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June 29, 1982

Director, Office of Nuclear Reactor Regulation
Attention: D. M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Docket No. 50-206
Upgraded SRO and RO Training and Training for Mitigating Core Damage - Request for Additional Information
San Onofre Nuclear Generating Station
Unit 1

References:

1. Letter, D. M. Crutchfield, NRC, to R. Dietch, SCE, Upgraded SRO and RO Training and Training for Mitigating Core Damage - Request for Additional Information
2. Letter, R. W. Krieger, SCE, to D. M. Crutchfield, NRC, Post-TMI Requirements, June 15, 1982
3. Letter, K. P. Baskin, SCE, to D. M. Crutchfield, NRC, Reactor Operator Training Program, March 24, 1982

Reference 1 forwarded to us a request for additional information with regard to upgraded SRO and RO training and training for mitigating core damage to be provided to you within 30 days of our receipt of the letter. Reference 2 informed you that this information could be provided to you by June 28, 1982.

The purpose of this correspondence is to provide the following information requested in Reference 1. For convenience, the questions from Reference 1 are restated followed by our response.

A. Training Program

1. Does your initial training program for Reactor Operator and Senior Reactor Operator cover the subjects of heat transfer, fluid flow, and thermodynamics to the level of detail spelled out in Enclosure 2 of the Denton letter? Please send a course outline if available.

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Response: The initial training program for San Onofre Unit 1 has been upgraded to comply with Enclosure 2 of the Denton letter. The level of detail covered in the program meets or exceeds that which is required by the Denton letter. A course outline is not presently available due to the fact that this upgrade, as defined in training memorandum 20-81 attached as Enclosure 1 to Reference 3 has necessitated the development of a new outline.

2. Does your initial training program for Reactor Operator and Senior Reactor Operator cover the subject of using installed plant systems to control or mitigate an accident in which the core is severely damaged? If it does, is the coverage to the level of detail spelled out in Enclosure 3 of Denton's letter? Please send course outlines if available.

Response: Responsive to the Denton letter, San Onofre expanded its training in the area of accidents and transients (see Enclosure 1 of Reference 3). The detail of this training meets or exceeds that which is required by the Denton letter.

3. Are the lectures and quizzes on the subject of accident mitigation given to shift technical advisors and operating personnel from the plant manager through the operations chain to the licensed operators? If they are, would you please provide the titles of the people who are trained and an organization chart which illustrates their position in the operations chain?

Response: The lectures and quizzes on the subject of accident mitigation are given to operations personnel from the station manager through the plant operators and the shift technical advisors as defined in Figure 6.2.2.2 in Section 6 of the San Onofre Unit 1 Technical Specifications (Enclosure 2 to this letter). This is formally defined in San Onofre Nuclear Generating Station Training Memorandum 10-81.

4. Do the training program elements which involve heat transfer, fluid flow, thermodynamics and accident mitigation involve 80 contact hours in each program? (A contact hour of instruction 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 under this definition.)

Response: The training program at San Onofre Unit 1 entails 80 contact hours for training in the program elements which involve heat transfer, fluid flow, and thermodynamics. There are an additional 40 hours for accident mitigation training, as detailed in Training Memorandum 8-80, Appendix A (Enclosure 1 to this letter).

5. Is there an increased emphasis on reactor and plant transients in the reactor operator and senior reactor operator training program as required by item A.2.C.3 of Enclosure 1 of Denton's March 28, 1980, letter? If there is, does this training deal with both normal transients and abnormal (accident) transients?

Response: Responsive to the Denton letter, San Onofre Nuclear Generating Station Training Memorandum 8-80 was originated which addressed these items. The result was an increase in emphasis on accident topics (i.e., training in FSAR accidents and normal transients) and in the time spent in the course.

B. Requalification Program

1. The requalification program for reactor operators (3.2.1) has lectures which appear to cover the subjects of heat transfer, fluid flow and thermodynamics as called out in Enclosure 1 of Denton's March 28, 1980, letter. Do these lectures in fact cover this material and is the coverage to the level of detail spelled out in Enclosure 2 of the Denton letter? Please send a course outline if it is different from that used in the training program.

Response: The operator requalification program at San Onofre Unit 1 was provided to you as Enclosure 2 to Reference 3 which outlines the criteria for operator requalification. As stated in our response to question A.1 above, the entire training program at San Onofre Unit 1 has been upgraded to comply with the criteria given in the Denton letter. It should be noted while the requalification program covers the topics in the initial training program, but not to the detail of the initial training program in recognition of the fact that it is a review.

2. The reactor operator and senior reactor operator requalification program (3.2.1) has a lecture which appears to address the subject of using installed plant systems to control or mitigate an accident in which the core is severely damaged. Does this lecture address the topic and does it cover the subject to the level of detail spelled out in Enclosure 3 of Denton's letter? Please send a course outline if it is different from that used in the training program.

Response: The topics are covered in the requalification program, and as stated in our response to B.2 above, the entire operator requalification program has been modified to include the topics and the detail as defined in the Denton letter.

3. The requalification program, Section 3.1.5 item (g), identifies as "Loss of Salt water cooling," is this the same as "Loss of Service water cooling?"

Response: The salt water cooling system at San Onofre Unit 1 provides the safety related cooling function for component cooling that service water cooling might provide at a plant that does not use salt water for its ultimate heat sink. This assumes the definition for service water system originates from SRP 9.2.1.

4. Please answer question 3 of Section A with respect to your requalification program.

Response: The entire contingent of personnel, as indicated in our response to A.3 above, that are initially trained on accident mitigation are requalified on a two-year cycle.

5. Please answer question 4 of Section A with respect to your requalification program.

Response: The requalification program does not involve a total of 80 contact hours, but the portion of time spent on these topics is proportional to the amount of time spent during the initial training program.

If you have any questions, please let me know.

Very truly yours,

KP Baskin

ENCLOSURE 1

SAN ONOFRE NUCLEAR GENERATING STATION

NUCLEAR TRAINING DIVISION

TRAINING MEMORANDUM 8-80/REV. 1

February 23, 1981

TO: DISTRIBUTION

FROM: MANAGER, NUCLEAR TRAINING

SUBJECT: TRAINING FOR MITIGATING CORE DAMAGE

Enclosures:
1. Mitigating Core Damage Lecture Outline Unit 1
2. Mitigating Core Damage Lecture Outline Units 2&3
3. Attendance Matrix

References:

A. Mitigating Reactor Core Damage (3 Vols.) General Physics Corporation.

B. Thermal Hydraulic and Degraded Core Lecture Series C.E. Corporation.

C. FSAR Unit 1

D. FSAR Unit 2 & 3

E. Analysis of TMI Unit 2 Accident. NSAC - 1 Report July 1979.

F. Rogovin Report to Commissioners and Public on TMI.

G. NUREG 0737 Section II-B-4.

H. Various Instrument Technical Manuals.

I. INPO. Guidelines for training to recognize and mitigate the consequences of severe core damage, Rev. 1, 1/15/81.

OBJECTIVE

The objectives of this memorandum are (1) to define the scope and content of the program (2) identify, by position, those personnel required to attend this training (3) define the extent of participation of the identified personnel and (4) establish milestone dates associated with the program.

RESPONSIBILITY

The Nuclear Training Division is responsible for all phases of this program. The Operations Training Administrator is responsible for the implementation and administration of the program. The Training Services Administrator is responsible for documentation of training completed as delineated in Training Memorandum 4-80.

DISCUSSION

The subject training program is required by Mr. H. Denton's letter of March 28, 1980 to be conducted for all licensed operators, license candidates, Shift Technical Advisors and management personnel in the operations chain. Additionally selected portions of this training is required for Instrumentation and Control personnel, Health Physics and Chemistry personnel including managers of these areas.

ADMINISTRATION

The training program will be conducted in two segments.

Initial Training

This training will be forty (40) contract hours (eighty [80] contract hours for Units 2 & 3) in length for Unit 1. One contract hour being 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. Training will consist of lectures in the following subject areas:

A. Core Cooling Mechanics
B. Recognizing Core Damage
C. Monitoring Critical Parameters during Accident Conditions.
D. Radiation Hazards and Radiation Monitor Response.
E. Hydrogen and Gas Hazards during Severe Accidents.

The program subject area lectures are detailed in Appendices A & B.

ADMINISTRATION (Continued)

Retraining

This training will be approximately eight contact hours in length and will be incorporated into the Operator Requalification Program. The program will consist of review lectures on those subject areas addressed in initial training. This program will review basic concepts as well as introduce new/revised material as applicable.

Personnel participation in the initial and retraining programs shall be in accordance with the Attendance Matrix (Appendix C).

J. L. WILLIS

ATTACHMENTS

Appendix A - Mitigating Core Damage Lecture Outline Unit 1
Appendix B - Mitigating Core Damage Lecture Outline Units 2 & 3
Appendix C - Attendance Matrix

WM:tlw

Appendix A

MITIGATING CORE DAMAGE LECTURE OUTLINE UNIT 1

A - CORE COOLING MECHANICS - 10 Contact Hrs.

OUTLINE OF MATERIAL COVERED

(1) Describe alternate methods of core cooling available to the operator for specific plant conditions.

(2) Explain the advantages and disadvantages of hot leg vs. cold leg injection.

(3) Describe heat removal paths for core cooling including heat sinks and the mechanics of natural circulation.

(4) Explain how boron precipitation affects the core cooling mechanics.

(5) Explain the effect of boron concentration versus temperature and boron precipitation due to boiling in the core.

(6) Explain the effects of quenching on fuel cladding.

(7) Describe limiting core conditions such as: clad and fuel melt temperatures, boiling in the core, and core material deformation criteria.

(8) Describe procedures for inadequate core cooling recovery to mitigate core damage.

(9) Discuss optimum core flow rate with a damaged fuel cladding.

(10) Describe the indications of flow channel blockage and core hot spots.

(11) Discuss cooling mode equipment and power supplies under accident conditions.

B - RECOGNIZING CORE DAMAGE - 16 Contact Hrs.

OUTLINE OF MATERIAL COVERED

(1) Explain the use of core thermocouples, range and alternate methods of readouts and recording.

(2) Identify how the following parameters/systems will aid the operator in determining whether core damage may exist.

a. Radiation monitoring system to assess extent of damage as well as radiation/contamination levels.

b. Isotopic analyses indicating clad damage, fuel pellet decomposition, and fuel in the coolant from clad damage.

c. Thermocouples for use in locating blocked flow channels.

d. Post accident critical parameter instrumentation.

e. Use of movable incore detectors to determine extent of core damage and geometry changes.

(3) Describe the fuel/clad materials behavior in the inadequate cooling case including the following topic:

a. Fission gas release

(4) Recognize that increase in neutron detector output may result from either low reactor water level or increase in multiplication and act conservatively.

(5) Describe neutron instrumentation response on approach to core criticality in a post accident condition.

(6) Compare neutron instrumentation response for core/annulus voiding and multiplication-induced increase in neutron readings.

(7) Discuss the importance of maintaining containment isolation.

(8) Discuss the corrosion effects on equipment within containment including expected time to failure in the case of submerged equipment.

C - MONITORING CRITICAL PARAMETERS DURING ACCIDENT CONDITIONS - 8 Contact Hr

OUTLINE OF MATERIAL COVERED

(1) Identify the critical parameters to be monitored during accident conditions.

(2) Describe the factors that affect the reliability and potential failure of instrumentation associated with critical parameters.

(3) Describe the probable failure modes and degree of accuracy of critical instrumentation when exposed to an accident environment including loss of instrument power.

(4) Discuss the containment pressure, temperature, radiation and mositure effects on readings in a post accident environment.

(5) Discuss the degree of accuracy to be expected in instrumentation following a parameter's return to normal value from an offscale value.

(6) Describe alternate means of determining approximate value for critical parameters assuming the primary method of measurement has failed. This may entail utilizing pressure-temperature relationships, level-temperature-pressure relationship and liquid inventory balancing considering appropriate tank and containment levels.

(7) Review basic instrumentation.

D - RADIATION HAZARDS AND RADIATION MONITOR RESPONSE - 4 Contact Hrs.

OUTLINE OF MATERIAL COVERED

(1) Identify plant areas normally used that may become High Radiation Areas.

(2) Discuss the precautions associated with sampling primary coolant and containment atmosphere.

(3) Describe post accident response from radiation monitors within containment.

(4) Discuss radiation monitor failure modes.

(5) Discuss a method of determining radiation levels by direct measurement of detector (Radiation Monitoring System) output signal.

E - HYDROGEN AND GAS HAZARDS DURING SEVERE ACCIDENTS - 2 Contact Hrs.

OUTLINE OF MATERIAL COVERED

(1) List the sources of hydrogen and oxygen within the primary system and containment.

(2) State the hazardous concentration range of explosive and flammable mixtures of hydrogen and oxygen.

(3) Explain the hazardous characteristics of hydrogen explosions.

(4) Discuss the hydrogen/oxygen concentration measuring equipment and alternate means during containment isolation.

(5) Discuss methods available to reduce hydrogen/oxygen concentration from containment in a post-accident environment.

(6) Discuss primary system gas venting in a post accident mode.

(7) Describe the sources of gas/steam vapor during accident conditions.

(8) Explain the symptoms and effects of gas/steam binding on the following:

   a. The vessel/generator tube areas.

   b. Reactor coolant pump.

   c. Natural circulation.

MITIGATING CORE DAMAGE LECTURE OUTLINE UNITS 2 & 3

A - CORE COOLING MECHANICS - 12 Contact Hrs.

OUTLINE OF MATERIAL COVERED

(1) Describe alternate methods of core cooling available to the operator for specific plant conditions.

(2) Explain advantages and disadvantages of hot leg vs. cold leg injection.

(3) Describe heat removal paths for core cooling including heat sinks and the mechanics of natural circulation.

(4) Explain how boron precipitation affects the core cooling mechanics.

(5) Explain the effect of boron concentration versus temperature and boron precipitation due to boiling in the core.

(6) Explain the effects of quenching on fuel cladding.

(7) Describe limiting core conditions such as: clad and fuel melt temperatures, boiling in the core, and core material deformation criteria.

(8) Describe procedures for inadequate core cooling recovery to mitigate core damage.

(9) Discuss optimum core flow rate with a damaged fuel cladding.

(10) Describe the indications of flow channel blockage and core hot spots.

(11) Discuss cooling mode equipment and power supplies under accident conditions.

B - RECOGNIZING CORE DAMAGE - 24 Contact Hrs.

OUTLINE OF MATERIAL COVERED

(1) Explain the use of core thermocouples, range and alternate methods of readouts and recording.

(2) Describe the plant computer capabilities for data acquisition.

(3) Identify how the following parameters/systems will aid the operator in determining whether core damage may exist.

a. "Failed Fuel" detector or similar system.

b. Radiation monitoring system to assess extent of damage as well as radiation/contamination levels.

c. Isotopic analyses indicating clad damage, fuel pellet decomposition, and fuel in the coolant from clad damage.

d. Thermocouples for use in locating blocked flow channels.

e. Post accident critical parameter instrumentation.

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

(4) Describe the fuel/clad materials behavior in the inadequate cooling case including the following topics:

a. Zirc-Oxide formation
b. ZrO_2 - UO_2 eutectic
c. Fission gas release

(5) Recognize that increase in neutron detector output may result from either low reactor water level or increase in multiplication and act conservatively.

(6) Describe neutron instrumentation response on approach to core criticality in a post accident condition.

(7) Compare neutron instrumentation response for core/annulus voiding and multiplication-induced increase in neutron readings.

(8) Discuss the importance of maintaining containment isolation.

(9) Discuss the corrosion effects on equipment within containment including expected time to failure in the case of submerged equipment.

C - MONITORING CRITICAL PARAMETERS DURING ACCIDENT CONDITIONS - 20 Contact H

OUTLINE OF MATERIAL COVERED

(1) Identify the critical parameters to be monitored during accident condiions.

(2) Describe the factors that affect the reliability and potential failure of instrumentation associated with critical parameters.

(3) Describe the probable failure modes and degree of accuracy of critical instrumentation when exposed to an accident environment including loss of instrument power.

(4) Discuss the containment pressure, temperature, radiation and moisture effects on readings in a post accident environment.

(5) Discuss the degree of accuracy to be expected in instrumentation following a parameter's return to normal value from an offscale value.

(6) Describe alternate means of determining approximate value for critical parameters assuming the primary method of measurement has failed. This may entail utilizing pressure-temperature relationships, level-temperature-pressure relationship and liquid inventory balancing considering appropriate tank and containment levels.

(7) Discuss the use and capability of the plant computer in monitoring and analyzing critical parameters.

D - RADIATION HAZARDS AND RADIATION MONITOR RESPONSE - 8 Contact Hrs.

OUTLINE OF MATERIAL COVERED

(1) Identify plant areas normally used that may become High Radiation Areas.

(2) Discuss the precautions associated with sampling primary coolant and containment atmosphere.

(3) Describe post accident response from radiation monitors within containment.

(4) Discuss radiation monitor failure modes.

(5) Discuss a method of determining radiation levels by direct measurement of detector (Radiation Monitoring System) output signal.

E - HYDROGEN AND GAS HAZARDS DURING A SEVERE ACCIDENT - 16 Contact Hrs.

OUTLINE OF MATERIAL COVERED

(1) List the sources of hydrogen and oxygen within the primary system and containment.

(2) State the hazardous concentration range of explosive and flammable mixtures of hydrogen and oxygen.

(3) Explain the hazardous characteristics of hydrogen explosions.

(4) Discuss the hydrogen/oxygen concentration measuring equipment and alternate means during containment isolation.

(5) Discuss methods available to reduce hydrogen/oxygen concentration from containment in a post-accident environment.

(6) Discuss primary system gas venting in a post accident mode.

(7) Describe the sources of gas/steam vapor during accident conditions.

(8) Explain the symptoms and effects of gas/steam binding on the following:

a. The vessel/generator tube areas.

b. Reactor coolant pump.

c. Natural circulation.

(9) Discuss the possible effects of introducing nitrogen into the Primary System during a Small Break LOCA.

APPENDIX C

ATTENDEES	INITIAL TRAINING REQUIRED LECTURES	INITIAL TRAINING SCHEDULE MILESTONES	ANNUAL RETRAINING REQUIRED LECTURES
UNIT 1			
Licensed Operators Shift Technical Advisors, Operations Staff, Plant Manager	All	Initiate Training 4/1/81 Complete Training 10/1/81	All
Instrumentation and Control Personnel and Managers who work on Reactor Control Equipment	B, C, D	Initiate Training 4/1/81 Complete Training 10/1/81	B, C, D
Health Physics Personnel and Managers Chemical Personnel and Managers	B, D, E	Initiate Training 4/1/81 Complete Training 10/1/81	B, D, E
UNITS 2 & 3			
Same as Unit 1	Same as Unit 1	Complete Training by Full Power Operations of Unit 2	Same as Unit 1

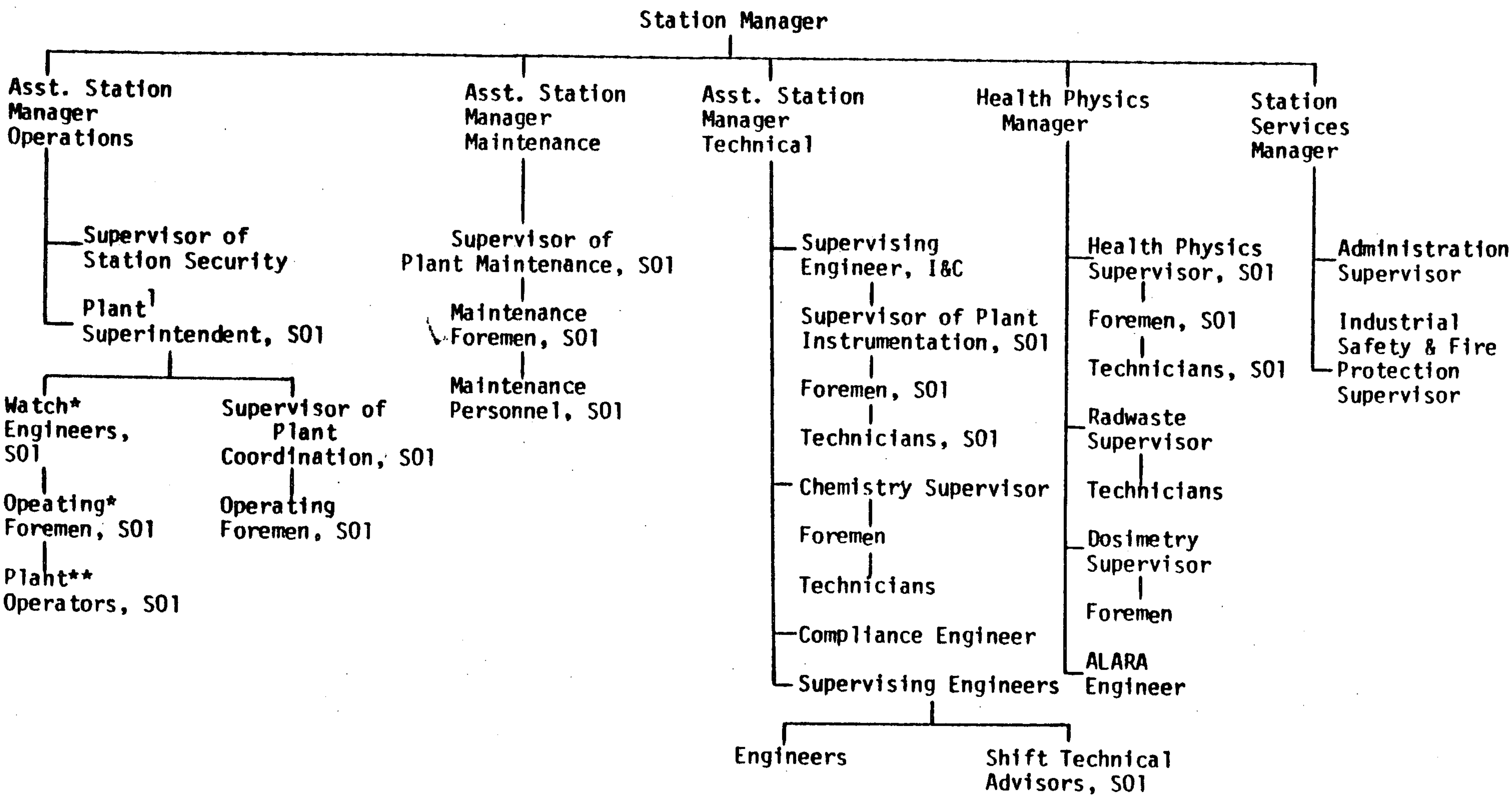
NOTE:

A. Core Cooling Mechanics
B. Recognizing Core Damage
C. Monitoring Critical Parameters during Accident Conditions.
D. Radiation Hazards and Radiation Monitor Response.
E. Hydrogen and Gas Hazards during Severe Accidents.

ENCLOSURE 2

FIGUR 2.2.2

FACILITY ORGANIZATION



[1]At time of appointment to the position, Senior Reactor Operator License Required
*Senior Reactor Operator License Required
**Control and Assistant Control Operators are holders of Reactor Operator Licenses