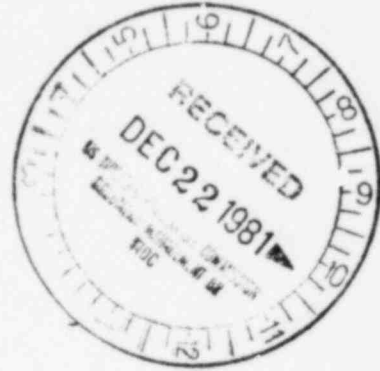


DEC 21 1981



MEMORANDUM FOR: Darrell G. Eisenhut, NRR  
Edward L. Jordan, IE  
Donald B. Mausshardt, NMSS  
Robert M. Bernero, RES  
Clemens J. Heltemes, Jr., AEOD  
Joseph Scinto, ELD

FROM: Victor Stello, Jr., Chairman  
Committee to Review Generic Requirements

SUBJECT: CRGR MEETING NUMBER 5

The Committee to Review Generic Requirements will meet on Thursday, January 7, 1982, from 1-5 pm in Room 6507 MNBB. The meeting agenda is as follows:

1. Regulatory Guide 1.68.3 Briefing - Preoperation Testing of Instrument and Control Air Systems. This Regulatory Guide was sent to my office for concurrence prior to final printing and distribution (Enclosure 1). I have asked Robert Minogue, Director of Research, to have his staff brief the CRGR regarding Reg. Guide 1.68.3 (1 hour).
2. Equipment Qualification Briefing - The Commission is considering the proposed Equipment Qualification Rule. In this regard, I have asked the Office Directors involved with the proposed rule to brief the CRGR on this topic (Enclosures 2 & 3) (1 hour).
3. Continuation of Emergency Response Discussions - During the last CRGR meeting, the Committee continued discussion of the previous meeting on the topic of "Facilities, Equipment and Procedures to Cope with Emergencies in Nuclear Power Plants." Ed Blackwood of the DEDROGR staff discussed the initial findings of a Task Force review of NRC's requirements in this area. The Committee decided that it will seek comments from the Program Offices after the Task Force refines the proposed requirements. The DEDROGR staff is drafting an integrated plan for further EDO actions. These are to be discussed. As soon as the DEDROGR staff completes its work but prior to the meeting, I will forward some information to you regarding this subject (1 hour).
4. The CRGR will discuss and develop its recommendations in a closed session. (1 hour).

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With regard to attendance at CRGR meetings, I believe that having 25-30 senior level staff in attendance is unnecessary and unproductive. By copy of this memo, I am requesting the Office Directors to limit attendance of their staffs at CRGR meetings to those few senior staff needed to address the agenda item under discussion. In addition, the time set aside for the CRGR to discuss and develop its recommendations will be closed to all but CRGR members and invited participants.

Original signed by  
Victor Stello

Victor Stello, Jr., Chairman  
Committee to Review Generic  
Requirements

Enclosures: As stated

cc: Office Directors  
T. Rehm

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SURNAME ▶	TEMurley:bg	VStello					
DATE ▶	12/21/81	12/21/81					



# REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

*3rd PMO 7/14/81*

REGULATORY GUIDE 1.68.3

(Task RS 709-4)

*Concurrence package*

## PREOPERATIONAL TESTING OF INSTRUMENT AND CONTROL AIR SYSTEMS

### A. INTRODUCTION

General Design Criterion 1, "Quality Standards and Records," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," requires that structures, systems, and components important to safety be tested to quality standards commensurate with the importance of the safety functions to be performed. Criterion XI, "Test Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 requires that a test program be established to ensure that all testing, including preoperational testing, required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed. Instrument and control air systems supply pressurized air to operate various loads, including components and systems that are required to perform functions important to safety. This guide, which replaces Regulatory Guide 1.80, describes a method acceptable to the NRC staff for complying with the Commission's regulations with respect to preoperational testing to verify that instrument and control air systems<sup>1</sup> and the loads they supply will operate properly at normal system pressures and to ensure the operability of functions important to safety in the event that system pressure is lost, reduced below normal operating level, or increased above the design pressure of the system components.

### B. DISCUSSION

Instrument and control air systems typically furnish pressurized air to a wide variety of equipment in nuclear power plants. The extent to which such air systems are used varies with different designs of both the nuclear and the balance-of-plant portions of the facility.

<sup>1</sup>The recommendations of this guide should also be applied to (1) compressed gas systems that, although not designated as instrument and control air systems, supply loads that could affect the overall safety and performance of the plant, (2) compressed gas systems that supply loads only to specific systems that are important to safety, and (3) systems important to safety that use compressed gases other than air.

Because of the diversity of loads normally supplied, there is a possibility for unsafe interactions. Therefore, it is important that testing be done to verify proper functioning during normal operation and to determine the effects of total loss, reduction, or increase of the pressure within the entire instrument and control air distribution system and portions thereof.

It is essential that testing verify that the system will respond appropriately to both normal operation of the plant and upset, faulted, or emergency conditions with consideration being given to (1) complete and sudden loss of pressure resulting from such postulated events as inadvertent valve operation in the supply system, severance of a system pipe, loss of offsite electric power, loss of d.c. power, and component malfunction; (2) partial or gradual loss of system pressure to the entire distribution system or portions thereof resulting from such events; and (3) increases in pressure due to component malfunction or failure.

Air-operated valves and other air-operated components are normally designed to respond in a given manner, i.e., fail open, fail closed, or fail as is, if the instrument and control air supply is lost or its pressure is reduced or increased. Verification of system response to a loss-of-air-pressure event is an essential part of testing at the preoperational stage, at which time it can be accomplished with a minimum risk to power plant equipment and personnel. Testing also provides a means for determining the adequacy of operating and emergency procedures for coping with a loss of air supply.

Preoperational testing of the instrument and control air system following construction of the plant and installation of the instrument and control air system will help ensure that the air supply equipment (compressors and associated controls and backup air supplies) and the equipment provided to maintain the quality of air supplied (e.g., filters and dryers) will function within design requirements.

The applicant is responsible for developing a suitable preoperational test program for the instrument and control air system. This includes preparing adequate procedures for carrying out the program, properly conducting the preopera-

#### USNRC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the NRC staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

This guide was issued after consideration of comments received from the public. Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience.

Comments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

The guides are issued in the following ten broad divisions:

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 1. Power Reactors                 | 6. Products                       |
| 2. Research and Test Reactors     | 7. Transportation                 |
| 3. Fuels and Materials Facilities | 8. Occupational Health            |
| 4. Environmental and Siting       | 9. Antitrust and Financial Review |
| 5. Materials and Plant Protection | 10. General                       |

Copies of issued guides may be purchased at the current Government Printing Office price. A subscription service for future guides in specific divisions is available through the Government Printing Office. Information on the subscription service and current GPO prices may be obtained by writing the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Publications Sales Manager.

tional tests, and establishing the validity of the test results by adequate review and approval.

### C. REGULATORY POSITION

As part of the initial preoperational testing program and also after major modifications or repairs to the instrument and control air system or portions thereof (e.g., where air-flow-rate requirements are significantly altered or where opened systems are subject to contamination), the system and loads should be tested as described below to verify that all components function properly at normal pressures and following possible pressure increases and that the systems respond as designed to a loss-of-air-pressure event.

1. The test program for the instrument and control air system and associated equipment should include the applicable prerequisite checks, verifications, and tests provided in Section C.2 of Regulatory Guide 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants."

2. Compressors, aftercoolers, oil separator units, air receivers, and pressure-reducing stations should be tested to verify proper operation according to system design. The operation of compressor unloaders, automatic and manual start and stop circuits of standby compressors, high- and low-pressure alarms, pressure indicators, and temperature indicators should be checked. Relief valve settings should be verified.

3. Air dryer units should be tested for proper functioning, and the units should be operated through at least one regeneration cycle. Acceptable operation at maximum flow rates should be verified. The appropriate differential pressures and proper operation of pressure switches, high- and low-pressure alarms, safety and relief valves, bypass valves, and alarms and resets should be verified.

4. It should be verified by test that the instrument and control air system will meet specifications relating to flow, pressure, and temperature of the product air.

5. It should be established by appropriate measurements or observations that the total air demand at normal steady-state conditions, including leakage from the system, is in accordance with design.

6. The ability of the system to meet the quality requirements of ANSI/ISA S7.3-1975, "Quality Standard for Instrument Air,"\* with respect to oil, water, and particulate matter contained in the product air should be verified by analyzing the air at the end of each feeder line using continuous flow techniques or by analyzing a discrete sample.

7. When redundant components and air supplies are provided in the facility design to meet the single-failure criterion for a given safety function, it should be verified by test that the single-failure criterion is met.

8. It should be verified by tests that the air-operated or air-powered loads that are a part of (or support the opera-

tion of) portions of the facility important to safety respond in accordance with design to a loss of air pressure. Testing should be sufficiently comprehensive to determine the response of loads to complete loss of system pressure, both sudden and gradual, and to partial reductions in system pressure. The tests should verify the adequacy of design requirements relating to system pressures at which supplied loads change state (e.g., fail open, fail closed, fail as is, fail upscale, fail downscale, or fail to perform other required functions). Testing should also verify that the backup supplies for the protected loads supplied by the system, e.g., accumulators and backup bottled gas supplies, will maintain sufficient air pressure to permit these loads to perform their design function.

As part of the above testing, loss-of-air-supply tests should be conducted on all branches of the instrument and control air system simultaneously, if practicable, or on the largest number of branches of the system that can be adequately managed. For each test, the valves to be tested should be placed in their normal operating position, and the rest of the plant should be maintained in as close to normal conditions as is practicable. (It should be noted that not all valves can be placed in the required normal operating position because of operating procedure requirements or personnel or equipment safety factors.) The following tests should be performed:

a. Shut off the instrument and control air system in a manner that would simulate a sudden air pipe break and verify that the affected components respond properly.

b. Repeat test a., but shut the instrument and control air system off very slowly to simulate a gradual loss of pressure.

9. Tests should be conducted, as appropriate, to demonstrate that plant equipment designated by design to be supplied by the instrument and control air system is not being supplied by other compressed air supplies (such as service air) that may have less restrictive air quality requirements.

10. Plant components requiring large quantities of instrument and control air for operation (such as large valve operators) should be operated simultaneously while the system is operating at normal steady-state conditions (unless it can be shown that simultaneous operation is prohibited by interlock or appropriate procedure) to verify that pressure transients in the distribution system do not exceed acceptable values.

11. Functional testing of instrument and control air systems important to safety should be performed to ensure that credible failures resulting in an increase in the supply system pressure will not cause peak transient pressures above the design pressure of the system components.

### D. IMPLEMENTATION

Except in those cases in which an applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described in this guide will be used in the evaluation of all applications for operating licenses received after June 1, 1982.

\* Copies may be obtained from the Instrument Society of America, P.O. Box 12277, Research Triangle Park, North Carolina 27709.

*When issued, this guide replaces Regulatory Guide 1.68.3-2*

## VALUE/IMPACT STATEMENT

### BACKGROUND

Regulatory Guide 1.80 provides methods for preoperational testing of instrument air systems to ensure that the instrument air systems and components as designed and installed will function properly and that they are free from foreign matter that could cause malfunctions during operation. The guide also contains provisions for tests to demonstrate that the systems will respond as expected to a loss-of-instrument-air accident.

Experience in using the guide has shown that there have been problems in applying the guide where there is a relationship between the instrument air system and the control air system. Therefore, the scope of Regulatory Guide 1.80 was expanded to include the control air system because of the possibility that it may be associated with systems important to safety. However, the expanded guide is being issued as Regulatory Guide 1.68.3 in order to group it with other guides in the initial test program subseries, and Regulatory Guide 1.80 is being withdrawn.

### VALUE/IMPACT

1. The scope of the guide has been expanded to include control air systems as well as instrument air systems.

*Value* - This change will make it clear that some testing is needed for all instrument and control air systems. Some applicants have taken the position that their plants are so designed that failure of the instrument air system (i.e., total loss of pressure) will cause no safety problems. The instrument air system of these plants has not been designated as important to safety and therefore, by this logic, Regulatory Guide 1.80 is not applicable. This argument ignores the fact that, although loss of system pressure may not be serious, malfunction of the air system (e.g., introduction of dirt, oil, or moisture also addressed by Regulatory Guide 1.80) could lead to failure of loads that are important to safety. The revised guide makes it clear that the testing applies to all air systems that supply air to loads that are important to safety.

*Impact* - There may be some impact if applicants have not been testing because their systems have been identified by names different from those used in the guide. However, the staff position has always been that systems important to safety should be tested to demonstrate proper operation and to ensure that the functioning of loads important to safety is not jeopardized by failure of associated systems.

2. Regulatory Position 5, which calls for verification by tests that the total air demand at normal steady-state conditions, including leakage from the system, is in accordance with design, was added.

*Value* - The tests called for by this provision will verify actual air demands so that air supply capacity can be verified as adequate with the necessary margin to account

for peak loads and increased leakage that may occur as the system is used.

*Impact* - Although not specifically mentioned, it has been the intent that the tests called for in this position be accomplished. The position is stated explicitly to improve guidance. For those plants that were not already obtaining the information, the impact should be minimal as the data can be obtained by normal system observations and simple measurements.

3. Regulatory Position 9, which calls for tests, measurements, and observations to be conducted to demonstrate that air supplies such as the service air supply are not inadvertently tied into the instrument and control air systems, was added.

*Value* - The tests called for in this position will demonstrate that air systems with poor quality air are not inadvertently tied into the systems that supply air to loads that are important to safety. Since air systems are generally field run, verification of independence by test is essential.

*Impact* - The impact will be minimal. The demonstration that there are no crossties from the service air system can be accomplished by cutting off the instrument and control air source with all other air systems under pressure and showing that no air is being introduced into the system.

4. Regulatory Position 10, which states that plant components requiring large quantities of air for operation should be operated simultaneously to establish that pressure transients created by such operation do not exceed acceptable values, was added.

*Value* - This test will demonstrate that the maximum operating transients on the system are within limits that will not adversely affect the operation of loads that are important to safety.

*Impact* - There should be minimal impact since the test can be run by simple operational procedures and data observations.

5. The regulatory position that provided for a test of the loss of air with valves placed in other than the failed position was deleted.

*Value* - An unnecessary system test was deleted. The response of components to a loss of air pressure (when the valves are placed in a position other than the failed position) can be verified, where required, on an individual component basis.

*Impact* - There is no impact since no new position is imposed.

6. The regulatory position calling for the test results to be included in the startup report was deleted.

*Value* - An unnecessary reporting provision was removed. This provision was inappropriate since preoperational testing precedes the startup test program. The test results should be retained as part of the plant historical record.

*Impact* - There is no impact since no new position is imposed.

7. Regulatory Position 11, which provides for functional testing to ensure that credible failures resulting in an increase in the supply system pressure will not cause peak

transient pressures above the design pressure of the system components, was added.

*Value* - Operating experience (e.g., Pilgrim) has shown that pressure transients above the design pressure of some components can cause those components to malfunction, which could cause unsafe conditions to exist.

*Impact* - There should be minimal impact. Additional testing will be required. However, the test setup should be no different from that needed to conduct the loss-of-pressure tests, hence increased test time would be the only factor.



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

DEC 10 1981

MEMORANDUM FOR: Harold Denton, Director  
Office of Nuclear Reactor Regulation

Richard DeYoung, Director  
Office of Inspection and Enforcement

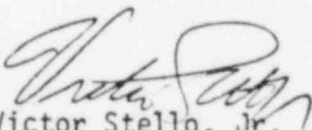
Robert Minogue, Director  
Office of Nuclear Regulatory Research

FROM: Victor Stello, Jr.  
Deputy Executive Director  
Regional Operations and Generic Requirements

SUBJECT: EQUIPMENT QUALIFICATION RULEMAKING

The enclosed letter from Chairman Palladino to Mr. Vandenburg of Yankee Atomic Electric Company notes that the proposed requirements in the area of Equipment Qualification will include a value-impact assessment and will provide an estimate of the potential risk reduction that can be obtained from implementation of the requirements.

In your plans for developing the proposed Equipment Qualification Rule, you should plan on submitting the Rule to the CRGR for review. We are scheduling a briefing for the CRGR on this topic for Thursday, January 7, 1982. Please have representatives from your offices coordinate a briefing on the background, plans and schedules for developing the Equipment Qualification Rule.

  
Victor Stello, Jr.  
Deputy Executive Director  
Regional Operations and Generic  
Requirements

Enclosure: As stated

cc: W. Dircks  
CRGR Members

*Copy of*  
~~\_\_\_\_\_~~  
PDR



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

December 2, 1981

Mr. D. E. Vandenburg  
Senior Vice President  
Yankee Atomic Electric Co.  
1671 Worcester Road  
Framingham, Massachusetts 01701

Dear Mr. Vandenburg:

This is in response to your letter of September 14, 1981 which discusses your concern with current Commission actions on equipment qualification and with use of interim requirements unsupported by appropriate value-impact analyses,

As you know, the background and basis for the current staff actions on environmental qualification of safety-related electrical equipment is contained in the Commission's Memorandum and Order, CLI-80-21, dated May 23, 1980. This Memorandum and Order was issued when it became clear to the Commission that resolution of the qualification issues was not receiving the attention it deserved.

Since the staff guidelines and applicable NUREG document apply progressively less strict standards to older plants, the Memorandum and Order specified rulemaking as the appropriate vehicle for determining the final qualification requirements. CLI-80-21 stated that:

"If the staff proposed rule does not require plants to be upgraded to a single uniform standard along the lines of the 1974 requirements in NUREG-0588, then its justification for that position will be articulated in depth and will be subject to comment in the proceeding."

The rulemaking process is intended to assure that unnecessary requirements or changes in requirements which would unduly tax industry and NRC resources would not be issued and that all alternative means to achieve safety objectives be given full consideration.

You have pointed out the importance of value-impact analysis in the setting of new requirements. It is our view that consideration of costs is always appropriate in deciding among alternative methods for achieving a given level of

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safety. These factors are being considered and will be applied in the ongoing rulemaking on equipment qualification. We intend to allow licensees sufficient time for in-depth engineering, design, and procurement of high quality equipment and for proper installation, compatible with operational schedules to the extent possible in view of public health and safety considerations.

Finally, you expressed concern about the overall implementation of seismic, dynamic and environmental qualification of safety-related electrical and mechanical equipment. In establishing the proposed and the final requirements in this area the Staff will develop a value-impact assessment and will provide an estimate of the potential risk reduction that can be obtained from implementation of the requirements. These assessments will be evaluated by the Commission during our deliberations on the requirements.

Sincerely,

Original Signed by  
Victor Gilinsky

*for*

Nunzio J. Palladino

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