

(J.D. Watts)

ETHYL CORPORATION

INTER-OFFICE

October 10, 1975

To Mr. W. C. Strader

FROM D. E. Park/H. E. Broemmelsiek

SUBJECT Baton Rouge Plant Air System

Mr. H. O. Bourque
Mr. S. A. D'Armonc
Mr. J. E. Gonce
Mr. R. B. Hollaway
Mr. R. H. Jones
Mr. H. K. Kelley
Mr. J. K. Presswood
✓ Dr. T. R. Robinson
Mr. R. D. Sinner
Mr. R. G. Stirling

SUMMARY

This letter deals with the problems of VCI and oil in the plant air system. It is not intended to cover the problems involved in maintaining the present system. The oil problem is discussed extensively although the VCI problem may be of greater importance now. Recommendations are made in four phases to upgrade the plant air system and eventually utilize centrifugal compression (oil-free) for generation of all plant air. Some development work will be necessary to design facilities for removing VCI with systems such as potassium permanganate.

If, upon reconsideration, the level of VCI in the plant breathing air system is judged to be acceptable, Phase I, which deals with VCI removal, would be eliminated.

INTRODUCTION

A simplified schematic of the plant air system is attached to show the relative locations of the compressors. Also, attached is a table showing approximate air rates for the different areas and uses. Instrument air for the processing areas is obtained by drying plant air. In TEL and PVC, oil removal facilities are also included but the systems are not designed to handle the relatively large quantities of oil originating from the portable compressors. Mask air is also derived from the plant air system through the Ethyl standard Mask Air Reducing Stations. These stations are located as needed throughout all areas and include a filter of batting and activated carbon (see attachments).

PROBLEMS

Based on the Power group's operating experience, recent analyses of the breathing air, recent shift coverage in the PVC plant, and Dr. T. R. Robinson's September 24 letter on "Plant Breathing Air System," several problems are apparent with the existing plant air system.

EC4710

E-03778

1. VCI in the Mask Air

Medical has judged VCI concentrations in the mask air to be "hygienically unsatisfactory." This problem is not immediate in the sense that personnel will become sick upon breathing it; rather, it is a long term potential problem. Since the mask air originates from plant air, the VCI is also present in plant air.

2. Oil in the Plant Air

At least three problems are caused by oil in the plant air. Oil and water combine to form sludges that effectively plug water traps throughout the air distribution system. This results in condensate holdup within the piping system during low air demand (night) and large slug flows in some areas as the flow rates are suddenly increased (beginning of day shift).

Instrumentation problems in the PVC plant have been traced to excessive amounts of oil in the instrument air caused primarily by the portable air compressors. Portable air compressors utilize injection of oil into compressor air for lubrication and to remove heat of compression. Oil temperatures are maintained between 180-190°F to prevent moisture condensation within the compressor system. This operation protects the compressor but puts all incoming water vapor into the plant air system. The intimate contact between oil and air results in oil carryover as a fine mist. Failure of the lambs wool filter has resulted in dumping the compressor oil into the system over a short time period. Excessive carryover can also occur when the plant air pressure drops below 80 psig.

Oil used in the stationary reciprocating compressors also causes difficulties. Although these units have jacketed cylinders, an intercooler and an aftercooler to remove heat of compression, the air temperatures still reach 395°F before the aftercooler. Excessive oil use - as indicated by long ring life and short valve life - results in oil carryover from these compressors also. Oil cracking contributes to deposits that foul exhaust valves and plug aftercooler tubes. Light hydrocarbons may also be formed that would go into the plant air system as vapor.

Oiled compressors occasionally cause fires in the plant air system and high carbon monoxide concentrations may reasonably be expected to result. Carbon monoxide is generated in compressor cylinders by partial combustion of lubricating oil and carbon deposits. This is the usual source although contaminated intake air is also a potential source. Fires fed by accumulated oil deposits in the air supply headers will also generate carbon monoxide. Plant air is checked for carbon monoxide content once a day on day shift; but, to fully protect a user, continuous monitoring with an alarm would be required at most mask air stations.

EC4711

The last fire in our plant air system occurred in October, 1974, when No. 7 compressor aftercooler was ruined. Although no employees reported to Medical, there were unofficial reports of discomfort being experienced with the breathing air. (The incident was apparently detected initially by mask air users.) Serious injury was probably averted by the dilution effect of air from other compressors. However, the presence of oil in the air distribution system means a fire is possible past the compressors which (with an ignition source; e.g., welding on air line) could create a more hazardous situation. While the use of activated charcoal in the mask air reducing stations is essential for adsorbing lead alkyls from the air, it will also serve to mask telltale odors caused by a fire. According to the Deltech Engineering regional sales manager, OSHA in at least one location has stopped the use of activated charcoal alone (without CO removal facilities) in breathing air systems because of this effect.

RECOMMENDATIONS

Although oil in the plant air is a significant problem, the VCl present in the mask air may provide justification for correction. Accordingly, we propose four phases of work on the plant air system with the first phase dealing with VCl removal. If, upon reconsideration, the level of VCl in the plant breathing air system is judged to be acceptable, Phase I would be eliminated.

Phase I - AC-21 compressor (centrifugal type which produces oil free air) in the Oxy plant contributes from one-third to one-half of the plant air requirements. This compressor serves the Hydrocarbons Area and Central Shops - Sandblasting, exclusively; Sodium and the TEL area, partially. From previous data, AC-21 is probably the main source of VCl contamination. The Phase I work described here assumes that cleaning up the AC-21 contribution to plant air will remove the VCl problem. The proposed system is based on scrubbing the air stream with potassium permanganate to eliminate the VCl. R&D Polymer Research demonstrated the feasibility of permanganate scrubbing but additional development work is needed to complete a design package. Specifically, the following questions need definition.

1. What are the products of the KMnO_4 -VCl reaction? If chlorine is released, removal facilities will be needed.
2. Will a permanganate bed suffice in place of a 2% KMnO_4 solution? Use of a bed would eliminate the auxiliary equipment needed for handling a liquid scrubbing system.

EC4712

E-03780

3. What is the effect of temperature on VCl removal with a bed rather than a solution? AC-21 discharges air at 120 to 130°F. If cooling is desirable to maintain good conversion, a water cooled aftercooler and separator will be needed. Insulation and minimal heating of the bed may be necessary to prevent condensation of water from the saturated air stream.

4. Would a multiple layer bed be more efficient than KMnO_4 alone; e.g., activated charcoal followed by KMnO_4 repeated several times? Using charcoal in a surge capacity may spread out peak concentrations and provide more complete removal.

5. What conversion efficiency is achieved at low concentrations (0.5 to 1.0 ppm) of VCl in air? Polymer Research work was based on a standard gas - 85 ppm VCl in nitrogen.

6. What is the effect of scale-up on conversion efficiency? Air distribution problems may force the design to many small units rather than one or two large converters.

For this first phase, the entire AC-21 contribution to the plant air system would be treated to remove VCl. While only a small part of that air is used for breathing air, it seems more feasible to treat one source than to service each mask air reducing station. This latter approach was considered using Del-Monox Air Purifiers but these units are primarily for conversion of carbon monoxide to carbon dioxide. Deltech Engineering will not recommend their units for VCl removal.

Phase II - The primary purpose of this phase is removal of oil slugs into the plant air system from the portable compressors. This would be achieved by routing the portable air to existing receivers before entering the supply headers as outlined in the following steps:

1. Route the portable air from Well No. 13 location to the two receiver tanks at Drum Blast. Re-pipe the drain lines on these tanks for easy blowdown.

2. Eliminate the portable hook-up spot south of No. 1 Cell Room because of the potential for chlorine entry into the plant air via a leak in the chlorine transfer lines in that area.

3. At the Kemp pad location, add one additional hook-up spot to replace the spot eliminated in Step 2. Provide new discharge lines from each end of the portable compressor header to the Nos. 1, 2, 3, 4, 5, and 7 air receivers. Route both lines through the water in the No. 2 Reservoir to achieve some cooling of the air before entering the receivers.

EC4713

E-03781

Phase III - This phase would put the mask air and instrument air users on AC-21 air through the addition of separate headers.

1. Take off of the six-inch supply header from the Hydrocarbons Area at a point upstream of the line branching to Sodium. Supply the Sodium mask air station and the TEL mask air stations from this point as well as the TEL instrument air dryer.

2. Change the blind location in the eight-inch plant air to Shops line to take the Shops Sandblast air from the TEL area (not from AC-21).

3. Install a new header to PVC from the Central Shops area to supply AC-21 air for mask air and instrument air use. A takeoff at Sandblast should be provided for mask air use in that area. The Drumming Plant mask air may also be serviced from this new header.

4. Relocate the mask air supply to Drum Blast to pick up air from AC-21. (Presently obtained from AC-21 but Step 2 changes the source.)

Phase IV - After the third phase work provides for oil-free mask and instrument air, the next step is to provide backup capacity for AC-21. This would be accomplished by gradually replacing the stationary compressors with centrifugal units and tying them into the plant air system to insure oil-free mask air with AC-21 down. While this work is listed last, any replacement of existing compressors in the interim is strongly recommended to be made with centrifugal rather than oil-lubricated capacity.

Comments on these proposals are invited.



H. E. Broemmelsiek

HEB:jht

EC4714

E-03782

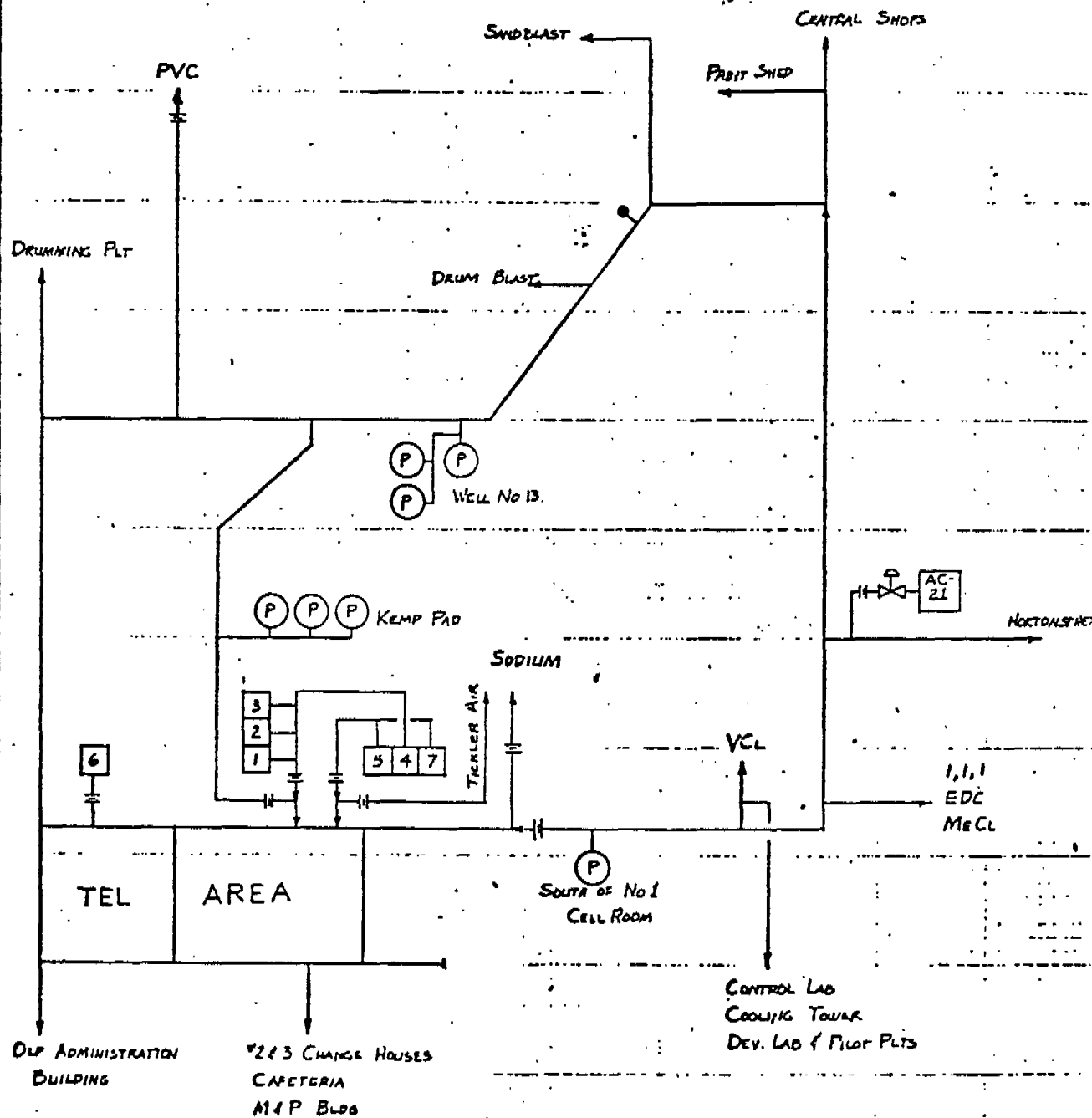
STATIONARY COMPRESSORS ☐

No	LOCATION	CAPACITY, SCFM
1	No 2 PUMP House	645
2		645
3		645
4	No 2 AIR COMP House	645
5		785
6	No 1 AIR COMP House	785
7	No 2 AIR COMP House	1300
AC-21 OXY PLANT		3400 TO 4400

ETHYL CORPORATION
R&D DEPARTMENT
PROCESS FLOW DIAGRAM

PORTABLE COMPRESSOR HOOK-UP SPOTS. (P)

ETHYL OWNED 600 SCFM
RENTED 600, 1200 OR 1600 SCFM



EC4715

E-03783

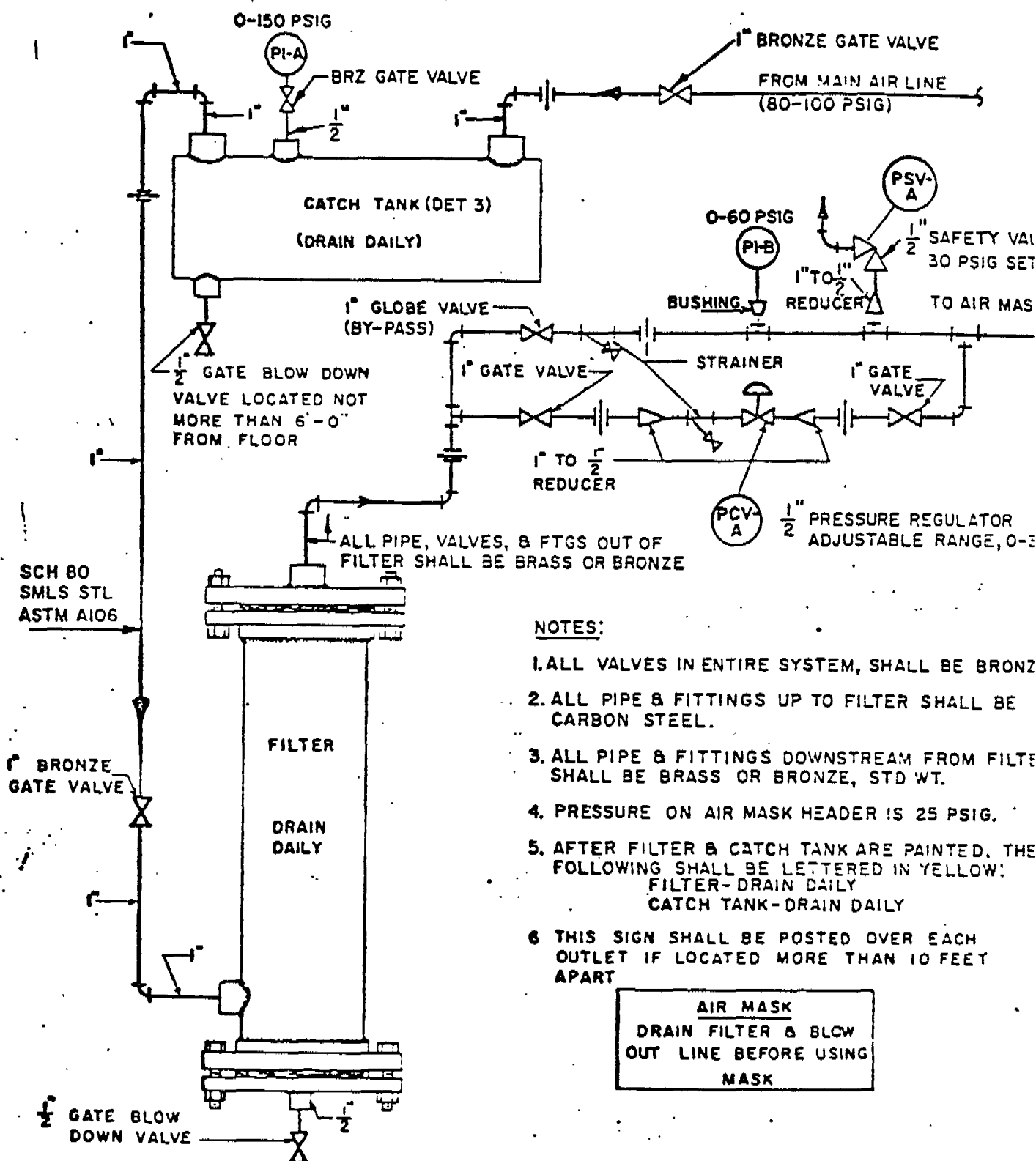
PLANT AIR CONSUMPTION			
		DATE	10-3-75
		BY	HEB
USER	PLANT AIR SCFM	INSTRUMENT AIR SCFM	MASK AIR SCFM
TEL	1250 ⁽¹⁾	250	35
SODIUM	1800	300	NIL
H.C.	—	800	NIL ⁽⁵⁾
PVC (2)	200	550	20 ⁽⁵⁾
DRUM BLAST (3)	1490	—	10
CENTRAL SHOPS, SAND (4) BLAST & H.C. MAINT	1465	—	35
	6905	1900	100

- (1) ASSUMES STD USE & INCLUDES "D" BLDG OPERATING 18 TEL N/C's.
- (2) PVC USE METERED AS PLANT AIR BEFORE INSTRUMENT AND MASK AIR TAKEOFFS.
- (3) ESTIMATED VALUE PER HKK DURING DRUM CLEANING OPERATION
- (4) ESTIMATED VALUE PER HKK BASED ON CHANGE IN AIR SENT TO TEL AREA AT END OF DAY SHIFT.
- (5) SIGNIFICANT INCREASES IN MASK AIR CONSUMPTION ARE POSSIBLE AFTER APRIL 1, 1976 IN THESE AREAS.

EC4716

E-03784

AIR MASK REDUCING SYSTEM		AG-3-
APPROVAL CHIEF ENGR.: GSR DATE: 11-15-54 REV 7 APR 72 GENERAL REV		SHEET <u>1</u> OF <u>1</u> DRAWN <u>BCH</u>



EC4717

E-03785

AG-3-3

AIR MASK REDUCING SYSTEM

ENGINEERING DEPARTMENT

SHEET 2 OF 3

DRAWN BCH

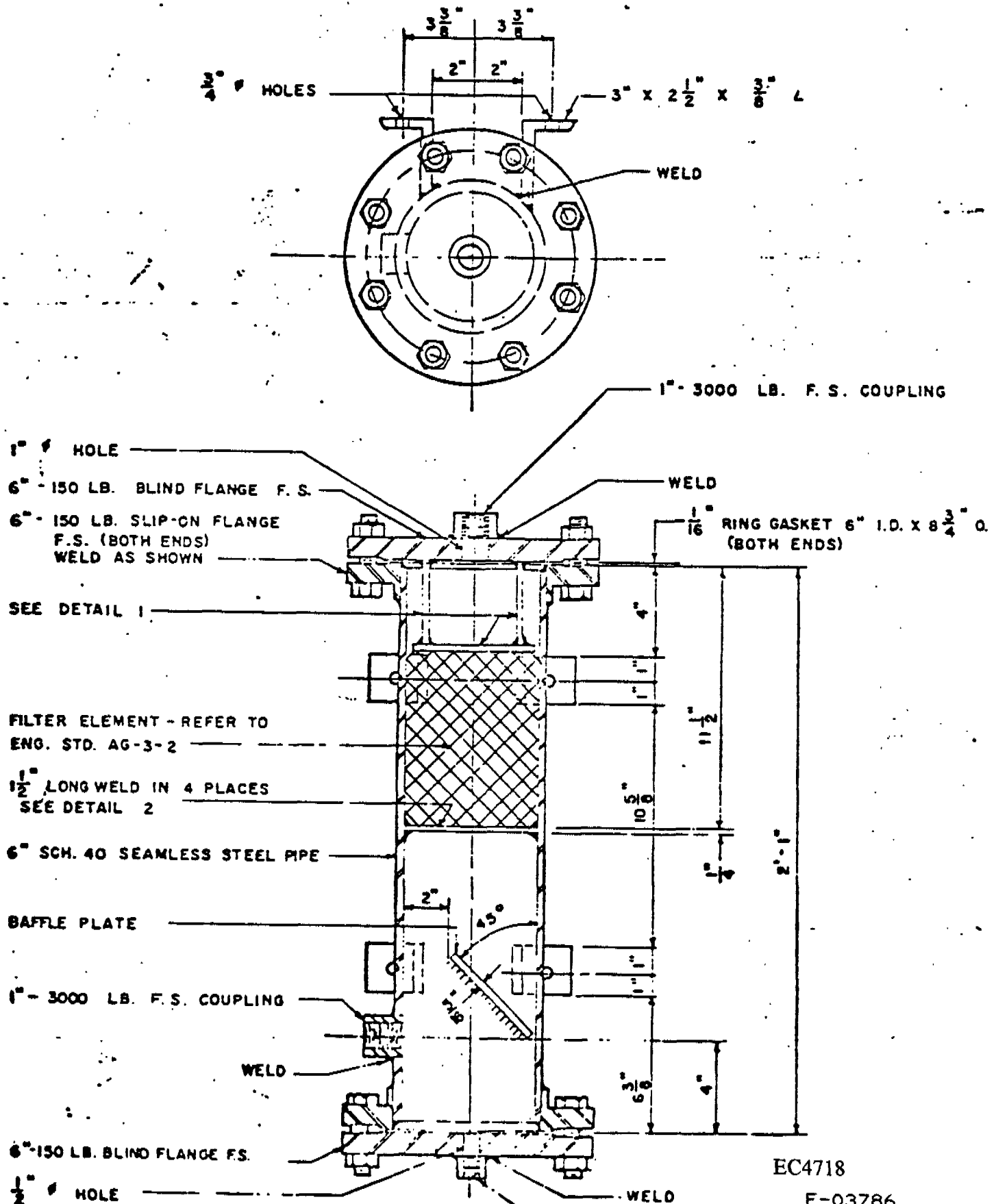
APPROVAL

CHIEF ENGR.: GSR (DATE: 11-15-54)

REV 7

APR 72

NO CHG ON THIS SHT



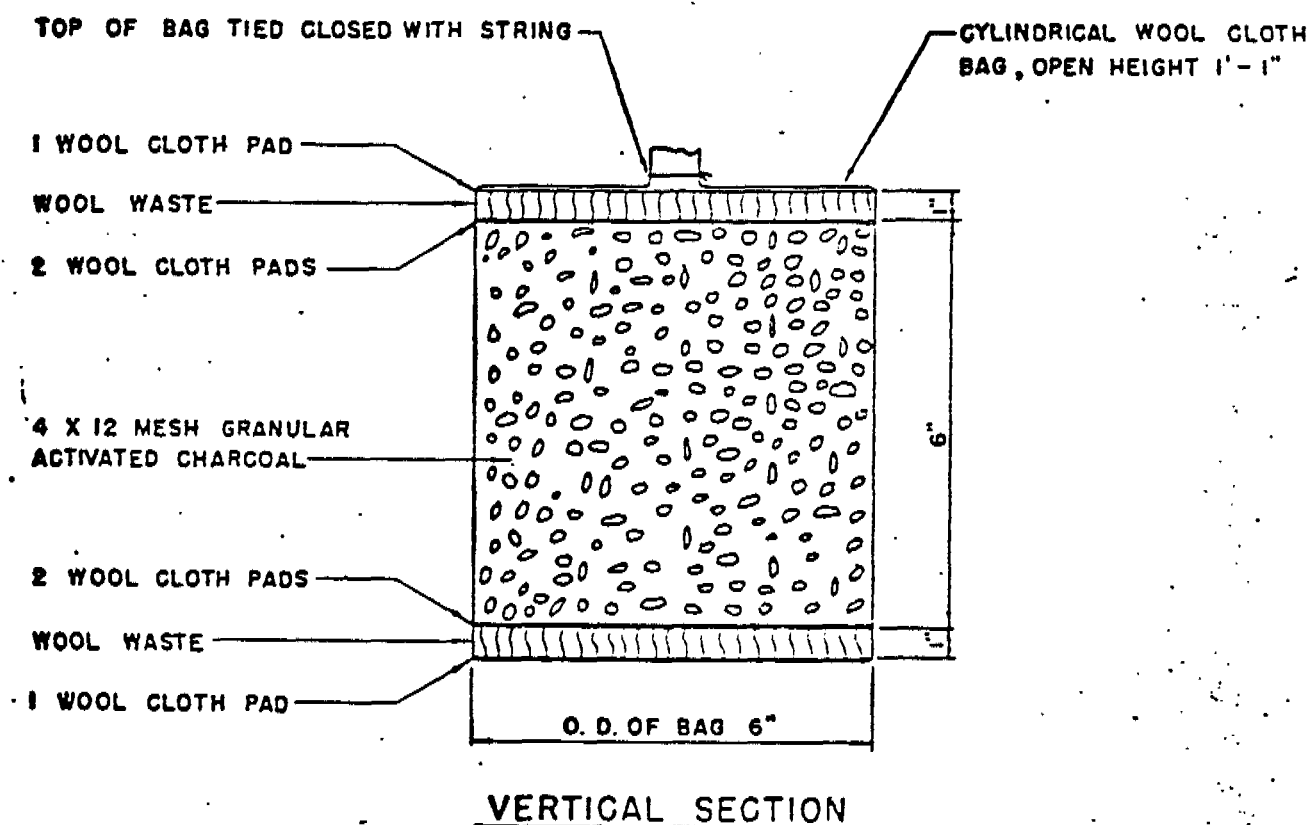
EC4718

E-03786

APPROVALS	REV. 2	DEC., 1956
OPERATIONS		
M & C		
CHIEF ENGR.		EDITORIAL REVISION

AIR MASK FILTER ELEMENT

ENG STD AG
SHEET 1 OF 1
DRAWN W.O.S.
DATE 3-6-5



NOTES:

1. MATERIAL FOR WOOL CLOTH BAG & WOOL CLOTH PADS TO BE 100% VIRGIN WOOL SERGE OR 100% VIRGIN WOOL GABARDINE.
2. FOR USE IN STANDARD AIR FILTER AS SHOWN ON ENG. STD. AG-3-3, INVERT BAG BEFORE INSERTING IN FILTER.

EC4719

E-03787

