

# DUKE POWER COMPANY

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May 8, 1989

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Subject: McGuire Nuclear Station  
Catawba Nuclear Station  
Docket Nos. 50-369, -370; 50-413, -414  
NRC Generic Letter No. 88-14  
Instrument Air Supply System Problems Affecting  
Safety-Related Equipment

Gentlemen:

Mr. F. J. Miraglia, Jr.'s (NRC/ONRR) August 8, 1988 letter (Generic Letter 88-14) concerned instrument air supply system problems affecting safety-related equipment. The purpose of this generic letter was to request review of NUREG-1275 Volume 2, and performance of a design and operations verification of the instrument air system. This verification was to include:

1. Verification by test that actual instrument air quality is consistent with the manufacturer's recommendations for individual components served.
2. Verification that maintenance practices, emergency procedures, and training are adequate to ensure that safety-related equipment will function as intended on loss of instrument air.
3. Verification that the design of the entire instrument air system including air or other pneumatic accumulators is in accordance with its intended function, including verification by test that air-operated safety-related components will perform as expected in accordance with all design-basis events, including a loss of the normal instrument air system. This design verification should include an analysis of current air operated component failure positions to verify that they are correct for assuring required safety functions.

In addition to the above, a discussion of the program for maintaining proper instrument air quality was to be provided.

Accordingly, attached is the requested verification and program discussion for the McGuire and Catawba Nuclear Stations. Attachment 1 for each station addresses Generic Letter Item 1 above, Attachment 2 addresses Item 2, Attachment 3 addresses Item 3, and Attachment 4 is the requested program discussion. Also attached (Attachment 5) for your convenience is a compilation from the above mentioned attachments of action items that remain to be completed and their

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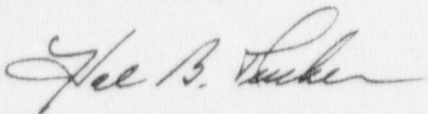
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respective due dates. Pursuant to the requirements of the Generic Letter, when all requirements of the Generic letter have been implemented, written notification will be provided stating that all actions are complete, and the documentation assembled for this verification will be retained for a minimum of two years from this submittal date for future audit by the NRC staff.

Pursuant to the provisions of 10CFR 50.54(f), I declare under penalty of perjury that the statements set forth herein are true and correct to the best of my knowledge. Please note that this submittal was previously delayed via my letter of February 10, 1989. Should there be any questions concerning this matter, or if additional information is required, please advise.

Very truly yours,



Hal B. Tucker

PBN165/lcs

Attachments

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May 8, 1989

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Section File: MC-815.07 (88-14)

CN-815.07 (88-14)

DUKE POWER COMPANY  
MCGUIRE NUCLEAR STATION  
NRC GENERIC LETTER 88-14 RESPONSE

## Attachment 1

### McGuire Air Quality Test Results

<u>Sample Point</u>	<u>Dewpoint (°F)</u>	<u>Particulate (Microns)</u>	<u>Oil Content (PPM)</u>
Dryer outlet	41.7	0	<0.016
Unit 1 Auxiliary Building	36.2	0	<0.016
Unit 2 Auxiliary Building	34.0	3	<0.016
Unit 1 Doghouse	27.9	0	<0.016
Unit 2 Turbine Building	18.3	0	<0.016

Air quality testing is performed per a recently written performance test procedure. Per this procedure, dew point in the instrument air system is determined every six months, while oil concentration and particulate contamination are determined once per year. Sample locations include the Service Building (dryer outlet), Turbine Building, Auxiliary Buildings, and the Unit 1 Doghouse. Samples were not obtained on the Containment air systems due to an interlock problem between the compressor and the dryer. This problem is being corrected at the present time.

The test acceptance criteria will be determined by Duke's Design Engineering Department. The acceptance criteria will be based on air operated valve vendor recommendations and the Instrument Air Standard ISA-S7.3-1975.

The criteria likely will be as follows:

1. Dewpoint temperature at system pressure <35°.
2. Oil concentration <1 PPM.
3. No particles >5 microns detected.

The dewpoint temperature was measured using a chilled mirror dewpoint hygrometer. Oil concentration is measured by passing 500 liters of air through a filter. The filter is then analyzed by Duke's Industrial Health Group to determine the mass of oil contained in the filter. The particulate content is checked by using a Royco Model 218 Portable Particle Monitor.

## Attachment 2

### McGuire Maintenance Practices Review

All preventative maintenance (PM) activities were reviewed on supply equipment and all will meet or exceed manufacturer's requirements after some minor additions. The equipment reviewed were the reciprocating compressors, centrifugal compressor, refrigerant dryers, particulate filters, desiccant dryer, and each containments Instrument Air system supply components. The following is a description of each preventative maintenance activity on each of these components.

The three reciprocating compressors receive a semi-annual overhaul due to their age and operating history. These compressors will be replaced by two new centrifugal compressors by 6/1/89. The following checks are made during the semi-annual PM:

1. An oil sample is drawn for analysis.
2. The inlet air filter and oil filter are replaced.
3. The compressor oil is replaced.
4. The condition of the belts are checked.
5. The unloader solenoid valves are checked.
6. All valves are removed, ground, and reassembled.
7. Piston clearances are checked.
8. A functional verification is performed.

The one operating centrifugal compressor receives monthly, semi-annual, and annual preventative maintenance. The following checks are made during the monthly PM:

1. The oil level is checked.
2. Oil and water systems integrity is verified.
3. Oil filter D/P is checked.
4. The inlet air filter primary element is inspected.
5. A functional verification is performed.

During the semi-annual PM, the following checks are made in addition to those done on the monthly PM:

1. An oil sample is drawn for analysis.
2. The main driver coupling is lubricated and alignment checked.
3. The prelube pump coupling is lubricated.
4. The oil mist arrester is visually inspected.
5. The discharge check valve is visually inspected.
6. The condensate traps are removed and cleaned.
7. The inlet throttle and bypass valve calibration are checked.
8. A functional verification is performed.

During the annual PM, the following checks are made in addition to those done on the semi-annual PM:

1. The main driver is inspected.
2. The bull gear teeth are inspected for wear.
3. The bull gear bearing is checked for roughness.
4. The oil sump filters are inspected and cleaned.
5. The oil cooler tubes are inspected for leaks.
6. The inlet throttle valve and bypass valve are visually inspected.
7. A functional verification is performed.

The four refrigerant dryers receive quarterly preventative maintenance. The following checks are made during the quarterly PM.

1. A visual inspection is performed.
2. The refrigerant system and charge are checked. Freon is added if necessary.
3. The condenser coils are cleaned.
4. A functional verification is performed.

The two full flow particulate filters have their elements replaced once per year or on high differential pressure, whichever ever comes first.

The Integrated Leak Rate Test (ILRT) desiccant dryer is only operated every three years and its air quality is verified prior to use. If necessary, the desiccant, prefilter, and after filter elements are replaced under a PM work request.

Each containment has its own, small, instrument air system. Each compressor, dryer, and coalescing filter receive monthly, semi-annual, and annual preventative maintenance. The following checks are made during the monthly PM:

1. The inlet air filter is inspected.
2. The compressor hour meter reading is recorded.
3. The oil sump is vented.
4. The compressor oil is replaced.
5. V-belt tension is checked.
6. The oil return line orifice is cleaned.
7. The air receiver is vented.
8. The after cooler is inspected.
9. The air/oil separator is inspected.
10. The coalescing filter is inspected.
11. The refrigerant dryer is inspected.
12. A system functional verification is performed under full load.

During the semi-annual PM, the following checks are made in addition to those done on the monthly PM:

1. The after cooler is cleaned and inspected.
2. The motor sheave to compressor sheave is aligned and the V-belt is tightened.
3. The compressor oil element is replaced.
4. The dryer is inspected.
5. The refrigerant charge on the dryer is checked.
6. The dryer condenser coils are cleared.
7. A functional verification is performed.

During the annual PM, the following checks are made in addition to those done on the semi-annual PM:

1. The inlet air filter element is replaced.
2. The coalescing filter element is replaced.
3. A function verification is performed.

#### **IAE Maintenance Practice Review**

A preventative maintenance program is being established for critical instrument air demand equipment. A list of approximately 56 critical to operation air operated valves (AOVS) have been identified to have associated air regulator filters replaced. These filters were replaced during the last Unit 1 and 2 outages. PM work requests are being written to change out these filters every 2 years. This work activity will be completed by August 1, 1989. Additional PM's may be established as deemed necessary.

#### **McGuire Emergency Procedure Review**

The Loss of Instrument Air abnormal procedures were reviewed for the McGuire, Catawba, and Oconee nuclear stations in November and December of 1988. Guidance for the procedure review was provided by NUREG-1275, recommendation 2.a and reports provided by other industry groups such as NSAC and INPO. The procedure review involved determining the availability of a procedure for each station, the procedural strategy employed to cope with loss of instrument air events, and a review of the technical content of the procedures.

McGuire has in place, in the control room, a procedure to address a loss of instrument air system event. The overall strategy employed is to stabilize the plant by restoring the instrument air system functions by recovering normal air supply sources to providing a backup source of air and isolating any air leaks. The technical content of the procedure carries out this strategy by identifying components to be manipulated, the sequence, and failure positions of components on loss of air. Our plants have experienced significant loss of air events. The plants recovered from these events without serious incident using the strategy that is contained in all three of the plant's loss of air procedures. The lessons learned from these events were used to strengthen the technical content of the procedures.



In conclusion, the McGuire loss of instrument air procedure is deemed adequate to cope with anticipated loss of instrument air events. Also, because of our experience with losses of air, the procedure in effect has been validated.

### McGuire Training Review

#### BASIC AND GENERAL TRAINING

##### - Mechanical Maintenance

The Control Valve Maintenance and Repair Lesson Plan was revised to reflect problems that may result if extreme care is not taken to ensure no contamination exists in the air system components.

##### - Power Plant Fundamentals

The existing "Compressed Air Systems" lesson plan covers the importance of the Instrument Air System with discussion of uses of air systems for valve operation and instrument control. This Lesson Plan also covers major components, function, and adverse effects of loss of air. References to INPO SOER 88-1 (which was based in part on NRC Case Study Report AEOD/C701, i.e., essentially NUREG 1275) have already been included.

##### - Instrument and Electrical

SOER 88-1 will be added to the Pressure Measurement Lesson Plan, which is the first exercise oriented lesson addressing the use of instrument air components in the Basic Instrumentation and Electrical (I&E) Program. This will be complete by 7/1/89. Subject information will also be added to the Fisher Control Valve Actuator Lesson Plan presently under development for use as an advance topic. The Instrument Air System and the failure of instrument air is presently covered in the "Plant Air Systems" lesson plan.

#### STATION

McGuire Nuclear Station will cover this SOER in its '89 Operating Experience Program (OEP) Training Programs stressing the importance of the Instrument Air System and sensitizing the technicians to its vulnerability. SOER 88-1 will be reviewed at least every 3 years to determine its continued applicability.

#### BASIC OPERATOR TRAINING

The operation of the instrument air system and the consequences of the loss of instrument air are covered in the Systems Specific Module of the Basic Operator Training Program. This training is provided to all learners prior to them reporting to the stations.

- Classroom training on the instrument air system is provided to all operators during the Introduction to Systems Specific (ISS) module of training after reporting to the stations.

- Each Non-Licensed Operator (NLO) is required to qualify on the operation of the instrument air system using the appropriate Training and Qualification (T&Q) guide prior to operating the system.
- Each NLO requalifies on the operation of the instrument air system, after initial qualification, at a frequency deemed appropriate by the NLO requal program at McGuire. This frequency is presently every two years.
- Each licensed operator receives classroom and simulator training on the loss of instrument air during the license preparatory module. This training includes specific simulator scenarios developed that require the operators to respond and to recover from a loss of instrument air.
- Each licensed operator receives requal training on the loss of instrument air at a frequency deemed appropriate by the requal program at McGuire. This training includes simulator training utilizing scenarios that require the operators to respond and to recover from a loss of instrument air. This training is presently conducted at a frequency of each year at McGuire.

### Attachment 3

#### McGuire Instrument Air System Design Verification

Item no. 3 of the subject document calls for "verification that the design of the entire instrument air system including air or other pneumatic accumulators is in accordance with its intended function, including verification by test that air-operated safety-related components will perform as expected in accordance with all design-basis events, including a loss of the normal instrument air system. This design verification should include an analysis of current air-operated component failure positions to verify they are correct for assuring required safety functions". In order to meet the requirements of this item, Design's review for McGuire took place in five parts:

- 1) Verify that dryers and filters are sized correctly for existing and anticipated future compressor capacity
- 2) Evaluation of instrument air lines located in areas where temperatures are potentially lower than the dryer dew point
- 3) Review instrument details to ensure that air-operated active valves fail in their intended positions
- 4) Check for non-qualified/extraneous devices which could impede the vent paths for the air-operated active valve actuators
- 5) Verify that backup accumulators are properly designed to perform their intended function

The results of our review are as follows:

- 1) Verify That Dryers and Filters are Sized Correctly for Existing and Anticipated Future Compressor Capacity:

McGuire has a total of four instrument air compressors, one centrifugal unit (1500 scfm) and three reciprocating units (650 scfm each). All are designed to be oil-free. The centrifugal compressor serves as the base unit while the three reciprocating units operate in a stand-by mode, starting on decreasing system pressure. The maximum anticipated base load is 1400 to 1500 scfm.

Discharge air from the compressors passes through a series of aftercoolers, moisture separators, dryers, and filters. The refrigerant dryers are designed to have a dew point of 35°F. Combined dryer capacity is 2100 scfm (three at 700 scfm each) while the combined filter capacity is 2400 scfm (two at 1200 scfm each). The filters are rated at 5 microns which is slightly higher than the ISA-S7.3 standard of 3 microns. However, 5 microns has been shown acceptable per Duke's review of air quality requirements from the manufacturers of the associated air-operated equipment.

Therefore, based upon the above information, the McGuire instrument air system filters and dryers are adequately sized and are designed to provide high quality air to the components served.

2) Evaluation of Instrument Air Lines Located in Areas Where Temperatures are Potentially Lower Than the Dryer Dew Point:

A review was also performed to determine if instrument air lines were routed to areas which could see temperatures potentially lower than 35°F (the dryer dew point) and, therefore, be susceptible to condensate formation and/or freezing. The potential areas identified were the interior and exterior doghouses (there are no instrument air lines routed to the yard which serve safety-related equipment). These areas will be maintained at a 40°F minimum ambient temperature through the use of existing electrical heaters and administrative control of louver positions. A Station Problem Report (SPR) was initiated for the station to address this problem by 6/15/89.

3) Review of Instrument Details to Ensure that Air-Operated Active Valves Fail in Their Intended Positions:

The McGuire active valve list was reviewed to determine which valves were air-operated (active valves are defined as those which are required to move to accomplish their safety function - i.e., prevent or mitigate the consequences of a design basis accident). Valve drawings and flow diagrams were reviewed to determine the failure positions of the active valves. These are given in Attachment A. A review of corresponding instrument details confirmed that all the air-operated active valves at McGuire are designed to fail in their correct position due to loss of instrument air. Also, all air-operated valves on Attachment A are verified by test to go to their fail-safe position on a periodic basis with the exception of: 1 YC-54, -76, -113, -135, -148, -162, -176, -190, -204, -218, -232, and -246. A Problem Investigation Report (PIR) has been written to determine if these valves should be added to the periodic valve inservice testing program.

4) Check For Non-Qualified/Extraneous Devices Which Could Impede the Vent Paths For the Air-Operated Active Valve Actuators:

The instrument details referenced in Item #3 above were reviewed for non-qualified/extraneous devices which could impede the active valve actuator vent paths. This is significant because it may affect the ability of these valves to achieve their failure positions on a loss of air. Several potential concerns were discovered. Non-qualified positioners were found between safety-related solenoid valves and the operators on sixteen (16) active valves. The PIR referenced in item #3 above also addresses this issue. Subsequent corrective action will be taken.

During the current Unit 1 outage, the pneumatic controls for an additional valve (INV459) were found to be connected in error, even though the instrument details were drawn correctly. The valve controls will be connected correctly during the outage.

5) Verify that Backup Accumulators are Properly Designed to Perform Their Intended Function:

The list of air-operated active valves was again reviewed to determine which of these valves had accumulators as a redundant source of air to ensure the valve achieves its proper failure position. The only air-operated active valves with vendor supplied accumulators are 1 & 2 RN-89, -190 (Nuclear Service Water System). Duke then performed a design verification. The accumulators were found to be properly sized to perform their intended function; yet, the system lines were found to contain extraneous devices which could impede the vent paths. PIRs were written and resolved, and subsequent corrective action was taken to install qualified components.

Summary And Action Items:

- 1) The McGuire instrument air system filters and dryers are adequately sized and are designed to provide high quality air to the components served.
- 2) The interior and exterior doghouses will be maintained at a minimum ambient temperature of 40°F through the use of existing electrical heaters and administrative control of louver positions. A Station Problem Report (SPR) was initiated for the station to address this problem by 6/15/89.
- 3) All of McGuire's air-operated active valves fail in their correct position on loss of air per instrument detail review. Also, all air-operated valves at McGuire are verified by test to go to their fail-safe position on a periodic basis with the exception of: 1 YC-54, -76, -113, -135, -148, -162, -176, -190, -204, -218, -232, and -246. A Problem Investigation Report (PIR) has been written to determine if these valves should be added to the periodic inservice testing program. This PIR also addresses the non-qualified positioners between safety-related solenoid valves and the operators on sixteen (16) active valves. Subsequent action will be taken.
- 4) The accumulators for active valves 1 & 2 RN-89, -190 (Nuclear Service Water System) are properly sized to perform their intended function; yet, the system lines were found to contain extraneous devices which could impede the vent paths. PIRs were written and resolved, and subsequent corrective action was taken to install qualified components.

In summation, McGuire has recognized the need to provide quality instrument air and is taking proper action to ensure these needs are met. To the best of our knowledge, the instrument air system at McGuire is designed in accordance with its intended function. Any design deficiencies have been identified and proper corrective action has been/is being taken. Verification by test that air-operated safety-related components will perform as expected has been conducted.

**MCGUIRE AIR-OPERATED ACTIVE VALVES  
OPERATOR FAILURE POSITIONS**

<u>Valve Tag</u>	<u>Failure Position</u>
1, 2 BB1	Closed
1, 2 BB2	Closed
1, 2 BB3	Closed
1, 2 BB4	Closed
1, 2 BB5	Closed
1, 2 BB6	Closed
1, 2 BB7	Closed
1, 2 BB8	Closed
1, 2 CA20	Closed
1, 2 CA27	Closed
1, 2 CA32	Closed
1, 2 CA36	Open
1, 2 CA40	Open
1, 2 CA44	Open
1, 2 CA48	Open
1, 2 CA52	Open
1, 2 CA56	Open
1, 2 CA60	Open
1, 2 CA64	Open
1, 2 CF17	Closed
1, 2 CF20	Closed
1, 2 CF23	Closed
1, 2 CF32	Closed
1, 2 CF104	Closed
1, 2 CF105	Closed
1, 2 CF106	Closed
1, 2 CF107	Closed
1, 2 KC57	Open
1, 2 KC82	Open
1, 2 KC320	Closed
1, 2 KC332	Closed
1, 2 KC333	Closed
1, 2 NC32	Closed
1, 2 NC34	Closed
1, 2 NC36	Closed
2 NC56	Closed
1, 2 ND14	Open
1, 2 ND29	Open
1, 2 NF228	Closed
1, 2 NF233	Closed
1, 2 NF234	Closed
1, 2 NV457	Closed
1, 2 NV458	Closed

ATTACHMENT A  
(cont.)

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**MCGUIRE AIR-OPERATED ACTIVE VALVES  
OPERATOR FAILURE POSITIONS**

<u>Valve Tag</u>	<u>Failure Position</u>
1, 2 NV459	Closed
1 RF821	Closed
1 RF832	Closed
1, 2 RN21	Closed
1, 2 RN22	Closed
1, 2 RN25	Closed
1, 2 RN26	Closed
1, 2 RN68	Open
1, 2 RN89	Open
1, 2 RN103	Open
1, 2 RN112	Open
1, 2 RN114	Open
1, 2 RN117	Open
1, 2 RN126	Open
1, 2 RN130	Open
1, 2 RN140	Open
1, 2 RN161	Open
1, 2 RN166	Open
1, 2 RN170	Open
1, 2 RN190	Open
1, 2 RN204	Open
1, 2 RN213	Open
1, 2 RN215	Open
1, 2 RN218	Open
1, 2 RN227	Open
1, 2 RN231	Open
1, 2 RN240	Open
1, 2 RN252	Closed
1, 2 RN253	Closed
1, 2 RN276	Closed
1, 2 RN277	Closed
1 RN442	Open
1 RN445	Open
1 RN457	Open
1 RN460	Open
1, 2 RV32	Closed
1, 2 RV33	Closed
1, 2 RV76	Closed
1, 2 RV77	Closed
1, 2 RV79	Closed
1, 2 RV80	Closed
1, 2 RV101	Closed

MCGUIRE AIR-OPERATED ACTIVE VALVES  
OPERATOR FAILURE POSITIONS

<u>Valve Tag</u>	<u>Failure Position</u>
1, 2 RV102	Closed
1, 2 SA48	Open
1, 2 SA49	Open
1, 2 SM1	Closed
1, 2 SM3	Closed
1, 2 SM5	Closed
1, 2 SM7	Closed
1, 2 SM9	Closed
1, 2 SM10	Closed
1, 2 SM11	Closed
1, 2 SM12	Closed
1, 2 SV1	Closed
1, 2 SV7	Closed
1, 2 SV13	Closed
1, 2 SV19	Closed
1, 2 VP1	Closed
1, 2 VP2	Closed
1, 2 VP3	Closed
1, 2 VP4	Closed
1, 2 VP6	Closed
1, 2 VP7	Closed
1, 2 VP8	Closed
1, 2 VP9	Closed
1, 2 VP10	Closed
1, 2 VP11	Closed
1, 2 VP12	Closed
1, 2 VP13	Closed
1, 2 VP15	Closed
1, 2 VP16	Closed
1, 2 VP17	Closed
1, 2 VP18	Closed
1, 2 VP19	Closed
1, 2 VP20	Closed
1, 2 VQ1	Closed
1, 2 VQ2	Closed
1, 2 VQ5	Closed
1, 2 VQ6	Closed
1, 2 VX31	Closed
1, 2 VX33	Closed
1 YC54	Note 1
1 YC76	Note 1
1 YC113	Note 1



**MCGUIRE AIR-OPERATED ACTIVE VALVES  
OPERATOR FAILURE POSITIONS**

<u>Valve Tag</u>	<u>Failure Position</u>
1 YC135	Note 1
1 YC148	Note 1
1 YC162	Note 1
1 YC176	Note 1
1 YC190	Note 1
1 YC204	Note 1
1 YC218	Note 1
1 YC232	Note 1
1 YC246	Note 1
1 YC347	Open
1 YC357	Open

Note 1 - These 3-way valves fail to a position to allow chilled water to flow through the coil of their respective air handling units.

SYSTEM KEY

BB - Steam Generator Blowdown System  
CA - Auxiliary Feedwater System  
CF - Main Feedwater System  
KC - Component Cooling System  
NC - Reactor Coolant System  
ND - Residual Heat Removal System  
NF - Ice Condenser Refrigeration System  
NV - Chemical Volume and Control System  
RF - Fire Protection System  
RN - Nuclear Service Water System  
RV - Containment Ventilation Cooling Water System  
SA - Main Steam Supply to Auxiliary Equipment  
SM - Main Steam System  
SV - Main Steam Vent to Atmosphere  
VP - Containment Purge Ventilation System  
VQ - Containment Air Deluge and Addition System  
VX - Containment Air Return Exchange & Hydrogen  
Skimmer System  
YC - Chilled Water System

#### Attachment 4

##### McGuire Instrument Air Quality Program

Instrument air is presently supplied by three reciprocating and one centrifugal compressor. In the near future, all instrument air will be supplied by three centrifugal compressors. All existing and future compressors are oil free. Each compressor takes suction from the service building basement through an inlet filter. This area is free of corrosive contaminants and hazardous gases. Downstream of each reciprocating compressor, the hot compressed air flows through an aftercooler and water separator before discharging into a receiver. The aftercooler cools the hot compressed air and the water separator removes any water condensed in the cooling process. Downstream of the receivers, the instrument air is dried to a dew point of 35°F to 39°F by four refrigerated air dryers. After the dryers, the air passes through one of two full flow particulate filters which remove particulates larger than five microns. At each air operated valve or instrument the air is filtered again through a filter regulator. Each containment is provided with an independent source of instrument air by a rotary screw compressor. The compressor takes suction from containment through a filter. From the compressor, the air flows into an air receiver, after cooler, water separator, refrigerated air dryer, and a coalescing filter. The coalescing filter removes 99.9% of the oil.

The instrument air system is now fully tested for acceptable air quality on a regular basis. Air moisture content is tested semi-annually, oil content and foreign particulate are tested annually. Air dew point should not exceed 35°F, oil content should not exceed 1 ppm, and foreign particulate should not exceed 5 microns in size. If any of these limits are exceeded, appropriate corrective actions are taken. Initial sampling points are each containment header, service building (dryer outlets), auxiliary building, turbine buildings, and each dog house. After which, sample points will be limited to each containment header, the dryer outlets, and any identified problems headers.

All instrument air supply components are maintained in accordance with their respective manufacturers recommendations and our own maintenance experience. Also, the filter-regulators associated with critical to operation air-operated valves will be regularly maintained by August 1, 1989.

## Attachment 5

### Compilation of McGuire Action Items

1. The air quality testing specification will be written by 6/1/89.
2. The air-operated valve filter change out periodic preventive maintenance procedures on 56 air-operated valves will be written by 8/1/89.
3. The interior and exterior doghouses will be maintained at or above 40°F through the use of existing space heaters and administrative control of louver positions by 6/15/89.
4. A Problem Investigation Report (PIR) will determine whether 12 Unit 1 YC valves will be added to the periodic valve inservice testing program. This PIR is also addressing the non-qualified positioners between safety-related solenoid valves and the operators on the same 12 YC valves including 4 RN valves.
5. SOER 88-1 will be added to the Pressure Measurement Lesson Plan by 7/1/89. Information will also be added to the Fisher Control Valve Actuator Lesson Plan, presently under development.
5. Valve 1NV459 controls will be correctly connected by end of the current Unit 1 outage.

DUKE POWER COMPANY  
CATAWBA NUCLEAR STATION  
NRC GENERIC LETTER 88-14 RESPONSE

## Attachment 1

### Catawba Air Quality Test Results

<u>Sample Point</u>	<u>Dewpoint (°F)</u>	<u>Particulate (Microns)</u>	<u>Oil Content (PPM)</u>
Unit 1 Service Building	31.5	<5	0.02
Unit 1 Turbine Building	31.5	<5	0.33
Unit 1 Auxiliary Building	27.8	<5	0.02
Unit 2 Service Building	32.1	<5	0.017
Unit 2 Turbine Building	29.9	<5	0.0
Unit 2 Auxiliary Building	27.8	<5	0.033

Air quality testing is performed per a performance test procedure. Per this procedure, dew point in the instrument air system is determined every six months, while oil concentration and particulate contamination are determined once per year. Sample locations include the Turbine Buildings, Service Buildings, and the Auxiliary Buildings.

The test acceptance criteria was determined by Duke's Design Engineering Department. The acceptance criteria is based on air operated valve vendor recommendations and the Instrument Air Standard ISA-S7.3-1975. The criteria is as follows:

1. Dewpoint temperature at system pressure <35°F.
2. Oil concentration <1 PPM.
3. No particles >5 microns detected.

Dewpoint temperature is measured utilizing a General Eastern Condensation Dew point Hygrometer. Oil concentration is determined by passing a predetermined volume of air through a filter, then analyzing the filter for oil. This analysis is performed by Duke's Industrial Health Group. Particulate contamination is checked with a Royco Model 218 Portable Particle Monitor.

## Attachment 2

### Catawba Maintenance Practices Review

All preventative maintenance (PM) activities were reviewed on supply equipment and all will meet or exceed vendor requirements after some additions. The equipment reviewed were the reciprocating compressors, centrifugal compressor, refrigerant dryers, desiccant dryers, and coalescing filters. The following is a description of each preventative maintenance activity on each of these components.

The three reciprocating compressors receive quarterly, semi-annual, and annual preventative maintenance. The following checks are made during the quarterly PM:

1. A visual inspection of all compressor components is performed.
2. The air intake pre-filter and final filter are checked, cleaned, and replaced if necessary.
3. The compressor run time is recorded.
4. The carrier ring wear clearance is checked.
5. The compressor is returned to service and a function verification is performed.
6. The oil pressure, level, and water temperature is checked.
7. The condition of the V-belts are checked.
8. The after cooler moisture separator and receiver tanks are blown down.

During the semi-annual PM, the following checks are made in addition to those done on the quarterly PM:

1. The compressor oil and oil filter are replaced.
2. The crankcase oil screen is cleaned.
3. A crosshead and crankcase inspection is performed.
4. The air breather is cleaned.
5. The motor is greased.
6. A functional verification is performed.

During the annual PM, the following checks will be made in addition to those done on the semi-annual PM. This is a new PM and will be added by 9/1/89:

1. All valves are inspected and cleaned.
2. The cylinder water jackets are inspected and cleaned.
3. The intercooler is inspected and cleaned.

In addition to the above PM's, a complete compressor overhaul will be performed every 8000 hours of run time. The following checks will be made in addition to those done on the regular PM's. This is a new PM and will be added by 9/1/89:

1. The pistons are removed and inspected.
2. The cylinder bore is checked for wear.

3. The crosshead and crosshead wrist pin are inspected and clearances are checked.
4. The main bearings are inspected.
5. A functional verification is performed.

The one operating centrifugal compressor receives bi-monthly, semi-annual, and annual preventative maintenance. Several steps are being added to each PM. This will be complete by 9/1/89. The following checks are made during the bi-monthly PM:

1. The air pre-filter and final filter are replaced if required.
2. The moisture traps are manually blown down.
3. The compressor oil level is checked. (ADD)
4. Oil and water systems integrity is verified. (ADD)
5. Oil filter D/P is checked and changed if required. (ADD)
6. A functional verification is performed.

During the semi-annual PM, the following checks are made in addition to those done on the bi-monthly PM:

1. The mist arrester is replaced if necessary.
2. The discharge check valve is inspected.
3. The condensate traps are removed and cleaned.
4. The main driver coupling is lubricated and its alignment is checked. (ADD)
5. The inlet and bypass valve calibration is checked. (ADD)
6. An oil sample is drawn and analyzed. (ADD)
7. The oil filter housing is checked for corrosion and its sealing surfaces are checked. (ADD)
8. A functional verification is performed.

During the annual PM, the following checks are made in addition to those done on the semi-annual PM:

1. The oil pump suction screens are inspected and cleaned.
2. The discharge check, inlet throttle, and bypass valves are all inspected.
3. The shell and tube side of the oil cooler is inspected and cleaned. (ADD)
4. The bull gear teeth and bull gear bearings are inspected. (ADD)
5. A functional verification is performed.

The four refrigerant air dryers receive quarterly and annual preventative maintenance. The annual PM is new and will be added by 9/1/89. The following checks are made during the quarterly PM:

1. A general, external, visual inspection is performed looking for broken or missing parts.
2. The dryer is removed from operation.
3. The condensate system is drained, if required, the automatic traps are cleaned.
4. The service panel is removed and the refrigerant system is inspected and cleaned.
5. The fan motors are lubricated.

6. The dryer is returned to service.
7. The refrigerant is checked through the liquid indicator.
8. All parameters are verified to be within the normal limits.
9. The unit is adjusted as necessary to achieve proper operation.

During the annual PM, maintenance is performed on the exchanger coil:

1. The dryer is removed from service.
2. The dryer is isolated from the Instrument Air system.
3. The interior of the exchanger coil is cleaned, soaked, and flushed.
4. The unit is returned to service.

The Integrated Leak Rate Test (ILRT) desiccant dryer is only operated every three years and its air quality is verified prior to use. If necessary, the desiccant and filters are replaced.

The two small desiccant dryers serving outdoor components receive semi-annual preventative maintenance. This PM is a general inspection and will verify that the moisture indicator gauge is reading below 90%. If it's above 90%, a new desiccant cartridge is installed.

The four coalescing filters have their elements replaced once per year or on high differential pressure, whichever comes first.

#### **IAE Maintenance Practice Review**

A preventative maintenance program is being established for critical instrument air demand equipment. A list of approximately 42 critical to operation air operated valves (AOVs) have been identified to have their associated air regulator filters replaced. These filters have been replaced for Unit 1, and Unit 2 filters should be replaced by May 31, 1989. PM work requests are being written to change out these filters every two (2) years. This work activity will also be completed by May 31, 1989. Additional PM's may be established as deemed necessary.

#### **Catawba Emergency Procedure Review**

The Loss of Instrument Air abnormal procedures were reviewed for the McGuire, Catawba, and Oconee nuclear stations in November and December of 1988. Guidance for the procedure review was provided by NUREG-1275, recommendation 2.a and reports provided by other industry groups such as NSAC and INPO. The procedure review involved determining the availability of a procedure for each station, the procedural strategy employed to cope with loss of instrument air events, and a review of the technical content of the procedures.

Catawba has in place, in the control room, a procedure to address a loss of instrument air system event. The overall strategy employed is to stabilize the plant by restoring the instrument air system functions by recovering normal air supply sources to providing a backup source of air and isolating any air leaks. The technical content of the procedure carries out this strategy by identifying components to be manipulated, the sequence, and failure positions of components



on loss of air. Our plants have experienced significant loss of air events. The plants recovered from these events without serious incident using the strategy that is contained in all three of the plant's loss of air procedures. The lessons learned from these events were used to strengthen the technical content of the procedures.

In conclusion, the Catawba loss of instrument air procedure is deemed adequate to cope with anticipated loss of instrument air events. Also, because of our experience with losses of air, the procedure in effect has been validated.

### Catawba Training Review

#### BASIC AND GENERAL TRAINING

##### - Mechanical Maintenance

The Control Valve Maintenance and Repair Lesson Plan was revised to reflect problems that may result if extreme care is not taken to ensure no contamination exists in the air system components.

##### - Power Plant Fundamentals

The existing "Compressed Air Systems" lesson plan covers the importance of the Instrument Air System with discussion of uses of air systems for valve operation and instrument control. This Lesson Plan also covers major components, function, and adverse effects of loss of air. References to INPO SOER 88-1 (which was based in part on NRC Case Study Report AEOD/C701, i.e., essentially NUREG 1275) have already been included.

##### - Instrument and Electrical

SOER 88-1 will be added to the Pressure Measurement Lesson Plan, which is the first exercise oriented lesson addressing the use of instrument air components in the Basic Instrumentation and Electrical (I&E) Program. This will be complete by 7/1/89. Subject information will also be added to the Fisher Control Valve Actuator Lesson Plan presently under development for use as an advance topic. The Instrument Air System and the failure of instrument air is presently covered in the "Plant Air Systems" lesson plan.

#### STATION

Catawba Nuclear Station will cover this SOER in its '89 Operating Experience Program (OEP) Training Programs stressing the importance of the Instrument Air System and sensitizing the technicians to its vulnerability. SOER 88-1 will be reviewed at least every 3 years to determine its continued applicability.

#### BASIC OPERATOR TRAINING

The operation of the instrument air system and the consequences of the loss of instrument air are covered in the Systems Specific Module of the Basic Operator

Training Program. This training is provided to all learners prior to them reporting to the stations.

- Classroom training on the instrument air system is provided to all operators during the Introduction to Systems Specific (ISS) module of training after reporting to the stations.
- Each Non-Licensed Operator (NLO) is required to qualify on the operation of the instrument air system using the appropriate Training and Qualification (T&Q) guide prior to operating the system.
- Each NLO requalifies on the operation of the instrument air system, after initial qualification, at a frequency deemed appropriate by the NLO requal program at Catawba. This frequency is presently every four years.
- Each licensed operator receives classroom and simulator training on the loss of instrument air during the license preparatory module. This training includes specific simulator scenarios developed that require the operators to respond and to recover from a loss of instrument air.
- Each licensed operator receives requal training on the loss of instrument air at a frequency deemed appropriate by the requal program at Catawba. This training includes simulator training utilizing scenarios that require the operators to respond and to recover from a loss of instrument air. This training is presently conducted at a frequency of every year at Catawba.

### Attachment 3

#### Catawba Instrument Air System Design Verification

Item no. 3 of the subject document calls for "verification that the design of the entire instrument air system including air or other pneumatic accumulators is in accordance with its intended function, including verification by test that air-operated safety-related components will perform as expected in accordance with all design-basis events, including a loss of the normal instrument air system. This design verification should include an analysis of current air-operated component failure positions to verify they are correct for assuring required safety functions". In order to meet the requirements of this item, Design's review for Catawba took place in five parts:

- 1) Verify that dryers and filters are sized correctly for existing and anticipated future compressor capacity
- 2) Evaluation of instrument air lines located in areas where temperatures are potentially lower than the dryer dew point
- 3) Review instrument details to ensure that air-operated active valves fail in their intended positions
- 4) Check for non-qualified/extraneous devices which could impede the vent paths for the air-operated active valve and safety-related damper actuators
- 5) Verify that backup accumulators are properly designed to perform their intended function

The results of our review are as follows:

- 1) Verify That Dryers and Filters are Sized Correctly for Existing and Anticipated Future Compressor Capacity:

Catawba has a total of four instrument air compressors. One of these is the recently installed centrifugal compressor (1537 scfm) and the other three are the original reciprocating compressors (650 scfm each). Normally, the centrifugal compressor serves as the base compressor and two of the reciprocating units serve as standby compressors, ready to start as system load demands them. The maximum anticipated base load is 1400 scfm. In terms of peak demand, only the centrifugal compressor and one of the reciprocating units are expected to be needed simultaneously. Their combined output would be 2187 scfm. Installed refrigerant air dryer capacity is 2800 scfm (four at 700 scfm each) and filter capacity is 3600 scfm (four at 900 scfm each). Cyclone air/water separators are installed in each reciprocating compressor's discharge line upstream of the dryers. The design dew point of the refrigerant air dryers is 35°F at system pressure and rated flow. The filters have retention characteristics as follows:

Solid particle retention - 100% of particles  $\geq$  1.0 micron  
Oil aerosol particle retention - 95% of aerosols  $\geq$  0.04 micron  
- 100% of aerosols  $\geq$  3.00 micron

Additional filtration of supply instrument air to instrumentation and solenoid valves is done by each element's filter regulator. Duke has specified and supplied filters with the following ratings, except where vendor recommendations deviate:

<u>Component</u>	<u>Filter Rating</u>
pneumatic instruments	5 micron
solenoid valves	50 micron

Occasional problems with solenoids in refrigerant air dryer compressor freon circuits have been observed. Some of the original solenoid valves intermittently fail to cycle as intended, or cycle excessively. A new type of solenoid has been installed on two of the dryers. To date, cycling problems have ceased. Station personnel continue to monitor the situation on a daily basis and will take corrective action as they deem appropriate.

Therefore, the Catawba instrument air system filters and dryers are adequately sized and are designed to provide high quality air to the components served. Any operational problems have been identified and proper corrective action has been taken.

2) Evaluation of Instrument Air Lines Located in Areas Where Temperatures are Potentially Lower Than the Dryer Dew Point.

A review was also performed to determine if instrument air lines were routed in areas which could see temperatures potentially lower than the dryer dew point and therefore be susceptible to condensate formation and/or freezing. Several potential areas were identified. Desiccant air dryers, which are designed to drop the dew point to  $-40^{\circ}\text{F}$ , are installed in lines upstream of those portions subjected to temperatures below  $40^{\circ}\text{F}$ .

Two problems surfaced as a result of this review. First, heaters in the inboard and outboard doghouses are presently set to maintain a  $35^{\circ}\text{F}$  ambient temperature rather than  $40^{\circ}\text{F}$ . Second, each instrument air line routed to the yard has a desiccant air dryer which can be "valved in" during cold weather when line temperatures could potentially drop below  $40^{\circ}\text{F}$ . Duke has determined these dryers, to date, have not been used when needed.

Duke is taking appropriate action to address these problems. A Problem Investigation Report (PIR) was written to reset the heaters to maintain a minimum temperature of  $40^{\circ}\text{F}$ . In addition, a change to the FSAR has been written regarding this setpoint. As for the desiccant dryers, Duke's Design Engineering Department will issue written guidelines to the site prior to October 1, 1989 for their alignment during the winter months.

3) Review of Instrument Details to Ensure That Air-Operated Active Valves Fail in Their Intended Positions:

The Catawba Active Valve List was reviewed to determine which valves are air-operated (active valves are defined as those which are required to move to accomplish their safety function - i.e., prevent or mitigate the consequences of a design basis accident). Air-operated safety-related dampers were also identified. Valve drawings and the Catawba Active Valve List were reviewed to determine the failure positions of the active valves while manufacturer's drawings and Duke flow diagrams were reviewed to determine the failure positions of the safety-related dampers. Valve and damper numbers and their respective failure positions are given in Attachment A. A review of the corresponding instrument details confirmed that all the air-operated active valves and safety-related dampers at Catawba are designed to fail in their correct position on loss of instrument air. Also, all of the air-operated valves and dampers on Attachment A are verified by test to go to their fail-safe position on a periodic basis with the exception of: 1 & 2 NV-1A, -2A, -122B, and -123B. As a result of a previously initiated design study, 1 & 2 NV-1A and -2A will be added to the periodic valve inservice testing program. Valves 2 NV-1A, -2A will be tested during the present refueling outage while valves 1 NV-1A, -2A will be tested during the next cold shutdown. Valves 1 & 2 NV-122B and -123B do not receive a safety signal and, therefore, are not fail-safe tested.

4) Check For Non-Qualified/Extraneous Devices Which Could Impede the Vent Paths For the Air-Operated Active Valve And Safety-Related Damper Actuators:

a) Valves -

This task was segregated into two categories:

i) Non-qualified extraneous devices supplied **with** the valve and actuator -

Manufacturer's drawings for the air-operated active valves and their respective actuators were reviewed to determine if any non-safety vendor supplied devices existed between the actuators and the safety solenoid valves in the air supply line. From this review, no problems were identified.

ii) Non-qualified extraneous devices supplied separately from the valve and actuator -

Catawba's instrumentation details for active valves were reviewed and yielded two problems:

First, the solenoid valves for the Main Feedwater System (CF) Feedwater Bypass Control Valves (1 & 2 CF30, 39, 48, and 57) were found to be non-qualified. This status has been justified since

their failure will not preclude the process valves from fulfilling their safety function. A Station Problem Report (SPR) has been written to initiate replacement with 1E qualified solenoids. The replacements are currently scheduled for the end of each unit's next refueling outage (U1 - 2/11/90; U2 - 7/31/90).

Second, non-safety solenoid valves 1 & 2 SASV0052, which are installed in safety-related tubing runs, have been identified. These solenoids are in the actuator vent paths for the Auxiliary Feedwater Pump Turbine Steam Control Valves. The solenoids will not preclude the system from its fail-safe design since the safety functions related to the control valves are performed by other solenoid valves in the instrument line which are safety-related. The current design does not present an operability problem, but they are non-1E qualified. They will be moved to a point in the tubing outside the safety vent path. An SPR has been issued to initiate corrective action on this problem. The Unit 2 work was completed on 3/30/89 while the Unit 1 work is currently scheduled for 2/11/90 (end of its next refueling outage).

b) Dampers -

Manufacturer's control and instrument details were reviewed for non-qualified, extraneous devices associated with the safety-related dampers. It was determined that the pilot valves for damper 1 & 2 FPX-2A,B through -7A,B are non-safety. However, these dampers are required only for the movement of fuel and not to mitigate the consequences of a design basis accident (i.e., they perform a non-safety function). Therefore, we do not recommend replacing the existing pilot valves with safety grade valves.

5) Verify That Backup Accumulators are Properly Designed to Perform Their Intended Function:

The list of air-operated active valves was again reviewed to determine which of these valves had accumulators as a redundant source of air to ensure the valve achieves its proper failure position. Per the review, no such valves exist.

Summary and Action Items:

- 1) The Catawba instrument air system filters and dryers are adequately sized and are designed to provide high quality air to the components served. Any operational problems have been identified and proper corrective action has been taken.

- 2) A Problem Investigation Report (PIR) was written to reset the heaters in the inboard and outboard doghouses to maintain a minimum temperature of 40°F. In addition, a change to the FSAR has been written regarding this setpoint.
- 3) Design Engineering will issue written guidelines to the site prior to October 1, 1989 for the alignment during the winter months of desiccant dryers in each instrument air line routed to the yard.
- 4) All of the air-operated valves and dampers on Attachment A are verified by test to go to their fail-safe position on a periodic basis with the exception of: 1 & 2 NV-1A, -2A, -122B, and -123B. Valves 2 NV-1A, -2A will be tested during the present refueling outage while valves 1 NV-1A, -2A will be tested during the next cold shutdown. Valves 1 & 2 NV-1A and -2A will be added to the periodic valve inservice testing program. Valves 1 & 2 NV-122B and -123B do not receive a safety signal and, therefore, are not fail-safe tested.
- 5) There are no non-safety vendor supplied devices between the air actuators and the safety solenoid valves for Catawba's air-operated active valves.
- 6) The solenoid valves for the Main Feedwater System (CF) Feedwater Bypass Control Valves (1 & 2 CF30, 39, 48, and 57) were found to be non-qualified. A Station Problem Report (SPR) has been written to initiate replacement with 1E qualified solenoids. The replacements are currently scheduled for the end of each unit's next refueling outage (U1 - 2/11/90; U2 - 7/31/90).
- 7) Non-safety solenoid valves 1 & 2 SASV0052, which are installed in safety-related tubing runs, have been identified. These solenoids are in the actuator vent paths for the Auxiliary Feedwater Pump Turbine Steam Control Valves. They will be moved to a point in the tubing outside the safety vent path. An SPR has been issued to initiate corrective action on this problem. The Unit 2 work was completed on 3/30/89 while the Unit 1 work is currently scheduled for 2/11/90 (end of its next refueling outage).
- 8) The pilot valves for safety-related dampers 1 & 2 FPX-2A,B through -7A,B were determined to be non-safety. However, because these dampers are required only for the movement of fuel and not to mitigate the consequences of a design basis accident (i.e., they perform a non-safety function), we do not recommend replacing the existing pilot valves with safety grade valves.
- 9) Catawba's air-operated active valves do not have accumulators which provide a redundant source of air to ensure the valve achieves its failure position.

In summation, Catawba has recognized the need to provide quality instrument air and is taking proper action to ensure these needs are met. To the best of our knowledge, the instrument air system at Catawba is designed in accordance with its intended function. Any design deficiencies have been identified and proper

corrective action has been/is being taken. Verification by test that air-operated safety-related components will perform as expected has been/will be conducted.



CATAWBA AIR-OPERATED ACTIVE VALVES AND SAFETY-RELATED DAMPERS  
OPERATOR FAILURE POSITIONS

<u>Valve Tag</u>	<u>Failure Position</u>
1, 2 CA36	Open
1, 2 CA40	Open
1, 2 CA44	Open
1, 2 CA48	Open
1, 2 CA52	Open
1, 2 CA56	Open
1, 2 CA60	Open
1, 2 CA64	Open
1, 2 CA149	Closed
1, 2 CA150	Closed
1, 2 CA151	Closed
1, 2 CA152	Closed
1, 2 CA185	Closed
1, 2 CA186	Closed
1, 2 CA187	Closed
1, 2 CA188	Closed
1, 2 CF28	Closed
1, 2 CF30	Closed
1, 2 CF37	Closed
1, 2 CF39	Closed
1, 2 CF46	Closed
1, 2 CF48	Closed
1, 2 CF55	Closed
1, 2 CF57	Closed
1, 2 CF87	Closed
1, 2 CF88	Closed
1, 2 CF89	Closed
1, 2 CF90	Closed
1, 2 KC57A	Open
1, 2 KC82B	Open
1, 2 NC32B	Closed
1, 2 NC34A	Closed
1, 2 NC36B	Closed
1, 2 ND26	Open
1, 2 ND27	Closed
1, 2 ND60	Open
1, 2 ND61	Closed
1, 2 NF228A	Closed
1, 2 NF234A	Closed
1, 2 NV1A	Closed
1, 2 NV2A	Closed
1, 2 NV10A	Closed
1, 2 NV11A	Closed

CATAWBA AIR-OPERATED ACTIVE VALVES AND SAFETY-RELATED DAMPERS  
OPERATOR FAILURE POSITIONS

<u>Valve Tag</u>	<u>Failure Position</u>
1, 2 NV13A	Closed
1, 2 NV122B	Closed
1, 2 NV123B	Closed
1, 2 RN291	Open
1, 2 RN351	Open
1, 2 SA2	Open
1, 2 SA5	Open
1, 2 SM1	Closed
1, 2 SM3	Closed
1, 2 SM5	Closed
1, 2 SM7	Closed
1, 2 SM9	Closed
1, 2 SM10	Closed
1, 2 SM11	Closed
1, 2 SM12	Closed
1, 2 SV1	Closed
1, 2 SV7	Closed
1, 2 SV13	Closed
1, 2 SV19	Closed
1, 2 VP1B	Closed
1, 2 VP2A	Closed
1, 2 VP3B	Closed
1, 2 VP4A	Closed
1, 2 VP6B	Closed
1, 2 VP7A	Closed
1, 2 VP8B	Closed
1, 2 VP9A	Closed
1, 2 VP10A	Closed
1, 2 VP11B	Closed
1, 2 VP12A	Closed
1, 2 VP13B	Closed
1, 2 VP15A	Closed
1, 2 VP16B	Closed
1, 2 VP17A	Closed
1, 2 VP18B	Closed
1, 2 VP19A	Closed
1, 2 VP20B	Closed

<u>Damper Tag</u>	<u>Failure Position</u>
1, 2 ABF-D-3	Open
1, 2 ABF-D-5	Closed
1, 2 ABF-D-7	Open

**CATAWBA AIR-OPERATED ACTIVE VALVES AND SAFETY-RELATED DAMPERS  
OPERATOR FAILURE POSITIONS**

<u>Damper Tag</u>	<u>Failure Position</u>
1, 2 ABF-D-10	Open
1, 2 ABF-D-12	Closed
1, 2 ABF-D-14	Open
1, 2 ABF-D-17	Open
1, 2 FPX-D-2A,B	Open
1, 2 FPX-D-3A,B	Open
1, 2 FPX-D-4A,B	Closed
1, 2 FPX-D-5A,B	Open
1, 2 FPX-D-6A,B	Open
1, 2 FPX-D-7A,B	Closed

SYSTEM KEY

CA - Auxiliary Feedwater System  
CF - Main Feedwater System  
KC - Component Cooling System  
ND - Residual Heat Removal System  
NF - Ice Condenser Refrigeration System  
NV - Chemical volume and Control System  
RN - Nuclear Service Water System  
RV - Containment Ventilation Cooling Water System  
SA - Main Steam Supply to Auxiliary Equipment  
SM - Main Steam System  
SV - Main Steam Vent to Atmosphere  
VP - Containment Purge Ventilation System  
ABF - Auxiliary Building Ventilation System (VA)  
Damper  
FPX - Fuel Handling Building Ventilation System  
(VF) Damper

## Attachment 4

### Catawba Instrument Air Quality Program

Instrument air is supplied by three reciprocating and one centrifugal compressor. The compressors intakes are in the service building which is free of corrosive contaminants and hazardous gases. Each compressor takes suction through an inlet filter. Downstream of each reciprocating compressor, the hot compressed air flows through an aftercooler and water separator before discharging to a receiver. The aftercooler cools the hot compressed air and the water separator removes any water condensed in the cooling process. Downstream of the receivers, the instrument air is dried to a dew point of 35°F to 39°F by four refrigerated air dryers. In addition, desiccant dryers are provided on the lines going outside the buildings to dry the air to a dew point of -40°F. After the refrigerated dryers, the air passes through coalescing filters which remove oil and particles larger than 3 microns. At each air operated valve or instrument, the air is filtered again through a filter-regulator.

The Instrument Air system is tested for acceptable air quality. Air moisture content is tested semi-annually, oil content and foreign particulate are tested annually. Air dew point should not exceed 35°F, oil content should not exceed 1 ppm, and foreign particulate should not exceed 5 microns in size. If any of these limits are exceeded, appropriate corrective actions are taken. In addition to sampling at the dryer outlets (service building), instrument air is also sampled in the turbine building and auxiliary building.

All Instrument Air supply components will be maintained in accordance with their respective manufacturers recommendations and our own maintenance experience by 9/1/89. Also, the filter-regulators associated with critical to operation air-operated valves will be regularly maintained by May 31, 1989.

## Attachment 5

### Compilation of Catawba Action Items

1. Add annual Preventative Maintenance (PM) to reciprocating compressor maintenance activities by 9/1/89.
2. Add 8000 hour overhaul to reciprocating compressor maintenance activities by 9/1/89.
3. Add 3 steps to centrifugal compressor's bi-monthly PM by 9/1/89.
4. Add 4 steps to centrifugal compressor's semi-annual PM by 9/1/89.
5. Add 2 steps to centrifugal compressor's annual PM by 9/1/89.
6. Add annual PM to refrigerant dryer maintenance activities by 9/1/89.
7. The air-operated valve filter change out periodic PM's on 42 air-operated valves will be written by 5/31/89, and filter change out on Unit 2 completed by 5/31/89.
8. Guidelines will be issued for aligning the small desiccant dryers serving outdoor components by 10/1/89.
9. Valves 2NV-1A and 2A will be fail safe tested by the end of the present refueling outage. These valves are also being added to the periodic valve inservice testing program.
10. Valves 1NV-1A and 2A will be fail safe tested during the next Unit 1 cold shutdown. This will be no later than 4/1/90. These valves are also being added to the periodic valve inservice testing program.
11. The non-qualified solenoid valves for 1, 2 CF-30, 39, 48, and 57 will be replaced with 1E qualified solenoids by the end of the each units next refueling outage. Unit 1 - 2/11/90, Unit 2 - 7/31/90.
12. Non-safety solenoid valve SASV0052 will be moved to a point in the tubing outside the safety vent path by the end of the next Unit 1 refueling outage (2/11/90).
13. SOER 88-1 will be added to the Pressure Measurement Lesson Plan by 7/1/89. Information will also be added to the Fisher Control Valve Actuator Lesson Plan presently under development.