Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-01, Rev. 0

Modification Review Administrative Checklist

Prepared by:	A. A. NERI	[signature]	4-7-97
	Name	Signature	Date
Approved by:	D. K. Schopfer	D. K. Schopfer	4-25-97
	Name	Signature	Date

IMPLEMENTATION

System	
Modification No.	
Lead Verifier	
SRG Lead	

Modification Review Administrative Checklist

Instructions

This checklist supplements PI-MP3-03 and shall be used to document the completion of the modification review process. Individual checklists shall be prepared for each system modification in accordance with the following instructions:

a. The SRG Lead shall initiate a checklist for each system modification. The SRG Lead shall enter the modification number and the assigned Lead Verifier for the modification.

b. The Lead Verifier shall initial and date each attribute when the attribute has been reviewed.

c. When all applicable SRG attributes have been reviewed, the Lead Verifier shall attach all applicable completed modification review checklists and shall sign and date the checklist cover sheet.

d. The SRG Lead shall indicate his concurrence that the SRG modification review has been completed by signing and dating the checklist coversheet.

e. The system name and modificaton number shall be indicated on all sheets of the checklist. Sheet numbers shall be sequential (i.e. 1,2,3, etc.). Insert pages may be added and numbered alphabetically (i.e. 1A, 1B, 1C, etc.) if needed.

Northeast Utilities
Millstone Unit 3

CK-MP3-03-01
System ____________________________
Modification No.___________________
Sheet ______ of ______

Modification Review Administrative Checklist

Assigned Lead Verifier: ____________________________

Mod Review Attribute	Initials	Date
a. Modification screening complete, Checklist CK-MP3-03-02 attached, Verifiers assigned to review affected elements		
b. Modification element detailed review completed, applicable checklist attached.		

Element	Applicability Yes/No	Initials	Date
Mechanical Systems Design Review (CK-MP3-03-03)			
Electrical Design Review (CK-MP3-03-04)			
I&C Design Review (CK-MP3-03-05)			
Structural Design Review (CK-MP3-03-06)			
Alara Design Review (CK-MP3-03-07)			
Security Review (CK-MP3-03-08)			
Appendix R Compliance Review (CK-MP3-03-09)			
Electrical Equipment Qualification Review (CK-MP3-03-10)			
Seismic Qualification Review (CK-MP3-03-11)			
Radiological Environmental Review (CK-MP3-03-12)			
Non-Radiological Environmental Review (CK-MP3-03-13)			
Station Blackout Review (CK-MP3-03-14)			
Control Panel Design Review (CK-MP3-03-15)			
Piping Design Review (CK-MP3-03-16)			
Setpoint Database Design Review (CK-MP3-03-17)			
Hazards/HELB Program Review (CK-MP3-03-18)			
Fire Protection Review (CK-MP3-03-19)			
PRA Review (CK-MP3-03-21)			
Quality Software Design Review (CK-MP3-03-22)			

Mod Review Attribute	Initials	Date
c. Installation Plan Review completed, Checklist CK-MP3-03-23 attached.		
d. Test Plan review completed, Checklist CK-MP3-03-24 attached.		
e. Licensing document review completed, Checklist CK-MP3-03-20 attached.		
f. Modification closeout review completed, Checklist CK-MP3-03-25 attached.		
g. DR's initiated per PI-MP3-11		

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-02, Rev. 1

Modification Screening Checklist

Prepared by:	A.A. NERI	[signature]	4-18-97
	Name	Signature	Date
Approved by:	D.K. Schopfer	D.K. Schopfer	4-25-97
	Name	Signature	Date

IMPLEMENTATION

System	
Modification No.	
Lead Verifier	
SRG Lead	

Sheet 1 of ___

Modification Screening Checklist

Instructions

This checklists supplements project instruction PI-MP3-03 and provides instructions for screening modifications for the purpose of identifying elements which require a detailed review. The checklist addresses various subjects and refers to various NU programs and documents. Prior to utilizing this checklist, the Lead Verifier and/or Verifiers shall read the NU documents to become familiar with Millstone's specific requirements. Use of this checklist shall be as follows:

1. The SRG Lead shall assign a Lead Verifier from the applicable discipline.

2. The Lead Verifier shall perform the screening by answering the questions on the checklist.

3. The Lead Verifier shall initial each response.

4. The Lead Verifier may request assistance from the discipline Verifiers as needed. Discipline Verifiers shall initial the responses they provide.

5. The Lead Verifier shall assemble the completed checklist by entering the system identifier and modification number in the titleblock on each sheet. The Lead Verifier shall also number the checklist pages sequentially and sign and date the cover sheet.

6. The SRG Lead shall indicate his concurrence that the checklists have been completed by signing and dating the cover sheet.

7. For elements determined to be affected, the Lead Verifier shall distribute checklists and the modification package to applicable discipline verifier for detailed review.

Modification Screening Checklist

Modification Screening Summary

Review Attribute	Affected Yes	Affected No	Initials
Mechanical System Design	______	______	________
Electrical Design	______	______	________
I&C Design	______	______	________
Structural Design	______	______	________
ALARA	______	______	________
Security	______	______	________
Appendix R Compliance	______	______	________
Electrical Equipment Qualification	______	______	________
Seismic Qualification	______	______	________
Radiological Environment	______	______	________
Non-Radiological Environment	______	______	________
Station Blackout	______	______	________
Control Panel Design	______	______	________
Piping Design Review	______	______	________
Setpoint Database	______	______	________
Hazards/HELB	______	______	________
Fire Protection	______	______	________
PRA	______	______	________
Training Procedures	______	______	________
Emergency Preparedness Plan	______	______	________
Plant Procedures	______	______	________
Configuration Change	______	______	________
Quality Software Design Review	______	______	________

Modification Screening Checklist

Mechanical System Design

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03.

		No	Yes	Initials
1.	Does the modification affect mechanical or ventilation systems or components.?	_______	_______	_______
2.	Does this modification affect piping systems?	_______	_______	_______
3.	Does this modification alter or penetrate any barriers (i.e. HELB, fire, CO_2 halon, ventilation, water, flooding, tornado, radiation, etc.)?	_______	_______	_______
4.	Will the change increase the potential for flooding, reduce the capability to isolate or cope with local flooding or locate essential equipment where it would be susceptible to flooding?	_______	_______	_______
5.	Does this modification add insulation inside the containment which is of a different type than that already used inside containment?	_______	_______	_______
6.	Does this modification increase aluminum or add paint or coatings of a different type than that already used inside containment?	_______	_______	_______
7.	Does this modification affect mechanical analysis or calculations such as thermal loading, flow and pressure drop evaluations?	_______	_______	_______
8.	Does this modification affect mechanical drawings, data sheets, lists or databases, or other mechanical documents?	_______	_______	_______

Modification Screening Checklist

Electrical Design

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-04.

		No	Yes	Initials
1.	Does this modification alter, add or delete cables, raceways or physical separation barriers (e.g., use of theraset flame retardant electrical insulating materials, siltemp-wrap, armoring, flex conduit, etc.)?	_____	_____	_______
2.	Does this modification add hot piping, valves, pipe fittings or any other device that generates heat such that the installation of these components are within close proximity (less than 30 inches) of electrical raceways, (conduits, trays) or cables or could otherwise significantly impact ambient operating temperatures of electrical equipment?	_____	_____	_______
3.	Does this modification change, add or delete any electrical loads, or alter the loading sequence on any electrical bus?	_____	_____	_______
4.	Does this modification change, add, or delete a motor or MOV, alter the control circuit to an existing motor or MOV, or change the stroke time of any MOV?	_____	_____	_______
5.	Does this modification add or alter a circuit which utilizes a containment electrical penetration?	_____	_____	_______
6.	Does this modification revise a relay setting or alter, add, or delete in any way a protective device, alarm, or indication (i.e. fuse, breaker, undervoltage, underfrequency tol etc.)?	_____	_____	_______
7.	Does this modification add or alter a structure which would affect the lightning protection and/or grounding system?	_____	_____	_______
8.	Does this modification add to or alter the wiring, insulation, or connections in a control panel?	_____	_____	_______

Modification Screening Checklist

		No	Yes	Initials
9.	Does this modification alter or affect in any way the equipment or structures which interface with any offsite power source or Switchyard or affect the HVAC requirements of any onsite power source enclosure (i.e. EDG, Battery or Inverter Room)?	_____	_____	_______
10.	Does this modification affect electrical drawings, datasheets, lists or databases, etc.?	_____	_____	_______
11.	Does this modification affect electrical calculations, such as equipment sizing, voltage drop, setpoints, overcurrent protection?	_____	_____	_______

Modification Screening Checklist

I&C Design

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-05.

		No	Yes	Initials
1.	Does the design affect the process parameters, which could require setpoint or calibration changes?	_____	_____	_______
2.	Does the design require any indication, alarms or protective interlocks with existing equipment?	_____	_____	_______
3.	Does the design install or modify the wiring or terminations inside panels?	_____	_____	_______
4.	Does the design add, delete or modify any existing protection, control or indication loops?	_____	_____	_______
5.	Does the design add, delete, modify any microprocessor-based instrumentation?	_____	_____	_______
6.	Does the design affect the electrical and mechanical separation requirement as applied to the channelization of protection loops?	_____	_____	_______
7.	Does the design add, delete or modify the tubing or tubing tray for any instrument loops?	_____	_____	_______
8.	Does the design add, delete or modify air loading on the control or station air systems?	_____	_____	_______
9.	Does the design affect instrumentation which provides input to the plant process computer?	_____	_____	_______
10.	Does the design change environmental parameters of an area containing safety-related instrumentation?	_____	_____	_______

Modification Screening Checklist

Structural Design

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-06.

		No	Yes	Initials
1.	Does the modification add, modify or delete piping or pipe supports?	______	______	________
2.	Does the modification add, modify or delete any equipment mounted to floors or walls or steel beams?	______	______	________
3.	Does the modification add, delete or modify electrical raceway or raceway supports?	______	______	________
4.	Does the modification add, delete or modify HVAC ductwork or ductwork supports?	______	______	________
5.	Does the modification add, delete or modify access platforms?	______	______	________
6.	Does the modification require concrete excavation for anchor bolts, core drills, etc.?	______	______	________
7.	Does the modification affect site facilities such as buildings, fences, roadways, parking lots, buried commodoties or site drainage?	______	______	________
8.	Does the modification require breaking of any outer walls?	______	______	________
9.	Does the modification involve heavy load considerations?	______	______	________
10.	Does this modification involve painting or coating activities?	______	______	________
11.	Does this modification affect structural drawings or analysis?	______	______	________

Modification Screening Checklist

ALARA Design

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-07.

	Question	No	Yes	Initials
1.	Did the modification alter systems which contain or could contain radioactivity (e.g., liquid, gaseous, or solid radwaste; HVAC in contaminated areas; post-accident recovery systems, etc.)?	_____	_____	_______
2.	Did the modification alter parts of components that could be in a flow path leading to the reactor core?	_____	_____	_______
3.	Did the modification alter, delete or add radiation shields?	_____	_____	_______
4.	Was the estimated additional annual operating and maintenance dose from this modification greater than 1.0 person-rem?	_____	_____	_______
5.	Will this project involve process, area, or airborne radiation monitoring equipment?	_____	_____	_______
6.	Was any work performed inside radiological posted areas?	_____	_____	_______
7.	Is there a possibility of coming in contact with contaminated liquid?	_____	_____	_______
8.	Is there a possibility of coming in contact with airborne radioactivity?	_____	_____	_______
9.	Is the estimated installation dose from this modification greater than 1.0 person-rem?	_____	_____	_______

Modification Screening Checklist

Security

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-08.

		No	Yes	Initials
1.	Will the work process or the design change create any openings in the Protected Area Barrier?	_____	_____	_______
2.	Will the work process or the design change create any openings or require opening systems that penetrate the Vital Area Barrier (e.g., service water, circulating water, ventilation systems)? Will the work process require the opening of any door, roof, or floor plug that forms a portion of a Vital Area Barrier?	_____	_____	_______
3.	Will the work process or the design change affect the Security System Power Supply, the Security Diesel Generator, the Security CCTV System or minimum lighting?	_____	_____	_______
4.	Will the work process or the design change affect Security in any other way, or will Security support be required?	_____	_____	_______

Modification Screening Checklist

Appendix R Compliance

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-09.

		No	Yes	Initials
1.	Will the change alter the access/egress routes and/or the emergency lighting paths? The access/egress routes and emergency lighting locations are specified on drawings contained in each compliance report.	____	____	______
2.	Will the change alter the design or operation of any component utilized for reactor shutdown? These components are identified in the compliance report equipment listing section.	____	____	______
3.	Will the change alter the location, functionability, design, or material requirements of fire suppression or detection system, fire barriers on cabling wraps, structural steel coating, or fire dampers in areas associated with Items 1 and 2 above?	____	____	______
4.	Will the change alter the configuration of shutdown components of Item 2 by introducing combustible material near or between these components?	____	____	______
5.	Will the change alter the power or control cabling configuration to any of the shutdown components of Item 2?	____	____	______
6.	Will the change alter any communication systems that are utilized during plant shutdown following a fire? The Unit Compliance Report Communication Section identifies the communication systems needed for Appendix R Compliance.	____	____	______
7.	Will the change alter the reactor coolant pump oil collection system?	____	____	______
8.	Will the change add additional electrical or mechanical components whose failure or malfunction could prevent or degrade a plant shutdown after a fire? The necessary components are described in the Unit's shutdown Equipment and Methods Section in the Compliance Report.	____	____	______

Modification Screening Checklist

Electrical Equipment Qualification

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-10.

		No	Yes	Initials
1.	Does the proposed design change modify the installation or configuration of any equipment or associated component listed on the EEQ Master List?	_____	_____	_______
2.	Does the proposed design change add any electrical system or portion of an electrical system credited for accident mitigation component where the equipment is located in a harsh environment?	_____	_____	_______
3.	Does the proposed design change alter the electrical portion of any accident mitigating or monitoring system (including cable and interfaces) located in an area where the environment is affected by an accident?	_____	_____	_______
4.	Does the proposed design change credit any electrical system or portion thereof which is located in a harsh environment, which has not previously been credited for accident mitigating or monitoring?	_____	_____	_______
5.	Does the proposed design change alter the operating time during any phase of the accident when the devise is called on to function, or alter the time during of operation?	_____	_____	_______
6.	Does the proposed design change the accuracy requirements of any instrument credited during or following an accident, including the R.G. 1.97 instruments, where the instrument is located in a harsh environment?	_____	_____	_______
7.	Does the proposed design change alter the physical arrangement or boundary of any EQ Zone, including doors, hatches, ductwork, piping or electrical penetrations and structural walls, which could affect the basis of the HELB analysis?	_____	_____	_______

Modification Screening Checklist

		No	Yes	Initials
8.	Does the proposed design change affect area ventilation flows:	_____	_____	________
a.	open or seal flow paths in boundary?	_____	_____	________
b.	change duct configuration (i.e., duct size, routing, GRDs)?	_____	_____	________
c.	change duct velocity at fire dampers?	_____	_____	________
d.	change duct velocity at elbow turning vanes?	_____	_____	________
e.	change duct velocity at FES, silencers, or RS?	_____	_____	________
f.	change supply air temperature?	_____	_____	________
9.	Does the proposed design change revise area design environmental parameters (maximum/minimum temperature, relative humidity, pressure or radiation dose for normal or abnormal modes)?	_____	_____	________
10.	Does the proposed design change increase or decrease area heating/cooling loads?	_____	_____	________
a.	electrical equipment loads?	_____	_____	________
b.	control equipment loads?	_____	_____	________
c.	lightning loads?	_____	_____	________
d.	cable loads?	_____	_____	________
e.	motor loads (operating bhp or nameplate Hp increase)?	_____	_____	________
f.	piping loads (line temperature increases, insulation thickness decrease or removal, size increase, length increase)?	_____	_____	________
g.	pipe support loads (line temperature/size, support type, number of supports)?	_____	_____	________

Modification Screening Checklist

		No	Yes	Initials
h.	piping valves (temperature increase, size increase, quantity increase)?	____	____	______
i.	transmission loads (room construction)?	____	____	______
j.	number of people in area?	____	____	______
k.	mechanical equipment (tanks/vessels temperature, insulation, quantity)?	____	____	______
l.	ventilation flows?	____	____	______
m.	steam or water leaks?	____	____	______
12.	Does the proposed design change affect HVAC equipment performance?	____	____	______
a.	fans (flow temperature, pressure, speed, blade setting)?	____	____	______
b.	coils (air/water flows, air/water temperature, airside/waterside fouling)? (This includes foreign material spilled and hardened on the face of a coil or equipment located in front of and blocking an HVAC duct.)	____	____	______
c.	refrigeration equipment (condenser/evaporator operating conditions, refrigeration piping)?	____	____	______
d.	filters (flow, loading)?	____	____	______
13.	Does the proposed design change affect the amount of H_2 released to space (i.e., batteries)?	____	____	______
14.	Does the proposed design change revise the use for the area?	____	____	______
15.	Does the proposed design change affect the quantity/type of hazardous materials stored in space?	____	____	______

Modification Screening Checklist

		No	Yes	Initials
16.	Does the proposed design change affect HVAC system or equipment instrument setpoints?	_____	_____	_______
a.	time delay relays?	_____	_____	_______
b.	flow controllers, switches, transmitters, relays?	_____	_____	_______
c.	temperature controllers, switches, transmitters, relays?	_____	_____	_______
d.	pressure controllers, switches, transmitters, relays?	_____	_____	_______
e.	humidity controllers, switches, transmitters, relays?	_____	_____	_______

Modification Screening Checklist

Seismic Qualification

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-11.

		No	Yes	Initials
1.	Does the design change provide for the installation of the new Seismic Category I structures, systems, or components?	_____	_____	_______
2.	Does the design change provide for the installation, replacement modification, or removal of equipment which could effect the seismic response of Seismic Category I structures, systems, or components?	_____	_____	_______
3.	Does the design change alter the state or condition during normal or accident scenarios for previously qualified equipment?	_____	_____	_______
4.	Does the design change modify or alter the mounting condition of existing Seismic Category I equipment?	_____	_____	_______

Modification Screening Checklist

Radiological Environment

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-12.

		No	Yes	Initials
1.	Will the change cause an increase or potential increase in the amount of radioactive airborne effluents or liquid effluents, or significantly alter the nuclide mix of such effluents?	_____	_____	_______
2.	Will the change result in a new radioactive liquid or gaseous discharge point, or decrease the ability to sample or monitor existing release paths?	_____	_____	_______
3.	Will the change significantly increase (for example, greater than five per year) the number of solid radwaste shipments per year?	_____	_____	_______
4.	Will the change cause an increase in the direct or scattered dose rate at the site boundary greater than 0.1 mrem/year?	_____	_____	_______
5.	Will the change, in the judgment of the individual performing the review, constitute an increased radiological environmental impact for reasons not already considered above?	_____	_____	_______

Modification Screening Checklist

Non-Radiological Environment

Answer each of the questiors below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-13.

	Question	No	Yes	Initials
1.	Does the proposed design/Procedure alter the water quality characteristics regulated by NPDES permit? Increases in these characteristics that exceed permit conditions require environmental review.	_____	_____	_______
2.	Does the proposed design change/procedure modify water discharges under NPDES permit and their Discharge Serial Numbers? New discharges created by the proposed change require environmental review. Modifications to existing discharges require environmental evaluation to determine whether an environmental review is required.	_____	_____	_______
3.	Does the proposed change alter the type or amount of fossil fuel burned?	_____	_____	_______
4.	Does the proposed change create a source of air pollution?	_____	_____	_______
5.	Does the proposed change involve use of a volatile chemical?	_____	_____	_______
6.	Does the proposed change involve the use, storage, handling or disposal of a chemical product at variance with the BMP?	_____	_____	_______
7.	Does the proposed change involve the generation, use, storage, or disposal hazardous materials, hazardous wastes, toxic substances, or other environmentally regulated matter?	_____	_____	_______
8.	Does the proposed change involve a construction site area greater than five acres?	_____	_____	_______
9.	Does the proposed change involve any other known environmental issues or regulations?	_____	_____	_______

Modification Screening Checklist

Station Blackout

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-14.

		No	Yes	Initials
1.	Will the change alter the design or operation of any SBO equipment? SBO equipment is identified in the Production Maintenance Management System (PMMS) Database?	_____	_____	_______
2.	Will the change potentially impact the operation of any SBO equipment (i.e., non-SBO equipment potentially affecting SBO equipment operation)?	_____	_____	_______
3.	Will the change alter the determination of dominant areas of concern or impact the results of analysis which determined dominant areas of concern (i.e., increase the area temperature)?	_____	_____	_______

Modification Screening Checklist

Control Panel Design

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-15.

		No	Yes	Initials
1.	Does the proposed modification occur in the control room or at local panels?	______	______	________
2.	Does the proposed modification involve the installation or change of equipment that restricts operator or maintenance personnel movement at local panels or change to the communications equipment at local panels?	______	______	________
3.	Does the proposed modification involve the location, layout and capability of the user-computer interface (access) devices?	______	______	________
4.	Does the proposed modification involve the change of information or display characteristics of any system?	______	______	________

Modification Screening Checklist

Piping Design

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-16.

		No	Yes	Initials
1.	Does this design change involve a piping arrangement change (i.e., new pipe, rerouting of existing pipe, or complete or partial deletion of piping)?	____	____	____
2.	Does this design change involve a permanent change in piping inventory (for example, steam service to water service)?	____	____	____
3.	Does this design change involve an addition, deletion or modification of any in-line component?	____	____	____
4.	Does this design change involve a change in orientation of an existing in-line component?	____	____	____
5.	Does this design change involve a change in piping material or wall thickness?	____	____	____
6.	Does this design change involve a change in piping system design parameters or classification (i.e., Operating/Design Temperature or Pressure; Code Class)?	____	____	____
7.	Does this design change involve the addition, removal or modification of insulation on piping?	____	____	____
8.	Does this design change involve the addition, removal or modification of lead shielding supported by piping.	____	____	____
9.	Does this design change involve the addition, removal, modification of any piping appurtenance supported by existing piping.	____	____	____

Modification Screening Checklist

Setpoint Database

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-17.

		No	Yes	Initials
1.	Does the design change add, delete or change any setpoint in the Master Setpoint Index (MSI) database?	_____	_____	_______
2.	Does the design change reference information in the MSI such as database description, type of setpoint description, controiling department, responsible person, or mechanism of control?	_____	_____	_______
3.	Does this modification alter the loading sequence on any electrical bus?	_____	_____	_______
4.	Does this modification revise a relay setting or alter, add or delete in any way a protective device (i.e. fuse, breaker, undervoltage, under frequency tol, etc.)?	_____	_____	_______
5.	Does the modification alter, add, or delete any instrumentation?	_____	_____	_______

Modification Screening Checklist

Hazards/HELB

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-18.

		No	Yes	Initials
1.	Does the modification alter or add any structures or equipment to Category I buildings, structures, or equipment?	_____	_____	_______
2.	Does the modification potentially violate established boundaries in Category I and II structures causing communication with adjacent Category I structures.	_____	_____	_______

If the answers to the above questions are "No," the review is complete; no further evaluation is necessary and completion of the remaining questions is not required. If the response to any of these questions is "Yes," continue to respond to the following questions.

3.	Does this modification alter the energy level (i.e., operating temperature, fluid quality, or pressure) of any fluid system during an operating condition?	_____	_____	_______
4.	Does this modification introduce a new fluid or gas system or relocate an existing fluid or gas system?	_____	_____	_______
5.	Does this modification introduce a new source or modify an existing source of a potential missile generated from a high energy system (e.g., valve stems which are not backseated, valve body to bonnet connection hardware, thermowell, incore detector)?	_____	_____	_______
6.	Does this modification introduce a new piece of rotating equipment?	_____	_____	_______
7.	Does this modification alter the location, orientation, rotational energy, or casing of any rotation equipment?	_____	_____	_______
8.	Does this modification introduce or relocate a safety related component or system?	_____	_____	_______

Modification Screening Checklist

		No	Yes	Initials
9.	Does this modification introduce any equipment with anchorage that has not been specifically designed to withstand seismic loads?	_____	_____	_______
10.	Does this modification introduce any seismically anchored component or system which is to be installed within two inches of any seismically anchored component or system?	_____	_____	_______
11.	Does the modification introduce or relocate a safety-related component or system within six inches of nonseismically anchored component or system?	_____	_____	_______
12.	Does this modification introduce or relocate a safety-related component which is potentially in the path of a nonseismically anchored gravity missile (i.e., nonseismic component or system which may fall and impact the safety-related component)?	_____	_____	_______
13.	Does this modification alter, extend, or degrade any barriers, seals, etc., designed to contain or mitigate the environmental effects of a high energy line break.	_____	_____	_______

Modification Screening Checklist

Fire Protection

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-19.

	No	Yes	Initials
1. Fire Barriers			
- Are changes proposed (including penetrations) to any fire barriers such as floors, walls, or ceilings enclosing separate fire areas or will any existing penetration be modified/abandoned?	_____	_____	_______
- Are changes proposed (modification, removal) to any integral component of any fire barrier (doors, door frames, and assemblies, dampers, structural steel supports, hatches, steel plates, marinite boards, radiant energy shields, curbs)?	_____	_____	_______
- Will proposed changes modify the technical nature of the surveillance or periodic test procedures for fire barriers and their components (doors, dampers, penetration seals) or fire response?	_____	_____	_______
2. Combustibles			
- Are changes proposed that will modify combustible loading (increase or decrease)?	_____	_____	_______
- Will the configuration of the combustibles be modified?	_____	_____	_______
- Is non-IEEE 383 qualified cable being added.	_____	_____	_______
- Is PVC insulated cable being added.	_____	_____	_______

Modification Screening Checklist

		No	Yes	Initials
3.	Detection			
-	Are changes proposed that will modify any of the plant's fire detection systems, including quantity, type, circuitry, detector location and spacing, and sensitivity?	_____	_____	_____
-	Are changes proposed to structures, cable trays, or ventilation ducts that will impact the performance of any detection system?	_____	_____	_____
-	Will the proposed changes cause air velocities or directions to change; or introduce heat producing device in an area containing fire or smoke detectors? For example, the proposed change replaces an existing component with one which includes a self-contained forced air cooling system.	_____	_____	_____
-	Will proposed changes modify the technical nature of the surveillance or periodic test procedures for the plant's fire detection systems or fire response?	_____	_____	_____
4.	Suppression			
-	Are changes proposed that will modify any of the plant's fire suppression systems? Suppression systems include automatic sprinklers, water spray systems, foam systems, Halon suppression systems, CO_2 suppression systems, water supplies (fire pumps, water mains), fire hose stations (houses, carts, etc.), hydrants and portable extinguishers.	_____	_____	_____
-	Are any structures, cable trays, ventilation ducts, piping or other components being installed or modified which could impact the performance of a fixed fire suppression system (both manual and automatic) or impact the ability of the fire brigade to access and utilize manual fire suppression equipment particularly under adverse emergency conditions?	_____	_____	_____

Modification Screening Checklist

	No	Yes	Initials
- Will proposed changes modify the technical nature of the surveillance or periodic test procedures for plant's fire suppression systems or fire response?	_____	_____	_______

5. Ventilation

	No	Yes	Initials
- Will the proposed change alter the location or type of air supply or discharge registers or other openings intended for air circulation in a room or area containing smoke or fire detectors; or change the velocity or quantity of air being supplied to or discharged from a room or area containing smoke or fire detectors.	_____	_____	_______
- Are any ventilation systems being modified such that fire barriers are penetrated and consideration of additional fire dampers is necessary?	_____	_____	_______

6. Fire Wrap

	No	Yes	Initials
- Are changes proposed that will in any way modify the existing configuration and type of cable tray, conduit, cable shaft, panel, equipment, or ventilation duct wrap, including supports.	_____	_____	_______
- Will any existing wrap be abandoned?	_____	_____	_______
- Will proposed changes modify the technical nature of the surveillance or periodic test procedures for fire wrap?	_____	_____	_______

7. RCP Oil Collection

	No	Yes	Initials
- Are changes proposed that will modify the performance, capacity, or location of the Reactor Coolant Pump Oil collection system?	_____	_____	_______

Modification Screening Checklist

		No	Yes	Initials
8.	Structural Steel			
	- Are changes proposed that will in any way modify the fire coating to structural steel?	_____	_____	_______
9.	General Plant Arrangement			
	- Will the proposed change alter the access to or limit the range of manual fire fighting equipment by modifying the general arrangement of an area such as installing floor mounted equipment which could inhibit fire brigade efforts or fire fighting equipment?	_____	_____	_______
	- Do the proposed changes renovate an area for a different occupancy such as enclosing or fencing off an area for use as a storage space or establishing a personnel work station or office, etc.?	_____	_____	_______

Modification Screening Checklist

PRA

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-21.

		No	Yes	Initials
1.	Could the modification change event frequencies assumed in the unit PRA analysis?	_____	_____	_______
2.	Could the Modification impact On-Line Maintenance Risk Assumptions?	_____	_____	_______
3.	Could the modification change the Maintenance Rule significance or scope?	_____	_____	_______

Modification Screening Checklist

Quality Software

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the applicable discipline verifier for review in accordance with CK-MP3-03-22.

		No	Yes	Initials
1.	Does the proposed design include or effect any computer program (i.e., programmable set of instructions) that is processed by a computer (e.g., main frame computer, minicomputer, microprocessor, embedded processor, programmable devices, etc.) that could be Quality Software, Category I Quality Software, Controlled Software, or a Computerized Quality Database?	_____	_____	_______
2.	Will the change involve a plant process computer (i.e., any real-time sensor-based monitoring or control computer system that assists nuclear unit operation. Included are the following: systems traditionally known as "unit process computer;") special purpose computer, minicomputer or microprocessor computer-based instrumentation monitoring and process control systems; and station security systems).	_____	_____	_______
3.	Does the proposed design add, delete, or modify any input or output point for a plant process computer?	_____	_____	_______

Modification Screening Checklist

Training Procedures

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the ORG for review in accordance with PI-MP3-06.

		No	Yes	Initials
1.	Does the design change add or delete components (not parts) or change the physical orientation of plant equipment such that the Operator's response could be impacted by the modification?	_____	_____	_____
2.	Does the design change add or delete components (not parts) that will affect equipment operational practice, surveillance's, maintenance practices or testing practices?	_____	_____	_____
3.	Does the design change alter or modify power supplies, change controls, operational characteristics or indication of components or systems, affect equipment operational procedures, surveillance procedures, maintenance practices or testing practices?	_____	_____	_____
4.	Does the design change add, delete, or modify power supplies, equipment, actuators, or setpoints such that a simulator modification(s) will be required?	_____	_____	_____

Modification Screening Checklist

Emergency Preparedness Program

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the ORG for review in accordance with PI-MP3-06.

		No	Yes	Initials
1.	Does the modification alter/add equipment which has the potential to impact the emergency plan, procedures, facilities, equipment, and software (e.g., OFIS)?	_____	_____	_______

Modification Screening Checklist

Plant Procedures

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the ORG for review in accordance with PI-MP3-06.

	Question	No	Yes	Initials
1.	Will the proposed design change test plan require preservice or inservice testing, inspection or base line data generation etc.? (i.e. is it within the ASME class 1, 2 or 3 boundary)	_____	_____	_______
2.	Will the proposed design change require the generation of ASME Section XI repair packages per NGP 7.05?	_____	_____	_______
3.	Will the proposed design change impact the Erosion/Corrosion program? (i.e. flow, pressure, piping geometry, temperature, water chemistry on carbon steel components)	_____	_____	_______
4.	Does this modification add or delete a motor or MOV or alter the control circuit to an existing motor or MOV?	_____	_____	_______
5.	Will the proposed design change impact an MOV? (i.e. flow, temperature, pressure, electrical, thermal overloads, stroke time)	_____	_____	_______
6.	Will the proposed design change impact the Check Valve program? (i.e. modify, replace, repair, add, delete, alter flow conditions or change location of a check valve)	_____	_____	_______
7.	Will the proposed design change impact Containment Configuration Testing (Appendix J)?	_____	_____	_______
8.	Will the proposed design change impact the Maintenance Rule Program? (i.e., maintenance requirements, or changes to program scope documents such as an addition or deleting of a MR SSC or change of functions.)	_____	_____	_______

Modification Screening Checklist

		No	Yes	Initials
9.	Will the proposed design change impact the Maintenance requirements of any new or existing Plant Equipment? (i.e., equipment accessibility, maintainability, proper design to accommodate predictive maintenance technologies, etc.)	_____	_____	_______
10.	Does the modification affect equipment that is referenced (or needs to be referenced) in any Emergency Operating Procedure?	_____	_____	_______
11.	Does the modification affect equipment that is referenced (or needs to be referenced) in any Operating Procedure? (AOP, OP, ARP, ST, IST, etc.)	_____	_____	_______
12.	Does the modification affect equipment that is referenced (or needs to be referenced) in any Chemistry Procedure?	_____	_____	_______
13.	Does the modification affect equipment that is referenced (or needs to be reference) in any Maintenance Procedure?	_____	_____	_______
14.	Does the modification affect equipment that is referenced (or needs to be referenced) in any I&C Procedure?	_____	_____	_______
15.	Does the modification affect equipment that is referenced (or need to be referenced) in any other procedures?	_____	_____	_______

Modification Screening Checklist

Configuration

Answer each of the questions below yes or no. If any of the answers are yes, submit a copy of the screening form and modification package to the ORG for review in accordance with PI-MP3-06.

		No	Yes	Initials
1.	Does the design change make any physical changes to the system configuration?	_____	_____	_______

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-03, Rev. 0

Mechanical System Design Review

	Name	Signature	Date
Prepared by:	A.A.NERI	AANeri	4-7-97
Approved by:	D.K. Schopfer	D.K. Schopfer	4-25-97

System	
Modification No.	
Verified by:	
Concurrence by:	

Mechanical System Design Review

Instructions

This checklist supplements PI-MP3-03 and shall be used to document the mechanical design review process for system modifications. Application and use of this checklist shall be as follows:

1. When the need for a mechanical design review is identified by the modification screening checklist (CK-MP3-03-02), the Verifier shall implement this check to verify that mechanical system design aspects have been properly addressed in the modification.
2. The Verifier shall review each attribute listed in the checklist and shall determine whether the attribute has been properly addressed or is not applicable. The determination shall be documented by checking the appropriate column in the checklist.
3. For all "Yes" and "No" responses, the Verifier shall assign a sequential comment number and shall describe the basis for the response on the comment sheet included in this checklist. Comments may also be provide for "N/A" responses.
4. When all attributes have been reviewed, the Verifier shall sign and date the cover sheet
5. The Lead Verifier shall indicate his concurrence that the mechanical system review has been completed by signing and dating the cover sheet.

The system designation and modification number shall be entered on all sheets of the completed checklist. Pages shall be sequentially numbered. It shall be acceptable to add insert pages numbered as 1A, 1B, 2A, etc.

Mechanical System Design Review

	Attribute	Yes	No	N/A	Comments
1.	Performance requirements such as capacity, rating, output, are clearly identified and addressed.	______	______	______	________
2.	Codes, standards and regulatory requirements are documented, including applicable issue date and/or addenda. Exceptions are highlighted.	______	______	______	________
3.	Basic function of each system and component is discussed.	______	______	______	________
4.	Failure modes are identified and considered, e.g., loss of air, loss of power, loss of function (start, stop, open and close control).	______	______	______	________
5.	Interface requirements are specified and addressed.	______	______	______	________
6.	Operational requirements including mode restriction are identified; affect on all system operating alignments.	______	______	______	________
7.	Hydraulic requirements such as NPSH, pressure/pressure drop and fluid velocities are considered in the design of the system and its components, e.g., pumps, valves, orifices, and filter/strainers.	______	______	______	________
8.	Redundancy and separation requirements are addressed.	______	______	______	________
9.	New locked valves are identified.	______	______	______	________
10.	Breached barrier requirements, including mode restrictions, are clearly stated.	______	______	______	________
11.	Piping Code Classes are in accordance with Applicable Standards.	______	______	______	________
12.	Industry Experience was factored intc design where necessary.	______	______	______	________

Mechanical System Design Review

	Attribute	Yes	No	N/A	Comments
13.	Component temperature/pressure rating are reconciled with the system design temperature/pressure.	______	______	______	________
14.	Overpressure protection and thermal relief considerations are factored into the design.	______	______	______	________
15.	The design minimizes cross contamination potential.	______	______	______	________
16.	Modified heat loads are reconciled with existing heat removal capability and operating temperature limits.	______	______	______	________
17.	Effect on Accident Analysis Input Parameters (including containment mass tracking inventory) as addressed.	______	______	______	________
18.	The design has adequately addressed material corrosion potential (i.e., galvanic, erosion/corrosion, etc.) to minimize inservice effects on system/component design integrity.	______	______	______	________
19.	Affected calculations have been revised and/or new calculations have been prepared.	______	______	______	________
	a. Pipe min wall thickness	______	______	______	________
	b. Pump Net Positive Suction Head	______	______	______	________
	c. Pump Total System Head and Sizing				
	d. Heat transfer (sizing of heat exchangers, condensers, heaters, etc.)	______	______	______	________
		______	______	______	________
	e. Pump/System Performance	______	______	______	________
	f. Pressure/Vacuum Relief Valves Sizing	______	______	______	________
	g. Sump Capacity	______	______	______	________
	h. Cooling Water Flowrates	______	______	______	________
	i. Equipment Performance and Sizing	______	______	______	________
	j. Corrosion/Erosion Allowances				
	k. Tank Sizing (volume, wall thickness, overflow capacity, etc.)	______	______	______	________
		______	______	______	________
	l. Pipe Sizing	______	______	______	________
	m. System Design/Operating Pressure and Temperature	______	______	______	________
	n. Pump Brake Horsepower Requirements	______	______	______	________
	o. Valve Actuation Times	______	______	______	________

Mechanical System Design Review

Attribute	Yes	No	N/A	Comments
p. MOV Sizing Calculation				
q. Control Valve Sizing				
r. Heating and Cooling Loads				
s. Duct Sizing and Pressure Drop				
t. Equipment Performance/Design Requirements (fans, chillers, coils, filters, dampers)				
u. System Performance (supply, return, and exhaust airflow requirements)				
v. Refrigerant Line Sizing				
w. Refrigerant Specialties Sizing/Performance				
x. Refrigerant Vent Line Sizing				
y. Allowable Duct and Filter Housing Leakage (for nuclear air cleaning systems)				
z. Residence Time for Charcoal Filter Units				
aa. Allowable Damper Leakage				
ab. Damper Closure Time Requirements				
ac. Duct Weight and Hanger Loading				
ad. Allowable Boundary Leakage				
ae. Space Sound Levels (noise calc)				
20. Affected mechanical drawings and databases have been revised.				
a. Piping & Instrumentation Diagrams (P&IDs)				
b. General Arrangements				
c. Equipment Location				
d. Piping Single Line Drawings				
e. Plumbing/Drainage				
f. Heating & Ventilation				
g. Process Diagram				
h. Piping Isometric				
I. Hanger Drawings				
j. Design Installation and Test Specifications				
k. Design Basis Documents				
l. Procurement Specifications				
m. Vendor Drawing/Data Sheets				
n. Vendor Manual				
o. Valve List				
p. Line List				
q. Component datasheets/databases				

Mechanical System Design Review

Attribute	Yes	No	N/A	Comments
r. Damper List				
s. Boundary Seals (ventilation, fire, radiation, flooding)				
t. Penetrtion Schedules				
u. Grille, Register, and Diffuser Lists				
v. Refrigerant Specialty Datasheets/Database				
21. Other mechanical system requirements as described in the System Requirements Checklist (CK-MP3-02-02) have been addressed. (Identify below the requirement number from the System Requirements List.)				

Northeast Utilities
Millstone Unit 3

CK-MP3-03-03
System ________________
Modification No. _________
Sheet ______ of ______

Mechanical System Design Review

<u>Comment Form</u>

Comment No.	Comment

Prepared by	Signature	Date

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-04, Rev. 1

Electrical System Design

Prepared by:	IAN WARNER Name	Ian Warner Signature	4-18-97 Date
Approved by:	A ANEKI Name	[illegible] Signature	4-18-97 Date

System	
Modification No.	
Verified by:	
Concurrence by:	

Electrical System Design Review

Instructions

This checklist supplements PI- MP3-03 and shall be used to document the electrical design review process for system modifications. Application and use of this checklist shall be as follows:

1. When the need for a electrical design review is identified by the modification screening checklist (CK-MP3-03-02), the Verifier shall implement this check to verify that electrical system design aspects have been properly addressed in the modification.
2. The Verifier shall review each attribute listed in the checklist and shall determine whether the attribute has been properly addressed or is not applicable. The determination shall be documented by checking the appropriate column in the checklist.
3. For all "Yes" and "No" responses, the Verifier shall assign a sequential comment number and shall describe the basis for the response on the comment sheet included in this checklist. Comments may also be provide for "N/A" responses.
4. When all attributes have been reviewed, the Verifier shall sign and date the cover sheet
5. The Lead Verifier shall indicate his concurrence that the electrical system review has been completed by signing and dating the cover sheet.

The system designation and modification number shall be entered on all sheets of the completed checklist. Pages shall be sequentially numbered. It shall be acceptable to add insert pages numbered as 1A, 1B, 2A, etc.

Northeast Utilities
Millstone Unit 3

CK-MP3-03-04
System ________________
Modification No. _________
Sheet _____ of ______

Electrical System Design Review

	Attribute	Yes	No	N/A	Comment
1.	Performance requirements such as capacity, rating, output, are clearly identified and addressed.				
2.	The scope of the design document defines the basis/reason for the design/design change and provides an adequately detailed description of the design change. The content of the design document fulfills the stated scope.				
3.	Codes, standards and regulatory requirements are documented, including applicable issue date and/or addenda. Exceptions are highlighted.				
4.	Assumptions necessary to perform the design activity are adequately described and reasonable and the design method used was appropriate.				
5.	Failure modes are identified and considered, e.g., loss of air, loss of power, loss of function (start, stop, open and close control).				
6.	Interface requirements are specified and addressed.				
7.	Operational requirements including mode restrictions are identified; effect on all system operating alignments.				
8.	Redundancy and separation requirements are addressed.				
9.	Assumptions necessary to perform the design activity are adequately described and reasonable and the design method used was appropriate.				
10.	Breached barrier requirements, including mode restrictions, are clearly stated.				
11.	The effects of design changes, issued or in-process, have been reviewed for impact on the design document. There is a process for identifying open modifications against proposed design changes.				
12.	Industry Experience was factored into design where necessary.				
13	Component temperature/voltage rating are reconciled with the system design temperature/voltage.				
14.	Overcurrent protection and voltage drop considerations are factored into the design.				

Electrical System Design Review

Attribute	Yes	No	N/A	Comment
15. Assignment of equipment and identification tagging was adequately addressed.				
16. Materials and equipment are adequately identified, specified, and suitable for the service environment and process conditions. For example, electrical device and component performance characteristics are identified and have been verified to be adequate for the application (such as minimum and maximum voltage, etc.). Resources such as IE Notices have been reviewed for applicable field service experience.				
17. Special material or equipment specification requirements or tests have been appropriately specified. (Examples: 10CFR50.49, IEEE-323, UL/FM Approved)				
18. Maintainability factors were accounted for in the design [such as location, accessibility, arrangement, environment, and isolation/separation features (breakers, fuses)].				
19. Affected calculations have been revised and/or new calculations have been prepared.				
a. Ampacity				
b. Voltage drop				
c. Relay or Trip device sizing and coordination				
d. Interrupting rating, both momentary and full load				
e. Voltage Regulation				
f. Bus loading under appropriate conditions				
g. Second Level Undervoltage				
h. Overload settings				
i. Equipment operating pressure				
j. MOV Calculations, e.g. overload, torque, stroke time, etc.				
k. Configuration control, e.g. fuse sizing, bus loading, cable tray loading				
20. Affected electrical drawings and databases have been updated?				
a. Schematics				
b. General Arrangements				
c. Equipment Location				
d. Single Line Drawings				
e. Wiring Diagrams				
f. Front Elevations (if appropriate)				
g. Logic Diagram				
h. Bus Loading				

Electrical System Design Review

Attribute	Yes	No	N/A	Comment
i. Cable Tray Loading	____	__	____	_______
j. Design Installation and Test Specifications	____	__	____	_______
k. Design Basis Documents	____	__	____	_______
l. Procurement Specifications	____	__	____	_______
m. Vendor Drawing/Data Sheets	____	__	____	_______
n. Vendor Manual	____	__	____	_______
o. Valve List	____	__	____	_______
p. Electrical Equipment List	____	__	____	_______
q. Component datasheets/databases	___			
21. If a containment electrical penetration was utilized, then all applicable factors were considered, e.g., splicing, sizing, segregation, short circuit and overload protection, etc.	_____	_____	_____	_______
22. Any changes in alarm settings, or the addition of new alarms, were properly evaluated against licensing requirements and operating procedures.	_____	_____	_____	_______
23. If new equipment was added, or existing equipment was modified such that changes in heat loading occurred, the impact was evaluated on existing HVAC systems.	_____	_____	_____	_______
24. Grounding and lightning protection was considered for any new equipment additions.	_____	_____	_____	_______
25. Post Modification Test requirements have been specified and include acceptance criteria sufficient to allow verification that design requirements have been satisfactorily accomplished.	_____	_____	_____	_______
26. Proper consideration was given to the mounting of small components or pieces of equipment relative to interaction with large dynamic pieces of equipment.	_____	_____	_____	_______
27. Proper consideration was given to minimize or eliminate the possibility of water entry into electrical equipment.	_____	_____	_____	_______
28. Proper consideration was given to the impact on electrical equipment if it was mounted within close proximity to any components which generate heat, e.g. pipes, transformers, etc.	_____	_____	_____	_______
29. Human factor engineering considerations were incorporated into the design.	_____	_____	_____	_______
30. The design has no impact on security lighting.	_____	_____	_____	_______
31. The impact on the training curriculum and the simulator was correctly identified. Simulator compatible materials were specified.	_____	_____	_____	_______

Electrical System Design Review

Attribute	Yes	No	N/A	Comment
32. The impact on the Safety Parameter Display System (SPDS) and the Emergency Operating Procedures (EOPs) were properly addressed.				
33. Other electrical system requirements as described in the System Requirements Checklist (CK-MP3-02-02) have been addressed. (Identify below the requirement number from the System Requirements List.)				

Electrical System Design Review

Comment Form

Comment No.	Comment

Prepared by	Signature	Date

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-05, Rev. 0

I&C Design Review

	Name	Signature	Date
Prepared by:	J.W. DeMarco	JW DeMarco	4-7-97
Approved by:	A.A. NERI	AA Neri	4-7-97

IMPLEMENTATION

System		
Modification No./ Description.		
Verified by:		Date:
Concurrence by:		Date:

I&C Design Review

Instructions

This checklist supplements PI-MP3-02 and is used to document the review of I&C design for a modification. A single checklist shall be used for a given modification. The checklist shall be completed in accordance with the following instructions:

a. The Verifier shall review the I&C design for the modification against each attribute listed on Pages 3 through 7 of the checklist.

b. The Verifier shall indicate for each attribute whether the I&C design is satisfactory or unsatisfactory. If the attribute is not applicable, the Verifier shall indicate NA in both columns.

c. The Verifier shall assign a sequential comment number to each response indicated on Pages 3 through 7 and shall use the Page 8 comment sheet to provide justification for the responses on Pages 3 through 7. Multiple Page 8's may be used. The justification shall reference the section of the modification package reviewed for which the comment is applicable.

d. Comments shall be processed as discrepancies in accordance with PI-MP3-11.

e. When completed, the Verifier shall sign and date the checklist cover sheet.

f. The Lead Verifier shall indicate the Verifier's concurrence on the cover sheet that the I&C Design Review of the modification has been adequately completed.

g. The Lead Verifier shall compile the individual checklists and enter the Modification number on each sheet, number the sheets sequentially and sign the cover sheet. The sheet numbers shall be sequentially numbered (i.e., 1, 2, 3, etc.). It is acceptable to add insert pages (i.e., 1A, 1B, 1C, etc.) as needed.

h. The cover sheet and all applicable checklists and comment forms shall be included in the final project file copy.

I&C Design Review

	Attributes	Satisfactory	Unsatisfactory	Comment
1.	All instruments affected (added, deleted or changed) by the modification are explicitly identified in the modification.	________	________	________
2.	All affected existing protection, control or indication loops are explicitly identified in the modification.	________	________	________
3.	All affected microprocessor-based instrumentation has been identified in the modification.	________	________	________
4.	All design and functional requirements for the affected instruments has been identified or associated documents adequately referenced in the modification.	________	________	________
5.	If there has been a change to a process parameter, the affected instrument setpoint or its calibration has been changed accordingly.	________	________	________
6.	The basis for the setpoint or loop accuracy change and the resultant setpoint or loop accuracy value was adequately determined in an approved setpoint calculation and referenced in the modification.	________	________	________
7.	The instrument scaling, banding, setting tolerance requirements, and required testing frequency were documented or adequately referenced in the modification.	________	________	________
8.	Software for affected any programmed or programmable instrumentation has been modified and documented in accordance with approved Station and Software Quality Assurance procedures.	________	________	________

I&C Design Review

	Attributes	Satisfactory	Unsatisfactory	Comment
9.	The preoperational testing requirements for the affected instruments has been stated in the modification.	____	____	____
10.	Indication, alarms, and protective interlocks have been appropriately incorporated into the design.	____	____	____
11.	Affected wiring or terminations inside panels has been adequately identified in the modification.	____	____	____
12.	Electrical separation and mechanical separation for each of the protection loop channels has been adequately addressed and designed in the modification.	____	____	____
13.	Instrument process-connected tubing, pneumatic signal tubing and air supply tubing and tubing tray has been adequately designed to meet the functional requirements identified in the modification.	____	____	____
14	Air loading changes to the instrument/control air and station air systems have been adequately addressed and the affected air system loading calculation has been revised.	____	____	____
15.	Changes to the plant computer inputs and associated software have been adequately addressed in the modification.	____	____	____
16.	Changes to the plant simulator have been adequately addressed in the modification.	____	____	____
17.	Environmental parameter changes in an area containing safety-related or environmentally qualified instruments have been adequately addressed in the modification.	____	____	____

I&C Design Review

	Attributes	Satisfactory	Unsatisfactory	Comment
18.	Instruments have been seismically mounted as needed to meet Seismic Category I or II-over-I requirements.			
19.	Interaction with instrumentation in other systems has been adequately addressed.			
20.	EMI/RFI concerns have been adequately addressed in the modification.			
21.	Provisions for instrument access and maintenance has been considered in the modification.			
22.	ALARA considerations during installation and postmodification maintenance have been addressed in the modification.			
23.	Signal isolation between safety-related and non-safety related instruments or plant computer has been adequately addressed in the modification.			
24.	Construction and operating experiences have been incorporated into the design of the modification.			
25.	Quality Assurance and quality control requirements have been appropriately included in the modification.			
26.	Instruments and their associated parts meet the service requirements of the modification.			
27.	Failure Modes and Effects Analysis has adequately addressed the changes identified in the modification.			

I&C Design Review

	Attributes	Satisfactory	Unsatisfactory	Comment
28.	The Safety Analysis adequately addresses the safety impact of the modification on safety-related systems but also addresses impact on normal plant operation.			
29.	Human Factors concerns have been incorporated into the modification			
30.	System bypass control has been incorporated into the modification.			
31.	System independence has been addressed in the modification.			
32.	Control loop response time impact has been adequately documented in the modification.			
33.	Flood concerns have been addressed in the modification.			
34.	Regulatory Guide 1.97, Postaccident Monitoring, requirements have been incorporated into the modification.			
35.	All affected documents, drawings, and manuals for the modification have been properly annotated or revision submitted.			
	a. Design Criteria			
	b. FSAR			
	c. Technical Specification			
	d. Design Specifications			
	e. Functional Description			
	f. Logic Diagrams			
	g. Loop Schematics			
	h. Calculations			
	1) Setpoint Calculation			
	2) Loop Accuracy Calculation			
	3) Air Loading Calculation			
	i. Instrument Index/List/Database			
	j. Instrument Data Sheets			

I&C Design Review

	Attributes	Satisfactory	Unsatisfactory	Comment
35.	k. Scaling Document/Database			
	l. Input/Output Lists/Databases			
	m. Alarm List/Database			
	n. Valve List/Database			
	o. Piping Line List/Database			
	p. Instrument Line List/Database			
	q. Instrument Line/Tubing Isometric			
	r. Mounting Details/Sketches			
	s. Panel Layout Drawings			
	t. Vendor Drawings			
	u. Vendor Manuals			
	v. Bills of Material			
	w. Purchase Specifications			
	x. Heat Tracing			
36.	Instrument Tagging/Labeling			
37.	Other Attributes			
	1)			
	2)			
	3)			
	4)			
	5)			

Prepared by ____________________ Signature ____________________ Date ____________

I&C Design Review

I&C Design Review Comment Form

Comment No.	Comment

Prepared by ____________________ Signature ____________________ Date ____________

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-06, Rev. 0

Structural Design Review

Prepared by: NINO KLAIC (Name) | N. Klaic (Signature) | 4-7-97 (Date)

Approved by: A A NERI (Name) | [signature] (Signature) | 4-10-97 (Date)

IMPLEMENTATION

System	
Modification No./ Description	
Verified by:	
Concurrence by:	

Northeast Utilities
Millstone Unit 3

CK-MP3-03-06
System ________________
Modification No. ___ ______
Sheet ______ **of** __ _____

Structural Design Review

Instructions

This checklist supplements PI-MP3-03 and shall be used to document the structural design review process for system modifications. Application and use of this checklist shall be as follows:

1. When the need for a structural design review is identified by the modification screening checklist (CK-MP3-03-02), the Verifier shall implement this check to verify that structural design aspects have been properly addressed in the modification.
2. The Verifier shall review each attribute listed in the checklist and shall determine whether the attribute has been properly addressed or is not applicable. The determination shall be documented by checking the appropriate column in the checklist.
3. For all "Yes" and "No" responses, the Verifier shall assign a sequential comment number and shall describe the basis for the response on the comment sheet included in this checklist. Comments may also be provided for "N/A" responses.
4. When all attributes have been reviewed, the Verifier shall sign and date the cover sheet.
5. The Lead Verifier shall indicate his concurrence that the structural review has been completed by signing and dating the cover sheet.

The system designation and modification number shall be entered on all sheets of the completed checklist. Pages shall be sequentially numbered. It shall be acceptable to add insert pages numbered as 1A, 1B, 2A, etc.

Structural Design Review

	Attribute	Yes	No	N/A	Comments
1.	Codes, standards and regulatory requirements are documented, including applicable issue date and/or addenda. Exceptions are highlighted.	______	______	______	______
2.	Impact on the following project documents is addressed as applicable: • FSAR • Project Design Criteria • Design Control Summaries • Technical Training Package Exceptions are highlighted	______	______	______	______
3.	Impact of the attachment loads on the existing structures are adequately addressed.	______	______	______	______
4.	Local stresses at the attachment points are adequately addressed.	______	______	______	______
5.	All installation tolerances are addressed and justified.	______	______	______	______
6.	All design loads, load combinations and allowable stresses are clearly identified.	______	______	______	______
7.	Seismic response spectra curves used in design are adequately documented.	______	______	______	______
8.	Affect of rebar cuts, if any, is adequately addressed.	______	______	______	______
9.	Impact on buried structures is addressed.	______	______	______	______
10.	Assumptions related to connection fixities and torsional resistance in computer model correspond to actual connection configurations.	______	______	______	______
11.	The impact of locked-in stress is evaluated, if applicable.	______	______	______	______
12.	Impact of openings in steel beams is assessed, if applicable.	______	______	______	______

Northeast Utilities
Millstone Unit 3

CK-MP3-03-06
System ________________
Modification No. _________
Sheet ______ of ______

Structural Design Review

	Attribute	Yes	No	N/A	Comments
13.	Interaction of nuclear safety related and non-nuclear safety related systems is addressed.				
14.	The impact of adjacent attachments on the new installations is adequately addressed.				
15.	Computer model, if used in the analysis, corresponds to the design drawings. Exceptions and deviations are adequately addressed.				
16.	Impact of temperature changes or differential movements on steel framing are addressed, if applicable.				
17.	Impact of openings in reinforced concrete slabs is evaluated for new installations.				
18.	The impact of lamellar tearing is addressed, if applicable.				
19.	Principal axis bending of single angle sections is addressed.				
20.	Affected calculations and drawings have been revised and/or new calculations have been prepared.				
	a. Mechanical Component and Electrical Conduit Supports				
	b. Floor and Roof Framing Systems				
	c. Building Steel Framing				
	d. Horizontal and Vertical Bracing Systems				
	e. Column Systems including Anchor Bolts and Baseplates				
	f. Foundations and Earth Retaining Structures				
	g. Concrete and Brick Masonry Walls				
	h. Equipment Foundations				
	I. Shear Walls				
	j. Pipe Whip Restraints				
	k. Drilled-in Concrete Anchors				
	l. Buried Pipes				
	m. Penetration Sleeve Anchorage				
	n. Cable Trays				
	o. HVAC Ducts				
	p. Stainless Steel Pool Liners				

Structural Design Review

Attribute	Yes	No	N/A	Comments
q. Concrete Embedded Anchors and Plates	______	______	______	________
r. Concrete Containment Structures	______	______	______	________
21. Other structural design requirements as described in the System Requirements Checklist (CK-MP3-02-02) have been addressed. (Identify below the requirement number from the System Requirements List.)	______	______	______	________
____	______	______	______	________
____	______	______	______	________
____	______	______	______	________
____	______	______	______	________
____	______	______	______	________
____	______	______	______	________
____	______	______	______	________
____	______	______	______	________
____	______	______	______	________
____	______	______	______	________

Northeast Utilities
Millstone Unit 3

CK-MP3-03-06
System ________________
Modification No. ________
Sheet ______ of ______

Structural Design Review

Comment Form

Comment No.	Comment

Prepared by ______________________ Signature ______________________ Date ______________

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-07, Rev. 0

ALARA Design Review Checklist

Prepared by:	C. M. LAUNI Name	C M Launi Signature	4-7-97 Date
Approved by:	A. A. NERI Name	AA Neri Signature	4-7-97 Date

IMPLEMENTATION

System			
Modifiation No./ Description			
Verified by:		Date:	
Concurrence by:		Date:	

ALARA Design Review Checklist

Instructions

This checklist supplements the modification review process described in PI-MP3-03. Use of this checklist shall be as follows:

1. If Questions 1(a), 1(b), 1(c), 1 (d) or 1(e) of the ALARA Design portion of the Modification Screening Checklist CK-MP3-03-02 are answered "Yes" then the Verifier(s) shall complete Part 1 of ALARA Design Review Checklist.

    a. The Verifier(s) shall complete Section 1 of Part 1 of the ALARA Design Review Checklist.

    b. The Verifier(s) shall answer the questions following Section 1 of Part 1 of the ALARA Design Review Checklist to determine the additional extent of the design review needed.

    c. The Verifier(s) shall proceed to Section 6 of Part 1 of the ALARA design Review Checklist and identify the types of "equipment" added or modified and then complete those parts of Section 6 which are applicable.

2. If Questions 2(a), 2(b), 2(c), or 2(d) of the ALARA Design portion of of the Modification Screening Checklist CK-MP3-03-02 are answered "Yes" then the Verifier(s) shall complete Part 2 (Installation Review) of the ALARA Design Review Checklist.

    When completing Part 2 (Installation Review) the verifier(s) shall complete the total checklist.

3. The Verifier shall perform a technical review of the modification package and any new or revised design process documents that resulted from the modification per PI-MP3-02 and any new or revised output documents that resulted from the modification when completing the ALARA Design Review Checklist.

4. For each topic for which the applicability is determine to be affirmative, the verifier(s) shall enter a comment describing the impact of the modification on the topic, how the impact was resolved.

5. The Verifier shall generate a discrepancy report for any discrepancies identified during the review in accordance with Section 5.7 of PI-MP3-03.

ALARA Design Review Checklist

6. When the review is completed, the Verifier(s) shall sign and date the cover sheet of the ALARA Design Review Checklist and forward the completed checklist to the Lead Verifier.

ALARA Design Review Checklist

Part 1 - Design Review

Section 1 - Layout, Access Control, Radiological Boundaries & Activation Product Reduction

		Yes	No	N/A	Comment No.
1.1	**Radiological Boundaries**				
1.1.1	Were all associated radiological sources identified?	☐	☐	☐	____
1.1.2	Were area dose rates and personnel occupancy requirements reviewed?	☐	☐	☐	____
1.1.3	Has consideration been given to the provision of lifelines to pull accidentally injured or unconscious workers from high radiation areas or high airborne areas?	☐	☐	☐	____
1.1.4	Are appropriate communications provided at the work area?	☐	☐	☐	____
1.2	**Layout**				
1.21	Was equipment and areas well laid out?	☐	☐	☐	____
1.2.2	Was equipment properly segregated?	☐	☐	☐	____
1.2.3	Were work areas with similar radiological conditions grouped together?	☐	☐	☐	____
1.2.4	Does the layout facilitate future modifications?	☐	☐	☐	____
1.3	**Design For Installation**				
1.3.1	Did the design allow for as much installation work as possible to be performed outside radiologically significant areas?	☐	☐	☐	____
1.3.2	Were the parts and modules that were brought into the radiological work area of a size and weight that could be efficiently moved and handled?	☐	☐	☐	____
1.3.3	Did the design help to reduce the time that installation workers had to spend in radiologically significant areas?	☐	☐	☐	____

ALARA Design Review Checklist
Part 1 - Design Review

Section 1 - Layout, Access Control, Radiological Boundaries & Activation Product Reduction

		Yes	No	N/A	Comment No.
1.4	**Reactor Water - Activation Products Concerns**				
1.4.1	Did the design minimize the use of potentially activated materials (e.g., alloys containing nickel and cobalt) in and around the reactor where they will be exposed to neutron fields?	☐	☐	☐	______
1.4.2	Did the design minimize the use of potentially activated materials where they would be in contact with reactor coolant (e.g., stellite in valve seats)?	☐	☐	☐	______
1.4.4	Did the design maximize the removal of activated and potentially activated particulates from the reactor coolant?	☐	☐	☐	______

1.5 Determination of the Need for Additional ALARA Design Review

Complete additional Sections of the design review based on the answers to the following questions:

		YES	NO
a.	Did the modification involve equipment that processes contaminated fluids or gases? If answered "YES," complete Section 2 & 3.	☐	☐
b.	Did the modification involve areas where there is the potential for surface contamination? If answered "YES," complete Section 2 & 6.8.	☐	☐
c.	Did the modification involve a radiation area or a contaminated area that required occupancy for operation, maintenance or calibration? If answered "YES," complete Section 4.	☐	☐
d.	Did the modification involve design changes that could affect airflow? If answered "YES," complete Section 6.8.	☐	☐
e.	Did the modification involve areas having significant radiation fields or equipment emitting radiation? If answered "YES," complete Section 5.	☐	☐

ALARA Design Review Checklist
Part 1 - Design Review

Section 2 - External Contamination Concerns

		Sat	UnSat	N/A	Comment No.
2.1	**Contamination**				
2.1.1	Did the design help to reduce the spread of radiological contamination?	☐	☐	☐	_____
2.1.2	Can the surfaces of the items in the design be easily decontaminated?	☐	☐	☐	_____
2.1.3	Was the dose incurred when moving equipment to decontamination areas acceptable?	☐	☐	☐	_____
2.1.4	Did the decontamination methods anticipated or required by the design minimize the production of difficult to handle or mixed wastes?	☐	☐	☐	_____

ALARA Design Review Checklist
Part 1 - Design Review

Section 3 -Internal Contamination Concerns

		Sat	UnSat	N/A	Comment No.
3.1	**Minimize The Accumulation of Contamination**				
3.1.1	Were the number and size of potential crud traps minimized?	☐	☐	☐	____
3.1.2	Are internal surfaces smooth and corrosion resistant?	☐	☐	☐	____
3.1.3	Did the design provide flow that is turbulent; to help keep particles in suspension?	☐	☐	☐	____
3.2	**Ease the Removal of Contamination**				
3.21	Did the design facilitate decontamination?	☐	☐	☐	____
3.2.2	Did the design facilitate flushing and draining?	☐	☐	☐	____
3.2.3	Did the design facilitate remote crud removal?	☐	☐	☐	____
3.3	**Control the Spread of Internal Contamination**				
3.3.1	Are cross-ties between systems radiologically acceptable?	☐	☐	☐	____

ALARA Design Review Checklist
Part 1 - Design Review

Section 4 - Operability & Maintainability Concerns

		Sat	UnSat	N/A	Comment No.
4.1	**Minimize the Need for Operation & Maintenance in Radiological Areas**				
4.1.1	Were components selected to minimize the need for maintenance, calibration, and adjustment?	☐	☐	☐	_____
4.1.2	Is equipment sufficiently resistant to environmental damage?	☐	☐	☐	_____
4.1.3	Are components that require frequent attention or maintenance preferentially located in areas of low radiological significance?	☐	☐	☐	_____
4.1.4	Were maintenance instructions and other equipment information reviewed to identify operation or maintenance requirements that may be unacceptable in a radiologically significant area?	☐	☐	☐	_____
4.1.5	Does the design facilitate dose rate reduction during maintenance?	☐	☐	☐	_____
4.1.6	Is there adequate redundancy of components; along with appropriate isolation and bypass features?	☐	☐	☐	_____
4.1.7	Are operational sequences automated where possible?	☐	☐	☐	_____
4.1.8	Is remote viewing provided where appropriate?	☐	☐	☐	_____
4.2	**Facilitate Access for Maintenance**				
4.2.1	Were permanent ladders, stairways & galleries provided?	☐	☐	☐	_____
4.2.2	Were impediments to access minimized?	☐	☐	☐	_____
4.2.3	Were open frames used to support equipment instead of skids?	☐	☐	☐	_____

ALARA Design Review Checklist
Part 1 - Design Review

Section 4 - Operability & Maintainability Concerns

		Sat	UnSat	N/A	Comment No.
4.2.4	Are doorways and labyrinths large enough for personnel and equipment access?	☐	☐	☐	____
4.2.5	Do cover plates have captive quick-opening fasteners?	☐	☐	☐	____
4.2.6	Is there adequate space for in-place Maintenance?	☐	☐	☐	____
4.3	**Facilitate In-Service Inspection (ISI)**				
4.3.1	Are ISI points located in areas of low radiological significance?	☐	☐	☐	____
4.3.2	Are ISI points easily accessible?	☐	☐	☐	____
4.3.3	Are ISI points accessible from the required angles?	☐	☐	☐	____
4.4	**Facilitate Equipment Removal**				
4.4.1	Did the design facilitate removal of equipment to a lower dose rate area for maintenance?	☐	☐	☐	____
4.4.2	Are equipment removal paths adequate?	☐	☐	☐	____
4.4.3	Did the design facilitate rigging for equipment removal and later replacement?	☐	☐	☐	____
4.4.4	Was human lifting capacity considered?	☐	☐	☐	____
4.4.5	Are replaceable radioactive or contaminated items designed to allow remote replacement?	☐	☐	☐	____

ALARA Design Review Checklist

Part 1 - Design Review

Section 4 - Operability & Maintainability Concerns

		Sat	UnSat	N/A	Comment No.
4.5	**Special Tools for Maintenance**				
4.5.1	Were special tools and instruments provided to facilitate maintenance?	☐	☐	☐	______
4.5.2	Is storage space for special tools provided near the area of use?	☐	☐	☐	______
4.5.3	Was the use of robots considered?	☐	☐	☐	______

ALARA Design Review Checklist
Part 1 - Design Review

Section 5 - Radiation Shielding Concerns

		Sat	UnSat	N/A	Comment No.
5.1	**Permanent Radiation Shields**				
5.1.1	Was the use of permanent shielding, as opposed to temporary shielding evaluated?	☐	☐	☐	____
5.1.2	Does the shielding adequately reduce dose rates?	☐	☐	☐	____
5.1.3	Does the design allow for temporary shielding?	☐	☐	☐	____
5.1.4	Are hatches, plugs, and moving shields used preferential to removable walls?	☐	☐	☐	____
5.1.5	Is the design of removable block shield walls acceptable?	☐	☐	☐	____
5.1.6	Is local component shielding used where appropriate?	☐	☐	☐	____
5.1.7	Does skid-mounted equipment allow for installation of Shielding?		☐	☐	____
5.2	**Penetrations in Radiation Shields**				
5.2.1	Was the penetration of radiation shields avoided?	☐	☐	☐	____
5.2.2	Are shield penetrations properly designed and located?	☐	☐	☐	____
5.2.3	Is the annular penetration space appropriately filled with Shielding material?	☐	☐	☐	____
5.2.4	Is the effect of the penetration on HVAC control acceptable?	☐	☐	☐	____
5.2.5	Do penetrations through floors have raised sleeves, to keep materials from falling through?	☐	☐	☐	____
5.2.6	Are labyrinths adequately designed?	☐	☐	☐	____

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

Section 6 of the checklist considers issues specific to each of the "equipment" types listed below. Complete only those parts of Section 6 which are applicable to the modification (i.e., these "equipment" types to which YES is answered).

Did the modification add or modify any of the following types of "equipment"?

Section	YES	NO	Section	YES	NO
6.1 Coatings (being applied)	☐	☐	6.9 Instrumentation	☐	☐
6.2 Demineralizers	☐	☐	6.10 Thermal Insulation	☐	☐
6.3 Drainage Concerns	☐	☐	6.11 Pipes or Tubing	☐	☐
6.4 Electrical	☐	☐	6.12 Pumps	☐	☐
6.5 Evaporators	☐	☐	6.13 Sample Systems	☐	☐
6.6 Filters	☐	☐	6.14 Sumps	☐	☐
6.7 Heat Exchangers	☐	☐	6.15 Tanks	☐	☐
6.8 HVAC	☐	☐	6.16 Valves	☐	☐

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

		Sat	UnSat	N/A	Comment No.
6.1	**Coatings (Being Applied)**				
6.1.1	Were the base surfaces properly prepared to be smooth and inclusion-free?	☐	☐	☐	____
6.1.2	Are the coatings smooth and nonporous to ease decontamination?	☐	☐	☐	____
6.1.3	Do undercoatings have a contrasting color to provide an indication of surface coat wear?	☐	☐	☐	____
6.1.4	Are potentially contaminated surfaces coated where appropriate?	☐	☐	☐	____
6.2	**Demineralizers**				
6.2.1	Is resin handling controlled from a low dose rate and low contamination area?	☐	☐	☐	____
6.2.2	Is the resin transfer control system properly designed?	☐	☐	☐	____
6.2.3	Are resin control valves fully ported?	☐	☐	☐	____
6.2.4	Does the design accommodate remote viewing of sight glasses?	☐	☐	☐	____
6.2.5	Are there filters upstream and strainers downstream of the Demineralizers?	☐	☐	☐	____
6.2.6	Are the resin vessels designed so that they can be completely drained?	☐	☐	☐	____
6.2.7	Is the demineralizer vessel manway large enough to accommodate a worker in full protective clothing and a respirator?	☐	☐	☐	____
6.2.8	Is the exhaust from vessel vents properly controlled?	☐	☐	☐	____

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

		Sat	UnSat	N/A	Comment No.
6.3	**Drainage Concerns**				
6.3.1	Are curbs provided to keep water out of other areas in the event of the failure of a tank, pipe, or pump?	☐	☐	☐	____
6.3.2	Do floors continuously slope to drain points?	☐	☐	☐	____
6.3.3	Are measures taken to keep solids out of drain lines?	☐	☐	☐	____
6.3.4	Are floor trenches used in high solids areas where drain pipe plugging would be expected?	☐	☐	☐	____
6.3.5	Is the slope of drain lines sufficient to carry solids downstream?	☐	☐	☐	____
6.3.6	Does the design facilitate the clean-out of drain lines and associated traps?	☐	☐	☐	____
6.3.7	Have both exposed and buried lines been analyzed as potential radiation sources?	☐	☐	☐	____
6.3.8	Are nonradioactive drain lines isolated from those that are radioactive?	☐	☐	☐	____
6.3.9	Has the hazard of airborne contamination transfer through drain lines been addressed in the design?	☐	☐	☐	____
6.3.10	Dose the design eliminate direct connections between floor drain lines and potentially pressurized equipment?	☐	☐	☐	____
6.4	**Electrical Design**				
6.4.1	Are electrical connections, pull spaces, junction boxes, panels, motor control centers, switches, and other items requiring personnel access located in low dose rate and low contamination areas to the extent practical?	☐	☐	☐	____

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

		Sat	UnSat	N/A	Comment No.
6.4.2	Do cable runs avoid areas of high radiation or contamination?	☐	☐	☐	____
6.5	**Evaporators**				
6.5.1	Did the modification facilitate flushing and chemical cleaning?	☐	☐	☐	____
6.5.2	Are controls and readouts located in low dose rate and low contamination areas?	☐	☐	☐	____
6.5.3	Can frozen high solids lines be remotely cleared?	☐	☐	☐	____
6.6	**Filters**				
6.6.1	Does the design help to minimize the dose to workers during filter cartridge replacement?	☐	☐	☐	____
6.6.2	Does the design help to minimize the spread of contamination during filter cartridge replacement?	☐	☐	☐	____
6.6.3	Are the controls of precoat filter well designed?	☐	☐	☐	____
6.7	**Heat Exchangers**				
6.7.1	Does the design minimize internal crud accumulation?	☐	☐	☐	____
6.7.2	Dose the design facilitate tube inspection and maintenance?	☐	☐	☐	____
6.8	**HVAC**				
6.8.1	Are high-maintenance components located in low dose rate and low contamination areas?	☐	☐	☐	____
6.8.2	Is there adequate redundancy in the HVAC system?	☐	☐	☐	____

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

		Sat	UnSat	N/A	Comment No.
6.8.3	Is duct leakage properly controlled?	☐	☐	☐	____
6.8.4	Does the design keep airborne particulates suspended within the ducts?	☐	☐	☐	____
6.8.5	Are design features that increase the life of radiological filters included?	☐	☐	☐	____
6.8.6	Is supply air for potentially contaminate areas filtered?	☐	☐	☐	____
6.8.7	Does the design allow filter change-out with a minimal spread of contamination?	☐	☐	☐	____
6.8.8	Are filter change-out locations in low dose rate areas?	☐	☐	☐	____
6.8.9	Are areas with differing potentials for airborne contamination properly isolated?	☐	☐	☐	____
6.8.10	Is potentially contaminated air properly controlled?	☐	☐	☐	____
6.8.11	Is adequate local HVAC control provided where appropriate?	☐	☐	☐	____
6.8.12	Is the production of airborne contamination reduced at the source?	☐	☐	☐	____
6.8.13	Is the airflow sufficient to achieve the design concentrations?	☐	☐	☐	____
6.9	**Instrumentation**				
6.9.1	Are instruments (or at least their readouts and control points) located in low contamination and low dose rate areas?	☐	☐	☐	____
6.9.2	Has the amount of radioactive fluid contained in	☐	☐	☐	____

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

		Sat	UnSat	N/A	Comment No.
	instruments been minimized?				
6.9.3	Is the failure mode in the high direction with annunciation?	☐	☐	☐	____
6.9.4	Are an adequate number of ARMs, PRMs, and CAMs provided?	☐	☐	☐	____
6.9.5	Are ARMs located to provide good coverage of radiation fields?	☐	☐	☐	____
6.9.6	Are the background dose rates in the area of radiation monitors acceptable?	☐	☐	☐	____
6.9.7	Are the readouts of radiation instruments clear and unambiguous?	☐	☐	☐	____
6.9.8	Are radiation monitors provided with adequate local and remote readouts and alarms?	☐	☐	☐	____
6.10	**Insulation (Thermal)**				
6.10.1	Is the insulation resistant to contamination?	☐	☐	☐	____
6.10.2	Is the insulation easy to remove and replace?	☐	☐	☐	____
6.10.3	Is the insulation marked to show what is underneath?	☐	☐	☐	____
6.10.4	Is the insulation designed to facilitate anticipated removal?	☐	☐	☐	____
6.11	**Pipes or Tubing**				
6.11.1	Is there adequate access to welds requiring inspection?	☐	☐	☐	____
6.11.2	Is piping or tubing designed to minimize crud accumulation and plugging?	☐	☐	☐	____
6.11.3	Are the provisions for decontamination adequate?	☐	☐	☐	____

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

	Sat	UnSat	N/A	Comment No.
6.11.4 Is piping or tubing carrying radioactive fluids well routed?	☐	☐	☐	_____
6.11.5 Are the weld techniques used acceptable?	☐	☐	☐	_____
6.11.6 Are flanged connections provided where frequent disconnection (e.g., for equipment removal, etc.) is anticipated?	☐	☐	☐	_____
6.11.7 Does the design facilitate unplugging operations?	☐	☐	☐	_____

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

		Sat	UnSat	N/A	Comment No.
6.12	**Pumps**				
6.12.1	Does the design minimize the dose incurred during normal operation of pumps?	☐	☐	☐	____
6.12.2	Does the design minimize the need for maintenance?	☐	☐	☐	____
6.12.3	Does the design minimize the dose incurred during maintenance?	☐	☐	☐	____
6.13	**Sample Systems**				
6.13.1	Does sample line design minimize source buildup?	☐	☐	☐	____
6.13.2	Are sample hoods provided and properly designed?	☐	☐	☐	____
6.13.3	Is the sample waste properly routed to radwaste or back to its stream of origin?	☐	☐	☐	____
6.13.4	Are sample bombs designed to be quickly disconnected?	☐	☐	☐	____
6.14	**Sumps**				
6.14.1	Is there adequate local shielding for sumps?	☐	☐	☐	____
6.14.2	Are provisions for access into sumps adequate?	☐	☐	☐	____
6.14.3	Are screens provided around sump intakes?	☐	☐	☐	____
6.14.4	Are the sump contents agitated during draw-down?	☐	☐	☐	____
6.14.5	Does the design keep materials from being ejected from sumps?	☐	☐	☐	____
6.14.6	Is the sump lining acceptable?	☐	☐	☐	____
6.14.7	Is the HVAC control of sump airspace adequate?	☐	☐	☐	____
6.15	**Tanks**				

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

	Sat	UnSat	N/A	Comment No.
6.15.1 Was local shielding considered for tanks?	☐	☐	☐	____
6.15.2 Do tanks have adequate spare connections?	☐	☐	☐	____
6.15.3 Are tank hatches/manways properly designed?	☐	☐	☐	____
6.15.4 Are tank drain valves located away from the tank bottom?	☐	☐	☐	____
6.15.5 If a tank is open-topped, is this radiologically acceptable?	☐	☐	☐	____
6.15.6 Does tank design minimize sludge accumulation?	☐	☐	☐	____
6.15.7 In high solids situations, does the design address tank plugging problems?	☐	☐	☐	____
6.15.8 Does the design facilitate decontamination?	☐	☐	☐	____
6.15.9 Are tanks sized to accommodate a temporary loss of processing and provided with properly designed overflows?	☐	☐	☐	____
6.15.10 Is the exhaust from tank vents properly controlled?	☐	☐	☐	____
6.15.11 Are there adequate provisions to control overflow and accidental releases from outdoor tanks?	☐	☐	☐	____
6.15.12 Are tank overflow lines lower then the vent lines?	☐	☐	☐	____
6.15.13 Are tank overflow lines direct to an appropriate sump?	☐	☐	☐	____
6.15.14 Has consideration been given to the provision of lifelines to pull accidentally injured or unconscious workers from tanks.	☐	☐	☐	____

ALARA Design Review Checklist
Part 1 - Design Review

Section 6 - Equipment Types

		Sat	UnSat	N/A	Comment No.
6.16	**Valves**				
6.16.1	Are locally operated valves designed and located for ease of operation?	☐	☐	☐	_____
6.16.2	Are valves in high-solids systems sequenced so that flow does not stop between transfer and flushing operations?	☐	☐	☐	_____
6.16.3	Have valves and operators that are located in radiologically significant areas been selected for minimum maintenance requirements?	☐	☐	☐	_____
6.16.4	Are valves located and oriented for quick maintenance?	☐	☐	☐	_____
6.16.5	Are remote valve operators used where appropriate?	☐	☐	☐	_____
6.16.6	Does the design of valves minimize internal crud buildup?	☐	☐	☐	_____
6.16.7	Is valve leakage minimized and controlled?	☐	☐	☐	_____
6.16.8	Are valve galleries used to isolate valves from large radiation sources?	☐	☐	☐	_____
6.16.9	Are isolation valves located as near to shield wall penetrations as possible on the low dose rate side of the shield walls?	☐	☐	☐	_____
6.16.10	Are relief valves properly designed?	☐	☐	☐	_____
6.16.11	Are process valves given special attention?	☐	☐	☐	_____

ALARA Design Review Checklist
Part 1 - Design Review
Comment Sheet

Comment No.	Comment

ALARA Design Review Checklist
Part 2 - Design Review

		Sat	UnSat	N/A	Comment No.
1.0	**Dose Reduction Techniques** If the installation dose was greater than 1 person-rem, the following items should have been evaluated, as applicable:				
1.1	Temporary shields (lead blankets, etc.).	☐	☐	☐	______
1.2	Special plant conditions (shutdown, low power, etc.).	☐	☐	☐	______
1.3	Decontamination before installation (including sub-system chemical decontamination when appropriate).	☐	☐	☐	______
1.4	Training for control of hot particles.	☐	☐	☐	______
1.5	Was remote monitoring used?	☐	☐	☐	______
1.6	Special tooling (automatic, remote, long handle, etc.).	☐	☐	☐	______
1.7	Was Mockup training utilized?	☐	☐	☐	______
1.8	Was draining or filling of neighboring systems to reduce radiation sources considered?	☐	☐	☐	______
1.9	Was flushing (including hydrolasing) utilized?	☐	☐	☐	______
1.10	Did the design allow as much installation work as possible to be performed in low dose and/or clean areas?	☐	☐	☐	______
1.11	Were the parts and modules that were brought into the radiological work area of a size and weight that can be efficiently moved and handled?	☐	☐	☐	______

ALARA Design Review Checklist
Part 2 - Design Review

		Sat	UnSat	N/A	Comment No.
2.0	**Control of Contaminated Liquids** If there was a possibility of coming into contact with contaminated liquids, the following items should be evaluated, as applicable:				
2.1	Flushing and draining before installation?	☐	☐	☐	____
2.2	Glove bags and other containment means used?	☐	☐	☐	____
2.3	Good access to drains?	☐	☐	☐	____
2.4	Curbs (temporary or permanent) present?	☐	☐	☐	____
2.5	"Wet" vacuum cleaners used?	☐	☐	☐	____
3.0	**Control of Airborne Contamination:** If there was a possibility of coming into contact with airborne contamination, the following items should have been evaluated, as applicable:				
3.1	Glove bags and other containment means used?	☐	☐	☐	____
3.2	Local HVAC filtration used?	☐	☐	☐	____
3.3	Decontamination prior to installation?	☐	☐	☐	____

ALARA Design Review Checklist
Comment Sheet

Comment No. **Comment**

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-08, Rev. 0

Security

	Name	Signature	Date
Prepared by:	DAVID A SCHROEDER IAN WARNER	[signature] Ian Warner	4/7/97 4/7/97
Approved by:	A.A. NERI	[signature]	4-7-97

System	
Modification No.	
Verified by:	
Concurrence by:	

Security Review

Instructions

This checklist supplements PI- MP3-03 and shall be used to document the security review process for system modifications. Application and use of this checklist shall be as follows:

1. When the need for a security review is identified by the modification screening checklist (CK-MP3-03-02), the Verifier shall implement this check to verify that electrical system design aspects have been properly addressed in the modification.
2. The Verifier shall review each attribute listed in the checklist and shall determine whether the attribute has been properly addressed or is not applicable. The determination shall be documented by checking the appropriate column in the checklist.
3. For all "Yes" and "No" responses, the Verifier shall assign a sequential comment number and shall describe the basis for the response on the comment sheet included in this checklist. Comments may also be provide for "N/A" responses.
4. When all attributes have been reviewed, the Verifier shall sign and date the cover sheet
5. The Lead Verifier shall indicate his concurrence that the electrical system review has been completed by signing and dating the cover sheet.

The system designation and modification number shall be entered on all sheets of the completed checklist. Pages shall be sequentially numbered. It shall be acceptable to add insert pages numbered as 1A, 1B, 2A, etc.

Northeast Utilities
Millstone Unit 3

CK-MP3-03-08
System ________________
Modification No. __________
Sheet ______ of ______

Security Review

	Attribute	**Yes**	**No**	**N/A**	**Commen**
1.	Are alarms, cable protection and tamper protection properly addressed for new card readers?				
2.	The design meets the plant surveillance requirements for the isolation zones, protected areas, and camera coverage.				
3.	The design meets the plant protected and vital area barrier intrusion alarms requirements.				
4.	The design meets the plant protected area barrier requirements for fencing, shoreline, doors, manholes, air conditioning units, pipes, or other openings through/in barriers.				
5.	The design meets the plant vital island barrier requirements for exterior and interior structures and barriers.				
6.	The design meets the plant communication requirements.				
7.	The design meets other Security System requirements per the Plant Security Plan.				
8.	The design complies with NRC, Security, and other commitments.				
9.	The design has no impact on Security System Power Supplies.				
10.	The design has no impact on security lighting.				
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					

Northeast Utilities
Millstone Unit 3

CK-MP3-03-08
System ________________
Modification No. _________
Sheet ______ of _______

Security Review

Comment Form

Comment No.	Comment

______________________ Prepared by
______________________ Signature
____________ Date

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-09, Rev 0

Appendix R Compliance Review Checklist

	Name	Signature	Date
Prepared by:	C.M. LAUNI	C M Launi	4-7-97
Approved by:	A.A. NERI	A Neri	4-7-97

IMPLEMENTATION

System			
Modification No./ Description			
Verified by:		Date:	
Concurrence by:		Date:	

Sheet 1 of ___

Appendix R Compliance Review Checklist

Instructions

This checklist supplements the modification review process described in PI-MP3-03. Use of this checklist shall be as follows:

1. The Verifier(s) shall complete the Appendix R Compliance Review Checklist.

2. The Verifier shall perform a technical review of the modification package and any new or revised design process documents that resulted from the modification per PI-MP3-02 and any new or revised output documents that resulted from the modification when completing the Appendix R Compliance Review Checklist.

3. For each topic for which the applicability is determine to be affirmative, the verifier(s) shall enter a comment describing the impact of the modification on the topic, how the impact was resolved.

4. The Verifier shall generate a discrepancy report for any discrepancies identified during the review in accordance with Section 5.7 of PI-MP3-03.

5. When the review is completed, the Verifier(s) shall sign and date the cover sheet of the Appendix R Compliance Review Checklist and forward the completed checklist to the Lead Verifier.

Appendix R Compliance Review Checklist

		Yes	No	N/A	Comment No.
1.	**Appendix R Fire Protection Issues**				
1.1	Were any new potential paths of fire propagation or crossing of fire area boundaries created by the modification?	☐	☐	☐	_____
1.2	Have any changes been made that degrade required fire detection, control or protection systems installed to comply with Appendix R?	☐	☐	☐	_____
	a) Were any fire protection system changes made that could interact between Unit 3 and Units 1 (2) that could adversely affect the other units	☐	☐	☐	_____
	b) Did the modification affect any design parameter associated with a fire suppression or fire detection system?	☐	☐	☐	_____
	c) Were automatic fire suppression system operational obstructions impacted by the modification?	☐	☐	☐	_____
1.3	Did the modification exceed any combustible loading margin? (Does the increase in combustibles in any fire zone exceed a limit identified in a SER/SSER or Appendix R deviation or exemption?)	☐	☐	☐	_____
1.4	Did the modification permanently change any aspect of an Appendix R fire rated wall, floor, ceiling or fire rated enclosure?	☐	☐	☐	_____
	a) Were cable or cable tray wraps impacted by the modification?	☐	☐	☐	_____
	b) Were cable tray fire breaks impacted by the modification?	☐	☐	☐	_____
	c) Were fire barrier ratings impacted by the modification?	☐	☐	☐	_____
	d) Were new or exiting penetrations and/or fire seals impacted by the modification?	☐	☐	☐	_____

Appendix R Compliance Review Checklist

		Yes	No	N/A	Comment No.
	e) Was structural steel fire proofing impacted by the modification?	☐	☐	☐	____
	f) Was the fire rating of an existing barrier (rated or unrated) upgraded by the modification? (if, so all penetrations should have the same fire rating as the barrier.)	☐	☐	☐	____
	g) Did the modification involve an alteration to any of the existing fire barriers through the installation, removal, or modification of a penetration or penetration seal, such as:	☐	☐	☐	____
	i. fire doors	☐	☐	☐	____
	ii. pipe and HVAC ducts penetration seals	☐	☐	☐	____
	iii. fire dampers	☐	☐	☐	____
	iv. electrical penetration seals of trays, conduits, risers	☐	☐	☐	____
	v. access openings	☐	☐	☐	____
1.5	Were water removal features impacted by the modification?	☐	☐	☐	____
1.6	Were requirements for gas control features impacted by the modification?	☐	☐	☐	____
1.7	Did the modification affect an unrated barrier that was taken credit for in the FHA or SSA to limit the spread of fire or the effects of fire? (If so was an evaluation of the barrier's continued acceptability documented?)	☐	☐	☐	____

2. Safe Shutdown (SSD) Issues

2.1 Electrical Issues

		Yes	No	N/A	Comment No.
2.1.1	Were safety related circuits isolated and separated from non-safety related circuits?	☐	☐	☐	____
2.1.2	Was the diesel generator or battery loading checked?	☐	☐	☐	____

Appendix R Compliance Review Checklist

		Yes	No	N/A	Comment No.
2.1.3	Are there any electrical systems that could interact between Unit 3 and Units 1 (2) that could adversely effect the other Units?	☐	☐	☐	____
2.1.4	Did the modification add, remove, or reroute any cables or raceways associated with safe shutdown equipment?	☐	☐	☐	____
	a) Would operation of a hot or cold post-fire shutdown system be affected by a circuit fault?	☐	☐	☐	____
	b) Would potential fire induced circuit or cable faults introduce additional spurious operations of equipment (e.g., breakers or valves) adverse to safe shutdown and not previously analyzed?	☐	☐	☐	____
	c) Does the circuit share a common power source with post-fire safe shutdown equipment in a manner that degrades the availability of that equipment?	☐	☐	☐	____
	d) Does the circuit create a safe shutdown "common enclosure" problem? This occurs when one circuit or cable shares a common enclosure with both redundant safe shutdown trains. If the circuit does not have adequate electrical protection, or penetrates a fire barrier without an adequate fire seal installed, fire affecting the circuit and one safe shutdown train could also disable the redundant safe shutdown train.	☐	☐	☐	____
2.1.5	Did the modification alter any design parameter associated with a safe shutdown system?	☐	☐	☐	____
2.1.6	Did the modification remove or add a power or control feed to safe shutdown equipment? (SSD must be accomplished with or without offsite power. Removal of an offsite AC power feed to an SSD component might impact the SSD).	☐	☐	☐	____

Appendix R Compliance Review Checklist

		Yes	No	N/A	Comment No.
2.2	**SSD Systems, Equipment and Physical Separation Issues**				
2.2.1	Were Safe Shutdown (SSD) systems and components added or removed by the modification?	☐	☐	☐	____
2.2.2	Were effects of mechanical damage on commonly routed cables impacted by the modification?	☐	☐	☐	____
2.2.3	Were electrical and physical separation requirements for SSD items effected by the modification?	☐	☐	☐	____
2.2.4	Was the design bases of electrical and mechanical systems required for SSD impacted by the modification?	☐	☐	☐	____
2.2.5	Did the modification add or delete any motor operated valve which would divert or block an SSD system flow path?	☐	☐	☐	____
2.2.6	Did the modification change piping which would reduce system flow below that required by the SSD analysis?	☐	☐	☐	____
2.2.7	Did the modification remove or add a SSD component?	☐	☐	☐	____
2.2.8	Were any physical separation and electrical isolation commitments in the post-fire safe shutdown report violated by the modification?	☐	☐	☐	____
3.	**SSD Actions and Procedures**				
3.1	Were manual operation or repairs needed for safe shutdown equipment effect by the modification?	☐	☐	☐	____
	a) Are additional design features (e.g., isolation switch) or manual actions necessary for hot shutdown caused by the modification?	☐	☐	☐	____
	b) Were additional repair procedures or manual actions necessary for cold shutdown caused by the modification?	☐	☐	☐	____

Appendix R Compliance Review Checklist

		Yes	No	N/A	Comment No.
3.2	Was access to SSD paths or equipment impacted by the modification?	☐	☐	☐	____
3.3	Did the modification block access to, or egress from plant areas for post-fire safe shutdown equipment operation or fire fighting?	☐	☐	☐	____
3.4	Did the modification have an impact or emergency communication Systems?	☐	☐	☐	____
3.5	Did the modification have an impact on emergency lighting systems?	☐	☐	☐	____
4.	**Appendix R Documentation/Commitments**				
4.1	Were SER or exemption/deviation request commitments impacted by the design?	☐	☐	☐	____
4.2	Was a revision to the Fire Hazards Analysis (FHA), Safe Shutdown Analysis (SSA), or Fire Protection Report (FPR) needed due to the modification?	☐	☐	☐	____
4.3	If the modification added combustible materials, will they be located in areas identified as being free of intervening combustibles (e.g. Used to meet Appendix R safe shutdown circuit separation requirements)	☐	☐	☐	____
4.4	Did the modification affect any of the Appendix R commitments made by the safe shutdown analysis?	☐	☐	☐	____
4.5	Did the modification cause the plant to be outside the basis of an Appendix R Deviation or exemption? (deviations and exemptions commonly used are: low combustible loading, no combustible loading, no intervening combustibles, the existence of fire suppression or detection systems, and spatial separation in their bases)	☐	☐	☐	____

Appendix R Compliance Review Checklist
Comment Sheet

Comment No.	Comment

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-10, Rev. 0

Electrical Equipment Qualification Review Checklist

Prepared by:	J.L. TENWINKEL Name	[signature] Signature	4/7/97 Date
Approved by:	A.A. NERI Name	[signature] Signature	4/28/97 Date

IMPLEMENTATION

System			
Modification No. / Rev. No.			
Verified by:		Date:	
SRG Concurrence by:		Date:	

Sheet 1 of ___

Electrical Equipment Qualification Review

Instructions

This checklist shall be used for the design process document review process described in PI-MP3-02 and for the modification review process described in PI-MP3-03.

1. The Lead Verifier shall enter the System, and if applicable, the Modification Number/ Description, on the checklist cover sheet.

2. [If reviewing a modification, the Lead Verifier or Discipline Verifier shall first determine whether the modification includes the addition of electrical components subject to Equipment Qualification requirements. If no such components are being added by the modification, Attachments A through F are not applicable, and the Verifier shall complete Attachment G only. For all other modifications, and for the system review, Attachments A through F shall be completed (as applicable) as instructed below.] The Lead Verifier or Discipline Verifier shall determine which electrical components in the System or Modification are subject to environmental qualification, and shall list those components on Attachment A of this checklist. (Note that components which are identical or similar may be grouped on Attachment A, such that the environmental qualification review may cover a group of components. Grouping in this fashion should be based not only on component similarity, but also on the Millstone environmental qualification documentation.) All components listed on Attachment A shall be reviewed using, as a minimum, Attachment B of this checklist, entitled "Environmental Qualification Review of Class 1E Equipment." In addition, specific categories of electrical components shall also be reviewed using the specialized checklists in Attachment C, D, E, or F, as follows:

Component Category	Use Attachment B plus
Cable & Splices	C
Electrical Penetrations	D
Valve Actuators	E
AC Induction Motors	F

Attachment G shall be completed for all modifications.

Use of one of the additional checklists shall be indicated on Attachment A in the space provided. When Attachment A has been completed for the applicable System or Modification, print, sign, and date the bottom of Attachment A.

3. Based on Attachment A, the Lead Verifier or Discipline Verifiers shall complete Attachment B for all components and Attachments C, D, E, or F for specific categories of components, as required. The checklists shall be numbered sequentially within each category, i.e., Attachment B checklist numbered 1 through x, etc., with the last one identified as "Final." When filling out the Attachments, the following shall be observed:

   a. An answer shall be provided to each question, no questions are to be left blank.

   b. Not Applicable (N/A) shall only be used where an "N/A" blank is provided in the checklist.

   c. Whenever the answer to a question is "No", meaning that the seismic qualification aspect being reviewed is unsatisfactory, a Comment No. shall be entered in the right hand column of the checklist, and a comment shall be entered on the Comment Sheet, provided at the end of the Attachment. Comments shall be numbered sequentially within an individual attachment.

In addition, for each unsatisfactory response, the preparer shall initiate a Discrepancy Report (DR) in accordance with PI-MP3-11. The DR number shall be referenced in the comment.

d. When the Attachment has been completed, the preparer shall print, sign, and date at the end of the document in the space provided.

4. When all of the individual attachments have been completed for a System or Modification, they shall be assembled together with Attachment A and the main checklist CK-MP3-03-10 for the Lead Verifier to review. The Lead Verifier shall then print, sign and date the CK-MP3-03-10 cover sheet to signify that the Electrical Equipment Qualification Review has been completed for the applicable System or Modification.

Northeast Utilities
Millstone Unit 3

CK-MP3-03-16
System____________________________
Modification No.__________________
Sheet______ of ______

Attachment A
List of Electrical Components Subject to Environmental Qualification

Attachment B Checklist #	Special Attachment and Checklist #		Component No. (s)	Description

[Include additional sheets as necessary, sign and date final sheet of Attachment A only.]

Name	Signature	Date

CK-MP3-03-10
System________________________
Modification No.______________
Sheet______ of ______

Attachment B
Review of EQ for Class 1E Electrical Equipment

Spec No. and
Title: ____

Vendor: ____

Equipment Name/Description: ____

Equipment Model Number(s): ____

Qualification Report No., Title, Revision, and Date: ____________________

Qualification Report Status: ☐ Approved Vendor ☐ Not Approved by Vendor
Source for Environmental Conditions: ___________________________________

A. CONCLUSION OF REVIEW

☐ Accepted ☐ Rejected

Comments: ____
____

B. METHOD OF QUALIFICATION

☐ Type Testing ☐ Analysis ☐ Operating Experience
☐ Other: ____

C. INSTRUCTIONS

C1. Review all reports against Section B, D, and E and (depending on the qualification method shown in B) against the applicable Section(s) F, G, and/or H.

*C2. In the space provided for comments after each question,

(a) If the answer to the question is "yes", reference the report section where the information can be found.

(b) If the answer to the question is "no", indicate if the exclusion of information is acceptable or unacceptable and state the basis for the decision (attach justification, if necessary).

Attachment B
Review of EQ for Class 1E Electrical Equipment

(c) If the answer to the question is "not applicable", explain the basis for the decision.

C3. If a component-unique checklist is used for this review, Sections F through I of this checklist may not be required and Section D3 must identify the unique checklist.

C4. For equipment located in mild environments, use only the applicable sections of this checklist.

*The reviewer need not provide specific references for each question in order to satisfy (a), (b), and (c) requirements whenever, in his judgment, such information is not necessary.

D. REFERENCES

D1. IEEE 323 (1974) - "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations."

D2. NUREG-0588 (July 1981) - "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment."

D3. Other. Specify

____

	YES	NO	Comment #	N/A
E. EQUIPMENT DESCRIPTION				
E1. Has all the equipment in the report been identified by manufacturer and model number?	____	___	_____	_
E2. Is the equipment listed in the report identical to that being supplied under the specification?	____	___	_____	_
F. QUALIFICATION BY TYPE TESTING				
F1. Performance Requirements: Does the report outline the equipment and characteristics needed to judge performance [Refs. D1: Sec. 6.3.1.1(6) and D2: Sec. 2.2(7)?	____	___	_____	_
F2. Acceptance Criteria: Based on the identified performance measurements, does the report identify the limiting values of these measurements which would constitute failure [Refs. D1: 6.3.1.1(9) and D2: Sec. 2.2(1)]?	____	___	_____	_

Attachment B
Review of EQ for Class 1E Electrical Equipment

		YES	NO	Comment #	N/A
F3.	Test Sequence: Has the equipment been tested to the following required sequence: inspection of equipment for damage, performance measurements, aging (wear, thermal, radiation), DBA exposure, performance measurement, and inspection? (Refs. D1: Sec. 6.3.2 and D2: Sec. 2.3)				
F4.	Actual Type Testing: Use the following References: Aging, D1: Sec. 6.3.3 and D2: Sec. 4.0; Quantities, D1: Sec. 6.3.1.1(2); Mounting, D1: Sec. 6.3.1.2; Connections, D1: Sec. 6.3.1.3; DBA, D1: Sec. 6.3.2(6) and D2: Sec. 2.2.				
F4.1	Thermal Aging:				
F4.1.1	Does the report identify the number of samples of equipment to be thermally aged?				
F4.1.2	Does the report describe how the equipment is mounted during thermal aging?				
F4.1.3	Does the mounting description provided in the report reflect the installation design?				
F4.1.4	Does the report describe how equipment external connections are made during thermal aging?				
F4.1.5	Does the method of external connections reflect the installation design?				
F4.1.6	Have the accelerated aging parameters been identified (time and temperature)?				
F4.1.7	Have the equivalent real time ad temperatures been identified?				
F4.1.8	If an activation energy is used for determining accelerated parameters, is a reference provided identifying the source of the activation energy value?				
F4.1.9	If a regression line is used for determination of accelerated values, are the following provided?				
	a. Test points identified on the line				
	b. Failure mode used for determining the regression line				

Attachment B
Review of EQ for Class 1E Electrical Equipment

		YES	NO	Comment #	N/A
F4.1.10	Was the equipment operated during thermal aging?	____	___	______	__
F4.2	Radiation Aging:				
F4.2.1	Does the report identify the number of samples of equipment to be irradiated?	____	___	______	__
F4.2.2	Does the report describe how the equivalent will be mounted during radiation testing?	____	___	______	__
F4.2.3	does the mounting description provided in the report reflect the installation design?	____	___	______	__
F4.2.4	Does the report describe how external connections are made to the components during radiation testing?	____	___	______	__
F4.2.5	Does the method of external connections reflect the installation design?	____	___	______	__
F4.2.6	Does the report identify the test radiation source type?	____	___	______	__
F4.2.7	Is the exposure dose acceptable?	____	___	______	__
F4.3	Cyclic or Wear Aging:				
F4.3.1	Does the report identify the number of samples of equipment to be cycle aged?	____	___	______	__
F4.3.2	Does the report describe how the equipment will be mounted during cycle aging?	____	___	______	__
F4.3.3	Does the mounting description provided in the report reflect the installation design?	____	___	______	__
F4.3.4	Does the report describe how the external connections are made to the components during cycle aging?	____	___	______	__
F4.3.5	Does the method of external connections reflect the installation design?	____	___	______	__
F4.3.6	Has the cycle rate been defined?	____	___	______	__

Attachment B
Review of EQ for Class 1E Electrical Equipment

		YES	NO	Comment #	N/A
F4.4	Does the report address qualification to the normal operating conditions of ambient humidity and pressure (these items may be addressed through a LOCA or HELB test)?	____	___	______	_
F4.5	Does the report describe loads (or load combination) applied to the equipment during testing?	____	___	______	_
F4.6	Does the applied loads reflect normal operating conditions?	____	___	______	_
F4.7	Synergistic Effects: (Ref. D2: Sec. 4.3):				
F4.7.1	Does the report address synergistic effects?	____	___	______	_
F4.7.2	Does the report consider for the equipment any known synergistic effects that have a significant effect on equipment performance?	____	___	______	_
F4.8	DBA				
F4.8.1	Does the report identify the number of samples of equipment to be typed tested?	____	___	______	_
F4.8.2	Does the report describe how the equipment will be mounted during the DBA?	____	___	______	_
F4.8.3	Does the mounting description reflect the installation design?	____	___	______	_
F4.8.4	Does the report describe how external connections are made to the components during DBA testing?	____	___	______	_
F4.8.5	Does the method of external connections reflect the installation design?	____	___	______	_
F4.8.6	Does the electrical termination test configuration represent the electrical termination configuration per the applicable design documents in regard to:				
	a) type of termination (e.g., ECSA, taped splices, shrink tubing, terminal block, etc.)?	____	___	______	_
	b) the worst configuration, as allowed by the installation specification (e.g., location of the termination in the junction box, condulent, component, etc.), in regard to potential current leakage paths?	____	___	______	_

Attachment B
Review of EQ for Class 1E Electrical Equipment

		YES	NO	Comment #	N/A
F4.8.7	Was the equipment operated throughout its range of anticipated input power requirements? (E.g., voltage, current, power, frequency, pressure, etc.)	___	___	___	___
F4.8.8	Were performance measurements taken before/during/after DBA exposure?	___	___	___	___
F4.8.9	Does the report include qualification of equipment for the specified post-DBA time period? Post-DBA is considered to be the extended time period (e.g., time period out to 100 days or one year) following the exposure to elevated temperature and pressure.	___	___	___	___
F4.8.10	Was chemical spray and/or demineralized water spray introduced during LOCA exposure?	___	___	___	___
F4.9	<u>Seismic:</u> Were seismic tests performed on aged samples?	___	___	___	___
F4.10	<u>Anomalies:</u> Were any anomalies identified in the report? If yes, has the disposition of these anomalies been identified? Has the disposition been reviewed and are the results acceptable? (Outline in the Comment Section, if necessary, the basis for accepting or rejecting the disposition of the anomalies.)	___	___	___	___
F5.	<u>Service Conditions:</u>				
F5.1	Does the report identify values for the normal plant service conditions for which the equipment is qualified?	___	___	___	___
F5.2	Do these test values (in F5.1) outlined in the report envelope the specified requirements?	___	___	___	___
F5.3	Identify the type of DBA tested for in the report: ☐ LOCA ☐ HELB ☐ Combination LOCA/HELB ☐ Seismic ☐Other: (list in Comments Section)				
F5.4	Does the report identify values for the abnormal plant service conditions for which the equipment is qualified?	___	___	___	___

Attachment B
Review of EQ for Class 1E Electrical Equipment

		YES	NO	Comment #	N/A
F5.5	Do these test values (in F5.4) envelope the specified requirements?	___	___	______	__
F6.	Margin: For all service conditions, does the report address and identify the degree of applied margin? Refs. D1: Sec. 6.3.1.5 and D2: Sec. 3.	___	___	______	__
F7.	Submergence: Does the report qualify the equipment for long term submergence?	___	___	______	__
F8.	Environmental Variables: Does the report identify the environmental variables monitored to simulate the service conditions?	___	___	______	__
F9.	Test Equipment:				
F9.1	Does the report outline the test equipment (meters, volt meters, etc.) used during testing?	___	___	______	__
F9.2	Have test equipment accuracies and latest date of calibration been documented?	___	___	______	__
F10.	Test Results and Conclusions: Have the results of all type tests been identified? Has a conclusive statement been made regarding the equipment's qualified life?	___	___	______	__
F11.	Maintenance and Inspection: Do the maintenance and inspection requirements consist of nondestructive tests and realistic requirements for inspection?	___	___	______	__

G. OPERATING EXPERIENCE

Qualification by operating experience is judged solely upon adequate documentation being available (use references D1: Sec. 6.4.2 and D2: Sec. 2.4). Does the documentation clearly identify the following for the operating equipment upon which the qualification of new equipment is based?

		YES	NO	Comment #	N/A
G1.	Physical location of existing in their respective facilities.	___	___	______	__
G2.	Mounting arrangement of operating equipment.	___	___	______	__
G3.	Method of external connections to operating equipment.	___	___	______	__

Attachment P
Review of EQ for Class 1E Electrical Equipment

		YES	NO	Comment #	N/A
G4.	Performance characteristics of existing equipment as called for in their specification(s).	____	___	______	_
G5.	Records of failures and trends for operating equipment.	____	___	______	_
G6.	Log of periodic maintenance and inspections for operating equipment.	____	___	______	_
G7.	Record of operating environment.	____	___	______	_
G8.	Demonstration with margin that new equipment will be placed in an environment with physical boundaries less severe than operating environment.	____	___	______	_
G9.	Statement of qualified life which does not exceed the operational times of existing equipment.	____	___	______	_

H. ANALYSIS

Does the analysis include the following details? (Ref. D1: Sec. 6.5 and D2: Sec. 2.4).

H1. Mathematical Model:

		YES	NO	Comment #	N/A
H1.1	Description of mathematical model (a regression analysis is considered a mathematical model).	____	___	______	_
H1.2	Principles by which model was developed (e.g., standards, test data, operating experience).	____	___	______	_
H1.3	A description of the equipment performance requirements.	____	___	______	_
H1.4	A listing of the environmental variables which affect equipment performance.	____	___	______	_
H1.5	Justification for any environmental variable not listed in H1.4.	____	___	______	_
H1.6	Model identified such that equipment performance is a function of time and variables listed in H1.4.	____	___	______	_

H2. Extrapolation of the Model:

		YES	NO	Comment #	N/A
H2.1	Identification of postulated equipment failure modes.	____	___	______	_

Attachment B
Review of EQ for Class 1E Electrical Equipment

		YES	NO	Comment #	N/A
H2.2	The postulated failure modes for the equipment should be shown to be the same as those produced by the model.	___	___	___	___
H2.3	The extrapolation of the model out to the desired life must be justified by using:				
	(a) confidence bounds.	___	___	___	___
	(b) thermal testing of a component based on the aging rate of the regression line and to same failure criteria.	___	___	___	___
	(c) surveillance requirements.	___	___	___	___
	(d) Other: (List in Comment Section)	___	___	___	___
H3.	Determination of Qualified Life: Through the model it must be demonstrated that equipment performance exceeds requirements for an environment as severe as anticipated while in service.	___	___	___	___
H4.	Maintenance: A description of periodic maintenance and replacement requirements.	___	___	___	___

Attachment B
Review of EQ for Class 1E Electrical Equipment

Comment Sheet

Comment No.	Comment

(Attach additional sheets as necessary, sign and date last sheet only.)

Prepared by:

____________________	____________________	____________________
Name	Signature	Date

Attachment C
Review of EQ for Class 1E Electrical Cables and Splices

Checklist No. __________ Component No.(s) __________________

Specification Number: ______________ ______________

Qualification Report No.,
Title, Rev., & Date: ______________________________

A. REFERENCES

In addition to References D1 and D2 in Attachment B, the following documents were used as a basis for developing this qualification checklist:

A1. IEEE 383 (\(1974) - "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Station."

A2. ICEA S-68-516 (1984) - "ICEA/NEMA Standards Publication for Ethylene- Propylene-Rubber Insulated Wire and Cable."

A3. ICEAS-66-524 (1984) - "ICEA/NEMA Standards Publication for Cross-Linked Thermosetting Polyethylene Insulated Wire and Cable."

A4. AEIC CS6-82 - "Specifications for Ethylene-Propylene-Rubber Insulated Shielded Power Cables Rated 5 through 69kV," 4th Edition.

A5. AEIC CS5-82 - "Specifications for Thermoplastic and Cross-Linked Polyethylene Insulated Shielded Power Cables Rated 5 through 69 kV," 8th Edition.

A6. 1978 Annual Book of ASTM Standards, Parts 39 & 40 - Electrical Insulation.

A7. 1977 Annual Book of ASTM Standards - Copper and Copper Alloys.

A8. U.S. NRC Regulatory Guide 1.131 - "Qualification Tests of Electric Cables, Field Splices, and Connections for Light-Water-Cooled Nuclear Power Plants" (8/77).

Attachment C
Review of EQ for Class 1E Electrical Cables and Splices

		YES	NO	Comment #	N/A
B.	QUALIFICATION BY TYPE TESTING				
B1.	Identification. Does the report identify the following?				
B1.1	Conductor (Refs. A2, A3, and A6).				
	Material	___	___	___	___
	Size	___	___	___	___
	Stranding	___	___	___	___
	Coating	___	___	___	___
B1.2	Insulation (Refs. A2, A3, and A4).				
	Material	___	___	___	___
	Thickness	___	___	___	___
B1.3	Assembly (for multiconductors only) (Refs. A2 and A3). Number and arrangement of conductors.	___	___	___	___
B1.4	Shielding (Refs. A2 and A3).	___	___	___	___
B1.5	Jacket (Refs. A3 and A3).				
	Type	___	___	___	___
	Thickness	___	___	___	___
B1.6.1	Rated voltage/current	___	___	___	___
B1.6.2	Operating temperature rating (Refs. A4 and A5).				
	Normal	___	___	___	___
	Emergency	___	___	___	___
	Short-Circuit	___	___	___	___

Attachment C
Review of EQ for Class 1E Electrical Cables and Splices

		YES	NO	Comment #	N/A
B1.6.3	Instrumentation Cables (when applicable):				
	Capacitance	____	____	______	__
	Attenuation	____	____	______	__
	Characteristic Impedance	____	____	______	__
	Microphonics	____	____	______	__
	Insulation Resistance	____	____	______	__
B2.	Testing to Qualify for Normal Operation	____	____	______	__
B2.1	Does the report cover the temperature and moisture resistance?	____	____	______	__
B2.2	Long term thermal aging properties.	____	____	______	__
B2.2.1	Does the report identify the number of samples used for evaluating the long term thermal aging properties?	____	____	______	__
B2.2.2	Have the long term thermal aging parameters been identified (time(s) and temperature(s))?	____	____	______	__
B.2.2.3	Was the equipment operated during the collection of these parameters?	____	____	______	__
B2.2.4	have the equipment real time and temperature been identified?	____	____	______	__
B2.2.5	If an activation energy is used for determining acceleration parameters, is a reference provided identifying the source of the activation energy value?	____	____	______	__
B2.2.6	If a regression line is used for determining acceleration values, are the following provided?				
	a. Test points identified on the line?	____	____	______	__
	b. Failure mode used for determining the regression line?	____	____	______	__

Attachment C
Review of EQ for Class 1E Electrical Cables and Splices

		YES	NO	Comment #	N/A
B2.3	Thermal and radiation exposure.				
B2.3.1	Does the report identify the number of samples that received thermal and radiation aging?	___	___	_____	__
B2.3.2	Does the report identify the time and temperature used for thermal aging?	___	___	_____	__
B2.3.3	Was the equipment operated during the thermal aging?	___	___	_____	__
B2.3.4	Does the report identify the test radiation source type?	___	___	_____	__
B2.3.5	Is the exposure dose acceptable?	___	___	_____	__
B2.3.6	Does the report cover the post radiation withstand test (Ref. A1)?	___	___	_____	__
B2.4	Do the parameters in B.2. and B2.3 meet the specification requirements?	___	___	_____	__
B2.5	Synergistic effects				
B2.5.1	Does the report address synergistic effects?	___	___	_____	__
B2.5.2	Does the report consider for the equipment any known synergistic effects that have a significant effect on equipment performance?	___	___	_____	__

Attachment C
Review of EQ for Class 1E Electrical Cables and Splices

		YES	NO	Comment #	N/A
B3.	Service Conditions.	___	___	___	_
B3.1	Does the report identify values for the normal plant service conditions for which the equipment is qualified?	___	___	___	_
B3.2	Do these test values (in B3.1) envelop the specification requirements?	___	___	___	_
B4.	Testing for Operation During DBA.	___	___	___	_
B4.2	Identify the type of DBA tested for in the report. ☐ LOCA ☐ HELB ☐ Combination LOCA/HELB ☐ Seismic ☐ Other: (List in Comment Section)				
B4.3	Does the report identify values for the DBA testing conditions for which the equipment is qualified?	___	___	___	_
B4.3.1	Does the electrical termination test configuration represent the electrical termination configuration per the applicable design documents in regard to:				
	a) type of termination (e.g., ECSA, taped splices, shrink tubing, terminal block, etc.)?	___	___	___	_
	b) the worst configuration, as allowed by the installation specification (e.g., location of the termination in the junction box, condulet, component, etc.), in regard to potential current leakage paths?	___	___	___	_
B.4	Post LOCA simulation (Reg. A1).	___	___	___	_
B4.4.1	Voltage withstand test.	___	___	___	_
B4.4.2	Insulation resistance.	___	___	___	_
B4.5	Do the test parameters in B4.1 through B4.4 meet the specification requirements?	___	___	___	_
B4.6	Have the type tests been performed in accordance with the following sequence: Thermal, radiation aging, and DBA testing?	___	___	___	_

Attachment C
Review of EQ for Class 1E Electrical Cables and Splices

		YES	NO	Comment #	N/A
B5	Flame Tests (Ref. A1) Vertical Tray.				
B5.1	Does the report identify the following:				
B5.1.2	Evaluation.	___	___	___	___
B5.1.3	Test specimen data.				
	Cable description	___	___	___	___
	Flame source	___	___	___	___
	Exposure vertical length	___	___	___	___
	Test time in minutes	___	___	___	___
	Temperatures	___	___	___	___
	Flame height in inches	___	___	___	___
	Afterburn time	___	___	___	___
	Core damage	___	___	___	___
	Jacket char	___	___	___	___
	Propagation	___	___	___	___
B5.2	Do the test parameters in B5.1 meet the specification requirements?	___	___	___	___
B6.	Splices				
B6.1	Does the report include the following?				
B6.1.1	Factory type assembled to cable.	___	___	___	___
B.6.1.2	Field type assembled to cable.	___	___	___	___
B6.1.3	Production repairs to cable (if not included, repaired cables are not acceptable for use).	___	___	___	___

Attachment C
Review of EQ for Class 1E Electrical Cables and Splices

		YES	NO	Comment #	N/A
B6.1.4	Conductor connection.				
	Type	___	___	___	___
	Material	___	___	___	___
B6.1.5	Does the electrical termination test configuration represent the electrical termination configuration per the applicable design documents in regard to:				
	a) type of termination (e.g., ECSA, taped splices, shrink tubing, terminal block, etc.)?	___	___	___	___
	b) the worst configuration, as allowed by the installation specification (e.g., location of the termination in the junction box, condulet, component, etc.), in regard to potential current leakage paths?	___	___	___	___
B6.1.6	Insulation Material.				
	Tape:				
	Material	___	___	___	___
	Thickness	___	___	___	___
	Method of Application	___	___	___	___
	Heat Shrinkable:				
	Material	___	___	___	___
	Thickness	___	___	___	___
	Method of Application	___	___	___	___
B6.1.7	Voltage and temperature characteristics.				
B6.2	Were the splices included in the cable tests covered in B4 and B5?	___	___	___	___
B7.	**Margin**: For all service conditions, does the report address and identify the degree of applied margin?	___	___	___	___
B8.	**Test Equipment**: Does the report outline the test equipment used (meters, volt meters, etc.), accuracies and latest date of calibration?	___	___	___	___

Attachment D
Review of EQ for Class 1E Electrical Penetrations

	YES	NO	Comment #	N/A
B9. **Maintenance and Inspection**: Do the maintenance and inspection requirements consist of nondestructive tests and realistic requirements of inspection?	____	___	______	__

Attachment D
Review of EQ for Class 1E Electrical Penetrations

Comment Sheet

Comment No.	Comment

(Attach additional pages as necessary, sign and date last shet only.)

Prepared by:

____________	____________	____________
Name	Signature	Date

Attachment D
Review of EQ for Class 1E Electrical Penetrations

Checklist No. _________ Component No.(s) __________________

Specification Number: ____________________________

Qualification Report No.,
Title, Rev., & Date: ____

A. REFERENCES

In addition to References D1 and D2, the following documents were used as a basis for developing this qualification checklist:

A1. "IEEE 317 (1983) - IEEE Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations."

A2. U.S. NRC Regulatory Guide 1.63 - "Electric Penetration Assemblies in Containment Structures for Light Water Cooled Nuclear Plants" (Revision 2, July 1978)

A3. ANSI C96.1-1964 - "Temperature Measurement Thermocouple"

A4. ANSI K65.21-1965 - "Method of Test for Flammability of Self-Supporting Plastics" (ASTM D635-68).

A5. ANSI K65.12001971 - "Method of Test for Flammability of Flammable Plastics" (ASTM D568-69).

A6. ANSI N45.2.2-1972 - "Packaging, Shipping, Receiving Storage and Handling of Items for Nuclear Power Plants (During the Construction Phase)."

A7. IEEE 98 (1984) - "Guide for the Preparation of Test Procedures for the Thermal Evaluation and Establishment of Temperature Indexes of Solid Electrical Insulating Materials."

A8. IEEE 101 91972) - "Guide for the Structural Analysis of Thermal Life Test Data."

A9. IEEE 336 (1985) - "Installation, Inspection, and Testing Requirements for Instrumentation and Electric Equipment During the Construction of Nuclear Power Generating

Attachment D
Review of EQ for Class 1E Electrical Penetrations

		YES	NO	Comment #	N/A
A10.	IEEE 383 91974) - "Standard for type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations" (for pigtail and socket connections).				
A11.	IPCEA-S-19-81 (NEMA WC-3) - "Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy" 91984)				
A12.	ASME Boiler & Pressure Vessel Code, Section III, Subsection NE; 1974 Edition.				

B. QUALIFICATION BY TYPE TESTING

		YES	NO	Comment #	N/A
B1.	**Quantities**. Does the report identify the quantity of penetration assemblies or feedthroughs for each phase of type testing?	____	___	______	__
B2.	**Mounting.**				
B2.1	Does the report describe the mounting of the penetration assemblies during each phase of type testing?	____	___	______	__
B2.2	For each phase of type testing, does the mounting description provided in the report reflect the installation design?	____	___	______	__
B3.	**External Connections.**				
B3.1	Does the report describe how external connections are made to the penetration assemblies during each phase of type testing?	____	___	______	__
B3.2	For each phase of type testing, does the method of external connections reflect the installation design?	____	___	______	__
B3.3	Does the electrical termination test configuration represent the electrical termination configuration per the applicable design documents in regard to:				
	a) type of termination (e.g., ECSA, taped splices, shrink tubing, terminal block, etc.)?	____	___	______	__
	b) the worst configuration, as allowed by the installation specification (e.g., location of the termination in the junction box, condulet, component, etc.), in regard to potential current leakage paths?	____	___	______	__

Attachment D
Review of EQ for Class 1E Electrical Penetrations

		YES	NO	Comment #	N/A
B4.	**Performance Requirements**. Does the report consider and identify the following characteristics needed to judge performance?				
	Temperature Rating	___	___	___	___
	Voltage Rating	___	___	___	___
	Continuous Current Rating	___	___	___	___
	Short-Time Overload (STOL) Current Rating & Duration	___	___	___	___
	Rated Short Circuit Current and Duration	___	___	___	___
	Pressure Rating	___	___	___	___
	Maximum Gas Leakage Rate	___	___	___	___
	Maximum Duration of Rated Short Circuit Current	___	___	___	___
B5.	**Acceptance Criteria**. Based on the identified performance characteristics, does the report identify the limiting values of the measurements which would constitute failure/acceptance for the following tests?	___	___	___	___
B5.1	Insulation type tests.				
	Dielectric strength test (each medium voltage power conductor must be given an impulse withstand test)	___	___	___	___
	Insulation resistance test	___	___	___	___
	Partial-discharge (Corona) test (medium voltage power conductors only)	___	___	___	___
B5.2	Continuous current rating test.	___	___	___	___
B5.3	Short-time overload (STOL) current rating and duration test.	___	___	___	___
B5.4	Short circuit current rating and duration test.	___	___	___	___
B5.5	Rated maximum duration of rated short circuit current test.	___	___	___	___

Attachment D
Review of EQ for Class 1E Electrical Penetrations

		YES	NO	Comment #	N/A
B5.6	Pneumatic pressure rating test.	___	___	___	___
B5.7	Maximum gas leakage rate test.	___	___	___	___
B6.	**Type Tests**. Were the following performed?				
B6.1	Gas leak rate test (may be combined with pneumatic pressure test).	___	___	___	___
B6.2	Pneumatic pressure test (may be combined with gas leak test).	___	___	___	___
B6.3	Conductor continuity test.	___	___	___	___
B6.4	Dielectric strength test.	___	___	___	___
B6.5	Impulse test (for medium voltage power conductors only).	___	___	___	___
B6.6	Insulation resistance test.	___	___	___	___
B6.7	Partial-discharge (Corona) test (medium voltage power conductors only).	___	___	___	___
B6.8	Rated continuous current test.	___	___	___	___
B6.9	Cycling and aging tests.				
	Shipping and storage simulation	___	___	___	
	Installation welding test	___	___	___	___
	Thermal cycle test	___	___	___	___
	Thermal aging (simulation or normal service conditions)	___	___	___	___
	Radiation aging (normal service environment exposure)	___	___	___	___
B6.10	Acceptance tests.	___	___	___	___
	Gas leak rate test	___	___	___	___
	Dielectric resistance test	___	___	___	___
	Insulation resistance test	___	___	___	___
	Conductor continuity test	___	___	___	___
B6.11	Synergistic effects				

Attachment D
Review of EQ for Class 1E Electrical Penetrations

B6.11.1	Does the report address synergistic effects?	____	____	______	__
B6.11.2	Does the report consider for the equipment any known synergistic effects that have a significant effect on equipment performance?	____	____	______	__
B6.12	Rated short-time overload (STOL) current test.	____	____	______	__
B6.13	Short circuit current and duration test.	____	____	______	__
B6.14	Seismic testing.	____	____	______	__
B6.15	Rated continuous current test.	____	____	______	__
B6.16	Design Basis Event tests.	____	____	______	__
B6.17	Rated maximum duration of rated short circuit current test.	____	____	______	__
B6.18	A final gas leak rate test.	____	____	______	__
B6.19	Was the test sequence of B6.1 through B6.18 followed?	____	____	______	__
B7.	**Service Conditions.**				
B7.1	Does the report identify values for the normal and abnormal service conditions for which the penetration assemblies are qualified?	____	____	______	__
B7.2	Identify the type of DBA tested for in the report.				

☐ LOCA ☐ HELB

☐ Combination LOCA/HELB ☐ Seismic

☐ Other: (List in Comment Section)

B7.3	Do the service condition parameters (in B7.1) envelope the specification requirements?	____	____	______	__

Attachment D
Review of EQ for Class 1E Electrical Penetrations

		YES	NO	Comment #	N/A
B8.	**Material tests.**				
B8.1	Time and temperature aging.				
B8.1.1	Have the acceleration aging parameters been identified (times and temperatures)?	____	___	______	_
B8.1.2	Have the equivalent real time and temperatures been identified?	____	___	______	_
B8.1.3	If an activation energy is used for determining acceleration parameters, is the source of the activation energy value identified?	____	___	______	_
B8.1.4	If a regression line is used for determining acceleration values, are the following provided?				
	a. Test points identified on the line?	____	___	______	_
	b. Failure mode used for determining the regression line?	____	___	______	_
B8.2	Radiation				
B8.2.1	Does the report identify the test radiation source type?	____	___	______	_
B8.2.2	Is the exposure rate provided?	____	___	______	_
B8.3	Fire resistance.				
B8.3.1	Have the insulated conductors been qualified in accordance with Ref. A10?	____	___	______	_
B8.3.2	Have all other rigid and flexible nonmetallic materials been classified to be "nonburning" or "self-extinguishing" by this test, as defined by Reference A4 or Reference A5, as applicable, except that the samples have passed the testing?	____	___	______	_
B9.	**DBA Testing.**				
B9.1	Does the report identify values for the abnormal plant service conditions for which the equipment is qualified?	____	___	______	_
B9.2	Were the conditions shown in B9.1 present, concurrently, during DBA testing?	____	___	______	_

Attachment D
Review of EQ for Class 1E Electrical Penetrations

B9.3 Were insulation resistance for Class 1E conductors and pressure and temperature of the assembly monitored periodically during the DBA testing to verify specified performance? ____ ____ ____ ____

B9.4 Was the equipment exposed to the entire time frame of the accident as called for in the specification? ____ ____ ____ ____

AB9.5 Does the report include qualification of equipment for the specified post-DBA time period? ____ ____ ____ ____

B10. **Margin.**

B10.1 Were the following minimum test margins applied to the service conditions for which the electric penetration is qualified?

+5% of rated current values ____ ____ ____ ____

+10% of rated voltage values ____ ____ ____ ____

+8°C (+15°F) ____ ____ ____ ____

+10% of gauge pressure, but not more than $7x10^4$Pa ($10lbf/in^2$) ____ ____ ____ ____

+10% added to the acceleration of the response spectrum at the mounting point of the penetration assembly ____ ____ ____ ____

+10% radiation (on accident dose) ____ ____ ____ ____

B10.2 If the qualification testing were conducted under saturated steam conditions, was the temperature margin such that the test pressure did not exceed the saturated steam pressure (corresponding to peak service temperature) by more than $7x10^4$Pa ($10lbf/in^2$)? ____ ____ ____ ____

B11. **Environmental Variables**. Does the report identify the environmental variables monitored to simulate the specified service conditions? ____ ____ ____ ____

B12. **Test Equipment.**

B12.1 Does the report outline the test equipment (meters, voltmeters, etc.) used during testing? ____ ____ ____ ____

Attachment D
Review of EQ for Class 1E Electrical Penetrations

		YES	NO	Comment #	N/A
B12.2	Have test equipment accuracies and latest date of calibration been documented?	____	___	______	__
B13.	**Test Results and Conclusions**. Have the results of all type tests been identified? Has a conclusive statement been made regarding the penetration's qualified life?	____	___	______	__
B14.	**Maintenance and Inspection**. Do the maintenance and inspection requirements consist of nondestructive tests and realist requirements for inspection?	____	___	______	__

Attachment D
Review of EQ for Class 1E Electrical Penetrations

Comment Sheet

Comment No.	Comment

(Attach additional pages as necessary, sign and date last sheet only.)

Prepared by:

____________________	______________________________	____________
Name	Signature	Date

Attachment E
Review of EQ for Class 1E Electric Valve Actuators

Checklist No. __________ Component No.(s) ____________________

Specification Number: ______ _________________________

Qualification Report No.,
Title, Rev., & Date: ____

A. REFERENCES

In addition to References D1 and D2 in Attachment B, the following documents were used as a basis for developing this qualification checklist:

	YES	NO	Comment #	N/A
B. EQUIPMENT IDENTIFICATION				
B1. Does the qualification report identify the samples and the bases on which samples were selected to represent a generic actuator group?	____	____	______	__
B2. Is the equipment listed in the report identical to that is being supplied under the specification?	____	____	______	__
B3. Does the report include the document requirements specified in Ref. A1, Sec. 7.2 and 7.3?	____	____	______	__
C. QUALIFICATION BY ANALYSIS				
Does the analysis include the following details?	____	____	______	__
C1. Identification of Valve Actuators' performance requirements.	____	____	______	__
C2. A listing of qualified service conditions.	____	____	______	__
C3. Do the service conditions envelop the plant operating conditions?	____	____	______	__
C4. Do the mounting method and external connections of the Valve Actuator in the report simulate plant conditions?	____	____	______	__
C5. **Mathematical Model.**				
C5.1 Description of mathematical model (a regression analysis is considered a mathematical model).	____	____	______	__

Attachment E
Review of EQ for Class 1E Electric Valve Actuators

		YES	NO	Comment #	N/A
C5.2	Principles by which model was developed (e.g., standards, test data, operating experience).	____	____	______	__
C5.3	A listing of the environmental variables monitored which affect equipment performance.	____	____	______	__
C5.4	Justification for any environmental variable not listed in C5.3.	____	____	______	__
C5.5	Model identified such that equipment performance is a function of time and variables as listed in C5.3.	____	____	______	__
C6.	**Extrapolation of the Model.**				
C6.1	Identification of postulated equipment failure modes.	____	____	______	__
C6.2	The postulated failure modes for the equipment should be shown to be the same as those produced by the model.	____	____	______	__
C6.3	The extrapolation of the mode to the desired life must be justified by using:	____	____	______	__
	a. Confidence bounds.	____	____	______	__
	b. Thermal testing of a component based on the aging rate of the regression line and to same failure criteria.	____	____	______	__
	c. Through surveillance requirements.			______	__
	d. Other (List in Comment Section)	____	____	______	__
		____	____	______	__
C6.4	**Description of Analytical Methods**. A written explanation of how the model was selected to represent a generic actuator group and the parameters on which the selection was based.	____	____	______	__

Attachment E
Review of EQ for Class 1E Electric Valve Actuators

		YES	NO	Comment #	N/A
C7.	A comparison of the Valve Actuator to be qualified to the qualified generic Valve Actuator:	____	___	_______	__
C8.	**Determination of qualified life.** The model must demonstrate that the equipment performance exceeds requirements for an environment as severe as that anticipated in service.	____	___	_______	__
C9.	**Maintenance.** A description of periodic maintenance ad replacement requirements.	____	___	_______	__

Attachment E
Review of EQ for Class 1E Electric Valve Actuators

Comment Sheet

Comment No.	Comment

(Attach additional pages as necessary, sign and date last sheet only.)

Prepared by:

Name	Signature	Date

Attachment F
Review of EQ for Class 1E AC Induction Motors

Checklist No. _________ Component No.(s) ___________________

Specification Number: ______________________________

Qualification Report No.,
Title, Rev., & Date: ____

A. REFERENCES

In addition to References D1 and D2 in Attachment B, the following documents were used as a guide in developing this qualification checklist:

A1. IEEE 43-1974 - "Recommended Practice for Testing Insulation Resistance of Rotating Machinery."

A2. IEEE 56-1977 - "Guide for Insulation Maintenance for Large Alternating Current Rotating Machinery."

A3. IEEE 62-1978 - "Guide for Field Testing Power Apparatus Insulation."

A4. IEEE 98-1984 - "guide for the Preparation of Test Procedures for the Thermal Evaluation and Establishment of Temperature Indices of Solid Electrical Insulation Materials."

A5. IEEE 99-1980 - "Recommended Practice for the Preparation of Test procedures for the Thermal Evaluation of Insulation Systems for Electrical Equipment."

A6. IEEE 101-1972 - "guide for the Statistical Analysis of Thermal Life Test Data."

A7. IEEE 117-1974 - "Standard Test procedure for Evaluation of Systems of Insulating Materials for Random-Wound AC Electric Machinery."

A8. IEEE 275-181 - "Recommended Practice for Thermal Evaluation of Insulation Systems for AC Electric Machinery Employing Form-Wound Preinsulated Stator Coils (machine Rated 6900V and Below."

Attachment F
Review of EQ for Class 1E AC Induction Motors

	YES	NO	Comment #	N/A
A9. IEEE 334-1974 - "Standard for Type Tests of Continuous Duty Class 1E Motors for Nuclear Power Generating Standards."				
A10. IEEE 429-1972 - "Standard Test Procedure for the Evaluation of Sealed insulation Systems for AC Electric Machinery Employing Form-Wound Stator Coils."				
A11. NEMA MG-1-1978 - "ANSI/NEMA Standards Publication, Motors and Generators."				
B. QUALIFICATION BY TYPE TESTING				
B1. Identification. Does the qualification report identify the following?				
B1.1 Coil Construction (check one)	____	____	____	____
B1.2 Insulation Class (Ref. A11)	____	____	____	____
For B1.3 through B1.7, indicate type and material	____	____	____	____
B1.3 Temperature Values (Ref. A11)				
Ambient Temperature	____	____	____	____
Temperature rise by resistance	____	____	____	____
B1.4 Lubricant				
Manufacturer	____	____	____	____
Type	____	____	____	____

Attachment F
Review of EQ for Class 1E AC Induction Motors

		YES	NO	Comment #	N/A
B1.5	Bearings				
	Type	____	___	______	__
	Bearing Life	____	___	______	__
B1.6	Seals	____	___	______	__
B1.7	Auxiliary Devices				
	Space Heaters	____	___	______	__
	Stator Resistance Temperature Detectors	____	___	______	__
	Bearing Thermocouples	____	___	______	__
	Insulated Lugs	____	___	______	__
	Stator Lead Cables	____	___	______	__
	Other	____	___	______	__
B2.	Regression Analysis				
B2.1	**Motorette Construction:** Is the description or reference in accordance with one of the following:				
	Random Wound (Sec. 2.1, IEEE 429)	____	___	______	__
	Form Wound (Section 2.1, IEEE 429)	____	___	______	__
B2.2	**Quantities of Motorettes and Test Temperatures**				
	Were at least 3 test temperatures used?	____	___	______	__
	(If "No," justify acceptance in "Comments.")				
	Were at least 10 motorettes per temperature used?	____	___	______	__
	(If "No," justify acceptance in "Comments.")				

Attachment F
Review of EQ for Class 1E AC Induction Motors

		YES	NO	Comment #	N/A
B2.3	**Motor Insulation System**				
B2.3.1	**Motor Insulation:** Does the report state that the insulation on the motorettes is the same as the insulation used on actual motors?	____	___	______	_
B2.3.2	**Motor Lead Insulation**: Does the report state that the insulation on the motorettes is the same as the insulation used on actual motors?	____	___	______	_
	(If no, justify acceptance:)				
B2.4	**Test Cycle and Voltage Checks**: Are the test cycle and voltage checks as described or referenced in accordance wit one of the following:				
	Random-Wound (Test Cycle, Sec. 2.2, IEEE 117) (Voltage Checks, Sec. 2.3, IEEE 117)	____	___	______	_
	Form-Wound (Test Cycle, Sec. 2.2, IEEE 429) (Voltage Checks, Sec. 2.3, IEEE 429) (Test Cycle, Part 2, Sec. 2, IEEE 275) (Voltage Checks Part 2, Sec. 3, IEEE 275)	____	___	______	_
B3.	**Qualification of Equipment**				
	☐ Inside Containment ☐ Outside Containment				
B3.1	**Temperature**: Is the qualified life statement based on the total temperature (winding temperature rise plus ambient) rating of the insulation class? (If yes, motor is qualified for continuous operation at the qualified life value.)	____	___	______	_
B3.2	**Time and Temperature Aging**				
B3.2.1	Have the accelerated aging parameters been defined?	____	___	______	_
B3.2.3	Are the aging parameters based on regression analysis?	____	___	______	_

Attachment F
Review of EQ for Class 1E AC Induction Motors

		YES	NO	Comment #	N/A
B3.3	**Radiation**				
B3.3.1	Analysis				
	Were the components of the insulating system analyzed individually?	____	____	________	__
	Are references provided as to the source of the input data used in the analysis?	____	____	________	__
	Is the statement of radiation qualification based on the weak link material analysis?	____	____	________	__
B3.3.2	**Type testing During Regression Development**				
	Were all motorettes at each test temperature used?	____	____	________	__
	Is the radiation source identified?	____	____	________	__
	Is the total integrated dose identified?	____	____	________	__
B.3.3.3	**Type Testing of New Motorettes and/or Motors**				
	Is the radiation source identified?	____	____	________	__
	Is the total integrated dose identified?	____	____	________	__
	Was an AC high potential test performed at the end of radiation testing?	____	____	________	__
B3.4	**Humidity**: Does the report identify level of humidity?	____	____	________	__
B3.5	**Vibration**: Does the report identify level of vibration?	____	____	________	__
B3.6	**Seismic**				
B3.6.1	Has the vendor submitted a seismic report for the motor?	____	____	________	__
B3.6.2	Does the report address the effects of aging on seismic qualification?	____	____	________	__
B3.6.3	Does the report address synergistic effects?	____	____	________	__
B3.6.4	Does the report consider for the equipment any known synergistic effects that have a significant effect on equipment performance?	____	____	________	__

Attachment F
Review of EQ for Class 1E AC Induction Motors

		YES	NO	Comment #	N/A
B3.7	**Lubricant**				
	Was the lubricant included in a radiation test or analysis?				
	Was the lubricant included in a thermal aging test or analysis?				
B3.8	**Bearings:** Has the vendor provided the rating in accordance with the Anti-Friction Bearing Manufacturing Association Standards 9-1978 and 11-1978?	____	____	______	__
B3.9	**Seals**				
	Were the seals included in a radiation test or analysis?	____	____	______	__
	Were the seals included in a thermal aging test or analysis:	____	____	______	__
B3.10	**Auxiliary Devices**				
B3.10.1	Are the auxiliary devices identified in Sec. B1.7 of this checklist defined as safety-related or non-safety-related? (If safety-related, define appropriate guidelines/checklist, which determines adequacy of qualification.)	____	____	______	__
B3.10.2	If non-safety-related, has the vendor included an FMEA analyzing the effects of an open, short ground on the auxiliary device?	____	____	______	__
B3.11	**Environmental Variables:** Does the report either identify a file reference or provide information for environmental variables?	____	____	______	__
B3.12	**Test Samples:** For the motor to be typed tested, has the following information been provided?				
B3.12.1	Type	____	____	______	__
B3.12.2	Frame Size	____	____	______	__
B3.12.3	Bearing and Lubrication System	____	____	______	__
B3.12.4	Insulation System Classification	____	____	______	__
B3.12.5	Total Temperature Rise (°C) by Resistance	____	____	______	__

Attachment F
Review of EQ for Class 1E AC Induction Motors

		YES	NO	Comment #	N/A
B3.12.6	Voltage Rating				
B3.13	**Performance Requirements**				
	Does the report identify the variables that will be monitored during testing to judge performance?	___	___	_____	__
B3.14	**Acceptance Criteria**				
	Based on the variables to be monitored, have acceptance criteria been defined?	___	___	_____	__
B3.15	**Design Basis Event**				
B3.15.1	Was the motor operated during the DBA?	___	___	_____	__
B3.15.2	Were the voltage and frequency varied?	___	___	_____	__
B3.15.3	Were performance measurements taken before, during, and after the DBA?	___	___	_____	__
B3.15.4	Was chemical spray introduced?	___	___	_____	__
B3.15.5	Is the spray rate defined?	___	___	_____	__
B3.15.6	Is the pH of the spray defined?	___	___	_____	__
B3.15.7	Does the temperature/pressure profile envelope the plant profile?	___	___	_____	__
B3.15.8	Was the equipment exposed to the entire frame of the accident as called for in the specification?	___	___	_____	__
B3.15.9	Was the exposure at least 1 hour beyond the equipments' required operability during a DBA?	___	___	_____	__

Attachment F
Review of EQ for Class 1E AC Induction Motors

		YES	NO	Comment #	N/A
B3.15.10	Does the electrical termination test configuration represent the electrical termination configuration per the applicable design documents in regard to:				
	a) type of termination (e.g., ECSA, taped splices, shrink tubing, terminal block, etc.)?	____	___	______	_
	b) the worst configuration, as allowed by the installation specification (e.g., location of the termination in the junction box, condulet, component, etc.) in regard to potential current leakage paths?	____	___	______	_
B4.	**Test Equipment**				
B4.1	Does the report identify the test equipment used during the testing?	____	___	______	_
B4.2	Have the test equipment accuracies and latest date of calibration been documented?	____	___	______	_
B5.	**Test Results and Conclusion**				
	Does the report include the tabulated results of the performance measurements?	____	___	______	_
B6.	**Maintenance and Inspection**				
	Have the maintenance and inspection requirements been defined to ensure qualified life?	____	___	______	_

Attachment F
Review of EQ for Class 1E AC Induction Motors

Comment Sheet

Comment No.	Comment

(Attach additional pages as necessary, sign and date last sheet only.)

Prepared by:

____________________	________________________________	_____________
Name	Signature	Date

Attachment G
Review of Modification for Impact on EQ for Existing Electrical Components

Identify potential impact of the modification on equipment qualification of existing electrical components as a result of the modification changing any of the following:

- Normal pressure, temperature, humidity or radiation dose/exposure
- Abnormal (accident) pressure, temperature, humidity or radiation dose/exposure

Discuss the specific impact, dilineate how the modification addressed it, and indicate whether it was adequately addressed, and why it is adequate. If it is determined that the impact was not adequatcly addressed, initiate a Discrepancy Report (DR) per PI-MP3-11, and include reference to the DR number in this Attachment G. (Use the continuation page as necessary.)

The effects of the modification on EQ of existing electrical components were adequately addressed.

__________ Yes   __________ No

______________________________________ Prepared by   __________ Date

Attachment G
Review of Modification for Impact on EQ for Existing Electrical Components

(Continuation Page)

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-11, Rev. 1

Seismic Qualification Checklist

Prepared by:	J. L. Tenwinkel	[signature]	4/28/97
	Name	Signature	Date
Approved by:	A. A. Neri	[signature]	4/28/97
	Name	Signature	Date

IMPLEMENTATION

System			
Modification No./Description			
Verified by:		Date:	
Concurrence by:		Date:	

Sheet 1 of ___

(CK-MP3-03-11, Rev. 0)
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Seismic Qualification Review Checklist

Instructions

This checklist shall be used for the design process document review process described in PI-MP3-02 and for the modification review process described in PI-MP3-03.

1. The Lead Verifier shall enter the System and, if applicable, the Modification Number/Description on the checklist cover sheet.

2. If reviewing a modification, the Lead Verifier or Discipline Verifier shall first determine whether the modification includes the addition of comonents subject to seismic qualification. If no such new compnents are being added by the modification, Attachment A and B of the checklist are not applicable, and the Verifier shall complete Attachmetn C only. For all other modifications, and for the system review, Attachments A and B shall be completed as instructed herin. The Lead Verifier or Discipline Verifiers shall determine which components in the System or Modification are subject to seismic qualification and list those components on Attachment A of this checklist. Note that components which are identical or similar may be grouped on Attachment A such that only one Component Seismic Qualification Review Checklist (CSQRC) is prepared for that group of components. Grouping in this fashion should be based not only on component similarity, but also on the Millstone seismic qualification documentation. When Attachment A has been completed for the applicable System or Modification, print, sign, and date the bottom of Attachment A.

3. Based on Attachment A, the Lead Verifier or Discipline Verifiers shall complete a CSQRC - see Attachment B of this checklist - for each component or group of components listed in Attachment A. Each CSQRC shall be numbered sequentially for the System or Modification as delineated in Attachment A. If it becomes necessary to revise the numbering sequence, Attachment A shall be updated to agree. In completing Attachment B, the following shall be observed:

   a. An answer shall be provided to each question; no questions are to be left blank.

   b. Not Applicable (N/A) shall only be used where an "N/A" blank is provided in the checklist.

   c. Whenever the answer to a question is "No," meaning that the seismic qualification aspect being reviewed is unsatisfactory, a Comment No. shall be entered in the right hand column of the checklist, and a comment shall be entered on the checklist provided at the end of Attachment B. Comments shall be numbered sequentially within an individual CSQRC. In addition, for each unsatisfactory response, the Preparer shall initiate a Discrepancy Report (DR) in accordance with PI-MP3-11. The DR number shall be referenced in the comment in Attachment B.

d. When the Attachment B CSQRC has been completed, the Preparer shall print, sign, and date at the end of the document in the space provided.

4. When all of the individual CSQRCs have been completed for a System or Modification, they shall be assembled together with Attachment A and the main checklist for the Lead Verifier to review. The Lead Verifier shall then print, sign, and date the CK-MP3-03-11 cover sheet to signify that the seismic qualification review has been completed for the applicable System or Modification.

Attachment A
List of Components Subject to Seismic Qualification

Attachment B Checklist No.	Component No.(s)	Description

(Include additional sheets as necessary. Sign and date final sheet only.)

Prepared by:

Name	Signature	Date

Attachment B
Component Seismic Qualification Review Checklist

Checklist No. ______________________ Component No.(s) __________ __________

A. COMPONENT IDENTIFICATION

Spec.: ________________________ Vendor: ____________________________

Description: ____

Manufacturer/Model No.: ____

B. DOCUMENT AND SOURCE IDENTIFICATION (Identify document no. and rev. or date)

B1. Qualification Report: ____

B2. Postulated Dynamic Loads: ____

B3. Classification: ____

B4. Mounting Details: ____

B5. Other: ____

C. CONCLUSION OF REVIEW:

_______ Accepted _______ Rejected

Comments: ____

____

D. REFERENCES:

Attachment B
Seismic Qualification Review Checklist

D1. IEEE-344-1975 "IEEE Recommended Practices for Seismic Qualification of Class IE Equipment for Nuclear Power Generating Stations"

D2. NRC Regulatory Guide 1.61 "Damping Values for Seismic Design of Nuclear Power Plants"

D3. NRC Regulatory Guide 1.92 "Combining Modal Responses and Spatial Components in Seismic Response Analysis"

D4. NRC Regulatory Guide 1.100 "Seismic Qualification of Electric Equipment for Nuclear Power Plants"

E. CLASSIFICATION AND FUNCTION

E1. Classification

______ Nuclear Safety-Related Active: Component must operate and/or remain functional:

______ during and after postulated dynamic events

______ only after postulated dynamic events

______ Nuclear Safety-Related Passive: The structural integrity and/or pressure integrity of the component must be demonstrated during and after postulated dynamic events. Operability is not required.

______ Non-Safety-Related Seismic: Component has no safety-related function but must remain intact during and after postulated dynamic events.

E2. The component's safety-related function(s) is: ______________________________

____

F. LOCATION AND MOUNTING

F1. Location

Building: __________________________________

Elevation: __________________________________

F2. Field Mounting Condition

______ ______________________________

Attachment B
Seismic Qualification Review Checklist

_____ Panel/pipe/HVAC duct: ______________________________

_____ Wall/floor: ______________________________

_____ Other: ______________________________

F3. Field Mounting Method

_____ Expansion anchor bolts

_____ Embedded anchor bolts

_____ Welding

_____ Other: ______________________________

G. REQUIRED VIBRATORY INPUT

G1. Postulated Dynamic Loads to be Considered

_____ Seismic

_____ Seismic and hydrodynamic

_____ Other: ______________________________

G2. Frequency range associated with postulated loads: ______________________________

G3. Postulated dynamic loads defined as:

_____ Response Spectra

a. Method of combining required response spectra:

_____ Not applicable, only seismic loads postulated.

Absolute sum

Attachment B
Seismic Qualification Review Checklist

_____

_____ SRSS

b. Damping:

Upset/Service Level B ______________________________

Emergency/Service Level C Faulted/Service Level D ______________________________

c. Basis for damping: ______________________________

Seismic Coefficients (Required acceleration in each direction)

______

a. Upset/Service Level B:	H_1________	H_2________	V________
b. Emergency/Service Level C Faulted/Service Level D	H_1________	H_2________	V________

	YES	NO	COMMENT NUMBER	N/A
G4. Are these dynamic loads defined at equipment mounting?	___	___	___________	___

H. METHOD OF QUALIFICATION

_____ Static Analysis _____ Test

_____ Dynamic Analysis

_____ Other: ____________________

Is the qualification method used capable of adequately demonstrating the component's ability to perform its safety function?	___	___	___________	___

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
I. QUALIFICATION BY TESTING				
I1. Does the qualification report identify the component tested and is this component identical to the component being installed?	____	____	____________	
If no, has similarity been adequately demonstrated?	____	____	____________	
I2. Mounting				
Does the qualification report identify the test mounting and does the test mounting simulate the actual service mounting in regard to:				
a. Mounting method (bolt or weld)	____	____	____________	
b. Bolt torque requirements or anti-loosening requirements?	____	____	____________	____
c. Mounting orientation?	____	____	____________	
I3. Interfacing Connections and Structures				
Does the qualification report adequately address the effect of the following interfaces:				
a. Piping?	____	____	____________	____
b. Electrical conduit?	____	____	____________	____
c. Instrumentation tubing?	____	____	____________	____
14. Test Input Motion				

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
______ Single Axis; does the qualification report adequately account for cross-coupling effects in accordance with IEEE-344-1975, Section 6.6.6?				
______ Component is rigid, no possibility of cross-coupling.	____	____	____________	
______ Dependent (pseudo) biaxial				
______ Independent biaxial				
______ Independent triaxial				
I5. Are the number of test orientations in accordance with IEEE-344-1975, Section 6.6.6?	____	____	____________	
I6. Test Input Waveform				
______ Sine Dwell (Single Frequency)				
a. Does the qualification report adequately account for multimode excitation in accordance with IEEE-344-1975, Section 6.6.2?	____	____	____________	
_____ Component is rigid, no possibility of multimode excitation.				
b. Is the sinusoidal input motion applied at:				

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
1. Frequencies spaced no further than ½ octave intervals.	____	____	____________	
2. Each equipment's natural frequency?	____	____	____________	____
c. Is the test duration in accordance with IEEE-344-1975, Section 6.6.5 (equivalent to five OBEs and one SSE where the duration of each event is equivalent to the duration of the strong motion portion of the SSE?)	____	____	____________	
d. Is the peak amplitude of the input greater than or equal to the ZPA of the RRS?	____	____	____________	
_____ Sine Beat (Single Frequency)				
a. Does the qualification report adequately account for multimode excitation in accordance with IEEE-344-1975, Section 6.6.2?	____	____	____________	
_____ Component is rigid, no possibility of multimode excitation.				

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
b. Are the sine beats applied at:				
1. Frequencies spaced no further than ½ octave intervals.	____	____	____________	
2. Each equipment's natural frequency?	____	____	____________	____
c. Is there a sufficient pause between application of beats (at any one frequency) to avoid superposition of equipment response motion?	____	____	____________	
d. Is the test duration in accordance with IEEE-344-1975, Section 6.6.5 (equivalent to five OBEs and one SSE where the duration of each event is equivalent to the duration of the strong motion portion of the SSE)?	____	____	____________	
e. Is the peak amplitude of the input greater than or equal to the ZPA of the RRS?	____	____	____________	

_____ Random Motion (Mutilfrequency)

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
a. Is the input motion controlled using ♋ octave or narrower bandwidth filters?	___	___	__________	
b. Is the amplitude of the input controlled such that:				
1. The peak amplitude of the input is greater than or equal to the ZPA of the RRS.	___	___	__________	
2. The TRS envelopes the RRS?	___	___	__________	
c. Is the duration of the test input in accordance with IEEE-344-1975, Section 6.6.5 (equivalent to five OBEs and one SEE where the duration of each event is equivalent to the duration of the strong motion portion of the SSE but is not less than 15 second)?	___	___	__________	

17. <u>Dynamic Characteristics</u>

_____ Natural frequencies not determined.

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
______				
______ Natural frequencies:				
H_1 ______________				
H_2 ______________				
V ______________				
These frequencies were determined via:				
____ Sine Sweep, frequency range ____				
input acceleration ____				
sweep rate ____				
____ Other: __________				
I8. Normal Operating Conditions				
Does the qualification report adequately address the following normal operating loads:				
Electrical Loads?	____	____	____________	____
Mechanical Loads?	____	____	____________	____
Thermal Loads?	____	____	____________	____
Pressure?	____	____	____________	____
Operating vibration? (rotating equipment)	____	____	____________	____

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
I9. Monitoring				
a. Was the monitoring of the component adequate to evaluate its performance?	____	____	____________	
b. Was the operability of the component verified?	____	____	____________	____
c. Did the component's performance satisfy functional requirements?	____	____	____________	
I10 Disposition of Test Anomalies				
Have all test anomalies been adequately dispositioned?	____	____	____________	____

J. QUALIFICATION BY ANALYSIS

J1. Type of Analysis

______ Static Analysis

______ Simplified Dynamic Analysis

______ Response Spectrum Analysis

______ Time History Analysis

______ Other: ____________

J2. Analytical Model

_____ Finite Element

_____ Other: ____________

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
J3. Method of Analysis				
______ Computer-Aided Calculation				
a. Programs used: ______________________ ____________________________				
b. Is there evidence that the programs used have been validated? ______ Yes _______ No				
______ Hand Calculation				
J4. Operating Loads				
Does the qualification report adequately address the following normal operating loads?				
a. Piping nozzle reactions?	___	___	___________	___
b. Electrical conduit reactions?	___	___	___________	___
c. Pressure?	___	___	___________	___
d. Thermal expansion?	___	___	___________	___
e. Startup torque for rotating equipment?	___	___	___________	___
J5. Static/Simplified Dynamic Analysis				

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
a. Is the analysis method used justified in accordance with the guidelines established by NRC Regulatory Guide 1.100, Section C1?	___	___	___________	
b. Do the seismic coefficients used in the analysis envelope the required input postulated to occur at the equipment base?	___	___	___________	
c. Are the seismic coefficients applied in each of the three orthogonal directions simultaneously?	___	___	___________	
J6. Response Spectra Modal Analysis				
a. Do the response spectra used in the analysis envelop the RRS?	___	___	___________	
b. Does the model used adequately represent the equipment's:				
1. Mass distribution?	___	___	___________	
2. Stiffness characteristics?	___	___	___________	
3. Boundary conditions?	___	___	___________	
c. Is the cutoff frequency for the analysis adequate to ensure that the effect of all significant modes is considered?	___	___	___________	
d. Is the method of combining modal responses in accordance with NRC Regulatory Guide. 1.92?	___	___	___________	

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
J7. Results				
a. Are the correct allowable stresses identified?	___	___	__________	
b. Does the analysis demonstrate that all stresses are below the allowable?	___	___	__________	
c. Does the analysis adequately assure operability by demonstrating that all deflections/clearances are within the allowables?	___	___	__________	____
K. DESIGN REQUIREMENTS/CONSTRAINTS				
K1. Does the qualification report identify any design requirements/constraints which need to be implemented by parties other than the supplier (and/or his subcontractor, if any)?	___	___	__________	
If no, go to Section L.				
If yes, list these requirements/constraints in the comments section and provide references. Then complete Item K2.				
K2. Are these design requirements/constraints incorporated (as applicable) in the:				
a. Design Change Documents for existing configurations? If yes, specify in the comments section.	___	___	__________	

Attachment B
Seismic Qualification Review Checklist

	YES	NO	COMMENT NUMBER	N/A
b. appropriate design documents (including vendor drawings) for new or alternate replacement components or new construction within the design scope?	___	___	___________	

L. DOCUMENTATION

	YES	NO	COMMENT NUMBER	N/A
L1. Does the qualification report define all input data and assumptions?	___	___	___________	
L2. Does the report indicate that it has been reviewed and approved by the originating organization?	___	___	___________	
L3. For test reports:				
a. Is the test facility identified?	___	___	___________	
b. Is the test equipment along with date of last calibration identified?	___	___	___________	
c. Is the report complete (i.e., no pages missing)?	___	___	___________	

Attachment B
Seismic Qualification Review Checklist

Prepared by: ____________________ ____________________________ ______

Name Signature Date

System______________

Modification No.______________

Sheet ____ of ____

Attachment B
Seismic Qualification Review Checklist

Comment No.	Comment

Attach additional pages as necessary.

System______________
Modification No.____________
Sheet ____ of ____

Attachment C
Seismic Qualification Review Checklist for Modifications with No New Components being Added

For a modification to the plant that does not involve the addition of new components requiring qualification, identify the potential impact of the modification on the seismic qualification of existing systems, structures, or components, discuss how this impact was addressed by the modification, and indicate whether this was adequately addressed and why it is adequate. If it is determined that this issue was not adequately addressed, initiate a Discrepancy Report (DR) as required by PI-MP3-11, and include reference to the DR number in this Attachment C. (Use the continuation page as necessary.)

The effect of the modification on seismic qualifications of existing systems, structures, and components was adequately addressed.

_______ Yes _______ No

__________________________ __________________
Prepared by Date

Attachment C
Seismic Qualification Review Checklist for Modifications
with No New Components being Added

(Continuation Page)

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-12, Rev. 0

Radiological Environmental Review Checklist

	Name	Signature	Date
Prepared by:	C M. LAUNI	C M Launi	4-25-97
Approved by:	A A Neri	[illegible]	4-25-97

IMPLEMENTATION

System			
Modification No./ Description			
Verified by:		Date:	
Concurrence by:		Date:	

Radiological Environmental Review Checklist

Instructions

This checklist supplements the modification review process described in PI-MP3-03. Use of this checklist shall be as follows:

1. The Verifier(s) shall complete the radiological environmental review checklist.

2. The Verifier shall perform a technical review of the modification package and any new or revised design process documents that resulted from the modification per PI-MP3-02 and any new or revised output documents that resulted from the modification when completing the Radiological Environmental Review Checklist.

3. For each topic for which the applicability is determine to be affirmative, the verifier(s) shall enter a comment describing the impact of the modification on the topic, how the impact was resolved.

4. The Verifier shall generate a discrepancy report for any discrepancies identified during the review in accordance with Section 5.7 of PI-MP3-03.

5. When the review is completed, the Verifier shall sign and date the cover sheet of the Radiological Environmental Review Checklist and forward the completed checklist to the Lead Verifier.

Radiological Environmental Review Checklist

		Yes	No	N/A	Comment No.
1.	**Plant Ventilation**				
1.1	Did the Modification require connections to potentially contaminated areas or HVAC systems?	☐	☐	☐	_____
1.2	Were changes made to the HVAC system which caused cross-connect between a potentially contaminated HVAC systems and clean systems?	☐	☐	☐	_____
1.3	Did the modification cause any leakage from a HVAC system?	☐	☐	☐	_____
1.4	Did the modification create any new airborne effluent flow paths from the plant?	☐	☐	☐	_____
1.5	Are ducts carrying potentially contaminated air operated at negative pressure where they pass through clean areas?	☐	☐	☐	_____
1.6	Has hard-piping to HVAC of contaminated systems relief valves and vents been avoided?	☐	☐	☐	_____
1.7	Can confined areas direct contaminated high energy discharges due to the the modification to properly filtered HVAC discharges?	☐	☐	☐	_____
2.	**Piping**				
2.1	Was the exhaust from pressure relief valves or rupture discs for radioactive systems designed so it would not be released from the plant untreated or monitored?	☐	☐	☐	_____
2.2	Were tank vents for radioactive systems designed so they would not vent from the plant untreated or unmonitored?	☐	☐	☐	_____

Radiological Environmental Review Checklist

		Yes	No	N/A	Comment No.
2.3	Were tank over flows on radioactive systems designed so the over flow would be contained in the plant (e.g. the release from the tank would treated and monitored before released from the plant)?	☐	☐	☐	_____
2.4	Have berms, runoff ponds, etc., been provided for outdoor tanks containing radioactive materials?	☐	☐	☐	_____
2.5	Are interconnections between radioactive and non-radioactive systems equipped with double isolation valves (Two check valves or one check valve and a stop valve)? Note interconnection between systems and equipment of different radiation potential are not recommended and should be allowed only when thoroughly reviewed.	☐	☐	☐	_____
2.6	Did the modification create any new liquid or gaseous effluent flow paths from the plant?	☐	☐	☐	_____
3.	**Radiation Monitoring**				
3.1	Did the modification have an effect on the radiation detection monitoring or alarm systems?	☐	☐	☐	_____
3.2	Are sampler, sample flow, and sampling line characteristics matched to the parameter to be measured and the physical characteristics of the source stream or volume to be measured?	☐	☐	☐	_____
3.3	Are sample probes located where sampling is isokinetic? (i.e., a sufficient distance from the last flow input)	☐	☐	☐	_____
3.4	Are sample probes in liquid streams located in a suitable flow region of the stream being sample?	☐	☐	☐	_____

Radiological Environmental Review Checklist

		Yes	No	N/A	Comment No.
3.5	Did the modification of an area or system served by a radiation monitor change the performance characteristics, setpoints, or location of the monitor or system?	☐	☐	☐	_____
3.6	Are the effluent and process monitors for any waste stream modified appropriately?	☐	☐	☐	_____
3.7	Did the modification effect the instrument ranges or sensitivity (i.e. ensure readout of the highest and lowest levels of activity, including accident conditions if appropriate), and is the response time adequate for its function?	☐	☐	☐	_____
4.	**Radiation Dose Limits for Individual Members of the Public**				
4.1	Did the modification cause the total effective dose equivalent to individual members of the public from the plant to exceed 0.1 rem/year?	☐	☐	☐	_____
4.2	Did the modification cause the dose in any unrestricted area from external sources to exceed 0.002 rem in any one hour?	☐	☐	☐	_____
4.3	Did the modification cause the annual average concentrations of radioactive material released in gaseous effluents at the boundary of the unrestricted area to exceed the values specified in Table 2 of Appendix B to 10 CFR Part 20?	☐	☐	☐	_____
4.4	Did the modification cause the annual average concentrations of radioactive material released in liquid effluents at the boundary of the unrestricted area to exceed the values specified in Table 2 of Appendix B to 10 CFR Part 20?	☐	☐	☐	_____

Radiological Environmental Review Checklist

		Yes	No	N/A	Comment No.
4.5	Did the modification cause radioactive material to be discharged into sanitary sewerage?	☐	☐	☐	____
4.6	Did the modification treat or dispose of licensed radioactive material by incineration?	☐	☐	☐	____
4.7	Did the modification increase the radwaste storage capability and/or move storage closer to the sight boundary which results in a higher offsite dose (dose rate)?	☐	☐	☐	____
4.8	Did the modification cause the licensee to dispose of licensed radioactive material that exceeded 0.05 micocurie per gram as if it was not radioactive material?	☐	☐	☐	____
4.9	Did the modification cause the licensee to dispose of tissue in a manner that would permit its use either as food for humans or as animal feed?	☐	☐	☐	____
4.10	Were release of radioactive material to unrestricted areas during normal reactor operations designed to be kept as low as practicable?	☐	☐	☐	____
4.11	Is there any change in the exclusion area or site boundary conditions which would increase the on-site or off-site dose rates?	☐	☐	☐	____
4.12	Were there any changes affecting protection of safety class structures, that have the potential of containing radioactive material, from natural phenomena and meteorological conditions (tornadoes, rain loads, snow loads, etc.)?	☐	☐	☐	____

Northeast Utilities
Millstone Unit 3

CK-MP3-03-12
System No.:________________
Modification No.:____________
Sheet ________ of ________

Radiological Environmental Review Checklist

Comment Sheet

Comment No. | Comment

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-13, Rev. 1

Non-Radiological Environmental Review Checklist

Prepared by:	C.M. LAUNI Name	C M Launi Signature	4-25-97 Date
Approved by:	A.A. NERI Name	A Neri Signature	4-25-97 Date

IMPLEMENTATION

System		
Modification No./ Description		
Verified by:		Date:
Concurrence by:		Date:

Non-Radiological Environmental Review Checklist

Instructions

This checklist supplements the modification review process described in PI-MP3-03. Use of this checklist shall be as follows:

1. The Verifier(s) shall complete the Non-Radiological Environmental Review Checklist.

2. The Verifier shall perform a technical review of the modification package and any new or revised design process documents that resulted from the modification per PI-MP3-02 and any new or revised output documents that resulted from the modification when completing the Non-Radiological Environmental Review Checklist.

3. For each topic for which the applicability is determine to be affirmative, the verifier(s) shall enter a comment describing the impact of the modification on the topic, how the impact was resolved.

4. The Verifier shall generate a discrepancy report for any discrepancies identified during the review in accordance with Section 5.7 of PI-MP3-03.

5. When the review is completed, the Verifier shall sign and date the cover sheet of the Non-Radiological Environmental Review Checklist and forward the completed checklist to the Lead Verifier.

Non-Radiological Environmental Review Checklist

		Yes	No	N/A	Coment No.
1.	**Pollutant**				
1.1	Did the modification effect the ambient air quality of the plant from the following pollutants?				
	a) Sulfur Dioxide	☐	☐	☐	_____
	b) Particulate Matter	☐	☐	☐	_____
	c) Nitrogen Oxides	☐	☐	☐	_____
	d) Carbon Monoxide	☐	☐	☐	_____
	e) Ozone	☐	☐	☐	_____
	f) Lead	☐	☐	☐	_____
1.2	Were run-on and runoff controls necessary? (The design could be required to accommodate up to a 100-year, 24-hr rainfall event)	☐	☐	☐	_____
1.3	Did the modification account for the following prohibited discharges?				
	a) PCBs	☐	☐	☐	_____
	b) Oil spills	☐	☐	☐	_____
	c) Cooling tower maintenance chemicals (except for chlorine, chromium, phosphorous and zinc which have effluent limits)	☐	☐	☐	_____
1.4	Was a spill prevention control and countermeasure plan (SPCC Plan) needed for this modification?	☐	☐	☐	_____
1.5	Were discharges avoided or minimized using other alternatives where possible?	☐	☐	☐	_____
1.6	Were any new pollutants added to the plant's emissions?	☐	☐	☐	_____

Non-Radiological Environmental Review Checklist

		Yes	No	N/A	Coment No.
1.7	Did the modification effect the performance testing and/or continuous monitoring of pollutants at the station?	☐	☐	☐	_____
2.	**Solid Waste**				
2.1	Did the modification obtain the needed permits for solid waste? (Solid waste typically includes any garbage, refuse, sludge or discarded material including solids, semi-solids, liquids, or contained gases.)	☐	☐	☐	_____
2.2	Did the modification allow for the storage of wastes? (Storage of wastes is prohibited to the extent that they could cause a nuisance or health hazard.)	☐	☐	☐	_____
2.3	Did the modification generate any hazardous waste? (hydrazine, etc.)	☐	☐	☐	_____
2.4	Did the modification transport any hazardous waste?	☐	☐	☐	_____
2.5	Were dumping permits needed for this modification?	☐	☐	☐	_____
2.6	Did the modification store any hazardous waste?	☐	☐	☐	_____
2.7	Was a discharge of dredged or fill material permit needed? (A dredged and fill material discharge permit is intended to protect water quality and the environment (impact on municipal water supplies, shellfish beds, fishery areas, wildlife, or recreation areas.)	☐	☐	☐	_____
3.	**Other**				
3.1	Was the groundwater effected by this modification?	☐	☐	☐	_____
3.2	Due to the modification, are groundwater monitoring wells needed? (Usually a minimum of one upgradient well and two down-gradient wells are required)	☐	☐	☐	_____

Non-Radiological Environmental Review Checklist

		Yes	No	N/A	Coment No.
3.3	Was an Environmental Impact Statement (EIS) needed for modification?	☐	☐	☐	_____
3.4	Did the modification affect any wetlands?	☐	☐	☐	_____
3.5	Did the modification affect any active spawning areas?	☐	☐	☐	_____
3.6	Did the modification affect any aquatic species due to discharges?	☐	☐	☐	_____
3.7	Did the modification affect waterfowl breeding areas due to discharges?	☐	☐	☐	_____
3.8	Did the modification affect the potable water at the point of used in the plant? (the levels of inorganic chemicals, organic chemicals, turbidity, bacteria, and radioactive materials must be checked in the plant's potable water supply, also secondary drinking water standards must be meted, appearance, odor, and taste.)	☐	☐	☐	_____
3.9	Did the modification affect the height of the stack?	☐	☐	☐	_____
4.	**Water Intake and Return**				
4.1	Did the modification have an affect on fish impingement and entrainment?	☐	☐	☐	_____
4.2	Did the modification change the impact of thermal effluent from the plant?	☐	☐	☐	_____
5.	**Plant Ventilation**				
5.1	Did the Modification bypass HVAC systems?	☐	☐	☐	_____
5.2	Did the modification cause any leakage from a HVAC system?	☐	☐	☐	_____

Non-Radiological Environmental Review Checklist

		Yes	No	N/A	Coment No.
5.3	Did the modification create any new airborne effluent flow paths from the plant?	☐	☐	☐	_____
5.4	Are ducts carrying potentially contaminated air operated at negative pressure where they pass through clean areas?	☐	☐	☐	_____
5.5	Has hard-piping to HVAC of contaminated systems relief valves and vents been avoided?	☐	☐	☐	_____
6.0	**Piping**				
6.1	Was the exhaust from pressure relief valves designed so it would not be released from the plant untreated or monitored?	☐	☐	☐	_____
6.2	Were tank vents designed so they would not vent from the plant untreated or unmonitored?	☐	☐	☐	_____
6.3	Were tank over flows designed so the over flow would be contained in the plant (e.g. the release from the tank would treated and monitored before released from the plant)?	☐	☐	☐	_____
6.4	Have berms, runoff ponds, etc., been provided for outdoor tanks?	☐	☐	☐	_____
6.5	Did the modification create any new liquid effluent flow paths from the plant?	☐	☐	☐	_____

Northeast Utilities
Millstone Unit 3

CK-MP3-03-13
System No.:_______________
Modification No.:___________
Sheet ________ of ________

Non-Radiological Environmental Review Checklist

Comment Sheet

Comment No. **Comment**

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-14, Rev. 0

Station Blackout Review Checklist

	Name	Signature	Date
Prepared by:	C. M. LAUNI	C M Launi	4-7-97
Approved by:	A. A. NERI	AA Neri	4-7-97

IMPLEMENTATION

System			
Modifiation No./ Description			
Verified by:		Date:	
Concurrence by:		Date:	

Sheet 1 of ___

Station Blackout Review

Instructions

This checklist shall be used for the modification review process described in PI-MP3-03. It shall be used for those modifications for which the Station Blackout was identified by the Lead Verifier, in the Modification Screening Checklist (CK-MP3-03-02), as the affected design element. The objective of completing this checklist will be to perform a detailed review to verify that the Station Blackout was adequately addressed in the modification.

The following instructions apply for completing this checklist:

1. This checklist shall be completed by a verification team (VT) member with a technical background which is appropriate for the subject.

2. The reference document for related information is SP-EE-363, "MP3 Station Blackout Safe Shutdown Scenario Document".

3. The checklist below is divided into sections and subsections. If the applicability of the topic in a section is "NO", the applicability of the topics in its subsections need not be addressed.

4. The Verifier(s) shall perform a technical review of the modification package, any new or revised design process documents that resulted from the modification per PI-MP3-02, and any new or revised output documents that resulted from the modification when completing this checklist. For each topic for which the applicability is determined in the affirmative, the Verifier(s) shall enter a comment towards the end of the checklist describing the impact of the modification on the topic. A review of the impact on the SBO safe shutdown shall also be provided by the Verifier(s). If the said impact cannot be established from available documents, the need for further analysis/review shall be identified by the Verifier(s).

5. The Verifier(s) shall generate a discrepancy report for any discrepancies identified during the review in accordance with Section 5.7 of PI-MP3-03.

6. When the review is completed, the Verifier(s) shall sign and date the cover sheet of this checklist and forward it to the Lead Verifier.

Northeast Utilities
Millstone Unit 3

CK-MP3-03-14
System No.:___________________
Modification No. _______________
Sheet ____ of ____

Station Blackout Review

		YES	NO	N/A	Comment No.
1.	**Systems and Components**				
1.1	Did the modification affect the SBO Diesel Generator?	☐	☐	☐	______
1.2	Did the modification affect the SBO Diesel Air Start?	☐	☐	☐	______
1.3	Did the modification affect the SBO Diesel Lube Oil?	☐	☐	☐	______
1.4	Did the modification affect the SBO Fuel Oil?	☐	☐	☐	______
1.5	Did the modification affect the following components of the RCS PressureBoundary?				
	a) RCS Pump Bleedoff Isolation Valves, CHS*MV8100, 8109A-D, CCP*MOV49A,B	☐	☐	☐	______
	b) RCS Sampling System Isolation Valves	☐	☐	☐	______
	c) RCS Letdown System Isolation Valves, CHS*CV8152, -8160, RCS8LCV460, -459 RCS*AV8037A-D, -8053, MV8098	☐	☐	☐	______
	d) RPV Vent Valves, RCS*HCV442A, RCS*SV8095, -8096	☐	☐	☐	______
	e) RCS Loop Temp Monitor	☐	☐	☐	______
	f) Pressurizer Level Monitor	☐	☐	☐	______
	g) Pressurizer Pressure Monitor	☐	☐	☐	______
1.6	Did the modification affect the following components of the Main SteamSystem?				
	a) MSIVs, 3MSS*CTV27A-D	☐	☐	☐	______
	b) S/Gs, 3SG1A-D	☐	☐	☐	______
	c) S/G Safety Valves, 3MSS-RV22-26A-D	☐	☐	☐	______
	d) Main Steam Atmospheric Dump Valves, 3MSS*PV20A	☐	☐	☐	______

Station Blackout Review

		YES	NO	N/A	Comment No.
	e) AFW Terry Turbine Steam Supply	☐	☐	☐	______
1.7	Did the modification affect the following components of the Auxiliary Feedwater System?				
	a) DWST, 3FWA*TK1	☐	☐	☐	______
1.8	Did the modification affect the Feedwater Piping from Aux Feed to S/Gs?	☐	☐	☐	______
1.9	Did the modification affect the Main Steam Valve Bldg Ventilation (fresh air to MSVB)?	☐	☐	☐	______
1.10	Did the modification affect the following components of the Chemical and Volume Control System?				
	a) Charging Pumps	☐	☐	☐	______
	b) Boric Acid Storage Tanks	☐	☐	☐	______
	c) RWST	☐	☐	☐	______
1.11	Did the modification affect the Charging Pump Cooling?	☐	☐	☐	______
1.12	Did the modification affect the Service Water (Cooling for CCE)?	☐	☐	☐	______
1.13	Did the modification affect the Quench Spray (RWST Supply to CHS)?	☐	☐	☐	______
1.14	Did the modification affect the High Pressure Safety Injection(Piping for CHS Loop Charging)?	☐	☐	☐	______
1.15	Did the modification affect the Aux Bldg Ventilation (Fresh Air to Charging Pump Cubicles)?	☐	☐	☐	______
1.16	Did the modification affect the Battery Room Exhaust?	☐	☐	☐	______

Station Blackout Review

		YES	NO	N/A	Comment No.
1.17	Did the modification affect the following components of the Alternate AC Power System?				
	a) 4160VAC Power	☐	☐	☐	______
	b) 480VAC Power	☐	☐	☐	______
1.18	Did the modification affect the following components of the 125 VDC Power System?				
	a) Batteries	☐	☐	☐	______
	b) Breakers	☐	☐	☐	______
1.19	Did the modification affect the 120 VAC Vital Control Power?	☐	☐	☐	______
1.20	Did the modification affect the following components of the Reactor Protection System	☐	☐	☐	______
	a) 52/RTA Reactor Breaker, 3RPS*ACB-RTA	☐	☐	☐	______
	b) 52/RTB Reactor Breaker, 3RPS*ACB-RTB	☐	☐	☐	______
	c) 52BYA Bypass Breaker, 3RPS*ACB-BYA	☐	☐	☐	______
	d) 52BYB Bypass Breaker, 3RPS*ACB-BYB	☐	☐	☐	______
1.21	Did the modification affect the Control Room Panel Doors?	☐	☐	☐	______
1.22	Did the modification affect the Vital Instrumentation and Portions of the Class 1E Electrical Distribution System to Support Above SBO Systems	☐	☐	☐	______
2.	**Procedures**				
2.1	Did the modification affect the CONVEX Operating Instruction No. 006, "Restoration"?	☐	☐	☐	______

Station Blackout Review

		YES	NO	N/A	Comment No.
2.2	Did the modification affect the CONVEX, Operating Instruction No. 6913,"Millstone 15G"?	☐	☐	☐	______
2.3	Did the modification affect the CONVEX Operating Instruction No. 8601, "Millstone 345 kV Substation Salt Decontamination"?	☐	☐	☐	______
2.4	Did the modification affect Procedure TD 250, "Load Shedding and Interruptible Loads"?	☐	☐	☐	______
2.5	Did the modification affect Procedure TD 503, " "Transmission Line Patrols?	☐	☐	☐	______
2.6	Did the modification affect Procedure TD 506, "Transmission Line Emergency Patrols Regional/Area Assistance"?	☐	☐	☐	______
2.7	Did the modification affect Procedure AOP 3569, "Severe Weather Conditions" ?	☐	☐	☐	______
2.8	Did the modification affect Procedure EOP 35 ECA-0.0, "Loss of All AC Power"?	☐	☐	☐	______
2.9	Did the modification affect Procedure EOP 35 ECA-0.1, "Loss of All AC Power Recovery Without SI Required"?	☐	☐	☐	______
2.10	Did the modification affect Procedure EOP 35 ECA-0.2, "Loss of All AC Power Recovery With SI Required"?	☐	☐	☐	______
2.11	Did the modification affect Operating Procedure OP-3346A?	☐	☐	☐	______
2.12	Did the modification affect Surveillance Procedure SP-3646A.1,2?	☐	☐	☐	______
2.12	Did the modification affect Engineering Department Instruction 1-ENG-10.06, "Emergency Generator Reliability Monitoring for SBO Rule Compliance"?	☐	☐	☐	______

Station Blackout Review

		YES	NO	N/A	Comment No.
2.14	Did the modification affect NEO 5.26, "Station Blackout Quality Assurance Program"?	☐	☐	☐	_______

Station Blackout Review

		YES	NO	N/A	Comment No.
3.	**Dominant Areas of Concern**				
3.1	Does the modification affect the temperature environment of the Control Room?	☐	☐	☐	______
3.2	Does the modification affect the temperature environment of the Instrument Rack Room?	☐	☐	☐	______
3.3	Does the modification affect the temperature environment of the Steam Driven Aux. Feed Pump Room?	☐	☐	☐	______
3.4	Does the modification affect the temperature environment of the East Switchgear Room?	☐	☐	☐	______
3.5	Does the modification affect the temperature environment of the West Switchgear Room?	☐	☐	☐	______
3.6	Does the modification affect the temperature environment of the Main Steam Valve Building?	☐	☐	☐	______
3.7	Does the modification affect the temperature environment of the Charging Pump Cubicle?	☐	☐	☐	______
3.8	Does the modification affect the temperature environment of the East and West MCC Rod Control Area?	☐	☐	☐	______

Northeast Utilities
Millstone Unit 3

CK-MP3-03-14
System No.:____________________
Modification No. __________________
Sheet ____ of ____

Station Blackout Review

Comment Sheet

Comment No. **Comment**

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-15, Rev. 0

Control Panel Design Review

Prepared by:	J.W. DeMarco Name	JW DeMarco Signature	4/28/97 Date
Approved by:	A A NERI Name	[signature] Signature	4/28/97 Date

IMPLEMENTATION

System			
Modification No./ Description			
Verified by:		Date:	
Concurrence by:		Date:	

Control Panel Design Review

Instructions

This checklist supplements PI-MP3-02 and shall be used for the Control Panel Design Review process described in the PI. The application and use of this checklist shall be as follows:

1. The Lead Verifier shall identify all Control Panels included in the scope of the review and shall list the component ID and description on the form included as Page 3 of this checklist. The Lead verifier shall sign and date the form when this step is completed. Multiple Page 3's may be used.

2. The Verifier shall then complete an individual Control Panel Design Checklist, Page 5 for each Control Panel affected by the modification.

3. The Lead Verifier or Verifier shall indicate for each attribute whether the Control Panel design is satisfactory or unsatisfactory. If the attribute is not applicable, the Verifier shall indicate NA in both columns.

4. The Verifier shall assign a sequential comment number to each response indicated on the checklist and shall use the Page 4 comment sheet to provide justification for the responses. Multiple Page 4's may be used. The justification shall reference the section of the modification package reviewed for which the comment is applicable.

5. Comments shall be processed as discrepancies in accordance with PI-MP3-11.

6. When completed, the Verifier shall sign and date the checklist cover sheet.

7. The Lead Verifier shall indicate concurrence on the cover sheet that the Control Panel Design Review of the modification has been adequately completed.

8. The Lead Verifier shall compile the individual checklists and enter the Modification number on each sheet, number the sheets sequentially and sign the cover sheet. The sheet numbers shall be sequentially numbered (i.e., 1, 2, 3, etc.). It is acceptable to add insert pages (i.e., 1A, 1B, 1C, etc.) if needed.

9. The cover sheet and all applicable checklists and comment forms shall be included in the final project file copy.

Northeast Utilities
Millstone Unit 3

CK-MP3-03-15
System ____________________
Modification No. ____________
Sheet ______ of ______

Control Panel Design Review

Control Panel List

Component ID	Description

Prepared by ____________ Signature ____________ Date ____________

Control Panel Design Review

Control Panel Design Review Comment Form

Comment No.	Comment

Prepared by ____________ Signature ____________ Date ____________

Northeast Utilities
Millstone Unit 3

CK-MP3-03-15
System ____________________
Modification No. ___________
Sheet _____ of _____

Control Panel Design Review

Control Panel ID: ______________________

	Attributes	Yes	No	Comment
1.	The relocation, modification, or change of a control or visual display used by the operators in the control room or at local panels meets Human Factors guidelines.	___	___	________
2.	A change to the ambient illumination, noise or atmospheric conditions of the control room meets visual, communication and habitability requirements.	___	___	________
3.	The addition of or change in the accessibility to emergency equipment in the control room by operators has been adequately addressed.	___	___	________
4.	The modification of control workspaces, arrangement or general layout does not reduce or impair the operating staffs view or access to the control boards.	___	___	________
5.	The installation or change of equipment does not restrict operator or maintenance personnel movement in the control room or at local panels.	___	___	________
6.	The addition or change to the communications equipment within the control room or at local panels permits ready access and use.	___	___	________
7.	The addition or modification of auditory signal systems in the control room panel or local panels are discrenible from and do not mask other auditory signals.	___	___	________
8.	The addition or modifications to the existing annunciator logic in the control room or at local panels does not deviate from SP-EE-261 criteria.	___	___	________
9.	The addition, modification or replacement of panels mimics, demarcation, color coding or hierarchical labeling does not deviate from SP-EE-261 criteria.	___	___	________
10.	The installation or change of equipment labels or location aids in the control room or at local panels does not deviate from SP-EE-261 guidelines.	___	___	________
11.	The redesign, modification or addition of a control room panel or local panel arrangement allows ready access to other panels and panel components.	___	___	________
12.	The response time from control activation to CRT or display presentation does not delay appropriate operator action.	___	___	________
13.	The location, layout and capability of the user-computer interface (access) devices allow ready man-machine interface.	___	___	________
14.	The change or addition to operating or surveillance procedures does not reduce performance or operator action.	___	___	________
15.	The change of information or display characteristics of a post-accident monitoring instrument or system does not reduce operator's ability to assess	___	___	________

plant condition.

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-16, Rev. 0

Piping Design Review Checklist

Prepared by:	P.R. OLSON	[signature]	4-7-97
	Name	Signature	Date
Approved by:	A.A. NERI	[signature]	4-7-97
	Name	Signature	Date

IMPLEMENTATION

System		
Document No. / Rev. No.		
Modification No. / Rev. No.		
Verified by:		Date:
SRG Concurrence by:		Date:

System_______________
Document No.______________
Modification No.______________
Sheet______ of ______

Piping Design Review Checklist

Instructions

This set of checklists shall be used for the modification review process described in PI-MP3-03 and for the design process document review process described in PI-MP3-02. The application and use of these checklists shall be as follows:

1. The Verifier shall identify if the Design Process Document to be reviewed is;
   a. Identified as a document to be reviewed under the modification review process (PI-MP3-03) or
   b. Identified as a document to be reviewed under the design review process (PI-MP3-02).
2. The Verifier shall complete the Piping Design Consideration Checklist (see page 3) to define the design considerations applicable to the Design Process Document being reviewed.
   a. Enter the System name, Design Process Document Number / Rev. No. and, if applicable, the Modification No.
   b. If a design consideration is applicable to the Design Process Document, check (√) as applicable. Note that more than one design consideration may apply.
   c. If not applicable, check not applicable (NA).
   d. If other design considerations are addressed by the Design Process Document which are not covered by the checklists provided, list these design considerations under "Other".
   e. Print, sign and date when identification of applicable design considerations is completed.

   Note: Only those checklists for which a design consideration is identified in step 2 need be completed under step 3.
3. For each applicable design consideration identified, the Lead Verifier or Discipline Verifier, as applicable, shall complete the applicable Design Review Ckecklist (s) and comment page(s) as follows:
   a. Enter the System name, Design Process Document Number and, if applicable, the Modification No. on all checklist sheets. The sheets shall be sequentially numbered (i.e. 1,2,3 ect.). It is acceptable to add insert pages (i.e. 1A, 1B, 1C, etc.) if needed.
   b. Review the Design Process Document for each major design attribute on the checklist(s). A detailed list of potential design considerations follows each major design attribute in the checklist. These detailed items should be considered during the review and may form the basis for comments, but each item is not required to to be marked as to its acceptability. Each major design attribute should be addressed as follows:
      b.1 If the review determines the attribute is satisfied, check satisfactory (Y).
      b.2 If the review determines the attribute is not satisfied, check unsatisfactory (N) and enter a sequential comment number and enter the comment number and comment on the Piping Design Review Comment Form (see page 4).
      b.3 If the specific design consideration is not applicable, check not applicable (NA).
   c. Once the review is complete, sign and date the checklist cover sheet.
4. The SRG Lead shall indicate concurrence that the checklist has been implemented satisfactorily by signing and dating the checklist cover sheet.
5. The cover sheet and all applicable checklists and comment forms shall be included if the final project file copy.
6. Comments shall be processed as discrepancies in accordance with PI-MP3-11.

Piping Design Review Checklist

Piping Design Considerations Checklist

Checklist No.	Design Consideration	Applicability Yes (√)/ No (NA)
1.0	General Modeling and Design (ASME Class 1, 2 & 3 and B31.1 Piping)	______________
2.0	ASME Class 2 & 3 and B31.1 Stress Analysis	______________
3.0	ASME Class 1 Stress Analysis	______________
4.0	Hydraulic Transient Analysis	______________
5.0	Interaction Analysis	______________
6.0	Pipe Rupture Calculations and Design Considerations	______________
7.0	Resolution of Change Documents (Including modification close out for as built conditions)	______________
8.0	Simplified Small Bore Piping and Tubing Analysis	______________
9.0	Others (List)	______________

______________________________ ______________________________ ______________

Prepared by Signature Date

System____________
Document No.____________
Modification No.____________
Sheet_____ of _____

Piping Design Review Checklist

Piping Design Review Comment Form

Comment No.	Comment

______________________ ______________________ ______________
Prepared by Signature Date

System______________
Document No.______________
Modification No.______________
Sheet______ of ______

Piping Design Review Checklist

General Modeling and Design Checklist
Applicable to ASME Class 1, 2 & 3 and B31.1 Piping

Review Checklist No. and Subsections	Title	Applicability Yes (√)/ No (NA)
1.0	GENERAL MODELING AND DESIGN	______
1.1	BASIC DATA	______
1.2	DEAD WEIGHT ANALYSIS	______
1.3	HYDRO WEIGHT ANALYSIS	______
1.4	THERMAL EXPANSION ANALYSIS	______
1.5	DISPLACEMENT ANALYSIS	______
1.6	SEISMIC RESPONSE SPECTRA ANALYSIS	______
1.7	SAFETY RELIEF VALVE ANALYSIS (SRVA)	______
1.8	TIME HISTORY ANALYSIS	______
1.9	HAND-PREPARED DESIGN CALCULATIONS	______

Prepared by ______________ Signature ______________ Date ______________

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.0	General Modeling and Design		
1.1	BASIC DATA	______	______
1.1.1	Are the materials at all elements in compliance with the reference design basis drawings?		
1.1.2	Is the specified internal peak pressure (higher of design pressure and maximum operating pressure) for each data point correctly coded in psig? Are the material properties coded correctly?		
1.1.3	Are the uniform weights on the geometry cards coded correctly?		
1.1.4	For all non submerged piping, does the uniform weight on each geometry card include the pipe weight, normal operating content weight, insulation weight and jacketing weight?		
1.1.5	For all submerged piping, does the uniform weight on each geometry card include the pipe weight and hydrodynamic mass.		
1.1.6	Is the insulation weight correctly specified on the analytical drawings, based on the insulation type identified in the piping Line List?		
1.1.7	For each pipe geometry input, is the correct outside diameter of pipe/pipe fitting specified?		
1.1.8	For each pipe geometry input, is the correct wall thickness of pipe/pipe fitting specified?		
1.1.9	If any special modeling geometry's (e.g., equipment or valve flexibility, expansion joints, special restraint configurations, etc.) were used in the analysis, are they appropriate?		
1.1.10	Is the correct radius in feet coded on all tangent point data cards?		
1.1.11	Does the basic data accurately represent the pipe routing shown on the reference design basis isometric drawings?		
1.1.12	Are the data point types coded correctly?		
1.1.13	Are the coded location and angularity changes of all supports within the appropriate design tolerance criteria?		
1.1.14	Is the restraint type on the restraint drawing in compliance with the coding(unless it is a specified snubber/variable to a rigid restraint change)?		
1.1.15	Is at least one data point coded approximately		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	halfway between any two restraints in the same direction or between a restraint and an anchor?		
1.1.16	For header subsystems where the ratio of run piping out side diameter to the branch piping outside diameter is less than 3.0, or other specific criteria, are all branch lines modeled in the analysis of header subsystem?		
1.1.17	For header subsystems where the ratio of run piling outside diameter to the branch piping outside diameter is greater than or equal to 3.0, is an element of the branch subsystem coded?		
1.1.18	For branch subsystems anchored at the header subsystem, is the anchor modeled correctly?		
1.1.19	Are all anchors coded at their proper locations?		
1.1.20	Are the anchor types coded correctly using appropriate modeling techniques?		
1.1.21	Are all trunnion and stanchion supports properly coded?		
1.1.22	Are all penetrations modeled correctly after consideration of the sealant material?		
1.1.23	Is the length/diameter ratio(L/D)of all straight pipe elements and curved pipe elements on large diameter bends within appropriate acceptance criteria?		
1.1.24	Is there a smooth transition in length/diameter ratio (L/D) from element to element?		
1.1.25	Is the frequency of all pipe elements greater than 33 Hz?		
1.1.26	Are all valves where the perpendicular distance from the C.G. to the pipe center line is less than or equal to 1/2 the outside diameter of the pipe, modeled as a single element?		
1.1.27	If the answer to 1.1.26 is yes, does the uniform weight on all geometry cards include the valve weight, insulation weight and jacketing weight?		
1.1.28	Are all valves where the perpendicular distance from the C.G. to the pipe center line is greater than 1/2 the outside diameter of the pipe, modeled as three weightless elements?		
1.1.29	If the answer to 1.1.28 is yes, has the valve C.G. been correctly located, considering both valve and operator?		
1.1.30	Is the valve operator orientation with respect to the pipe properly modeled for all three element valves?		
1.1.31	Is the outside diameter of the valve(s) coded		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	correctly?		
1.1.32	Is the wall thickness of the valve(s) on the geometry card(s) equal to the maximum valve body wall thickness (obtained from vendor 'valve drawing) or two times the wall thickness of the adjoining pipe?		
1.1.33	If a valve has reducers at its ends, have they been correctly model led in accordance with the reference acceptance criteria?		
1.1.34	Are all valve skew angles (orientations) coded correctly?		
1.1.35	If applicable have the data points of all valve been correctly specified on the valve acceleration save data card?		
1.1.36	Are interfaces with the piping contractor's piping properly modeled?		
1.1.37	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.2	DEAD WEIGHT ANALYSIS		
1.2.1	Are the weights not modeled as uniform weight (e.g., restraint hardware weights, pipe fitting weights, etc.) included as data point lumped masses or fixed end force sets?		
1.2.2	Are all data point lumped masses coded correctly with respect to magnitude and direction?		
1.2.3	Are the data point lumped masses for all three element valves (including contents and insulation) coded at the valvc		
1.2.4	For all data point lumped masses, is the global (-direction unrestrained in the weight analysis?		
1.2.5	Are the weights for all single element valves (including contents and insulation) coded as uniform weight?		
1.2.6	For spring hangers modeled as upward forces, has the correct preload been specified?		
1.2.7	If fixed end force sets were used, are the sign and magnitude of forces and moments coded correctly?		
1.2.3	Are all the global Y-direction restraint reactions n the. weight analysis positive?		
1.2.9	Are the deflections of all data points in the		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	subsystem within the appropriate allowable Limit?		
1.2.10	If pipe deflections exceed the appropriate allowable Limit, is the general slope or the line still maintained?		
1.2.11	Are all risers stable?		
1.2.12	Is the overall supporting system balanced (i.e., no large differences between hanger loads or excessive upward deflections)?		
1.2.13	Does the weight analysis satisfy the equilibrium check?		
1.2.14	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.3	HYDRO WEIGHT ANALYSIS	______	______
1.3.1	If the subsystem carries only steam, is a separate hydro weight analysis performed?		
1.3.2	Have the pipe weights and all other masses been correctly modified to account for the weight of water?		
1.3.3	Are all variable and/or spring hangers considered as pinned (rigid) during the hydro weight analysis?		
1.3.4	Does the hydro weight analysis satisfy the equilibrium check?		
1.3.5	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.4	THERMAL EXPANSION ANALYSIS	______	______
1.4.1	Is a thermal expansion analysis performed for each thermal mode shown in the appropriate design basis document with consideration for cut off temperature and thermal anchor movements?		
1.4.2	Is a thermal expansion analysis performed for cold modes of operation (i.e. for temperatures less than 70° F) to obtain the maximum thermal stress range?		
1.4.3	For each thermal mode analysis, is the correct temperature assigned to the affected pipe		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	elements?		
1.4.4	If applicable, for each thermal mode, is the ambient temperature coded at each modeled stanchion or trunnion element?		
1.4.5	Are the thermal anchor movements and rotations identified on the applicable design documents or as calculated for equipment nozzles and header connections input correctly?		
1.4.6	If applicable have the sources of each terminal header anchor movement shown on the appropriate design basis reference drawings been properly referenced by subsystem name calculation number revision and data point?		
1.4.7	Are the terminal header anchor movements obtained from an approved piping stress analysis?		
1.4.8	Are the thermal modes of the header subsystem in compliance with the modes of this subsystem?		
1.4.9	Are the deflections for all data points in this subsystem within the appropriate allowable limit?		
1.4.10	Does the thermal analysis satisfy. the equilibrium check?		
1.4.11	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.5	DISPLACEMENT ANALYSTS		
1.5.1	HEADER DISPLACEMENT	________	________
1.5.1.1	If the subsystem is a branch line, are the dynamic deader displacement analyses performed for all applicable dynamic loads?		
1.5.1.2	Is the input for header displacements and rotations in compliance with the latest approved header subsystem analysis?		
1.5.13	For each dynamic load, are six displacement groups considered for each header connection?		
1.5.1.4	Are the header rotations correctly specified?		
1.5.1.5	Other checks, explain.		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.5.2	BUILDING DISPLACEMENT	______	______
1.5.2.1	Is a building displacement analysis required?		
1.5.2.2	If a building displacement analysis was performed, is the correct computer file name used in each analysis?		
1.5.2.3	Are the correct record numbers used for every support in this analysis?		
1.5.2.4	Is the source of the building displacement input data properly referenced in this piping stress analysis?		
1.5.2.5	Are all header anchor data points included in the correct support group, considering the upstream and downstream restraint attachment locations in the header subsystem?		
1.5.2.6	Has each of the applicable dynamic load been considered?		
1.5.2.7	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.5.3	SEISMIC RELATIVE SUPPORT DISPLACEMENT ANALYSIS	______	______
1.5.3.1	Is a seismic relative support displacement analysis required?		
1.5.3.2	If applicable, is the correct computer file name used in each analysis?		
1.5.3.3	Are the dynamically active restraints(rigids, snubbers and anchors) specified at the correct data points and properly divided into support groups?		
1.5.3.4	Are the correct record numbers used for every support group locations in this analysis?		
1.5.3.5	Is the source of the input data properly referenced?		
1.5.3.6	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.6	SEISMIC RESPONSE SPECTRA ANALYSIS	______	______
1.6.1	Are the seismic response spectra files (i.e.,		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	computer file name, revision, element name, location, elevation, damping, etc.) properly used in this analysis?		
1.6.2	If this is a branch subsystem, are the header seismic response spectra correctly specified?		
1.6.3	Are the restraint hardware weights, pipe fitting weights and other lumped masses coded correctly?		
1.6.4	If applicable, is the method of eigen value calculation used correct?		
1.6.5	Are the damping values for the applicable seismic response spectra correct as per the Regulatory Guide 3.61?		
1.6.6	Do the seismic time duration's comply with the reference acceptance criteria?		
1.6.7	Are the mode shapes printed in the computer output?		
1.6.8	Is square root of the absolute double sum method used to combine she dynamic modal responses?		
1.6.9	For each seismic response spectra analysis, does the last modal period fall on the ZPA of the enveloped response spectra in each direction?		
1.6.10	Are the deflections for all data points in this subsystem reasonable?		
1.6.11	If applicable, is the effect of seismic differential anchor movements considered correctly?		
1.6.12	Does the dynamic analysis satisfy the orthogonality check for the modal vectors?		
1.6.13	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.7	SAFETY RELIEF VALVE ANALYSIS(SRVA)	______________	______________
1.7.1	If applicable, have the effects of safety relief valve discharge been considered properly?		
1.7.2	Has the valve opening time been specified correctly?		
1.7.3	Does the steam stagnation pressure and density reflect the SRV set point?		
1.7.4	Are the pipe ID and pipe segment lengths input properly identified in the analysis?		
1.7.5	Are the pipe submerged lengths input data correctly calculated?		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.7.6	Is the fluid density input correctly calculated?		
1.7.7	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.8	TIME HISTORY ANALYSIS	______	______
1.8.1	For all appropriate restraint and anchor locations, have the time histories and multiplication factors been specified correctly?		
1.8.2	If this is a branch subsystem, have the header subsystem name and header data point been specified cot-correctly?		
1.8.3	Are the restraint hardware weights, pipe fitting weights and other lumped masses coded correctly?		
1.8.4	Is the integration time step in seconds small enough?		
1.8.5	If this is a header subsystem, are the time histories saved for all appropriate branch subsystem data point locations?		
1.8.6	Does the time history analysis satisfy the orthogonality check for the modal vectors?		
1.8.7	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.9	HAND PREPARED DESIGN CALCULATIONS	______	______
1.9.1	Are the hand-prepared design calculations property documented in accordance with approved procedures?		
1.9.2	Has a procedure or method of design calculations been properly referenced and defined?		
1.9.3	Is the input data from other piping stress calculation packages or sources properly referenced and identified in this piping stress calculation package?		
1.9.4	If any non-standard formulas, equations, constants, etc., are used, are they properly		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	referenced and identified or are the supporting derivations included in this piping stress calculation package?		
1.9.5	Are the design calculations logically composed and justifiable for their intended purpose?		
1.9.6	Has the accuracy of the design calculations been verified?		
1.9.7	Other checks, explain.		

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Piping Design Review Checklist

ASME Class 2 & 3 and B31.1 Stress Analysis Checklist

Review Checklist No. and Subsections	Title	Applicability Yes (√)/ No (NA)
2.0	CLASS 2&3 AND B31.1 PIPING STRESS ANALYSIS	________
2.1	COMBINED STRESSES	________
2.2	COMBINED REACTIONS	________
2.3	COMBINED ACCELERATIONS	________
2.4	EQUIPMENT NOZZLE ALLOWABLE LOADS	________
2.5	FLUED HEAD AND DRYWELL PENETRATION ALLOWABLE LOADS	________
2.6	CLASS 2&3 WELDED ATTACHMENT DESIGN	________
2.7	WELDED ANCHOR ATTACHMENT DESIGN	________
2.8	FUNCTIONAL CAPABILITY REQUIREMENTS	________
2.9	FLANGED JOINT ANALYSIS	________

______________________ ______________________ ______________
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Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.0	Class 2 & 3 and B31.1 Piping Stress Analysis		
2.1	COMBINED STRESSES	________	________
2.1.1	Is appropriate combined stress analysis included with this piping stress calculation package for all data points in this subsystem?		
2.1.2	Is the allowable stress, Sc, for the specified pipe material calculated at the subsystem ambient temperature?		
2.1.3	Is the allowable stress, Sh for the specified pipe material(s) calculated at the subsystem's highest temperature?		
2.1.4	Are all save tape load I.D.'s identified and input correctly?		
2.1.5	Have all the thermal modes shown on the appropriate design basis reference drawings been considered in the thermal range set?		
2.1.6	If the number of thermal expansion mode cycles exceed the program default value, are they specified?		
2.1.7	Is the specified internal peak pressure (higher of design pressure and maximum operating pressure) for each data point correctly coded in psig?		
2.1.8	Are the Load combinations correct as per approved procedures?		
2.1.9	If applicable, are the hydro weight load combinations considered properly?		
2.1.10	Are the pipe stresses for each service level at all data points in this subsystem within the applicable code allowable stresses?		
2.1.11	Have the stress intensification factors of all non 90 degree tee nodes been properly increased in accordance with the appropriate acceptance criteria?		
2.1.12	If non standard stress intensification factors were used, have they been calculated correctly and the stresses properly amplified?		
2.1.13	Are pipe breaks identified based on stress criteria?		
2.1.13	Other checks, explain.		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.2	COMBINED REACTIONS	______________	______________
2.2.1	Is appropriate combined reaction analysis included with this piping stress calculation package for all restraints, anchors and valve ends in this subsystem?		
2.2.2	Are all save tape load I.D.'s identified and input correctly?		
2.2.3	Have the subsystem name and reference design basis isometric drawing number been correctly identified in the computer input?		
2.2.4	Are all anchor and restraint information cards include the proper identification and description of all restrained data points?		
2.2.5	Are the load combinations correct as per approved procedures?		
2.2.6	If applicable, are the hydro weight load combinations considered properly?		
2.2.7	Are all snubbers and variable supports reviewed to determine if they can be replaced by rigid restraints in accordance with the appropriate acceptance criteria?		
2.2.8	Are all vertical rigid rod hangers and spring hangers loaded in tension?		
2.2.9	Are all elbow lug supports loaded in tension?		
2.2.10	Are all stanchion supports loaded in compression?		
2.2.11	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.3	COMBINED ACCELERATIONS	______________	______________
2.3.1	If the subsystem has any valves, is the combined acceleration analysis properly performed?		
2.3.2	Have the subsystem, design basis isometric drawings, and valve descriptions been correctly identified in the input?		
2.3.3	Are the correct data points specified for each valve (valve cg for three element valves and valve ends for single element valves)?		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.3.4	Have all save tape load I.D.'s been identified and input correctly?		
2.3.5	Are the load combinations correct as approved procedures?		
2.3.6	Are the coordinate system and units for valve accelerations consistent with those of the allowable accelerations?		
2.3.7	Are the valve accelerations within the allowable values?		
2.3.8	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.4	EQUIPMENT NOZZLE ALLOWABLE LOADS	______	______
2.4.1	Is there any equipment nozzle in this subsystem?		
2.4.2	Are the load combinations correct as per the vendor's recommendation?		
2.4.3	Are the coordinate system and units for the equipment nozzle loads consistent with those of the allowable loads provided by the manufacturers?		
2.4.4	Are the equipment nozzle loads within the allowable loads provided by the manufacturers?		
2.4.5	Are there any expansion joints in this subsystem?		
2.4.6	Are the expansion joint loads and displacements within the allowable values provided by the manufacturers?		
2.4.7	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.5	FLUED HEAD AND DRYWELL PENETRATION ALLOWABLE LOADS	______	______
2.5.1	Are there any penetrations in this subsystem?		
2.5.2	Are the load combinations correct as per the piping analyses from both sides of the penetration?		
2.5.3	Are the coordinate system and units for the penetration loads consistent with those of the allowable loads?		
2.5.4	Are the penetration loads within the allowable loads?		

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	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.5.5	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.6	CLASS 2&3 WELDED ATTACHMENT DESIGN		
2.6.1	Have calculations been performed for all integral welded attachments (e.g., shear lugs, stanchions, trunnions, elbow lugs, circumferential tugs) in this subsystem?		
2.6.2	Are the welded attachment dimensions in compliance with the reference design basis drawings?		
2.6.3	Are the welded attachment materials in compliance with the reference design basis drawings?		
2.6.4	Are the loads at all the welded attachment data points correctly obtained from the piping analysis?		
2.6.5	Are the primary pipe stresses at all the welded attachment data points correctly obtained from the piping analysis?		
2.6.6	Is the clamp fit-up (shim details) assumed in compliance with the reference design basis drawings?		
2.6.7	Are the assumptions clearly specified and correct?		
2.6.8	Are all the welded attachment designs performed in accordance with the' approved acceptance criteria?		
2.6.9	Are the directions and magnitudes of the loads correctly used in this design?		
2.6.10	For a piping subsystem, where the temperature is greater than the subsystem's ambient temperature, has the effect of friction loads been considered properly in the design of the stanchions on slide bearing supports?		
2.6.11	Is the temperature of each stanchion/trunnion support, modeled as a pipe element, specified at subsystems ambient temperature?		
2.6.12	Are the total pipe stresses (primary plus local) at all the welded attachment data points, within the		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	code allowable stresses?		
2.6.13	Have qualification calculations been performed for all welds which are not on the pipe but are part of the assembly?		
2.6.14	Has the accuracy of the design calculations been verified?		
2.6.15	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.7	WELDED ANCHOR ATTACHMENT DESIGN		
2.7.1	Have calculations been performed for all integral welded anchor attachments in this subsystem?		
2.7.2	Is the design input information for this calculation correct?		
2.7.3	Are the assumptions clearly specified and correct?		
2.7.4	Are all the welded anchor attachment designs performed in accordance with the approved acceptance criteria?		
2.7.5	If a structural anchor attachment is to be seismically designed, were the seismic loads considered from both sides of the anchor?		
2.7.6	Has the accuracy of the design calculations been verified?		
2.7.7	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.8	FUNCTIONAL CAPABILITY REQUIREMENTS		
2.8.1	Does the piping subsystem require a functional capability check as per as defined by approved procedures?		
2.8.2	Are the functional capability requirements properly addressed in this piping stress calculation package?		
2.8.3	Is the functional capability evaluation performed as per the requirements specified in approved procedures?		
2.8.4	Are the functional capability requirements		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	satisfied at all applicable data points in this subsystem?		
2.8.5	Are the allowable stresses used for the functional capability check correct?		
2.8.6	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.9	FLANGED JOINT ANALYSIS	________	________
2.9.1	Are there any flanged joints in this subsystem?		
2.9.2	Is the design input information for this calculation correct?		
2.9.3	Are the assumptions clearly specified and correct?		
2.9.4	Are all the flanged joint evaluations performed in accordance with approved procedures?		
2.9.5	Are the stresses at all the flanged joint data points within the code allowable stresses?		
2.9.6	Has the accuracy of the design calculations been verified?		
2.9.7	Other checks, explain.		

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Piping Design Review Checklist

ASME Class 1 Stress Analysis Checklist

Review Checklist No. and Subsections	Title	Applicability Yes (√)/ No (NA)
3.0	CLASS 1 PIPING STRESS ANALYSIS	______
3.1	FITTING INVENTORY	______
3.2	PIPING SYSTEM DESIGN BASIS PRESSURE TEMPERATURE TRANSIENT HISTORY (PTTH)GENERATION	______
3.3	HIGH AND LOW LOAD SET INVENTORY	______
3.4	HIGH AND LOW ENVELOPE LOAD SETS	______
3.5	THERMAL TRANSIENT STRESS ANALYSIS	______
3.6	ADDITIONAL FATIGUE THERMAL MODES	______
3.7	STRESS INDICES	______
3.8	COMPUTER STRESS ANALYSIS	______
3.9	HAND-PREPARED DESIGN CALCULATIONS	______
3.10	NB-3640 PRESSURE DESIGN EVALUATION NB-3643.1 MINIMUM THICKNESS OF PIPE WALL	______
3.11	NB-3642.1 MINIMUM THICKNESS OF PIPE WALL	______
3.12	NB-3643 PRESSURE DESIGN CALCULATIONS FOR SOCKET WELDED BOSS	______
3.13	COMPUTER OUTPUT REVIEW	______
3.14	CLASS 1 WELDED ATTACHMENT DESIGN	______
3.15	WELDED ANCHOR ATTACHMENT DESIGN	______
3.16	FLUED HEAD AND DRYWELL PENETRATION ALLOWABLE LOADS	______
3.17	EQUIPMENT NOZZLE ALLOWABLE LOADS	______
3.18	COMBINED ACCELERATIONS	______
3.19	FUNCTIONAL CAPABILITY REQUIREMENTS	______
3.20	NB-3658 FLANGED JOINT ANALYSIS	______

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Prepared by Signature Date

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.0	CLASS 1 PIPING STRESS ANALYSIS		
3. 1	FITTING INVENTORY	______________	______________
3.1.1	Are all thermal stress discontinuities (i.e., gamma plugs, valve ends, dissimilar metal welded joints, equipment nozzles, safe ends, branch connections, tees, SOLs, elbows, bends, reducers, flanges, couplings, penetrations, flued heads, shear lugs, trunnions, stanchions, welded anchors, etc.) properly identified?		
3.12	Are the material types properly used for each pipe size and pipe fitting from appropriate spool piece drawings?		
3.1.3	Is the data point representing the pipe fitting specified correctly based on the appropriate design basis reference drawings?		
3.1.4	Are the similar pipe fittings / discontinuities enveloped properly into representative but more conservative pipe fitting?		
3.1.5	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.2	PIPING SYSTEM DESIGN BASIS PRESSURE TEMPERATURE TRANSIENT HISTORY (PTTH) GENERATION	______________	______________
3.2.1	If applicable, for each line, has a PTTH been completed for each event as described in the original system thermal transient calculations?		
3.2.2	If applicable, are the following input data correctly used from the original system thermal transient calculations to the PTTH for each Line:		
a.	Piping fluid pressure time history?		
b.	Piping fluid temperature time history?		
c.	Piping fluid flow rate time history?		
d.	Equipment or header temperature time history?		
e.	Have all of the above time histories been synchronized?		
3.2.3	Are all load sets properly identified by additional event index numbers and event descriptions for the following:		
a.	Each piping fluid pressure maximum and		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	minimum?		
b.	Each piping fluid temperature maximum and minimum?		
c.	Each piping fluid flow rate maximum and minimum?		
d.	Each equipment or header temperature maximum and minimum?		
3.2.4	Are all static thermal expansion modes correctly identified for each load set?		
3.2.5	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.3	HIGH AND LOW LOAD SET INVENTORY	______	______
3.3.1	Is the following information recorded correctly for each high/low load set?		
a.	Load Set ID number and corresponding event description?		
b.	Piping fluid temperature?		
c.	Piping fluid pressure?		
d.	Equipment or header temperature?		
e.	Piping temperature change, rate and total temperature change(ΔT)?		
f.	The design basis number of occurrences associated with each event?		
3.3.2	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.4	HIGH AND LOW ENVELOPE LOAD SETS	______	______
3.4.1	Are all load sets identified previously included correctly in an envelope load set?		
3.4.2	Is each load set grouped as follows for High/Low envelope load sets:		
a.	Similar maximum/minimum piping fluid temperatures and pressures?		
b.	Similar maximum/minimum equipment or header temperatures?		
c.	Similar magnitudes for piping temperature change rates and flow rates?		
3.4.3	Is the following information referred to each		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	high envelope load set correctly defined to represent the group:		
a.	The highest piping fluid pressure?		
b.	The largest temperature change rate?		
c.	The largest fluid flow rate for each line?		
d.	The thermal expansion mode with the highest piping fluid temperature and equipment or header temperature?		
e.	If the enveloped event has no fluid flowing, is the appropriate equipment or header connection thermal expansion mode used?		
f.	The assigned number of occurrences for the envelope load set equal to the summation of the number of occurrences of individual load set that they represent?		
g.	The maximum temperature distribution range?		
3.4.4	Is the following information referred to each low envelope load set correctly defined to represent the group:		
a.	The lowest piping fluid pressure?		
b.	The largest temperature change rate?		
c.	The largest fluid flow rate for each line?		
d.	The thermal expansion mode with the lowest piping fluid temperature and equipment or header temperatures?		
e.	If the enveloped event has no fluid flowing, is the appropriate equipment or header connection thermal expansion mode used?		
f.	The assigned number of occurrences for the envelope load set equal to the summation of the number of occurrences of individual load set that they represent?		
g.	The maximum temperature distribution range?		
3.4.5	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.5	THERMAL TRANSIENT STRESS ANALYSIS	____ __________	______________
3.5.1	Is the temperature distribution of all axisymmetric solids (e.g., pipe fittings and all straight pipe weld locations) which experience a flow thermal transient condition evaluated based on non-linear heat transfer program?		

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	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.5.2	Is the temperature distribution of all axisymmetric solids (e.g., pipe fittings and all straight pipe weld locations) which experience a no flow thermal transient condition evaluated properly?		
3.5.3	Are all input data for pipe fitting dimensions specified correctly based on the appropriate design basis reference drawings?		
3.5.4	Are the thermal transient forcing function parameters of fluid (i.e. flow rate, conductivity, viscosity, Reynolds Number, Prandtl Number, film coefficient, density, velocity) evaluated at appropriate temperatures?		
3.5.5	Are the thermal transient forcing function parameters of material (i.e. thermal conductivity, specific heat, density, Young's Modulus of Elasticity, coefficient of thermal expansion)evaluated at appropriate temperatures?		
3.5.6	Are the fluid flow and no flow thermal transient conditions consistent with the PTTH's?		
3.5.7	Are the thermal transients to be forced on the model consistent with PTTH and envelope load sets?		
3.5.8	Are the d/t values (d = inside diameter of pipe fitting, t = average thickness of pipe fitting) correctly evaluated on either side of the gross structural and/or material discontinuity location?		
3.5.9	Are the time increments and number of time step's correctly specified for the forcing function to obtain an accurate solution?		
3.5.10	Are all events run for the appropriate time to obtain maximum stresses?		
3.5.11	Is the ambient temperature correctly specified?		
3.5.12	Is a sufficient length of pipe analyzed for no fluid flow thermal transient condition?		
3.5.13	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.6	ADDITIONAL FATIGUE THERMAL MODES	________	________
3.6.1	Does every high and low envelope Load set		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	have a fatigue thermal mode associated with it?		
3.6.2	Is the temperature correctly specified at every pipe element?		
i.6.3	Is the stagnant fluid temperature profile correctly specified for 'No Flow' condition?		
3.6.4	Have equipment or header movements been evaluated at the correct temperature for all specified thermal modes?		
3.6.5	Are all stresses and displacements reasonable for each fatigue thermal mode?		
3.6.6	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.7	STRESS INDICES	______	______
3.7.1	Are the data point types correctly specified for each pipe fitting or discontinuity in the Basic Data?		
3.7.2	Are the data point types correctly specified for all elbow/elbow or bend/elbow butt welded joints (or butt welded joints separated by less than 1 pipe OD)?		
3.7.3	Are the indices correctly specified for all taps on elbows or bends?		
3.7.4	Are the indices correctly specified and referenced for all gamma plugs?		
3.7.5	Are the indices correctly specified and referenced for all reducing elbows?		
3.7.6	Are the data point types correctly specified for ..ll reducers?		
3.7.7	Are the reducer cone angle a, distances L1 and L2 correctly specified?		
3.7.8	If the answer to 3.7.7 is are these values based upon approved sketches?		
3.7.9	If indices are calculated using the applicable computer program or other applicable methods, are these properly documented and referenced in this piping stress calculation-on package?		
3.7.10	Other checks, explain.		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.8	CLASS 1 COMPUTER STRESS ANALYSIS		
3.8.1	Are all the data points in every Class A portion of this piping system correctly specified?		
3.8.2	Has the fatigue curve been correctly specified?		
3.8.3	Are the values of 'Sm' (Design Stress Intensity) and 'Sy'(Yield Strength) for pipe and fitting evaluated at the maximum operating temperature?		
3.8.4	Are the save tape ID numbers correctly specified for all applicable loads?		
3.8.5	Are the number of cycles correctly specified for all applicable fatigue Loads?		
3.8.6	If applicable, is the correct multiplication factor specified for each load?		
3.8.7	Does every high and low envelope load set have a pressure mode associated with it?		
3. 8.8	Is the pressure correctly specified at each data point in the Class A port-ion of this piping system?		
3.8.9	Is the assigned number of cycles for each pressure mode equal to the summation of the number of occurrences of all envelope load sets that they represent?		
3.8.10	Is the design pressure mode correctly specified in Code Equation 9?		
3.8.11	Do all data points in every Class A portion of this piping system have a set of thermal transient stresses specified for each high and low envelope load set?		
3.8.12	Are the thermal transient stresses used in the Stress analysis input deck/file element obtained from the appropriate thermal transient computer run?		
3.8.13	Is the proper sign convention assigned for each thermal transient stress value?		
3.8.14	For Lines with temperature distribution analysis, has the proper sign convention been assigned for the (TA-TB) stress terms based on different Section A and Section B definition?		
3.8.15	If time phasing is applied for transient stresses, is it properly used and documented?		
3.8.16	Has one stress range been defined, including all high and low envelope load sets? 3.8.17 Are the thermal, pressure and thermal transient modes		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	properly specified together, as defined by each high and low envelope load set?		
3.8.17	Are the thermal, pressure and thermal transient modes properly specified together, as defined by each high and low envelope load set?		
3.8.18	Is the number of cycles correctly specified for each mode, corresponding to the number of cycles of the envelope load set that it represents?		
3.8.19	Is a detailed computer output for Piping Stress Analysis included with this piping stress calculation package?		
3.8.20	Are the load combinations correctly specified as per applicable guidelines?		
3.8.21	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.9	HAND-PREPARED DESIGN CALCULATIONS	________________	________________
3.9.1	Are the hand-prepared design calculations properly documented in accordance with the applicable guidelines?		
3.9.2	Has a procedure or method of design calculations been properly referenced and defined?		
3.9.3	Is the input data from other piping stress calculation packages or sources properly referenced and identified in this piping stress calculation package?		
3.9.4	If any non-standard formulas, equations, constants, etc., are used, are they properly referenced and identified or are the supporting derivations included in this piping stress calculation package?		
3.9.5	Are the design calculations logically composed and justifiable for their intended purpose?		
3.9.6	Has the accuracy of the design calculations been verified?		
3.9.7	Other checks, explain,.		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.10	NB-3640 PRESSURE DESIGN EVALUATION NB-3641.1 MINIMUM THICKNESS OF PIPE WALL	________	________
3.10.1	Is the design pressure correct?		
3.10.2	Is the minimum thickness of pipe wall correctly specified per the ASTM Specification		
3.10.3	Is the corrosion allowance correctly included 'to determine the minimum thickness of pipe wall as per the reference acceptance criteria?		
3.10.4	Is the ratio of "Actual Minimum Thickness of Pipe Wall" to the "Required Minimum Thickness of Pipe Wall" greater than or equal to 3.0? i.e. ta/tm >3.0		
3.10.5	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.11	NB-3642.1 MINIMUM THICKNESS OF PIPE WALL	________	________
3.11.1	Is the design pressure correct?		
3.11.2	Is the minimum thickness of pipe wall correctly specified per the ASTM Specification?		
3.11.3	Is the corrosion allowance correctly included to determine the minimum thickness of pipe wall as per the reference acceptance criteria?		
3.11.4	Has the required minimum thickness of pipe wall been increased by 20%?		
3.11.5	Is the ratio of Actual Minimum Thickness of Pipe Wall" to the "Required Minimum Thickness of Pipe Wall" greater than or equal to 3.0?(i.e., ta/tm > 3.0		
3.11.6	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.12	NB-3643 PRESSURE DESIGN CALCULATIONS FOR SOCKET WELDED BOSS	________	________
3.12.1	Are the openings for all socket welded bosses evaluated?		
3.12.2	Are the values of "Sin" (Design Stress Intensity) for the pipe and pipe fitting evaluated at the		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	design temperature?		
3.12.3	Is the ratio of the "Total Available Reinforcement" to the "Required Reinforcement" greater than or equal to 3.0? ie AA/A ≥ 3.0		
3.12.4	Is the ratio of the area bounded by the "Reinforcement Limit" to the "Required Reinforcement," greater than or equal to 2/3?(i.e., AA/A ≥ 2/3)		
3.12.5	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.13	COMPUTER OUTPUT REVIEW	________	________
3.13.1	Is the ASME Boiler and Pressure Vessel Code Equation 9 satisfied at each data point?		
3.13.2	Is Code Equation 10 or Equations 12 and 13 satisfied at each data point in the Class A portion of this piping system?		
3.13.3	Is the Cumulative Usage Factor at each data point on Class A portion of this piping system 3.0?		
3.13.4	Have all pipe nodes in a break exclusion area met the ASME Boiler and Pressure Vessel Code, Section III, NB-3600 pipe rupture criteria		
a.	Cumulative Usage Factor < 0.1		
b.	Eq. 10 or Eq. 12 and Eq. 13 < 2.4 Sm		
3.13.5	Are pipe breaks identified based on stress criteria?		
3.13.6	Are all pipe fittings, meshes, PTTH's, transient results and computer runs included with this piping stress calculation package properly documented		
3.13.6	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.14	CLASS 1 WELDED ATTACHMENT DESIGN	________	________
3.14.1	Have calculations been performed for all integral welded attachments (e.g., shear lugs, stanchions, trunnions, elbow lugs, circumferential lugs) in the Class A portion of this piping system?		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.14.2	Are the welded attachment dimensions in compliance with the spool piece drawings?		
3.14.3	Are the welded attachment materials in compliance with the spool piece drawings?		
3.14.4	Are the loads at all the welded attachment data points correctly obtained from the piping analysis?		
3.14.5	Is the clamp fit-up (shim details) assumed in compliance with the reference design basis drawings?		
3.14.6	Are the assumptions clearly specified and correct?		
3.14.7	Are the welded attachment designs performed in accordance with the approved acceptance criteria?		
3.14.8	Are the directions and magnitudes of the loads correctly used in this design?		
3.14.9	For a piping subsystem, where? the temperature is greater than the subsystem's ambient temperature, has the effect of friction loads been considered properly in the design of the stanchions on slide bearing supports?		
3.14.10	Is the temperature of each stanchion/trunnion support, modeled as a pipe element, specified at subsystem's ambient temperature?		
3.14.11	Are the pipe bending moments at the welded attachment location correctly specified?		
3.14.12	Are the primary Load combinations correctly specified as per applicable guidelines?		
3.14.13	Are the maximum load combinations conservatively specified?		
3.14.14	Are the thermal, pressure and thermal transient modes properly specified together, as defined by each high and tow envelope load set?		
3.14.15	Are the number of cycles correctly specified for all applicable fatigue loads?		
3.14.16	Are the fatigue load combinations correctly specified as per applicable guidelines?		
3.14.17	Are the total pipe stresses(primary plus local) at all the welded attachment data points in this subsystem within the code allowable stresses?		
3.14.18	Have qualification calculations been performed for all welds which are not on the pipe but are within scope of work?		
3.14.19	Has the accuracy of the design calculations been verified?		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.14..20	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.15	WELDED ANCHOR ATTACHMENT DESIGN	______	______
3.15.1	Have calculations been performed for all integral welded anchor attachments in the Class A portion of this piping system?		
3.15.2	Is the design input information for these calculations correct?		
3.15.3	Are the assumptions clearly specified and correct?		
3.15.4	Are all the welded anchor attachment designs performed in accordance with the approved acceptance criteria?		
3.15.5	If a structural anchor is to be seismically designed, are the seismic Loads properly considered from both sides of the anchor?		
3.15.6	Has the accuracy of the design calculations been verified?		
3.15.7	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.16	FLUED HEAD AND DRYWELL PENETRATION ALLOWABLE LOADS	______	______
3.16.1	Are there any penetrations in the Class A portion of this subsystem?		
3.16.2	Are the load combinations correct as per the piping analysis from both sides of the penetration?		
3.16.3	Are the coordinate system and units for the penetration Loads consistent with those of the allowable Loads? Are the penetration loads within the allowable loads?		
3.16.4	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.17	EQUIPMENT NOZZLE ALLOWABLE	______	______

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	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	LOADS		
3.17.1	Is there any equipment nozzle in the Class A portion of this subsystem?		
3.17.2	Are the load combinations correct as per the vendor's recommendation?		
3.17.3	Are the equipment nozzle loads within the allowable loads provided by the manufacturers?		
3.17.4	Are there any expansion joints in this subsystem.		
3.17.5	Are the expansion joint loads and displacements within the allowable values provided by the manufacturers?		
3.17.6	Are the coordinate system and units for the equipment nozzle loads consistent with those of the allowable loads provided by the manufacturers?		
3.17.7	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.18	COMBINED ACCELERATIONS		
3.18.1	If the piping system has any valves, is the combined acceleration analysis properly performed?		
3.18.2	Have the piping subsystem, design basis isometric drawings, valve I.D.'s and valve descriptions been correctly identified in the input?		
3.18.3	Have all save tape load I.D.s been identified and input correctly?		
3.18.4	Are the load combinations correct as per applicable guidelines?		
3.18.5	Are the correct data points specified for each valve (valve C.C. for three element valves and valve ends for single element valves)?		
3.18.6	Are the coordinate system and units for the valve accelerations consistent with those of the allowable accelerations?		
3.18.7	Are the valve accelerations within the allowable values?		
3.18.8	Other checks, explain.		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.19	FUNCTIONAL CAPABILITY REQUIREMENTS	______________	______________
3.19.1	Does the piping subsystem require a functional capability check as per applicable guidelines?		
3.19.2	Are the functional capability requirements properly addressed in this piping stress calculation package?		
3.19.3	Are the functional capability requirements satisfied at all applicable data points in this subsystem? Are the Functional capability evaluation performed as per the requirements specified in applicable guidelines?		
3.19.4	Are the allowable stresses used for the functional capability check correctly specified?		
3.19.5	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.20	NB-3658 FLANGED JOINT ANALYSIS	______________	______________
3.20.1	Are there any flanged joints in the Class A portion of this subsystem?		
3.20.2	Is the design input information for this calculation correct?		
3.20.3	Are the assumptions clearly specified and correct?		
3.20.4	Are all the flanged joint evaluations performed in accordance with approved procedures?		
3.20.5	Are the stresses at all the flanged joint data points within the code allowable stresses?		
3.20.6	Has the accuracy of the design calculations been verified?		
3.20.7	Other checks, explain.		

Piping Design Review Checklist

Hydraulic Transient Analysis Checklist

Review Checklist No. and Subsections	Title	Applicability Yes (√)/ No (NA)
4.0	HYDRAULIC TRANSIENT ANALYSIS	__________

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	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
4.0	HYDRAULIC TRANSIENT ANALYSIS		
4.1	Is the analyzed subsystem modeled as a set of consecutive piping leg segments?		
4.2	Are elbows, branch connections, reducers or an intersecting point appropriately treated as leg ends?		
4.3	Is the program applicable for the calculation of pressure, velocity and force transients in a liquid filled piping system?		
4.4	Are the following input quantities correct for each of the hydraulic transient events?		
a.	Piping material property		
b.	Piping inside diameter		
c.	Number of piping legs		
d.	Piping leg segments		
e.	Number of junctions		
f.	Fluid flow 'velocity		
g.	Fluid flow weight density		
h.	Hydraulic grade line		
l.	Piping leg segment reference elevation datum		
j.	Valve closure time		
k.	Vessel pressure		
l.	Pump characteristics		
4.5	Are the different sets of boundary condition characteristics for pump, valve, check valve, tank, pressurizer, etc., properly considered in the water hammer transient computations?		
4.6	Are the number of time steps correct between printing of results?		
4.7	Are the numb[illegible] of time steps correct between result output [illegible] saved file?		
4.8	Is the satura[illegible] pressure of the fluid evaluated at appropriat[illegible] te[illegible]peratures of the piping system?		
4.9	Is the am[illegible]bient pressure of the fluid coded correct[illegible]?		
4.10	Is the Darcy Weisbach Friction Factor(DWFF) or equivalent appropriately used to calculate friction factors for piping legs with zero velocity?		
4.11	Is the following time information correctly speci[illegible] such that an accurate solution will be obtained?		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
a.	Time step		
b.	Run end time		
c.	Save file end time		
4.12	Are the following specified junction description correctly coded?		
a.	Junction name		
b.	Junction type		
c.	Maximum pressure difference indicator		
d.	Elevation		
e.	Resistance coefficient		
4.13	Is the input data applicable for these design calculations?		
4.14	Is the force time history output correct at all piping leg segments?		
4.15	Is the file name of saved file properly documented in this piping analysis?		
4.16	Are the design calculations properly documented in accordance with approved procedures or criteria documents?		
4.17	Have all of the reference design document been sufficiently identified by author, title, revision, date, drawing number, file number, etc.?		
4.18	Are there any open assumptions or input data used that must be verified in the future?		
4.19	Has all of the input data been approved for use in these design calculations?		
4.20	Other checks, explain.		

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Interaction Analysis Checklist

Review Checklist No. and Subsections	Title	Applicability Yes (√)/ No (NA)
5.0	INTERACTION ANALYSIS	________________
5.1	PROCEDURES/METHODOLOGIES	________________
5.2	ENGINEERING JUDGMENTS	________________
5.3	REFINED REQUIRED CLEARANCE CALCULATIONS	________________
5.4	COMPUTER-AIDED ANALYSIS	________________
5.5	DOCUMENTATION OF-DESIGN CALCULATIONS	________________

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	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
5.0	INTERACTION ANALYSIS		
5.1	PROCEDURES/METHODOLOGIES	______	______
5.1.1	Are the required interaction calculations properly performed in accordance with the approved acceptance criteria?		
5.1.2	Are all potential interactions justifiably resolved?		
5.1.3	Is the methodology used to resolve a specific interaction (e.g., Engineering Judgments, Refined Required Clearance calculations, Impact Analyses, etc.) clearly identified?		
5.1.4	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
5.2	ENGINEERING JUDGMENTS	______	______
5.2.1	Are all engineering judgments used to resolve the interactions logically composed with adequate explanations and clearly documented in these piping interaction identification calculations?		
5.2.2	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
5.3	REFINED REQUIRED CLEARANCE CALCULATIONS	______	______
5.3.1	Are the partial clearances of interacting components properly determined?		
5.3.2	Are the required total clearances of the interacting components properly evaluated?		
5.3.3	Are the as-built clearances appropriate to resolve the interactions considering the calculated required total clearances?		
5.3.4	Other checks, explain.		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
5.4	COMPUTER-AIDED ANALYSIS	______	______
5.4.1	Is the program applicable for this calculation?		
5.4.2	Does the input data:		
a.	Conform with the design input?		
b.	Correctly define the problem for the program algorithm?		
c.	Contain sufficient accuracy to produce results within any numerical Limitation of the program?		
5.4.3	Are the results:		
a.	Consistent with the input?		
b.	Correct and within the stated assumptions and limitations of the program?		
c.	If a programmable calculator or microcomputer generated program was used in this analysis is the program file audit trail as used by the preparer adequate?		
d.	Are the methodologies used in the validation adequately validate the program for this application?		
5.4.4	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
5.5	DOCUMENTATION OF DESIGN CALCULATIONS	______	______
5.5.1	Are the interaction design calculations properly documented in accordance with approved procedures or criteria?		
5.5.2	Is the following information recorded correctly in this piping interaction calculations?		
a.	Purpose		
b.	Input Data		
c.	Assumptions		
d.	References		
5.5.3	Have the reason and the scope of work for the design calculations been clearly stated?		
5.5.4	Are the assumptions clearly specified and correct?		
5.5.5	Has all of the input data been approved for use in these design calculations?		
5.5.6	Is the input data applicable for these design calculations?		
5.5.7	Are there any open assumptions or input data		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	used that must be verified in the future?		
5.5.8	If the answer to 5.5.7 is "Yes," has it been clearly stated?		
5.5.9	Have all of the reference design documents been sufficiently identified by author, title, revision, date, drawing number, tile number, etc.?		
5.5.10	Has all of the design information been satisfactorily evaluated?		
5.5.11	Other checks, explain.		

Piping Design Review Checklist

Pipe Rupture Calculations and Design Considerations Checklist

Review Checklist No. and Subsections	Title	Applicability Yes (√)/ No (NA)
6.0	PIPE RUPTURE CALCULATIONS	________
6.1	DETERMINATION OF PIPE BREAK AND RESTRAINT LOCATIONS	________
6.2	PIPE DATA	________
6.3	RESTRAINT LOAD CALCULATIONS	________
6.4	SUPPORT LENGTH, OVERHANG LENGTH AND GAP DATA	________
6.5	COMPUTER-AIDED DESIGN CALCULATIONS	________
6.6	HAND PREPARED DESIGN CALCULATIONS	________
6.7	DOCUMENTATION OF DESIGN CALCULATIONS	________

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Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
6.0	PIPE RUPTURE CALCULATIONS		
6.1	DETERMINATION OF PIPE BREAK AND RESTRAINT LOCATIONS	______	______
6.1.1	Is the high energy portion of the subsystem properly identified based on the P&ID and/or equivalent identifying document?		
6.1.2	Are pipe breaks postulated in accordance with the approved acceptance criteria?		
6.1.3	If the answer to 6.1.2 is "No," has the design basis of postulated pipe break locations been identified?		
6.1.4	Are the pipe break numbers and locations properly marked on the design basis drawings?		
6.1.5	Are the restraint numbers and locations properly marked on the design basis drawings?		
6.1.6	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
6.2	PIPE DATA	______	______
6.2.1	Does the following pipe data shown in the pipe whip restraint design data tables agree with the data used for the piping analysis?		
a.	Piping diameter		
b.	Piping wall thickness		
c.	Fluid flow area		
d.	Unit weight		
e.	Plastic moment		
f.	Fluid pressure and temperature		
6.2.2	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
6.3	RESTRAINT LOAD CALCULATIONS	______	______
6.3.1	Are the pipe whip restraint blow down force calculations performed in accordance with the approved acceptance criteria?		
6.3.2	Does the point of application and orientation of the load on the restraint acting in the plane of the		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	restraint agree with the design basis drawings and approved acceptance criteria?		
6.3.5	Are the tip weights property calculated?		
6.3.6	If applicable, are the reaction-deflection curves or restraint force time histories properly generated?		
6.3.7	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
6.4.	SUPPORT LENGTH, OVERHANG LENGTH AND GAP DATA	____________	____________
6.4.1	Is the applicable support length properly calculated?		
6.4.2	Is the overhang length property calculated?		
6.4.3	Are the gaps properly calculated?		
6.4.4	If the answer to 6.4.3 is "Yes," has the design bases used to calculate the gaps been noted properly in the pipe whip restraint design data tables?		
6.4.5	Is the final overhang length and gap data based on as built documentation?		
6.4.6	Is the final piping thermal analysis based on the as built routing?		
6.4.7	Has the original pipe whip restraint design input data tables been updated, to reflect the final overhang length and gap data?		
6.4.8	Other checks, expiain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
6.5	COMPUTER-AIDED DESIGN CALCULATIONS	____________	____________
6.5.1	Is the following information identified ?		
a.	Program Acronym		
b.	Program lumber		
c.	Run I.D.		
d.	Run Date		
6.5.2	Is the program applicable for the design calculation?		
6.5.3	Does the input data:		
a.	Conform with the design input?		

Piping Design Review Checklist

b. Correctly define the problem for the program algorithm?
c. Contain sufficient accuracy to produce results within any numerical limitation of the program?
6.5.4 Are the results:
a. Consistent with the design input?
b. Correct and within the stated assumptions and limitations of the program?
6.5.5 For dynamic transient analysis, have the adequacy of the following been verified by response spectra time history?
a. Integration time' step
b. Time duration of integration
6.5.6 For dynamic transient analysis, are the damping constants and correct?
6.5.7 If static analysis is used, have satisfactory justifications been provided?
6.5.8 Other checks, explain.

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
6.6	HAND PREPARED DESIGN CALCULATIONS	______________	______________
6.6.1	Has a procedure or method of design calculations been properly referenced and defined?		
6.6.2	Is the input data from other piping stress calculation packages or sources properly referenced and identified?		
6.6.3	If any non-standard formulas, equations, constants, etc., are used, are they properly referenced?		
6.6.4	Are the design calculations logically composed and justifiable for their intended purpose?		
6.6.5	Other checks, explain.		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
6.7	DOCUMENTATION OF DESIGN CALCULATIONS	______________	______________
6.7.1	Are the pipe rupture design calculations properly documented?		
6.7.2	Is the following information recorded correctly in this piping stress calculation package?		
a.	Purpose		
b.	Input Data		

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	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
c.	Assumptions		
d.	References		
6.7.3	Have the reason and the scope of work for the design calculations been clearly stated?		
6.7.4	Are the assumptions clearly specified and correct?		
6.7.5	Has all of the input data been approved for use in these design calculations?		
6.7.6	Is the input data applicable for these design calculations?		
6.7.7	Are there any open assumptions or input data used that must be verified in the future?		
6.7.8	If the answer to 6.7.7 is "Yes," has it been clearly stated?		
6.7.9	Have all of the reference design documents been sufficiently identified by author, title, revision, date, drawing number, file number, etc.?		
6.7.10	Has all of the design information been justifiably evaluated?		
6.7.11	Other checks, explain.		

Piping Design Review Checklist

Resolution of Change Documents and As Built Analysis Checklist

Review Checklist No. and Subsections	Title	Applicability Yes (√)/ No (NA)
7.0	RESOLUTION OF CHANGE DOCUMENTS AND AS -BUILT ANALYSIS	______________

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	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
7.0	RESOLUTION OF CHANCE DOCUMENTS	__________	__________
7.1	Is the information contained in the design change documents properly compared and evaluated with the as analyzed condition based on the requirements of appropriate acceptance criteria?		
7.2	Are all design change document dimensions, angularity, etc., within the allowable tolerance limits?		
7.3	Are all outside of tolerance dimensions, angularity, etc., justifiably resolved?		
7.4	If the answer to 7.3 is "Yes," are the required reconciliation calculations, reanalysis, logically composed engineering judgments, etc., properly included in these design calculations?		
7.5	Are the pipe stresses within the applicable code allowable?		
7.6	Are the support loads affected?		
7.7	If the answer to 7.6 is "Yes," is the support design verified?		
7.8	Are all equipment nozzle loads within the allowable loads provided by the manufacturers?		
7.9	Are the valve accelerations within the allowable values?		
7.10	if applicable, is the rated fluid flow still maintained considering the effect of design change documents?		
7.11	Has the information contained in the design change documents been approved for use?		
7.12	Are there any open items that must be verified in the future?		
7.13	If the answer to 7.12 is yes has it been clearly stated?		
7.14	Have all of the reference design documents been sufficiently identified by author, title, revision, date, drawing number, file number, etc.?		
7.15	Has all of the design information been justifiably evaluated?		
7.16	Are the resolutions of design change documents properly documented in accordance with applicable guidelines?		
7.17	Other checks, explain.		

Piping Design Review Checklist

Simplified Small Bore Piping and Tubing Analysis Checklist

Review Checklist No. and Subsections	Title	Applicability Yes (√)/ No (NA)
8.0	SIMPLIFIED SMALL BORE PIPING AND TUBING ANALYSIS	______
8.1	PRESSURE STRESS	______
8.2	GRVITY LOAD	______
8.3	THERMAL EXPANSION	______
8.4	SEISMIC ANALYSIS	______
8.5	EFFECTIVE WEIGHT	______
8.6	SEISMIC ANCHOR MOVEMENT (SAM)	______
8.7	NON OPERATING VENTS AND DRAINS	______
8.8	BUILDING SETTLEMENT	______

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	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
8.0	Simplified Small Bore Piping and Tubing Analysis		
8.1	PRESSURE STRESS	______	______
8.1.1	Is the correct internal pressure (P) used?		
8.1.2	Is the correct pipe outside diameter (D)used?		
8.1.3	Is the correct pipe schedule used?		
8.1.4	Is the correct factor (K) used from applicable guidelines for stainless and carbon steel?		
8.1.5	If pipe is other than given in applicable guidelines, is the factor (K) properly calculated?		
8.1.6	Is the longitudinal pressure stress calculated correctly?		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
8.2	GRAVITY LOAD	______	______
8.2.1	Is the pipe insulated?		
8.2.2	If yes, is the insulation density specified ?		
8.2.3	If yes to 8.2.1, is the insulation thickness specified?		
8.2.4	Is the pipe contents liquid or gas?		
8.2.5	Is the pipe material carbon or stainless steel, or copper tubing?		
8.2.6	Are all support spacing within the allowable spans given in applicable guidelines?		
8.2.7	Are all support loads calculated correctly?		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
8.3	THERMAL EXPANSION	______	______
8.3.1	Is the correct value of Young's Modulus (E) used?		
8.3.2	Is the correct change in pipe temperature (ΔT) used?		
8.3.3	Is the correct coefficient of linear expansion for the metal used?		
8.3.4	Is the correct length of cold pipe used?		
8.3.5	Is the pipe thermal expansion calculated correctly?		
8.3.6	Is the correct offset length for thermal expansion		

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	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	used?		
8.3.7	Have the pipe stresses been used with correct S.I.F.?		
8.3.8	Is the number of equivalent full temperature cycles available?		
8.3.9	Is the allowable stress in cold and hot condition correct?		
8.3.10	Is the 'S' allowable calculated correctly?		
8.3.11	Were correct pipe stresses obtained from applicable guidelines?		
8.3.12	Were correct support reactions obtained from applicable guidelines?		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
8.4	SEISMIC ANALYSIS	______________	______________
8.4.1	Are guides provided at all concentrated masses, at all extended masses, and at each change of direction		
8.4.2	Is the support spacing within allowable?		
8.4.3	Were the correct guidelines used with respect to the system locations within the plant?		
8.4.4	Were correct support reactions obtained from applicable guidelines?		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
8.5	EFFECTIVE WEIGHT	______________	______________
8.5.1	Were correct pipe spans considered in calculation for each seismic restraint?		
8.5.2	Are the effective weights calculated correctly?		
8.5.3	Have all three directions (x,y,z) been considered?		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
8.6.	SEISMIC ANCHOR MOVEMENT "SAM"	______________	______________
8.6.1	Is the small pipe connected to a large pipe		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
	(header)?		
8.6.2	Is the small pipe connected to equipment?		
8.6.3	Is pipe passing through and anchored to a floor?		
8.6.4	Is the pipe anchored to a wall going to another building?		
8.6.5	Is the small pipe in one building connected to same structure or floor?		
8.6.6	Are header, equipment, or anchor displacements correct and properly documented?		
8.6.7	Were seismic displacements of the wall/floor, where the first support in each direction is, added to the header, equipment or anchor displacements?		
8.6.8	If the answer to 8.6.2 is yes, are any of the first supports connected to the same floor/wall as the equipment or anchor?		
8.6.9	If the answer to 8.6.8 is yes, was pipe checked for flexibility above and below the floor?		
8.6.10	If yes to 8.6.4, were seismic displacements assumed out of phase?		
8.6.11	Is the total of header, equipment, or anchor displacements less than 1/16 inch?		
8.6.12	If no to 8.6.11, is there enough piping flexibility to absorb there displacements using tables?		
8.6.13	Were correct pipe stresses obtained?		
8.6.14	Were correct support reactions obtained?		

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
8.7.	NON-OPERATING VENTS AND DRAINS	____________	____________
8.7.1	Is vent or drain of a type that is prequalified pr approve procedures?		
8.7. 2	Are the dimensions within tolerance?		
8.7.3	Are valve-weights available and not greater than than the prequlified cases?		
8.7.4	if the answer to 8.7.1, 2 or 3 is no are unique calculations prepared?		

Piping Design Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
8.8	BUILDING SETTLEMENT	____________	____________
8.8.1	Is piping passing through one building to another?		
8.8.2	If yes, was a 3/4 inch vertical movement applied at first vertical seismic support?		
8.8.3	If a spring support is present between the first seismic support, is it capable of accommodating a 3/4 inch in vertical displacement?		
8.8.4	Were correct pipe stresses obtained?		
8.8.5	Were they added to thermal and "SAM" stresses?		
8.8.6	Were correct support reactions on both sides of seismic joint?		

Piping Design Review Checklist

Other Analytical Topics Checklist

Review Checklist No. and Subsections	Title	Applicability Yes (√)/ No (NA)
9.0	Other Analytical Topics List topics below with disposition (Acceptable or Unacceptable) . Comments are to be entered on a Design Review Comment Form.	______________

______________________________ ______________________________ ______________

Prepared by Signature Date

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-17, Rev. 0

Setpoint Database Review

Prepared by:	J.W. DeMarco	JW DeMarco	4/28/97
	Name	Signature	Date
Approved by:	A A. NERI	[signature]	4/28/97
	Name	Signature	Date

IMPLEMENTATION

System			
Modification No./ Description			
Verified by:		Date:	
Concurrence by:		Date:	

Setpoint Database Review

Instructions

This checklist supplements PI-MP3-02 and is used to document the review of I&C design for a modification. A single checklist shall be used for a given modification. The checklist shall be completed in accordance with the following instructions:

a. The Verifier shall review the I&C design for the modification against each attribute listed on Page 3 of the checklist.

b. The Verifier shall indicate for each attribute whether the I&C design is satisfactory or unsatisfactory. If the attribute is not applicable, the Verifier shall indicate NA in both columns.

c. The Verifier shall assign a sequential comment number to each response indicated on Page 3 and shall use the Page 4 comment sheet to provide justification for the responses on Page 3. Multiple Page 4's may be used. The justification shall reference the section of the modification package reviewed for which the comment is applicable.

d. Comments shall be processed as discrepancies in accordance with PI-MP3-11.

e. When completed, the Verifier shall sign and date the checklist cover sheet.

f. The Lead Verifier shall indicate concurrence on the cover sheet that the I&C Design Review of the modification has been adequately completed.

g. The Lead Verifier shall compile the individual checklists and enter the Modification number on each sheet, number the sheets sequentially and sign the cover sheet. The sheet numbers shall be sequentially numbered (i.e., 1, 2, 3, etc.). It is acceptable to add insert pages (i.e., 1A, 1B, 1C, etc.) if needed.

h. The cover sheet and all applicable checklists and comment forms shall be included in the final project file copy.

Setpoint Database Review

	Attributes	Satisfactory	Unsatisfactory	Comment
1.	The governing procedure at the time the setpoint change was made is determined as either NGP 3.16 or Design Control Manual, Rev. 3.	______	______	______
2.	Additions, deletions, and modifications to the Master Setpoint list, such as: setpoint value, allowable tolerances, quality classification, Setpoint Change Record (SCR) number, and supplemental information has been properly documented.	______	______	______
3.	Changes to reference information in the MSI such as database description, type of setpoint description, controlling department, responsible person, or mechanism of control have been properly documented.	______	______	______
4.	Changes to the loading sequence on affected electrical bus which in turn affect sequence timing have been appropriately documented.	______	______	______
5.	Changes to a relay setting or changes in any way to a protective device (i.e., fuse, breaker, undervoltage, under-frequency tolerance, etc.) have been properly documented.	______	______	______
6.	Changes to instruments which required a setpoint change have been properly identified and documented.	______	______	______
7.	Changes to a setpoint in a microprocessor-based component have been properly documented.	______	______	______
8.	The appropriate technical data sheet was filled out and submitted in the SCR as data input for the Setpoint Database change.	______	______	______

____________________________ ______________________________

Setpoint Database Review

Prepared by	Signature	Date

Setpoint Database Review

Setpoint Database Review Comment Form

Comment No.	Comment

Prepared by ______________ Signature ______________ Date ______________

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-18, Rev. 0

Hazards / HELB Review Checklist

Prepared by:	P.R. OLSON Name	P.R. Olson Signature	4-7-97 Date
Approved by:	A.A. NEKI Name	AA Nei Signature	4-7-97 Date

IMPLEMENTATION

System		
Modification No. / Rev. No.		
Verified by:		Date:
Concurrence by:		Date:

Hazards / HELB Review Checklist

Instructions

This set of checklists shall be used for the modification review process described in PI-MP3-03. The application and use of these checklists shall be as follows:

1. When the need for a Hazards/HELB design review is identified by the Modification Screening Checklist (CK-MP3-03-02), the Verifier shall implement this set of checklists to verify that the Hazards/ HELB design considerations have been properly addressed in the modification.

2. The Verifier shall complete the Hazards/HELB Design Consideration Checklist (see page 3) to define the design considerations applicable to the modification being reviewed.
   a. Enter the System name and the Modification No.
   b. If a design consideration is applicable to the modification, check (√) as applicable. Note that more than one design consideration may apply.
   c. If not applicable, check not applicable (NA).
   d. Print, sign and date when identification of applicable design considerations is completed.

   Note: Only those checklists for which a design consideration is identified in step 2 need be completed under step 3.
3. For each applicable design consideration identified, the Verifier or Discipline Verifier shall complete the applicable Design Review Checklist (s) and comment page(s) as follows:
   a. Enter the System name and the Modification No. on all checklist sheets. The sheets shall be sequentially numbered (i.e. 1,2,3 etc.). It is acceptable to add insert pages (i.e. 1A, 1B, 1C, etc.) if needed.
   b. Review the modification document an all applicable Design Process Documents for each major design attribute on the checklist. Each major design attribute should be addressed as follows:
      - b.1 If the review determines the attribute is satisfied, check satisfactory (Y).
      - b.2 If the review determines the attribute is not satisfied, check unsatisfactory (N).
      - b.3 For both satisfactory (Y) and unsatisfactory (N) responses, the Verifier shall enter a sequential comment number and comment on the Design Review Comment Form (see page 4). Comments shall describe the basis for the response and include a reference to the Design Process Document(s) which formed the basis for the review.
      - b.4 If the specific design consideration is not applicable, check not applicable (NA).
   c. Once the review is complete, sign and date the checklist cover sheet.
4. The Lead Verifier shall indicate concurrence that the checklist has been implemented satisfactorily by signing and dating the checklist cover sheet.
5. The cover sheet and all applicable checklists and comment forms shall be included if the final project file copy.
6. Discrepancies shall be processed in accordance with PI-MP3-11.

Hazards / HELB Review Checklist

Hazards / HELB Considerations Checklist

Checklist No.	Design Consideration	Applicability Yes (√)/ No (NA)
1.0	Hazards - Flooding	______________
2.0	Hazards - Missile Protection	______________
3.0	HELB/MELB - High and Moderate Energy Line Break	______________

______________________ ______________________ ______________

Prepared by Signature Date

System______________
Modification No.____________
Sheet______ of ______

Hazards / HELB Review Checklist

Hazards / HELB Review Comment Form

Comment No.	Comment

Prepared by ______________ Signature ______________ Date ______________

Hazards / HELB Review Checklist

Hazards - Flooding

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.0	FLOODING		
1.1	Water Level Flood Design for Seismic Category I Structures - External Sources (Applicable only if the modification involves the circulating and service water pump house structures or flood barrier structures)	______	______
1.1.1	If the modification alters, either temporarily or permanently, any water tight walls, doors or equipment hatches are the supporting design basis calculations for these structures and enclosed equipment addressed?	______	______
1.1.2	If the modification alters, either temporarily or permanently, any existing drains or sumps are the supporting design basis calculations for these structures and enclosed equipment addressed?	______	______
1.1.3	If the modification alters, either temporarily or permanently, any seaward wall are the supporting design basis calculations for these structures and enclosed equipment addressed?	______	______
1.2	Flood Design - Internal Sources (Applicable to both the affected compartment and potential impact on adjacent compartments)	______	______
1.2.1	Does the modification involve any of the following: a. Introduce a new line in a compartment b. Increase the line pressure of any piping c. Decrease the pipe wall thickness of any piping and, if so, are these factors dispositioned to demonstrate flood protection is adequately maintained?	______	______
1.2.2	Does the modification involve making a physical change such as introduce a new opening or modify, add or delete any opening, seal, door sweep, curb, floor drain, etc. which is credited as a drain path or barrier to/from the compartment and if so are the supporting calculations dispositioned?	______	______
1.2.3	Does the modification delete any valve or change a normally closed or fail closed valve to a normally open or fail open condition and if so are the supporting calculations dispositioned?	______	______

Hazards / HELB Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
1.2.4	Does the modification change or alter any level indicators used to detect leakage and if so is the information necessary to provide timely isolation demonstrated to be maintained?		
1.2.5	Does the modification add any safety related (1E) electrical components (including junction boxes electrical fittings, slices or terminations) at locations below the predicted flood levels?		
1.2.6	Does the modification remove or alter any remote, manual or automatic control for any valve?		

Prepared by ______________ Signature ______________ Date ______________

Hazards / HELB Review Checklist

Hazards - Internally Generated Missiles

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
2.0	MISSILE PROTECTION Note: UFSAR Section 3.5 provides specific exclusions for the following components. - Valves on non high energy piping - Valves with back seated stems - Valve bonnets which are welded, bolted in a controlled manner or valves which include a large inertia valve operator - Large rotating equipment as defined in UFSAR Section 3.5.1.1 and 3.5.1.2.1	________	________
2.1	Internally Generated Missiles		
2.1.1	Does the modification add potential missile sources such as valves, rotating equipment or thermowells/ detectors to high energy piping or pressurized equipment, which are not shown to be isolated or shown not to impact safety related components?	________	________
2.1.2	Does the modification add safety related equipment in the path of existing missile sources (including turbine missiles) which are not then qualified?	________	________
2.1.3	Does the modification relocate or replace any existing missile sources such that the isolation, separation or elimination basis as a source is documented or updated as required?	________	________
2.2	Externally Generated Missiles		
2.2.1	Does the modification locate any safety related equipment external to a safety related building and document the protection features provided?	________	________
2.2.2	Does the modification locate any new openings or change the features of an exterior wall to a safety related building and document the protection features provided?	________	________

______________________ ______________________ ______________

Prepared by Signature Date

Hazards / HELB Review Checklist

HELB/MELB - High and Moderate Energy Line Break

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.0	HIGH AND MODERATE ENERGY LINE BREAK Note: High energy piping systems are tabulated in UFSAR Tables 3.6-1 and 3.6-2 and shown on Figure 3.6-1. Moderate energy piping systems are tabulated in UFSAR Tables 3.6-3 and 3.6-4 and shown on Figure 3.6-1. Essential equipment is tabulated on UFSAR Table 3.6-5 and the relative locations are shown in Figures 3.6-2 through 3.6-7.		
3.1	Does the modification involve any of the following: a. Introduce additional high energy piping to the system layout? b. Increase the line pressure of any piping c. Revise the pipe wall thickness of any piping and, if so, are these factors dispostioned to demonstrate that pipe break protection is adequately maintained?	________	________
3.2	Does the modification involve making a physical pipe routing or terminal end change and if so are the supporting pipe stress calculations dispositioned to demonstrate that pipe break locations are adequately maintained?	________	________
3.3	Does the modification add, delete or change any normally closed valve which forms a high to moderate energy pressure boundary and if so are the supporting calculations dispositioned to demonstrate that pipe break protection is adequately maintained?	________	________
3.4	Are any safety related, essential components (either mechanical or electrical) added or relocated to an area subject to pipe break postulation and if so, shown to meet separation criteria?	________	________

Essential equipment in the vicinity of break locations should be demonstrated to be protected by separation, enclosures, protective devices or design. In the event a separation basis is not demonstrated, do supporting calculations demonstrate the following.

Hazards / HELB Review Checklist

	DESCRIPTION	ACCEPTANCE CHECK Y/N/NA	COMMENT
3.5	Does the analysis of pipe motion caused by the dynamic effects of postulated breaks demonstrate that the pipe motion will not result in unacceptable impact upon, or over stress of, any structure, system, or component important to safety to the extent that essential functions would be impaired or precluded?	________	________
3.6	Are protective structures designed to withstand the effects of a postulated piping failure (pipe whip, jet impingement, pressurization of compartments, water spray, as appropriate) in combination with loading associated with the OBE and SSE within the respective design limits for the structure?	________	________
3.7	Does the analysis for jet impingement forces meet the identified analytical criteria?	________	________
3.8	Are the results of revised rupture restraint loads within the design margins of existing designs or are new designs within identified criteria?	________	________
3.9	Are the effects of environmental conditions for both mechanical and electrical components addressed?	________	________

________________ ________________ ________________

Prepared by Signature Date

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-019, Rev. 0

<u>Fire Protection Review Checklist</u>

Prepared by:	C M LAUNI Name	C M Launi Signature	4-7-97 Date
Approved by:	AANEL Name	AB Nei Signature	4-7-97 Date

IMPLEMENTATION

System		
Modification No./ Description		Date:
Verified by:		Date:
Concurrence by:		

Sheet 1 of ___

Fire Protection Review Checklist

Instructions

This checklist supplements the modification review process described in PI-MP3-03. Use of this checklist shall be as follows:

1. When completing the Fire Protection design checklist the Verifier(s) shall complete the total checklist.

2. The Verifier(s) shall perform a technical review of the modification package and any new or revised design process documentation that resulted from the modification per PI-MP3-02 and any new or revised output documents that resulted from the modification when completing the Fire Protection Checklist.

3. For each topic for which the applicability is determine to be affirmative, the verifier(s) shall enter a comment describing the impact of the modification on the topic, how the impact was resolved.

4. The Verifiers(s) shall generate a discrepancy report for any discrepancies identified during the review in accordance with Section 5.7 of PI-MP3-03.

5. When the review is completed, the Verifier shall sign and date the coversheet of the Fire Protection design review checklist and forward the completed checklist to the Lead Verifier.

Fire Protection Review Checklist

		Yes	No	N/A	Comment No.
1. Fire Protection Barriers					
1.1	Did the modification impact any fire barrier ratings?	☐	☐	☐	______
1.2	Did the modification impact installation details for fire rated assemblies?	☐	☐	☐	______
1.3	Did the modification impact new or existing penetrations and/or seals?	☐	☐	☐	______
1.4	Did the modification impact structural steel fire proofing?	☐	☐	☐	______
1.5	Did the modification impact cable tray fire breaks, cable tray wraps and supports?	☐	☐	☐	______
1.6	Did the modification involve the addition or alteration of a fire door (door, frame or assembly)?	☐	☐	☐	______
1.7	Did the modification involve the addition or alteration of a fire damper?	☐	☐	☐	______
1.8	Did the modification add, remove or modify any curbs?	☐	☐	☐	______
1.9	Did the modification impact any liquid containment features, requirement for gas control features, or water removal features?	☐	☐	☐	______

Fire Protection Review Checklist

		Yes	No	N/A	Comment No.
2.	**Combustibles**				
2.1	Were all the design changes with respect to combustible loading identified? Identify combustible loading changes by completing Table 2.1.	☐	☐	☐	_____
2.2	Were all the design changes with respect to site structures identified?	☐	☐	☐	_____
2.3	Were any previously unanalyzed materials or process hazards identified?	☐	☐	☐	_____
2.4	Did the modification install combustible materials near safety related equipment?	☐	☐	☐	_____
2.5	Did the modification install combustible materials near or on a fire area boundary?	☐	☐	☐	_____
2.6	If flammable and combustible liquids were added by the modification, are curbs and or drainage adequate to hold the liquids?	☐	☐	☐	_____
2.7	Did the modification create any unique fire hazards not considered in the fire hazards analysis (focuse on unique hazards presented by type or process involved, e.g., cadweld material may present an explosion hazard, oil under high pressure, etc.)?	☐	☐	☐	_____

Fire Protection Review Checklist

Table 2.1

Fire Area/ Fire Zone	Equipment Description	Combustible Material	Quantity (Unit) (1)	Heat of Comoustion * (BUT/Unit) (2)	Heat Load (BTU) (1)x(2)=(3)	Floor Area of Fire Zone (4)	Change in Combustible Loading (3)/(4)	Combustible Loading Margin **

* Heat of combustion values and fire zone floor areas are defined in the combustible loading calculations or tables provided in the Fire Hazard Analysis.

** Combustible loading margin is the difference between combustible loading limits and the existing combustible loading. Combustible loading limits are defined in the Fire Protection Licensing Basis. Combustible loading limits were established to justify deviations or exemptions from NRC required configurations. For example, if a fire zone was not protected by area wide automatic fire suppression and detection systems, as required, low combustible loading may have been used as justification for deviation or exemption. The resulting limit shall not be exceeded without analysis and a commitment change.

Fire Protection Review Checklist

		Yes	No	N/A	Comment No.
3.	**Fire Detection**				
3.1	Did the modification remove any fire detectors?	☐	☐	☐	______
3.2	Did the modification add or replace any fire detectors?	☐	☐	☐	______
3.3	Did the modification make changes that could affect the performance of the fire detectors?	☐	☐	☐	______
	a) Were any obstructions added (structures, cable trays ducts, equipment, etc.)?	☐	☐	☐	______
	b) Was the HVAC system modified such that air velocity and direction in the room was changed?	☐	☐	☐	______
	c) Was a heat source added to an area containing heat detectors?	☐	☐	☐	______
	d) Were combustible materials added that would change the nature of any potential fires in the area?	☐	☐	☐	______
	e) Were any detector locations changed?	☐	☐	☐	______
	f) Was the detector circuitry modified?	☐	☐	☐	______
3.4	Did the modification impact any National Fire Protection Asociation (NFPA) standards or deviations?	☐	☐	☐	______

Fire Protection Review Checklist

		Yes	No	N/A	Comment No.
4.	**Fire Suppression**				
4.1	Did the modification obstruct or impair the operation of any automatic fire suppression systems?	☐	☐	☐	____
4.2	Did the modification impact the fire suppression system occupancy classification design basis?	☐	☐	☐	____
4.3	Did the modification cause an inadvertent system operation?	☐	☐	☐	____
4.4	Did the modification cause the addition or deletion of active features?	☐	☐	☐	____
4.5	Did the modification impact the adequacy of the water supply?	☐	☐	☐	____
4.6	Did the modification impact the adequacy of the drainage system?	☐	☐	☐	____
4.7	Is access to manual fire fighting equipment impaired due to the modification?	☐	☐	☐	____
4.8	Did the modification impact the design bases of the active fire protection features?	☐	☐	☐	____
4.9	Did the modification affect the surrounding barriers of a fire zone whereby the hold time or concentration of a gaseous suppression system is affected?	☐	☐	☐	____
4.10	Did the modification impact any National Fire Protection Association (NFPA) standard compliances or deviations.?	☐	☐	☐	____
4.11	Did the modification alter the arrangement of equipment thereby altering the access or limiting the range of manual fire fighting equipment?	☐	☐	☐	____

Fire Protection Review Checklist

		Yes	No	N/A	Comment No.
5.	**Addition or Deletion of Structures**				
5.1	If the modification involves a structure, is there adequate separation between other structure and hazards?	☐	☐	☐	_____
5.2	What effect will a new structure have on existing fire protection features?	☐	☐	☐	_____
5.3	Are the active fire protection features adequate for the the new structure and the existing hazards? Is there adequate separation from other structures, systems and components?	☐	☐	☐	_____

Fire Protection Review Checklist

		Yes	No	N/A	Comment No.
6.	**Documentation**				
6.1	Were any descriptions of the fire protection program in the FSAR and/or Fire Hazards analysis (FHA) changed by the modification?	☐	☐	☐	____
6.2	Did the modification affect any Safety Evaluation Report (SER) commitments?	☐	☐	☐	____
6.3	Did the modification affect any FSAR or 10CFR50 Appendix R Exemption Request commitments?	☐	☐	☐	____
6.4	Did the modification affect any surveillance or periodic test procedure?	☐	☐	☐	____

Fire Protection Review Checklist
Comment Sheet

Comment No. **Comment**

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-20, Rev. 0

<u>Licensing Review Checklist</u>

Prepared by:	C.M. LAUNI	C M Launi	4-28-97
	Name	Signature	Date
Approved by:	A.A. NERI	A Neri	4-28-97
	Name	Signature	Date

IMPLEMENTATION

System			
Modification No./ Description			
Verified by:		Date:	
Concurrence by:		Date:	

Licensing Review Checklist

Instructions

This checklist supplements the modification review process described in PI-MP3-03. Use of this checklist shall be as follows:

1. The Verifier(s) shall complete the Licensing Review Checklist.

2. The Verifier shall perform a technical review of the modification package and any new or revised design process documents that resulted from the modification per PI-MP3-02 and any new or revised output documents that resulted from the modification when completing the Licensing Review Checklist.

3. For each topic for which the applicability is determined to be affirmative, the verifier(s) shall enter a comment describing the impact of the modification on the topic and how the issue was resolved.

4. The Verifier shall generate a discrepancy report for any discrepancies identified during the review in accordance with Section 5.7 of PI-MP3-03.

5. When the review is completed, the Verifier(s) shall sign and date the cover sheet of the Licensing Review Checklist and forward the completed checklist to the Lead Verifier.

Licensing Review Checklist

	Yes	No	N/A	Comment No.
1.0 Safety Analysis Report (SAR)				
1.1 Does the modification affect the Safety Analysis Report?	☐	☐	☐	_____
1.2 If the modification affects the Safety Analysis Report, does it create an unreviewed safety question? (no unreviewed safety question would have been created if the answers to a - g are no.)	☐	☐	☐	_____
a) Did the modification increase the probability of equipment malfunction previously evaluated in the SAR?	☐	☐	☐	_____
b) Did the modification increase the probability of an accident previously evaluated in the SAR?	☐	☐	☐	_____
c) Did the modification increase the consequences of equipment malfunction previously evaluated in the SAR?	☐	☐	☐	_____
d) Did the modification increase the consequences of an accident previously evaluated in the SAR?	☐	☐	☐	_____
e) Did the modification create the possibility of equipment malfunction not previously evaluated in the SAR?	☐	☐	☐	_____
f) Did the modification create the possibility of an accident not previously evaluated in the SAR?	☐	☐	☐	_____
g) Did the modification reduce a margin of safety?	☐	☐	☐	_____
1.3 Did the modification create a test or experiment that is not described or anticipated in the Safety Analysis Report?	☐	☐	☐	_____
1.4 Did the modification alter any procedure outlined or described in the Safety Analysis Report?	☐	☐	☐	_____

Licensing Review Checklist

		Yes	No	N/A	Comment No.
1.5	Did the modification alter any system outlined or described in the Safety Analysis Report?	☐	☐	☐	_____
1.6	Did the modification alter any component outlined or described in the Safety Analysis Report?	☐	☐	☐	_____
1.7	Did the modification alter any structure outlined or described in the Safety Analysis Report?	☐	☐	☐	_____
1.8	Did the modification have a potential impact on public safety?	☐	☐	☐	_____
1.9	Did the modification required approval of the NRC prior to implementation?	☐	☐	☐	_____
1.10	Did the modification affect a component's critical design parameters, function, or method of performing its functions described in the SAR text?	☐	☐	☐	_____
1.11	Did the modification affect a system which is described in the SAR?	☐	☐	☐	_____
1.12	Did the modification affect a part of a system which is not defined in the SAR but exists as part of a larger system which is described in the SAR and whose operation affects the ability of the larger system to meet the functions described?	☐	☐	☐	_____
1.13	Did the modification affect a test or experiment which is described in the SAR or anticipated by the SAR (e.g., a test required by codes committed to in the SAR)?	☐	☐	☐	_____
2.	**Technical Specification**				
2.1	Did the modification affect the Technical Specification?	☐	☐	☐	_____
2.2	Did the modification potentially violate any Technical Specifications?	☐	☐	☐	_____

Licensing Review Checklist

		Yes	No	N/A	Comment No.
2.3	Did implementation of the modification violate a limiting condition of operation related to the availability of critical systems or components?	☐	☐	☐	______
2.4	Did the implementation of this modification require a change to plant's Technical Specifications including text, parameter values, setpoints or response times?	☐	☐	☐	______
2.5	Did the modification alter the operability of any plant component or system?	☐	☐	☐	______
2.6	Did the modification alter a parameter, including setpoints or response times, used in the Technical Specifications?	☐	☐	☐	______
3.	**50.59 Safety Evaluation**				
3.1	Is a 50.59 safety evaluation or 50.59 safety evaluation screening included with the modification package?	☐	☐	☐	______
3.2	Did the 50.59 safety evaluation screening require that a full 50.59 safety evaluation be performed?	☐	☐	☐	______
3.2.1	Was the 50.59 safety evaluation screening adequately completed?	☐	☐	☐	______
3.3	Was the 50.59 safety evaluation performed satisfactorily?	☐	☐	☐	______
3.3.1	Were any electrical design issues affected by the modification adequately addressed?	☐	☐	☐	______
3.3.2	Were any mechanical design issues affected by the modification adequately addressed?	☐	☐	☐	______
3.3.3	Were any fire protection design issues affected by the modification adequately addressed?	☐	☐	☐	______

		Yes	No	N/A	Comment No.
3.3.4	Were any flood protection design issues affected by the modification adequately addressed?	☐	☐	☐	____
3.3.5	Were any operational issues affected the modification adequately addressed?	☐	☐	☐	____
3.3.6	Were any radiological issues affected by the modification adequately adressed?	☐	☐	☐	____
3.3.7	Were any structural design issues affected by the modification adequately addressed?	☐	☐	☐	____
3.3.8	Were any nuclear fuel issues affected by the modification adequately addressed?	☐	☐	☐	____
3.3.9	Were any plant security features affected by the modification adequately addressed?	☐	☐	☐	____
3.4	Was the proper documentation reviewed and referenced to perform the safety evaluation?	☐	☐	☐	____
3.5	Did an unreviewed safety question (USQ) exist on the modification?	☐	☐	☐	____
3.5.1	If a USQ existed, was NRC approval obtained before the modication was implemented?	☐	☐	☐	____
3.6	Was a Technical Specification revision required?	☐	☐	☐	____
3.6.1	If a technical Specification revision was required was an NRC license amendment issued before the modification was implemented?	☐	☐	☐	____
4.	**Environmental Issues**				
4.1	Was a revision to the Natinoal Pollutant Discharge Elimination Permit (NPDESP) needed due to the modification?	☐	☐	☐	____

Licensing Review Checklist

		Yes	No	N/A	Comment No.
4.2	Was there an unreviewed environment impact from this modification?	☐	☐	☐	_____
4.2.1	Did the modificaiton expand the site boardaries?	☐	☐	☐	_____
4.2.2	Did the modification result in a significant change in the types of effluents?	☐	☐	☐	_____
4.2.3	Did the modification result in a significant increase in spent fuel storage capacity?	☐	☐	☐	_____
4.2.4	Did the modification result in an increase in the heat dissipated to the environment?	☐	☐	☐	_____
5	**Other**				
5.1	Were SER commitments impacted by the modification?	☐	☐	☐	_____

Licensing Review Checklist

Comment Sheet

Comment No.	Comment

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-21, Rev. 0

PRA Review

LATER

Prepared by:	______	______	______
	Name	Signature	Date
Approved by:	______	______	______
	Name	Signature	Date

IMPLEMENTATION	
System	
Modification No.	
Lead Verifier	
SRG Lead	

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-22, Rev. 0

Quality Software Review

Prepared by:	J.W. DeMarco	JWDeMarco	4-7-97
	Name	Signature	Date
Approved by:	A.A. Neri	AANeri	4-7-97
	Name	Signature	Date

IMPLEMENTATION

System		
Modification No./ Description		
Verified by:		Date:
Concurrence by:		Date:

Quality Software Review

Instructions

This checklist supplements PI-MP3-02 and is used to document the review of I&C design for a modification. A single checklist shall be used for a given modification. The checklist shall be completed in accordance with the following instructions:

a. The Verifier shall review the I&C design for the modification against each attribute listed on Page 3 of the checklist.

b. The Verifier shall indicate for each attribute whether the I&C design is satisfactory or unsatisfactory. If the attribute is not applicable, the Verifier shall indicate NA in both columns.

c. The Verifier shall assign a sequential comment number to each response indicated on Page 3 and shall use the Page 4 comment sheet to provide justification for the responses on Page 3. Multiple Page 4's may be used. The justification shall reference the section of the modification package reviewed for which the comment is applicable.

d. Comments shall be processed as discrepancies in accordance with PI-MP3-11.

e. When completed, the Verifier shall sign and date the checklist cover sheet.

f. The Lead Verifier shall indicate the Verifier's concurrence on the cover sheet that the I&C Design Review of the modification has been adequately completed.

g. The Lead Verifier shall compile the individual checklists and enter the Modification number on each sheet, number the sheets sequentially and sign the cover sheet. The sheet numbers shall be sequentially numbered (i.e., 1, 2, 3, etc.). It is acceptable to add insert pages (i.e., 1A, 1B, 1C, etc.) if needed.

h. The cover sheet and all applicable checklists and comment forms shall be included in the final project file copy.

Northeast Utilities
Millstone Unit 3

CK-MP3-03-22
System ____________________
Modification No. ____________
Sheet ______ of ______

Quality Software Review

Attributes	Satisfactory	Unsatisfactory	Comment
1. Changes to add new or revise any existing computer program (i.e., programmable set of instructions) that is processed by a computer (e.g., mainframe computer, minicomputer, microprocessor, embedded processor, programmable devices, etc.) have been properly referenced and documented in the modification.	________	________	________
2. Changes to Quality Software, Category I Quality Software, Controlled Software, or a Computerized Quality Database have appropriately validated and verified and documented in accordance with the applicable station procedures.	________	________	________
3. Changes to the plant process computer (i.e., any real-time sensor-based monitoring or control computer system that assists nuclear unit operation, including systems traditionally known as "unit process computer;" special purpose computer, minicomputer, microprocessor computer-based instrumentation monitoring and process control systems; and station security systems) have been properly referenced and documented in the modification.	________	________	________
4. Changes to any input or output point for a plant process computer have been appropriately identified and documented in the modification.	________	________	________

____________________	____________________	____________
Prepared by	Signature	Date

Quality Software Review

Quality Software Review Comment Form

Comment No.	Comment

Prepared by ______________________ Signature ______________________ Date ______________

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-23, Rev. 0

Installation Plan Review

Prepared by:	J.L. Tenwinkel Name	[signature] Signature	4/25/97 Date
Approved by:	A.A. Neri Name	[signature] Signature	4/28/97 Date

IMPLEMENTATION

System	
Modification No./ Description	
Verified by:	
Concurrence by:	

Modification Installation Plan Review Checklist

Instructions

This checklist shall be used to review every modification package to verify that installation requirements were adequately specified per Section 5.4 of PI-MP3-03.

1. The Lead Verifier shall enter the System and Modification No. and a brief description of the modification on the checklist cover sheet.

2. The Lead Verifier or Discipline Verifiers shall determine what categories of work involving installation requirements are applicable to the modification and indicate "Yes" or "No" in the "Applicability" column of the checklist.

3. The Discipline Verifiers shall review the modification package to ensure that installation requirements, for which Applicability has been indicated as "Yes," have been adequately specified. If the installation requirement has been adequately incorporated in the modification package, the Verifier shall check the "Yes" column, and if not, the "No" column.

4. Wherever an installation requirement has been designated as Applicable, a sequential Comment No. shall be entered in the checklist, and a comment explaining the details of the finding, whether Yes or No under "Incorporation," shall be entered on the Comment Sheet at the end of the checklist. A Discrepancy Report (DR) shall be initiated for each "No" answer in the "Incorporation" column in accordance with PI-MP3-11. The DR Number shall be referenced in the comment.

5. When the review of installation requirements for the modification has been completed, the Preparer shall print, sign, and date in the spaces provided at the end of the checklist.

6. The Lead Verifier shall print, sign, and date the cover sheet of the checklist in the "Verified by" space provided.

Northeast Utilities
Millstone Unit 3

CK-MP3-03-23
System ____________________
Modification No. ____________
Sheet _____ of _____

Modification Installation Plan Review Checklist

		Applicability (Y or N)	Incorporation Yes	Incorporation No	Incorporation Comment #
1.0	**SITEWORK**				
1.1	Subsurface Data - Information				
1.2	Lines and Grades				
1.3	Protection				
1.4	Removals and Alterations				
1.5	Earthwork				
1.6	Excavating for Structures				
1.7	Trenching and Backfilling for Underground Facilities				
1.8	Preparation of Bearing Soil				
1.9	Backfill Placement and Compaction Control				
2.0	**CONCRETE AND GROUT**				
3.6	Concrete - Formwork				
3.7	Concrete - Reinforcement				
3.10	Concrete - Finishing				
3.11	Concrete- Curing				
3.12	Grouting				
3.0	**MASONRY**				
3.1	Dampcoursing				
3.2	Concrete Masonry Units				
3.3	Concrete Masonry Unit Construction				
3.4	Painting and Cleaning of Masonry				
4.0	**METALS - STRUCTURAL AND MISCELLANEOUS**				
4.1	Metal Fastening - General				
4.2	Welding				
4.3	Anchor Bolts				
4.4	Bolting				
4.5	Miscellaneous Fasteners				
4.6	Structural Steel - Fabrication				
4.7	Structural Steel - Erection				
4.8	Metal Decking - Fabrication				
4.9	Metal Decking - Erection				
4.10	Miscellaneous Metals and Gallery Work - Fabrication				
4.11	Miscellaneous Metals and Gallery Work - Installation				
5.0	**MOISTURE AND THERMAL PROTECTION**				
5.1	Sealants and Seals				
5.2	Sealing of Joints between Masonry and Concrete - Fire Rated				

Modification Installation Plan Review Checklist

		Applicability (Y or N)	Incorporation Yes	No	Comment #
6.0	DOORS, WINDOWS AND FINISH HARDWARE				
6.1	Replacement or Addition of Hollow Metal Doors and Hardware	____	____	____	____
6.2	Replacement or Addition of Windows and Hardware	____	____	____	____
7.0	FINISHES	____	____	____	____
7.1	Fire-Rated Gypsum Board Partitions	____	____	____	____
7.2	Coating - General	____	____	____	____
7.3	Steel Preparation and Prime Coating	____	____	____	____
7.4	Field Coating	____	____	____	____
7.5	Safety-Related Coating	____	____	____	____
8.0	HEATING, VENTILATING, AND AIR-CONDITIONING				
8.1	Industrial Grade Duct Construction (Class I)	____	____	____	____
8.2	Commercial Grade Duct Construction (Class C)	____	____	____	____
8.3	Welding	____	____	____	____
8.4	Painting and Coating	____	____	____	____
8.5	Duct Installation	____	____	____	____
8.6	Testing and Balancing	____	____	____	____
		____	____	____	____
9.0	MECHANICAL				
9.1	Equipment Erection	____	____	____	____
9.2	Piping Installation	____	____	____	____
9.3	Controls and Instrument Erection	____	____	____	____
9.4	Piping Support Installation	____	____	____	____
9.5	Material Documentation, NDE Requirements for Piping Installation and Valve/Pump Fabrication	____	____	____	____
10.0	INSULATION				
10.1	Specified Products and Substitutions	____	____	____	____
10.2	Insulation Material Restrictions	____	____	____	____
10.3	Insulation Materials Outside Containment	____	____	____	____
10.4	Insulation Materials Inside Containment	____	____	____	____
10.5	Insulation Tables	____	____	____	____
11.0	FIRE PROTECTION	____	____	____	____
11.1	General	____	____	____	____
12.0	VALVES	____	____	____	____
12.1	Motor Operators	____	____	____	____
12.2	Packing	____	____	____	____
		____	____	____	

Northeast Utilities
Millstone Unit 3

CK-MP3-03-23
System ____________________
Modification No. ____________
Sheet _____ of _____

Modification Installation Plan Review Checklist

		Applicability (Y or N)	Incorporation Yes	No	Comment #
13.0	**ELECTRICAL**	______	______	______	______
13.1	Terminations	______	______	______	______
13.2	Fire Barriers	______	______	______	______
13.3	Raceway Installation	______	______	______	______
13.4	Grounding	______	______	______	______
13.5	Cable and Wiring	______	______	______	______

Prepared by:

______________________________ ______________________________ __________
Name Signature Date

Northeast Utilities
Millstone Unit 3

CK-MP3-03-23
System ____________________
Modification No. ____________
Sheet ___ of _____

Modification Installation Plan Review Checklist

Comment Sheet

Comment #	Comment

(Add additional sheets as necessary, label last sheet as "Final.")

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-24, Rev. 0

Test Plan Review

	Name	Signature	Date
Prepared by:	J.L. Tenwinkel	[signature]	4/24/97
Approved by:	A.A. Neri	[signature]	4/24/97

IMPLEMENTATION

System	
Modification No./ Description	
Verified by:	
Concurrence by:	

Modification Test Plan Review Checklist

Instructions

This checklist shall be used to review every modification package to verify that adequate test requirements and inspections were specified per Section 5.4 of PI-MP3-03.

1. The Lead Verifier shall enter the System and Modification No. and a brief description of the modification on the checklist cover sheet.

2. The Lead Verifier or Discipline Verifiers shall determine which testing requirements are applicable to the modification and indicate "Yes" or "No" in the "Applicability" column of the checklist. In determining applicability, there are three types of testing to be considered, defined as follows:

   2.1 Construction Testing - Construction testing consists of individual test(s) to verify that construction is complete and acceptable on an individual non-system basis. Construction testing is typically geared to test individual circuits and components. Construction tests should normally be completed prior to modification testing, but may be completed together when applicable. Some examples of construction tests include, but are not limited to hydrostatic and pneumatic tests, motor rotation checks, megger testing and circuit integrity tests. Construction tests shall normally be conducted to station work procedures, code, installation specification or other installation documents.

   2.2 Modification Testing - Modification tests are those tests performed to ensure design intent has been satisfied. The modification test must demonstrate the modified components properly function and the inter-relationship with other components within the affected boundary of the design change was not adversely affected. Modification tests should consider testing under both normal and abnormal operating conditions to the extent practical. Since the test is to demonstrate proper function of the entire system, actuation of sensors and components by the process medium should be required wherever possible. Some examples include, but are not limited to, valve stroke times, electrical circuit logic tests, system flow test, demonstration of failure mode on loss of power, instrument system response tests, and emergency system actuation tests. Modification tests will be performed to written instructions, including acceptance criteria and per applicable station procedures. While station surveillance procedures are normally used to satisfy equipment operability test, they may be used for modification testing.

Modification Test Plan Review Checklist

2.3 Equipment Operability Tests - Equipment operability tests are those tests performed after a modification is complete to ensure the equipment or system, as modified, is operable as defined in the Technical Specifications, Final Safety analysis Report (FSAR), and Updated FSAR (UFSAR). It is the testing that is performed on return to service to demonstrate equipment operability which normally consists of, but is not limited to, performance of the applicable operating or instrument surveillances. Operability tests may not be required if compliance with equipment and system requirements is demonstrated by modification testing. Operability testing requirements may be satisfied by the performance of the applicable station surveillance procedure.

Note: If any Operability tests are found to be applicable, a copy of this checklist along with the test requirements and acceptance criteria shall be forwarded to the ORG for review per Section 5.4.4 of PI-MP-303.

3. The Discipline Verifiers shall review the modification package to ensure that requirements and acceptance criteria, for which Applicability has been indicated as "Yes" have been adequately specified. If the test requirement has been adequately specified, the Verifier shall check the "Yes" column, and if not, the "No" column.

4. Wherever a test requirement has not been adequately specified, a sequential Comment No. shall be entered in the checklist, and a comment explaining the details of the finding shall be entered on the Comment Sheet at the end of the checklist. A Discrepancy Report (DR) shall be initialed for each "No" answer in accordance with PI-MP3-11. The DR number shall also be referenced in the comment.

5. When the review of test requirements for the modification is complete, the Preparer shall print, sign, and date in the spaces provided at the end of the checklist.

6. The Lead Verifier shall print, sign, and date the cover sheet of the checklist in the "Verified by" space provided.

Modification Test Plan Review Checklist

Following are lists of the types of components involved in design changes. Use these lists to determine the specific types of components involved in this design change and establish the specific test requirements for the design change.

		Applicability (Y or N)			Incorporation		
		Const. Testing	Mod. Testing	Ops. Testing	Yes	No	Comment #
I.	**Electrical**						
I-A	Cable & Wiring	______	______	______	______	______	______
I-B	Electrical Metering	______	______	______	______	______	______
I-C	Control & Protection Circuits	______	______	______	______	______	______
I-D	Transformers	______	______	______	______	______	______
I-E	Switchgear, Motor Control & Load Centers	______	______	______	______	______	______
I-F	Distribution Panels	______	______	______	______	______	______
I-G	Circuit Breakers	______	______	______	______	______	______
I-H	Motors	______	______	______	______	______	______
I-J	Inverters	______	______	______	______	______	______
I-K	Batteries	______	______	______	______	______	______
I-L	Generators	______	______	______	______	______	______
I-M	Non-Motor Devices	______	______	______	______	______	______
I-N	Annunciators & Sequence of Events Recorders	______	______	______	______	______	______

Are there any Additional electrical components or tests involved in this design change? _______ If so, list them here.

____

____

		Applicability (Y or N)			Incorporation		
		Const. Testing	Mod. Testing	Ops. Testing	Yes	No	Comment #
II.	**Instrumentation & Controls**						
II-A	Instrument Sensing Lines & Tubing	______	______	______	______	______	______
II-B	Local Indicators & Indicating Switches	______	______	______	______	______	______
II-C	Control & Indicating Loops (Power Supply/Converter & Indicator/Recorder)	______	______	______	______	______	______

Are there any additional instrument and control components or tests involved in this design change? If so list them here. ______________

____

____

		Applicability (Y or N)			Incorporation		
		Const. Testing	Mod. Testing	Ops. Testing	Yes	No	Comment #
III.	**Mechanical**						
III-A	Piping & Pipe Supports	______	______	______	______	______	______
III-B	Containment Penetrations	______	______	______	______	______	______
III-C	Heat Exchangers	______	______	______	______	______	______

Northeast Utilities
Millstone Unit 3

CK-MP3-03-24
System ____________________
Modification No. _____________
Sheet ______ of ______

Modification Test Plan Review Checklist

		Applicability (Y or N)			Incorporation		
		Const. Testing	Mod. Testing	Ops. Testing	Yes	No	Comment #
III-D	Tanks & Vessels						
III-E	Valves & Dampers - Manually Operated						
III-F	Valves & Dampers - Motor Operated						
III-G	Valves - Solenoid Operated						
III-H.1	Valves & Dampers - Air Operated						
III-H.2	Valves & Dampers - Air Operated (Accessories)						
III-I	Valves - Hydraulically Operated						
III-J	Valves - Self Regulating						
III-K	Valves - Safety & Relief						
III-L	Valves - Check						
III-M	Pumps						
III-N	Turbines						
III-O	Air Ducts						
III-P	Air Filters						
III-Q	Fans						
III-R	Air Heaters						
III-S	Air Chillers						
III-T	Air Compressors						
III-U	Compressed Air Filters						
III-V	Compressed Air Dryers						

Are there any additional mechanical components or test involved in this design change? ______ If so, list them here. _______________

____

____

Indicate if any of the following tests are required on the modified system(s) in order to confirm that they have been modified and/or that they perform as intended?

		Applicability (Y or N)			Incorporation		
		Const. Testing	Mod. Testing	Ops. Testing	Yes	No	Comment #
IV.	**Structural Acceptance Testing Requirements**						
IV-A	Load Test of Crane, Hoist, or Elevator						
IV-B	Containment Leak Rate						
IV-C	Containment Structural Integrity						
IV-D	NDE Requirements						
IV-E	Bolt Torquing						
IV-F	Material Destructive Testing						

Modification Test Plan Review Checklist

IV-G

Are there any additional structural components or tests involved in this design change? _____ If so, list them here. __________

____

____

		Applicability (Y or N)			Incorporation		
		Const. Testing	Mod. Testing	Ops. Testing	Yes	No	Comment #
V.	**Nuclear Acceptance Testing Requirements**	____	____	____	____	____	____
V-A	Shielding	____	____	____	____	____	____
	a) Dose Rates	____	____	____	____	____	____
V-B	Reactor						
	a) Control Rod Worth	____	____	____	____	____	____
	b) Control Rod Timing	____	____	____	____	____	____
	c) ECCS Injection Rates	____	____	____	____	____	____
	d) Vessel Flow Rate or Distribution	____	____	____	____	____	____
	e) Steam Flow or Quality	____	____	____	____	____	____
	f) Vessel Pressure Drop	____	____	____	____	____	____
	g) Core Internal Vibration or Loose Parts	____	____	____	____	____	____
V-C	Fuel Racks	____	____	____	____	____	____
	a) Neutron Poison Absorbing Characteristics	____	____	____	____	____	____
	b) Materials Surveillance Programs	____	____	____	____	____	____
	c) Special Fuel Warranty Conditions	____	____	____	____	____	____

V-D

Are there any additional nuclear components or test involved in this design change? If so, list them here. ______________

____

____

		Incorporation		
The following questions are intended to identify whether there are any additional tests that have not been identified by the above questions.		Yes	No	Comment #
VI.	Identifications of Additional Test Requirements	___	___	______
VI-A	Are there any additional test required by applicable codes, standards or standard specification? _____ List the codes, standards and standard specifications considered here and list any specific test requirements. ______________________________	___	___	______

____

____

____

Northeast Utilities
Millstone Unit 3

CK-MP3-03-24
System ____________________
Modification No. ____________
Sheet _____ **of** _____

Modification Test Plan Review Checklist

		Yes	Incorporation No	Comment #
VI-B	Are any additional test required by the applicable Tech Spec sections? ____________ List the tech spec sections considered here and list any specific requirements. ____________ ____________ ____________	___	___	______
VI-C	Are there any ISI/IST test requirements applicable to this design change? ____________ List the sources considered here and list any specific requirements. ____________ ____________ ____________	___	___	______
VI-D	Will a simulation be required for any part of the testing? ______ Provide a brief explanation here and provide the specific requirement. ____________ ____________ ____________ ____________	___	___	______
VI-E	Is an engineering review of the test results required? ______ Provide an explanation here and identify the specific requirement. ____________ ____________ ____________	___	___	______

Prepared by:

Name	Signature	Date
____________________	____________________	______

Northeast Utilities
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CK-MP3-03-24
System ____________________
Modification No. ____________
Sheet ______ of ______

Modification Test Plan Review Checklist

Comment Sheet

Comment #	Comment

(Add additional sheets as necessary, label last sheet as "Final.")

Northeast Utilities
Millstone - Unit 3

Independent Corrective Action Verification Program
(ICAVP)

Modification Review Checklist

CK-MP3-03-25, Rev. 0

Project Closeout Review

Prepared by:	A A Neri		4/21/97
	Name	Signature	Date
Approved by:	D.K. Schopfer	D.K. Schopfer	4-25-97
	Name	Signature	Date

System	
Modification No.	
Verified by:	
Concurrence by:	

Project Closeout Review

Instructions

This checklist supplements PI-MP3-03 and shall be used to document the project closeout review process for system modifications. Application and use of this checklist shall be as follows:

1. The Verifier shall implement this check to verify that project closeout activities have been properly completed.
2. The Verifier shall review each attribute listed in the checklist and shall determine whether the attribute has been properly addressed or is not applicable. The determination shall be documented by checking the appropriate column in the checklist.
3. For all "Yes" and "No" responses, the Verifier shall assign a sequential comment number and shall describe the basis for the response on the comment sheet included in this checklist. Comments may also be provide for "N/A" responses.
4. When all attributes have been reviewed, the Verifier shall sign and date the cover sheet
5. The Lead Verifier shall indicate his concurrence that the project closeout review has been completed by signing and dating the cover sheet.

The system designation and modification number shall be entered on all sheets of the completed checklist. Pages shall be sequentially numbered. It shall be acceptable to add insert pages numbered as 1A, 1B, 2A, etc.

Northeast Utilities
Millstone Unit 3

CK-MP3-03-25
System ________________
Modification No. __________
Sheet ______ of _______

Project Closeout Review

	Attribute	Yes	No	N/A	Comments
1.	Design Drawings either have been updated to reflect modification or change documents are posted and tracked against the drawing	_____	_____	_____	_______
2.	Lists and databases have either been updated to reflect modification or change documents are posted and tracked against the lists and databases.	_____	_____	_____	_______
3.	Existing vendor drawings and manuals have either been updated to reflect modification or change documents are posted and tracked against the vendor drawings and manuals.	_____	_____	_____	_______
4.	New vendor drawings and manuals have been incorporated into document control.	_____	_____	_____	_______
5.	Design documents such as system descriptions, DBD's, procurement specifications etc. have either been updated or have change documents posted and tracked against them.	_____	_____	_____	_______
6.	Licensing documentation such as the USAR, Technical Specifications, Environmental Plan, Security Plan and Emergency Plan have either been updated or have pending change documents.	_____	_____	_____	_______

Northeast Utilities
Millstone Unit 3

CK-MP3-03-25
System ________________
Modification No. __________
Sheet ______ of _______

Project Closeout Review

Comment Form

Comment No.	Comment

_______________________ Prepared by
_______________________ Signature
____________ Date