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October 18, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Byron Generating Station Units 1 and 2
Braidwood Generating Station Units 1 and 2
HVAC Systems
NRC Docket Nos. 50-454/455 and 50-456/457

Dear Denton:

This letter provides additional information regarding the testing of filters and ducts in the Byron/Braidwood HVAC filter systems. This information is supplied at the request of the NRC Staff to address the questions regarding FSAR commitments.

Attachment A to this letter contains responses to Staff questions on filter and duct testing with respect to Regulatory Guide 1.152 and 1.140. Attachment B contains the handouts from a meeting with the NRC in Bethesda on June 5, 1984. Attachment C contains revised FSAR pages which reflect agreements reached with NRC Staff regarding these matters.

Please address further questions regarding this matter to this office.

Very truly yours,

T. R. Tramm

T. R. Tramm
Nuclear Licensing Administrator

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Attachments

9349N

B001
1/1

ATTACHMENT A

A. Response to NRC's Questi ns on Filter and Duct Leak Testing (Regulatory Guide 1.52)

Question 1

Audible leaks must be sealed.

Response

Prior to final system turnover, the non-accessible exhaust system of the auxiliary building HVAC system , the control room recirculation system, and the Fuel Handling fuilding exhaust system will be operated and the ductwork will be visually and audibly checked for leaks. Leaks will be sealed.

Question 2

Ensure laboratory analysis on charcoal be performed when painting, fire or chemical release occurs.

Response

This will be ensured per commitment in the Technical Specification. Signs will be posted in the auxiliary building warning workers that the charcoal dampers should be closed to avoid charcoal damage when painting, generating smoke, or releasing chemicals.

B. Response to NRC's Questions on Filter and Duct Leak Testing (Regulatory G. ide 1.140)

Question 1

Radwaste Building: Does the contaminated interspace have an MCP concentration less than 1.1 times the MPC concentration within the duct?

Response

Yes. The interspace concentration is equal to or less than the concentration in the ductwork.

Question 2

Does the volume reduction filter unit of Table 3 refer to that filtering potentially contaminated cubicle of the VR System or the VR off-gas filter unit? Both should be addressed in this table. The positive pressure portion of this duct does not qualify to exception "a" of Section 5.10.8.1 of ANSI N509-1980.

Response

The filter referenced in the table (provided in the written responses to NRC questions dated April 23, 1984, that was given to Mr. J. Hayes of the ETSB in a meeting on June 5, 1984, in Bethesda) is the unit that filters air from contaminated cubicles of the VR System. The positive pressure duct associated with this filter will be leak tested. The VR Off-gas Filter Unit is a deep bed charcoal unit that filters the process exhaust from the volume reduction system. Only ventilation system filters are addressed in the table and the VR Off-gas Filter was not included. The VR System design utilizes piping with welded connection and no ductwork is used.

Question 3

Normal Purge - What is the MPC of the duct? Is it less than 5 MPC?

Response

Yes, the duct is less than 5 MPC.

Question 4

Post-LOCA Purge - Rational for exclusion is unacceptable.

Response

Post-LOCA Purge duct that is under positive pressure will be leak tested.

Question 5

Mini-flow Purge - Is this the item on the bottom of the table?

Response

No. This is included in the discussion of normal purge ducts.

Question 6

TSC Supply - Is the TSC negative pressure duct going to be leak tested as indicated in the table?

Response

Yes. The negative pressure duct sections that would affect the habitability of the TSC will be leak tested.

ATTACHMENT B

Slides and Handouts from Meeting

June 5, 1984

Bethesda, Maryland

9349N

6.5.1 ENGINEERED SAFETY FEATURE AIR FILTRATION SYSTEM

NRC COMMENT #1 (REGULATORY GUIDE 1.52, POSITION 2.F)

"... REGULATORY POSITION 2.F OF REGULATORY GUIDE 1.52 DOES NOT ADDRESS IN-PLACE TESTING NOR ANYTHING CLOSELY RELATED TO IN-PLACE TESTING,"; "...THE STAFF WILL REQUIRE THAT IN-PLACE TESTING BE PERFORMED IN ACCORDANCE WITH REGULATORY GUIDE 1.52."

CECO RESPONSE

WE CONCUR WITH THIS COMMENT. THE INTENT OF OUR EXCEPTION TO REGULATORY POSITION 2.F WAS MEANT TO ADDRESS LIMITATIONS ON MAXIMUM CAPACITY AND OUR EXCEPTION HAS BEEN REVISED TO CLARIFY THIS. TESTING EXCEPTIONS HAVE BEEN DELETED FROM THIS EXCEPTION AND ARE NOTED IN EXCEPTIONS TO THE APPROPRIATE REGULATORY POSITIONS AS FOLLOWS:

PROPOSED FSAR REVISION

2.F THE AUXILIARY BUILDING NON-ACCESSIBLE AREA EXHAUST FILTER SYSTEM CONSISTS OF THREE BUILT-UP FILTER TRAINS (ONE STANDBY) WITH A CAPACITY OF 66,900 CFM EACH. FOR MAINTENANCE PURPOSES EACH TRAIN IS DIVIDED INTO THREE BANKS WITH EACH BANK SIZED FOR SEVEN FILTERS WIDE AND THREE HIGH.

THE AUXILIARY BUILDING ACCESSIBLE AREA EXHAUST FILTER SYSTEM HAS A CAPACITY OF 162,300 CFM. THIS SYSTEM CONSISTS OF FOUR BUILT-UP FILTER TRAINS (ONE STANDBY) AND EACH TRAIN IS DIVIDED INTO THREE BANKS. EACH BANK IS SIZED FOR SEVEN FILTERS WIDE AND THREE FILTERS HIGH.

NRC COMMENT #2 (REGULATORY GUIDE 1.52, POSITION 2.L)

"...IT IS IMPORTANT THAT THE FILTER HOUSINGS BE LEAKTIGHT. HOWEVER, THIS TEST NEED NOT BE PERFORMED IF THE APPLICANT PERFORMS A MOUNTING-FRAME-PRESSURE LEAK TEST. A MOUNTING FRAME LEAK TEST VERIFIES THAT THERE ARE NO LEAKS THROUGH THE HEPA FILTER ..."; "THEREFORE, THE STAFF WILL REQUIRE THAT A MOUNTING-FRAME-PRESSURE LEAK TEST BE PERFORMED IN LIEU OF A FILTER HOUSING TEST."

CECO RESPONSE

WE CONCUR WITH THIS COMMENT. EXCEPTION TO REGULATORY POSITION 2.L HAS BEEN REVISED AS FOLLOWS:

PROPOSED FSAR REVISION

2.L FILTER HOUSINGS

ALL OF THE AUXILIARY BUILDING AND FUEL HANDLING BUILDING EXHAUST SYSTEM FILTER HOUSINGS ARE DESIGNED IN ACCORDANCE WITH ANSI N509-76. THE HOUSINGS ARE AT NEGATIVE PRESSURE WITH RESPECT TO THEIR SURROUNDINGS AND ARE LOCATED IN THE AUXILIARY BUILDING GENERAL AREA, WHICH IS A LOW AIRBORNE RADIATION ENVIRONMENT. ANY IN-LEAKAGE FROM THE GENERAL AREA WILL NOT ADVERSELY AFFECT APPENDIX I RELEASES. HENCE, THE HOUSINGS WILL NOT BE LEAK TESTED TO THE ANSI N509-76 REQUIREMENTS. HOWEVER, FILTER MOUNTING FRAME LEAK TESTS WILL BE PERFORMED IN ACCORDANCE WITH ANSI N510-80.

THE CONTROL ROOM EMERGENCY MAKE-UP AIR SYSTEM FILTER HOUSINGS ARE DESIGNED IN ACCORDANCE WITH ANSI N509-76. THE FILTER HOUSINGS ARE AT NEGATIVE PRESSURE WITH RESPECT TO THEIR SURROUNDINGS AND ARE LOCATED WITHIN THE CONTROL ROOM BOUNDARY, WHICH IS A HABITABLE ENVIRONMENT THE SAME AS THE CONTROL ROOM. ANY IN-LEAKAGE WILL BE FROM THE CONTROL ROOM ENVIRONMENT AND, THEREFORE, WILL NOT ADVERSELY AFFECT THE QUALITY OF THAT ENVIRONMENT: HENCE, THE HOUSINGS WILL NOT BE LEAK TESTED TO ANSI N509-76 REQUIREMENTS. HOWEVER, FILTER MOUNTING FRAME LEAK TESTS WILL BE PERFORMED IN ACCORDANCE WITH ANSI N510-80.

NRC COMMENT #3 (REGULATORY GUIDE 1.52, POSITION C.)

"...THE APPLICANT HAS INDICATED THAT THE DUCTWORK WILL NOT BE LEAK TESTED IN ACCORDANCE WITH ANSI N509-76 AND HAS NOT PROPOSED ANY ALTERNATIVE TESTING FOR THE DUCTWORK; EVEN THE LESS RIGOROUS TESTING OF ANSI/ASME N509-80. THE STAFF INITIALLY ACCEPTED THE APPLICANT'S EXCEPTION TO LEAK TESTING THE DUCTWORK BECAUSE ALL RADIOACTIVITY WOULD LEAK INTO THE DUCTWORK AND WOULD BE FILTERED. HOWEVER, FURTHER CONSIDERATION OF THIS EXCEPTION HAS RAISED OTHER QUESTIONS..."

3.1 "OBVIOUSLY, THE ADDITIONAL IN-LEAKAGE TO THE DUCTS WILL RESULT IN AN INCREASE IN THE QUANTITY OF RADIOACTIVITY RELEASED OFFSITE IN THE EVENT OF AN ACCIDENT."

3.2 "HOWEVER, MORE IMPORTANTLY, A GREATER PROBLEM EXISTS WITH RESPECT TO THE POTENTIAL DEGRADATION OF THE CHARCOAL IN THE ESF FILTER TRAINS DUE TO THE UNKNOWN TRANSMISSION OF FUMES FROM PAINTING, FIRES OR CHEMICAL RELEASES VIA THE LEAKY DUCTWORK. SUCH A TRANSMISSION COULD BE CHRONIC AND PLANT PERSONNEL MAY NEVER LABORATORY-TEST THE CHARCOAL UNTIL THE SCHEDULED REFUELING OUTAGE. IN THE INTERVENING MONTHS, THE PLANT MAY HAVE BEEN OPERATING WITH CHARCOAL INCAPABLE OF PERFORMING AT THE EFFICIENCY ASSUMED IN THE STAFF'S SER.

NRC COMMENT #3 (CONT'D)

3.3 "...THE STAFF IS ALSO CONCERNED THAT THE RELATIVE HUMIDITY SEEN BY THE CHARCOAL ADSORBERS MAY BE ALTERED DUE TO THE VARIATION IN THE FLOW RATE BROUGHT ABOUT BY THIS DUCTWORK IN-LEAKAGE FROM THE VARIOUS SOURCES TO THE FILTRATION UNITS AND THAT THE ANALYSES PRESENTED BY THE APPLICANT JUSTIFYING THE EXCLUSION OF ELECTRICAL HEATERS MAY BE INVALIDATED."

"THEREFORE, IT IS THE STAFF'S POSITION THAT THE DUCTWORK ASSOCIATED WITH THE ESF FILTER SYSTEMS MUST BE PRESSURIZED AND ALL AUDIBLE LEAKS MUST BE LOCATED AND SEALED. FURTHERMORE, IN ACCORDANCE WITH ANSI/ASME N509-80, ALL DUCTS MUST BE SUBJECTED TO A QUANTITATIVE MEASUREMENT OF LEAKAGE UNLESS THE DUCT IS LOCATED WITHIN A CONTAMINATED SPACE OR PROTECTED SPACE (AS DEFINED IN ANSI/ASME N509-80) OR HAS A LENGTH OF THIRTY FEET OR LESS MEASURED EITHER FROM THE FAN OR THE AIR CLEANING UNIT TO ITS TERMINUS. THE ALLOWABLE LEAK RATES FOR THE DUCTS SHOULD BE IN CONFORMANCE WITH SECTION 4.12 OF ANSI N509-80."

CECO RESPONSE: AUXILIARY BUILDING HVAC SYSTEM

DUCT LEAKAGE EFFECTS

SYSTEM FUNCTION AND LAYOUT

FIGURE 1 IS A SIMPLIFIED SCHEMATIC WHICH SHOWS ONE-HALF OF THE AUXILIARY BUILDING SYSTEM, WHICH IS SHARED BETWEEN UNIT 1 AND UNIT 2.

THE AUXILIARY BUILDING HAVC SYSTEM SERVES MULTIPLE FUNCTIONS. IT OPERATES DURING NORMAL PLANT OPERATION TO PROVIDE CONDITIONED AIR TO THE GENERAL AREAS FOR COOLING PURPOSES. THE AIR SUPPLIED TO THE GENERAL AREA IS THEN INDUCED INTO CUBICLES WHICH HAVE BEEN CATEGORIZED AS "ACCESSIBLE" AND "NON-ACCESSIBLE." THE "NON-ACCESSIBLE" CUBICLES, SHOWN ON THE ATTACHED, ARE SO CATEGORIZED DUE TO THEIR POTENTIAL FOR BECOMING CONTAMINATED DURING EITHER NORMAL OPERATION OR POST-ACCIDENT. AS YOU CAN SEE IN THIS LISTING OF NON-ACCESSIBLE CUBICLES, SEVERAL CUBICLES OTHER THAN THE ESF PUMP CUBICLES ARE CATEGORIZED AS "NON-ACCESSIBLE." ALSO, "NON-ACCESSIBLE" CUBICLES OR AREAS ARE FOUND ON EVERY ELEVATION OF THE AUXILIARY BUILDING.

THE AIR IS INDUCED INTO THE CUBICLES BY THE AUXILIARY BUILDING EXHAUST SYSTEM, WHICH DRAWS AIR FROM EACH CUBICLE, THROUGH PREFILTERS AND HEPA'S AND DISCHARGES THAT AIR TO THE OUTDOORS THROUGH THE PLANT VENTILATION STACK.

THE AIR DRAWN FROM THE "NON-ACCESSIBLE" CUBICLES IS MONITORED BY RADIATION MONITORS LOCATED IN THE DUCTS, UPSTREAM OF THE FILTER UNITS, AS WELL AS IN THE PLANT VENT STACKS. ON A HIGH RADIATION SIGNAL, THE CONTROL ROOM OPERATOR CAN DIRECT THE "NON-ACCESSIBLE" AREA EXHAUST THROUGH CHARCOAL AND HEPA FILTERS. NORMALLY,

HOWEVER, THESE FILTERS ARE BYPASSED AND NO EXHAUST AIR FLOWS THROUGH THESE FILTERS.

THE EXHAUST DUCTS FROM THE "ACCESSIBLE" AREAS IS ROUTED FROM THESE AREAS THROUGH THE GENERAL AREA TO THE PRE/HEPA FILTERS. ACCESSIBLE AREA EXHAUST DUCTWORK, EXCEPT FOR ABOUT A 5 FOOT SECTION OF DUCT, IS NOT ROUTED THROUGH NON-ACCESSIBLE AREAS.

ALL DUCTWORK ON THE SUCTION SIDE OF THE EXHAUST FANS, WHICH IS THE MAJORITY OF DUCTWORK, IS UNDER A NEGATIVE PRESSURE. THERE IS NO DUCTWORK BETWEEN THE PRE/HEPA FILTER PLENUMS AND THE MAIN EXHAUST FANS AND ONLY A SHORT DUCT (LESS THAN 30 FEET) BETWEEN THE CHARCOAL FILTER BOOSTER FANS AND THE MAIN EXHAUST FAN. THIS DUCTWORK IS WITHIN A HOUSING.

THE QUANTITY OF AIR SUPPLIED TO THE GENERAL AREAS AND TO THE CUBICLES IS BASED ON MAINTAINING DESIGN TEMPERATURES DURING NORMAL PLANT OPERATION WITH A LOWER LIMIT TO MAINTAIN DIRECTION OF FLOW INTO THOSE POTENTIALLY CONTAMINATED AREAS WITH LOW HEAT GAIN DURING NORMAL OPERATION. ON THIS MODE THE SYSTEM FUNCTIONS AS A NON-ESF COOLING SYSTEM WITH NON-ESF FILTRATION (REGULATORY GUIDE 1.140).

POST-ACCIDENT, THE SYSTEM ASSUMES ADDITIONAL FUNCTIONS. COOLING THE ESF PUMPS LOCATED IN CUBICLES IS PROVIDED BY COOLERS LOCATED WITHIN THE PUMP ROOM WHICH RECIRCULATE AND COOL THE CUBICLE AIR. AIR CONTINUES TO BE EXHAUSTED FROM THE "NON-ACCESSIBLE" AREAS AND ON SI OR HIGH RAD SIGNAL IS DIRECTED THROUGH THE CHARCOAL FILTERS.

IF NO COINCIDENT LOEP OCCURS, THE REMAINING COMPONENTS OF THE AUXILIARY BUILDING SYSTEM OPERATE AS IN NORMAL PLANT OPERATION. IF A COINCIDENT LOEP OCCURS, UNTIL DIESEL LOADS ARE SHED (APPROXIMATELY 2 HOURS), ONLY 2 CHARCOAL BOOSTER FANS OPERATE TO MAINTAIN THE BUILDING AT A NEGATIVE PRESSURE AND FILTER AIR FROM THE ESF PUMP CUBICLES AS WELL AS OTHER "NON-ACCESSIBLE AREAS" (THE LATTER NOT REQUIRED, BUT IS DONE BASED ON DESIGN FOR NORMAL PLANT OPERATION). THUS, POST ACCIDENT, THE AUXILIARY BUILDING HVAC SYSTEM OPERATES PRIMARILY AS AN ESF FILTRATION SYSTEM. DURING THIS LATTER MODE, THE CONTAMINATED SPACE COULD BE CONSIDERED TO BE THE ENTIRE AUXILIARY BUILDING.

AS YOU CAN SEE THIS SYSTEM HAS MULTIPLE PERSONALITIES AND DOES NOT FIT NEATLY INTO THE CATEGORIES DEFINED BY ANSI N509 MAKING INTERPRETATIONS VERY DIFFICULT. IT IS IMPORTANT TO KEEP A CLEAR UNDERSTANDING OF THE SYSTEM'S FUNCTION DURING ANY DISCUSSION OF SCENARIOS.

DUCT CONSTRUCTION

THE CONSTRUCTION DETAILS OF THE DUCTWORK USED FOR THE AUXILIARY BUILDING HVAC SYSTEM MEETS OR EXCEEDS THAT USED THROUGHOUT THE SHEET METAL INDUSTRY AS RECOMMENDED BY SMACNA, SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION. IN MOST CASES, THE DUCTWORK IS ONE GAUGE HEAVIER THAN THAT RECOMMENDED BY SMACNA. THE TRANSVERSE JOINTS AND LONGITUDINAL SEAMS ARE IN ACCORDANCE WITH SMACNA RECOMMENDATIONS.

THE TRANSVERSE JOINTS ARE ALL GASKETED, BOLTED COMPANION ANGLE TYPE (SEE FIGURE 2) WITH COMPANION ANGLE JOINT CORNERS SEALED TO LIMIT LEAKAGE.

THE LONGITUDINAL SEAMS FOR DUCTS LESS THAN 48" IN EITHER WIDTH OR HEIGHT ARE MECHANICAL LOCK SEAMS (PITTSBURGH LOCK) WHICH IS A MULTIPLE LAYER, INTERLOCKING JOINT. FOR DUCTS 48" AND LARGER, THE LONGITUDINAL SEAMS ARE WELDED.

THERE IS A LOT OF SHEET METAL INDUSTRY EXPERIENCE WITH THIS TYPE OF CONSTRUCTION AND THE EXPERIENCE HAS SHOWN THAT LEAKAGE LESS THAN 1% OF SYSTEM CAPACITY IS POSSIBLE. SMACNA, IN THE HIGH PRESSURE DUCT CONSTRUCTION STANDARDS, STATES:

> "HIGH VELOCITY DUCTS MUST BE SUFFICIENTLY AIR TIGHT TO INSURE ECONOMICAL AND QUIET PERFORMANCE OF THE SYSTEM. IT MUST BE RECOGNIZED THAT AIR TIGHTNESS IN DUCTS AS PRACTICAL MATTER CANNOT, AND NEED NOT, BE ABSOLUTE (AS IT MUST BE IN WATER PIPING SYSTEM). ADEQUATE AIR TIGHTNESS CAN NORMALLY BE ASSURED BY: A) SELECTION OF CONSTRUCTION

DETAIL KNOWN TO COMPLY WITH THE FUNCTIONAL STANDARDS NUMBER 3 AND NUMBER 4 IN CHAPTER 11; B) PROPER ASSEMBLY AND C) ELIMINATION OF LEAKS THAT ARE AUDIBLE AND THOSE THAT CAN BE FELT BY HAND.

WHEN AIR AT A PRESSURE OF 4" W.G. OR GREATER ESCAPES THROUGH A SMALL ORIFICE, IT WILL CAUSE NOISE. AS GREATER AMOUNTS OF AIR ESCAPE FROM THE ORIFICE, THE NOISE LEVEL WILL INCREASE. CORRELATION OF EXPERIENCE IN ELIMINATING ALL AUDIBLE LEAKS AND ACTUAL MEASUREMENT OF LEAKAGE HAS LED TO THE CONCLUSION THAT BY ELIMINATING ALL LEAKS WHICH ARE AUDIBLE TO THE AVERAGE PERSON IN REASONABLY QUIET SURROUNDINGS, THE TOTAL LEAKAGE WILL BE LESS THEN (1) PERCENT OF THE SYSTEM CAPACITY.

FURTHERMORE, LEAKAGE TESTS ARE AN ADDED EXPENSE IN SYSTEM INSTALLATION. THE DESIGNER SHOULD DETERMINE THE ACTUAL NEED FOR LEAKAGE TESTS, IN SOME CASES REPRESENTATIVE TESTS (OF SELECTED PORTIONS OF A SYSTEM) MAY BE DESIRED; IN OTHERS THE COMPLETE SYSTEM MAY BE TESTED. WHEN PROJECT REQUIREMENTS ARE SUCH THAT THE THREE ELEMENTS OF LEAKAGE CONTROL MENTIONED ABOVE WILL NOT SERVE TO INSURE SATISFACTORY INSTALLATION, THE PROJECT DOCUMENTS SHOULD CLEARLY INDICATE THE EXTENT OF TESTING REQUIRED. TEST PROCEDURES ARE DESCRIBER HEREINAFTER."

OUR EXPERIENCE WITH DUCT LEAKAGE TESTING HAS SHOWN THAT WITH THIS TYPE OF CONSTRUCTION LEAKAGE OF 0.05 CFM/FT^2 IS POSSIBLE. (THIS IS LESS THAN HALF THE ALLOWABLE LEAKAGE RATE FOR ESF CLASS II DUCTS IN N509.) FOR EXAMPLE, 150 FEET OF 44 x 20 LABORATORY EXHAUST SYSTEM DUCTWORK FABRICATED TO THIS TYPE OF CONSTRUCTION WAS TESTED AT BYRON AND FOUND TO EXHIBIT .03 CFM/FT^2 OF LEAKAGE.

LET US PUT THIS QUANTITY IN PERSPECTIVE FOR THIS TYPE OF SYSTEM. WITH A TOTAL SYSTEM CAPACITY OF AROUND 350,000 CFM, THE LEAKAGE RATE IS AS SOWN IN TABLE 2.

THE MOST STRINGENT REQUIREMENT IS 1% OF SYSTEM CAPACITY. REMEMBER THAT OUR SYSTEM HAS MULTIPLE PERSONALITIES. WHAT IS THE APPROPRIATE SYSTEM CAPACITY FOR AIR CLEANING EFFECTIVENESS? AND WHY IS 1% LEAKAGE THE SACRED NUMBER? IN THIS CASE, THE CAPACITY IS SET PRIMARILY BY NORMAL COOLING REQUIREMENTS AND NOT BY FILTRATION REQUIREMENTS. THUS, THE ALLOWABLE LEAKAGE RATE COULD BE MUCH HIGHER. HEALTH PHYSICS, IN TERMS OF AFFECTING OFFSITE DOSE, SHOULD BE THE LIMITING FACTOR. FOR THIS CASE, THE IMPACT OF DUCT LEAKAGE IS NEGLIBLE ON OFFSITE DOSE, POST-ACCIDENT, SINCE ALL THE LEAKAGE IS INTO THE DUCTWORK UPSTREAM OF THE FILTERS. DURING NORMAL OPERATION, INLEAKAGE WILL ALSO BE FILTERED IF AIRBORNE PARTICULATE OR GASEOUS IODINE LEVELS EXCEED MONITORING LIMITS EXPECIALLY SINCE ACCESSIBLE AREA DUCTWORK IS NOT ROUTED THROUGH NON-ACCESSIBLE AREAS.

IN ADDITION, AS I POINTED OUT BEFORE, THE AUXILIARY BUILDING COULD BE CLASSIFIED AS A CONTAIMINATED SPACE POST-ACCIDENT (SINCE OUTSIDE AIR IS BEING DRAWN INTO THE BUILDING AND COULD CONTAIN HIGH CONCENTRATIONS OF PARTICULATE NOBLE GASES, IODINE AND, THEREFORE,

AS YOU POINTED OUT IN YOUR COMMENT, WOULD NOT BE REQUIRED TO BE LEAK TESTED.

FOR THESE REASONS WE DO NOT FEEL A COMPLEX, COSTLY, LEAKAGE TEST IS REQUIRED.

TO FURTHER SUPPORT THIS, WE WOULD LIKE TO POINT OUT THAT ALL AUXILIARY BUILDING HVAC SYSTEM DUCTWORK IS INSTALLED IN ACCORDANCE WITH HVAC CONTRACTOR'S QC PROCEDURES AND IS THOROUGHLY INSPECTED AFTER INSTALLATION. A SAMPLE CHECKLIST IS ATTACHED.

FROM THIS CHECKLIST YOU CAN SEE THAT THE INSTALLATION IS INSPECTED TO ENSURE PROPER CONNECTIONS AND WILL HELP TO MINIMIZE GROSS LEAKAGE DUE TO INCOMPLETE INSTALLATION (MISSING ACCESS DOORS) WHICH IS THE MOST PROBABLE CAUSE OF HIGH LEAKAGE.

IN ADDITION TO THE DETAILED INSPECTION, THE HVAC SYSTEM IS TESTED AND BALANCED. ACTUAL SYSTEM AND BRANCH AIRFLOWS ARE MEASURED USING PITOT TUBES AND FLOWS ARE BALANCED TO ACHIEVE DESIGN FLOW RATES. DURING THIS PROCESS, GROSS LEAKAGE WOULD BE DETECTED IF DESIGN FLOW RATES COULD NOT BE ACHIEVED WITHIN MEASUREMENT TOLERANCES. IT IS ALSO POSSIBLE TO COMPARE MAIN SYSTEM FLOW RATES WITH THE SUM OF THE FLOWS FROM EACH BRANCH AND THUS IDENTIFY ANY MAJOR FLOW DISCREPANCIES.

THESE MEASURES, WE FEEL, WILL ENSURE THAT GROSS LEAKAGE WOULD BE DETECTED AND NECESSARY CORRECTIVE ACTION TAKEN. ANY REMAINING LEAKAGE WOULD NOT BE SIGNIFICANT OR DETRIMENTAL TO THE BASIC SYSTEM FUNCTION. WITH THIS IN MIND, THE FOLLOWING ARE THE SPECIFIC RESPONSES TO THE THREE ISSUES IDENTIFIED:

3.1 EFFECTS ON OFFSITE RADIACTIVITY RELEASES

BECAUSE OF THE DUCT ROUTING, DIRECTION OF AIRFLOW FROM CLEAN TO DIRTY AND SYSTEM OPERATION LEAKAGE INTO THE ACCESSIBLE OR NON-ACCESSIBLE AREA EXHAUST DUCTWORK IN THE GENERAL ACCESS AREAS WILL BE CLEAN AND, IN RELATION TO OVERALL FLOW RATES, SHOULD BE A RELATIVELY SMALL QUANTITY. THE ACCESSIBLE AREA DUCTWORK IS ROUTED THROUGH THE CLEAN AREAS WITH THE EXCEPTION OF A 5 FOOT SECTION OF DUCT. THERE WOULD NOT BE ANY POTENTIALLY CONTAMINATED AIR LEAKAGE INTO THE ACCESSIBLE AREA DUCT WHICH WOULD BYPASS THE CHARCOAL FILTERS. INLEAKAGE INTO THE NON-ACCESSIBLE AREA DUCTWORK ALONG WITH THE EXHAUST FROM OTHER NON-ACCESSIBLE CUBICLES WILL BE MONITORED BY RAD MONITORS LOCATED IN BRANCH DUCTS AT THE INLET TO THE FILTER PLENUMS. THIS EXHAUST AIR WILL THEN BE DIRECTED TO CHARCOAL FILTERS IF LEVELS EXCEED MONITOR SETPOINTS. IN ADDITION, PLANT VENT STACK RAD MONITORS MEASURE AND RECORD PARTICULATE, NOBLE GAS AND IODINE CONCENTRATIONS AND ALARM CONDITIONS WHICH EXCEED MONITOR SETPOINTS. TOTAL VENT STACK AIRFLOW RATES ARE RECORDED.

3.2 EFFECT ON CHARCOAL EFFICIENCY

WITH RESPECT TO DEGRADATION OF CARBON EFFICIENCY DUE TO UNKNOWN TRANSMISSION OF FUMES, THE CHARCOAL FILTERS WILL NOT BE IN THE AIRFLOW PATH UNLESS THERE IS A HIGH RADIATION PRESENT IN THE NON-ACCESSIBLE AREA EXHAUST IN EXCESS OF MONITOR SETPOINTS.

IF THE CHARCOAL FILTERS ARE ON LINE, LEAKAGE INTO THE DUCTWORK WILL NOT RESULT IN ANY SIGNIFICANT INCREASE IN DEPOSITION OF

3.2 EFFECT ON CHARCOAL EFFICIENCY (CONT'D)

CHEMICAL FUMES ON THE FILTERS. IF A RELEASE DID OCCUR IN THE GENERAL AREA OF THE AUXILIARY BUILDING DUE TO THE GENERAL LAYOUT OF THE BUILDING, THE PRINCIPLE AIR MOVEMENT PATTERN IN THE BUILDING (I.E., DIRECTION OF AIRFLOW FROM GENERAL AREAS TO CUBICLES), THE OPEN HATCHES AND STAIRWELLS THROUGHOUT THE BUILDING AND EXISTENCE OF NATURAL THERMAL DUCTS THROUGH THE GENERAL AREA, THE FUMES COULD END UP ON THE FILTERS EVEN IF THERE WERE NO INLEAKAGE. IT CANNOT BE PREVENTED. THEREFORE, IT HAS TO BE ASSUMED THAT A RELEASE IN ANY AREA, OTHER THAN INSIDE AN ACCESSIBLE CUBICLE, COULD END UP IN THE CHARCOAL FILTERS IF IT IS NOT REMOVED BY OTHER MEANS (I.E., PLATE OUT OR OTHER ABSORPTION MECHANISM).

3.3 EFFECT ON RELATIVE HUMIDITY

SINCE GROSS LEAKAGE WILL BE DETECTED THROUGH THE DUCT INSPECTION AND TESTING AND BALANCING, THE REMAINING LEAKAGE FOR THIS TYPE OF DUCT CONSTRUCTION WILL RESULT IN VERY INSIGNIFICANT LEAKAGE COMPARED TO THE TOTAL SYSTEM FLOW RATE.

IF WE VERY CONSERVATIVELY ASSUME 10% LEAKAGE INTO THE EXHAUST DUCTS IN THE GENERAL AREA, ADJUST THE FLOW RATES ASSUMED IN THE MOISTURE CONTENT CALCULATIONS ACCORDINGLY, AND FURTHER CONSERVATIVELY ASSUME THAT THE INLEAKAGE AIR IS AT 100% RH, THE RELATIVE HUMIDITY WOULD BE INCREASED FROM 51% TO APPROXIMATELY 59%. IN FACT, LEAKAGE RATES OF UP TO 30% OF THE AIRFLOW RATE COULD BE TOLERATED AND STILL NOT RAISE THE EXHAUST AIR RELATIVE HUMIDITY ABOVE 70%.

3. EFFECT ON RELATIVE HUMIDITY (CONT'D)

FIGURE 3 SHOWS WHAT INSIGNIFICANT EFFECT LEAKAGE HAS ON THE RELATIVE HUMIDITY OF THE AIR STREAM ENTERING THE FILTER PLENUM EVEN WITH THESE CONSERVATIVE ASSUMPTIONS.

IN CONCLUSION, THE REQUIREMENT FOR DUCT LEAKAGE TESTING FOR THE AUXILIARY BUILDING DUCTWORK IS UNNECESSARY AND EXCESSIVE BASED ON SYSTEM FUNCTION, LAYOUT, CONSTRUCTION AND PRESENT INSPECTION AND TESTING PROCEDURES. THE MAGNITUDE OF POTENTIAL LEAKAGE HAS RELATIVELY LITTLE OR NO IMPACT ON OFFSITE DOSE, CARBON EFFICIENCY DEGRADATION OR EFFLUENT RELATIVE HUMIDITY.

PROPOSED FSAR REVISIONS

NONE

TABLE 1

Room Description	Floor Elevation
Filter Valve Aisle	383'
Filter Rooms	383'
Filter Pipe Tunnels	383'
Pipe Tunnel - Units 1 and 2	394'-6"
Residual Heat Remover Mixed Room - 1A, 1B, 2A and 2B	357'
Pipe Penetration Area - Units 1 and 2	364'
Pipe Tunnel - Units 1 and 2	375'
Safety Injection Pump - 1A, 1B, 2A and 2B	364'
Positive Displacement Charging Pump Room - Units 1 and 2	364'
Centrifugal Charging Pump Room - 1A, 1B, 2A and 2B	364'
Recycle Hold-up Tank Pipe Tunnel	374'-6"
Residual Heat Remover Pump Room - 1A, 1B, 2A and 2B	343'
Containment Spray Pump Room - 1A, 1B, 2A and 2B	343'
Recycle Evaporator Feed Pump - OA and OB	346'
Recycle Evaporator Room - OA and OB	344'-6"
Gas Decay Tank Valve Aisle	346'
Gas Decay Tank Room	346'
Gas Decay Tank and Recycle Evaporator Pipe Tunnel	355'-4" & 358'-2"
Collection Drain Sump Room - Units 1 and 2	346'
Floor Drain Sump Room - Units 1 and 2	330'
Equipment Drain Pump Room - Units 1 and 2	330'

TABLE 2

AUXILARY BUILDING

HVAC SYSTEM

ESTIMATED ALLOWABLE LEAKAGE

	N509 DUCT LEAK RATE (*)	TOTAL LEAKAGE CFM (*)
AIR CLEANING EFFECTIVENESS	1.0%	3,500 (.06 CFM/FT^2)
DUCT AND HOUSING QUALITY	.10 CFM/FT^2	6,000
HEALTH PHYSICS	-	N.A.

* CLASS II DUCT, 350,000 CFM 60,000 FT^2

FIGURE 1
AUXILIARY BUILDING HVAC SYSTEM

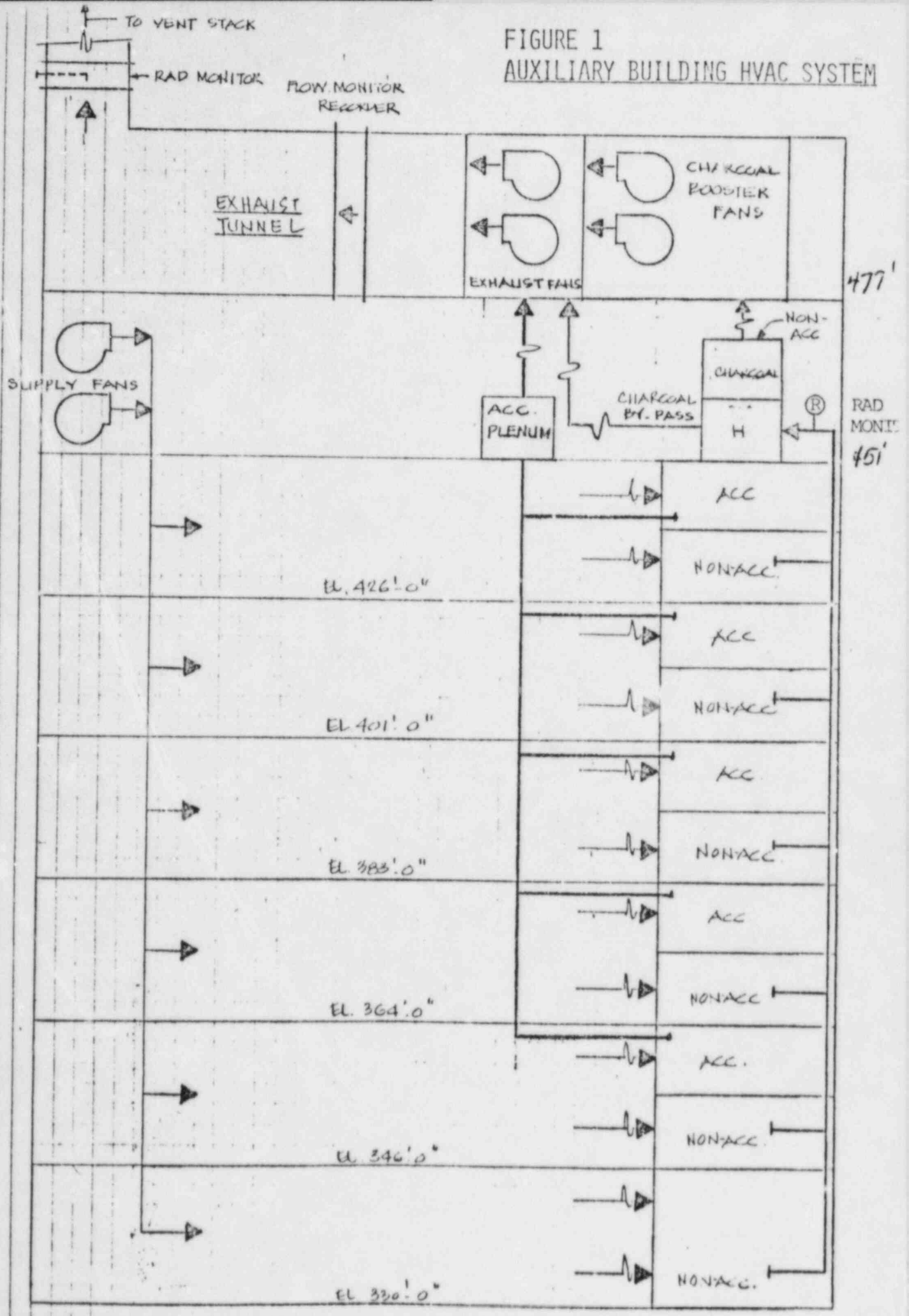
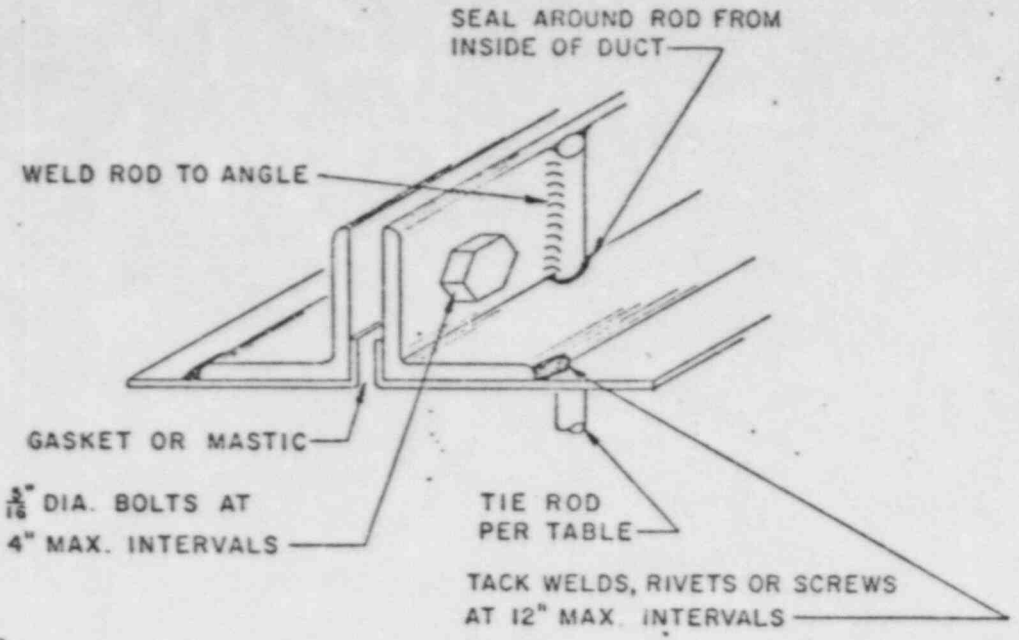
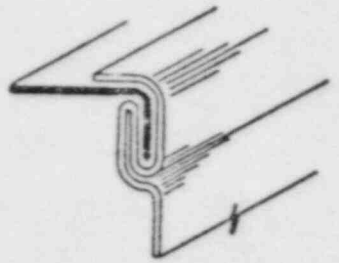


FIGURE 2

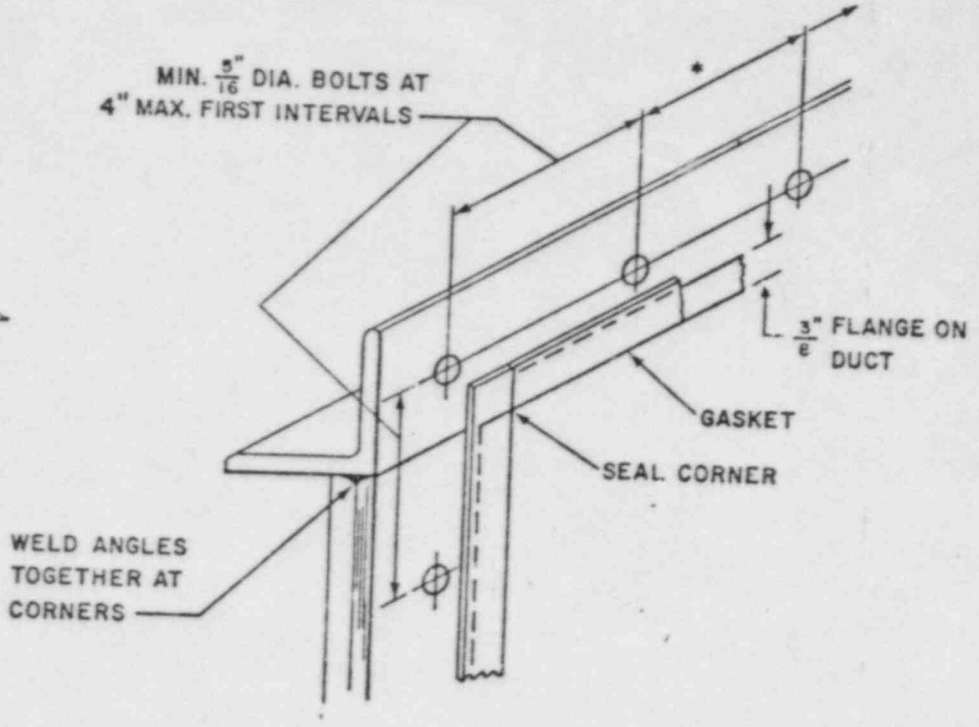


TYPICAL JOINT SECTION



PITTSBURGH LOCK SEAM

18 ga and less



CORNER DETAIL

(FIGURE 3 FROM MOISTURE CONTENT ANALYSIS REPORT)

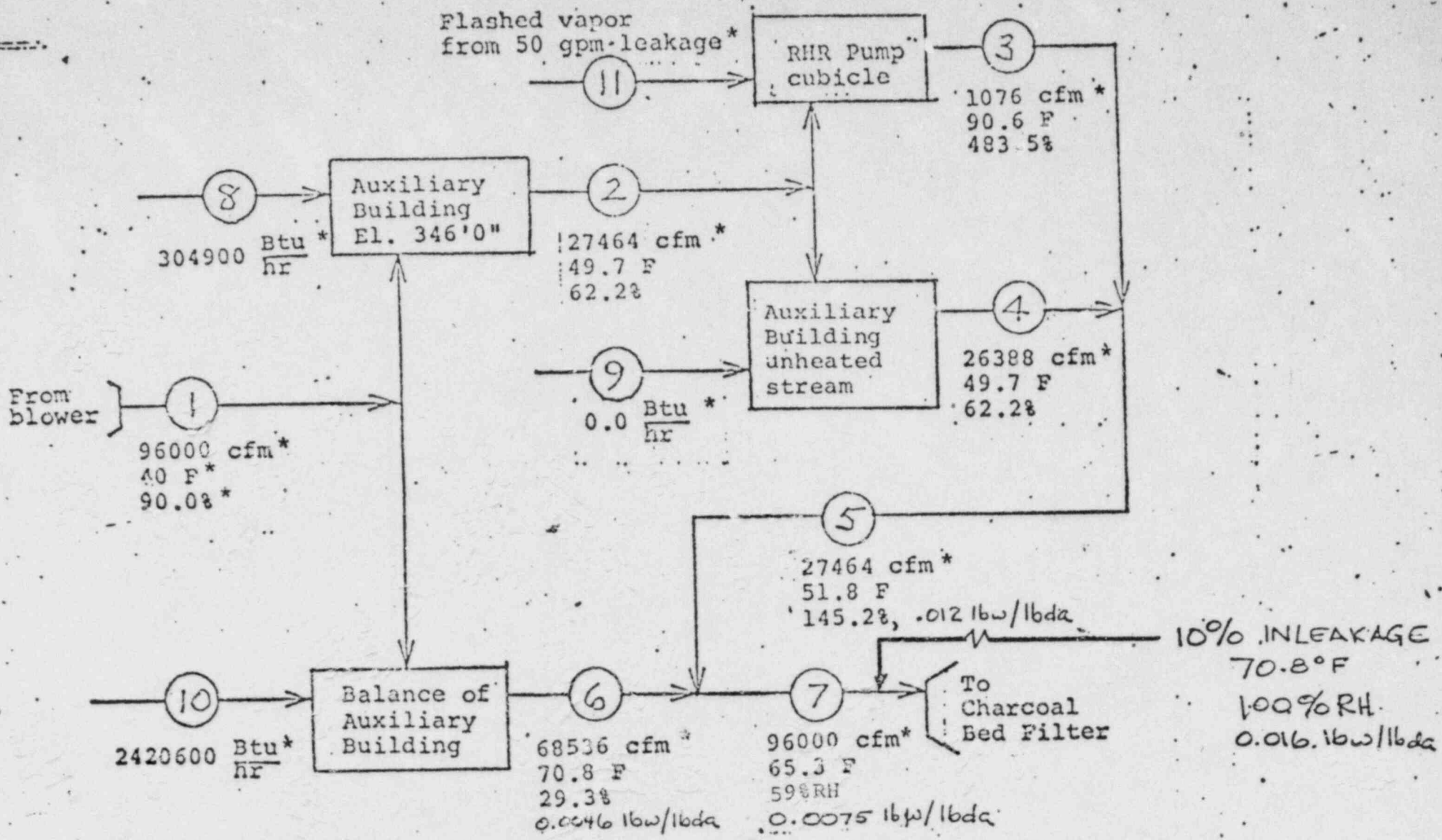


FIGURE 2: Case from Table 1 with Highest Relative Humidity
FROM MOISTURE CONTENT ANALYSIS REPORT

*These quantities are input data and all the remaining temperatures and relative humidities were calculated as described in Section V.

SAMPLE INSPECTION CHECKLIST

RELIABLE SHEET METAL WORKS, INC.

PROCEDURE AMENDMENT AUTHORIZATION (RSM FORM 31-1)

Procedure Type/No. 23 Rev. - Date 9-24-82 Page Affected - of - Article Affected *

* Revised Form Page 1 of 2

TYPE 2 SYSTEM/SUBSYSTEM INSPECTION REPORT (RSM FORM 23-6, REV. 1) pg. 1

SYSTEM _____ PRELIMINARY ☐ FINAL ☐

S & L DRAWING NO. _____ SHEET _____ REV. _____

INSPECTION COVERAGE FROM _____ TO _____

1. REVIEW OF TYPE 1 INSPECTION DOCUMENTATION

	ACC.	REJ.	REMARKS
A. Fab. Tickets and I.R.'s Complete			
B. N.R.'s Closed (List Open)			
C. D.R.'s Closed (List Open)			
D. ECN(s)/FCR(s) used in addition to design drawings			

QCI: LEVEL: DATE:

2. DUCT SECTION(S)

	ACC.	REJ.	REMARKS
A. Installations are identified per RSM Proc. 30 Rev. ____			
B. Installation per Design Drwg., Details and Duct. Const. Manual			
C. Components Undamaged			
D. Bolting Complete			
E. Sealants Applied			
F. Welds Painted			
G. DR initiated ___ Yes ___ No DR No. _____ DR closed by: _____ Date: _____			

QCI: LEVEL: DATE:

3. AIR MONITORS/AIR DAMPERS/FIRE DAMPERS/FLEX CONNECTIONS/ACCESS DOORS/GRILLS/RADIATION PROOFS

	ACC.	REJ.	REMARKS
A. Receipt inspection reports complete			
B. Installations are identified per RSM Proc. 30 Rev. ____			
C. Installation per Design Drwg., Details and Duct. Const. Manual			
D. Components Undamaged			
E. Bolting Complete			
F. Sealants Applied			
G. Welds Painted			
H. DR initiated ___ Yes ___ No DR No. _____ DR Closed By: _____ Date: _____			

QCI: LEVEL: DATE:

Prepared by/Date

Russell Sink 6/3/83

See Drawing Orig

K O Mcraven 6-4-83

Owner Station Construction

Approved by/Date

Russell Sink 6/3/83

Quality Assurance Supervisor

SEE K N Hausing 6/8/83

Owner Quality Assurance

SAMPLE INSPECTION CHECKLIST

RELIABLE SHEET METAL WORKS, INC.

PROCEDURE AMENDMENT AUTHORIZATION (RSM FORM 31-1)

Procedure Type/No. 23 Rev. - Date 9-24-82 Page Affected - of - Article Affected *

* Revised Form Page 2 of 2

SYSTEM/SUBSYSTEM INSPECTION REPORT (RSM FORM 23-6, REV. 1) Pg. 2

SYSTEM _____

S & L DRAWING NO. _____ SHEET _____ REV. _____

INSPECTION COVERAGE FROM _____ TO _____

INSPECTION TYPE 3 - DESIGN DRAWING REV.

QC INSPECTOR/LEVEL/DATE

1. INSTALLATION IN PLACE, INTACT, UNDAMAGED
2. NO HOLD TAGS ATTACHED
3. DISCREPANCY REPORTS CLOSED
4. TESTING AND BALANCING REPORTS APPROVED

COMMENTS: _____

_____

_____ BY: QCI INSPECTOR/LEVEL DATE:

INSPECTION TYPE 4

FINAL ACCEPTANCE OF INSTALLATION PER RSM PROCEDURE 23 REV. _____ PARA. ____

INSTALLATION ACCEPTED — QC INSPECTOR/LEVEL/DATE

1. HANGERS
2. DUCT
3. SUSPENDED EQUIPMENT
4. SET EQUIPMENT
5. NO HOLD TAGS ATTACHED

FINAL ACCEPTANCE OF DOCUMENTATION PER COMPLETION OF INSPECTION TYPES 1, 2 AND 3.

DOCUMENTATION ACCEPTED — __ QA __ QC INSPECTOR/LEVEL/DATE

1. HANGERS
2. DUCT
3. SUSPENDED EQUIPMENT
4. SET EQUIPMENT
5. TEST AND BALANCING REPORTS

COMMENTS: _____

_____

__ QA __ QC INSPECTOR/LEVEL DATE:

PROJECT SUPERINTENDENT APPROVAL/DATE: _____

CUSTOMER REPRESENTATIVE ACCEPTANCE/DATE: _____

Prepared by/Date

Russell Smith 6/3/83

Jon Braun Mgr.

EJ Mraw 6.4.83

Owner Station Construction

Approved by/Date

Russell Smith 6/3/83

Quality Assurance Supervisor

per KJ Hansing 6/5/83

Owner Quality Assurance

SAMPLE INSPECTION CHECKLIST

SYSTEM/SUBSYSTEM FINAL INSPECTION REPORT

JOB NUMBER: C-761006 CUSTOMER: COMMONWEALTH EDISON
DESIGN DRAWING NO. _____ REVISION NO. USED FOR INITIAL ~~FIR~~ FIR _____
DUCT CONSTRUCTION MANUAL REV./DATE _____

INSPECTION TYPE 2 - REVIEW AND ACCEPTANCE OF INSTALLATION

		QC INSPECTOR/LEVEL/DATE
	#11 Rev. #12 Rev. #15 Rev.	
1.	INSTALLATIONS IDENTIFIED PER RSM PROCEDURES	_____
2.	INSTALLATION PER DESIGN DRAWING, DETAILS AND DUCT CONST. MAN.	_____
3.	COMPONENTS UNDAMAGED	_____
4.	ALL REQUIRED BOLTING COMPLETE PER DUCT CONSTRUCTION MANUAL	_____
5.	ALL REQUIRED SEALANTS APPLIED PER DUCT CONSTRUCTION MANUAL	_____
6.	ALL REQUIRED WELDS ARE PAINTED PER DUCT CONSTRUCTION MANUAL	_____
7.	NO HOLD TAGS ATTACHED	_____
8.	DISCREPANCY REPORT INITIATED ___ YES ___ NO	_____
	- DR#	
	- DR CLOSED: BY DATE	_____

COMMENTS: _____

BY: QC INSPECTOR/LEVEL DATE: _____

REVIEW AND ACCEPTANCE OF INSPECTION TYPE 1 DOCUMENTATION

__ QA
__ QC INSPECTOR/LEVEL/DATE

1.	FAB. TICKETS AND INSPECTION REPORTS COMPLETE	_____
2.	NONCONFORMANCE REPORTS REFERENCED AND CLOSED	_____
3.	DISCREPANCY REPORTS CLOSED	_____
4.	ECN(S)/FCR(S) INCORPORATED INTO DESIGN DRAWINGS	_____

COMMENTS: _____

BY: __ QA
__ QC INSPECTOR _____ LEVEL _____ DATE ___

(RSM FORM 23-6)

NRC COMMENT #4 (REGULATORY GUIDE 1.52, POSITION 2.G)

"...IT IS NOT APPARENT TO THE STAFF HOW THE APPLICANT WILL BE ABLE TO ENSURE THAT THE FLOW RATE IN THE NON-ACCESSIBLE AREA EXHAUST FILTER SYSTEMS AND THE CONTROL ROOM EMERGENCY MAKE-UP AIR FILTERS IS MAINTAINED WITHIN ±10% OF ITS DESIGN FLOW WHEN FLOW IS ONLY SENSED. IT MUST BE ENSURED THAT THE RESIDENCE TIME IN THE CHARCOAL ADSORBER IS MAINTAINED AT THE DESIGN VALUE OF 0.25 SECONDS PER TWO INCHES OF CHARCOAL AND THAT THE FLOW RATE CAPABILITY OF THE HEPA FILTERS IS NOT EXCEEDED. THEREFORE, THE APPLICANT SHOULD ADDRESS HOW FLOW WILL BE MAINTAINED TO SATISFY THESE CONDITIONS..."; "...THE APPLICANT SHOULD ALSO ADDRESS THE RECORDING OF FLOW FOR THE FUEL HANDLING BUILDING FILTRATION UNITS."

CECO RESPONSE

A. AUXILIARY BUILDING NON-ACCESSIBLE EXHAUST FILTERS AND FUEL HANDLING EXHAUST FILTERS

EACH OF THE AXUILIARY BUILDING NON-ACCESSIBLE EXHAUST FILTERS AND FUEL HANDLING EXHAUST FILTERS ARE PROVIDED WITH THE FOLLOWING:

1. TWO 100% BOOSTER FANS
2. UPSTREAM HEPA RECORDER ON THE MAIN CONTROL PANEL (MCP)
3. HIGH AND LOW ΔP ALARMS FOR EACH FAN ON MCP, WHICH ARE LOGGED BY SEQUENCE OF EVENTS RECORDER IN THE CONTROL ROOM
4. FAN PRESSURE DIFFERENTIAL INDICATION ON LOCAL CONTROL PANEL
5. FLOW INDICATION ON LOCAL CONTROL PANEL

CECO RESPONSE (CONT'D)

FIGURES 4 AND 5 PROVIDE THE FAN NORMAL OPERATING POINTS BETWEEN THE CLEAN AND DIRTY FILTER RESISTANCE IN THE SYSTEM FOR NON-ACCESSIBLE FILTERS AND FUEL HANDLING BUILDING EXHAUST FILTERS, RESPECTIVELY. AS CAN BE SEEN FROM THESE CURVES, FOR SYSTEM NORMAL OPERATING CONDITIONS, THE FLOW VARIATION BETWEEN TWO POINTS IS LESS THAN 10%, THUS ASSURING DESIGN FLOW.

FOR ANY POSTULATED SYSTEM UPSET CONDITIONS, THE FAN WILL BE OPERATING BEYOND THE TWO OPERATING POINTS, WHICH WILL THEN BE ALARMED AT MCP BY EITHER THE HIGH OR LOW ΔP ALARM OF THE FAN THUS ALERTING THE OPERATOR FOR FURTHER ACTION.

ALSO, AS SHOWN IN FIGURE 6, THE ENTIRE EXHAUST FLOW FROM THE AUXILIARY BUILDING AND OTHER AREAS ARE MONITORED BY FLOW MONITORS LOCATED IN THE PLANT VENT STACK. THE FLOW FOR EACH TUNNEL IS INDICATED AND RECORDED ON THE LOCAL CONTROL PANEL. THE FLOW MONITORS ALSO PROVIDE A SIGNAL TO THE RADIATION DETECTION CABINENTS.

B. CONTROL ROOM MAKE-UP AIR FILTERS

EACH MAKE-UP AIR FILTER UNIT OF THE CONTROL ROOM IS PROVIDED WITH THE FOLLOWING, ASSURING THAT PROPER FLOW IS MAINTAINED:

1. HIGH AND LOW ΔP ALARMS FOR FANS ON MCP WHICH ARE ALSO LOGGED BY SEQUENCE OF EVENTS RECORDER IN THE CONTROL ROOM.

CECO RESPONSE (CONT'D)

2. FAN PRESSURE DIFFERENTIAL INDICATION AND FLOW INDICATION ON THE LOCAL CONTROL PANEL (LCP), WHICH IS LOCATED IN THE HVAC EQUIPMENT ROOM THAT IS PART OF THE CONTROL ROOM BOUNDARY. ANY UPSET CONDITIONS IN THE SYSTEM WILL CREATE HIGHER OR LOWER ΔP THAN THE NORMAL ΔP ACROSS THE FAN AND IS ALARMED FOR OPERATOR'S ACTION.

   A RADIATION MONITOR IS ALSO PROVIDED IN THE DISCHARGE DUCT-WORK DOWNSTREAM OF EACH FAN, WHICH WOULD ALSO PROVIDE THE MEANS TO DETECT AN INCREASE IN MAKE-UP AIR RADIOACTIVITY LEVELS DUE TO SYSTEM UPSETS.

FIGURE 4

AUXILIARY BUILDING CHARCOAL BOOSTER FANS

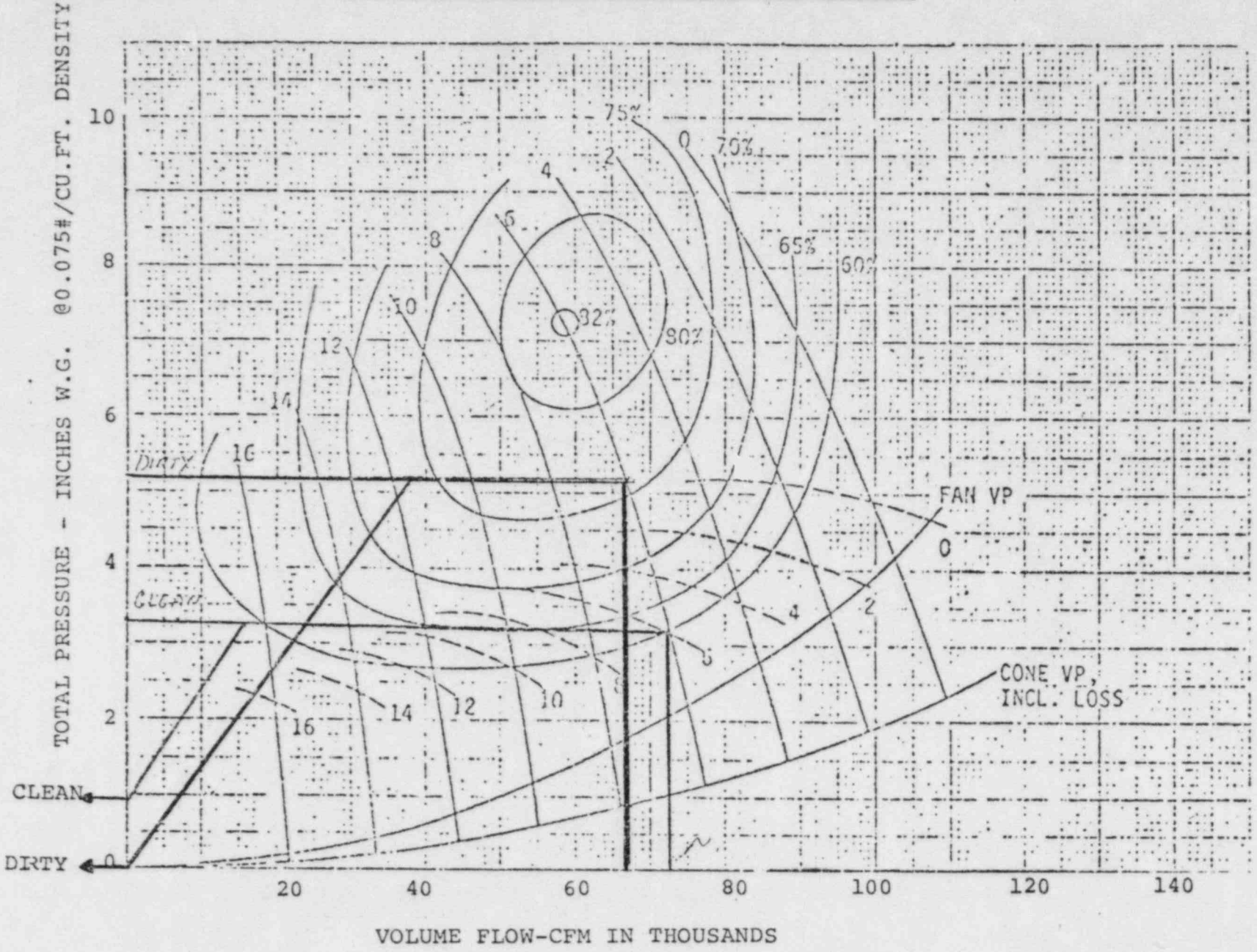


FIGURE 5

FUEL HANDLING BUILDING BOOSTER FAN

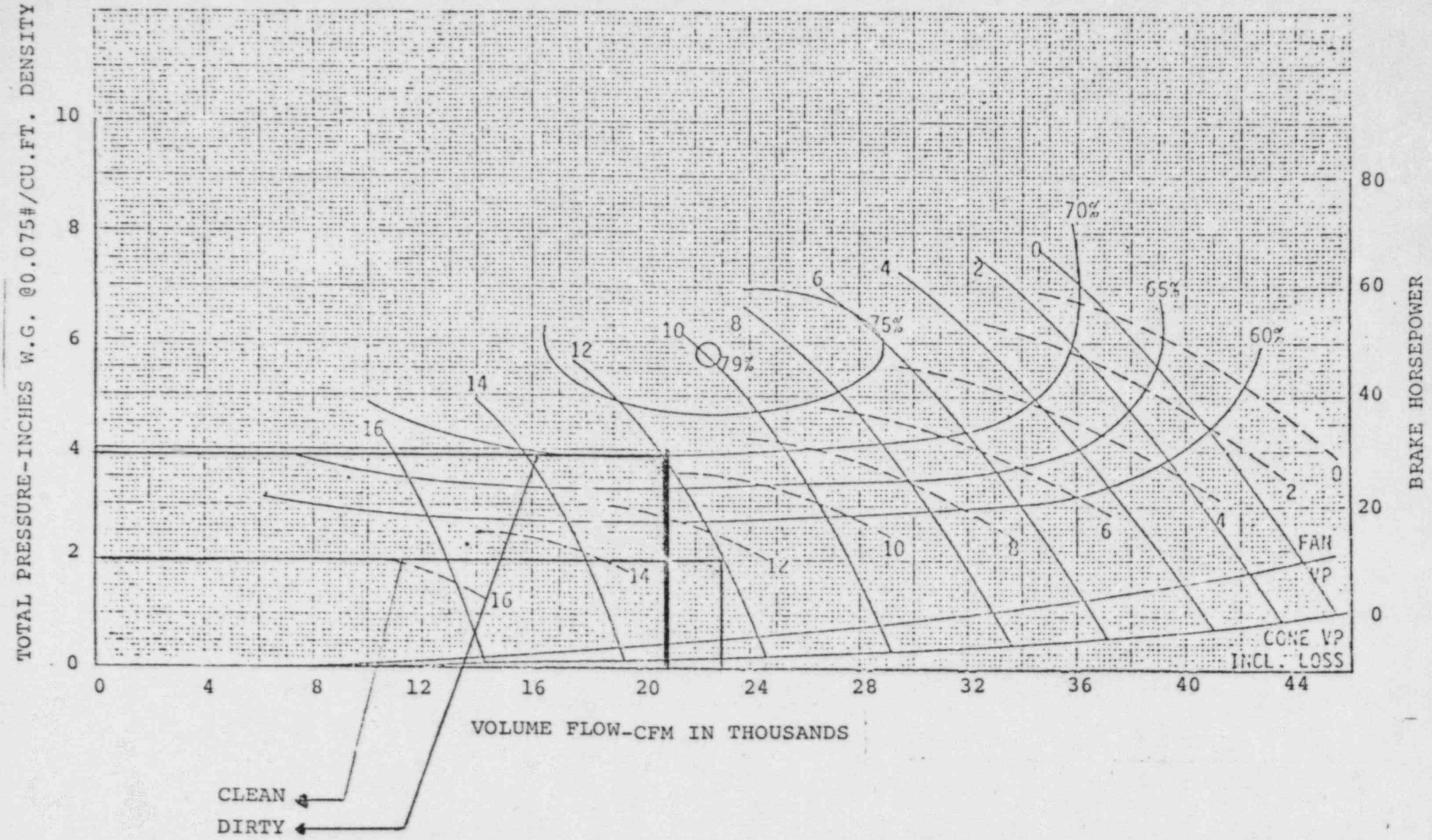
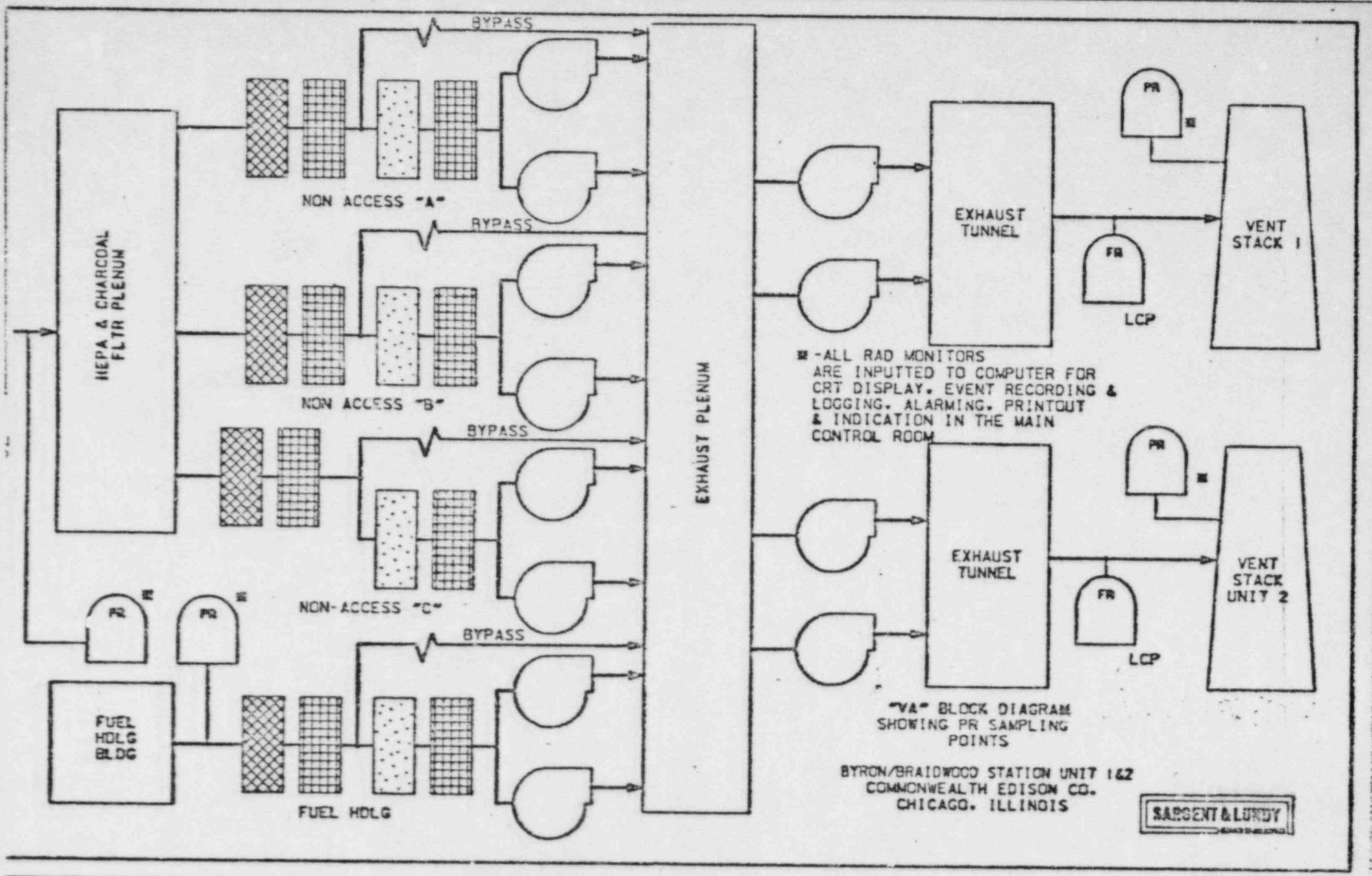


FIGURE 6

VM052



PROPOSED FSAR REVISIONS

2.G ALL ESF FILTER SYSTEMS HAVE LOCAL CONTROL PANEL AIRFLOW INDICATION. IN ADDITION, THE FLOW RATE IN EACH OF THE STACKS IS RECORDED AT THE LOCAL CONTROL PANEL. THE AIRFLOW RATE THROUGH THE CONTROL ROOM EMERGENCY MAKE-UP AIR FILTER UNITS AND THE AUXILIARY BUILDING AND FUEL HANDLING BUILDING EXHAUST CHARCOAL BOOSTER FANS IS CONTINOUSLY SENSED.

THE DIFFERENTIAL PRESSURE ACROSS ALL OF THE ESF FILTER UNIT FANS IS INDICATED ON LOCAL CONTROL PANELS. HIGH AND LOW DIFFERENTIAL PRESSURE AND FAN TRIP ANNUNCIATION IS PROVIDED ON THE MAIN CONTROL PANEL.

THE DIFFERENTIAL PRESSURES ACROSS ALL HEPA FILTERS ARE INDICATED ON LOCAL CONTROL PANELS. IN ADDITION, THE PRESSURE DROP ACROSS THE HEPA FILTERS UPSTREAM OF CHARCOAL FILTERS IS RECORDED IN THE MAIN CONTROL ROOM. HIGH DIFFERENTIAL PRESSURE ACROSS ALL HEPA FILTERS IS ANNUNCIATED ON THE MAIN CONTROL PANEL AND ON LOCAL CONTROL PANELS. UPSET CONDITIONS WILL THEREFORE BE IDENTIFIED TO THE CONTROL ROOM OPERATOR ALLOWING HIM TO TAKE THE APPROPRIATE ACTION.

THE AUXILIARY BUILDING EXHAUST FLOW RATE AND FUEL HANDLING BUILDING EXHAUST FLOW RATE IS CONTINUOUSLY SENSED BY THE EXHAUST STACK AIRFLOW MEASURING EQUIPMENT AND RECORDED IN A LOCAL CONTROL PANEL AND BY THE PLANT COMPUTER.

NRC GENERIC LETTER 83-13

CLARIFICATION OF SURVEILLANCE REQUIREMENTS FOR HEPA FILTERS AND CHARCOAL ADSORBER UNITS IN STANDARD TECHNICAL SPECIFICATIONS ON ESF CLEAN-UP SYSTEMS (SEE ATTACHED).

CECO RESPONSE

WE CONCUR WITH NRC GENERIC LETTER 83-13.

PROPOSED FSAR REVISION (REGULATORY GUIDE 1.52 AND 1.140 POSITION 5C AND 5D

THE IN-PLACE DOP TEST FOR HEPA FILTERS AND R-12 TEST FOR ACTIVATED CHARCOAL ADSORBERS WILL CONFORM TO SECTION 10 AND SECTION 12 OF ANSI N510-80, RESPECTIVELY, TO VERIFY THAT THE CLEAN-UP SYSTEM SATISFIES THE IN-PLACE PENETRATION AND BY-PASS LEAKAGE TESTING ACCEPTANCE CRITERIA OF LESS THAN 0.05%, APPLICABLE WHEN A HEPA FILTER OR CHARCOAL ADSORBER EFFICIENCY OF 99% IS ASSUMED, OR 1% WHEN A HEPA FILTER OR CHARCOAL ADSORBER EFFICIENCY OF 95% IS ASSUMED.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

March 2, 1983

TO ALL APPLICANTS FOR OPERATING LICENSES AND HOLDERS OF CONSTRUCTION PERMITS FOR POWER REACTORS

Gentlemen:

SUBJECT: CLARIFICATION OF SURVEILLANCE REQUIREMENTS FOR HEPA FILTERS AND CHARCOAL ADSORBER UNITS IN STANDARD TECHNICAL SPECIFICATIONS ON ESF CLEANUP SYSTEMS (Generic Letter No. 83-13)

It has come to our attention that the Surveillance Requirements for HEPA filters and charcoal adsorber units in ESF atmospheric cleanup systems as stated in the Standard Technical Specifications (STS) in use by applicants for operating licenses require clarification. The current revisions of the STS for all power reactors do not clearly reflect the required relationship between the guidance provided in Regulatory Guide 1.52, Revision 2, and ANSI N510-1975; the testing requirements of the HEPA filters and charcoal adsorbers units; and the NRC staff assumptiors used in its safety evaluations for the ESF atmospheric cleanup systems. In order to clarify this relationship, the wording in the Surveillance Requirements for testing the HEPA filters and charcoal adsorber units has been modified.

We have enclosed the revised testing requirements for HEPA filters and charcoal adsorber units in ESF atmospheric cleanup systems that are to be used in your submittal of proposed Technical Specifications, or, if your proposed Technical Specifications have already been submitted, the staff will make the necessary revisions. These changes will also be incorporated in the next revision of the STS. The generic changes are indicated by a line in the margin of the Surveillance Requirement. Specific ESF atmospheric cleanup systems have not been indicated since the changes apply only to the testing of HEPA filters and charcoal adsorber units in every ESF atmospheric cleanup system.

This request has been approved by OMB Clearance Number 3150-0011, which expires April 30, 1985.

Sincerely,

for Darrell G. Eisenhut, Director
Division of Licensing

Enclosure:
"Revised Surveillance Requirements
for Testing of HEPA Filters and
Charcoal Adsorber Units"

ENCLOSURE

Revised Surveillance Requirements for Testing of HEPA Filters and Charcoal Adsorbers Units

1. At least once per 18 months, or (1) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (2) following painting, fire, or chemical release in any ventilation zone communicating with the system, by:

   1) Verifying that the cleanup system satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than (*)% and uses the test procedure guidance in Regulatory Positions C.5.a, C.5.c, and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, and the system flow rate is _____cfm ± 10%.

   2) Verifying, within 31 days after removal, that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978, for a methyl iodide penetration of less than (**)%; and

   3) No change

2. After every 720 hours of charcoal adsorber operation, by verifying, within 31 days after removal, that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, meets the laboratory testing criteria of Regulatory Position C.6.a of Regulatory Guide 1.52, Revision 2, March 1978, for a methyl iodide penetration of less than (**)%.

3. After each complete or partial replacement of a HEPA filter bank, by verifying that the HEPA filter bank satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than (*)% in accordance with ANSI N510-1975 for a DOP test aerosol while operating the system at a flow rate of _____ cfm ± 10%.

4. After each complete or partial replacement of a charcoal adsorber bank, by verifying that the charcoal adsorber bank satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than (*)% in accordance with ANSI N510-1975 for a halogenated hydrocarbon refrigerant test gas while operating the system at a flow rate of _____ cfm ± 10%.

---

* 0.05% value applicable when a HEPA filter or charcoal adsorber efficiency of 99% is assumed, or 1% when a HEPA filter or charcoal adsorber efficiency of 95% or less is assumed in the NRC staff's safety evaluation. (Use the value assumed for the charcoal adsorber efficiency if the value for the HEPA filter is different from the charcoal adsorber efficiency in the NRC staff's safety evaluation).

** 0.175% value applicable when a charcoal adsorber efficiency of 99% is assumed, or 1% value applicable when a charcoal adsorber efficiency of 95% is assumed, or 10% value applicable when a charcoal adsorber efficiency of 90% is assumed in the NRC staff's safety evaluation.

NRC COMMENT #5 (REGULATORY GUIDE 1.52, POSITION 2.1)

"THE STAFF...CONCERNED AS TO HOW THE APPLICANT CAN ASSURE THAT THE FLOW RATE IN VARIOUS ECCS PUMP ROOM CUBICLES IS MAINTAINED DURING THE COURSE OF AN ACCIDENT SO THAT ADEQUATE COOLING OF EQUIPMENT OCCURS WHEN THE DUCTWORK WILL NOT BE LEAK TESTED AND FLOW DISTRIBUTION MAY VARY, THEREBY NEGATING COOLING ASSUMPTIONS." "THE STAFF IS ALSO CONCERNED AS TO THE POTENTIAL IMPACT UPON THE VALIDITY OF THE APPLICANT'S ANALYSIS TO SHOW THAT MOISTURE SEPARATORS ARE NOT REQUIRED FOR THE NON-ACCESSIBLE AREA FILTRATION SYSTEM. THE APPLICANT SHOULD ADDRESS THESE POTENTIAL IMPACTS."

CECO RESPONSES

THE DUCT IN-LEAKAGE WILL NOT AFFECT THE COOLING OF ECCS PUMP ROOM CUBICLES, BECAUSE THESE CUBICLES ARE PROVIDED WITH INDIVIDUAL CUBICLE COOLERS. THE EFFECT OF IN-LEAKAGE ON MOISTURE SEPARATOR ANALYSIS FOR NON-ACCESSIBLE AREA FILTRATION SYSTEM IS ADDRESSED IN THE RESPONSE TO NRC COMMENT #3.

PROPOSED FSAR REVISION

SEE PROPOSED REVISIONS TO NRC COMMENT #3.

11.3 GASEOUS WASTE MANAGEMENT SYSTEMS

NRC COMMENT #1 (REGULATORY GUIDE 1.140, POSITION 5B)

"...THE STAFF FINDS IT ACCEPTABLE NOT TO PERFORM AIRFLOW DISTRIBUTION AND AIR-AEROSOL MIXING TESTS ON THE NON-ENTRY TYPE FILTER UNIT...THEREFORE, THE EXCEPTION TO THIS REGULATORY POSITION IS ACCEPTABLE."

CECO RESPONSE: CONCUR

FSAR REVISION - NOT CHANGE TO EXCEPTION REQUIRED.

NRC COMMENT #2 (REGULATORY GUIDE 1.140, POSITION 2.F AND 3.F)

"THE CONCERNS OF THE STAFF WITH RESPECT TO THE FILTER HOUSING TESTING ARE ESSENTIALLY THOSE DISCUSSED IN SECTION 6.5.1 OF THIS SAFETY EVALUATION REPORT. THEREFORE, THE FILTER HOUSING NEED NOT BE TESTED PROVIDED THE MOUNTING FRAME IS LEAK TESTED."

CECO RESPONSE

THE MOUNTING FRAMES WILL BE LEAK TESTED. THE EXCEPTIONS TO REGULATORY POSITIONS 2.F AND 3.F OF REGULATORY GUIDE 1.140 HAS BEEN REVISED TO CLARIFY THIS AS FOLLOWS:

NRC COMMENT # 2 (CONT'D)

PROPOSED FSAR REVISION

FILTER HOUSINGS

ALL NON-ESF FILTER HOUSINGS, EXCLUSIVE OF THE TECHNICAL SUPPORT CENTER AND POST-LOCA PURGE UNITS, ARE AT NEGATIVE PRESSURE WITH RESPECT TO THEIR SURROUNDINGS, AND ARE LOCATED IN AREAS WHICH ARE LOW AIRBORNE RADIATION ENVIRONMENTS. ANY IN-LEAKAGE WILL NOT ADVERSELY AFFECT APPENDIX I RELEASES, HENCE, THE HOUSINGS WILL NOT BE LEAK TESTED TO THE ANSI N509-76 REQUIREMENTS. HOWEVER, ALL THE FILTER MOUNTING FRAMES WILL BE LEAK TESTED. THE TECHNICAL SUPPORT CENTER UNIT HOUSING IS LOCATED IN AN AREA WHERE THE AIRBORNE RADIATION LEVEL OF THE ROOM AIR MAY EXCEED THAT OF THE AIR WITHIN THE HOUSING: HOWEVER, IT IS AT POSITIVE PRESSURE WITH RESPECT TO THE SURROUNDINGS, HENCE, IT WILL NOT BE TESTED TO ANSI N509-76 REQUIREMENTS. THE FILTER MOUNTING FRAMES WILL BE LEAK TESTED. THE POST-LOCA PURGE UNIT HOUSING WILL BE LEAK TESTED TO ANSI N509-76 REQUIREMENTS.

NRC COMMENT #3 (REGULATORY GUIDE 1.140, POSITION 2F AND 3F)

A. "THOSE NEGATIVE PRESSURE SECTIONS OF DUCTWORK WHICH SUPPLY AIR TO FILTER SYSTEMS WHICH CONTAIN CHARCOAL ADSORBER UNITS SHOULD BE LEAK TESTED BECAUSE THESE FILTER SYSTEMS MAY BE DRAWING THROUGH LEAKAGE AIR WHICH CONTAINS PAINT FUMES, VARIOUS ORGANICS, INDUSTRIAL POLLUTANTS, SMOKE, ETC., WHICH COULD POISON THE CHARCOAL. THEREFORE, THE DUCTWORK UNDER NEGATIVE PRESSURE WHICH SUPPLIES AIR TO SYSTEMS CONTAINING CHARCOAL ADSORBERS SHOULD BE LEAK TESTED IN ACCORDANCE WITH ANSI N509-1980.

B. FURTHERMORE, IN ACCORDANCE WITH ANSI/ASME N509-1980, ALL DUCTS MUST BE SUBJECTED TO A QUANTITATIVE MEASUREMENT OF LEAKAGE UNLESS THE DUCT IS LOCATED WITHIN A CONTAMINATED SPACE OR PROTECTED SPACE (AS DEFINED IN ANSI/ASME N509-1980) OR HAS A LENGTH OF THIRTY FEET OR LESS MEASURED EITHER FROM THE FAN OR THE AIR CLEANING UNIT TO ITS TERMINUS. THE ALLOWABLE LEAK RATES FOR THE DUCTS SHOULD BE IN CONFORMANCE WITH SECTION 4.12 OF ANSI N509-1980.

FOR THOSE SYSTEMS WHICH DO NOT HAVE CHARCOAL ADSORBERS, LEAK TESTING OF DUCTS SHOULD BE EVALUATED ON A CASE BY CASE BASIS. FOR POSITIVE PRESSURE DUCTWORK, THE LEAK RATE TESTING OF DUCTWORK SHOULD BE ADDRESSED ON A CASE BY CASE BASIS. HOWEVER, THE DUCTS WHICH ARE NOT QUANTITATIVELY TESTED SHOULD BE THOSE EXCLUDED BY SECTION 5.10.8 OF ANSI N509-1980.

NRC COMMENT # 3 (CONT'D)

CECO RESPONSE

THE ATTACHED TABLE IDENTIFIES THE REGULATORY GUIDE 1.140 FILTER UNITS AND CHARCOAL AND/OR HEPA FILTRATION PROVIDED. FOR EACH FILTER UNIT JUSTIFICATION IS SHOWN FOR EXCLUDING TESTING BASED ON ANSI N509 EXCEPTIONS NOTED IN ARTICLE 5.10.8. IN ADDITION, ADDITIONAL JUSTIFICATION IS GIVEN FOR THOSE UNITS WHICH DO NOT MEET THE CRITERIA IN N509 BUT FOR WHICH LEAKAGE WILL NOT BE SIGNIFICANT ENOUGH TO AFFECT DOSE EXPOSURES.

THE FOLLOWING RESPONDS TO THE SPECIFIC NRC COMMENTS NOTED ABOVE:

A. FROM THE ATTACHED TABLE, IT CAN BE SEEN THAT THE NEGATIVE PRESSURE "DUCTWORK" FOR ALL FILTER UNITS CONTAINING CHARCOAL ABSORBERS ACTUALLY HAVE SCHEDULE TO PIPING IN LIEU OF SHEET METAL DUCT, EXCEPT VOLUME REDUCTION AND TSC FILTER UNITS. VOLUME REDUCTION DUCTWORK IS LESS THAN APPROXIMATELY THIRTY FEET AND WITHIN THE RADWASTE BUILDING. LEAKAGE WOULD BE MINIMAL DUE TO THE LENGTH OF DUCT. THE TSC DUCTWORK IS TOTALLY WITHIN THE TSC EQUIPMENT AREA AND NORMALLY INOPERATIVE. HOWEVER, A CHEMICAL RELEASE OR FIRE WOULD HAVE TO OCCUR WITHIN THE EQUIPMENT ROOM TO HAVE ANY POTENTIAL EFFECT AT ALL.

NRC COMMENT #3 (CONT'D)

CECO RESPONSE (CONT'D)

B. FROM TABLE 1 IT IS CLEAR THAT THE ONLY DUCTS WHICH NEED BE TESTED ARE THE LABORATORY EXHAUST FILTER UNIT POSITIVE PRESSURE DUCT OUTSIDE THE EQUIPMENT ROOM AND THE RADWASTE BUILDING EXHAUST FILTER UNIT POSITIVE PRESSURE DUCTWORK WHICH IS WITHIN THE AUXILIARY BUILDING. DUCTWORK FOR THE RADWASTE BUILDING EXHAUST FILTER UNIT WILL BE TESTED PRIOR TO VOLUME REDUCTION SYSTEM BEING PLACED IN OPERATION. THE REMAINING SYSTEMS' DUCTWORK MEET ANSI N509 EXCEPTION CRITERIA AS NOTED AND HAVE NEGLIGIBLE IMPACT ON ALARA PRACTICES AND, THEREFORE, DO NOT WARRENT DETAILED LEAKAGE TESTING. ALL SYSTEMS ARE, HOWEVER, INSPECTED DURING INSTALLATION, AIRFLOW RATES BALANCED, AND GROSS LEAKAGE RESOLVED.

Table 3

REGULATORY GUIDE 1.140

EFFLUENT TREATMENT FILTERS

DUCT LEAKAGE TEST EXCEPTIONS

Filter Unit	N509 Exception Art. 5.10.3	Duct Press.	Reason
Off-Gas (HEPA & Charcoal)	(a)		Hard pipe on suction and discharge except for <30 feet of transition duct.
Laboratory Exhaust (HEPA)	*	P	Test positive pressure duct outside equipment room.(1)
	(c)	N	Inleakage into duct. Space has MPC less than duct.
Radwaste Building (HEPA)	*	P	Positive pressure duct will be tested. (1)
	(c)	N	Negative pressure ducts go through radwaste drumming station and radwaste filter cubicle. No leakage bypasses filters.
Volume Reduction (HEPA & Charcoal)	(a)	P	Positive pressure duct less than approx. 60 feet.
	(c)	N	Negative pressure passing through contaminated/clean interspace with MPC <1.1. Duct length approx. 30 ft.
Normal Purge (HEPA)	(b)	P	Passes through clean interspace with duct concen. less than 5 MPC.
	(c)	N	Negative pressure duct passes through clean interspace. Space has MPC less than duct.
Post-LOCA Purge (HEPA & Charcoal)	-	P	Not used during normal operation. Discharges to normal purge exhaust, only used as backup to redundant recombiner, 3 days after accident. Flow rate 1/100 of normal flow, duct length approx. 60 ft.
	(c)	N	Hard pipe on suction side - routed through clean area.

*TESTING REQUIRED

(1) DUCT MPC LEVELS POTENTIALLY GREATER THAN 5 MPC.

Filter Unit	N509 Exception Art. 5.10.8	Duct Press.	Reason
Containment Recirc. (HEPA & Charcoal)	(a)		Within contaminated space and no ductwork.
TSC Supply (HEPA & Charcoal)	-	P	Leakage from positive pressure ducts is clean air. Room pressurization is sensed and maintained. Thus, no effect on health physics.
	*	N	Negative test pressure duct outside protected space where inleakage would not normally be filtered.
Tank Vent (HEPA & Charcoal)	(a)	P	Positive pressure duct less than 30 ft.
	(c)	N	Hard pipe is used - all welded - no leakage.

FSAR REVISIONS

ALL OF THE DUCTWORK UPSTREAM OF THE NON-ESF FILTER UNITS IS UNDER NEGATIVE PRESSURE WITH RESPECT TO ITS SURROUNDINGS. DUCTWORK UPSTREAM OF THE FILTER UNITS IS LOCATED IN AREAS OF LOW AIRBORNE RADIOACTIVITY. ANY IN-LEAKAGE WILL NOT ADVERSELY AFFECT APPENDIX I RELEASES, HENCE, IT WILL NOT BE TESTED TO THE ANSI N509-76 REQUIREMENTS. ANY DUCTWORK SECTIONS WHERE LEAKAGE WOULD AFFECT THE HABITABILITY OF THE CONTROL ROOM OR TSC WILL BE TESTED TO THE ANSI N509-76 REQUIREMENTS.

THE DUCTWORK UPSTREAM OF THE TSC FILTER UNIT IS LOCATED IN THE HVAC EQUIPMENT ROOM. THE QUALITY OF THE EQUIPMENT ROOM ENVIRONMENT IS THE SAME AS THAT OF THE OUTSIDE AIR WHICH IS WITHIN THE DUCT. ANY IN-LEAKAGE WILL BE FILTERED PRIOR TO ITS RELEASE TO THE TSC ENVIRONMENT, HENCE, THIS DUCTWORK WILL NOT BE TESTED TO THE ANSI N509-76 REQUIREMENTS.

POSITIVE PRESSURE DUCTWORK FOR THE LABORATORY EXHAUST FILTER UNIT OUTSIDE THE LABORATORY HVAC EQUIPMENT ROOM AND THE POSITIVE PRESSURE DUCTWORK RADWASTE BUILDING EXHAUST FILTER UNIT IN THE AUXILIARY BUILDING WILL BE LEAK TESTED TO ANSI N509-80 REQUIREMENTS. ALL REMAINING DUCTWORK MEETS THE EXCEPTION OF ANSI N509 OR HAVE NEGLIGIBLE IMPACT ON ALARA PRACTICES AND THEREFORE, WILL NOT BE LEAK-TESTED. POSITIVE PRESSURE RADWASTE BUILDING EXHAUST DUCTWORK IN THE AUXILIARY BUILDING WILL BE TESTED BEFORE THE RADWASTE VOLUME REDUCTION SYSTEM IS PUT INTO OPERATION.

ATTACHMENT C

FSAR REVISIONS

Appendix A Discussions of

Regulatory Guides 1.52 and 1.40

PROPOSED REVISIONS
OCTOBER, 1984

REGULATORY GUIDE 1.52

Revision 2, March 1978

DESIGN, TESTING AND MAINTENANCE CRITERIA FOR ENGINEERING-SAFETY-FEATURE ATMOSPHERE CLEANUP SYSTEM AIR FILTRATION AND ADSORPTION UNITS OF LIGHT-WATER-COOLED NUCLEAR POWER PLANTS

The Applicant complies with the Regulatory Position with the following comments and exceptions keyed to paragraph numbers in Section C of the Position:

1.e (Deleted) (Note 1)

2.a Entrained water droplets are not considered credible due to significant quantities of ductwork with elbows. Water droplets, if present, will impinge on ducts and drop out of vertical duct risers as the air enters exhaust plenums. However, the auxiliary building exhaust system does contain prefilters which can serve as demisters.

2.d (Deleted) (Note 1)

2.f The Auxiliary Building non-accessible area exhaust filter system consists of three built-up filter trains (one standby) with a capacity of 66,900 cfm each. For maintenance purposes each train is divided into three banks with each bank sized for seven filters wide and three high.

The Auxiliary Building Accessible area exhaust filter system has a capacity of 162,300 cfm. This system consists of four built-up filter trains (one standby) and each train is divided into three banks. Each bank is sized for seven filters wide and three filters high.

2.g All ESF filter systems have local control panel airflow indication. In addition, the flow rate in each of the stacks is recorded at the local control panel. The airflow rate through the control room emergency make-up air filter units and the Auxiliary Building and Fuel Handling Building exhaust charcoal booster fans is continously sensed.

The differential pressure across all of the ESF filter unit fans is indicated on local control panels. High and low differential pressure and fan trip annunciation is provided on the main control panel. The setpoints for low and high differential will be such that flows at +10% of design flow will be alarmed at the main control panel.

PRESSURE

The differential pressures across all HEPA filters are indicated on local control panels. In addition, the pressure drop across the HEPA filters upstream of charcoal filters is recorded in the main control room. High differential pressure across all HEPA filters is annunciated on the main control panel and on local control panels. Upset conditions will therefore be identified to the control room operator allowing him to take the appropriate action.

The Auxiliary Building exhaust flow rate and Fuel Handling Building exhaust flow rate is continuously sensed by the exhaust stack airflow measuring equipment and recorded in a local control panel and by the plant computer.

2.j Filter trains are not designed to be removable from the building as an intact unit. The size of the train precludes shipment off-site and there are no facilities for on-site disposal of the intact unit. The filter elements are removable and can be disposed of through the solid radwaste system.

2.1 Filter Housings

All of the Auxiliary Building and Fuel Handling Building exhaust system filter housings are designed in accordance with ANSI N509-76. The housings are at negative pressure with respect to their surroundings and are located in the Auxiliary Building General Area, which is a low airborne radiation environment. Any in-leakage from the general area will not adversely affect Appendix I releases. Hence, the housings will not be leak tested to the ANSI N509-76 requirements. However, filter mounting frame leak tests will be performed in accordance with ANSI N510-80.

The Control Room emergency make-up air system filter housings are designed in accordance with ANSI N509-76. The filter housings are at negative pressure with respect to their surroundings and are located within the control room boundary, which is a habitable environment the same as the Control Room. Any in-leakage will be from the Control Room environment and, therefore, will not adversely affect the quality of that environment: Hence, the housings will not be leak tested to ANSI N509-76 requirements. However, filter mounting frame leak tests will be performed in accordance with ANSI N510-80.

Ductwork

All auxiliary building, and fuel handling buildings exhaust system ductwork upstream of the filter units is under negative pressure with respect to its surroundings and is located in the same areas of the buildings served by the exhaust systems. Any in-leakage will be filtered prior to discharge to the atmosphere, hence, this ductwork will not be tested to ANSI N509-76 requirements.

AND THE FUEL HANDLING BUILDING EXHAUST SYSTEM

However, prior to final system turnover, the non-accessible exhaust system of the Auxiliary Building HVAC System will be operated and the ductwork will be visually and audibly checked for leaks. Leaks will be sealed.

All control room emergency makeup air system ductwork is located within the control room boundary which is a habitable environment. Any ductwork leakage will not adversely affect the habitability of the environment, hence, this ductwork will not be tested to ANSI N509-76 requirements.

The design airflow quantities for each system will be verified during testing, adjusting and balancing of the systems. Deviations of more than ± 10% of the design flow quantities will be evaluated and any disposition will be documented.

HOWEVER, PRIOR TO FINAL SYSTEM TURNOVER, THE CONTROL ROOM EMERGENCY MAKEUP AIR SYSTEM WILL BE OPERATED AND VISUAL AND AUDIBLE LEAKS IN DUCTWORK WILL BE SEALED.

2.m (Deleted) (Note 1)

3.b (Deleted) (Note 1)

3.d (Deleted) (Note 1)

3.e (Deleted) (Note 1)

3.h (Deleted) (Note 1)

3.i (Deleted) (Note 1)

4.b The space provided between components is 3 feet from the front (or rear) of the components to the nearest obstacle (filter frame or other filter component). This allows 3 feet of access between components.

4.c (Deleted) (Note 1)

5.b Airflow distribution tests will be performed to ensure that the airflow through any individual filter element does not exceed 120% of the elements rated capacity.

5.c (Deleted) (Note 1)

Further discussions on this subject can be found in Subsections 9.4.1.2 and 12.3.1.7.

Note 1: Exception to this section is no longer required because the Regulatory Guide has been revised to eliminate the criteria to which exception was originally taken.

PROPOSED AMENDMENT
OCTOBER 1984

REGULATORY GUIDE 1.140

Revision 0, March 1978

DESIGN, TESTING AND MAINTENANCE CRITERIA FOR NORMAL VENTILATION EXHAUST SYSTEM AIR FILTRATION AND ADSORPTION UNITS OF LIGHT-WATER-COOLED NUCLEAR POWER PLANTS

The design of the non-safety-related filter systems meet the requirements of this guide, except as noted below. The exceptions are keyed to paragraph numbers in the Regulatory Position.

1a and 1b - The equipment and components (excluding charcoal, filter pads and separator pads) are designed to withstand a maximum of 40-year integrated radiation dose and worst-case anticipated continuous service, rather than 40 years of continuous service.

2a - All of the exhaust filter systems contain prefilters, HEPA filters, fan and associated instrumentation. Charcoal adsorbers are only used when iodine is anticipated to be present, with heaters for over 70% relative humidity air streams.

2b - The purge system exhaust filter train is designed for 43,900 cfm. Filter efficiency will be tested at this capacity. The filter train consists of two banks with a grating between the filter banks. Each filter bank is three filters high and seven wide.

2f and 3f - Filter Housings

All non-ESF filter housings, exclusive of the Technical Support Center and post-LOCA purge units, are at negative pressure with respect to their surroundings, and are located in areas which are low airborne radiation environments. Any in-leakage will not adversely affect Appendix I releases, hence, the housings will not be leak tested to the ANSI N509-76 requirements. However, all the filter mounting frames will be leak tested. The Technical Support Center unit housing is located in an area where the airborne radiation level of the room air may exceed that of the air within the housing: However, it is at positive pressure with respect to the surroundings, hence, it will not be tested to ANSI N509-76 requirements. The filter mounting frames will be leak tested. The post-LOCA purge unit housing will be leak tested to ANSI N509-76 requirements.

PROPOSED AMENDMENT
OCTOBER 1984

2f and 3f - Ductwork

All of the ductwork upstream of the non-ESF filter units is under negative pressure with respect to its surroundings. Ductwork upstream of the filter units is located in areas of low airborne radioactivity. Any in-leakage will not adversely affect Appendix I releases, hence, it will not be tested to the ANSI N509-76 requirements.

The ductwork upstream of the TSC filter unit is located in the HVAC Equipment Room. The quality of the equipment room environment is the same as that of the outside air which is within the duct. Any in-leakage will be filtered prior to its release to the TSC environment, hence, this ductwork will not be tested to the ANSI N509-76 requirements.

The following ductwork will be leak tested to the ANSI N509-76 requirements:

1. Positive pressure ductwork for the laboratory exhaust filter unit outside the laboratory HVAC equipment room.

2. The positive pressure ductwork from the Radwaste Building exhaust filter unit in the Auxiliary Building.

3. The positive pressure ductwork from the volume reduction system area ventilation exhaust filter that is located in the Radwaste Building.

4. The positive pressure ductwork from the Post-LOCA purge filter unit.

5. All non-safety-related ductwork that is under pressure within the Control Room boundary.

6. TSC negative pressure duct sections outside the protected space where in-leakage would not normally be filtered.

All remaining ductwork meets the exception of ANSI N509 or have negligible impact on ALARA practices and therefore, will not be leak tested. Positive pressure Radwaste Building exhaust ductwork in the Auxiliary Building will be tested before the radwaste volume reduction system is put into operation.

3a. The components of the heaters are manufactured and assembled as per Section 5.5 of ANSI N509-76, similar to the requirements of heaters in safety-related filter systems, but the traceability of the components is not established as it would be in the case of safety-related heaters. Thus, no complete qualification program is done, however, all air heaters (ESF and Non-ESF) are purchased using the same design, construction, and performance specification.

5b - Airflow distribution and air-aerosol mixing tests will not be performed on the non-entry type filter units. Airflow distribution tests will be performed on all entry-type filter trains to ensure that the airflow through any individual filter element does not exceed 120% of the elements rated capacity.