR) 12/31/75

DEVELOPMENT OF FACTOR FOR MISSING ELEMENTS (CONTINUED)

COMPONENTS	MOR	MIN (MACHINE ONLY)
CYLINDERS HYD	6	13 (2 PUNCHES)
MOTORS	1 HYD	1
SWITCHES	10	10
PUMPS	0	2] NOT APPLICABLE
VALVES	0	0
	17	34
		12 ← 12
		22

$$\text{FACTOR} = \frac{17}{34} \times \frac{22}{34} = .3235$$

	MOR	MIN	
$\Delta\Sigma N\lambda$	122.992	416.922	
$\Sigma N\lambda$	0	31.53	NOT APPLICABLE

$416.922 \times .3235 = 134.874$

$$\frac{134.874}{122.992} = 1.097$$

$\Delta\Sigma NRTm$	521.102	1529.6942	
$\Sigma NRTm$	0	63.06	NOT APPLICABLE

$1529.6942 \times .3235 = 494.85607$

$$\frac{494.856}{521.102} = .9496$$

ADJUSTMENT IN ADEQUATE FOR MISSING ITEMS

12/31/75

BUILDING BLOCK: #24 MORTAR DEMIL MACHINE (MOR)

DEVELOPMENT OF FACTOR FOR MISSING ELEMENTS (CONTINUED)

COMPONENTS	MOR	RDM
CYLINDER HYD	6	3, 7, 6, 2, 20 : 34
MOTORS	1 HYD	1, 6 : 7 (6 SAW
SWITCHES	10	7, 3, 12, 7 : 29
PUMPS	0	1 : 1
VALVES	0	1, 1, 2, 6, 3, 2 : 15
SAW BLADES	0	4, 2, 1 : 7
	17	93

23

29 NOT APPL

$$\text{FACTOR} = \frac{17}{93} \times \frac{64}{93} = .1258$$

29/64

	MOR	RDM	
ΔENλ	122.892	685.133	
ENλ	0	59.14%	NOT APPLICABLE

685.133 × .1258 = 111.350

ΔENλTM	521.10%	3207.442	
ENλTM	0	120.912	NOT APPLICABLE

3207.442 × .1258 = 403.496

CONCLUSION = FACTORING RDM YIELDS LOWER NUMBER THAN ALREADY IDENTIFIED MOR ITEMS.

BUILDING BLOCK: #24 MORTAR DEMIL MACHINE (MOR) 13/5 1/15-1

DEVELOPMENT OF FACTOR MISSING ELEMENTS (CONTINUED)

CALCULATION W/O ADJUSTMENT FOR MISSING ITEMS

$\Delta N\lambda = 122.992 \times 5 = 614.96$ MTBF = 1/6 20.122

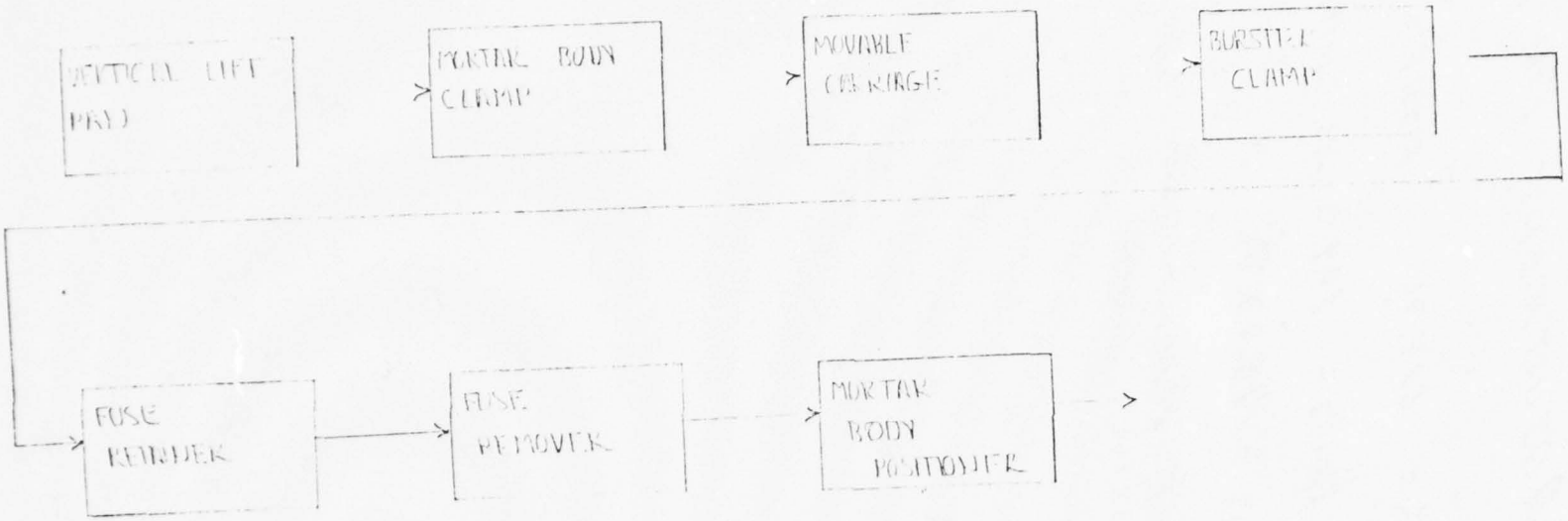
$\Delta N\lambda TM = 521.108 \times 5 \times 3 \times 1\frac{1}{3} = 10422.16$ MTTR = 16.943

$AVAIL = \frac{100}{1.0104223} = 98.97\%$

BEST POSSIBLE AVAILABILITY WITHOUT CONSIDERING MISSING PARTS

BUILDING BLOCK: #24 MORTAR DEMIL MACHINE (MOR)

FLOW CHART



EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #24 MORTOR DEMIL MACHINE (MOR)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ ($\times 10^{-6}$/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM ($\times 10^{-6}$)	SOURCE (*)	
CYLINDER HYD ▲	VERTICAL LIFT PAN			1		2	15.228	P15	15.228				4.0	60.912	P15	ACT ON HYD GND
CYLINDER HYD ▲	MORTAR BODY CLAMP MECH			1		2	15.228	P15	15.228				4.0	60.912	P15	ACT ON HYD GND
CLAMP MECH ▲				1		2	NEG									
MOTOR HYD ▲	MOVABLE CARRIAGE			1		2	15.228	P15	15.228				4.0	60.912	P15	ACT ON HYD GND
RINGS				4		2	2.059	P16	8.236				8.0	65.893	EST	BEARINGS GUN GND
CYLINDER HYD ▲	BURSTER CLAMP			1		2	15.228	P15	15.228				4.0	60.912	P15	ACT ON HYD GND
CLAMP MECH ▲				1		2	NEG									
CYLINDER HYD ▲	FUSE RETAINER			1		2	15.228	P15	15.228				4.0	60.912	P15	ACT ON HYD GND
FORK ▲				1		3	NEG									

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$\Delta\Sigma N\lambda$ = 84.570 x 10^{-6}/HR $\Delta\Sigma N\lambda TM$ = 337.643 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

▲ CYCLE ITEM AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #24 MORTOR DEMIL MACHINE (MOR)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ Δ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10⁻⁶) Δ	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
2.0		FUSE REMOVER															
2.1	TORQUE MOTOR HYD Δ		109-1005	CHAR-LYNN	1		2	12.053	P30	12.053				5.0	60.27	P30	REAR CONTR GEN GND
2.2	DEFUSING HEAD Δ				1		2	NEG									
3.0		MORTAR BODY POSITIONER															
3.1	CYLINDER, HYD Δ				1		2	15.228	P47	15.228				4.0	60.912	P15	HOT LIN HYD GND
4.0		INSTRUMENTATION															
4.1	SWITCHES Δ				10		2	1.133	P37	11.33				2.6	29.458	P37	SW SENS GND

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ΔΣNλ = 39.611 x 10^{-6}/HR ✓ ΔΣNλTM = 103.66 x 10^{-6} ✓

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N \lambda TM}{\Sigma N \lambda}$ = _____ = ____ HRS

AVAILABILITY = $\frac{1}{MTTR}$ x 100% = ____ %

CALCULATIONS - BUILDING BLOCK: #24 MORTAR DEMIL MACHINE (MOR) 12/31/75 Rates

ject Item No.	Rate /HR	ΔENR @10/HR	ENR x10⁻⁶	Shift Factor	NR x10⁻⁶	ΔENRTM @10/HR	ENRTM x10⁻⁶	Shift Factor	ENRTM x10⁻⁶	Learning Factor	ENRTM x10⁻⁶
	50										
1-5		84.576	—			570.48					
6-9		38.616	—			260.66					
SUB TOTAL		122.992	—			831.105					
FACTOR FOR MISSING DETAIL (SEE ATTACHMENT)		x1.5				1.25					
	50	184.488	—	x5	922.44	651.325	—	x5	3256.925	x3x1⅓	13027.7

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #25 MINE DEMIL MACHINE (MIN)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	NA	NA	NA	NA	
Rocket, 115mm, M55	VX	Comp B	M28	NA	NA	NA	NA	
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M121A1	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M121	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M122	GB	None	None	NA	NA	NA	NA	
Projectile, 8", M426	GB	None	None	NA	NA	NA	NA	
Projectile, 155mm, M121A1	VX	None	None	NA	NA	NA	NA	
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	NA	NA	NA	NA	
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	NA	NA	NA	NA	
Projectile, 155mm, M104	HD	Tetrytol	None	NA	NA	NA	NA	
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None	27757644	30.24	839879.04	13.96	96.
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1	HD	Tetryl	M5	NA	NA	NA	NA	
Cartridge,Mortar, 4.2",M2/M2A1	HT	Tetryl	M5	NA	NA	NA	NA	

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #25 MINE DEMIL MACHINE (MIN)

12/04/

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	N×TM	MTTR	AVAILABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	NA	NA	NA	NA	NA
Tank,Spray, TMU-28/B	VX	None	None	NA	NA	NA	NA	NA
Ton Container	GB	None	None	NA	NA	NA	NA	NA
Tone Container	VX	None	None	NA	NA	NA	NA	NA
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None	NA	NA	NA	NA	NA

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 3

SUPPLEMENTAL DATA

BUILDING BLOCK
#25 [illegible]

12/25/75 [illegible]

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. See [illegible] DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES _____

_____

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER _____ _____

2. NOTES _____

_____

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER _____

2. NOTES _____

_____

D. GENERAL REMARKS

BB # 25 MAIN

DRAWINGS

12/15/75 1/3

25-205-06		30 JUN 74	
25-309-32		13 AUG 72	
	-33	24 JUL 72	
	-34	26 JUL 72	
25-313	-1	1 DEC 72	
	-2	12 DEC 72	
	-3	18 DEC 72	
	-4	2 MAR 73	
	-5	27 FEB 73	
	-6	8 MAR 73	
	-7	NO DATE	
25-31	-2	8 MAR 73	
	-3	18 DEC 72	
	-5	27 FEB 73	
25-405	-4/19	8 FEB 72	
	-6/19	13 MAR 72	
	-9/19	22 MAR 72	
	-11/19	1 JUN 72	
	-17/19	22 JUN 73	
25-406	-1/9	26 NOV 73	REV 1 11 JUN 7
	-2/9	NOV 21-73	
	-3/9	30 OCT 73	
	-4/9	10 OCT 73	
	-5/9	17 OCT 73	
	-6/9	12 NOV 73	
	-9/9	17 AUG 73	REV 3 23 DEC 7
25-407	-1	27 FEB 74	
	-3	18 APR 73	REV 1 15 JUL 7
	-4	30 MAR 73	
	-5	25 DEC 73	
	-6	29 MAY 75	

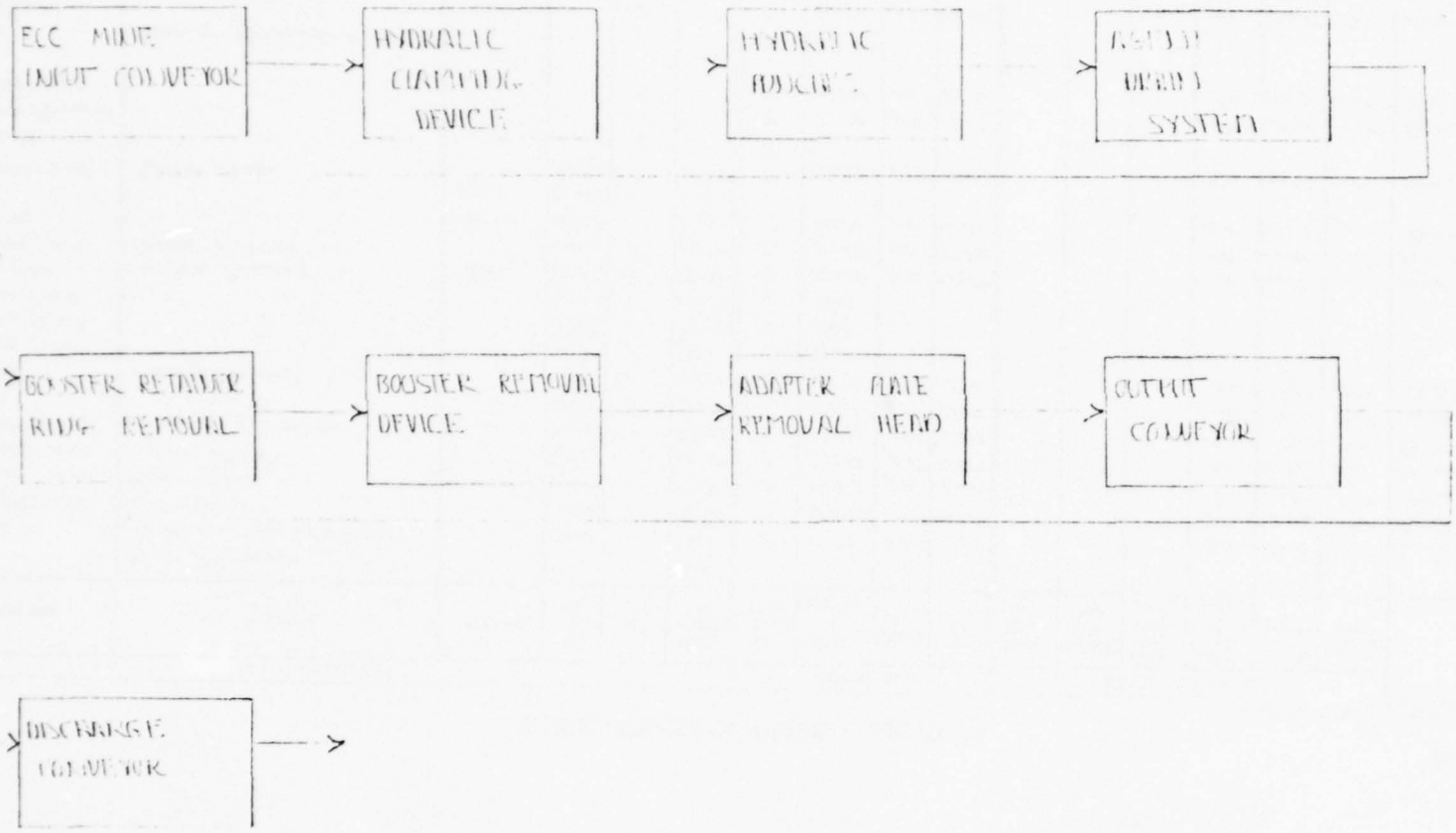
BB*25 MM

Drawings (Continued):

25-407	-7	6 DEC 73			
	-8	11 DEC 73			
	-9	11 DEC 73			
	-10	14 DEC 73			
	-11	19 DEC 73			
	-12	19 DEC 73			
	-13	21 DEC 73			
	-14	29 JAN 74			
	-15	8 JAN 74			
	-16	10 JAN 74			
	-17	11 JAN 74			
	-18	15 JAN 74			
	-19	16 JAN 74			
	-20	21 JAN 74			
	-21	29 MAY 75			
	-22	23 JAN 74			
	-23	24 JAN 74			
	-24	30 JAN 74			
	-25	10 JUL 74			
25-538	-1/3	13 FEB 73	REV 1	30 APR 7	
	-2/3	14 FEB 73	REV 1	30 APR 7	
	-3/3	15 FEB 73	REV 1	30 APR 7	
25-607-02	No DATE				

BUILDING BLOCK: #25 MINE DEMIL MACHINE (MIN)

FLOW CHART



EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #25 MINE DEMIL MACHINE (MIN)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: Nλ TM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
		MINE MACHINE				(309)											
1	SWITCH	CYL POSITION-PUSH OUT BURSTOR		MARCO	1	32-167	2	1.133	P37	1.133				2.6	2.9458	P37	SW SENS GND
2	CYLINDER, HYD	STOP PUSHER		SHEFFER	1	32-155	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
3	CYLINDER, HYD	EJECT MINE		SHEFFER	1	32-156	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
4	CYLINDER, HYD	CLAMP MINE		SHEFFER	1	32-157	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
5	CYLINDER, HYD	PUSH OUT BURSTOR		SHEFFER	1	32-158	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
6	SWITCH			MARCO	1	32-162	2	1.133	P37	1.133				2.6	2.9458	P37	SW SENS GND
7	SWITCH	MINE CLAMPED		MARCO	1	32-164	2	1.133	P37	1.133				2.6	2.9458	P37	SW SENS GND
8	SPRING COMP			LEE SP	1	33-11	2	NEG									
9	SPRING COMP			LEE SP	1	33-13	2	NEG									
10	RING COMP			LEE SP	1	33-54	2	NEG									
11	CYL, HYD	UNSCREW BURSTER	OSC	CHARLES	1	33-98	2	12.058	P30	12.058				5.0	60.29	P30	PUMP, CONTROL GND
12	CYL INDEX, HYD	ENGAGE BURSTER		SHEFFER	1	33-99	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
13	BUSHING		51620-16	BOSTON	1	33-151	2	2.059	P16	2.059				2.0	4.118	P16	BEARING, GEN GND
14	SEAL		9835	CHICAGO	4	33-153	3										
15	CYLINDER HYD	BOTTOM PUSH		SHEFFER	1	34-154	2	15.228	P15	15.228				4.0	60.912	P15	ACT LIN HYD GND
16	PUSHERS				2		3										
17	SWITCHES PROXIMITY				5		2	3.925	P40	19.624				2.0	39.25	P40	TRANSDUCERS, MATRIX, GND
18	CYLINDER HYD				7		2	15.228	P15	106.596				4.0	426.384	P15	ACT LIN HYD GND
19																	
20	COLLET	REMOVE RETAINER RING			1		3										
21	VAC PUMP				2		2	25.641	P31	51.282				4.0	102.564	EST	PUMP VAC GND
22	TANK	SURGE & SEPERATOR			2		2	1.611	P57	3.222				14.0	45.108	P57	TANK PROPELLANT GND
23	PUMP, H.A	AGENT BURN			1		2	12.058	P30	24.083				5.0	60.29	P30	PUMP, CONT GND
24	VALVES, SOL				6		2	1.276	P42	7.656				7.3	24.269	P42	VAL, FUEL SOL GND
25	SWITCH, PRESSURE				2		2	2.037	P36	4.09				2.0	8.28	P36	SW PRESS, AGEN GND
26	SWITCH LEVEL				1		2	11.905	P25	11.905				2.0	23.81	P25	INSTR CONTROL

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = 31.53 \times 10^{-6}$/HR
$\Delta 2N\lambda = 29.2350 \times 10^{-6}$

$\Sigma N\lambda TM = 63.66 \times 10^{-6}$
$\Delta \Sigma N\lambda TM: 1165.582 \times 10^{-6}$

MTBF = $\frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

SHEET 2 OF 5

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #25 MINE DEMIL MACHINE (MIN)

ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10^{-6} HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10^{-6})	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
SEAL, BOTH ENDS	SEAL MING AT ANCH POINTS			2		3										
SEAL	SEAL PUNCH			2		3										
PUMP, D.A	ACCUM			1		2	12.058	μ31	12.058				5.0	60.29	μ30	PUMP CONTR GND
SEAL ΔP	SUBSTR REMOVAL			2		3										
VALVE HYD PRESS REG	ΔP SYSTEM			1		2	8.416	μ43	8.416				1.0	25.248	μ45	VAL HYD PRESS REG GND
VALVE PRESS SOL	ΔP SYSTEM			1		2	102.56	μ45	102.56				3.3	338.448	μ45	VALPRES, SOL GND ~X10

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ΔΣNλ = 123.034 x 10^{-6}/HR ΔΣNλTM = 427.92 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\quad}{\quad} = \quad$ HRS

$AVAILABILITY = \frac{1}{\therefore MTTR} \times 100\% = \quad \%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #25 MINI DEMIL MACHINE (MIN)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ Δ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6}) Δ	SOURCE (*)	REMARKS
	MINE INPUT CONVEYOR				(705)											
CASTER Δ		106-5	Industrial	4	6-89	3										
BUSHING, CYLIN Δ		B 3137-16	SUTON	1	3-72	2	2.059	pIC	2.059				2.0	4.118	pIC	BEARING GEN GND
BEARING Δ		EW	AMERICAN	1	8-93	2	2.059	pIC	2.059				2.0	4.118	pIC	BEARING GEN GND
VALVE W FLOW CONTROL Δ	DECELERATION	DF 60-10-5	PARKER	2	11-144	2	8.416	p43	16.832				3.0	50.496	p43	1/10 SOL REC GND
ADAPTER Δ		MB 32	PARKER	1	11-146	2	NEG									
CABLE Δ		SJO 3C/18		1	11-147	2	NEG									
SWITCH Δ			MICRO	1	11-148	2	1.133	p37	1.133				2.6	29.458	p37	SW SENS GND
CONNECTOR Δ		CGE 197	COLLINS	1	11-149	2	.460	p20	.460				2.0	.92	EST	CONN CIR GND
SWITCH Δ			MICRO	1	11-150	2	1.133	p37	1.133				2.6	29.458	p37	SW SENS GND
24 VDC CABLE Δ			SUPPLY	1	1701	2	22.842	p15	22.842				4.0	91.368	p15	HOT LN HYD GND X 1% FOR CABLE RUN
TM Δ	MINE OFF		MICRO	1	1702	2	1.133	p37	1.133				2.6	29.458	p37	SW SENS GND
SWITCH Δ			MICRO	1	1703	2	1.133	p37	1.133				2.6	29.458	p37	SW SENS GND
PLAIN, PILLOW, BALL BEARING Δ		PB 204	SEALMASTER	2	1705	2	2.059	pIC	4.118				2.0	8.236	pIC	BEARING GEN GND
CASTER Δ		HSTH-TA27	CASTER	2	1707	3										

Δ ΣNλ = 52.902 x 10^{-6}/HR Δ ΣNλTM = 171.0392 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = ____ HRS \qquad MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = ____ = ____ HRS$$

$$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = ____ \%$$

SHEET 4 OF 5

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #25 MINE DEMIL MACHINE (MIK)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ X10^{-6}/HR	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
	INSIDE CONVEYOR				(406)											
ROLLER W/ BEARINGS		C737-15	01508	2	0104	2	2.059/RR	p16	8.236				2.0	16.472	p16	BEARINGS GEN GND
END ROLLER ASSM'Y		C770-15	01509	2	0105	2	2.09/SEAL/BR	p16	24.708				2.0	49.416	p16	BEARINGS GEN GND
MOTOR 1/2 HP				1	0106	2	7.552	p27	7.552				2.0	15.104	p27	MOTOR FRACT HP GND ATKS
GEAR ASSM'Y, GEAR		C701-15-1/2-72	01509	1	0107	2	11.726	p27	11.726				6.0	70.356	p27	GEAR SPUR TOOTH GENERAL GND ATKS
ROLLER BALL BUSHINGS		PB12 ADJ	THOMSON	4	0202	2	.944	p16	7.552				8.0	30.272	p16	BEARING BALL GND
SHAFT SUPPORTS BALL BEARINGS		SB12	THOMSON	4	0203	2	.944/BR	p16	7.552				8.0	60.544	p16	BEARING BALL GND
BALL TRANSFERS		101	MANROSS	4	0204	2	.946	p16	7.784				8.0	30.272	p16	BEARING BALL GND
CYLINDER HYD ▲			MISSILE	1	0206	2	15.223	p15	15.223				4.0	60.912	p15	ACTUN HYD GND
SWITCH ▲	DUMP CHUTE		MICRO	1	0802	2	1.133	p27	1.133				2.6	2.9458	p37	SW SENS GND

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = 69.553 \times 10^{-6}$/HR ✓
▲ $\Sigma N2 = 16.361 \times 10^{-6}$ ✓

$\Sigma N\lambda TM = 272.456 \times 10^{-6}$ ✓
▲ $\Sigma N\lambda TM = 63.8578 \times 10^{-6}$ ✓

MTBF = $\frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad = \quad$ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = \quad$ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #25 MINE DEMIL MACHINE (MIN)

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ. (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ Δ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶) Δ	SOURCE (*)	REMARKS
10		DISCHARGE CONVEYOR				(4.7)											
1	CONVEYOR BELT, SECTION	Δ	C643	MATHEWS	1	0301	2	NOS									
2	END ROLLER ASSEMBLY	Δ	C770	MATHEWS	1	0302	2	2.059/HR	P16	12.354				2.0	24.708	P16	BEARINGS, GEN GND
3	CONVEYOR DRIVE	Δ	C710	MATHEWS	1	0303											
11	MOTOR ELEC	Δ			1		2	7.552	P28	7.552				2.0	15.104	P28	MOTOR ELEC ASSY 40 CONT/60 INT
12	DRIVE MECH	Δ			1		2	11.72	P27	11.72				6.0	70.320	P27	MECH DRIVE TRANS GEAR SET, GEAR ASS
4	IDLER ASSEMBLY	Δ	C737-1181	MATHEWS	1	0304	2	NOS									
5	BELT, CONVEYOR	Δ		MATHEWS	1	0308	2	NOS									
6	BUSHING	Δ DISCHARGE GATE	G56-8-7	MATSON	1	0306	2	2.059	P16	2.059				2.0	4.118	P16	BEARING GEN GND
7	SEAL, DIVIDER	SHROUD	35-43-201-5	MATHEWS	197	0510	1										
8	SEAL, MANIFOLD	SHROUD	35-43-201-6	MATHEWS	239	1407	3										
9	4 W BEARINGS	Δ	2CR-276-....	79911	1	2501	2	2.059/HR	P16	4.118				2.0	8.236	P16	BEARING GEN GND
10	2 SPD MOTOR, CASED	Δ		26455	1	2502	2	22.842	P15	22.842				4.0	91.368	P15	MOTOR HYD INDUCTION TYPE FRACTIONAL HP
13	SWITCH	Δ IN POSITION		71828	1	2503	2	1.133	P37	1.133				2.0	29.458	P37	SW SENS GND
17	ACTUATOR, AIR HYD	Δ															
18	ARM FOLLOWER	Δ	DS15-1	27347	1	2504	2	172.14/HR	P15	26.484				4.0	105.936	EST	ACT ASS GEN AIR
14	CAM FOLLOWER	Δ	CF1/2 S	72563	2	2505	2	102.7/HR	P27	31.6127				2.0	63.2254	P27	MECH TRANS CAM AIR
			CF1/2 S	72563	2	2506	2	102.7/HR	P27	31.6127				2.0	63.2246	P27	MECH TRANS CAM AIR
15	SWITCH	Δ OUT POSITION		71828	1		2	1.133	P37	1.133				2.0	29.458	P37	SW SENS GND
16	CYLINDER HYD	Δ DUMP SEGMENTS			2	DRAFT COMP	2	15.228	P15	30.456				4.0	121.824	P15	ACT CYL HYD GND

Δ ΣNλ = 183.004 x 10⁻⁶/HR ✓ Δ ΣNλTM = 573.994 x 10⁻⁶

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

CALCULATIONS SIS # 25 MAIN

1/1

Item Nos	Prod Rate /HR	NITRE ΔENR cm/HR	NITRE ENR X10⁻⁶	NITRE Prod Factor	NITRE ENR X10⁻⁶	MITR ΔENRTM cm/HR	MITR ENRTM X10⁻⁶	MITR Prod Factor	MITR ENRTM X10⁻⁶	MITR Conn Factor	MITR ENRTM X10⁻⁶
1		283.982	31.53			1105.702	63.06				
1		123.034	—			423.996	—				
2		52.902	—			171.052	—				
3		16.361	67.358			63.9578	272.436				
4		183.094	—			573.994	—				
TOTAL	1/0	669.2416	98.888	X4	2775.9544	2338.5022	335.496	X4	7687.9264	X3x1⅓	38759.304

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BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: NO. 26 PIPING (PIP)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAI ABIL
*M55 ROCKET, GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	50.775	19,695	149.496	2.94	0.99
Rocket, 115mm, M55	VX	Comp B	M28	50.775	19,695	149.496	2.94	0.99
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None	50.775	19,695	149.496	2.94	0.99
Projectile, 155mm, M121A1	GB	None	None	50.775	19,695	149.496	2.94	0.99
Projectile, 155mm, M121	GB	None	None	50.775	19,695	149.496	2.94	0.99
Projectile, 155mm, M122	GB	None	None	50.775	19,695	149.496	2.94	0.99
Projectile, 8", M426	GB	None	None	50.775	19,695	149.496	2.94	0.99
Projectile, 155mm, M121A1	VX	None	None	50.775	19,695	149.496	2.94	0.99
*P/C, GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1	50.775	19,695	149.496	2.94	0.99
*PROJECTILES, MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None	23.908	41,827	64.232	2.69	0.99
Projectile, 155mm, M104	HD	Tetrytol	None	23.908	41,827	64.232	2.69	0.99
*M23 MINE, VX								
Mine, 2 gallon, M23	VX	Comp B	None	50.775	19,695	149.496	2.94	0.99
*4.2" MORTAR, MUSTARD								
Cartridge, Mortar, 4.2", M2/M2A1	HD	Tetryl	M6	23.908	41,827	64.232	2.69	0.99
Cartridge, Mortar, 4.2", M2/M2A1	HT	Tetryl	M6	23.908	41,827	64.232	2.69	0.99

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: NO. 26 PIPING (PIP)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABILITY
*BULK ITEMS, GB/VX								
Bomb, 750#, MC-1	GB	None	None	26.891	37,187	87.644	3.26	0.9
Tank, Spray, TMU-28/B	VX	None	None	26.891	37,187	87.644	3.26	0.9
Ton Container	GB	None	None	26.891	37,187	87.644	3.26	0.9
Ton Container	VX	None	None	26.891	37,187	87.644	3.26	0.9
*TON CONTAINER, MUSTARD								
Ton Container	HD	None	None	9.577	104,412	27.121	2.83	0.9

SHEET 1 OF 1

SUPPLEMENTAL DATA

BUILDING BLOCK
#26 PIPING (P)

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. REFERENCE ATTACHED LIST DATE: _____

b. DOCUMENT NO. - DATE: _____

c. OTHER DRAFT DEMIL PLAN FOR CAMDS VOLUMES 1 AND 2 DATE: AUGUST 1975

d. DISCUSSIONS WITH TEAD (CAPT. J. KING) 21, 22 OCTOBER 1975

2. NOTES _____

B. FAILURE DATA

1. SOURCE

a. CUSTOMER - _____ _____

b. OTHER RADC-TR-74-268, FINAL REPORT, OCTOBER 1974, "REVIS V < RADC NONELECTRONIC RELIABILITY NOTEBOOK" (RADC-TR-67-458,

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM THE TWO PRIME SOUR

(1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERATIONAL/TEST

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA REFERENCE NOTE

b. TEAD/EA REFERENCE NOTE

c. OTHER RADC-TDR-64-373, VOL II FINAL REPORT, DECEMBER 1964, "ANALYSIS OF MAINTENANCE TASK TIME DATA"

2. NOTES USEABLE DATA NOT YET AVAILABLE FROM THE TWO PRIME SOURCES: (1) CAMDS TESTING (2) ROCKY MOUNTAIN ARSENAL OPERAT -AL/TEST DATA.

D. GENERAL REMARKS

FIRST SUBMITTAL DATE: 12-29-75

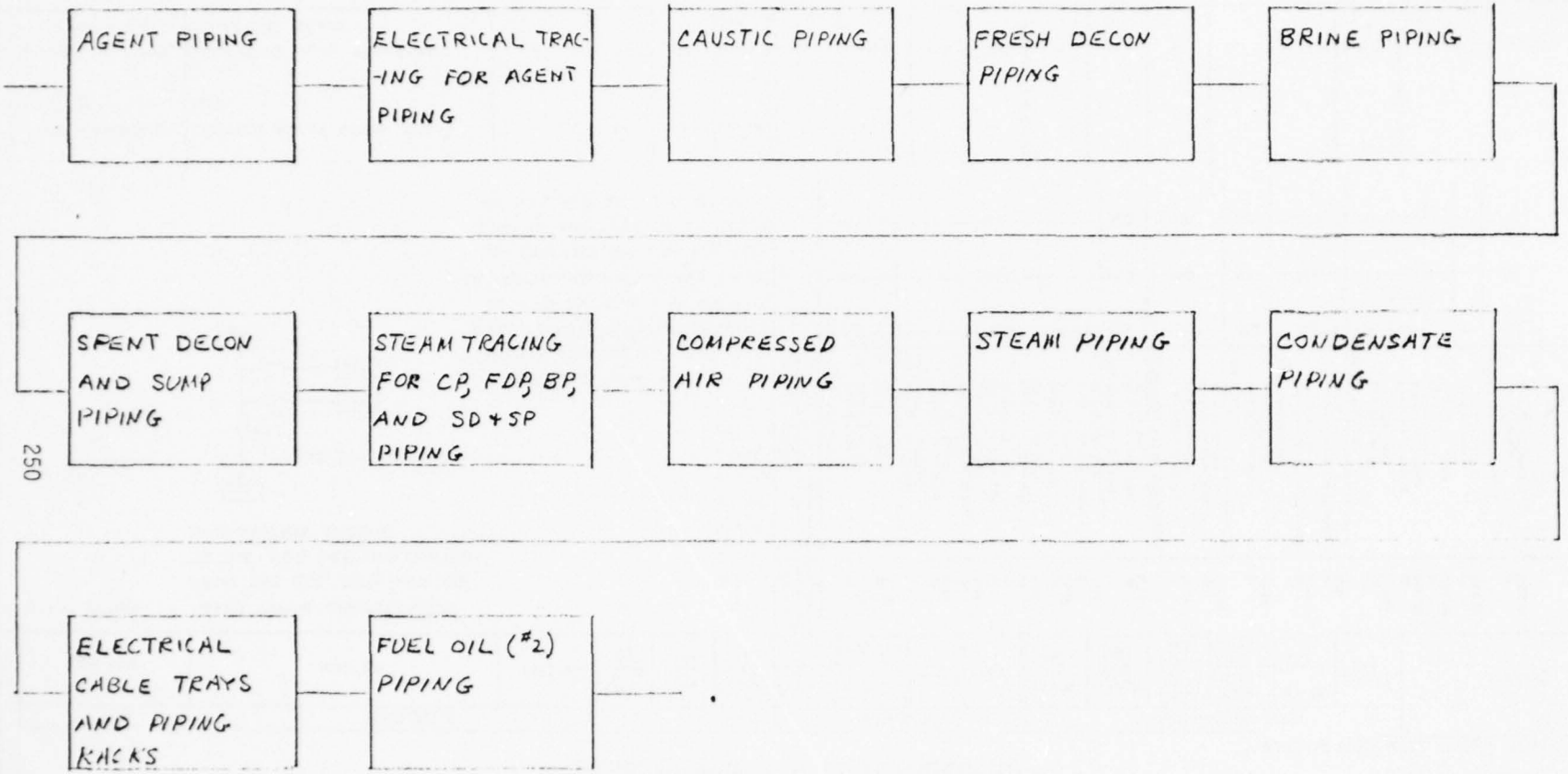
BB#26 PIPING (PIP) REFERENCE DRAWING LIST

DRAWING NO.	REV.	SHEET	TITLE
TCDS 26-601-01	6/3/75	1	Mechanical Flow Diagram, Chemical Agent Piping
26-601-02	6/3/75	1	Mechanical Flow Diagram, Fresh Decon & Dilute Caustic Piping
26-601-03	6/3/75	1	Mechanical Flow Diagram, Spent Decon, Drains and Sump Piping
26-601-04	6/5/75	1	Mechanical Flow Diagram, Steam, Condensate, and Air Piping
26-603-01	6/24/75	1	Chemical Agent Munition Disposal System, Rack Piping Sht #1,Plan
26-603-02	6/23/75	1	Chemical Agent Munition Disposal System, Rack Piping Sht #2,Plan
26-603-03	6/27/75	1	Chemical Agent Munition Disposal System,Rack Piping Sht #3,Plan
26-604-01	6/16/75	1	Piping Section and Detail
26-604-02	7/14/75	1	Piping Section and Detail
26-604-03	8/12/75	1	Piping Section and Detail
26-604-05	8/21/75	1	Pipe Support Details
26-606-01	7/16/75	1	Rack Piping, Isometric - Agent
26-606-02	8/20/75	1	Rack Piping, Agent Shroud Plan and Elevation
26-606-03	9/26/75	1	Agent Valve Shroud, Detail and Section
26-607-01	7/29/75	1	Rack Piping, Isometric - Caustic
26-607-02	7/25/75	1	Rack Piping, Isometric Brine
26-608-01	8/1/75	1	Rack Piping, Isometric Fresh Decon
26-609-01	7/30/75	1	Rack Piping, Isometric Spent Decon and Sump Piping

BB #26 PIPING (PIP) REFERENCE DRAWING LIST (CON'T)

	DRAWING NO.	REV.	SHEET	TITLE
	26-610-01	7/28/75	1	Rack Piping, Isometric Compressed Air
	26-611-01	7/21/75	1 of 2	Rack Piping, Isometric - Steam
	26-611-01	9/15/75	2 of 2	Rack Piping, Isometric - Steam
TCDS	26-611-02	7/23/75	1	Rack Piping, Isometric Condensate
	26-612-01	9/8/75	1	Underground Piping, Isometric #2 Fuel Oil
	26-614-01	9/17/75	1	Chemical Agent Munition Disposal System, Electrical Tracing-Isometric Agent
	26-614-02	9/14/75	1 of 4	Steam Tracing, Isometric Brine
	26-614-02	7/30/75	2 of 4	Steam Tracing, Isometric Spent Decon & Sump Piping
	26-614-02	8/1/75	3 of 4	Steam Tracing, Isometric Fresh Decon
	26-614-02	10/2/75	4 of 4	Steam Tracing Parts List
	26-616-01	8/12/75	1	Chemical Agent Munition Disposal System, Electrical Cable Tray Plan
	26-616-02	8/24/75	1	Chemical Agent Munition Disposal System, Electrical Cable Tray Details

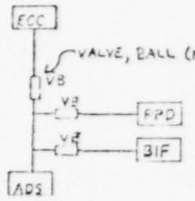
BUILDING BLOCK NO. 26 PIPING (PIP) FLOW CHART



EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 25 PIPING (PIP)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
AGENT PIPING	AGENT PIPING CARRIES AGENT FROM THE ECC, PPD, AND BIF TO THE ADS PER THE SKETCH AND MATRIX SHOWN.	–	–	1	601-01 603 604 606-01, 02, 03 614-01 616-01, 02	AGENT										



SEGMENT OF AGENT PIPING SYSTEM USED VS MUNITIONS

| | MUNITIONS | | | | | | | | | |

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 26 PIPING (HP)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
INT PIPING (SEG-NT 1) (CON'T)																
PE (1" SEAMLESS RBON STEEL D BG ASTM A106 B) (INC JOINTS ND WELDS)	CARRIES AGENT	—	—	AS REQ (≈30 WELD JOINTS)	(606-01) 0102, 0103	2	0.0017	P20	0.0510	—	—	—	4.0	0.204	ECT	A=AWELDS X PIPE FLEX REPAIR ECT; WELDS ARE INCLUDED IN CHARGED λ CLEARANCE LOCATIONS ARE TO BE DIFFERENT AS SHOWN AND NOT TO EXTEND ON MAINT TIME ALLOWED
ALL VALVE	VALVE OPEN DURING ECC/AGENT OPERATIONS - VALVE MUST NOT LEAK EXTERNALLY	VBW-01SA (CAMDS TAG)	98991	1	606-01 0108	2	0.022	P41	0.022	—	—	—	6.6	0.145	P19, P20 (117, 118, 228, 229, 234, 235)	PH λ = 0.212. THE AP... FAILURE MODE (EXTERNAL LEAKAGE AT THE BELL) IS ONE OF THE COMMON MODES LIKELY. THEREFORE λ = 2/13 * 0.022 WELDING AND SEALANT SPRING = 3 SHELL/INC. THE VALVES ARE WELDED INTO THE LINE AND ARE ENCL. IN A VALVE CHARGED. THEN FLEX JOINT REPAIR TIME = 3.3 x 2 = 6.6
SMALL VALVES	VALVES CLOSED DURING ECC/AGENT OPERATIONS - VALVES MUST NOT ALLOW INTERNAL OR EXTERNAL LEAKAGE	VBW-01SA (CAMDS TAG)	98991	2	606-01 0108	2 (EXT. LEAKAGE) 1 (INT. LEAKAGE)	0.022	P41	0.044	—	—	—	6.6	0.290	P19, P20 (117, 118, 228, 229, 234, 235)	PER ENTRY 1.1.3 INTERNAL LEAKAGE NOT

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

ALLOW AGENT INTO PIPE SEGMENTS 2 AND/OR 3 AS IT WOULD BE CONTAINED BY THE PIPING AND VALVES ON THE PPD AND BIF SIDES OF THE PIPING/BIF INTERFACES.

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EQUIPMENT INFORMATION AND [illegible]RE/MAINTAINABILITY DATA

BUILDING BLOCK 10.2[illegible] FI[illegible] CELL ____

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ ($\times 10^{-6}$/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM ($\times 10^{-6}$)	SOURCE (*)	
NT PIPING (SEG-T 1) (CON'T)																
MIT SWITCHES	INDICATE VALVE POSITION	—	—	3	606-01 0110	3	—	—	—	—	—	—	—	—	—	UNEXPECTED VALVE POSITION INDICATION OR LOSS OF SIGNAL INDICATION OF VALVE INDICATING TRUE POSITION, MAY CAUSE SHUTDOWN.
AGENT PIPING SHROUD (INC PIPE (SHROUD), VALVE SHROUD (WITH STEM PACKING), CONNECTING HARDWARE, AND ENDLINE PLUGS.	ENCLOSE AGENT PIPING AND VALVES IN A NO LEAKAGE SHROUD. ALSO, TO ALLOW AN ENCLOSED MEDIA TO SAMPLE THE ENVIRONMENT IMMEDIATELY ADJACENT TO THE AGENT PIPING TO DETECT ANY LEAKAGE IN THE PIPING. +NEGATIVE AIR PRESSURE	—	—	—	606-02 0201 TO 0205 606-03	3	~	~	~	—	—	—	—	—	—	SHOULD BE REPAIRED DURING SCHEDULED MAINTENANCE OR SHUTDOWN FOR OTHER UNSCHEDULE MAINTENANCE.
ELECTRICAL TRACING (INC CONDUCTOR, THERMOSTATS, SIGNAL LIGHTS, CONNECTORS AND INSULATION [illegible])	HEAT SOURCE FOR PIPE/IMMEDIATE ENVIRONMENT TO PREVENT THE AGENT FROM FREEZING.	—	53345, 34764	4 (THERMOSTATS, SIGNAL LIGHTS, ETC)	614-01 0101 TO 0107	3	~	—	—	—	—	—	—	—	—	REPAIRS COULD BE MADE WHILE DENIL OPERATION CONTINUED.

$\Sigma N\lambda$ = ____ $\times 10^{-6}$/HR $\Sigma N\lambda TM$ = ____ $\times 10^{-6}$

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO 3A PIPING (1)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
AGENT PIPING (SEGMENT 1) (CONT)																
PIPE HANGER ASSEMBLIES	HOLD AGENT PIPING AND SHROUD	—	—	AS REQ	606-02 0206	3	NEG	—	—	—	—	—	—	—	—	MULTIPLE FAILURES WOULD BE REQUIRED TO CHANGE FAILURE CODES TO A 2.
ELECTRICAL CABLE CLAMP	HOLD ELECT. CABLES	—	—	AS REQ	616-01 0101 TO 0216	3	NEG	—	—	—	—	—	—	—	—	PER ABOVE
PIPE RACK	HOLD PIPING	—	—	AS REQ	603-01 -03 604-01 -04	3	NEG	—	—	—	—	—	—	—	—	PER ABOVE
AGENT PIPING (SEGMENT 2)	CARRIES AGENT FROM PPD TO ADS.	—	—	1	601-01											ALL 1.2.X SUBENTRIES ARE IDENTICAL OR DIRECTLY EQUILIVANT TO THE 1.1.X SUBENTRIES.
AGENT PIPING (SEGMENT 3)	CARRIES AGENT FROM BIF TO ADS.	—	—	1	601-01											ALL 1.3.X SUBENTRIES ARE IDENTICAL OR DIRECTLY EQUILIVANT TO THE 1.1.X SUBENTRIES.

SUBCALCULATION FOR AGENT PIPING (SEGMENTS 1, 2, OR 3). MUNITION APPLICABILITY PER ENTRY 2.6-1.0.

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100%

SEE SHEET NO. 18 FOR FINAL CALCULATIONS.

	$N\lambda_E$	+ $N\lambda_{EA}$	= $\Sigma N\lambda$	$\frac{1}{\Sigma N\lambda}$ = MTBF
COND A	2.983	N/A	2.983	335233
COND 1	2.983	N/A	2.983	335233
COND 2	2.983	N/A	2.983	335233
COND 3	2.983	N/A	2.983	335232
COND 4	2.983	N/A	2.983	335233

	$N\lambda_E TM$	+ $N\lambda_{EA} TM$	= $\Sigma N\lambda TM$	COND E S	$\Sigma N\lambda TM_{EC}$	MTTR $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$
COND A	7.804	N/A	7.804	3 N/A	23.412	7.8 [illegible]
COND 1	7.804	N/A	7.804	3 N/A	23.412	7.8 [illegible]
COND 2	7.804	N/A	7.804	3 N/A	23.412	7.8 [illegible]
COND 3	7.804	N/A	7.804	3 N/A	23.412	7.8 [illegible]
COND 4	7.804	N/A	7.804	3 N/A	23.412	7.8 [illegible]

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO 26 PIPING (GB) ____

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
HEAD OBCON, DRUM MIXING, SPENT ACID, DRAINS, AND VENT PIPING.	THIS PIPING CARRIES ALL LIQUID (EXCEPT AGENT, STEAM, CONDENSATE, AIR, WATER, AND FUEL OIL) BETWEEN THE BUILDING BLOCKS DURING DEMIL OPERATIONS.	-	-	1	601-02 601-03 603 604 607-01, 02 608-01 609-01 614-02											

NOTES OF ANALYSIS:

1. INFORMATION OF THE PIPING SEGMENTS FOR THESE PIPING SUBSYSTEMS AND THE EIGHT PROCESS FLOW DIAGRAMS INDICATES THAT SUFFICIENT INFORMATION IS NOT YET AVAILABLE TO CONSTRUCT A PIPING SEGMENT UTILIZATION VS MUNITION LINE MATRIX AS WAS DONE FOR THE AGENT PIPING. THUS A MUNITION LINE SENSITIVE RELIABILITY/MAINTAINABILITY/AVAILABILITY ANALYSIS CANNOT BE ACCOMPLISHED. HOWEVER, USING CERTAIN CONSERVATIVE ASSUMPTIONS, A GENERAL MUNITION LINE AVAILABILITY VALUE CAN BE OBTAINED THAT WILL ESTABLISH A REALISTIC LOWER LIMIT AVAILABILITY. THE ASSUMPTIONS (ALL OF THESE ASSUMPTIONS ARE CONSERVATIVE):

(A) OPERATIONS INVOLVING THE FOLLOWING MUNITION PROCESS FLOWS UTILIZE 50% OF THE TOTAL PIPING DISCUSSED UNDER THIS ITEM NUMBER.
- M55 ROCKET, GE/VX
- PROJECTILES/CARTRIDGES, GE/VX WITHOUT BURSTERS
- PROJECTILES/CARTRIDGES, GE/VX WITH BURSTERS
- M23 MINE, VX

(B) OPERATIONS INVOLVING THE FOLLOWING MUNITION PROCESS FLOWS UTILIZE 25% OF THE TOTAL PIPING DISCUSSED UNDER THIS ITEM NUMBER.
- PROJECTILES, MUSTARD WITH BURSTERS
- 4.2" MORTAR, MUSTARD
- E/R ITEMS, GE/VX

(C) OPERATIONS INVOLVING THE FOLLOWING MUNITION PROCESS FLOWS UTILIZE 10% OF THE TOTAL PIPING DISCUSSED UNDER THIS ITEM NUMBER.
- TEA CONTAINER, MUSTARD

(D) IN ALL BUT OBVIOUS INSTANCES, A FAILURE CONSEQUENCE OF 2 RATHER THAN 3 IS ASSUMED.

2. A GIVEN COMPONENTS TOTAL FAILURE RATE IS ASSUMED FOR ALL FAILURE CONSEQUENCES OF 2.

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} =$ ____ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} =$ ____ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% =$ ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 26 PIPING (FLIP)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ ($\times 10^{-6}$/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM ($\times 10^{-6}$)	SOURCE (*)	REMARKS
CAUSTIC PIPING	THIS PIPING CARRIES ALL CAUSTIC BETWEEN THE BUILDING BLOCKS DURING DEFIL OPERATIONS.	—	—	1	607-01											
GASKET (INC FLANGE, BOLTS, AND NUTS)	PIPING/BB, PIPING/VALVE, AND PIPING END FLANGE INTERFACES	—	—	12	0115, 0116, 0124	2	1.433	P22	17.196	—	—	—	2.5	42.990	P149, 174, 189, 247, 234	REMOVE AND REPLACE: 72 MIN/BOLTING 32 MIN/NUT
PIPE (INC JOINTS AND WELDS)	CARRIES CAUSTIC	—	—	42 EQ (=42 WELD JOINTS)	0101-0105	2	0.0017	P30	0.071	—	—	—	2.0	0.1428	EST	MIN TM EST; MAX TM = 4.0
VALVES	FLOW CONTROL	VBF-015C (CAMDS TAG)	—	3	0118, 0119	2	0.215	P41	0.430	—	—	—	3.3	1.419	P156, 165, 173, 198, 228, 241, 254, 255	REMOVE AND REPLACE: 72 MIN/BOLTING 33 MIN/VALVE

$\Sigma N\lambda$ = ____ $\times 10^{-6}$/HR $\Sigma N\lambda TM$ = ____ $\times 10^{-6}$

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = $\frac{\quad}{\quad}$ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\%$ = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO 2.6 PIPING (FIB)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
FRESH DECON PIPING	THIS PIPING CARRIES ALL FRESH DECON BETWEEN THE BUILDING BLOCKS DURING ZONAL OPERATIONS	—	—	1	C03-01											
GASKET (INC FLANGE, BOLTS, AND NUTS)	PIPING/PIPING INTERFACE	—	96717	1	0118	2	1.433	P22	1.433	—	—	—	2.5	3.582	P44, 170, 178, 2.2, 34	REMOVE AND REPLACE: 72 HR / 27 INC = 2.5 HR/IN.
PIPE (INC JOINTS)	CARRIES FRESH DECON	—	—	AS REQ (≈100 JOINTS)	0101-0114	2	0.0170	EST	0.170	—	—	—	2.0	0.340	EST	ASSUMPTION: EST = 10 X WELD JOINT MIN TIME EST: MIN TM = 2 HRS
PLUG VALVES	FLOW CONTROL	VPF-015V (CAMDS TAG)	96717	4	0115	2	0.215	P41	0.860	—	—	—	3.3	2.838	P50, 162, 167, 178, 228, 241, 254, 255	REMOVE AND REPLACE: 95.5 HRS/29 INC = 3.3 HRS/IN.

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$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = $\frac{\quad}{\quad}$ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND ~~TIM~~ /MAINTAINABILITY DATA

BUILDING BLOCK NO. 26 BRINE FEED

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ. (**)	RATE λ ($\times 10^{-6}$/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM ($\times 10^{-6}$)	SOURCE (*)	
BRINE PIPING	THIS PIPING CARRIES ALL BRINE BETWEEN THE BUILDING BLOCKS DURING DENIL OPERATIONS	—	—	1	607-02											
(WELD, FLANGE BOLTS, AND NUTS)	PIPING/BB AND PIPING/VALVE INTERFACE	—	—	8	0214, 0215	2	1.433	P22	11.464	—	—	—	2.5	28.660	P169, 176, (86, 247, 254	REMOVE AND REPLACE: 92 MIN/37 INC = 2.5 MIN/INCH
PIPE (PIPE JOINTS AND WELDS)	CARRIES BRINE	—	—	AS REQ (≈30 WELD JOINTS)	0201-0207	2	0.0017	P20	0.051	—	—	—	2.0	0.102	EST	2 MAN TM EST: 1 MAN TIME/HR
DIAPHRAGM VALVES	FLOW CONTROL	VDF-0156 (CAMOS TAG)	—	3	0216, 0217	2	0.215	P41	0.430	—	—	—	3.3	1.419	P158, 163, 177, 178, 228, 241, 254, 259	REMOVE AND REPLACE: 35.5 MIN/29 INCH = 1.3 MIN/IN

$\Sigma N\lambda$ = ____ $\times 10^{-6}$/HR $\Sigma N\lambda TM$ = ____ $\times 10^{-6}$

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\%$ = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 24 PIPING (PIPE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
HOT DECON AND P PIPING	THIS PIPING CARRIES ALL SPENT DECON BETWEEN THE BUILDING BLOCKS DURING DEMIL OPERATIONS.	-	-	1	009-01											
ADAPT (INC FLANGE ..., AND PARTS)	PIPING/PIPING INTERFACE	-	06717	1	0110, 0117, 0118	2	1.433	P22	1.433	-	-	-	2.5	3.582	P19, P6, P8, P47, 284	REMOVE AND REPLACE: P2 MH/PIPING + 0.5 MH/INC
PE (INC JOINTS)	CARRIES SPENT DECON	-	-	NS REQ (2115 JOINTS)	0101 - 0109, 0111, 0112	2	0.0170	EST	1.955	-	-	-	2.0	3.910	EST	λ EST = 10X WELD JOINT MAN TM EST: MIN TAKE 2 HRS
INCH VALVE	FLOW CONTROL	-	-	9	0113, 0114	2	0.215	P41	1.935	-	-	-	3.3	6.385	P18, P6, P41, P19, P38, 241, 284, 285	REMOVE AND REPLACE: P3.3 MH/VLV + P3.3 MH/VLV

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK A0.26 PIPING (CLP)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ ($\times 10^{-6}$/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM ($\times 10^{-6}$)	SOURCE (*)	
STEAM TRACING FOR FRESH DECON, DRAINS, AND SPENT DECON & SUMP PIPING (INCLUDES: GATE VALVES (HP), REGULATORS (3), PRESSURE GAGES (3), GLOBE VALVES (3), STEAM TRAPS, UNIONS, TEES, TUBING, ELBOWS, AND ALL OTHER NECESSARY AUXILLARY HARDWARE)	HEAT SOURCE FOR PIPE/IMMEDIATE ENVIRONMENT TO PREVENT FRESH DECON, BRINE, AND SPENT DECON & SUMP MATERIALS FROM FREEZING.	–	–	1	614-07 SHEETS 1-4	3	–	–	–	–	–	–	–	–	–	THE FAILURE CAN BE ISOLATED AND REPAIRED MADE WHILE DEMO OPERATIONS CONTINUE.

SUBCALCULATION FOR FRESH DECON, DILUTE CAUSTIC, SPENT DECON, DRAINS, AND SUMP PIPING:

$N\lambda_{EA} = 0$

$N\lambda_C = \Sigma N\lambda = 37.4284$

$N\lambda_{EA}TM = 0$

$N\lambda_C TM = \Sigma N\lambda TM = \Sigma N\lambda TM_{BC} = 95.3713$

COND 1, 2, 3, 4 = N/A

COND B, C = N/A

$\Sigma N\lambda$ = ____ $\times 10^{-6}$/HR

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

$\Sigma N\lambda TM$ = ____ $\times 10^{-6}$

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\%$ = ____ %

SEE SHEET NO. 18 FOR FINAL CALCULATIONS

4 CYCLE ITEM

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 26 PIPING (PIP)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
STEAM, CONDENSATE, AND AIR PIPING	THIS PIPING CARRIES ALL STEAM (EXCEPT TRACING STEAM), CONDENSATE, AND AIR BETWEEN THE BUILDING BLOCKS DURING DEMIL OPERATIONS.	-	-	1	601-04 603 604 610-01 611-01 611-02											

BASIS OF ANALYSIS:
EXAMINATION OF THE PIPING SEGMENTS FOR THESE PIPING SUBSYSTEMS AND THE EIGHT PROCESS FLOW DIAGRAMS INDICATES THAT SUFFICIENT INFORMATION IS NOT YET AVAILABLE TO CONSTRUCT A PIPING SEGMENT UTILIZATION VS MUNITION LINE MATRIX AS WAS DONE FOR THE ASSET BUILDING. THUS, A MUNITION LINE SENSITIVE RELIABILITY/MAINTAINABILITY/AVAILABILITY ANALYSIS CANNOT BE ACCOMPLISHED. HOWEVER, USING CERTAIN CONSERVATIVE ASSUMPTIONS, A GENERAL MUNITION LINE AVAILABILITY VALUE CAN BE OBTAINED THAT WILL ESTABLISH A REALISTIC LOWER LIMIT AVAILABILITY.

ASSUMPTIONS (ALL OF THESE ASSUMPTIONS ARE CONSERVATIVE):
(1) OPERATIONS INVOLVING THE FOLLOWING MUNITION PROCESS FLOWS UTILIZE 50% OF THE TOTAL PIPING DISCUSSED UNDER THIS ITEM NUMBER:
- M55 ROCKET, GB/VX
- PROJECTILES/CARTRIDGES, GB/VX WITHOUT BURSTERS
- PROJECTILES/CARTRIDGES, GB/VX WITH BURSTERS
- M23 MINE, VX

(2) OPERATIONS INVOLVING THE FOLLOWING MUNITION PROCESS FLOWS UTILIZE 25% OF THE TOTAL PIPING DISCUSSED UNDER THIS ITEM NUMBER.
- PROJECTILES, MUSTARD WITH BURSTERS
- 4.2" MORTAR, MUSTARD
- BULK ITEMS, GB/VX

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK AND FLOW (FIG) ___

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
STEAM, CONDENSATE, AND AIR PIPING (CONT)																

ASSUMPTIONS (CONT)

(3) OPERATIONS INVOLVING THE FOLLOWING MUNITION PROCESS FLOWS UTILIZE 10% OF THE TOTAL PIPING DISCUSSED UNDER THIS ITEM: M[illegible] -TON CONTAINER, MUSTARD

(4) IN ALL BUT OBVIOUS INSTANCES, A FAILURE CONSEQUENCE OF 2 RATHER THAN 3 IS ASSUMED.

(5) A GIVEN COMPONENTS TOTAL FAILURE RATE IS ASSUMED FOR ALL FAILURE CONSEQUENCES OF 2.

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$\Sigma N\lambda = ____ \times 10^{-6}/HR$ $\quad \Sigma N\lambda TM = ____ \times 10^{-6}$

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{____} = ____ HRS$ $\quad MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{____}{____} = ____ HRS$

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = ____ \%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 26 PIPING (PIP)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						REMARKS
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	
COMPRESSED AIR PIPING	THIS PIPING CARRIES ALL COMPRESSED AIR BETWEEN THE BUILDING BLOCKS DURING DEMIL OPERATIONS.	–	–	1	610-01											
GASKET (INC FLANGE BOLTS AND NUTS)	PIPING/BB INTERFACES	–	–	5	0140, 0141, 0142,	2	1.433	P22	7.165	–	–	–	2.5	17.9125	P19, 17, P8, 247, 254	REMOVE AND REPLACE: 12 MAN/ST INCLUDING
PIPE (INC JOINTS OF MECHANICAL FITTINGS OR WELDS)	CARRIES COMPRESSED AIR SUPPLY.	–	–	AS REQ (≈85 MECHANICAL JOINTS, ≈10 WELD JOINTS)	0101-0135	2	0.0017	P20	0.1615	–	–	–	2.0	0.323	EST	λ(MECHANICAL JOINT) ASSUMED = λ(WELD JOINT) REMOVE AND REPLACE: MIN TM EST: MIN TM = 2 HR.
GATE VALVES*	FLOW CONTROL	VGT-015A (CAMDS TAG)	–	8	0143 0144	2	0.215	P41	1.720	–	–	–	3.3	5.6760	P19, 17, 17, 198, 248, 247, 254, 255	REMOVE AND REPLACE: 15.5 MAN/24 HR = 3.3 MAN/HR

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 11 OF 12

BUILDING BLOCK NO. 26 BOILER PLANT

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10^{-6}/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10^{-6})	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
[illegible]	TEAM PIPING	THIS PIPING CARRIES ALL TEAM (EXCEPT TRACING TEAM) BETWEEN THE BUILDING BLOCKS DURING DEAIL OPERATIONS. THIS STEAM IS USED PRIMARILY FOR FACILITY HEATING. HOWEVER, THE AFF REQUIRES STEAM AS A PART OF OPERATION DURING DEAIL PROCESSING.	–	–	1	611-01											
264	GASKET (INC FLANGE BOLTS AND NUTS)	PIPING/EQ, PIPING/VALVE INTERFACES	–	–	20	0162-0163	2	1.433	P22	28.66	–	–	–	2.5	71.650	MIL-HDBK-217, 124, 201, 254	REMOVE AND REPLACE 22 HR/EA INCLUDES
[illegible]	PIPE (INC JOINTS 1-2 WEEKS)	CARRIES STEAM SUPPLY	–	–	AS REQ (2735 WELD JOINTS)	0101-0129	2	0.0017	P20	0.2295	–	–	–	2.0	0.459	[illegible]	MAINTENANCE TEAM REPAIR
[illegible]	GATE VALVES AND GLOBE VALVES	FLOW CONTROL		–	22	0.215	2	0.215	P41	4.730	–	–	–	3.3	15.609	MIL-HDBK-217, 117, 224, 247, 254, 282	REMOVE AND REPLACE 2.5 MH/EA INCLUDES

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 15 OF 21

BUILDING BLOCK NO. 26 PIPING (B.P.)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
[illegible]	CONDENSATE PIPING	THIS PIPING CARRIES ALL CONDENSATE BETWEEN BUILDING BLOCKS DURING DEMIL OPERATIONS (MEDIUM PRESSURE CONDENSATE FROM ADS TO THE UTILITY BUILDING, LOW PRESSURE CONDENSATE FROM ALL B/B EXCEPT ADS TO THE UTILITY BUILDING.	–	–	1	0211-0232											
3321	GASKET (INC FLANGE GASKET, AND NUT)	PIPING/EQ INTERFACE JOINTS	–	–	9	0230-0232	2	1.433	P22	12.897	–	–	–	2.5	32245	[illegible]	REMOVE AND [illegible]
3322	PIPE (INC JOINTS WITH MECHANICAL FITTINGS OR VALVES)	CARRIES CONDENSATE TO UTILITY BUILDING	–	–	AS REQ (FOR MECHANICAL JOINTS. 2 WELD JOINTS)	0201-0228	2	0.0017	P20	0.1802	–	–	–	2.0	0.0204	E27	λ (MECHA[illegible] ASSUMED = λ (WELD) REMOVE AND [illegible]
3323	GATE VALVES	FLOW CONTROL	VGS-060B (CAMPS TAG)	–	11	0233-0234	2	0.215	P41	2.365	–	–	–	3.3	7.8045	[illegible]	REMOVE AND [illegible]

SUBCALCULATION FOR STEAM, CONDENSATE, AND AIR PIPING:

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure

$N\lambda_{EA} = 0$
$N\lambda_c = \Sigma N\lambda = 58.1082$
$N\lambda_{EA}TM = 0$

MTBF = $\frac{1}{\Sigma N\lambda}$ · ____ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 16 OF 32

BUILDING BLOCK NO. 24 ENGR. (SHC)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10^{-6}/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME TM (HR)	MAINTAINABILITY DATA: NλTM (X10^{-6})	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
266	ELECTRICAL CABLE TRAY AND PIPING RACKS (INCLUDES ALL STRUCTURAL COMPONENTS, PIPE HANGER ASSEMBLIES AND ANCILLARY HARDWARE)	THESE TRAYS AND RACKS SUPPORT ALL ABOVE GROUND ELECTRICAL CABLE AND PIPING.	–	–	1	616-01 (NOT TO 616 616-02 603-01 603-02 608-03 604-01 604-02 604-03 604-05	3	NEG									MULTIPLE FAILURES MUST BE REQUIRED TO RESULT IN A FAILURE CONSEQ OF 2.

SUBCALCULATION FOR ELECTRICAL CABLE TRAY AND PIPING RACKS: $\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ HRS

$N\lambda_{EQ} = 0$

$N\lambda_F = \Sigma N\lambda$ = NEGLIGIBLE

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK NO. 26 PIPING (FIG)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ ($\times 10^{-6}$/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM ($\times 10^{-6}$)	SOURCE (*)	REMARKS
OIL OIL (#2) PIPING	THIS UNDERGROUND PIPING CARRIES ALL #2 FUEL OIL BETWEEN THE SUPPLY TANK AND THE BUILDING BLOCKS DURING DEMIL OPERATIONS.	-	-	1	612-01											
PIPE (INC. JOINTS AND WELDS)	CARRIES #2 FUEL OIL SUPPLY	-	-	AS REQ (≈14 WELD JOINTS)	0101 - 0104	2	0.0017	P20	0.0238	-	-	-	100	2.380	EST	REMOVE AND REPLACE: SINCE THE PIPING IS UNDERGROUND A LEAK WOULD BE DIFFICULT TO PINPOINT AND WOULD REQUIRE A GOOD DEAL OF TIME AND EFFORT TO REPAIR.

SUBCALCULATION FOR FUEL OIL PIPING:

$\Sigma N\lambda$ = ____ $\times 10^{-6}$/HR $\Sigma N\lambda TM$ = ____ $\times 10^{-6}$

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

$N\lambda_{C_\Delta} = 0$

$N\lambda_C = \Sigma N\lambda = 0.0238$

$N\lambda_{C_\Delta} TM = 0$

$N\lambda_C TM = \Sigma N\lambda TM = \Sigma N\lambda TM_{BC} = 2.380$

COND 1, 2, 3, 4 = N/A

COND B, C = N/A

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

SEE SHEET NO. 18 FOR FINAL CALCULATIONS.

Δ Cycle Item

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 12 OF 15

BUILDING BLOCK NO. 26 PIPING (...)

ITEM NO.	DESCRIPTION: ITEM NAME	DESCRIPTION: FUNCTION	DESCRIPTION: PART NO.	DESCRIPTION: MFG CODE NO.	DESCRIPTION: QTY (N)	DESCRIPTION: INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	FAILURE DATA: RATE λ (X10⁻⁶/HR)	FAILURE DATA: SOURCE (*)	FAILURE DATA: Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	MAINTAINABILITY DATA: REPAIR TIME (HR)	MAINTAINABILITY DATA: CHECK-OUT TIME (HR)	MAINTAINABILITY DATA: TOTAL MAINT TIME (HR)	MAINTAINABILITY DATA: NλTM (X10⁻⁶)	MAINTAINABILITY DATA: SOURCE (*)	REMARKS
	FINAL CALCULATIONS FOR BB#26 (PIPING) AVAILABILITY.																
	REFERENCE SEE CALCULATION PAGES FOR INPUT NUMBERS:																
	PAGE 4 - AGENT PIPING																
	PAGE 10 - FRESH DECON, DILUTE CAUSTIC, SPENT DECON, DRAINS, AND SUMP PIPING																
	PAGE 15 - STEAM, CONDENSATE, AND AIR PIPING																
	PAGE 16 - ELECTRICAL CABLE TRAYS AND PIPING RACKS.																
	PAGE 17 - FUEL OIL PIPING																

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	AGENT PIPING		FRESH DECON, DILUTE CAUSTIC, SPENT DECON, DRAINS, AND SUMP PIPING		STEAM, CONDENSATE, AND AIR PIPING		ELECTRICAL CABLE TRAYS AND PIPING RACKS		FUEL OIL PIPING					
	$\Sigma N\lambda$	$\Sigma N\lambda TM_{RC}$	$\Sigma N\lambda$	$\Sigma N\lambda TM_{RC}$	$\Sigma N\lambda$	$\Sigma N\lambda TM_{RC}$	$\Sigma N\lambda$	$\Sigma N\lambda TM_{RC}$	$\Sigma N\lambda$	$\Sigma N\lambda TM_{RC}$	$\Sigma N\lambda$	$\Sigma N\lambda TM_{RC}$	MTBF	MTTR
MSS ROCKET, GB/VX	2.983	23.412	18.7142	47.6857	29.0541	76.0185	NEG	N/A	0.0238	2.384	50.7751	149.4962	19.693	2.944
PROJECTILES/CARTRIDGES, GB/VX W/O BURSTERS	2.983	23.412	18.7142	47.6857	29.0541	76.0185	NEG	N/A	0.0238	2.384	50.7751	149.4962	19.693	2.944
PROJECTILES/CARTRIDGES, GB/VX W/ BURSTERS	2.983	23.412	18.7142	47.6857	29.0541	76.0185	NEG	N/A	0.0238	2.384	50.7751	149.4962	19.693	2.944
PROJECTILES, MUSTARD WITH BURSTERS	N/A	N/A	9.3571	23.8428	14.5271	38.0092	NEG	N/A	0.0238	2.384	24.9380	64.2326	47.827	2.688
M23 MINE, VX	2.983	23.412	18.7142	47.6857	29.0541	76.0185	NEG	N/A	0.0238	2.384	50.7751	149.4962	19.693	2.944
4.2" MORTAR, MUSTARD	N/A	N/A	9.3571	23.8428	14.5271	38.0092	NEG	N/A	0.0238	2.384	24.9380	64.2326	47.827	2.688
BULK ITEMS, GB/VX	2.983	23.412	9.3571	23.8428	14.5271	38.0092	NEG	N/A	0.0238	2.384	26.8110	87.6440	29.81	2.708
TON CONTAINER, MUSTARD	N/A	N/A	3.7428	9.5371	5.8108	15.2037	NEG	N/A	0.0238	2.384	9.5774	27.1208	134.42	2.832

$\Sigma N\lambda$ = ____ x 10^{-6}/HR $\Sigma N\lambda TM$ = ____ x 10^{-6}

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\text{____}}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{\text{____}}$ x 100% = ____ %

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure

FAILURE RATE FACTORS:

HIGH CYCLIC APPLICATION FACTOR:

	MUNITION PROCESSING RATE (DA)	MUNITION PROCESSING RATE (HR)	FAILURE RATE FACTOR
CONDITION A (BASE)	N/A	N/A	1 (BASE)
CONDITION 1	400	20	2
CONDITION 2	650	32.5	3.25
CONDITION 3	800	40	4
CONDITION 4	1000	50	5

MAINTAINABILITY FACTORS:

MAINTAINABILITY FACTOR (SUIT REQUIREMENT):

SUIT REQUIREMENT	CONDITION B FACTOR
STREET	1
GLOVES	1.5
MASK AND GLOVES	2
PRESSURIZED SUIT	3

MAINTAINABILITY FACTOR (ACCESSIBILITY/SPACE LIMITATIONS)

ACCESSIBILITY/SPACE LIMITATION	CONDITION C FACTOR
NO LIMITATION	1
LIMITATION	1.33

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #27 ELECTRICAL (ELE)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAI ABIL
*M55 ROCKET,GB/VX				559.96	1961.1	1031.496	2.02	.99
Rocket, 115mm, M55	GB	Comp B	M28					
Rocket, 115mm, M55	VX	Comp B	M28					
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None					
Projectile, 155mm, M121A1	GB	None	None					
Projectile, 155mm, M121	GB	None	None					
Projectile, 155mm, M122	GB	None	None					
Projectile, 8", M426	GB	None	None					
Projectile, 155mm, M121A1	VX	None	None					
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1					
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None					
Projectile, 155mm, M104	HD	Tetrytol	None					
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None					
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1	HD	Tetryl	M6					
Cartridge,Mortar, 4.2",M2/M2A1	HT	Tetryl	M6					

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #27 ELECTRICAL (ELE)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAI ABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	509.916	1961.1	103,496	2.02	.7
Tank,Spray, TMU-28/B	VX	None	None					
Ton Container	GB	None	None					
Tone Container	VX	None	None					
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None					

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 O

SUPPLEMENTAL DATA

BUILDING B
#27 Eas
11/17/82

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. See Attached List DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES _____

_____

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER _____ _____

2. NOTES _____

_____

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

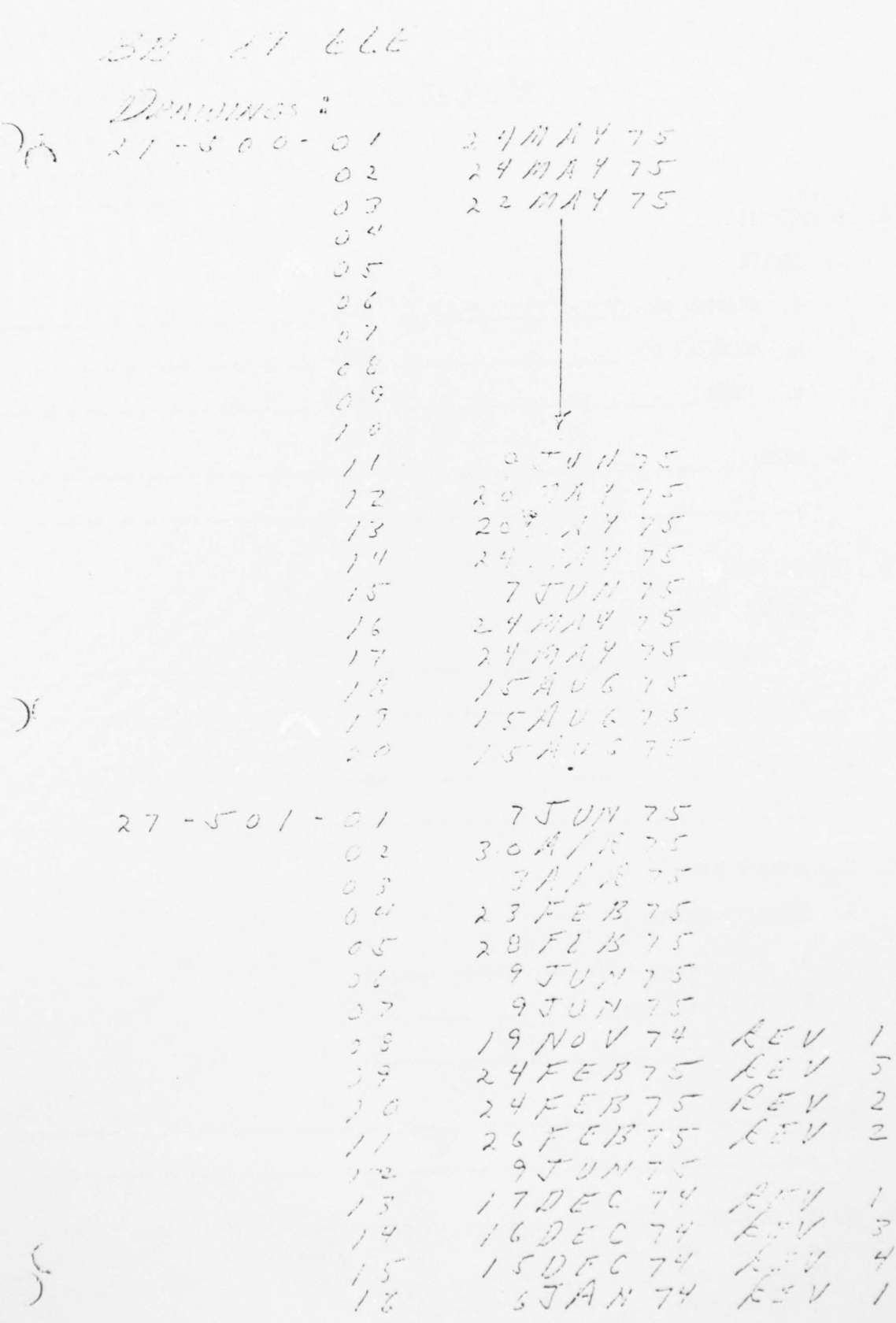
b. TEAD/EA _____

c. OTHER _____

2. NOTES _____

_____

D. GENERAL REMARKS The emergency generating systems and o
lighting are not included in this analysis.
Analysis of such items (under construction) will be made
upon their system availability.



[illegible] ACT

Sections (Continued):

27-501-	17	12 OCT 72		
	18	3 DEC 73	REV	2
	19	14 MAR 75		
	20	9 JUL 75		
	21	9 JUL 75		
	22	10 SEP 74	REV	2
	23	19 JUN 74		
	24 1/2	30 JUL 75		
	24 3/3	30 JUL 75		
	25	3 JUL 75		
27-511-	01	14 FEB 75		
	02	7 MAR 75		

BB-27 ELE

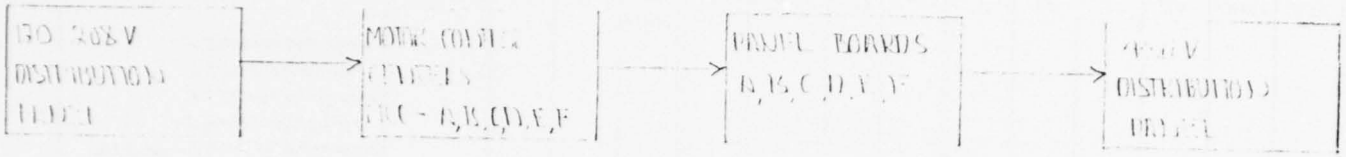
FAILURE RATES

CONTROL TRANSFORMER
MIL STD 217A p 7.7-11 0-60°C ($.5 \times 10^{-6}$)

FUSE
MIL STD 217A p 7.12-3 ($.1 \times 10^{-6}$)

BUILDING BLOCK: #27 ELECTRICAL (ELE)

FLOW CHART



EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #27 ELECTRICAL (ELE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ. (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	120/208V Power Distribution Panel				(501)											
Main Brk 2000A	Main Protection		ITE	1	↓	2	.692	p19	.692	.5	4.0	.5	5.0	3.46	Est	CB 3P Grnd
For Brks 7100A	Feeder Protection		ITE	7		2	.692	p19	4.844	.5	1.5	.5	2.5	12.11	Est	CB 3P Grnd
For Brks <100 A	Feeder Protection		ITE	1		2	.692	p19	.692	.5	1.0	.5	2.0	1.384	p19	CB 3P Grnd
Auto Trans Sw	Transfer to Emerg Generator		ITE	1	(502)	2	1.013	p33	1.013	.5	4.0	.5	5.0	5.065	Est	Relay Contactor Gnd
Differ Relay NC		Project 42		1	5	2	.166	p33	.166	.5	1.0	.5	2.0	.332	p33	Relay Gen Grnd
Delay Relay	Retransfer to Normal 21			1	(501)	2	1.446	p34	1.446	.5	1.0	.5	2.0	2.892	p34	
Tm Delay Relay	Normal to Emergency			1	↓	2	1.446	p34	1.446	.5	1.0	.5	2.0	2.892	p34	
	MCC A - Deac Feed Conveyor - Panels A1, A4, A6 • Control Ht Marine • Deac Furnace • Dunnage Saw Bldg															
Motor Starters		4YC83ZAAA		7	(501) 06	2	1.013	p33	7.091	.5	1.0	.5	2.0	14.182	p33	Relay Contactor Grnd
Motor Starters		4H1892A-A B1A		1	06	2	1.013	p33	1.013	.5	1.0	.5	2.0	2.026	p33	Relay Contactor Grnd

$\Sigma N\lambda$ = 12.403 x 10^{-6}/HR $\Sigma N\lambda TM$ = 44.348 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #27 ELECTRICAL (ELE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	MCC-A (CONTINUED)				(501)											
CONTACTORS	RESISTANCE HEATERS	40DA32BAA		2	06	2	1.018	p33	2.036	.5	1.0	.5	2.0	4.052	p33	Relay Contactor Grnd
CONTACTORS	LIGHTING	40FB32BA CBGA		1	06	2	1.013	p33	1.013	.5	1.0	.5	2.0	2.026	p33	Relay Contactor Grnd
SWITCH	LIGHTING	ATX		1	06	2	.568	p37	.568	.5	1.0	.5	2.0	1.136	p37	Toggle Grnd
CIRCUIT BKRS	≤ 100A			20	06	2	.692	p19	13.84	.5	1.0	.5	2.0	27.68	p19	CB 3P Grnd
CIRCUIT BKRS	> 100A			1	06	2	.692	p19	.692	.5	1.5	.5	2.5	1.73	EST	CB 3P Grnd
	10L TRANSFORMER			12	06	2	.3	X	3.6	.5	1.0	.5	2.0	7.2	EST	
	E. BUS			12	06	2	.1	X	1.2	.5	1.0	.5	2.0	2.4	EST	
OVERLOAD HTR				6	06	2	.692	p19	4.152	.5	1.0	.5	2.0	8.304	p19	CB 3P Grnd

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$\Sigma N\lambda$ = 27.091 x 10^{-6}/HR $\Sigma N\lambda TM$ = 54.529 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #27 ELECTRICAL (ELE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	MCC B IN UTILITY MODULE PANEL B1 AIR COMP, HYD PUMP, CONVEYORS, RDM SAWS				(501)											
MOTOR STARTERS				17	07	2	1.013	p33	17.221	.5	1.0	.5	2.0	34.442	p33	Relay Contactor Grad
CONTACTORS	RESISTANCE HEATING			1	07	2	1.013	p33	1.013	.5	1.0	.5	2.0	2.026	p33	Relay Contactor Grad
CONTACTORS	LIGHTING			1	07	2	1.013	p33	1.013	.5	1.0	.5	2.0	2.026	p33	Relay Contactor Grad
279 TCH	LIGHTING			1	07	2	.568	p37	.568	.5	1.0	.5	2.0	1.136	p37	Toggle Grad
CONTROL TRANSFORMER				19	07	2	.3	*	5.7	.5	1.0	.5	2.0	11.4	Est	
CIRCUIT BKRS	≤ 100 A			20	07	2	.692	p19	13.84	.5	1.0	.5	2.0	27.68	p19	CB 3P Grad
CIRCUIT BKRS	> 100 A			2	07	2	.692	p19	1.384	.5	1.5	.5	2.5	3.46	Est	CB 3P Grad
OVERLOAD HTRS				45	07	2	.692	p19	31.14	.5	1.0	.5	2.0	62.28	Est	CB 3P Grad
FUSE BUS				19	07	2	.1	*	1.9	.5	1.0	.5	2.0	3.8	Est	

$\Sigma N\lambda$ = 77.777 x 10^{-6}/HR $\Sigma N\lambda TM$ = 149.22 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Sequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad = \quad$ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{\quad}} \times 100\% = \quad \%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #27 ELECTRICAL (ELE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ. (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	MCC-C IN PDF BLDG PANELBOARDS C1, C2, C3 PDF MACHINE & CONVEYORS BIF AGITATOR MOTOR HYDRAULIC PUMP				(501)											
CIRCUIT BREAKER	≤ 100A			26	08	2	.692	p19	17.992	.5	1.0	.5	2.0	35.984	p19	CB 3P Gnd
CIRCUIT BREAKER	> 100A			2	08	2	.692	p19	1.384	.5	1.5	.5	2.5	3.46	Est	CB 3P Gnd
MOTOR STARTERS				10	08	2	1.013	p33	10.13	.5	1.0	.5	2.0	20.26	p33	Relay Contactor Gnd
CONTROL TRANSFORMER				10	08	2	.3	*	3	.5	1.0	.5	2.0	6.0	Est	
OVERLOAD HTRS				20	08	2	.692	p19	13.84	.5	1.0	.5	2.0	27.68	Est	CB 3P Gnd
FUSE, BUS				10	08	2	.1	*	1	.5	1.0	.5	2.0	2	Est	
	MCC-D IN EMPL. TRAFFIC BLDG															
CIRCUIT BKRS	≤ 100A			26	09	2	.692	p19	17.992	.5	1.0	.5	2.0	35.984	p19	CB 3P Gnd
CIRCUIT BKRS	> 100A			1	09	2	.692	p19	.692	.5	1.5	.5	2.5	1.73	Est	CB 3P Gnd
CONTROL TRANSFORMERS				8	09	2	.3	*	2.4	.5	1.0	.5	2.0	4.8	Est	
MOTOR STARTERS				8	09	2	1.013	p33	8.104	.5	1.0	.5	2.0	16.208	p33	Relay Contactor Gnd
OVERLOAD HTRS				16	09	2	.692	p19	11.072	.5	1.0	.5	2.0	22.144	Est	CB 3P Gnd
FUSE, BUS				8	09	2	.1	*	.8	.5	1.0	.5	2.0	1.6	Est	

$\Sigma N\lambda$ = 82.406 x 10^{-6}/HR $\Sigma N\lambda TM$ = 177.85 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #27 ELECTRICAL (ELE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	MCC-E 120/208VEMERG POWER				(501)											
CIRCUIT BREAKERS	≤ 100A			14	10	2	.692	p19	9.688	.5	1.0	.5	2.0	19.376	p19	CB 3P Grd
CIRCUIT BREAKERS	> 100A			2	10	2	.692	p19	1.384	.5	1.5	.5	2.5	3.46	Est	CB 3P Grd
MOTOR STARTERS				8	10	2	1.013	p33	8.104	.5	1.0	.5	2.0	16.208	p33	Relay Contactor Grd
CONTROL TRANSFORMERS				16	10	2	.3	*	4.8	.5	1.0	.5	2.0	9.6	Est	
OVERLOAD HTR				16	10	2	.692	N19	11.072	.5	1.0	.5	2.0	22.144	Est	CB 3P Grd
# BUS				8	10	2	.1	*	.8	.5	1.0	.5	2.0	1.6	Est	
	MCC-F IN PDF BLDG				(501)											
CIRCUIT BKRS	≤			21	11	2	.692	p19	14.532	.5	1.0	.5	2.0	29.064	p19	CB 3P Grd
CIRCUIT BKRS	> 100A			1	11	2	.692	p19	.692	.5	1.5	.5	2.5	1.73	Est	CB 3P Grd
MOTOR STARTER				6	11	2	1.013	p33	6.078	.5	1.0	.5	2.0	12.156	p33	Relay Contactor Grd
CONTROL TRANSFORMER				6	11	2	.3	*	1.8	.5	1.0	.5	2.0	3.6	Est	
OVERLOAD HTR				12	11	2	.692	p19	8.304	.5	1.0	.5	2.0	16.608	Est	CB 3P Grd
FUSE, BUS				6	11	2	.1	*	.6	.5	1.0	.5	2.0	1.2	Est	

281

$\Sigma N\lambda$ = 67.854 x 10^{-6}/HR $\Sigma N\lambda TM$ = 176.746 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Sequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\quad}{\quad} = \quad$ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = \quad \%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #27 ELECTRICAL (ELE)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	LIGHTING PANELBOARDS				(501)											
CIRCUIT BKRS	≤ 100A PANELS A1, 2, 3 & 4			99	12	2	.692	p19	68.508	.5	1.0	.5	2.0	137.016	p19	CB 3P Grnd
CIRCUIT BKRS	≤ 100A PANELS A5, 6, B1			62	13	2	.692	p19	42.904	.5	1.0	.5	2.0	85.808	p19	CB 3P Grnd
CIRCUIT BKRS	≤ 100A PANELS C1, 2 & 3			56	14	2	.692	p19	38.752	.5	1.0	.5	2.0	77.504	p19	CB 3P Grnd
CIRCUIT BKRS	≤ 100A PANELS E1, 2, 3 & 4			69	15	2	.692	p19	47.748	.5	1.0	.5	2.0	95.496	p19	CB 3P Grnd
CIRCUIT BKRS	≤ 100A PANELS D1, F1			34	16	2	.692	p19	23.528	.5	1.0	.5	2.0	47.056	p19	CB 3P Grnd
	480V DISTRIBUTION				(501)											
CIRCUIT BKRS	40-200A			17	24	2	.692	p19	11.764	.5	1.0	.5	2.0	23.528	p19	CB 3P Grnd
EMERG TRANS SW				1	24	2	1.013	p33	1.013	.5	2.0	.5	3.0	3.039	p33	Reby Controller Grnd
GROUND FAULT RELAY				1	24	2	.166	p33	.166	.5	1.0	.5	2.0	.332	p33	General Grnd

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = \frac{254.783}{509.976} \times 10^{-6}/HR$

$\Sigma N\lambda TM = \frac{467.779}{1031.496} \times 10^{-6}$

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{509.976} = 1964.027 HRS$

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{1031.496}{509.976} = 2.023$ HRS

$AVAILABILITY = \frac{1}{1 + MTTR} \times 100\% = 99.79\%$

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #30 CLOSED CIRCUIT TV (CTV)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAI ABIL
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	14.155	8760	228.31	2.0	.99
Rocket, 115mm, M55	VX	Comp B	M28					
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None					
Projectile, 155mm, M121A1	GB	None	None					
Projectile, 155mm, M121	GB	None	None					
Projectile, 155mm, M122	GB	None	None					
Projectile, 8", M426	GB	None	None					
Projectile, 155mm, M121A1	VX	None	None					
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1					
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None					
Projectile, 155mm, M104	HD	Tetrytol	None					
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None					
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1	HD	Tetryl	M6					
Cartridge,Mortar, 4.2",M2/M2A1	HT	Tetryl	M6	1	1	1	1	

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #30 CLOSED CIRCUIT TV (CTV)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAILABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	114.155	8760	228.31	2.0	.99
Tank,Spray, TMU-28/B	VX	None	None					
Ton Container	GB	None	None					
Tone Container	VX	None	None					
*TON CONTAINER,MUSTARD								
Ton Container	HD	None	None					

SHEET 1 OF 2

SUPPLEMENTAL DATA

BUILDING BLOCK
#30 CTV

11-12-75 [illegible]

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. See Attached List DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES The performance of this Building Block is judged to be unaffected by grad; in rates.

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____

b. OTHER Ron Carter - Denver Water Bd for Catalytic at open. at (303) - 623-6447

2. NOTES No written data available - Experience reported at Buckley on 30 systems indicates < 1 failure / year / system - Best estimate is one failure per year with system shutdown

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER _____

2. NOTES _____

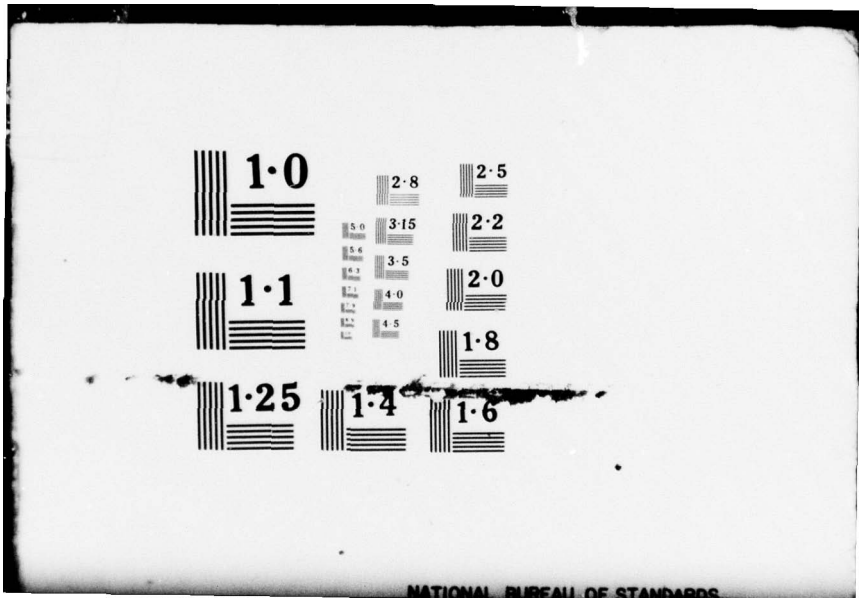
D. GENERAL REMARKS Failure of items listed will not automatically cause a production line shutdown. The items can be replaced or repaired during normal production activities. See above for basis of failure rate assignment.

AD-A062 401 TRW/ENVIRONMENTAL ENGINEERING DIV REDONDO BEACH CA F/G 14/4
RELIABILITY AND MAINTENANCE PROGRAM ANALYSIS RELIABILITY AND MA--ETC(U)
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UNCLASSIFIED DRCPM-DR-D-CR-76009-VOL-2 NL

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NATIONAL BUREAU OF STANDARDS

"BB" 30 CTU

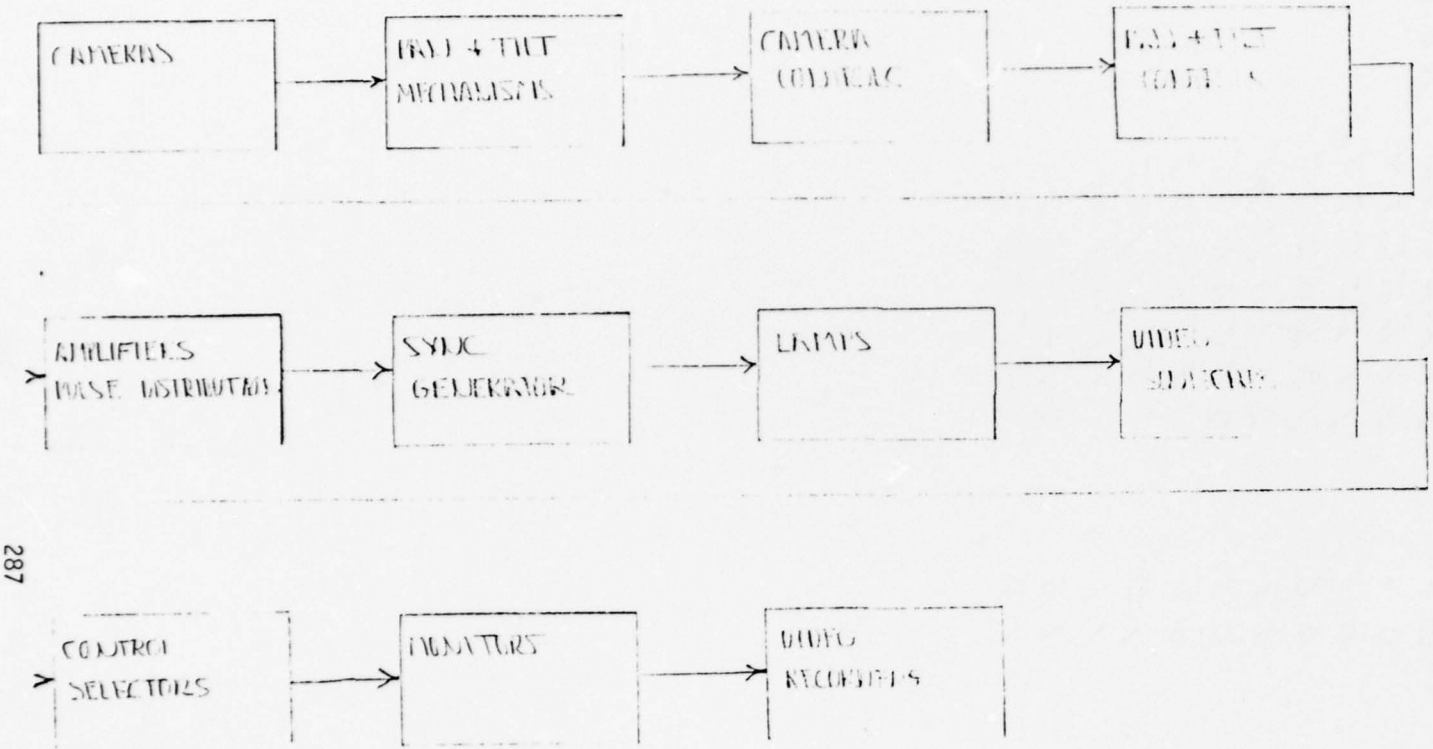
11-12-75 RW

Drawings:

30-5033-01	26 JUN 75	
02	28 FEB 75	
03	19 MAR 75	REV 1
04	12 DEC 74	
05	11 DEC 74	
06	19 DEC 74	
07	21 JAN 75	
08	25 JAN 75	
09	1 JUL 75	
10	5/24/75	
11	5/24/75	
12	24 FEB 75	
13	24 FEB 75	

BUILDING BLOCK: #30 CLOSED CIRCUIT TELEVISION (CTV)

FLOW CHART



EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 1

BUILDING BLOCK 130 CLOSED CIRCUIT TV (CTV)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (R)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
CAMERA, TV	SURVEILLANCE OF FACILITY	2006-001	05159	8	0301	3										
PAN & TILT		PT550-MX	12644	8	0302	3										
CAMERA CONTROL			05159	2	0314	3										
VIDEO BD, PS, DEFL BD, SYNC GEN																
CONTROL, PAN/TILT		2481-001	05159	8	0316	3										
PANEL, RISE DARK		9000-162		3	0318	3										
GENERATOR, SYNC		2740-400		1	0320	3										
MONITOR 9IN		72737		10	0321	3										
MONITOR 23 IN		72737		2	0323	3										
TCH, VIDEO		2038-SC-30		2	0322	3										
CAMERA HEAD		2006-012	05159	2	0301	3										
- CAMERA HEAD		2006-005	05159	7	0302	3										
TV CAMERA HEAD		2006-012	05159	1	0303	3										
LAMP HI TEMP		ER-7859	05159		0304	3										
PAN & TILT		PT550 MX	12644	2	0305	3										
CONTROL, CAMERA		3961-911	05159	4	0306	3										
CONTROL, SEQ MASTER		ER7722A	05159	1	0308	3										
CONTROL, SEQ SLAVE		ER7722B	05159	1	0309	3										
RECORDER, VIDEO		IVC-700	29641	2	0311	3										
SWITCH, VIDEO		VS 122A	11650	2	0312	3										
SYSTEM				1		2	114.155	*	114.155				2	228.310	EST	

ΣNλ = 114.155 x 10^{-6}/HR ΣNλTM = 228.31 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

MTBF = $\frac{1}{\Sigma N\lambda} = \frac{1}{114.155 \times 10^{-6}} = 8760$ HRS MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{228.310}{114.155} = 2.0$ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = 99.97\%$

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #31 COMMUNICATIONS (COM)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL ABIL
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	365.296	2737.51	1095.88	3.0	.99
Rocket, 115mm, M55	VX	Comp B	M28					
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None					
Projectile, 155mm, M121A1	GB	None	None					
Projectile, 155mm, M121	GB	None	None					
Projectile, 155mm, M122	GB	None	None					
Projectile, 8", M426	GB	None	None					
Projectile, 155mm, M121A1	VX	None	None					
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1					
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None					
Projectile, 155mm, M104	HD	Tetrytol	None					
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None					
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1	HD	Tetryl	M6					
Cartridge,Mortar, 4.2",M2/M2A1	HT	Tetryl	M6					

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #31 COMMUNICATIONS (COM)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAI ABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	365.296	2737.51	1095.884	3.0	.996
Tank,Spray, TMU-28/B	VX	None	None	↓	↓	↓	↓	↓
Ton Container	GB	None	None	↓	↓	↓	↓	↓
Tone Container	VX	None	None	↓	↓	↓	↓	↓
*TON CONTAINER,MUSTARD				↓	↓	↓	↓	↓
Ton Container	HD	None	None	↓	↓	↓	↓	↓

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 2

SUPPLEMENTAL DATA

BUILDING BLOCK
#31 Com.
Whsle Coup

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. See Attached List DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES The performance of this Building Block is judged to be unaffected by production rates.

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER _____ _____

2. NOTES Assumed one (1) failure in 5 years requiring processing shutdown due to failure & exchange. Assumed one (1) failure in one year requiring

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER _____

2. NOTES Assumed time & complete replace exchange with subject unit.

D. GENERAL REMARKS

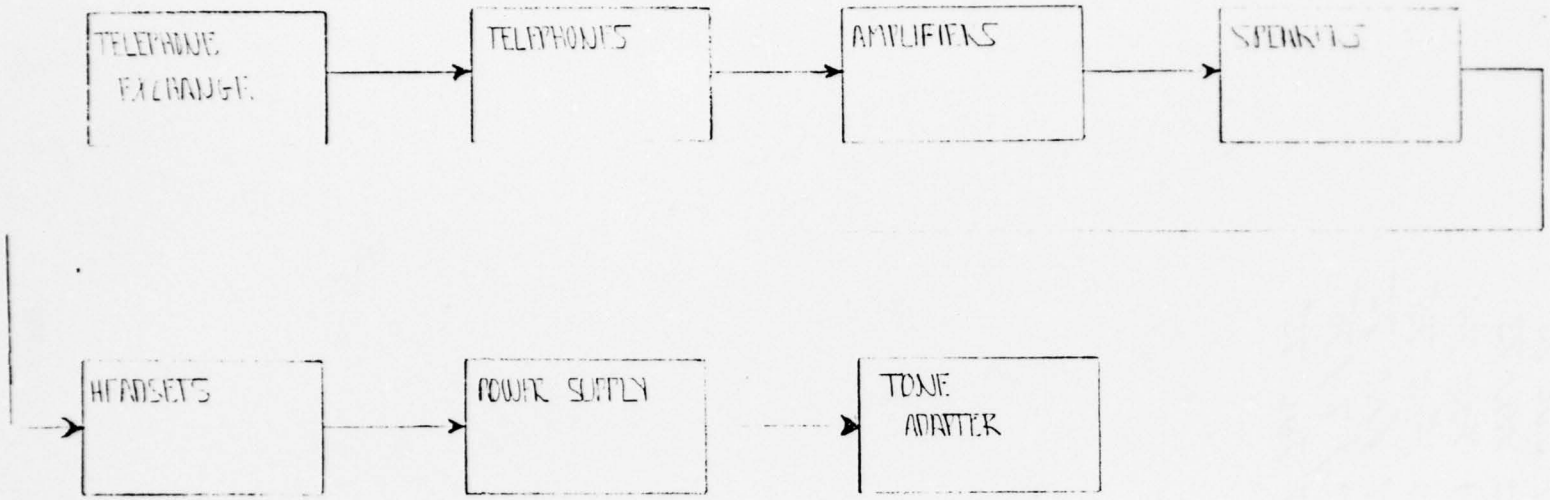
Failure of the items listed will not automatically cause a production line shutdown. The items can be replaced or repaired during normal production activities.

11/12/75

1515 - 31 Dwgs

31-502-	01	4 AUG 75
	02	7 JUL 75
	31	12 NOV 73
	41	19 FEB 74
	05	10 FEB 75
	07	11 APR 75
	08	7/7/75
	09	7 JUL 75

BUILDING BLOCK: #31 COMMUNICATIONS (COM) FLOW CHART



EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 1

BUILDING BLOCK #31 COMMUNICATIONS (COM)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFR CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL. CONSEQ (**)	$\lambda \times 10^{-6}$	SOURCE (*)	$N\lambda$	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	$N\lambda TM$ $(\times 10^{-6})$	SOURCE (*)	REMARKS
SPHONE EXCH. AUTOMATIC	CENTRAL SWITCHING & INTERCOM SYSTEM	AKD860	21189	1	(502) 0101	2	22.831	*	22831	2	8	3	18	410.958	*	
PHONE, PB DIAL	INTERCOM STATIONS	K-3554	34767	40	0102	3										
PLIFIER, PUBLIC ADDRESS	PUBLIC ADDRESS SYSTEM	LT-2000	22874	3	0107	2	114.155	*	342.465	.5	1.5	.5	2.0	684.93	Est	
ADAPTER		M-177-03 AKD741	82681	1	0119	3										
PHONE, VARIABLE VOLUME	PUBLIC ADDRESS SYSTEM	F10-7	05114	10	0104	3										
AKER, HORN	PUBLIC ADDRESS SYSTEM	C1B-7	87771	15	0105	3										
AKER, WALL	PUBLIC ADDRESS SYSTEM	R2-8	87771	22	0106	3										
SET W. MIKE	INTERCOM STATIONS	116840	82872	10	0107	3										
SET, SW&D	INTERCOM STATIONS	MS 50/155-2	22447	10	0108	3										
SUPPLY		BWA 2425	21789	1	0115	3										
MUFFLING, EAR	HEADSET FOR RUBBER SUIT	LS1-1105	78438		0504	3										
SET ASSY	HEADSET FOR RUBBER SUIT		82872		0505	3										
SWITCH	HEADSET FOR RUBBER SUIT				07	3										

$\Sigma N\lambda = 365.296 \times 10^{-6}$/HR $\Sigma N\lambda TM = 109.5556 \times 10^{-6}$

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure

2 - Prohibits Mission Shutdown Failure

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{365.296 \times 10^{-6}} = 2737.51$ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{109.5556}{365.296} = .30$ HRS

AVAILABILITY = $\frac{\quad}{\quad} \times 100\% = 99.89$

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #35 SITE CONTROL SYSTEM (SCS)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAIL ABIL
*M55 ROCKET,GB/VX								
Rocket, 115mm, M55	GB	Comp B	M28	2787.82	358.7	5973.74	2.14	.78
Rocket, 115mm, M55	VX	Comp B	M28					
*PROJECTILES/ CARTRIDGES, GB/VX WITHOUT BURSTERS								
Cartridge, 105mm, M360	GB	None	None					
Projectile, 155mm, M121A1	GB	None	None					
Projectile, 155mm, M121	GB	None	None					
Projectile, 155mm, M122	GB	None	None					
Projectile, 8", M426	GB	None	None					
Projectile, 155mm, M121A1	VX	None	None					
*P/C,GB/VX WITH BURSTERS								
Cartridge, 105mm, M360	GB	Tetrytol	M1					
*PROJECTILES,MUSTARD WITH BURSTERS								
Projectile, 155mm, M110	H	Tetrytol	None					
Projectile, 155mm, M104	HD	Tetrytol	None					
*M23 MINE, VX								
Mine, 2 gallon,M23	VX	Comp B	None					
*4.2" MORTAR, MUSTARD								
Cartridge,Mortar, 4.2",M2/M2A1	HD	Tetryl	M6					
Cartridge,Mortar, 4.2",M2/M2A1	HT	Tetryl	M6	1	1	1	1	

*MUNITION DEMILITARIZATION PROCESS FLOW

BUILDING BLOCK AVAILABILITY PARAMETER SUMMARY

BUILDING BLOCK: #35 SITE CONTROL SYSTEM (SCS)

MUNITION	AGENT	EXP.	PROP.	Nλ	MTBF	NλTM	MTTR	AVAI ABIL
*BULK ITEMS,GB/VX								
Bomb,750#,MC-1	GB	None	None	—	—	—	—	—
Tank,Spray, TMU-28/B	VX	None	None	—	—	—	—	—
Ton Container	GB	None	None	—	—	—	—	
Tone Container	VX	None	None	—	—	—	—	
*TON CONTAINER,MUSTARD MK94				—	—	—	—	—
Ton Container	HD	None	None	—	—	—	—	—

*MUNITION DEMILITARIZATION PROCESS FLOW

SHEET 1 OF 3

SUPPLEMENTAL DATA

BUILDING BLOCK:
35 SITE CONT
SYSTEM (SCS)
11/11/75 1500

A. DESCRIPTION

1. SOURCE

a. DRAWING NO. See Attached List DATE: _____

b. DOCUMENT NO. _____ DATE: _____

c. OTHER _____ DATE: _____

2. NOTES The performance of this Building Block is judged to be unaffected by production rates. The five components affected by production rates contribute to the total availability analysis in a minor way

B. FAILURE DATA

1. SOURCE

a. CUSTOMER _____ _____ _____

b. OTHER _____ _____

2. NOTES _____

_____

C. MAINTENANCE DATA

1. ESTIMATE SOURCE

a. RMA _____

b. TEAD/EA _____

c. OTHER _____

2. NOTES _____

_____

D. GENERAL REMARKS

11/14/75 Lucia

BUILDING BLOCK: #35 SITE CONTROL SYSTEM (SCS)

DRAWINGS:

35-204 APR 75

35-504-01	13 AUG 74	REV 2
02	7 AUG 74	REV 2
03	4 OCT 74	REV 3
04	13 AUG 74	REV 2
05	30 JUL 74	REV 1
06	20 JUN 74	
07	25 JUN 74	
08	12 SEP 74	REV 1
09	24 OCT 74	REV 3
10	2 JUL 75	
11	22 JUL 75	
12	22 JUL 75	
13	22 JUL 75	
14	13 SEP 74	REV 1
15	7 JUN 75	
16	3 JUL 75	
17	9 MAY 75	
18	10 SEP 74	
19	15 JAN 75	REV 1
20	6 JUN 75	
21	26 JUL 75	
22	10 FEB 75	REV 1
23	12 NOV 74	
24	24 FEB 75	
25	2 MAR 75	
26	4 MAR 75	
27	18 FEB 75	
30	31 MAY 75	
31	9 JUN 75	
32	6 JUN 75	

BUILDING BLOCK: #35 SITE CONTROL SYSTEM (SCS)

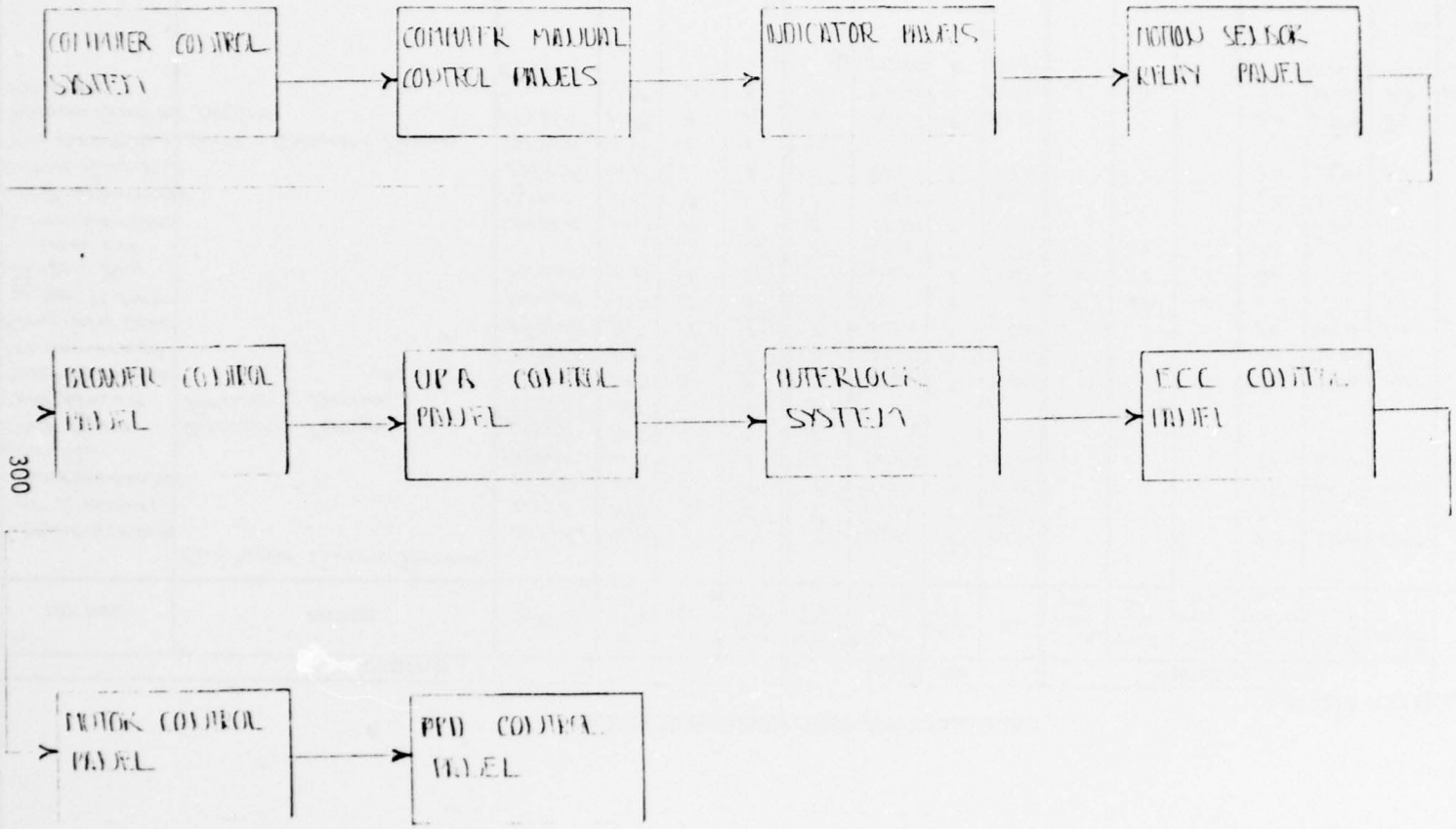
- SOURCE OF EQUIPMENT DESCRIPTION AND FAILURE RT.
  HEWLETT PACKARD - S NELSON - RADC Notebook II
- INTEGRATED CIRCUIT FAILURE RATE
  MIL STD 217A p 7.14-6 ($.4 \times 10^{-6}$)
- RESISTOR FAILURE RATE
  MIL STD 217A p 7.13-1 METAL GLAZD ($.0063 \times 10^{-6}$)
- REPAIR TIME FOR COMPUTER CONTROL SYSTEM INCLUDES TIME TO REPAIR BY 'CARD' SUBSTITUTION OR CHANGE TO SECONDARY UNIT (ie DUAL DISC)
- NR FOR CONDITIONS WHERE TWO UNITS ARE IN OPERATION AND ONLY ONE IS REQUIRED FOR CONTINUED PRODUCTION:

$$N_{R\,effective} = 1 \times R \times {}^{2}/_{3}$$

REFERENCE: RELIABILITY THEORY AND PRATICE
IGOR BAZOUSKI 1961

BUILDING BLOCK: #35 SITE CONTROL SYSTEM (SCS)

FLOW CHART



EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 1 OF 5

BUILDING BLOCK #35 SITE CONTROL SYSTEM (SCS)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFR CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10⁻⁶ HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
	COMPUTER CONTROL SYSTEM															
COMPUTER-32K MEM		2100A	HP	1	*	2	414.42	*	414.42				2.0	828.84	Est	
CRT TERMINAL		2615A	HP	2	*	2	245.369	*	245.369				2.0	490.738	Est	REFER TO NOTES RE Nλ
MULTIPROGRAMMER		6940A	HP	1	*	2	113.986	*	113.986				2.0	227.972	Est	
DUAL DISC		12960A	HP	2	*	2	463.606	*	463.606				2.0	927.212	Est	ONE UNIT USED FOR PRODUCTION
TAPE PUNCH	DIAGNOSTIC TESTING	2895A	HP	1	*	3										
TAPE READER	DIAGNOSTIC TESTING	2748A	HP	1	*	3										
MULTI PROG. EXECUTIVE		6941A	HP	2	*	2	47.619	*	95.239				2.0	190.478	Est	
TTL OUTPUT CARD		69331A	HP	18	*	2	20.122	*	362.196				2.0	724.392	Est	
EVENT SENSE CARD		69434A	HP	3	* (504)	2	57.100	*	171.303				2.0	342.606	Est	
103 W/IT IC SNAP		318-3AE	02735	3	23	2	.4	*	1.2	.5	1.0	.5	2.0	2.4	Est	
STORS 1/4W		CB 2045	50139	12	23	2	.0067	*	.0756	.5	1.0	.5	2.0	.1512	Est	
STORS 1W				12	23	2	.0063	*	.0756	.5	1.0	.5	2.0	.1512	Est	
ISOLATED INPUT CARD		69430A	HP	18	*	2	22.475	*	404.549				2.0	809.098	Est	
TIME BASE GENERATOR		12939C	HP	1	*	2	7.431	*	7.431				2.0	14.862	Est	
FLOATING POINT HDW		12901A	HP	1	*	2	9.921	*	9.921				2.0	19.842	Est	
TAPE READER/PUNCH INTERF	DIAGNOSTIC TESTING	12597A	HP	2	*	3										
TERMINAL INTERFACE	CRT/ITY	12531C	HP	4	*	2	26.663	*	106.652				2.0	213.304	Est	
PRINTER			HP	2	*	2	~~9.272~~	*	~~18.544~~	.5	2.0	.5	3.0	~~55.632~~ 1000	Est	Refer to Notes re Nλ
						□	333.333	*	333.333							~~Printer F.R. assumed to be three (3) times this.~~ □

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period

$\Sigma N\lambda$ = ~~4250.422~~ $\times 10^{-6}$/HR

ΣNA_{TM} = ~~70232.278~~ $\times 10^{-6}$ / 5792.0444

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{2729.3558}$ = ____ HRS

MTTR = $\frac{\Sigma NA_{TM}}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK #35 SITE CONTROL SYSTEM (SCS)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	COMPUTER MANUAL CONTROL & INDICATOR PANELS			4	(309)											Quantities shown for single set of panels
TOGGLE SWITCHES		11TW191-A002	91929	46	0102	3										
KEY SWITCH		PTK-E-A2-351C	91929	1	0103	2	1.329	p37	1.329				4.0	5.316	p37	(Rotary Gnd)
RELAY 4PDT		801-4JA-115	14195	4	0104	2	.166	p33	.664	.5	1.0	.5	2.0	1.328	p33	(Gen Gnd)
RELAY 4PDT		801-4JA-115	14195	1	0114	2	.166	p33	.166	.5	1.0	.5	2.0	.332	p33	(Gen Gnd)
BULBS		NE-51-NIBB	72619	7	0107	3										
BULBS		STL-7A-F40	26031	46	0110	3										
P.B. SWITCH MOMEN		BSA01	26031	1	0111	3										
POWER SUPPLY, 28V 2A		50A28		1	0113	3										
1/4 W RESISTOR 33K Ω		FSN0623375		48	0117	3										
1/4 W RESISTOR 330 Ω		FSN 4021125		1	0118	3										

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code

1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = \frac{2.157}{XY} \times 10^{-6}/HR = \frac{2.157}{8.636} \times 10^{-6}/HR$

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad HRS$

$\Sigma N\lambda TM = \frac{6.976}{XY} \times 10^{-6} = \frac{6.976}{27.904} \times 10^{-6}$ ← (FACTOR FOR 9 PANELS OF EACH)

$MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \quad = \quad HRS$

$AVAILABILITY = \frac{1}{1 + MTTR} \times 100\% = \quad \%$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 2 OF 5

BUILDING BLOCK #23 SCS 1/2 [illegible]

ITEM NO.	DESCRIPTION: ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAILURE DATA: FAIL CONSEQ (**)	RATE λ (X10⁻⁶/HR)	SOURCE (*)	Nλ	MAINTAINABILITY DATA: DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME (HR)	NλTM (X10⁻⁶)	SOURCE (*)	REMARKS
3.0		MOTOR SERVICE RELAY PANEL			1	(SDV)											
3.1	RELAY 5 VDC 110V		KRP-5A	Potter & Brum	20	0702	2	.166	p37	3.32	.5	1.0	.5	2.0	6.64	p37	(Gen Gnd)
4.0		BLOWER CONTROL PANEL			1												
4.1	SWITCH, MOMO		705-B-C2K9	Micro	18	0702	2	1.133	p33	20.394	.5	1.0	.5	2.0	54.432	p33	(Gen Gnd)
5.0		UPA CONTROL PANEL			1												
5.1	SWITCH			Micro	4	1902.5	2	.270	p33	1.08	.5	1.0	.5	2.0	2.16	p33	(Weld Builder Gnd)
5.2	INDICATOR			Micro	1	1906	3										
6.0		MOTOR CONTROL PANEL			1												
6.1	SEL SWITCH MOMO			53797	18	1902.3	2	1.133	p33	20.394	.5	1.0	.5	2.0	53.064	p33	(Gen Gnd)
7.0		INTERLOCK SYSTEM			1												
7.1	SEL SWITCH, KEY		STK 9F3224	91929	1	2401	2	1.329	p33	1.329				4.0	5.316	p33	(Relay Gnd)
7.2	LIGHT		PTL 2133	91929	1	2402	3										
7.3	LIGHT		PTL-2134	91929	1	2403	3										
	LIGHT		PTL-2136	91929	1	2404	3										
	LIGHT		PTL-2137	91929	1	2405	3										
	[illegible]		50A-12	[illegible]	1	2407	3										
7.7	RELAY, SWITCH		701-276R124	14535	1	2410	2	.166	p37	.166	.5	1.0	.5	2.0	.332	p37	(Gen Gnd)
7.8	FUSE				1		3										

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$\Sigma N\lambda$ = 47.223 x 10^{-6}/HR $\Sigma N\lambda TM$ = 121.7 x 10^{-6}

*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure
3 - Minor Failure - Repair During Maintenance Period
4 - See Supplemental Data Sheet

$MTBF = \frac{1}{\Sigma N\lambda} = \frac{1}{\quad} = \quad$ HRS $MTTR = \frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\quad}{\quad} = \quad$ HRS

$AVAILABILITY = \frac{1}{1 + \frac{MTTR}{MTBF}} \times 100\% = \quad \%$

SHEET 4 OF 5

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

BUILDING BLOCK 135 SITE CONTROL SYSTEM (SCS)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ. (**)	RATE λ (X10^{-6}/HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
	PPD CONTROL PANEL			1	(304)											
SWITCH, ROTARY		3813-7	82121	1	3005	2	1.329	p33	1.329	1.0	1.5	.5	4.0	5.316	p33	(Rotary Grd)
P.B. SWITCH UNLIT		PTH 33XBC04	91929	1	3007	3										
P.B. SWITCH LIT		PTH 22147BC00	91929	1	3008	3										
P.B. SWITCH LIT		PTH 22147BC00	91929	1	3009	3										
LIGHT		PTL 7113C00	91929	1	3010	3										
LIGHT		PTL 7113C00	91929	1	3011	3										
SWITCH SELECTOR		PTS 15028C00	91929	1	3012	3										
DIGITAL READOUT		SSR-72016Z	TEC LIGHT	2	3013	3										
LIGHT		PWL 11211	91929	7	3014	3										
FUSE		3AG	LITTLE FUSE ELECTRO-STATICS	1	3109	3										
SUPPLY 5V 3A		3120153-05		1	3105	3										

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda$ = 1.329 x 10^{-6}/HR

$\Sigma N\lambda TM$ = 5.316 x 10^{-6}
X3 = 15.948 x 10^{-6} Safe Factor for worst in PDF

MTBF = $\frac{1}{\Sigma N\lambda}$ = $\frac{1}{\quad}$ = ____ HRS

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda}$ = ____ = ____ HRS

AVAILABILITY = $\frac{1}{1 + \frac{MTTR}{MTBF}}$ x 100% = ____ %

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 5 OF 5 - AWA.

BUILDING BLOCK #35 SITE CONTROL SYSTEM (SCS)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART	MFR CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (X10^{-6}HR)	SOURCE (*)	λ	DIAGN. TIME (HR)	REPAIR TIME (HR)	SDT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (X10^{-6})	SOURCE (*)	REMARKS
ECC CONTROL PANEL				1	(504)											
SWITCH INDICATOR						3										
DIGITAL READOUT																
POWER SUPPLY SA																
FUSE 1A		3A A100														
SWITCH KEY							.037	1.329					.40	5.316	p37	(Rotary Gnd)

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*Information is detailed in Supplemental Data Sheet

Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

$\Sigma N\lambda = 1.329 \times 10^{-6}$/HR

$\Sigma N\lambda TM = 5.316 \times 10^{-6}$

MTBF = $\frac{1}{\Sigma N\lambda} = \frac{1}{.787.8723} = 2370.2$ HRS / 358.70

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{\quad}{\quad} = 2.442$ hrs / 2.47

AVAILABILITY = $\frac{1}{\text{MTTR}} \times 100\% =$

EQUIPMENT INFORMATION AND FAILURE/MAINTAINABILITY DATA

SHEET 5 OF 5 - AWA.

BUILDING BLOCK #35 SITE CONTROL SYSTEM (SCS)

DESCRIPTION						FAILURE DATA				MAINTAINABILITY DATA						
ITEM NAME	FUNCTION	PART NO.	MFG CODE NO.	QTY (N)	INFO. SOURCE (*)	FAIL CONSEQ (**)	RATE λ (x10^{-6}HR)	SOURCE (*)	Nλ	DIAGN. TIME (HR)	REPAIR TIME (HR)	CHECK-OUT TIME (HR)	TOTAL MAINT TIME TM (HR)	NλTM (x10^{-6})	SOURCE (*)	REMARKS
	ECC CONTROL PANEL			1	(504)											
SWITCH			93753	4	1704-5	3										
INDICATOR				3	1706,710	3										
DIGITAL READOUT		SSR7281B62	07137	1	1708	3										
POWER SUPPLY 5A		5DA-5	34538	1	1713	3										
FUSE 1/4		3A 6/10	75915	1	1716	3										
SWITCH KEY				1		2	1.329	p37	1.329				4.0	5.316	p37	(Rotary Grnd)

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*Information is detailed in Supplemental Data Sheet

**Failure Consequence Code
1 - Catastrophic Failure
2 - Production Line Shutdown Failure

□ MTBF = $\frac{1}{\Sigma N\lambda} = \frac{1}{.7877.8723} = 2329$ HRS / 358.70

$\Sigma N\lambda = 1.329 \times 10^{-6}$/HR

$\Sigma N\lambda TM = 5.316 \times 10^{-6}$ x 3 = 15.948 $\times 10^{-6}$

MTTR = $\frac{\Sigma N\lambda TM}{\Sigma N\lambda} = \frac{7577.11}{3508.329} = \frac{2442}{2.197}$ HRS

SAFETY FACTOR FOR WORK IN FILTER/FREEZER OUTSIDE ECC

AVAILABILITY = $\frac{1}{MTTR} \times 100\% = 99.96\%$

