Air Products and Chemicals, Inc.
CHEMICALS GROUP

☐ STANDARDS
☐ INSTRUCTIONS
☒ SPECIFICATIONS
☐

CC-1333

GEF 0468

FORM-APC-174

SCOPE OF WORK
BREATHING AIR SYSTEM

This project will install equipment to compress, purify, store and continuously monitor the air supplied to the breathing air stations in the PVOH and Emulsion Plants. Air from this system will be suitable for human respiration and will conform to the standards for Grade-D of the Compressed Gas Association Commodity Specification G-7.1, 1966. In addition the air supplied by this system will meet OSHA Standards (para. 1910.134 on Respiratory Protection).

Right spec? —

The compressors, desiccant air dryers and monitoring equipment will be installed in the Emulsion Plant truck alley. Design provisions have been made to incorporate carbon filtration equipment should it prove necessary. The breathing air storage receiver will be located outside, adjacent to the Emulsion Plant chemical storage area. Air processed from these units will be distributed to the seventeen (17) MSA respirator stations in the Emulsion Plant, twelve (12) MSA respirator stations in the PVOH Plant and to one(1) station in the PVOH control room.

Clean intake air? (See F-7 appears OK)

The major components and design features of this system include:

1. Two (2) 40 Hp air compressors each capable of supplying 100 CFM of water flushed air at 50 psig.

2. Dual desiccant air dryers with a capacity for conditioning 225 CFM of 50 PSIG air to a -10°F dew point.

3. Instrumentation to monitor and sound an alarm in event of a compressor failure and/or low system pressure.

? location of alarm?

4. A process gas chromatograph to monitor the system's air continuously for vinyl chloride and other hydrocarbons.

Type monitor for CO?

5. A 125 cubic foot air receiver to provide for storage of quality air in event of total compressor failure. This quantity of air is sufficient to provide five (5) minutes of maximum usage to thirty (30) percent of the installed stations.

PSV & venting Design basis?

6. A two (2) inch distribution header with one(1) tie-in to the Emulsion Plant stations, three(3) tie-ins to the PVOH Plant stations and a final tie-in and system purge at the PVOH control room.

7. Air intake for the compressors will be piped from a point twelve (12) feet above grade and approximately sixty (60) feet from the east wall of the Emulsion Plant.

8. Approximately two hundred (200) feet of the air header leading to the PVOH building will be electric traced and insulated to condition the air.
9. Present respirators will be replaced with new low pressure breathing masks.

Additional design features and the basis for design:

Respirator Stations

Number - 17 Emulsion and 13 PVOH, Total - 30
Type - Constant Flow/min. air flow 4.0 SCFM
Hose Size - 3/8" max. 50' length
Min. Pressure @ Respirator Valve - 20 psig
Max. Pressure @ Respirator Valve - 40 psig
Design for 6.7 SCFM/Respirator @ 20 psig min.
Max. Usage - 80% or 24 stations at anytime. Requiring a total of 161 SCFM.

OK?
Why? —

Compressor Requirements

Volume - Assume simultaneous usage max. of 80% utilization
Max. Usage for 24 Stations - 161 SCFM
Estimate System Losses Less Than 20 CFM
Design Contingency for Future Additions - 10%
Total Air Requirements - 200 CFM

System Pressure/Air Storage

Pressure @ Stations - 20 psig
Header Pressure Drop - 5 psig (workable design)
Allowable Drop Thru Dryer - 5 psig (workable design)
Allowable Drop Thru Carbon Bed - 5 psig
Min. Air Pressure at Receiver - 25 psig
Provide for 5 minute supply for 10 stations in event of compressor failure.

Design Features

The compressor package consists of 2-40 HP units. One compressor will carry a base load with the other compressor available to handle the system requirements at rated design. A transfer switch periodically alternates compressor positions and during periods of extended non-use both compressors will shutdown.

The desiccant air dryers are sized to handle 10% additional capacity and will condition the air to a -10°F dew point.

Release or relief

A pressure release valve operated intermittently through a timer will remove enough air from the system to insure compressor operation and to keep a fresh supply of air in the system.

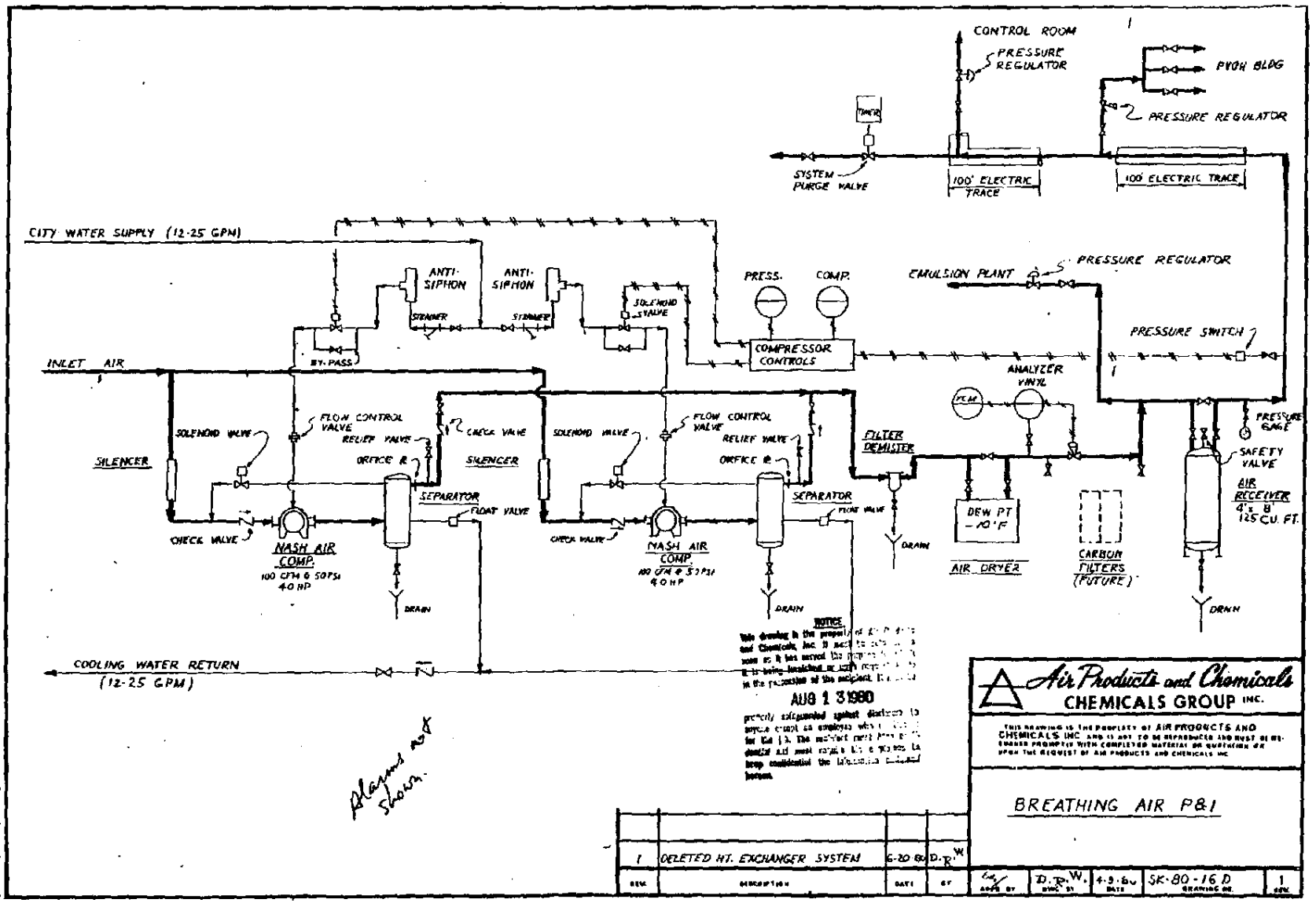
The distribution piping is sized to keep the normal operating drop through the system below 5 psig. The larger pipe also provides for additional air storage without a significant effect on the total cost.

adsorption

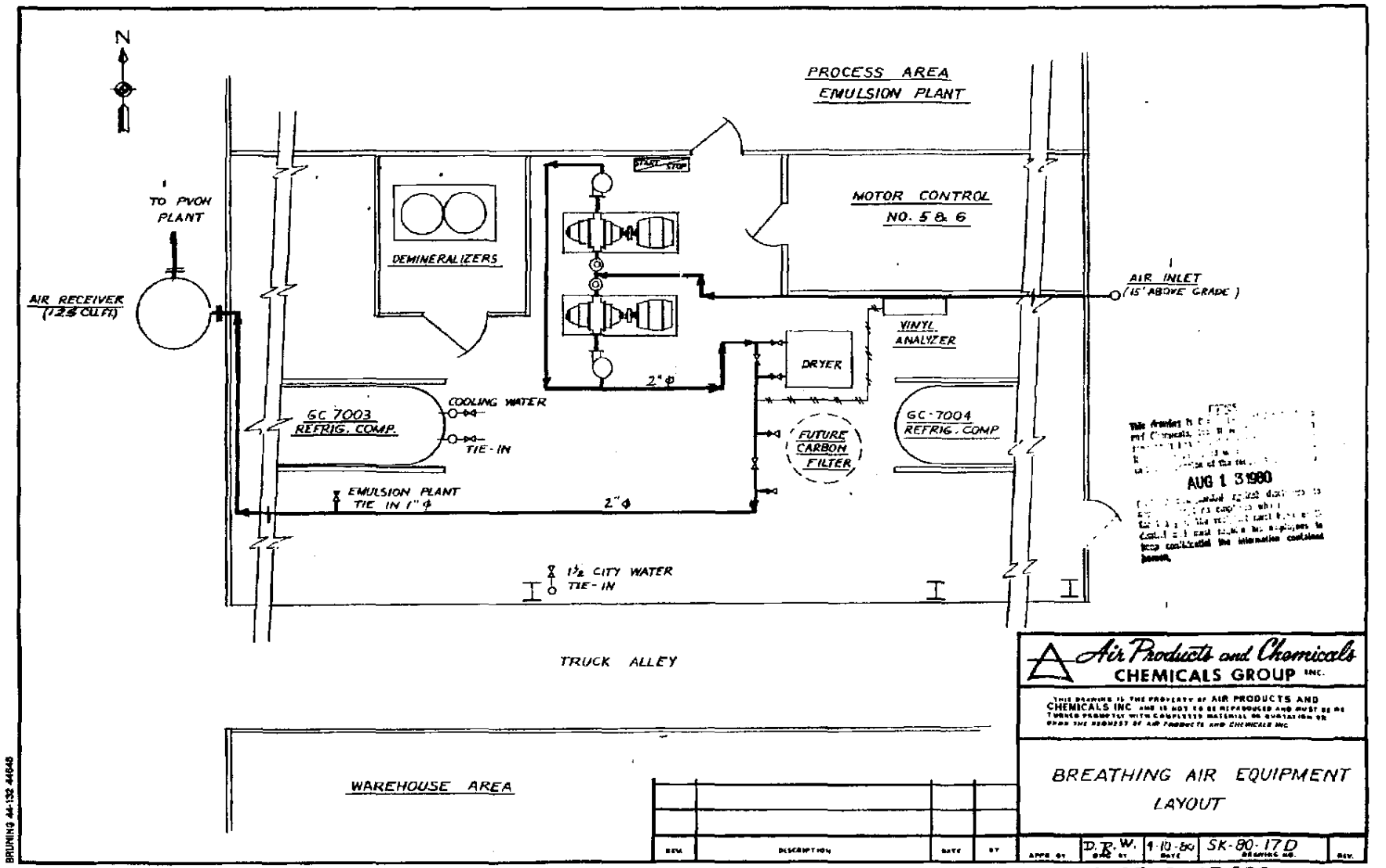
Provisions have been made to add a carbon absorption unit to the system. This unit, if needed will reduce the total hydrocarbon and vinyl chloride levels to conform to established standards.

A separate process gas chromatograph is included in the design. The twenty(20) minutes between sampling using the existing Emulsion Area VCM chromatograph is too infrequent to assure that the air is suitable for human respiration. However the new unit could be made available for other uses whenever the breathing air compressors are not in use.

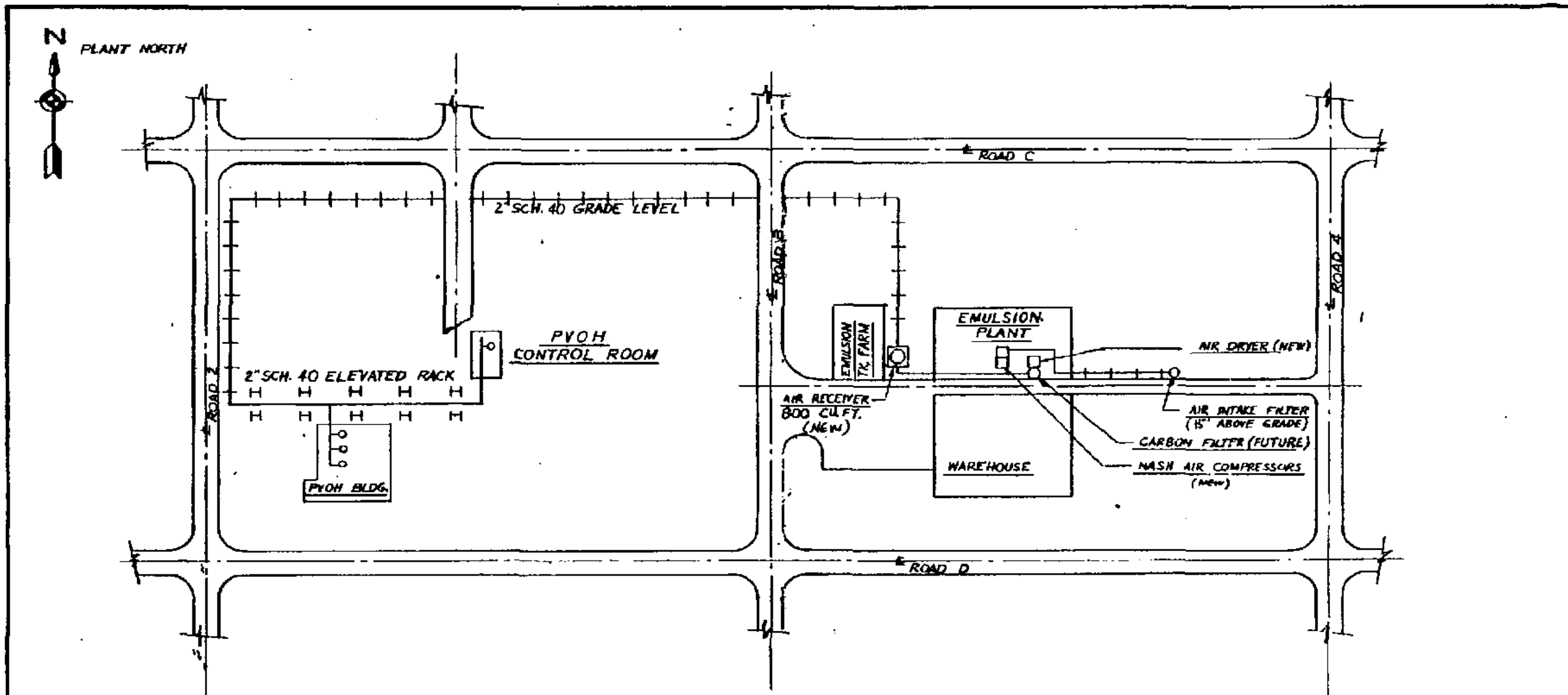
No dedicate!


CONTROL ROOM
PRESSURE REGULATOR
PYGH BLDG
PRESSURE REGULATOR
TIMER
SYSTEM PURGE VALVE
100' ELECTRIC TRACE
100' ELECTRIC TRACE
CITY WATER SUPPLY (12-25 GPM)
ANTI-SIPHON
STRAINER
ANTI-SIPHON
STRAINER
SOLENOID VALVE
BY-PASS
PRESS.
COMP.
COMPRESSOR CONTROLS
EMULSION PLANT
PRESSURE REGULATOR
PRESSURE SWITCH
INLET AIR
ANALYZER VINYL
PEAK
SOLENOID VALVE
FLOW CONTROL VALVE
RELIEF VALVE
ORIFICE
CHECK VALVE
SILENCER
SILENCER
SOLENOID VALVE
FLOW CONTROL VALVE
RELIEF VALVE
ORIFICE
FILTER DEMISTER
PRESSURE GAGE
SAFETY VALVE
AIR RECEIVER 4' x 8' 125 CU. FT.
SEPARATOR
FLOAT VALVE
SEPARATOR
FLOAT VALVE
CHECK VALVE
NASH AIR COMP.
100 CFM @ 50 PSI 40 HP
CHECK VALVE
NASH AIR COMP.
100 CFM @ 50 PSI 40 HP
DEW PT -40°F
AIR DRYER
CARBON FILTERS (FUTURE)
DRAIN
DRAIN
DRAIN
DRAIN
COOLING WATER RETURN (12-25 GPM)
NOTICE
AUG 1 3 1980
Aligned as shown.
Air Products and Chemicals
CHEMICALS GROUP INC.
BREATHING AIR P&I
1 DELETED HT. EXCHANGER SYSTEM 6-30-80 D.R.W.
SK-80-16 D
2505.03-1B001
BRUNING 44-132 44649

AP0031702


N
PROCESS AREA
EMULSION PLANT
TO PVOH PLANT
AIR RECEIVER (125 CU.FT.)
DEMINERALIZERS
DUST STOP
MOTOR CONTROL NO. 5 & 6
AIR INLET (15' ABOVE GRADE)
VINYL ANALYZER
DRYER
2"ϕ
GC 7003 REFRIG. COMP.
COOLING WATER
TIE-IN
FUTURE CARBON FILTER
GC-7004 REFRIG. COMP
EMULSION PLANT TIE IN 1"ϕ
2"ϕ
1½ CITY WATER TIE-IN
TRUCK ALLEY
WAREHOUSE AREA
AUG 1 3 1980
Air Products and Chemicals
CHEMICALS GROUP INC.
BREATHING AIR EQUIPMENT
LAYOUT
D.P.W.
9-10-80
SK-90-17D
2505.03-1B002
BRUNING 44-132-44648

AP0031703



NOTICE

This drawing is the property of Air Products and Chemicals, Inc. It must be [illegible] as soon as it has served the purpose [illegible] it is being furnished or upon request [illegible] in the possession of the recipient [illegible]

AUG 1 3 1980

properly safeguarded against disclosure to anyone except an employee who [illegible] for the job. The recipient must keep [illegible] and must require his employees to keep confidential the information contained herein.

REV.	DESCRIPTION	DATE	BY

Air Products and Chemicals
CHEMICALS GROUP INC.

BREATHING AIR
DISTRIBUTION SYSTEM
PVOH - EMULSION

APPR. BY	DWG. BY	DATE	DRAWING NO.	REV.
	D.R.W.	8-10-80	SK-80-18D	

2505.03-1B003

BRUNING 44-132 44648

AP00031704

Section 4.07
4.5.1.22

AIR PRODUCTS AND CHEMICALS, INC.
CALVERT CITY PROJECT ENGINEERING DEPARTMENT
ESTIMATE SUMMARY

GEF CHG?

PROJECT TITLE BREATHING AIR SYSTEM (PADH & EMHL) PROJECT NUMBER CC 1333

ESTIMATOR E.R. ZIMLICH CLASS OF ESTIMATE DEFINITIVE DATE 7/28/80

% QUOTED 30% CHECKED BY E.E. Anderson APPROVED BY T.C. Law Rev. ____ of ____

ITEM		LABOR MANHOUR	LABOR $	MATERIAL $	SUBCONTRACT $	TOTAL
EQUIPMENT						
	Pressure Vessels	104	2080	5300		7380
	Towers AIR DRYER	16	220	3380		5600
	~~Heat Exchangers~~ FILTER	8	110	250		360
	Pump - Compressors	132	1780	35560		37340
	LOW PRESS MASKS	8	110	2250		2360
	EQUIPT REMOVAL	32	430			430
	RENTAL CRANE	16	320		960	1280
A	Total Equipment	316	5050	51740	960	57750
OTHER						
B	Piping	1272	17200	9400		26600
C	Instruments	613	8310	31790		40100
D	Electrical	517	7240	7970		15210
E	Structural	37	500	500		10000
F	Concrete & Site	60	650	1310		19960
G	Insulation	75	1430	880		23100
H	Painting	146	1610	620		22230
I	Buildings					
J	HVAC					
K	Spare Parts			3580		35800
L	Freight					990
M	Plumbing					
	Total Others	2720	36940	56050		93980
	Total Direct Cost	3036	41990	107790	960	151730
FIELD COST						
	Supervision	18 %	7560			7560
	Equipment Rental	16 %	6720			6720
	Temporary Facilities	7 %	2940			2940
	Small Tools-Consumables	14 %	5880		Premium	5880
	Testing, Housekeeping	12 %	5040		Portion of	5040
	Overhead & Profit	31 %	13020		Overtime	13020
	Total Field Cost	98 %	41160			41160
DESIGN COST						
	Engineering	360				
	Drafting	360				
	Misc. Overhead					
	Estimate Cost	200				
N	Total Design Cost	920				23000
	SUBTOTAL					215890
P	Contingency, 7% of Subtotal					15110
R	Escalation, 10% of Subtotal					21600
Y	Proc. Engr. Start-Up Costs	40 MH				10000
S	Tax, 5% of Mat'l. Total					5390
T	Bldr's Risk, 0.35% of Subtotal					760
O	Interest, 0.917%/month					12500
	TOTAL					261000

AIR PRODUCTS AND CHEMICALS, INC.
Calvert City Project Engineering Dept.

EXPENDITURE & CONSTRUCTION SCHEDULE

PROJECT TITLE: Breathing Air System (Emulsion & PVOH)

PROJECT NO.: GEF-0468

DATE: July 8, 1980

CHECKED BY: _____ APPROVED BY: _____

MONTHS ELAPSED	REMARKS	CUMMULATIVE EXPENDITURES
0	Project Approval	5,000
1	Design Underway	5,500
1-1/2	Purchase Major Equipment	7,500
3	Prepare & Transmit Installation Package	10,000
4	Award Installation Contract	12,500
5	Receive Equipment	15,000
6	Begin Construction	17,000
7	Finish Construction, System Operational	77,000
8-1/2	Final Invoices	261,000

ORI