SAI-186-029-05

TECHNICAL EVALUATION REPORT

IMPROVEMENTS IN TRAINING AND REQUALIFICATION PROGRAMS AS REQUIRED BY TMI ACTION ITEMS I.A.2.1 AND II.B.4

for the

Haddam Neck Plant

(Docket 50-213)

September 1, 1982

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Contract NRC-03-82-096

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I. INTRODUCTION

Science Applications, Inc. (SAI), as technical assistance contractor to the U.S. Nuclear Regulatory Commission, has evaluated the response by Northeast Utilities (Connecticut Yankee Atomic Power Co.) for the Haddam Neck Plant (Docket 50-213) to certain requirements contained in post-TMI Action Items I.A.2.1, Immediate Upgrading of Reactor Operator and Senior Reactor Operator Training and Qualification, and II.B.4, Training for Mitigating Core Damage. These requirements were set forth in NUREG-0660 (Reference 1) and were subsequently clarified in NUREG-0737 (Reference 2).*

The purpose of the evaluation was to determine whether the licensee's operator training and requalification programs satisfy the requirements. The evaluation pertains to Technical Assignment Control (TAC) System numbers 44165 (NUREG-0737, I.A.2.1.4) and 44515 (NUREG-0737, II.B.4.1). As delineated below, the evaluation covers only some aspects of item I.A.2.1.4.

The detailed evaluation of the licensee's submittals is presented in Section IV; the conclusions are in Section V.

II. SCOPE AND CONTENT OF THE EVALUATION

A. I.A.2.1: Immediate Upgrading of Reactor Operator and Senior Reactor Operator Training and Qualifications

The clarification of TMI Action Item I.A.2.1 in NUREG-0737 incorporates a letter and four enclosures, dated March 28, 1980, from Harold R. Denton, Director, Office of Nuclear Reactor Regulation, USNRC, to all power reactor applicants and licensees, concerning qualifications of reactor operators (hereafter referred to as Denton's letter). This letter and enclosures imposes a number of training requirements on power reactor licensees. This evaluation specifically addressed a subset of the requirements stated in Enclosure 1 of Denton's letter, namely: Item A.2.c, which relates to operator training requirements; item A.2.e, which concerns instructor requalification; and Section C, which addresses operator requalification. Some of these requirements are elaborated in Enclosures 2, 3, and 4 of Denton's letter. The training requirements under evaluation are summarized in Figure 1. The elaborations of these requirements in Enclosures 2, 3, and 4 of Denton's letter are shown respectively in Figures 2, 3, and 4.

As noted in Figure 1, Enclosures 2 and 3 indicate minimum requirements concerning course content in their respective areas. In addition, the Operator Licensing Branch in NRC has taken the position (Reference 3) that

*Enclosure 1 of NUREG-0737 and NRC's Technical Assistance Control System distinguish four sub-actions within I.A.2.1 and two sub-actions within II.B.4. These subdivisions are not carried forward to the actual presentation of the requirements in Enclosure 3 of NUREG-0737. If they had been, the items of concern here would be contained in I.A.2.1.4 and II.B.4.1.

Figure 1. Training Requirements from TMI Action Item I.A.2.1*

Program Element	NRC Requirements**
OPERATIONS PERSONNEL TRAINING	Enclosure 1, Item A.2.c(1) Training programs shall be modified, as necessary, to provide training in heat transfer, fluid flow and thermodynamics. (Enclosure 2 provides guidelines for the minimum content of such training.) Enclosure 1, Item A.2.c(2) Training programs shall be modified, as necessary to provide training in the use of installed plant systems to control or mitigate an accident in which the core is severely damaged. (Enclosure 3 provides guidelines for the minimum content of such training.) Enclosure 1, Item A.2.c.(3) Training programs shall be modified, as necessary to provide increased emphasis on reactor and plant transients.
INSTRUCTOR REQUALIFICATION	Enclosure 1, Item A.2.e Instructors shall be enrolled in appropriate requalification programs to assure they are cognizant of current operating history, problems, and changes to procedures and administrative limitations.
PERSONNEL REQUALIFICATION	Enclosure 1, Item C.1 Content of the licensed operator requalification programs shall be modified to include instruction in heat transfer, fluid flow, thermodynamics, and mitigation of accidents involving a degraded core. (Enclosures 2 and 3 provide guidelines for the minimum content of such training.) Enclosure 1, Item C.2 The criteria for requiring a licensed individual to participate in accelerated requalification shall be modified to be consistent with the new passing grade for issuance of a license: 80% overall and 70% each category. Enclosure 1, Item C.3 Programs should be modified to require the control manipulations listed in Enclosure 4. Normal control manipulations, such as plant or reactor startups, must be performed. Control manipulations during abnormal or emergency operations must be walked through with, and evaluated by, a member of the training staff at a minimum. An appropriate simulator may be used to satisfy the requirements for control manipulations.

*The requirements shown are a subset of those contained in Item I.A.2.1.
**References to Enclosures are to Denton's letter of March 28, 1980, which is contained in the clarification of Item I.A.2.1 in NUREG-0737.

Figure 2. Enclosure 2 from Denton's Letter

TRAINING IN HEAT TRANSFER, FLUID FLOW AND THERMODYNAMICS

1. Basic Properties of Fluids and Matter.

This section should cover a basic introduction to matter and its properties. This section should include such concepts as temperature measurements and effects, density and its effects, specific weight, buoyancy, viscosity and other properties of fluids. A working knowledge of steam tables should also be included. Energy movement should be discussed including such fundamentals as heat exchange, specific heat, latent heat of vaporization and sensible heat.

2. Fluid Statics.

This section should cover the pressure, temperature and volume effects on fluids. Example of these parametric changes should be illustrated by the instructor and related calculations should be performed by the students and discussed in the training sessions. Causes and effects of pressure and temperature changes in the various components and systems should be discussed in the training sessions. Causes and effects of pressure and temperature changes in the various components and systems should be discussed as applicable to the facility with particular emphasis on safety significant features. The characteristics of force and pressure, pressure in liquids at rest, principles of hydraulics, saturation pressure and temperature and subcooling should also be included.

3. Fluid Dynamics.

This section should cover the flow of fluids and such concepts as Bernoulli's principle, energy in moving fluids, flow measure theory and devices and pressure losses due to friction and orificing. Other concepts and terms to be discussed in this section are NPSH, carry over, carry under, kinetic energy, head-loss relationships and two phase flow fundamentals. Practical applications relating to the reactor coolant system and steam generators should also be included.

4. Heat Transfer by Conduction, Convection and Radiation.

This section should cover the fundamentals of heat transfer by conductions. This section should include discussions on such concepts and terms as specific heat, heat flux and atomic action. Heat transfer characteristics of fuel rods and heat exchangers should be included in this section.

This section should cover the fundamentals of heat transfer by convection. Natural and forced circulation should be discussed as applicable to the various systems at the facility. The convection current patterns created by expanding fluids in a confined area should be included in this section. Heat transport and fluid flow reductions or stoppage should be discussed due to steam and/or noncondensible gas formation during normal and accident conditions.

This section should cover the fundamentals of heat transfer by thermal radiation in the form of radiant energy. The electromagnetic energy emitted by a body as a result of its temperature should be discussed and illustrated by the use of equations and sample calculations. Comparisons should be made of a black body absorber and a white body emitter.

5. Change of Phase - Boiling.

This section should include descriptions of the state of matter, their inherent characteristics and thermodynamic properties such as enthalpy and entropy. Calculations should be performed involving steam quality and void fraction properties. The types of boiling should be discussed as applicable to the facility during normal evolutions and accident conditions.

6. Burnout and Flow Instability.

This section should cover descriptions and mechanisms for calculating such terms as critical flux, critical power, DNB ratio and hot channel factors. This section should also include instructions for preventing and monitoring for clad or fuel damage and flow instabilities. Sample calculations should be illustrated by the instructor and calculations should be performed by the students and discussed in the training sessions. Methods and procedures for using the plant computer to determine quantitative values of various factors during plant operation and plant heat balance determinations should also be covered in this section.

7. Reactor Heat Transfer Limits.

This section should include a discussion of heat transfer limits by examining fuel rod and reactor design and limitations. The basis for the limits should be covered in this section along with recommended methods to ensure that limits are not approached or exceeded. This section should cover discussions of peaking factors, radial and axial power distributions and changes of these factors due to the influence of other variables such as moderator temperature, xenon and control rod position.

Figure 3. Enclosure 3 from Denton's Letter

TRAINING CRITERIA FOR MITIGATING CORE DAMAGE

A. Incore Instrumentation

1. Use of fixed or movable incore detectors to determine extent of core damage and geometry changes.

2. Use of thermocouples in determining peak temperatures; methods for extended range readings; methods for direct readings at terminal junctions.

3. Methods for calling up (printing) incore data from the plant computer.

B. Excore Nuclear Instrumentation (NIS)

1. Use of NIS for determination of void formation; void location basis for NIS response as a function of core temperatures and density changes.

C. Vital Instrumentation

1. Instrumentation response in an accident environment; failure sequence (time to failure, method of failure); indication reliability (actual vs indicated level).

2. Alternative methods for measuring flows, pressures, levels, and temperatures.

   a. Determination of pressurizer level if all level transmitters fail.

   b. Determination of letdown flow with a clogged filter (low flow).

   c. Determination of other Reactor Coolant System parameters if the primary method of measurement has failed.

D. Primary Chemistry

1. Expected chemistry results with severe core damage; consequences of transferring small quantities of liquid outside containment; importance of using leak tight systems.

2. Expected isotopic breakdown for core damage; for clad damage.

3. Corrosion effects of extended immersion in primary water; time to failure.

E. Radiation Monitoring

1. Response of Process and Area Monitors to severe damages; behavior of detectors when saturated; method for detecting radiation readings by direct measurement at detector output (overranged detector); expected accuracy of detectors at different locations; use of detectors to determine extent of core damage.

2. Methods of determining dose rate inside containment from measurements taken outside containment.

F. Gas Generation

1. Methods of H_2 generation during an accident; other sources of gas (Xe, Ke); techniques for venting or disposal of non-condensibles.

2. H_2 flammability and explosive limit; sources of O_2 in containment or Reactor Coolant System.

Figure 4. Control Manipulations Listed in Enclosure 4.

CONTROL MANIPULATIONS

*1. Plant or reactor startups to include a range that reactivity feedback from nuclear heat addition is noticeable and heatup rate is established.

2. Plant shutdown.

*3. Manual control of steam generators and/or feedwater during startup and shutdown.

4. Boration and or dilution during power operation.

*5. Any significant (greater than 10%) power changes in manual rod control or recirculation flow.

6. Any reactor power change of 10% or greater where load change is performed with load limit control or where flux, temperature, or speed control is on manual (for HTGR).

*7. Loss of coolant including:

1. significant PWR steam generator leaks
2. inside and outside primary containment
3. large and small, including leak-rate determination
4. saturated Reactor Coolant response (PWR).

8. Loss of instrument air (if simulated plant specific).

9. Loss of electrical power (and/or degraded power sources).

*10. Loss of core coolant flow/natural circulation.

11. Loss of condenser vacuum.

12. Loss of service water if required for safety.

13. Loss of shutdown cooling.

14. Loss of component cooling system or cooling to an individual component.

15. Loss of normal feedwater or normal feedwater system failure.

*16. Loss of all feedwater (normal and emergency).

17. Loss of protective system channel.

18. Mispositioned control rod or rods (or rod drops).

19. Inability to drive control rods.

20. Conditions requiring use of emergency boration or standby liquid control system.

21. Fuel cladding failure or high activity in reactor coolant or offgas.

22. Turbine or generator trip.

23. Malfunction of automatic control system(s) which affect reactivity.

24. Malfunction of reactor coolant pressure/volume control system.

25. Reactor trip.

26. Main steam line break (inside or outside containment).

27. Nuclear instrumentation failure(s).

* Starred items to be performed annually, all others biennially.

the training in mitigating core damage and related subjects should consist of at least 80 contact hours* in both the initial training and the requalification programs. The NRC considers thermodynamics, fluid flow and heat transfer to be related subjects, so the 80-hour requirement applies to the combined subject areas of Enclosures 2 and 3. The 80 contact hour criterion is not intended to be applied rigidly; rather, its purpose is to provide greater assurance of adequate course content when the licensee's training courses are not described in detail.

Since the licensees generally have their own unique course outlines, adequacy of response to these requirements necessarily depends only on whether it is at a level of detail comparable to that specified in the enclosures (and consistent with the 80 contact hour requirement) and whether it can reasonably be concluded from the licensee's description of his training material that the items in the enclosures are covered.

The Institute of Nuclear Power Operations (INPO) has developed its own guidelines for training in the subject areas of Enclosures 2 and 3. These guidelines, given in References 4 and 5, were developed in response to the same requirements and are more than adequate, i.e., training programs based specifically on the complete INPO documents are expected to satisfy all the requirements pertaining to training material which are addressed in this evaluation.

The licensee's response concerning increased emphasis on transients is considered by SAI to be acceptable if it makes explicit reference to increased emphasis on transients and gives some indication of the nature of the increase, or, if it addresses both normal and abnormal transients (without necessarily indicating an increase in emphasis) and the requalification program satisfies the requirements for control manipulations, Enclosure 1, Item C.3. The latter requirement calls for all the manipulations listed in Enclosure 4 (Figure 4 in this report) to be performed, at the frequency indicated, unless they are specifically not applicable to the licensee's type of reactor(s). Some of these manipulations may be performed on a simulator. Personnel with senior licenses may be credited with these activities if they direct or evaluate control manipulations as they are performed by others. Although these manipulations are acceptable for meeting the reactivity control manipulations required by Appendix A paragraph 3.a of 10 CFR 55, the requirements of Enclosure 4 are more demanding. Enclosure 4 requires about 32 specific manipulations over a two-year cycle while 10 CFR 55 Appendix A requires only 10 manipulations over a two-year cycle.

B. II.B.4: Training for Mitigating Core Damage

Item II.B.4 in NUREG-0737 requires that "shift technical advisors and operating personnel from the plant manager through the operations chain to the licensed operators" receive training on the use of installed systems to control or mitigate accidents in which the core is severely damaged.

*A contact hour is a one-hour period in which the course instructor is present or available for instructing or assisting students; lectures, seminars, discussions, problem-solving sessions, and examinations are considered contact periods. This definition is taken from Reference 4.

Enclosure 3 of Denton's letter provides guidance on the content of this training. "Plant Manager" is here taken to mean the highest ranking manager at the plant site.

For licensed personnel, this training would be redundant in that it is also required, by I.A.2.1, in the operator requalification program. However, II.B.4 applies also to operations personnel who are not licensed and are not candidates for licenses. This may include one or more of the highest levels of management at the plant. These non-licensed personnel are not explicitly required to have training in heat transfer, fluid flow and thermodynamics and are therefore not obligated for the full 80 contact hours of training in mitigating core damage and related subjects.

Some non-operating personnel, notably managers and technicians in instrumentation and control, health physics and chemistry departments, are supposed to receive those portions of the training which are commensurate with their responsibilities. Since this imposes no additional demands on the program itself, we do not address it in this evaluation. It would be appropriate for resident inspectors to verify that non-operating personnel receive the proper training.

* * * * *

The required implementation dates for all items have passed. Hence, this evaluation did not address the dates of implementation. Moreover, the evaluation does not cover training program modifications that might have been made for other reasons subsequent to the response to Denton's letter.

III. LICENSEE SUBMITTALS

The licensee (Northeast Utilities/Connecticut Yankee Atomic Power Co.) has submitted to NRC a number of items (letters and various attachments) which explain their training and requalification programs. These submittals, made in response to Denton's letter, form the information base for this evaluation. For the Haddam Neck Plant, there were 3 submittals with attachments, for a total of 9 items, which are listed below. The last three submittal items were in response to a request for additional information sent to the licensee on April 1, 1982 (Reference 6).

1. Letter from W.G. Counsil, Sr. Vice President Connecticut Yankee Atomic Power Co., to H.R. Denton, Director, Office of Nuclear Reactor Regulation, NRC. August 15, 1980. (2 pp, with enclosures: items 2, 3, 4, and 5). NRC Acc No: 8008260583. (re: Response to NRC letter dated 03/29/80).

2. "Licensed Reactor Operator Replacement Training", Connecticut Yankee Training Program, I.D.: OP-RO, Rev. 3. July 23, 80. (8 pp, attached to item 1).

3. "Licensed Senior Reactor Operator Replacement Training", Connecticut Yankee Training Program, I.D.: OP-SRO, Rev. 1. July 23, 1980. (5 pp, attached to item 1).

4. "Connecticut Yankee Reactor Operator Requalification", Connecticut Yankee Training Program, I.D.: OP-REQ, Rev. 1. July 23, 1980. (7 pp, attached to item 1).

5. "Instructor Requalification", Connecticut Yankee Training Program, I.D.: TC-TR 03. July 22, 1980. (2 pp, attached to item 1).

6. Letter from W.G. Counsil, Sr. Vice President Connecticut Yankee Atomic Power Company, to D.G. Eisenhut, Director, Division of Licensing, NRC. October 30, 1981. (2 pp). (re: NUREG-0737, Item II.B.4, Training for mitigating core damage). NRC Microfiche No: 10509/038.

7. Letter from W.G. Counsil, Sr. Vice President, Connecticut Yankee Atomic Power Company, to D.M. Crutchfield, Chief of Operating Reactors Branch #5, NRC. April 28, 1982. (3 pp, with enclosures: items 8 & 9). NRC Acc No: 8205110387. (re: Response to NRC's RAI dated March 9 1982).

8. Organizational Charts showing trained personnels. Untitled. January 18, 1982. (3 pp, attached to item 7).

9. "Operation with a Damaged Core". Undated. (4 pp, attached to item 7).(re: Lesson Outline).

IV. EVALUATION

SAI's evaluation of the training programs at Northeast Utilities (Connecticut Yankee Atomic Power Company) Haddam Neck Plant is presented below. Section A addresses TMI Action Item I.A.2.1 and presents the assessment organized in the manner of Figure 1. Section B addresses TMI Action Item II.B.4.

A. I.A.2.1: Immediate Upgrading of Reactor Operator and Senior Reactor Operator Training and Qualification.

Enclosure 1, Item A.2.c(1)

The basic requirements are that the training programs given to reactor operator and senior reactor operator candidates cover the subjects of heat transfer, fluid flow and thermodynamics at the level of detail specified in Enclosure 2 of Denton's letter.

The original submittal from the Haddam Neck plant (Submittal Item 2) listed: "Thermal and Hydraulic," "Fluid Flow and Pump Theory," "Thermodynamics," "Heat Transfer Fundamentals" and "Heat Transfer in a Core" as program elements included for reactor operator replacement training. Submittal Item 3 also listed the aforementioned subjects with the exception of "Thermal and Hydraulic," as program elements included in the senior reactor operator replacement training. No further details regarding these program elements were provided with these submittals.

The submittal of April, 1982 (Submittal Item 7) in response to the NRC request for additional information (Reference 6) provided no further detail but stated that the training programs provided the level of detail relative to heat transfer, fluid flow and thermodynamics specified in Enclosure 2 of Denton's letter. It is reasonable, therefore, to conclude that the requirements of this Enclosure 1 item have been fulfilled.

Enclosure 1, Item A.2.c(2)

The requirements are that the training programs for reactor and senior reactor operator candidates cover the subject of accident mitigation at the level of detail specified in Enclosure 3 of Denton's letter (see Figure 3 of this report).

The original submittal (Submittal Item 2) does not mention accident mitigation as such, however there are lectures on: "Emergency Core Cooling," "Nuclear Instrumentation," "Incore Instrumentation," "Operation with a Damaged Core," "Radiation Monitoring System," and a series of five lectures on "Accident Analysis" and another seven-lecture series on "Chemistry." Submittal Item 3 lists a seven-lecture series on "Chemistry" and lectures on, "Operation with a Damaged Core" and "Radiation Monitoring System." The absence of detail beyond lecture titles and the lack of explicitly identified instruction on "Gas Generation" (one of the topical areas specified in Enclosure 3 of Denton's letter) does not necessarily preclude the adequacy of these program elements because Submittal Item 7 states, "The RO training program addresses mitigating core damage at the required level. Items relative to mitigation are not addressed directly by topic, but are included at the required depth in system review lectures, license event reports (LER) discussions, Emergency Operating Procedures reviews, transient scenario discussions and annual plant drills." It can be reasonably concluded that the content and level of detail provided in training relative to accident mitigation meets the requirements, provided the topic of Gas Generation is, as we assume, addressed.

An additional criterion relative to accident mitigation is that about 80 contact hours be devoted to this and related subjects. The licensee's Submittal Item 7 contains the statement, "The present RO program, with emphasis placed on identifying and mitigating core damage has much more than 80 contact hours in this area." The fact that the reactor and senior reactor replacement training programs consume nearly 11 and four months respectively, it is reasonable to conclude that the 80 contact hour criterion is satisfied.

Enclosure 1, Item A.2.c(3)

The requirement is that there be an increased emphasis in the training program on dealing with reactor transients.

Submittal Items 2 and 3 indicate the provision of lectures on "Transients," "Normal Operations," "Emergency Operations," "Reactor Theory" and "Core Performance and Operation." Eight control manipulations are also identified in the replacement training program (all normal situations).

Submittal Item 7, in response to the NRC request for additional information (Reference 6), states that there are no actual manipulations designated in the training programs for abnormal situations. Further, it is stated that the emphasis on transients is addressed in transient analysis and in their requalification program when new modifications and system responses to transients are reviewed and [emphasis on transients] is also addressed daily in the school lecture contact. Abnormal manipulations are covered in walk-throughs and in simulator training. It is concluded that the requirement of this Enclosure 1 item has been fulfilled.

Enclosure 1, Item A.2.e

The requirement is that instructors for reactor operator training programs be enrolled in appropriate requalification programs to assure they are cognizant of current operating history, problems and changes to procedures and administrative limitations.

Submittal Item 5 very briefly outlines the activities required for instructor qualification. The submittal also indicates their instructor requalification program "Satisfies the requirement in Attachment One (Section 2e) of NRC (Denton) letter dated March 28, 1980, Subject: Qualifications of Reactor Operators."

It is concluded the program meets the requirement. We assume here that the material (particularly 3.0 Changes) presented/reviewed is understood and retained.

Enclosure 1, Item C.1

The primary requirement is that the requalification programs have instruction in the areas of heat transfer, fluid flow, thermodynamics and accident mitigation. The level of detail required in the requalification program is that of Enclosures 2 and 3 of Denton's letter. In addition, these instructions must involve an adequate number of contact hours.

Submittal Item 4 lists nine topical areas of which at least six lectures per year will be presented to all licensed personnel. This submittal also states, however, "Licensed operators are exempt from attending lectures covering materials on which they scored 80% or above on their annual examination."

Submittal Item 7, in response to the NRC request for additional information (Reference 6), states that the requalification program does not have 80 contact hours on heat transfer, fluid flow and thermodynamics per

annual session. The training does, however, include training on heat transfer, fluid flow, thermodynamics, accident mitigation and control manipulations and is presented at the SRO level. A phone conversation with the Haddam Neck NRC Project Manager (Reference 7) disclosed that only 20 contact hours per year during the requalification cycle are devoted to these subjects. Clearly the 80 contact hour criterion is not met and therefore, neither are the requirements of this Enclosure 1 item.

Enclosure 1, Item C.2

The requirement for licensed operators to participate in the accelerated requalification program must be based on passing scores of 80% overall, 70% in each category.

Submittal item 4 states: "An overall score of less than 80 percent or less than 70 percent in each category on the annual examination will result in the individual being relieved of licensed duties and provided acceleration training in deficient areas." The requirement of this Enclosure 1 item has been met.

Enclosure 1, Item C.3

TMI Action Item I.A.2.1 calls for the licensed operator requalification program to include performance of control manipulations involving both normal and abnormal situations. The specific manipulations required and their performance frequency are identified in Enclosure 4 of the Denton letter (see Figure 4 of this report).

The licensee provided, in Submittal Item 4, a list of manipulations which are part of their requalification program and were very nearly those identified in Enclosure 4 of Denton's letter. Three of the Enclosure items do not appear in the submittal, items 8, 9 and 23:

8. Loss of instrument air (if simulated plant specific)
9. Loss of electrical power (and/or degraded power source)
23. Malfunction of automatic control system(s) which affect reactivity

Submittal Item 7, in response to the NRC request for additional information (Reference 6), explains that items 8 and 9 of Enclosure 4 to Denton's letter had not been included (Submittal Item 4) due to lack of high fidelity plant-specific simulator models, but to meet the intent of those manipulation requirements, these and other significant transients are addressed during the plant drill portion of the requalification program which consists of both discussion and walk-through. It seems reasonable to infer that item 23 has been deleted for the same reason, and substituted for in the same manner. This inference has been verified by the NRC Project Manager (Reference 7). Therefore, it may be concluded that the requirements of this Enclosure 1 item are satisfied.

B. II.B.4 Training for Mitigating Core Damage

Item II.B.4 requires that training for mitigating core damage, as indicated in Enclosure 3 of Denton's letter, be given to shift technical advisors and operating personnel from the plant manager to the licensed operators. This includes both licensed and non-licensed personnel.

Submittal Item 9, "Operation With a Damaged Core Lesson Outline," does not provide for 80 contact training hours nor does the requalification program provide sufficient contact training hours (Enclosure 1, Item C.1) in related subjects to supplement the core damage mitigation course to the extent required by II.B.4. Therefore the requirements of II.B.4 are not met for licensed personnel.

The requirements of II.B.4 differ for nonlicensed personnel in that there is no specific requirement for contact hours of training in core damage mitigation-related subjects, i.e., heat transfer, fluid flow and thermodynamics. Therefore it is concluded (see Submittal Item 9) the requirements of II.B.4 have been met in the case of nonlicensed personnel.

The final criterion associated with training in core damage mitigation is that the course be given all licensed and nonlicensed operations personnel. Submittal Item 8 (Figure 5) provides an identification of the personnel who have received training in core damage mitigation. This final criterion has been met.

V. CONCLUSIONS

It is concluded that the Northeast Utilities (Connecticut Yankee Atomic Power Company) training programs do not fully meet the requirements of TMI Action Items I.A.2.1 and II.B.4.

The first exception is that the requisite number of contact training hours are not provided in the requalification program on the subjects of mitigating core damage, heat transfer, fluid flow and thermodynamics.

The second exception is the inadequacy of contact training hours in mitigating core damage and related subjects for licensed operations personnel, in relation to the requirements of II.B.4.

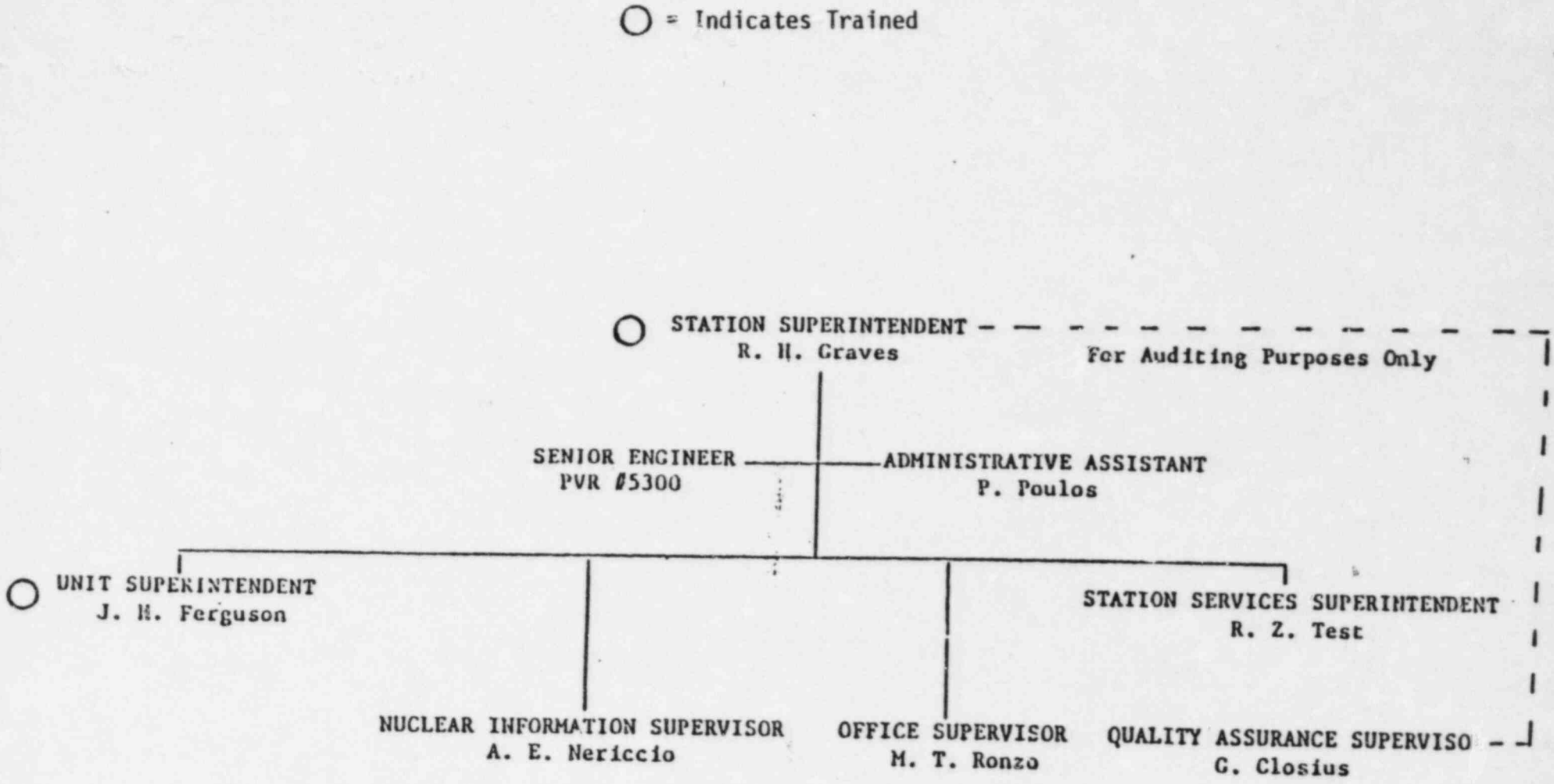

Figure 5. Personnel Trained in Accident Mitigation.

UNIT SUPERINTENDENT
J. H. Ferguson UNIT SUP

January 18, 1982

ENGINEERING
D. J. Ray ENGRSU

N. A. Burnett OPRAST
J. L. DeLawrence SRENGR
R. L. Eppinger SRENGR
P. L'Heureux SRENGR
PVR #5198 (1) SRENGR
R. C. Beganski ENGNER
T. G. Morris ENGNER
G. H. Tylinski ENGNER
D. C. Garlington ASOENG
R. M. Rogozinski ASOENG
T. J. Bransfield ASTENG
J. H. Evola ASTENG
~~H. S. Turner ASTENG~~
R. E. Borg ASTCPSC
D. E. Anderson STTECHA
~~S. J. Delwerth SSTECHA~~
R. Waggoner SSTECHA

INSTRUMENT & CONTROL
T. W. Campbell INCNSU

W. R. Olney ASICSUP
T. J. Riccio ASICSUP
W. V. Barch CINSSP
~~L. G. Brault CINSSP~~
H. G. Curtis CINSSP
B. R. Danielson CINSSP
~~R. H. Dickson CINSLP~~
~~A. C. Donzello CINSSP~~
T. C. Johnson CINSSP
J. H. Washburn CINSSP
E. A. Woods CINSSP
PVR #5306 CINSSP

MAINTENANCE
G. H. Bouchard MTCSUP

W. H. Eger MTCAST
R. J. Guilmette ASMTSUP
M. J. Mistl ASMTSUP
J. B. Overbaugh ASMTSUP
W. E. Ventres ASMTSUP
J. A. Adams ELECTR
R. V. Caminati ELECTR
P. C. Flood ELECTR
B. R. Miller ELECTR
A. A. Pach ELECTR
C. H. Urban ELECTR
E. G. Alexander MECHAN
T. H. Barber MECHAN
J. S. Belerle MECHAN
C. H. Bilyeu MECHAN
H. C. Bremer MECHAN
R. W. Bugden MECHAN
J. E. Campos MECHAN
G. H. Coleman MECHAN
P. D'Appollonio MECHAN
E. F. Gogal MECHAN
J. E. Grennan MECHAN
F. H. Hartke MECHAN
J. A. Hartzell MECHAN
H. P. Johnson MECHAN
H. W. Labonte MECHAN
J. F. Miskimen MECHAN
E. W. Modehn MECHAN
L. S. Parker MECHAN
C. A. Rodimon MECHAN
J. J. Schaschl MECHAN
R. E. Scoville MECHAN
I. L. VanHatre MECHAN
H. L. Warhouse MECHAN
PVR #5315 MECHAN
L. L. Annino SSTECHA
J. W. McGowan SSTECHA
PVR #5329 SSTECHA
J. S. Olney CLKTYP

OPERATIONS
R. E. Brown OPRSUP

R. L. Gracie OPRAST
M. F. Bray SHSUPV
D. G. Casey SHSUPV
E. J. Fetterman SHSUPV
M. D. Hadfield SHSUPV
R. B. Tourville SHSUPV
N. W. Young SHSUPV
M. W. Bachr SUCOPR
D. C. Heffernan SUCOPR
L. Palone SUCOPR
J. F. Piontkowski SUCOPR
R. H. Reeves SUCOPR
G. M. Walg SUCOPR
T. J. Galloway ASTENG
T. R. Ickes ASTENG
J. P. McEvoy ASTENG
M. J. Ranieri ASTENG
PVR #5211 (2) ASTENG

L. R. Andersen CONOPR
J. D. Hochdorfer CONOPR
R. M. Milardo CONOPR
E. L. Montalvo CONOPR
R. L. Morgan CONOPR
P. G. Rainha CONOPR
D. L. Rogers CONOPR
T. L. Tallman CONOPR
R. A. Willis CONOPR
PVR #5253 (2) CONOPR
PVR #5307 CONOPR

D. E. Andersen AUXOPR
M. E. Baca AUXOPR
W. L. Belovich AUXOPR
T. J. Blaisdell AUXOPR
C. W. Bousman AUXOPR
J. B. Bower AUXOPR
W. A. Buckmiller AUXOPR
C. J. Cannella AUXOPR
R. M. Carolus AUXOPR
W. B. Chesnutt AUXOPR
R. E. Connolly AUXOPR
A. L. Elms AUXOPR
M. L. Evers AUXOPR
T. P. Gilbert AUXOPR
R. W. Gossee AUXOPR
J. F. Houff AUXOPR
P. D. Lenk AUXOPR
R. A. Peters AUXOPR
D. M. Reilly AUXOPR
J. H. Rein AUXOPR
R. N. Riley AUXOPR
H. J. Steinbuchel AUXOPR
L. D. Wellbrock AUXOPR
J. L. Wheeler AUXOPR
M. E. White AUXOPR
T. D. Witt AUXOPR
PVR #5266 (1) AUXOPR
PVR #5321 AUXOPR
K. W. Wall SSTECHB

J. E. Robida SUPBLDS
G. E. Aldrich BLDMTC
G. Acatore BLDMTC
J. J. Biskupiak BLDMTC
P. L. Deguire BLDMTC
J. A. Fritz BLDMTC
A. Guglietti BLDMTC
J. J. Morello BLDMTC
J. R. Pickering BLDMTC

ISTA's

P.L'Heureux
R.Rogozinski
M.Morris
R.Beganski
J.Delawrence
K.Burton
G.Bouchard
R.Gracie
R.Eppinger
G.Tylinski

Figure 5. Personnel Trained in Accident Mitigation (continued).

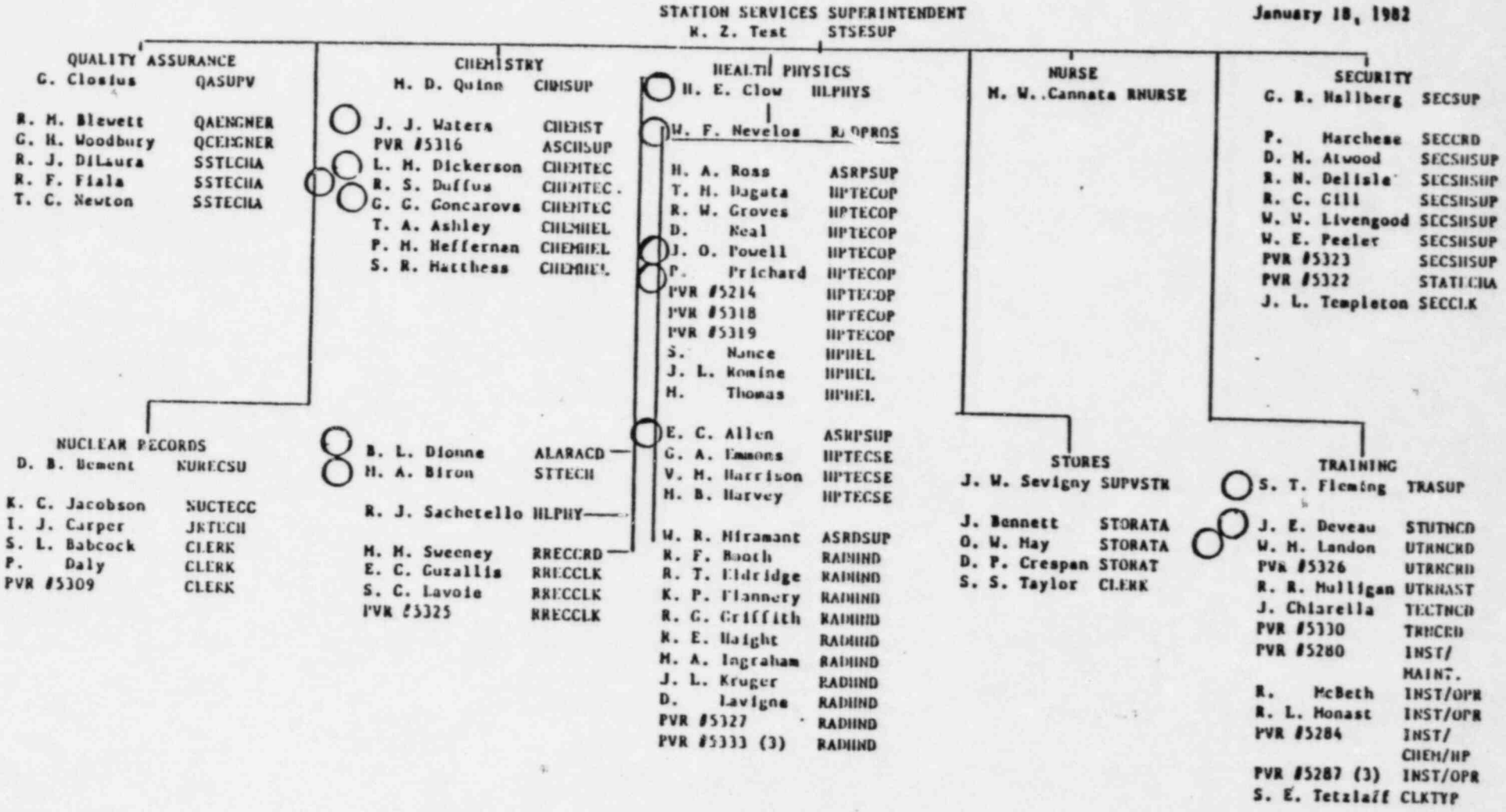

Figure 5. Personnel Trained in Accident Mitigation (continued).

V. REFERENCES

1. "NRC Action Plan Developed as a Result of the TMI-2 Accident." NUREG-0660, United States Nuclear Regulatory Commission. May 1980.

2. "Clarification of TMI Action Plan Requirements," NUREG-0737, United States Nuclear Regulatory Commission. November 1980.

3. The NRC requirement for 80 contact hours is an Operator Licensing Branch technical position. It was included with the acceptance criteria provided by NRC to SAI for use in the present evaluation. See letter, Harley Silver, Technical Assistance Program Management Group, Division of Licensing, USNRC to Bryce Johnson, Program Manager, Science Applications, Inc., Subject: Contract No. NRC-03-82-096, Final Work Assignment 2, December 23, 1981.

4. "Guidelines for Heat Transfer, Fluid Flow and Thermodynamics Instruction," STG-02, The Institute of Nuclear Power Operations. December 12, 1980.

5. "Guidelines for Training to Recognize and Mitigate the Consequences of Core Damage," STG-01, The Institute of Nuclear Power Operations. January 15, 1981.

6. "Licensing Action Request for Additional Information" NRC to Connecticut Yankee Atomic Power Company and Northeast Nuclear Company, dated February 19, 1982.

7. Phone conversation between C. Tropf, NRC, Haddam Neck Program Manager and Ray Roland, SAI staff on July 19, 1982.