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REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION-NBR: 9207220382 DOC. DATE: 92/07/17 NOTARIZED: NO DOCKET #
 FACIL: 50-387 Susquehanna Steam Electric Station, Unit 1, Pennsylvania 05000387
 AUTH. NAME AUTHOR AFFILIATION
 METER, J.J. Pennsylvania Power & Light Co.
 STANLEY, H.G. Pennsylvania Power & Light Co.
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 92-010-00: on 920613, offgas sys guard bed B experienced elevated temps. Caused by less than adequate procedural guidance for guard bed purging. Procedural guidance developed for operation of offgas beds. W/920717 ltr. r.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 12
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July 17, 1992

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 92-010-00
FILE R41-2
PLAS -531

Docket No. 50-387
License No. NPF-14

Attached is Licensee Event Report 92-010-00. Although it was determined that this condition is not reportable, this Voluntary report is being submitted in order to provide information to the Commission.

H.G. Stanley
Superintendent of Plant - Susquehanna

JJM/mjm

cc: Mr. T. T. Martin
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. G. S. Barber
Sr. Resident Inspector
U.S. Nuclear Regulatory Commission
P.O. Box 35
Berwick, PA 18603-0035

9207220382 920717
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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) **Susquehanna Steam Electric Station - Unit 1** DOCKET NUMBER (2) **0 5 0 0 0 3 8 7 1** PAGE (3) **1 OF 1**

TITLE (4) **Offgas System Guard Bed "B" Experienced Elevated Temperatures**

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)												
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)											
0	6	13	9	2	9	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

OPERATING MODE (9) 2	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
POWER LEVEL (10) 0 0 2	<input type="checkbox"/> 20.406(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
	<input type="checkbox"/> 20.406(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(vii)	<input checked="" type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A)
	<input type="checkbox"/> 20.406(a)(1)(iii)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	Voluntary
	<input type="checkbox"/> 20.406(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
	<input type="checkbox"/> 20.406(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME **J. J. Meter - Power Production Engineer** TELEPHONE NUMBER **7 1 7 5 4 2 - 1 1 8 7 3**

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14) YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On 06/13/92 at 1100 hours with Unit 1 in condition 2 at 2% power, the "1B" guard bed experienced a temperature excursion after purging the guard bed with heated air and during an air purge of the Unit 1 Offgas recombiner. Internal guard bed temperature indications were offscale high (greater than 150° F) and contact pyrometer readings indicated possible charcoal ignition. The guard bed was then isolated. Emergency Activation Level Procedures were consulted and it was determined that no Emergency Plan level needed to be declared. By 1300 hours, indications were that the guard bed was cooling at a rate of about 7° F per hour. The cause of the guard bed temperature rise was attributed to wetting and subsequently drying the guard bed charcoal with heated air. An event review team was established to analyze the incident. Root causes included less than adequate procedural guidance for guard bed purging as well as others. The guard bed charcoal was replaced and programmatic changes were made prior to Unit startup. Some long term corrective actions remain to be implemented. There were no compromises to the health and safety of the public.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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FACILITY NAME (1) Unit 1 Susquehanna Steam Electric Station	DOCKET NUMBER (2) 0 5 0 0 0 3 8 7 9 2	LER NUMBER (6)			PAGE (3)						
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER							
		9	2	0	1	0	0	2	OF	1	1

TEXT (If more space is required, use additional NRC Form 366A's) (17)

BACKGROUND INFORMATION

During normal unit operation, process steam from the Main turbine exhaust is condensed into water in the main condenser (EIIS Code: SG). To ensure efficient condensation, the noncondensable gases resulting from radiolysis and air in-leakage are continuously removed by steam-driven ejector nozzles. Hydrogen is recombined with oxygen in the recombiner train (EIIS Code: WF, see attached figure 1). The remaining gases ejected from the main condenser are then directed through the off-gas charcoal treatment system (EIIS Code: WF, see attached figure 2). The purpose of the off-gas ambient charcoal system is to delay the release of radioactive fission gases to the environment. This allows for Xenon and Krypton activity to decay while in the charcoal thus minimizing activity release. This works to keep radiation exposure at the plant site boundary within the limits established by the Code of Federal Regulations.

The off-gas system consists of three recombiner trains, one for Unit 1, one for Unit 2, and one common. There are two off-gas treatment systems, one for Unit 1 and one for Unit 2. Each one of these off-gas treatments systems consists of two water removal and temperature reduction subtrains with a guard bed which then enter a common charcoal adsorber assembly. (See Figures 2 & 4).

A low pressure air system is provided to regenerate (dry) guard bed charcoal should it adsorb water in excess of 5.5% by weight. The system consists of an air compressor, and a heater to assist in drying.

EVENT TIMELINE

On 6/6/92 Unit 1 was shutting down in preparation for maintenance of a reactor water feedpump (EIIS Code: SK). When the Unit was in Condition 3 at 2% power, the Unit 1 recombiner system isolated on a high hydrogen signal (greater than 2%). In order to maintain required vacuum in the main condenser, the common recombiner was aligned to Unit 1 and placed in service. Common recombiner parameters were oscillating while the system was in service. A manual drain valve (169084) from the common condensate cooler was found to be closed. The valve was subsequently opened. Common recombiner parameters stabilized and the recombiner was ultimately shutdown when main condenser vacuum was no longer required. Conditions indicated that both the "1A" and "1B" guard beds received moisture while the common recombiner was aligned to them with the manual drain valve closed.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9 2	0 1 0	0 0	0 3	OF 1 1

TEXT (If more space is required, use additional NRC Form 366A's) (17)

During the week, 6/7 - 6/12, heated air purges of the "1A" and "1B" guard beds were performed first using low pressure air and then later using instrument air. Indications were that the "1B" was drying but the "1A" was not. Plans were made to use the "2A" guard bed in conjunction with the "1B" to fulfill the need for two guard beds during a Unit startup. The "2A" would then be removed from service in Condition 1.

On 6/12/92 at 2215 hours a final purge of the "1B" guard bed (250° F air) was being performed (see figure 3) because conditions indicated that the "1B" was still slightly moist. At 0515 hours on 6/13/92, the heater for the purge was turned off when the guard bed internal temperature was 135° F. Air flow was continued until 0545 hours at which time the internal temperature indicated 120° F.

On 6/13/92, at 0900 hours the main control room was notified by the radwaste control room that the "1B" guard bed temperature was offscale high (greater than 150° F). Initial investigation did not show the external tank wall to be hot. It was believed that the elevated temperatures were a result of residual heat from the recently completed drying purge and that they would drop once cool air flowed through the bed. The "1B" bed was aligned to the Unit 1 recombiner for an air purge as part of normal recombiner startup. At 1100 hours local pyrometer readings of the "1B" guard bed indicated 406° F and the bed was subsequently isolated.

In the next hour the following occurred:

- O A temporary monitor was installed in the radwaste control room to expand the scale for the in-bed temperature elements. A maximum temperature of 372° F was recorded at 1226 hours.
- O Contact pyrometer readings of the guard bed were continued. Although a peak temperature of 762° F was recorded, the in-bed temperature readings are believed to be more representative of the guard bed temperatures.
- O Access to the guard bed room was controlled by Operations.
- O Emergency Activation Level Procedures were consulted and it was determined that no Emergency Plan level needed to be declared.

LICENSEE EVENT REPORT (LER)
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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

By 1300 hours a steady downward trend of about 7° F per hour was indicated on the temporary monitor in the radwaste control room. This was interpreted as combustion had ceased within the guard bed and the cooling process had begun. Since the offgas system was not available to support increasing reactor power, at 1445 hours with Unit 1 at 2% power the mode switch was placed to shutdown. By the afternoon of 6/15, the "1B" guard bed had reached ambient temperatures.

CAUSE OF EVENT

The ignition of the activated charcoal in the guard bed was attributed to the following phenomenon: Charcoal when wet and subsequently dried, will undergo an embrittlement process and fracture into smaller particles. This increases the total charcoal surface area on which oxidation can take place. Charcoal, by nature will adsorb elemental oxygen, and react with it at a rate dependent on temperature and charcoal conditions (e.g. shape, physical arrangement). This process will occur at room temperature and it releases heat. This will increase the temperature of the charcoal which in turn increases the rate of reaction. If heat cannot be removed rapidly enough, a self sustaining temperature rise will occur that will ignite the charcoal.

Analysis of the guard bed showed that under no-flow conditions, the physical configuration of the guard bed vessel will tend to increase the potential for spontaneous ignition. It was estimated that the ignition temperature, given the existing configuration, is in the range of 125° F to 150° F. It is believed that the combination of wetting the guard bed charcoal during the Unit shutdown and subsequent drying using a 250° F heated air purge of the guard bed increased the internal charcoal temperature to its ignition point in the manner described above.

REPORTABILITY/ANALYSIS

The event was determined to be not reportable under the requirements of the Code of Federal Regulations, Chapter 10. 10CFR 50.72 b(1)(vi) states "Any event that poses an actual threat to the safety of the nuclear power plant or significantly hampers site personnel in performance of duties necessary for the safe operation of the nuclear power plant including fires, toxic gas releases, or radioactive releases. In this case the guard bed was isolated and contained in its own room and was therefore no threat to the safety of the plant or personnel. Site

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		9 2	- 0 1 0	- 0 0	0 5	OF	1 1

TEXT (If more space is required, use additional NRC Form 356A's) (17)

Emergency Activation Level procedures were also reviewed and it was determined that no Emergency Plant level was warranted.

Although the event was determined to be not reportable, this Voluntary report is being submitted in accordance with an agreement with the Commission on 6/19/92. Lessons learned in association with this event could be useful to the rest of the industry.

There were no offsite releases associated with the event and therefore there were no compromises to the health and safety of the public.

ACTIONS TAKEN

Immediate Actions:

On 6/13/92, at 1100 hours, when local pyrometer readings indicated 406° F the "1B" guard bed was isolated. Pyrometer readings were continued as well as installing temporary monitors for internal bed temperature measurements. Access to the guard bed room was controlled by Operations. Emergency Activation Level Procedures were consulted and it was determined that no Emergency Plan level needed to be declared. Since the offgas system was not available to support increasing power, the mode switch was placed in shutdown.

POST EVENT INVESTIGATION:

An Event Review Team was established to analyze the incident, identify the causes, and recommend corrective actions. Root causes and causal factors for the event was determined to be:

- 0 Less than adequate procedural guidance and training for purging of guard beds.
- The oxidation process of the charcoal was not fully understood and subsequently not addressed in operating procedures or training.
- Acceptance criteria for when a guard bed was considered dry was less than adequate.
- Acceptance criteria for the need of a purge verses continued bed operation was less than adequate.



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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		-	0 1 0	-	0 0	0 6	OF 1 1

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- Acceptance criteria for change out of guard bed verses purging a wet guard bed was less than adequate.
- o Less than adequate procedural guidance and training for actions to take following a recombiner that isolates on a high hydrogen signal.
- o Operator oversight of a caution sticker on the local recombiner panel which was the flagging mechanism to identify valve 169084 as being closed.
- o Less than adequate guidance on caution forms (e.g. did not state that the common recombiner was unavailable for standby operation for Unit 1 when valve 169084 is closed).
- o Two valves in the Unit 1 recombiner system leaked by and had not been repaired.
- o Less than adequate corrective action to a previous Susquehanna guard bed incident in 1987.

CORRECTIVE ACTION AND ACTIONS TO PREVENT RECURRENCE

Actions Taken Prior to Unit 1 Startup:

- o Procedural guidance was developed for operation of offgas beds with regard to 1) indications of moisture content and high temperature 2) criteria for removal of bed from operation 3) criteria for when charcoal is to be changed. Purging of guard beds was removed from procedures.
- o Procedural guidance was developed for proper and safe removal of hydrogen from an isolated recombiner including a restart.
- o All caution forms were reviewed for adequacy and additional clarification was provided as necessary.
- o Repairs were made to leaking valves in the Unit 1 recombiner system.
- o Charcoal of the "1A" and "1B" guard beds was replaced.
- o The first of five main charcoal adsorber tanks was investigated for the presence of water. None was found.

LICENSEE EVENT REPORT (LER)
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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9 2	- 0 1 0	- 0 0	0 7	of 1 1

TEXT (If more space is required, use additional NRC Form 366A's) (17)

0 Operating procedures were revised to eliminate removal of primary steam jets from service during a Unit shutdown. This reduces the likelihood of a high hydrogen isolation of a recombiner during a Unit shutdown.

Long Term Corrective Actions:

- 0 Samples of charcoal removed from the "1B" guard bed will be sent to a vendor and analyzed for the presence of contaminants that could have lowered the charcoal ignition temperature.
- 0 Procedures will either be developed to describe purge drying a guard bed taking into consideration this event and technical material related to charcoal ignition or purging of guard beds will be eliminated altogether.
- 0 Recommendations of the 1987 guard bed incident, will be reevaluated in light of this event and actions taken as necessary.

ADDITIONAL INFORMATION

Failed Components: None

Previous Similar Events: One guard bed ignition in 1987. That event was evaluated to be not reportable at that time.

Reference Information: Factory Mutual Data Sheet 8-10 "Coal and Charcoal Storage"

Factory Mutual Data Sheet 7-12 "Waste Solvent Recovery"

Fire protection Handbook (16th Edition)

SFPE Handbook of Fire Protection

Engineering, Section 1 - Chapter 22

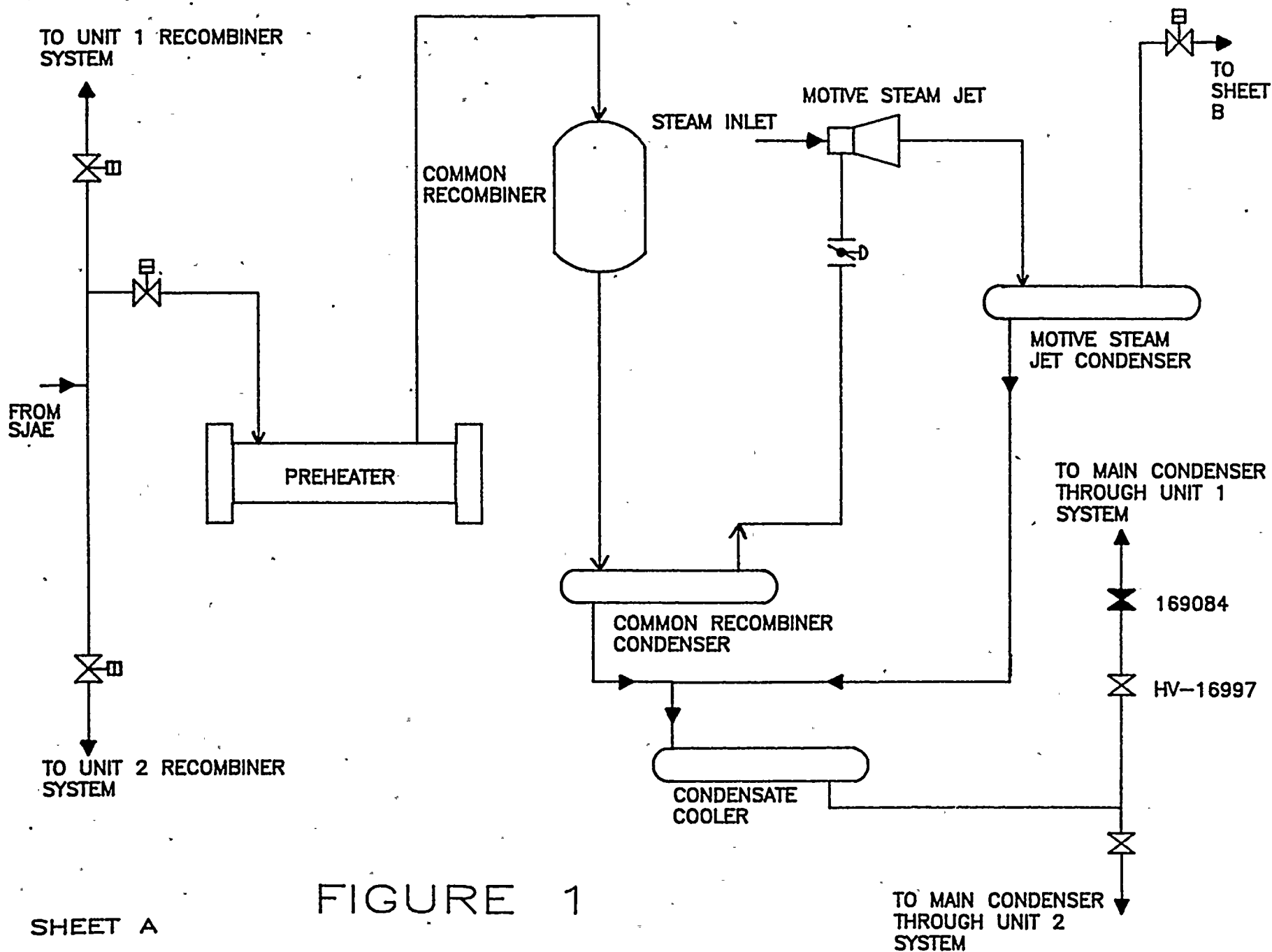


FIGURE 1

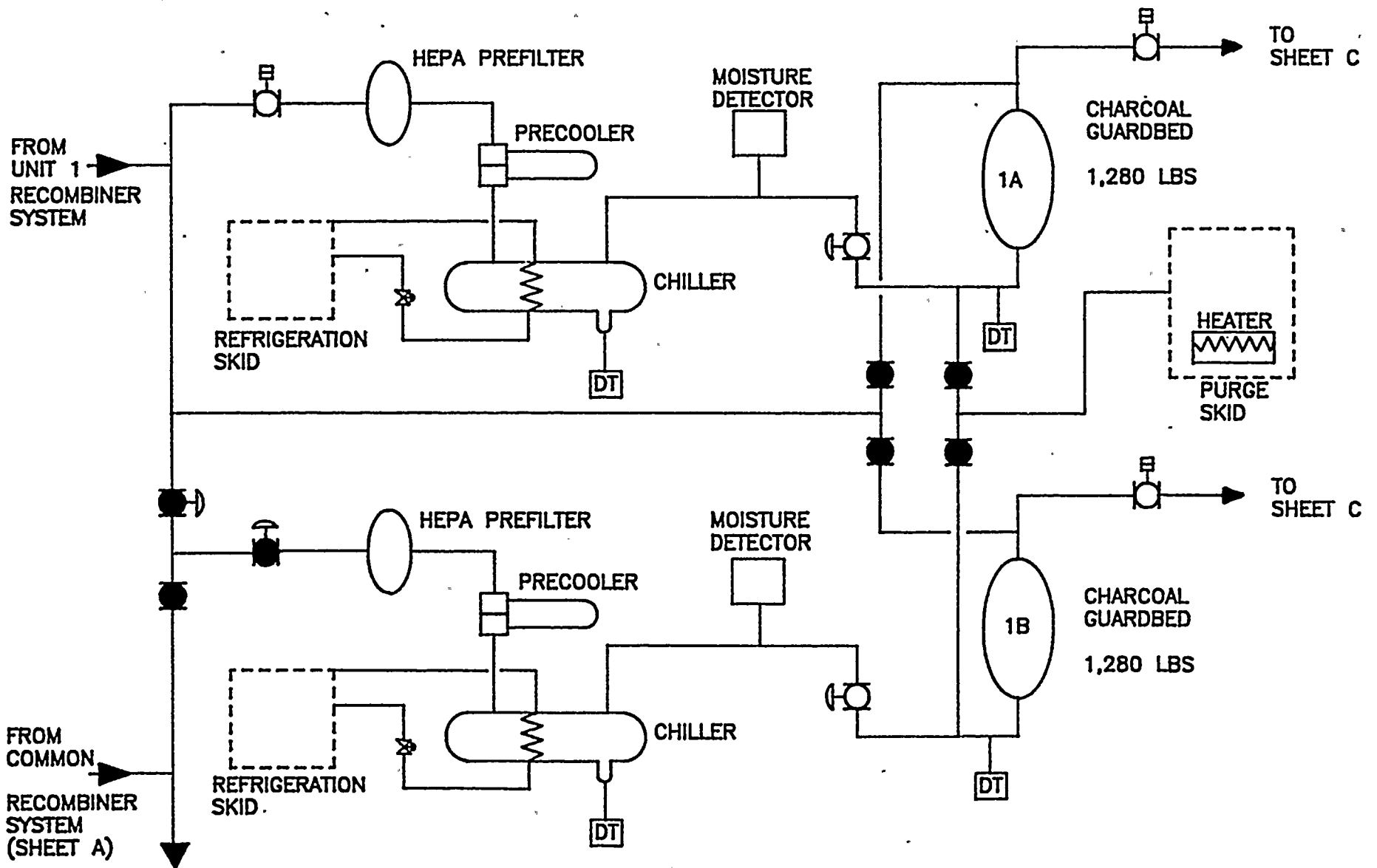
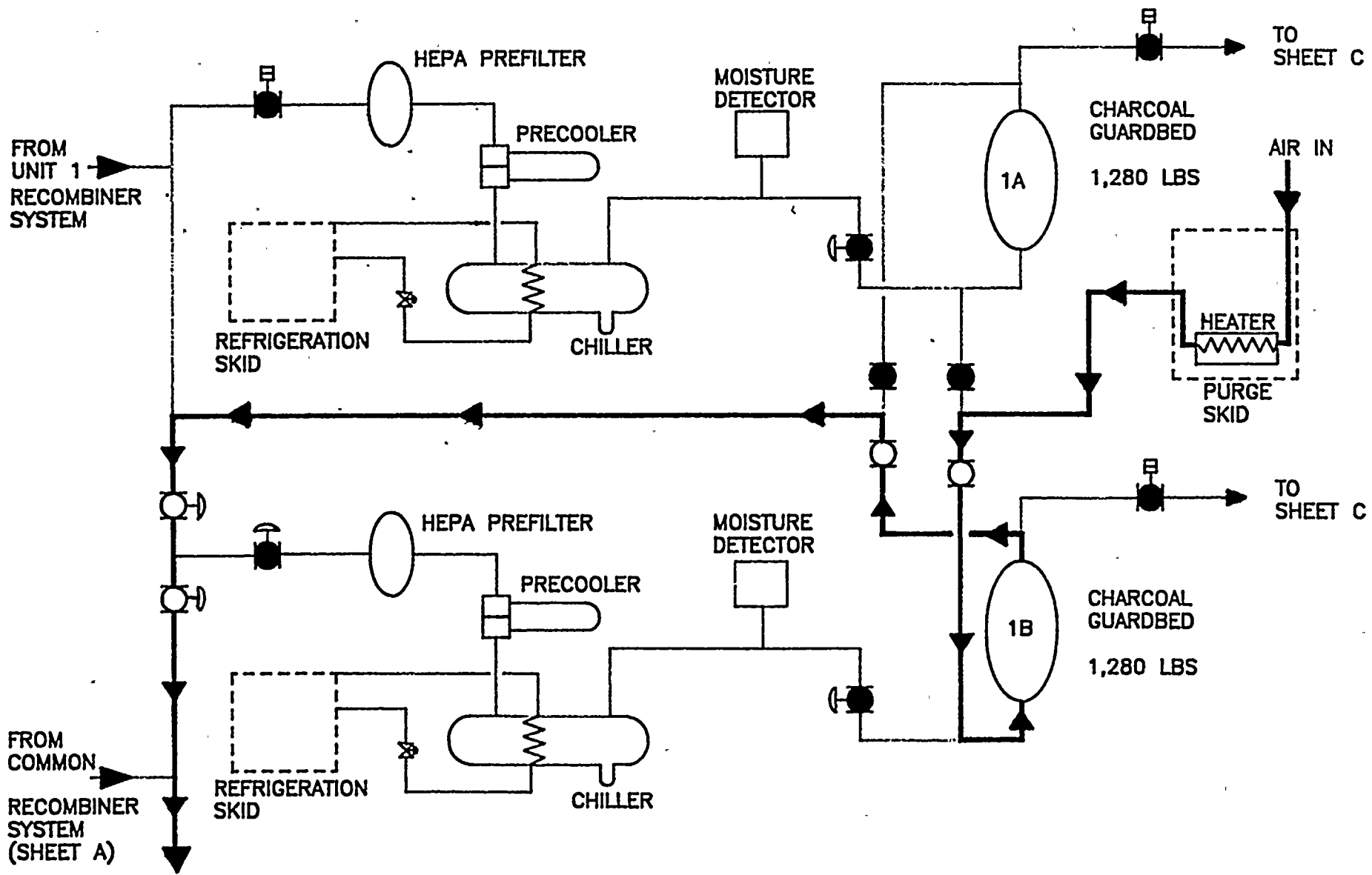


FIGURE 2

UNIT 2
CHARCOAL SYSTEM

SHEET B



UNIT 2
CHARCOAL SYSTEM

FIGURE 3

PURGE OF "1B" GUARDBED

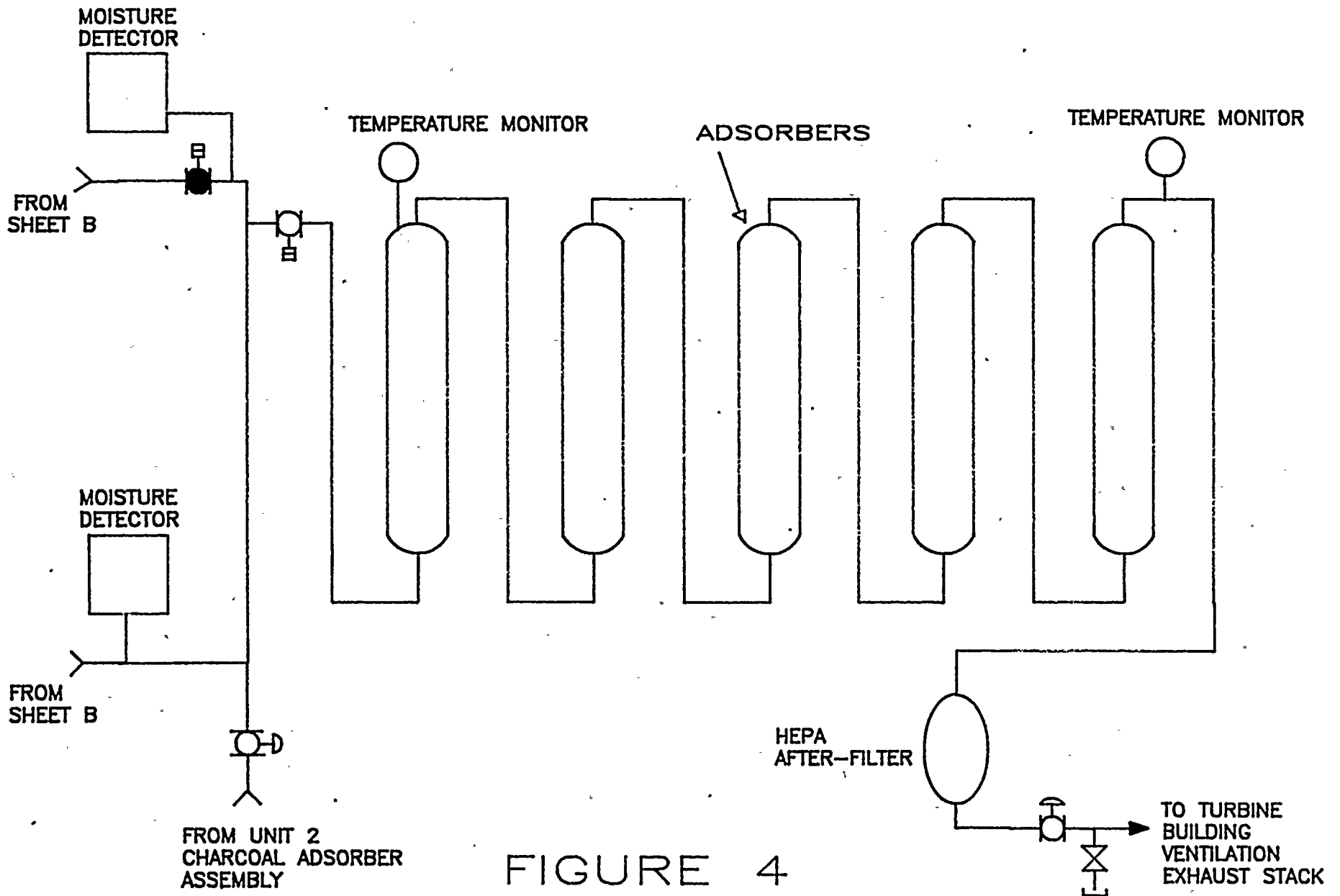


FIGURE 4