Appendix 3A. Tables

Table 3-1. Summary of Criteria - Structures

			Loading								
							Seismic		Tornado		
Structure	**Q.A. Req'd**	**Category**	**Normal Wind**	**Dead and Equipment**	**Live**	**Containment Accident Pressure**	**OBE**	**SSE**	**Wind**	**Missile[2]**	**Remarks Including Any Environmental Requirements**
Containment	X	I	-	X	X	X	X	X	-	-	Thermal Stresses and Partial Vacuum in Annulus. Equipment Missile Protected
Containment and Reactor Building Foundation Slab	X	I	X	X	X	X	X	X	X		Thermal Stresses
Containment Interior Concrete	X	I	-	X	X	-	X	X	-	-	Differential Accident Pressure; Pipe Rupture Loads Thermal Stresses. Equipment Missile Protected
Containment Penetrations	X	I	-	X	X	X	X	X	-	-	Checked for Potential Pipe Whipping
Containment Structural Steel	X	I	-	X	X	-	X	X	-	-	Thermal Stresses
Nuclear Service Water Pipe	X	I	X	X	X	-	X	X	X	X	Soil and Water Pressures on Buried Portion. Hydraulic Pressures. Moving Equipment Loads. Static Seismic Analysis. Spec. By Mech. Section.
Nuclear Service Water Intake/Discharge/ Overflow Structures	X	I	X	X	X	-	X	X	X	X	Soil and Water Pressures.
Standby Nuclear Service Water Pond Dam	X	I	X	X	X	-	X	X	X	X	Newmark's Method for Seismic Analysis of Dams; Hurricane Winds
Auxiliary Building, Including Diesel Bldg Fuel Pool (Concrete Walls, Liner Plate)	X	I	X	X	X	-	X	X	X	X	Soil and Water Pressures on Substructure; Tornado Pressure Drop; D/G Flywheel Reactor Missile Thermal Stresses and Cask Drop
New Fuel Storage Vault	X	I	-	X	X	-	X	X	X	X[3]	
Fuel Storage Racks	X	I	-	X	X	-	X	X	-	-	Thermal Stresses

			Loading								
							Seismic		Tornado		
Structure	Q.A. Req'd	Category	Normal Wind	Dead and Equipment	Live	Containment Accident Pressure	OBE	SSE	Wind	Missile²	Remarks Including Any Environmental Requirements
Main Steam and Feedwater Supports, Through Isolation Valve and First Support Outside Reactor Building	X	I	X	X	X	-	X	X	X	X	Pipe Loads, Pipe Rupture Loads
Reactor Building	X	I	X	X	X	-	X	X	X	X	Tornado Pressure Drop. Soil and Water Pressure on Substructure
Station Vent (Note 1)	-	I	X	X	X	-	X	X	X	-	
Refueling Water Storage Tank Foundations	X	I	X	X	X	-	X	X	X	-	
Refueling Water Storage Tank Pipe Trench		I	X	X	X	-	X	X	X	X	
Reactor Refueling Water Storage Tank Missile Wall	X	I	X	X	X	-	X	X	X	X	Secondary Containment for Tank
Relay House		III	X	X	X	-	-	-	-	-	
230 Kv Switch Station Steel and Fdts.		III	X	X	X	-	-	-	-	-	
Step-Up and Auxiliary Transformer Foundations	-	III	X	X	-	-	-	-	-	-	
Access Railroad, Including Structures	-	III	X	X	-	-	-	-	-	-	
Administration Building	-	III	X	X	-	-	-	-	-	-	
Heating Boiler Vent	-	III	X	X	-	-	-	-	-	-	
Condenser Cooling Water Pipe	-	III	X	X	-	-	-	-	-	-	Soil and Water Pressures. Moving Equipment Loads
Condenser Cooling Water Intake Structure	-	III	X	X	-	-	-	-	-	-	Soil and Water Pressures. Moving Equipment Loads

			Loading								
							Seismic		Tornado		
Structure	Q.A. Req'd	Category	Normal Wind	Dead and Equipment	Live	Containment Accident Pressure	OBE	SSE	Wind	Missile[2]	Remarks Including Any Environ-mental Requirements
Condenser Discharge Structure	-	III	X	X	-	-	-	-	-	-	Soil and Water Pressures. Moving Equipment Loads
Discharge Canal, Dike and Riprap	-	III	X	X	-	-	-	-	-	-	
Hydrogen and Nitrogen Houses	-	III	X	X	-	-	-	-	-	-	
Main Steam Line Supports, Excluding First Support Outside Reactor Building	-	III	X	X	-	-	-	-	-	-	
Service Building	-	III	X	X	-	-	-	-	-	-	
Turbine Building Equipment Supports	-	III	-	X	X	-	-	-	-	-	
Turbine Building Substructure	-	III	X	X	X	-	-	-	-	-	
Turbine Building Superstructure	-	III	X	X	X	-	-	-	-	-	Soil and Water Pressures
Turbine-Generator Foundation	-	III	-	X	X	-	-	-	-	-	
Yard Drainage	-	III	-	X	X	-	-	-	-	-	Per Manufacturer's Recommendations Soil and Water Pressures, Moving Equipment Loads
Hot Machine Shop, Decontamination Rooms, Shipping and Receiving Areas	-	III	X	X	X	-	-	-	-	-	Soil and Water Pressures, Moving Equipment Loads
Waste Water Collection Basin Dam (Non-(Nuclear Waste)	-	III	X	X	X	-	-	-	-	-	
Units 1 and 2 Makeup Water Storage Tank Foundation	X	I	X	X	X	-	X	X	X	-	

			Loading							
							Seismic		Tornado		
Structure	Q.A. Req'd	Category	Normal Wind	Dead and Equipment	Live	Containment Accident Pressure	OBE	SSE	Wind	Missile[2]	Remarks Including Any Environ-mental Requirements
Cowans Ford Auxiliary Intake Structure	-	III	X	X	X	-	-	-	-	-	
525 Kv Switch Station Steel and Foundations	-	III	X	X	X	-	-	-	-	-	
Radwaste Building	X	III	X	X	X	-	-	-	-	-	Meets the require- ments of Reg. Guide 1.143

Symbols:

OBE = Operating Basis Earthquake

SSE = Safe Shutdown Earthquake

X = Designed For

\- = Not Designed For

Note 1: The Station Vent is not designed for tornado misiles.

Note 2: Turbine missiles are included per section 3.5.1.2

Note 3: Reference Table 3-63

Table 3-2. Summary of Criteria - Equipment

Equipment	Scope	Quality Assurance Required	Category[3]	Code	Location	Rad[2] Source	Seismic OBE	Seismic SSE	Tornado Wind	Tornado Missile[4]	Remarks Including Any Environmental Requirements
Containment Polar Crane	D	X	11	ITTT, NEMA, NEC	C	-	X	X	-	-	Containment Accident Pressure, Dead and Equipment, Live Loads, Hold Down Device[1]
Fuel Handling Bridge Crane	D	X	11	ITTT, NEMA, NEC	AB	-	X	X	-	-	Dead and Equipment, Live Loads, Hold Down Device[1]

Symbols:

AB	= Auxiliary Building
C	= Containment
D	= Duke
X	= Designed For
-	= Not Designed For
OBE	= Operating Basis Earthquake
SSE	= Safe Shutdown Earthquake

Equipment	Scope	Quality Assurance Required	Category[3]	Code	Location	Rad[2] Source	Seismic		Tornado		Remarks Including Any Environmental Requirements
							OBE	SSE	Wind	Missile[4]	

Notes:

1. Polar crane and cask crane designed for seismic loads in unloaded condition only.
2. X = Source of radiation

   - = No source of radiation

   P = Possible source of radiation
3. Category II & III Structures are not safety related.
4. Turbine missiles are included per section 3.5.1.2

Table 3-3. Summary of Codes and Standards for Components of Water-Cooled Nuclear Power Units By NRC Quality Group Class and ANS Safety Class

	Quality Group Class A ANS Safety Class 1, SC-1	Quality Group Class B ANS Safety Class 2, SC-2	Quality Group Class C ANS Safety Class 3, SC-3	Quality Group Class D ANS Non Nuclear Safety, NNS
Component	**Codes and Standards**			
Pressure Vessels	ASME Boiler & Pressure Vessel Code, Section III, Class 1	ASME Boiler & Pressure Vessel Code, Section III, Class 2	ASME Boiler & Pressure Vessel Code, Section III, Class 3	ASME Boiler & Pressure Vessel Code, Section VIII, Division 1
0-15 psig Storage Tanks	–	ASME Boiler & Pressure Vessel Code, Section III, Class 2	ASME Boiler & Pressure Vessel Code, Section III, Class 3	API-620
Atmospheric Storage Tanks	–	ASME Boiler & Pressure Vessel Code, Section III, Class 2	ASME Boiler & Pressure Vessel Code, Section III, Class 3	API-650, AWWA D 100 or ANSI B96.1
Piping	ASME Boiler & Pressure Vessel Code, Section III, Class 1	ASME Boiler & Pressure Vessel Code, Section III, Class 2	ASME Boiler & Pressure Vessel Code, Section III, Class 3	ANSI B31.1.0 Power Piping
Pumps and Valves	ASME Boiler & Pressure Vessel Code, Section III, Class 1	ASME Boiler & Pressure Vessel Code, Section III, Class 2	ASME Boiler & Pressure Vessel Code, Section III, Class 3	Valves - ANSI B31.1.0 Pumps - Manufacturer's Standards

Table 3-4. Summary of Criteria - Mechanical System Components

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Reactor Coolant System										
Reactor Vessel	W	1	III-1	X	C	X	X	X	X	X
Reactor Coolant Pumps	W	1	III-1	X	C	X	X	X	X	X
Steam Generators (Tube)	B	1	III-1	X	C	X	X	X	X	X
(Shell)	B	2	III-2	X	C	X	X	X	X	X
Pressurizer	W	1	III-1	X	C	X	X	X	X	X
Pressurizer Relief Valves	D	1	III-1	X	C	X	X	X	X	X
Pressurizer Safety Valves	W	1	III-1	X	C	X	X	X	X	X
Pressurizer Relief Tank	W	NNS	VIII	X	C	X	X	X	X	X
RC Pump Motor Drain Tanks	D	NNS	API-620	-	C	P	-	-	X	X
RC Pump Motor Drain Tank Pump	D	NNS	-	-	C	P	-	-	X	X
Valves	D	1,2,3, NNS	III-1,-2,-3 B31.1.0	X	C,AB	X	X	X	X	X
Safety Injection System										
Safety Injection Pumps	W	2	P&V-II	X	AB	P	X	X	X	X
Accumulators	W	2	III-C	X	C	P	X	X	X	X
Valves	D&W	1,2,3	III-1,2,3	X	C,AB	P	X	X	X	X
UHI Water Accumulators	W	2	III-2	X	AB	P	X	X	X	X
UHI Nitrogen Accumulator	W	2	P&V-II	X	AB	P	X	X	X	X
UHI Surge Tank	W	2	P&V-II	-	AB	P	X	X	X	X
Gas/Water Inter. Membrane	W	2	P&V-II	X	AB	P	X	X	X	X
Residual Heat Removal System										
RHR Pumps	W	2	P&V-II	X	AB	P	X	X	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
RHR Heat Exchangers (Tube)	W	2	III-C	X	AB	P	X	X	X	X
(Shell)	W	3	VIII	X	AB	P	X	X	X	X
Valves	D	1,2	III-1,III-2	X	C,AB	P	X	X	X	X
Containment Spray System										
CS Pumps	D	2	III-2	X	AB	X	X	X	X	X
CS Heat Exchangers (Tube)[20]	D	2	III--C	X	AB	X	X	X	X	X
(Shell)[20]	D	3	VIII	X	AB	P	X	X	X	X
CS Nozzles	D	2	-	X	C	P	X	X	X	X
Valves	D	2	III-2	X	C	P	X	X	X	X
Chemical & Volume Control System										
Pumps										
Charging, Reciprocating	W	2	P&V-II	X	AB	X	X	X	X	X
Charging, Centrifugal	W	2	P&V-II	X	AB	X	X	X	X	X
Boric Acid Transfer	W	3	P&V-III	X	AB	X	X	X	X	X
Heat Exchangers										
Regenerative	W	2	III-C	X	C	X	X	X	X	X
Letdown (Tube)	W	2	III-C	X	AB	X	X	X	X	X
(Shell)	W	3	VIII	X	AB	P	X	X	X	X
Excess Letdown (Tube)	W	2	III-C	X	C	X	X	X	X	X
(Shell)	W	2	III-C	X	C	P	X	X	X	X
Seal Water (Tube)	W	2	III-C	X	AB	X	X	X	X	X
(Shell)	W	3	VIII	X	AB	X	X	X	X	X
Tanks										

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Volume Control	W	2	III-C	X	AB	X	X	X	X	X
Boric Acid	D	3	VIII	X	AB	P	X	X	X	X
Boric Acid Batching	W	NA	VIII	-	AB	-	-	-	X	X
Chemical Mixing	W	NA	VIII	-	AB	-	-	-	X	X
Resin Fill	D	NA	VIII	-	AB	-	-	-	X	X
Suction Stabilizer on Recip. Charging Pump	D	2	III-2	X	AB	X	X	X	X	X
Demineralizers										
Mixed Bed	W	3	VIII	X	AB	X	X	X	X	X
Cation	W	3	VIII	X	AB	X	X	X	X	X
Filters										
Reactor Coolant	W	2	III-C	X	AB	X	X	X	X	X
Seal Water Return	W	2	III-C	X	AB	X	X	X	X	X
Seal Water Injection	W	2	III-C	X	AB	X	X	X	X	X
Boric Acid	W	3	III-C	X	AB	-	X	X	X	X
Miscellaneous										
Letdown Orifices	W	2	III-2	X	C	X	X	X	X	X
Boric Acid Blender	W	3	III-3	X	AB	-	X	X	X	X
Valves	D	1,2,3	III-1,III-2 III-3	X	C,AB	X	X	X	X	X
Recip. Charging Pump Accum.	D	2	III-2	X	AB	X	X	X	X	X
Boron Recycle System										
Pumps										
Evaporator Feed	W	NNS	B31.1	-	AB	-	-	X	X	X
Reactor Makeup Water	W	NNS	-	-	AB	-	-	-	X	X

Component	Scope [2]	Safety Class [3]	Code [4]	QA Req'd [5]	Location [6]	Rad Source [7]	Seismic [1]		Wind [9]	Tornado Missile [22]
							OBE [8]	SSE [8]		
Recycle Evap. Concen. Pump	D	3	III-3	-	AB	X	X	X	X	X
Seal Cooling Water Pump	D	NNS	-	-	AB	P	-	-	X	
Tanks										
Holdup [11]	D	3	D100	X	AB	X	X	X	X	X
Reactor Makeup Water Storage [11]	D	NNS	D100	-	O	-	X	X	X	-
Reagent	W	NNS	V111	-	AB	-	-	-	X	X
Seal Cooling Water Tank	D	NNS	-	-	AB	P	-	-	X	X
Demineralizers										
Evaporator Feed	W	3	VIII	X	AB	X	X	X	X	X
Evaporator Condensate	W	NNS	VIII	-	AB	P	-	-	X	X
Filters										
Evaporator Feed	W	3	VIII	X	AB	X	X	X	X	X
Evaporator Condensate	W	NNS	VIII	-	AB	P	-	-	X	X
Evaporator Concentrates	W	NNS	VIII	-	AB	P	-	-	X	X
Seal Cooling Water Filter	D	NNS	VIII	-	AB	X	X	X	X	X
Miscellaneous										
Evaporator - Gas Stripper Pkg	W	NNS	B31.1	-	AB	X	-	-	X	X
Evaporator Condensate Return Unit	D	NA	-	-	AB	-	-	-	-	-
Valves	D	2,3	III-2,III-3	X	C,AB	X	X	X	X	X
Seal Cooling Water HX (Tube)	D	NNS	VIII	-	AB	P	-	-	X	X
(Shell)	D	NNS	VIII	-	AB	-	-	-	X	X
Boron Thermal Regeneration System										

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Heat Exchangers										
Moderating (Tube)	W	3	VIII	X	AB	X	X	X	X	X
(Shell)	W	3	VIII	X	AB	X	X	X	X	X
Letdown Chiller (Tube)	W	3	VIII	X	AB	X	X	X	X	X
(Shell)	W	NA	VIII	-	AB	-	X	X	X	X
Letdown Reheat (Tube)	W	2	III-C	X	AB	X	X	X	X	X
(Shell)	W	3	VIII	X	AB	X	X	X	X	X
Miscellaneous										
Chiller Units	W	NA	-	-	AB	-	-	-	X	X
Valves	D	2,3	III-C,III-3	X	AB	X	X	X	X	X
Chiller Surge Tank	W	NA	VIII	-	AB	-	-	-	X	X
Boron Chiller Pumps	W	NA	P&V-III	-	AB	-	-	-	X	X
NR Demin.	W	3	III-3	X	AB	X	X	X	X	X
Annulus Ventilation System										
Fans	D	3	AMCA(12)	X	AB	P	X	X	X	X
Filters	D	3	-(13)	X	AB	P	X	X	X	X
Moisture Separator	D	3	-(13)	X	AB	P	X	X	X	X
Valves	D	3	III-3	X	AB	P	X	X	X	X
Ice Condenser Refrigeration System										
Ice Baskets	W	2	As Applicable	X	C	P	X	X	X	X
Ice Bed Doors	W	2	As Applicable	X	C	P	X	X	X	X
NF Refrigeration Units	W	NA	-	-	AB	-	-	-	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1)		Wind (9)	Tornado Missile (22)
							OBE (8)	SSE (8)		
Ice Machine (Abandoned)	W	NA	-	-	AB	-	-	-	X	X
Ice Machine (New)	D	NA	-	-	O	-	-	-	-	-
Ice Condenser Bridge Crane	W	NA	-	-	C	-	-	-	X	X
Air Handling Units	W	NA	As Applicable	C		-	-	X	X	
Valves	D	2	III-2	X	C,AB	P	X	X	X	X
NF Glycol Pumps	W	NNS	-	-	AB	-	-	-	X	X
NF Glycol Mixing & Storage Pump	D	NNS	-	-	AB	-	-	-	X	X
Ice Solution Pumps	D	NNS	-	-	O	-	-	-	X	X
NF Floor Cooling Pumps	W	NNS	-	-	C	X	X	X	X	X
NF Glycol Mixing & Storage Tank	D	NNS	VIII	-	AB	-	-	-	X	X
Ice Solution Mixing Tanks	D	NNS	-	-	O	-	-	-	X	X
NF Glycol Expansion Tank	W	NNS	-	-	C	-	-	-	X	X
Ice Bin & Annex Cond. Units	W	NA	-	-	AB	-	-	-	X	X
Ice Bin	W	NA	-	-	AB	-	-	-	X	X
Ice Annex	W	NA	-	-	AB	-	-	-	X	X
Ice Bin & Annex Air Handlers	W	NA	-	-	AB	-	-	-	X	X
Ice Blower Package	W	NA	-	-	AB	-	-	-	X	X
Ice Cond. Cyclone Receiver	W	NA	-	-	C	-	-	-	X	X
Rotary Valve Assembly	W	NA	-	-	AB	-	-	-	X	X
NF Floor Cooling Defrost Heater	W	NA	-	-	C	-	-	-	X	X
NF Slab Cooling	W	NA	B31.1	-	C	-	-	-	X	X
NF Glycol Bypass Strainer	W	NA	B31.1	-	AB	-	-	-	X	X
Lower Support Coolers	W	NA	-	-	C	-	-	-	X	X
Ice Machine Cooling Towers	D	NA	-	-	O	-	-	-	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Ice Machine Cooling Tower Pumps	D	NA	-	-	O	-	-	-	X	X
Containment Isolation System										
Valves	D	2	III-2	X	C,AB	X,P	X	X	X	X
Containment Air Return & Hydrogen-Skimmer System										
Air Return Fans	D	2	AMCA(13)	X	C	-	X	X	X	X
Hydrogen Skimmer Fans	D	2	AMCA(13)	X	C	-	X	X	X	X
Valves	D	2	III-2	X	C	-	X	X	X	X
Component Cooling System										
Pumps										
Cooling Water	B	3	III-3	X	AB	P	X	X	X	X
Drain Tank	D	NA	-	-	AB	P	-	-	X	X
Heat Exchangers (Tube)	D	3	VIII	X	AB	-	X	X	X	X
(Shell)	D	3	VIII	X	AB	P	X	X	X	X
Tanks										
Surge	D	3	III-3	X	AB	P	X	X	X	X
Drain	D	NA	-	-	AB	P	-	-	X	X
Valves	D	2,3,NNS	III-2	X	AB	P	X	X	X	X
			III-3	X	C	P	X	X	X	X
			NA		AB	P	X	X	X	X
Liquid Waste Disposal System Waste Collection Section										
1. Tanks										
Waste Evap. Feed	D	NNS	III-3	-	AB	X	-	-	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Waste Drain	D	NNS	B31.1	-	AB	P	-	-	X	X
Laundry & Hot Shower	D	NNS	VIII	-	AB	P	-	-	X	X
Reactor Coolant Drain	W	NNS	VIII	-	C	X	-	-	X	X
Floor Drain	D	NNS	VIII	-	AB	X	-	-	X	X
Aux. Floor Drain Tank	D	NNS	D100	-	RF	X	X	X	X	X
Aux. Waste Evap. Feed Tank	D	NNS	D100	-	RF	X	X	X	X	X
2. Pumps										
Waste Evap. Feed Tank	D	NNS	VIII	-	AB	X	-	-	X	X
Waste Drain Tank	W&D	NNS	B31.1	-	AB	X	-	-	X	X
Laundry & Hot Shower Tank	W	NNS	P&V-III	-	AB	P	-	-	X	X
Floor Drain Tank	W	NNS	P&V-III	-	AB	P	-	-	X	X
Reactor Coolant Drain Tank	W	NNS	P&V-III	-	C	X	-	-	X	X
RHR & CS Pump Room Sump	D	NNS	-	-	AB	P	-	-	X	X
Groundwater Drainage Sump	D	3	III-3	X	AB	-	X	X	X	X
Waste Evap. Feed Tank Sump	D	NNS	-	-	AB	P	-	-	X	X
Floor Drain Tank Sump	D	NNS	-	-	AB	P	-	-	X	X
Containment Floor & Equipment Sump	D	NNS	-	-	C	P	X	X	X	X
Incore Inst. Sump	D	NNS	-	-	C	P	X	X	X	X
Aux. FDT Pump	D	NNS	VIII	-	RF	X	-	-	X	X
Aux. WEFT Pump	D	NNS	VIII	-	RF	X	-	-	X	X
IRF Sump Pump	D	NNS	-	-	RF	P	-	-	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
IRF Pipe Trench Sump Pumps	D	NNS	-	-	RF	P	-	-	X	X
Laundry Machine Sump Pumps	D	NNS	-	-	CW	X	-	-	X	X
Decon Equipment Sump Pumps	D	NNS	-	-	CW	X	-	-	X	X
3. Strainers										
Laundry & Hot Shower Tank	W	NNS	VIII	-	AB	P	-	-	X	X
Floor Drain Tank	W	NNS	VIII	-	AB	P	-	-	X	X
4. Filters										
Laundry & Hot Shower										
Tank Primary	W	NNS	VIII	-	AB	P	-	-	X	X
Tank Secondary	W	NNS	VIII	-	AB	P	-	-	X	X
Floor Drain Tank	W	NNS	VIII	-	AB	P	-	-	X	X
5. Miscellaneous										
Reactor Coolant Drain Tank Heat Exchanger										
(Tube)	W	NNS	VIII	-	C	P	X	X	X	X
(Shell)	W	3	VIII	X	C	P	X	X	X	X
Valves	W	2,3	III-3	X	AB	X	X	X	X	X
Gas Sample Vessel	D	3	III-3	X	AB	X	X	X	X	X
Waste Processing System										
1. Tanks										
Mixing and Settling	D	NNS	VIII	-	AB	P	-	-	X	X
Mixing and Settling Tank Reagent Tank	D	NA	-	-	AB	-	-	-	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Evaporator Conc. Lines Flush	D	NNS	VIII	-	AB	X	-	-	X	X
Seal Cooling Water Tank	D	NA	-	-	AB	P	-	-	X	X
2. Pumps										
Mixing and Settling Tank	D	NNS	VIII	-	AB	P	-	-	X	X
Mixing and Settling Tank Sludge	D	NNS	VIII	-	AB	P	-	-	X	X
Waste Evapor. Concen. Pump	D	3	III-3	X	AB	X	X	X	X	X
Seal Cooling Water Pump	D	NNS	-	-	AB	P	-	-	X	X
Seal Cooling Water Filter	D	NNS	VIII	-	AB	P	-	-	X	X
Seal Cooling Water HX (Tube)	D	NNS	VIII	-	AB	P	-	-	X	X
(Shell)	D	NNS	VIII	-	AB	P	-	-	X	X
3. Miscellaneous										
Waste Evap. Condensate Return	D	NA	-	-	AB	-	-	-	X	X
Waste Evaporator	W	NNS	B31.1	-	AB	X	-	-	X	X
Waste Evap. Cond. Demin.	W	NNS	VIII	-	AB	P	-	-	X	X
Waste Evap. Cond. Filter	W	NNS	VIII	-	AB	P	-	-	X	X
Waste Evap. Reagent Tank	W	NNS	VIII	-	AB	P	-	-	X	X
Waste Evap. Feed Filter	W&D	NNS	III-C,VIII	-	AB	X	-	-	X	X
Laundry & Hot Shower Carbon Filter	D	NNS	VIII	-	AB	P	-	-	X	X
Laundry & Hot Shower Demineralizer	D	NNS	VIII	-	AB	P	-	-	X	X
Laundry & Hot Shower Demin. Filter	D	NNS	VIII	-	AB	P	-	-	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Valves	D	3,NNS	III-3,B31.1.0	X	AB	X	X	X	X	X
Waste Monitor & Disp. Section										
1. Tanks										
Waste Monitor	D	NNS	VIII	-	AB	P	-	-	X	X
Recycle Monitor Tank	D	NNS	VIII	-	AB	P	-	-	X	X
Vent. Unit Cond. Dr. Tank	D	NNS	VIII	-	AB	P	-	-	X	X
2. Pumps										
Vent. Unit Cond. Dr. Tank	D	NNS	-	-	AB	P	-	-	X	X
Waste Monitor Tank	W	NNS	VIII	-	AB	P	-	-	X	X
Recycle Monitor Tank	W&D	NNS	VIII	-	AB	P	-	-	X	X
3. Miscellaneous										
Waste Monitor Demineralizer Filter	D	NNS	VIII	-	AB	P	-	-	X	X
Valves	D	NNS	B31.1.0	-	AB	X	-	-	X	X
Gaseous Waste Disposal System										
Waste Gas Compressor Pkg	W	NNS	B31.1.0	-	AB	X	-	-	X	X
Waste Gas Tanks	D	3	VIII	X	AB	X	X	X	X	X
Hydrogen Recombiners	W	3	-	-	AB	X	X	X	X	X
Auto Gas Analyzer	D	NNS	-	-	AB	X	X	X	X	X
Gas Decay Tank Drain Pump	W	NNS	-	-	AB	P	-	-	X	X
Gas Trap	W	NNS	-	-	AB	P	-	-	X	X
Valves	D	2,3	III-2,III-3	X	C,AB	X	X	X	X	X
Solid Waste Disposal System										
1. Tanks										

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Spent Resin Storage Tank	D	3	III-3	X	AB	X	X	X	X	X
Chemical Drain Tank	D	NNS	VIII	-	AB	X	-	-	X	X
Evaporator Concentrates Storage Tank	D	NNS	VIII	-	AB	X	-	-	X	X
Resin Batching Tank	D	NNS	VIII	-	AB	X	-	-	X	X
Evap. Concen. Batch Tank	D	NNS	VIII	-	AB	X	-	-	X	X
Binder Storage Tank	D	NA	-	-	B	-	-	-	-	-
2. Pumps										
Spent Resin Sluicing	W	NNS	-	-	AB	X	-	-	X	X
Chemical Drain Tank	W		-	-	AB	X	-	-	X	X
Resin Dewatering Pump	D	NNS	-	-	AB	X	-	-	X	X
Binder Transfer Pump	D	NA	-	-	O	-	-	-	-	-
3. Miscellaneous										
Hydraulic Compactor	D	NNS	-	-	AB	P	-	-	X	X
Spent Resin Sluicing Filter	W	NNS	VIII	-	AB	X	-	X	X	X
Valves	D	3,NNS	III-3,B31.1	X	AB	X	X	X	X	X
Radwaste Pump Skid Unit	D	NNS	B31.1	-	AB	X	-	-	X	X
Fuel Pool Cooling & Cleanup System										
Cooling Pumps	B	3	III-3	X	AB	X	X	X	X	X
Cooling Heat Exchanger	D	3	VIII	X	AB	X	X	X	X	X
Cooling Strainers	D	3	VIII	X	AB	X	X	X	X	X
Demineralizer	D	NNS	VIII	-	AB	X	-	-	X	X
Filter	D	NNS	VIII	-	AB	X	-	-	X	X
Skimmer Pump	D	NNS	-	-	AB	X	-	-	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Skimmer Filter	D	NNS	-	-	AB	X	-	-	X	X
Valves	D	3,NNS	III-3,B31.1.0	X,-	AB	X	X	X	X	X
Diesel Generator Fuel Oil System										
Day Tanks	D	3	(18)	X	AB	-	(18)	(18)	X	X
Booster Pumps	D	3	(18)	X	AB	-	(18)	(18)	X	X
Drip Tanks, Pumps, & Filters	D	NNS	-	-	AB	-	-	-	X	X
Recirculation Pump	D	NNS	-	-	O	-	-	-	-	-
Recirculation Filter	D	NNS	-	-	O	-	-	-	-	-
Transfer Filters	D	3	III-3	X	AB	-	X	X	X	X
Transfer Pumps	D	3	(18)	X	AB	-	(18)	(18)	X	X
Fuel Oil Tanks (17)	D	3	VII	X	B	-	X	X	X	X
Relief Valves	D	3,NNS	(18)	X, -	AB, o	-	(18), -	(18), -	X, -	X, -
Valves (In-line & Others)	D	3,NNS	III-3,(18), -	X, -	DB,B	-	X	X	X	X
Diesel Generator Cooling Water System										
Cooling Water Heat Exchangers	D	3	VIII	X	AB	-	X	X	X	X
Intercooler Pumps	D	3	(18)	X	AB	-	(18)	(18)	X	X
Jacket Water Circulating Pumps	D	3	(18)	X	AB	-	(18)	(18)	X	X
Jacket Water Heaters	D	3	(18)	X	AB	-	(18)	(18)	X	X
Surge Tanks	D	3	(18)	X	AB	-	(18)	(18)	X	X
Temperature Regulating Valves	D	3	(18)	X	AB	-	(18)	(18)	X	X
Valves (In-line & Others)	D	3	III-3,(18)	X	AB	-	(18)	(18)	X	X
Diesel Generator Lube Oil System										

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Dirty Lube Oil Tanks	D	NNS	-	-	TB	-	-	-	-	-
Heater Pumps	D	3	(18)	X	AB	-	(18)	(18)	X	X
Oil Heaters	D	3	(18)	X	AB	-	(18)	(18)	X	X
Full Flow Filters	D	3	VIII,(18)	X	AB	-	(18)	(18)	X	X
Lube Oil Coolers	D	3	(18)	X	AB	-	(18)	(18)	X	X
B & A Lube Oil Pumps	D	3	(18)	X	AB	-	(18)	(18)	X	X
Intake Strainers	D	3	VIII	X	AB	-	X	X	X	X
Temperature Regulating Valves	D	3	(18)	X	AB	-	(18)	(18)	X	X
Relief Valves	D	3	(18)	X	AB	-	(18)	(18)	X	X
Valves (In-line & Others)	D	3,NNS	III-3,(18),-	X,-	AB,B	-	X	X	X	X
Diesel Generator Starting Air System										
Air Compressors	D	NNS	-	X	AB	-	(18)	(18)	X	X
Starting Air Tanks	D	3	VIII,(18)	X	AB	-	(18)	(18)	X	X
Line Filters	D	3	III-3	X	AB	-	X	X	X	X
Control Air Filters	D	3	(18)	X	AB	-	(18)	(18)	X	X
Filter - Moisture Traps	D	3	(18)	X	AB	-	(18)	(18)	X	X
Relief Valves	D	3 NNS	III-3,(18)	X	AB	-	X,(18)	X,(18)	X	X
Valves (In-line & Others)	D	3	III-3	X	AB	-	X	X	X	X
Diesel Generator Intake and Exhaust System										
Intake Silencers	D	3	(18)	X	AB	-	(18)	(18)	X	X
Exhaust Silencers	D	3	(18)	X	AB	-	(18)	(18)	X	X
Valves	D	3,NNS	III-3,-	X	AB	-	X	X	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Diesel Generator Crankcase Vacuum System										
Vacuum Blowers	D	NNS	-	X	AB	-	(18)	(18)	X	X
Diesel Generator Room Sump Pump System										
Generator Pit Sump Pumps	D	NNS	-	-	AB	-	-	-	X	X
Generator Room High Capacity Sump Pumps	D	3	(15)	X	AB	-	X	X	X	X
Generator Room Low Capacity Sump Pumps	D	NNS	-	-	AB	-	-	-	X	X
Valves	D	3,NNS	III-3,-	X,-	AB,AB	-	X	X	X	X
Nuclear Service Water System										
Pumps	D	3	III-3	X	AB	-	X	X	X	X
Strainers	D	3	VIII	X	AB	-	X	X	X	X
Valves	D	2,3	III-2,III-3	X	AB,O	-	X	X	X	X
Conventional Service Water System										
Pumps	D	NA	-	-	SB	-	-	-	-	-
Strainers	D	NA	-	-	SB	-	-	-	-	-
Valves	D	NA	-	-	SB	-	-	-	-	-
Fuel Handling System										
Reactor Manipulator Crane	W	NNS	-	X	C	-	-	X	X	X
Fuel Transfer Tube	W	2	III-2	X	C,AB	-	X	X	X	X
Underwater Fuel Conveyor	W	NNS	-	X	C,AB	-	-	-	X	X
Spent Fuel Manipulator Crane	W	NNS	-	X	AB	-	-	X	X	X
Fuel Handling Tools	W	NNS	-	X	C,AB	-	-	-	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Sampling System										
Sample Heat Exchanger	D	NNS	VIII	-	AB	X	-	-	X	X
Sample Vessel	D	NNS	VIII	-	AB	X	-	-	X	X
Valves	D	2,3	III-2,III-3	X	C,AB	X	X	X	X	X
Refueling Water System										
Refueling Water Pump	D	NNS	-	-	AB	P	-	-	X	X
Refueling Water Recirc. Pumps	D	NNS	-	-	AB	P	-	-	X	X
Refueling Water Pump Strainer	D	NNS	-	-	AB	P	-	-	X	X
Storage Tank	D	2	D100	X	O	P	X	X	X	19
FW Pipe Trench Sump Pump	D	NA	-	-	O	-	-	-	-	-
Valves	D	2	III-2, B31.1.0	X	C,AB	P	X	X	X	X
Equipment Decontamination System										
Pump	D	NNS	-	-	AB	-	-	-	X	X
Tank	D	NNS	D100	-	AB	-	-	-	X	X
Valves	D	NNS	(18)	X	C,AB	-	X	X	X	X
Fire Protection System										
Fire Pumps	D	NA	(14)	-	O	-	-	-	-	-
Valves	D	NA	-	-	TB,SB,OB,AB	-	-	-	-	-
Station Ventilation Systems										
Containment Ventilation										
1. Containment Purge										
Fans	D	NNS	-	-	AB	P	-	-	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Filters	D	NNS	-	-	AB	P	-	-	X	X
2. Other Systems(16)										
Fan/Coil Units	D	NNS	-	-	C	P	-	-	X	X
Filters	D	NNS	-	-	C	P	-	-	X	X
CRDM Fans	D	NNS	-	-	C	P	-	-	X	X
3. Auxiliary Bldg. Ventilation										
Fan/Coil Units	D	NA	-	-	AB	-	-	-	X	X
Filters (Charcoal)	D	3	-	X	AB	P	X	X	X	X
ES Air Handling Units	D	3	-	X	AB	P	X	X	X	X
4. Control Bldg. Ventilation										
Fan	D	3	-	X	AB	P	X	X	X	X
Filters	D	3	-	X	AB	P	X	X	X	X
Air Conditioning Unit	D	3	-	X	AB	-	X	X	X	X
5. Diesel Bldg. Ventilation										
Fans	D	3	-	X	AB	P	X	X	X	X
Filters	D	3	-	X	AB	P	X	X	X	X
Main Steam System										
Isolation Valves	D	2	III-2	X	DH	-	X	X	X	X
Feedwater System										
Isolation Valves	D	2	III-2	X	DH	-	X	X	X	X
Auxiliary Feedwater System										
Motor Driven Pumps	D	3	III-3	X	AB	-	X	X	X	X
Steam Turbine Driven Pumps	D	3	III-3	X	AB	-	X	X	X	X
Valves	D	2,3	III-2,III-3	X	AB,DH	-	X	X	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Storage Tank	D	D-100	-	O	-	-	-	-	-	-
Steam Dump Systems										
Turbine Bypass	D	NA	-	-	TB	-	-	-	-	-
Relief Valves	D	2	III-2	X	DH	-	X	X	X	X[23]
Safety Valves	D	2	III-2	X	DH	-	X	X	X	X[23]
Steam Generator Blowdown Recycle System										
Note: Steam Generator Blowdown Recycle System is no longer in service. Flow path has been permanently isolated per NSM MG-1/2-2430.										
SG Blowdown HX	D	NNS	VIII	-	AB	P	-	-	X	X
SG Blowdown Tank	D	NNS	VIII	-	AB	P	-	-	X	X
SG Blowdown Pumps	D	NNS	-	-	AB	P	-	-	X	X
SG Blowdown Recycle Demin.	D	NNS	VIII	-	AB	P	-	-	X	X
Blowoff Tank	D	NNS	VIII	-	TB	-	-	-	-	-
Blowoff Tank Pumps	D	NNS	-	-	TB	-	-	-	-	-
Valves	D	2	III-2	X	C,AB	P	X	X	X	X
Condenser Circulating Water System										
Condenser Circulating Pumps	D	NA	-	-	O	-	-	-	-	-
Valves	D	NA	-	-	TB,O	-	-	-	-	-
Instrument Air System										
Compressors	D	NA	-	-	SB,O	-	-	-	-	-
After Coolers	D	NA	-	-	SB	-	-	-	-	-
Air Tanks (1A, 1B, 2A, 2B)	D	NA	III-3	-	AB	-	X	X	X	X
Air Receivers (A, B, C)	D	NA	VIII	-	SB	-	-	-	-	-
Air Dryers	D	2	VIII	-	SB	-	-	-	-	-

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
Valves	D	2	III-2	X	C,AB	P	X	X	X	X
Main Steam Isolation Valve										
Air Tanks	D	3	III-3	-	DH	-	-	-	X	X
Hydrogen System										
Hydrogen Vessels	D	NA	VIII	-	O	-	-	-	-	-
Valves	D	NA	-		AB	-	-	-	-	-
Nitrogen System										
Nitrogen Vessels	D	NA	VIII	-	O	-	-	-	-	-
Valves	D	NA	VIII	-	AT,TB	-	-	-	-	-
Containment Air Release and Addition System										
Filters	D	NNS	-	-	AB	P	-	-	X	X
Valves	D	2	III-2	X	AB,C	P	X	X	X	X

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)

Notes:

1. Equipment located in the Containment and Auxiliary Building not designed for seismic loading will be checked to verify that fault of such equipment will not result in the loss of function of safety class equipment.

2.	D	=	Duke
	B	=	Babcock & Wilcox
	W	=	Westinghouse
3.	1	=	Safety Class 1
	2	=	Safety Class 2
	3	=	Safety Clas 3
	NNS	=	Non-Nuclear Safety
	NA	=	Not Applicable
4.	III-1	=	ASME Boiler and Pressure Vessel Code – Section III, Class 1
	III-2	=	ASME Boiler and Pressure Vessel Code – Section III, Class 2
	III-3	=	ASME Boiler and Pressure Vessel Code – Section III, Class 3
	VIII	=	ASME Boiler and Pressure Vessel Code – Section VIII
	B31.1.0	=	ANSI B31.1.0 (1967)
	D100	=	American Waterworks Association, Standard for Steel Tanks, Standpipes, Reservoirs, and Elevated Tanks for Water Storage, AWWA, D100

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)

	API-620	=	American Petroleum Institute Recommended Rules for Design and Construction of Large Welded Low Pressure Storage Tanks
	ACI	=	American Concrete Institute
	AMCA	=	Air Moving and Conditioning Association
	NFUL	=	National Fire Underwrites Laboratory
	P&V-1	=	ASME Code for Pumps and Valves for Nuclear Power, Class I
	P&V-11	=	ASME Code for Pumps and Valves for Nuclear Power, Class II
	P&V-III	=	ASME Code for Pumps and Valves for Nuclear Power, Class III
	III-A	=	ASME Boiler and Pressure Vessel Code, Section III, Class A
	III-B	=	ASME Boiler and Pressure Vessel Code, Section III, Class B
	III-C	=	ASME Boiler and Pressure Vessel Code, Section III, Class C
	See Table 3-57 for HVAC design codes		
5.	Safety related quality assurance required: X = Yes; - = No		
6.	C	=	Containment
	RB	=	Reactor Building
	AB	=	Auxiliary Building
	TB	=	Turbine Building
	SB	=	Service Building
	DB	=	Diesel Building
	DH	=	Dog House

Component			Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)
	O	=	Outdoors above ground									
	B	=	Buried in ground									
	CW	=	Contaminated warehouse									
	RF	=	Radwaste facility									
7.	X	=	Source of radiation									
	-	=	No source of radiation									
	P	=	Possible source of radiaiton									
8.	X	=	Designed for									
	-	=	Not designed for									
9.	X	=	Protected by virtue of location in a structure designed for tornado wind and missiles									
	-	=	No protection required									
10.	Redundant electrical heaters are supplied											
11.	Tank is provided with diaphragm membrane for oxygen exclusion											
12.	AMCA Class III and performance tested in accordance with AMCA Standard Test Code for air moving devices.											
13.	Performance test required.											
14.	National Fire Protection Association No. 20.											
15.	Pump for this service designed and manufactured in accordance with Section III of ASME Boiler and Pressure Vessel Code is either unavailable or not as suitable for this service as conventional pump not in conformance to the ASME Code. Conventional, non-code pump will be furnished.											
16.	This refers to Upper and Lower Containment Ventilation Systems.											
17.	Tanks are designed for all external forces due to soil and water, inlcuding buoyancy.											
18.	These components were not built to applicable codes and standards, but have been qualified seismically.											

Component	Scope (2)	Safety Class (3)	Code (4)	QA Req'd (5)	Location (6)	Rad Source (7)	Seismic (1) OBE (8)	Seismic (1) SSE (8)	Wind (9)	Tornado Missile (22)

19. The storage tank, itself, is not designed to resist a tornado generated missile; instead, a wall has been installed around the tank to elevation 773+1 to resist any tornado generated missile. This wall assures that a minimum quantity of water is available to mitigate any postulated accident caused by a tornado.

20. CS HX was replaced at EOC-8. The configuration was changed to reverse flow patterns; the shell has containment spray, III-B, and tubes have raw lake water, III-C.

21. Lower Support Coolers – Function abandoned prior to start up. Now air-cooled due to radiation.

22. Turbine missiles are included per section 3.5.1.2

23. Reference Table 3-63

Table 3-5. System Piping Classification

Duke System Piping Class	NRC Quality Class	ANS Safety Class	Code Design Criteria	Designed For Seismic Loading
A	A	1	Class 1, ASME Section III, 1971	Yes
B	B	2	Class 2, ASME Section III, 1971	Yes
C	C	3	Class 3, ASME Section III, 1971[1]	Yes
D	B	2	Class 2, ASME Section III, 1971	No
E	D	NNS	ANSI B31.1.0 (1967)	No
F	D	NNS	ANSI B31.1.0 (1967)	Yes
G	-	-	ANSI B31.1.0 (1967)	No
H	-	-	Duke Power Company Specifications	No

Note:

Code Applicability: Due to the numerous code references located throughout this SAR, no attempt is made to revise these references as Codes are amended, superseded or substituted. The code references specified above are the basis for design and materials. Duke establishes an "effective code date" for the station in accordance with 10 CFR 50.55a, reviews and may elect to comply with portions of or all the latest versions of the above Codes unless material and/or design commitments have progressed to a stage of completion such that it is not practical to make a change. When only portions of Code Addenda are utilized, the appropriate engineering review of the entire addenda assures that the overall intent of the Code is still maintained.

1. The Nuclear Service Water System meets the requirements of ANSIB31.7, Class III, which was the required code at the time of initial design, procurement and installation.

Table 3-6. System Valve Classification

Duke System Piping Class	NRC Quality Class	ANS Safety Class	Code Design Criteria	Designed For Seismic Loading
A	A	1	Class 1, ASME Section III, 1971	Yes
B	B	2	Class 2, ASME Section III, 1971	Yes
C	C	3	Class 3, ASME Section III, 1971	Yes
D	B	2	Class 2, ASME Section III, 1971	No
E	D	NNS	ANSI B31.1.0 (1967)	No
F	D	NNS	ANSI B31.1.0 (1967)	Yes
G	-	-	ANSI B31.1.0 (1967)	No
H	-	-	Duke Energy Specifications	No

Table 3-7. Electrical Systems and Components Summary of Criteria

Equipment	Safety Class	QA Req'd	Location	Rad. Environ.	Seismic SSE	Tornado Wind	Tornado Missile	Scope
Air Conditioning System (Control, Equipment, and Cable Room)								
Compressor Motors	1E	X	AB	-	X	X	X	D
Vent Fan Motors	1E	X	AB	-	X	X	X	D
Chill Water Pump Motors	1E	X	AB	-	X	X	X	D
Control Room Makeup Fan Motor	1E	X	AB	-	X	X	X	D
Equipment & Cable Room Makeup Fan Motor	1E	X	AB	-	X	X	X	D
Annulus Vent System								
Fan Motors	1E	X	AB	X	X	X	X	D
Moisture Separator Electric Heaters	1E	X	AB	X	-	-	-	D
Air Operated Valves (Solenoids)	1E	X	AB	-	X	X	X	D
Auxiliary Building Vent System								
ESF Air Handling Unit Motors	1E	X	AB	-	X	X	X	D
Cabling Equipment (Essential Auxiliaries)								
Cable Support System	1E	X	AB,C,RB	X(Inside Cont.)	X	X	X	D
Cable	1E	X	AB,C,RB	X(Inside Cont.)	-	X	X	D
Chemical and Volume Control System								
Chg. Pump Motor (Centrifugal)	1E	X	AB	X	X	X	X	W

Equipment	Safety Class	QA Req'd	Location	Rad. Environ.	Seismic SSE	Tornado Wind	Tornado Missile	Scope
Boric Acid Transfer Pump Motor	1E	X	AB	-	X	X	X	W
Selected MO Valve Motors	1E	X	AB,C	X	X	X	X	D
Containment Air Return Systems								
Air Return Fan Motors	1E	X	C	X	X	X	X	D
H_2 Skimmer Fan Motors & MO Valve Motors	1E	X	C	X	X	X	X	D
Containment Spray System								
Containment Spray Pump Motors	1E	X	AB	X	X	X	X	D
Selected MO Valve Motors	1E	X	AB	X	X	X	X	D
Containment Isolation Systems								
Containment Isolation Valve Motors	1E	X	RB,C,AB	X	X	X	X	D
Component Cooling Water System								
Component Cooling Pump Motors	1E	X	AB	-	X	X	X	D
Selected M.O. Valve Motors	1E	X	AB	-	X	X	X	D
Diesel Building Ventilation System								
Diesel Room Supply Fan Motors	1E	X	AB	-	X	X	X	D
Proportioning Dampers	1E	X	AB	-	X	X	X	D
Emergency Disel Auxiliary Systems								
Emergency Diesel Generator	1E	X	AB	-	X	X	X	D
Diesel Crank Case VAC Pump Motor	1E	X	AB	-	X	X	X	D
Diesel F.O. Transfer Pump Motor	1E	X	AB	-	X	X	X	D

Equipment	Safety Class	QA Req'd	Location	Rad. Environ.	Seismic SSE	Tornado Wind	Tornado Missile	Scope
Diesel Gen. F.O. Booster Pump Motors	1E	X	AB	-	X	X	X	D
Diesel L.O. Filter Pump Motor	1E	X	AB	-	X	X	X	D
Diesel 600/120V Panelboard	1E	X	AB	-	X	X	X	D
Diesel Lube Oil Pump Motors	1E	X	AB	-	X	X	X	D
Diesel Jacket & Intercooler Pump Mtr	1E	X	AB	-	X	X	X	D
Diesel Air Compressor Motors	1E	X	AB	-	X	X	X	D
Diesel Generator Battery & Charger	1E	X	AB	-	X	X	X	D
Auxiliary Feedwater System								
Auxiliary Feedwater Pump Motor	1E	X	AB	-	X	X	X	D
Spent Fuel Cooling System								
Cooling Pump Motors	1E	X	AB	X	-	-	-	D
Deleted Per 2008 Update								
Nuclear Instrumentation System								
Detectors	1E	X	C	X	X	X	X	W/D
Amplifier Assembly	1E	X	C	X	X	X	X	D
Nuclear Instrumentation Racks								
1. Source Range Equipment	1E	X	AB	-	X	X	X	D
2. Intermediate Range Equipment	1E	X	AB	-	X	X	X	D
3. Power Range Equip.	1E	X	AB	-	X	X	X	W
Penetrations	1E	X	C,RB	X	X	X	X	D

Equipment	Safety Class	QA Req'd	Location	Rad. Environ.	Seismic SSE	Tornado Wind	Tornado Missile	Scope
4 KV ES Aux Power System								
4 KV Metalclad Bus	1E	X	AB	-	X	X	X	D
4 KV Metalclad ES Switchgear	1E	X	AB	-	X	X	X	D
4160/600V Transformers	1E	X	AB	-	X	X	X	D
600V Essential Aux Power System								
600V ES Aux Power system	1E	X	AB	-	X	X	X	D
600V ES Motor Control Centers	1E	X	AB	-	X	X	X	D
600/208V Essential Transformers	1E	X	AB	-	X	X	X	D
125V DC Vital Instrumentation & Control Power System								
125VDC Battery Chargers	1E	X	AB	-	X	X	X	D
125VDC Batteries	1E	X	AB	-	X	X	X	D
125VDC Distribution Centers	1E	X	AB	-	X	X	X	D
125VDC Panelboards	1E	X	AB	-	X	X	X	D
120V AC Vital Power System								
125V DC/120V AC Static Inverters	1E	X	AB	-	X	X	X	D
120 AC Vital Power Panelboards	1E	X	AB	-	X	X	X	D
Process Inst. & Control System								
Process I & C Racks (Protection)	1E	X	AB	-	X	X	X	W
Pri Sys Detectors (Protective)	1E	X	C,AB	X	X	X	X	W
Sec Sys Detectors (Protective)	1E	X	AB	X	X	X	X	W

Equipment	Safety Class	QA Req'd	Location	Rad. Environ.	Seismic SSE	Tornado Wind	Tornado Missile	Scope
Aux Sys Detectors (Protection)	1E	X	C,AB	X	X	X	X	W/D
Control Panels (Class 1E Circuits)								
Main Control Board	1E	X	AB	-	X	X	X	D
RCP Volt/Freq Monitor Panel	1E	X	AB	-	X	X	X	D
Aux Feedwater Panels	1E	X	AB	-	X	X	X	D
Aux Shutdown Panels	1E	X	AB	-	X	X	X	D
Diesel Generator Control Panels	1E	X	AB	-	X	X	X	D
HVAC Control Panels	1E	X	AB	-	X	X	X	D
Misc Termination Cabinets	1E	X	AB	-	X	X	X	D
Radioactive Waste Systems								
RHR & CS Pump Room Sump Pump Motor	1E	X	AB	X	X	X	X	D
Residual Heat Removal System								
RHR Pump Motors	1E	X	AB	X	X	X	X	W
Selected M.O. Valve Motors	1E	X	C,AB	X	X	X	X	D
Rod Control System								
Reactor Trip Switchgear	1E	X	AB	-	X	X	X	W
Safety Injection System								
Safety Injection Pump Motors	1E	X	AB	X	X	X	X	W
Selected Solenoid Valves	1E	X	AB	X	X	X	X	D
Selected M.O. Valve Motors	1E	X	AB	X	X	X	X	D

Equipment	Safety Class	QA Req'd	Location	Rad. Environ.	Seismic SSE	Tornado Wind	Tornado Missile	Scope
Service Water System (Nuclear)								
Service Water Pump Motors	1E	X	AB	-	X	X	X	D
Motor Operated Valve Motors	1E	X	AB	-	X	X	X	D
Reactor Protection System & Engineered Safety Feature Actuation System								
Solid State Protection Sys Racks	1E	X	AB	-	X	X	X	W
ESF Test Cabinet	1E	X	AB	-	X	X	X	W
Auxiliary Safeguard Cabinets	1E	X	AB	-	X	X	X	W
Steam Supply System								
Main Steam Isolation Valve Solenoids	1E	X	AB	-	X	X	X	D

Note:

The instrumentation described in Sections 7.2 through 7.6 is subject to the pertinent requirements of the Quality Assurance Program.

EXPLANATION OF SYMBOLS

Table Headings	Symbols		
Scope	W	= Westinghouse	
	D	= Duke	
Safety Class	1E	= Electrical Safety Class 1E	(Ref. 3.2.4.1)
	2E	= Electrical Safety Class 2E	(Ref. 3.2.4.1)
	3E	= Electrical Safety Class 3E	(Ref. 3.2.4.1)
	4E	= Electrical Safety Class 4E	(Ref. 3.2.4.1)

Equipment	Safety Class	QA Req'd	Location	Rad. Environ.	Seismic SSE	Tornado Wind	Tornado Missile	Scope
	-	= No Safety Class						
Q.A. Req'd	X	= Yes						
	-	= No						
Location	C	= Containment						
	RB	= Reactor Building						
	AB	= Aux. Building						
	TB	= Turbine Building						
	SB	= Service Building						
	O	= Outdoors Above Ground						
Rad Environ	X	= Designed for Rad. Environment						
	-	= Not Designed For						
Seismic	S.S.E.	= Safe Shutdown Earthquake						
	X	= Designed For						
	-	= Not Designed For						
Tornado	X	= Protection Required (Protected by virtue of location in a structure designed for tornado wind and missiles)						
	-	= No Protection Required						
Equipment	ESF	= Engineered Safety Features						

Table 3-8. Design Basis Tornado Generated Missiles

Design Basis Tornado Missiles are as defined below:
1. A 2 in. by 4 in. by 12 ft board weighing 40 pounds per cubic foot, end on at a speed of 300 mph.
2. A cross-tie, 7 in. by 9 in. by 8.5 ft weighing 50 pounds per cubic foot at a speed of 300 mph.
3. An automobile weighing 2,000 pounds with an impact area of 20 sq. ft. at 20 ft. above grade at a speed of 100 mph.
4. A steel pipe 2 in. in diameter by 7 ft. long end on at 100 mph.
Note: Design basis tornado generated missile direction is horizontal only (i.e. with no vertical velocity component).

Table 3-9. Category 1 Structures and Missiles Protected Against

Structure	Types of Missiles Protected Against
Reactor Building	Tornado Missiles and Turbine-Generator Missiles
Containment Interior Structures	Internal Missiles
Diesel Generator Building	Tornado Missiles and Turbine-Generator Missiles
Block Dividing Wall	D/G Flywheel Missiles
Auxiliary Building (outside walls, roof, floors and some internal walls)	Tornado Missiles, Turbine-Generator Missiles and Selected Internal Missiles
Spent Fuel Pool	Tornado Missiles and Selected Internal Missiles, Turbine-Generator Missiles
Control Room (outside walls and roof)	Tornado Missiles and Turbine-Generator Missiles

Table 3-10. CRDM Housing Plug Ejection

Plug Weight: 11 lbs		
Plug O.D.: 2.75 in.		
Travel, x (ft)	**Velocity, v (ft/sec)**	**Kinetic Energy (ft/lb)**
1	240	9,750
2	335	19,900
.		
3	370	23,300
4	415	29,200
5	440	33,000

Table 3-11. Drive Shaft Ejection

Diameter = 1.75 in.				
Length = 300 in.				
Weight = 120 lbs.				
Drive Shaft Travel Outside Housing[1] (ft)	**Drive Shaft Velocity (ft/sec)**	**Drive Shaft Kinetic Energy (ft-lb)**	**Missile Shield[2] Steel Plate Thickness (in.)**	**Missile Shield[2] Additional Concrete Slab Thickness (in.)**
1	151	42,900	1	---
2	162	49,000	1	2.5
3	171	55,000	1	10
4	179	60,200	1	16
5	189	66,500	1	25
10	269	134,700		

Notes:

1. Distance from top of rod travel housing to bottom of missile shield.
2. These thicknesses are indicative only, and shield design can optimize between steel and concrete thicknesses.

Table 3-12. Drive Shaft and Mechanism Ejection

Missile Weight: 1500 lbs		
Impact O.D.: 3.75 in.		
Travel, x (ft)	**Velocity (ft/sec)**	**Kinetic Energy (ft-lb)**
1	14.3	4,600
2	20.2	9,200
3	24.8	13,800
4	28.6	18,400
5	32.0	23,000

Table 3-13. Temperature Element Assembly Characteristics

1. For a tear around the weld between the boss and the pipe:		
Characteristics	**“without well”**	**“with well”**
Flow Discharge Area	0.11 in.^{2}	0.60 in.^{2}
Thrust Area	7.1 in.^{2}	9.6 in.^{2}
Missile Weight	11.0 lb	15.2 lb
Area of Impact	3.14 in.^{2}	3.14 in.^{2}
Missile Weight divided by Impact Area	3.5 psi	4.84 psi
Velocity	20 ft/sec	120 ft/sec
2. For a tear at the junction between the temperature element assembly and the boss for the “without well” element and at the junction between the boss and the well for the “with well” element.		
Flow Discharge Area	0.11 in^2	0.60 in^2
Thrust Area	3.14 in^2	3.14 in^2
Missile Weight	4.0 lb	6.1 lb
Area of Impact	3.14 in^2	3.14 in^2
Missile Weight divided by Impact Area	1.27 psi	1.94 psi
Velocity	72 ft/sec	120 ft/sec

Table 3-14. Pressurizer Space Valve Missiles

	Weight	Flow Discharge Area	Thrust Area	Impact Area	Weight to Impact Area Ratio	Velocity
1. Safety Relief Valve Bonnet (3" x 6")	350 lb	2.86 in.^{2}	80 in.^{2}	24 in.^{2}	14.6 psi	110 fps
2. 3" Motor Operated Isolation Valve Bonnet (plus Motor and Stem)	400 lb	5.5 in.^{2}	113 in.^{2}	28.3 in.^{2}	14.1 psi	135 fps
3. 2" Air Operated Relief Valve Bonnet (plus stem)	75 lb	1.8 in.^{2}	20.7 in.^{2}	20 in.^{2}	3.75 psi	115 fps
4. 3" Air Operated Spray Valve Bonnet (plus stem)	120 lb	5.5 in.^{2}	50.3 in.^{2}	50 in.^{2}	2.4 psi	190 fps
5. 4" Air Operated Spray Valve	200 lb	9.3 in.^{2}	50.3 in.^{2}	50 in.^{2}	4 psi	190 fps

Table 3-15. Properties of Credible Turbine Missiles

Missile	Weight (lb)	Initial Velocity fps	Exit Velocity fps	Energy (ft-lb) 10^6	Missile Area ft^{2}[(1)]		
					A_1	A_2	A_3
Disc No. 1	3521			Missile Contained			
Disc No. 2	3611	665	341	6.5	4.77	2.55	3.28
Disc No. 3	2741			Missile Contained			
Disc No. 4	3194	629	312	4.8	2.4	1.96	3.60
Disc No. 5	3961	574	345	7.3	3.03	2.52	4.00

Notes:

1. See Figure 3-4.
2. Disc No. 5 controls the thickness of the barrier.
3. or more details on the turbine missile properties, see Section 3.5, Reference No. 4.

Table 3-16. Internal Missiles. [(1)(4)]

Missile	Penetration Depth "t" Inches	Minimum Barrier Thickness Required, D=3t Inches
CRDM Housing Plug Ejection (FSAR Table 3-10)	2.1	6.3
Drive Shaft Ejection (FSAR Table 3-11)	1.1	3.3
Drive Shaft and Mechanism Ejection (FSAR Table 3-11)	1.112	3.336
Temperature Element Assembly Missiles (FSAR Table 3-13)	0.54	1.62
Safety Relief Valve Bonnet (Table 3-14)	1.96	5.88
3" Motor Operated Isolation Valve Bonnet Plus Motor and Stem (Table 3-14)	1.81	5.43
2" Air Operated Relief Valve Bonnet Plus Stem (Table 3-14)	0.38	1.14
3" Air Operated Spray Valve Bonnet plus Stem (Table 3-14)	0.65	1.95
4" Air Operated Spray Valve (Table 3-14)	1.04	3.12
Turbine Missiles [(2) (4)]		
Disc No. 5 of the Turbine	8.29	24.9
Diesel Generator Missiles[(5)]		
A 10# Section of the D/G Flywheel	1.7	5.1
Design Basis Tornado Generated Missiles [(3) (4) (6)]		
A 2" x 4" wooden board @300 mph	3.50	10.50
A Cross Tie 6" x 9" x 8.5' @ 300 mph	3.13	9.39
An Automobile 2000 lbs at speed of 100 mph	0.109	0.327
A steel pipe 2" diameter, 7' long @ 100 mph	2.03	6.09

Missile	Penetration Depth "t" Inches	Minimum Barrier Thickness Required, D=3t Inches

Notes:

1. Barriers for internal missiles include reinforced concrete walls, slabs and other components of the interior structure subjected to the paths of these missiles. Whenever a steel barrier is encountered by the missile, the required thickness of this barrier becomes 1/12 of the thickness required for a reinforced concrete barrier (see Reference 2).
2. Barriers are 1) Reactor Building dome and 2) Auxiliary Building roof.
3. Barriers are reinforced concrete slabs and walls, e.g.,: a) Reactor Building dome, b) Reactor Building shell, and c) Auxiliary Building roof and appropriate side walls.
4. The penetration depths of the reinforced concrete missile barriers are based on a concrete strength of 5000 psi.
5. Barrier is the reinforced block wall separating Diesel Generator Rooms A from B.
6. Design basis tornado generated missile direction is horizontal only (i.e. with no vertical velocity component).

Table 3-17. Minimum Barrier Thicknesses for all Category 1 Structures For Which Missile Protection Is Provided

Structure	Minimum Reinforced Concrete Missile Barriers Thickness Inches
Reactor Building Cylindrical Shell	36
Reactor Building Dome	27
Reactor Building Interior Structure	
1. Walls	24
2. Slabs	24
Auxiliary Building	
1. Main Building	
Roof	28(1)
Walls	12
2. Diesel Generator Building	
Roof	28
Walls	36
Dividing Wall	12(2)
3. Spent Fuel Storage Area	
Roof	28
Walls	24
4. New Fuel Storage Vault	
Roof	30
Walls	24
5. RN Manway Missile Barrier	12

Notes:

1. The thickness provided is considered as one independent thickness or the accumulation of several successive slabs.
2. Thickness is for grout filled, reinforced concrete masonry wall.

Table 3-18. High Energy Mechanical Piping Systems Analyzed for Consequences of Postulated Piping Breaks

System or Portion Thereof Operating During Normal Reactor Operation	System Identification	Pipe Break Protection Method
High Energy Safety Related Systems		
Steam Generator Blowdown Recycle System	BB	(a) (b)
Auxiliary Feedwater System (Motor Driven Pump Portion)	CA	(a) (b)
Nitrogen System	GN	(a)(b)
Reactor Coolant System	NC	(a) (b)
Residual Heat Removal System	ND	(a) (b)
Safety Injection System	NI	(a) (b)
Nuclear Sampling System	NM	(a) (b)
Boron Thermal Regeneration System	NR	(a)
Chemical and Volume Control System (Letdown Portion and Sealwater Injection)	NV	(a) (b)
Other High Energy Systems		
Feedwater System	CF	(a) (b) (c)
Main Steam Supply to Auxiliary Equipment	SA	(a)
Main Steam System	SM	(a) (b) (c)
Main Steam Vent to Atmosphere System	SV	(a)

Pipe Whip Protection Methods Legend:	
(a)	Physical Separation
(b)	Piping Restraints
(c)	Enclosures, structural, guard pipes, etc., (designed specifically for pipe break).

Note:

1. High Energy Systems may contain moderate energy portions; however, for brevity, high energy systems are only listed in this table.

Table 3-19. Moderate Energy Mechanical Piping Systems Analyzed for Consequences of Postulated Piping Breaks

System or Portion Thereof Operating During Normal Reactor Operation	System Identificatio n	Pipe Break Protection Method
Moderate Energy Safety Related Systems		
Auxiliary Feedwater System (Turbine Driven Portion)	CA	(a)
Diesel Fuel Oil System	FD	(a)
Refueling Water system	FW	(a)
Component Cooling System	KC	(a)
Diesel Generator Cooling Water System	KD	(a)
Spent Fuel Cooling System	KF	(a)
Diesel Generator Lube Oil System	LD	(a)
Boron Recycle System	NB	(a)
Residual Heat Removal System	ND	(a)
Containment Spray System	NS	(a)
Nuclear Service Water System	RN	(a)
Containment Ventilation Cooling Water System	RV	(a)
Main Steam Supply to Aux. Equipment	SA	(a)
FWP Turbine Exhaust	TE	(a)
Diesel Generator Starting Air System	VG	(a)
Gaseous Waste Recycle System	WG	(a)
Liquid Waste Recycle System	WL	(a)
Solid Waste Disposal System	WS	(a)
Deleted Per 2015 Update		
Other Moderate Energy Systems		
Auxiliary Steam System	AS	(a)
Recirculated Cooling Water System	KR	(a)
Ice Condenser Refrigeration System	NF	(a)
Fire Protection System	RF	(a)
Equipment Decontamination System	WE	(a)
Liquid Waste Monitor & Disposal System	WM	(a)
Chemical Addition System	YA	(a)

System or Portion Thereof Operating During Normal Reactor Operation	System Identification	Pipe Break Protection Method
Control Area Chilled Water System	YC	(a)
Plant Heating System	YH	(a)
Make-up Demineralizer System	YM	(a)

Pipe Whip Protection Methods Legends:	
(a)	Physical Separation
(b)	Piping Restraints
(c)	Enclosures, structural, guard pipes, etc., (Designed specifically for pipe break)

Table 3-20. Comparison of Duke Pipe Rupture Criteria And NRC Requirements Of Branch Technical Positions APCSB 3-1 (November 1975), MEB 3-1 (July 1981), and NRC Regulatory Guide 1.46 (May 1973)

NRC Criteria	Duke Criteria
APCSB 3-1, Section B.2.c	SAR Section 3.6.2.2
Section B.2.c. requires that piping between containment isolation valves be provided with pipe whip restraints capable of resisting bending and torsional moments produced by a postulated failure either upstream or downstream of the valves. Also, the restraints should be designed to withstand the loadings from postulated failures so that neither isolation valve operability nor the leaktight integrity of the containment will be impaired. Terminal ends should be considered to originate at a point adjacent to the required pipe whip restraints.	Duke criteria is roughly equivalent to NRC criteria as clarified below: The containment structural integrity is provided for all postulated pipe ruptures. In addition, for any postulated rupture classified as a loss of coolant accident, the design leaktightness of the containment fission product barrier will be maintained. Penetration design is discussed in SAR Section 3.9.2.8. This section also discussed penetration guard pipe design criteria. Terminal ends are defined as piping originating at structure or component that act as rigid constraint to the piping thermal expansion.
APCSB 3-1, Section B.2.d 1. The protective measures, structures, and guard pipes should not prevent the access required to conduct inservice inspection examination. 2. For portions of piping between containment isolation valves, the extent of inservice examinations completed during each inspection interval should provide 100 percent volumetric examination of circumferential and longitudinal pipe welds. 3. Inspection ports should be provided in guard pipes to permit the required examination of circumferential welds. Inspection ports should not be located in that portion of guard pipe passing through the annulus. 4. The areas subject to examination should be defined in accordance with Examination Categories C-F and C-G for Class 2 piping welds in Tables IWC-2520.	SAR Section 5.2.8 Duke criteria is different than the NRC criteria due to the code effective date as described below: ASME Class 2 piping welds will be inspected in accordance with Tables ISC-251 of Section XI (1971), through Winter 1971 Addenda, of the ASME Code, as accessibility permits. Inservice inspection program requirements are given in SAR Section 5.2.8.

NRC Criteria	Duke Criteria
APCSB 3-1, Appendix A High Energy fluid systems are defined as those systems that, during normal plant conditions, are either in operation or maintained pressurized under conditions where either or both of the following are met: 1. maximum operating temperature exceeds 200°F, or 2. maximum operating pressure exceeds 275 psig.	SAR Section 3.6.1.2 Duke criteria is the same as NRC criteria with expansion of definition as clarified below: 1. Non-liquid systems with a maximum normal pressure less than 275 psig are not considered high energy regardless of the temperature. Such low pressure system (i.e., Auxiliary Steam, 50 psig, 340°F) do not contain sufficient sensible energy to develop sudden, catastrophic failures. Propagation of a crack to a full failure is extremely unlikely. 2. Exception to the 200°F threshold for high energy systems is taken for non-water systems such as ethylene glycol. Such systems that operate at less than their boiling temperature are considered moderate energy.
APCSB 3-1, Appendix A In piping runs which are maintained pressurized during normal plant conditions for only a portion of the run (i.e., up to the first normally shut valve) a terminal end of such runs is the piping connection to this closed valve.	SAR Section 3.6.2.2.1 Duke criteria is different from NRC criteria as described and justified below: Terminal ends are considered at piping originating at structure or components that act as rigid constraint to the piping thermal expansion. Typically, the anchors assumed for the code stress analysis would be terminal ends. Stresses in the system either side of the closed valve will be about the same; therefore, terminal end classification based on constraint and high stresses are not applicable.

NRC Criteria	Duke Criteria
MEB 3-1, Section B.1.b(6) Section B.1.b(6) requires that guard pipe assemblies between containment isolation valves meet the following requirements: 1. The design pressure and temperature should not be less than the maximum operating temperature and pressure of the enclosed pipe under normal plant conditions. 2. The design stress limits of Paragraph NE-3131(c) should not be exceeded under the loading associated with design pressure and temperature in combination with the safe shutdown earthquakes. 3. Guard pipe assemblies should be subjected to a single pressure test at a pressure equal to design pressure.	SAR Section 3.9.2.8 Duke criteria is different from NRC criteria as described and justified below: Guard pipes provided between containment isolation valves is designed in accordance with SAR Section 3.9.2.8. Guardpipe thicknesses were developed using the criteria of ASME Code Case 1606 and the appropriate loading combination and stress limits of Table 3-48. Guard pipes are subjected to a pressure test as required by the material specification before welding to the penetration assembly. It is impractical to test guard pipes in the finished penetration assembly due to the configuration and potential damage to internal process pipe and associated insulation. Independent design analysis have been conducted to provide assurance that Duke penetration designs are acceptable. In addition, the extent of NDT conducted on guard pipes to flued head butt weld is such to assure integrity of design.

NRC Criteria	Duke Criteria
MEB 3-1, Sections B.1.c(3) Breaks in non-nuclear piping should be postulated at the following location: 1. Terminal ends, 2. At each intermediate pipe fitting, welded attachment, and valve. **Note:** PER GENERIC LETTER 87-11, ARBITRARY INTERMEDIATE BREAKS ARE NOT REQUIRED TO BE POSTULATED.	SAR Section 3.6.2.2.1 Duke criteria is roughly equivalent to NRC criteria as described and justified below: Breaks in Duke Class F piping (non-nuclear, seismic) are postulated at terminal ends and at intermediate locations based on the use of ASME Section III analysis techniques, the same as Duke Class B and C piping. Duke Class F piping is constructed in accordance with ANSI B31.1 and is dynamically analyzed and restrained for seismic loadings similar to ASME Section III piping. Materials are specified, procured, received, stored, and issued under Duke's QA program similar to ASME Section III materials except that certificate of compliance in lieu of mill test reports are acceptable on minor components, and construction documentation for erected materials is not uniquely maintained. Construction documentation for erected materials is generically maintained. MTR are required for the bulk of piping materials.
MEB 3-1, Section B.2.e Thru-wall cracks may be postulated instead of breaks in those fluid systems that qualify as high energy fluid systems for short operational periods. This operational period is defined as about 2 percent of the time that the system operates as a moderate energy fluid system.	SAR Section 3.6.1.2 Duke criteria is roughly equivalent to NRC criteria as clarified below: The operational period that classifies such systems as moderate energy in either: 1. One percent of the normal operating lifespan of the plant, or 2. Two percent of the time period required to accomplish its system design function.

NRC Criteria	Duke Criteria
Regulatory Guide 1.46 Longitudinal breaks are postulated in piping runs 4 inches nominal pipe size and larger. Circumferential breaks are postulated in piping runs exceeding 1 inch nominal pipe size.	SAR Section 3.6.2.2.1 Duke criteria is the same as NRC Branch Technical Position APCSB 3-1 and roughly equivalent to Regulatory Guide 1.46 with expansion of definition as described below: Longitudinal breaks are postulated in piping runs 4 inches nominal pipe size and larger except that longitudinal breaks are not postulated at terminal ends where the piping has no longitudinal welds.
Regulatory Guide 1.46 A whipping pipe should be considered capable of rupturing an impacted pipe of smaller nominal pipe size and lighter wall thickness.	SAR Section 3.6.2.2 Item 10 Duke criteria is the same as NRC Branch Technical Position APCSB 3-1 and roughly equivalent to Regulatory Guide 1.46 with expansion of definition as described below: The energy associated with a whipping pipe is considered capable of (a) rupturing impacted pipes of smaller nominal pipe sizes, and (b) developing thru-wall cracks in larger nominal pipe sizes with thinner wall thicknesses.
Regulatory Guide 1.46 Measures for restraint against pipe whipping need not be provided for piping where: 1. the design temperature is 200°F or less, and 2. the design pressure is 275 psig or less.	SAR Section 3.6.1.2 Duke criteria is roughly equivalent to NRC Branch Technical Position APCSB 3-1 and differs from Regulatory Guide 1.46 with expansion of definition as described below: High energy piping is reviewed for pipe whipping and is defined as those systems that during normal plant conditions are either in operation or maintained pressurized under conditions where either or both of the following are met: 1. maximum temperature exceeds 200°F, or 2. maximum pressure exceeds 275 psig, except that (1) non-liquid piping system with a maximum pressure less than or equal to 275 psig are not considered high energy regardless of the temperature, and (2) for liquid systems other than water, the atmospheric boiling temperature can be applied.

NRC Criteria	Duke Criteria
	Systems are classified as moderate energy if the total time that either of the above conditions are met is less than either: 1. one (1) percent of the operating lifespan of the plant, or 2. two (2) percent of the time period required to accomplish its system design function.

Note:

1. Pipe breaks in the RCS primary loop are not considered in certain aspects of plant design, as defined in Reference 3 of Section 3.6.6.

Table 3-21. Postulated Break Locations in Reactor Coolant Loops

Location of Postulated Rupture	Type
1. Reactor Vessel Inlet Nozzle[1]	Circumferential
2. Reactor Vessel Outlet Nozzle[1]	Circumferential
3. Steam Generator Inlet Nozzle[1]	Circumferential
4. Steam Generator Outlet Nozzle[1]	Circumferential
5. Reactor Coolant Pump Inlet Nozzle[1]	Circumferential
6. Reactor Coolant Pump Outlet Nozzle[1]	Circumferential
7. 50° Elbow on the Intrados[1]	Longitudinal
8. Loop Closure Weld in Crossover Leg[1]	Circumferential
9. Residual Heat Removal (RHR) Line/Primary Coolant Loop Connection	Circumferential (Viewed from the RHR line)
10. Accumulator (ACC) Line/Primary Coolant Loop Connection	Circumferential (Viewed from ACC line)
11. Pressurizer Surge (PS) Line/Primary Coolant Loop Connection	Circumferential (Viewed from the PS line)

Note:

1. Reference 1 of Section 3.6.6 defines the original basis for postulating pipe breaks in the Reactor Coolant System Primary Loop. References 3 and 4 of Section 3.6.6 provide the basis for eliminating the previously postulated reactor coolant system pipe breaks with the exception of those breaks at branch connections from certain aspects of design considerations.

Table 3-22. Comparison of Actual Moments To Reference Fatigue Analysis Moments

	Fatigue Analysis			Loadings Used In Fatigue Analysis		McGuire Loadings	
Node No.[1]	Cumulative Usage Factor	SI (psi)[2]	SI/S_m[1]	M_i (in-lbs) (OBE Moments)	M_i (in-lbs) (Thermal Expansion Moments)	M_i (in-lbs) (OBE Moments)	M_i (in-lbs) (Thermal Expansion Moments)
404	.632	94,772	5.26	$.341 \times 10^8$	$.243 \times 10^8$	$.0164 \times 10^8$	$.199 \times 10^8$
413	.0093	65,509	3.64	$.243 \times 10^8$	$.163 \times 10^8$	$.0113 \times 10^8$	$.122 \times 10^8$
415	.2656	75,528	4.19	$.243 \times 10^8$	$.203 \times 10^8$	$.0200 \times 10^8$	$.153 \times 10^8$
438	.0382	70,744	3.94	$.266 \times 10^8$	$.536 \times 10^7$	$.0538 \times 10^8$	$.047 \times 10^8$
459	.000	33,406	1.85	$.211 \times 10^8$	$.837 \times 10^8$	$.1363 \times 10^7$	$.073 \times 10^8$
468	.0060	61,100	3.39	$.29 \times 10^8$	$.729 \times 10^7$	$.0849 \times 10^8$	$.050 \times 10^8$
484	.0959	81,820	4.54	$.29 \times 10^8$	$.811 \times 10^7$	$.1150 \times 10^8$	$.057 \times 10^8$

Notes:

1. The loop closure weld, RHR line connection, accumulator line connection and surge line connection locations have not been included in this table since selection of these locations for postulated breaks is independent of detailed stress and fatigue analyses. Also, node numbers are defined in WCAP-8172.
2. SI = maximum primary plus secondary stress intensity range computed using Equation 10 of paragraph NB3653 of ASME, Section III. When $3S_m$, the limit of Equation 10, is exceeded, the requirements is NB3653.6 are used. Specifically, Equations 12 and 13 are satisfied and a factor K_e is used in the fatigue analysis (Equation 14).

Table 3-23. Deleted Per 2002 Update

Table 3-24. Exceptions to Criteria. Presented in FSAR Section 3.6 for the Performance of the Pipe Break Analysis

System	Exception	Reason for Exception	Alternative to Criteria
Safety Injection (10" accumulator lines)	Pipe break restraints are not provided for postulated breaks at eight locations in the 10" accumulator lines inside containment.	Construction of restraints would transfer large loads to the shield wall requiring a number of large anchor bolts. Since the shield wall is heavily reinforced, installation of high tension anchor bolts is impossible. Extreme congestion in the area further prohibits an adequate restraint design.	Inservice inspection with the addition of monitoring unidentified RCS Leakage utilizing the RCS Leakage Detection System is provided for the postulated break locations. These measures are considered equivalent to a rupture restraint, and therefore, adequate protection is provided for the postulated breaks.

Table 3-25. Damping Values for Westinghouse Supplied Equipment[6]

Item	Damping (Percent of Critical)	
	Normal / Upset Conditions	Faulted Condition
	OBE	SSE/DBA
Primary Coolant Loop System - Components	2	4[3]
Primary Coolant Loop System - Large Piping[1]	2[7]	4[7]
Small Piping	½, 1[2]	2
Welded Steel Structures	2	4[5]
Bolted and/or Riveted Steel Structures	4	7[4]
Control Rod Drive, Mechanisms & Support System	5[5]	5[3]
Fuel Assemblies	7[5]	9[3]

Note:

1. Generally applicable to 12" or larger piping
2. For multiple hanger supported piping
3. Damping of 3% used for steam generator replacement analysis
4. Damping of 5% used for steam generator replacement analysis
5. Damping of 2% used for steam generator replacement analysis
6. Also includes the BWI supplied replacement steam generators
7. N-411 damping used for OBE & SSE steam generator replacement analyses

Table 3-26. Reactor Building and Interior Structure Comparison of Peak Responses

	Peak Acceleration on the Response Spectrum(G's)		
Mass Location	**Fixed Base**	**Combined Interaction**	**Percent Increase**
Reactor Vessel Support	0.498	0.493	-0.1
Steam Generator Support	1.724	1.692	-1.85
Penetration Support	1.074	1.176	+9.5

Table 3-27. Comparison of Response Spectrum And Time-History Responses(1)(2)

Mass Point	Accelerations (G's)		Moments ($X10^4$ Ft-K)		Shears ($X10^3$ Kips)	
	Response Spectrum	Time-History	Response Spectrum	Time-History	Response Spectrum	Time-History
1	.0467	.1174	27.26	30.97	4.72	6.28
2	.0638	.1278	23.21	25.86	4.47	5.60
3	.0872	.1434	18.63	20.21	4.35	5.31
4	.1125	.1601	14.43	15.16	4.16	4.94
5	.1344	.1766	11.81	12.13	3.79	4.32
6	.1407	.1811	10.94	11.14	3.70	4.18
7	.1818	.2138	7.51	7.57	2.91	3.00
8	.2247	.2458	4.60	4.64	2.43	2.45
9	.2645	.2750	2.35	2.37	1.88	1.89
10	.2785	.2848	1.73	1.75	1.38	1.39
11	.3028	.3002	0.91	0.92	1.13	1.14
12	.3284	.3153	0.32	0.32	0.74	0.75
13	.3528	.3301	0.0	0.0	0.37	0.37

Notes:

1. Refer to Figure 3-20 for mathematical model
2. Values for Response Spectrum Technique are based on the original analysis (MCC-1134.02-00-0003), before Steam Generator replacement and Ice Condenser mass adjustments.

Table 3-28. Maximum Blowdown LOCA Load Resultants for the Containment Interior Structure

Loading	Maximum Value	Break Location	Time
OVERTURNING MOMENT	280,950 FT-K	ELEMENT NO. 1(1)	0.312 SEC.
HORIZONTAL SHEAR	3,977 KIPS	ELEMENT NO. 1(1)	0.312 SEC.
UPLIFT	6,354 KIPS	ELEMENT NO. 2(1)	0.222 SEC

Note:

1. The blowdown history and structural geometry for Elements No. 1 and No. 6, No. 2 and No. 5 are the same, therefore, the maximums for No. 1 apply to No. 6 and the maximums for No. 2 apply to No. 5.

   Refer to Table 6-1 through Table 6-6 for Containment Interior Structure blowdown model

Table 3-29 McGuire Nuclear Station - Containment Subcompartment Pressures Calculated Values of differential Pressure (psi)-Across Compartments

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

								Design Diff Pressure (= 1.4 x Diff Pressure)	
COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MAXIMUM	MINIMUM
1	2	0.7158E+01	0.0190	H.L. 1	-0.5517E+01	0.0190	H.L. 2	0.1002E+02	-0.7723E+01
1	6	0.1099E+02	0.0640	H.L. 1	-0.1086E+02	0.0550	H.L. 6	0.1539E+02	-0.1520E+02
1	7	0.1040E+02	0.2700	C.L. 1	-0.2167E+00	0.0370	C.L. 6	0.1456E+02	-0.3033E+00
1	8	0.1168E+02	0.2340	C.L. 1	-0.2000E+00	0.0280	H.L. 6	0.1634E+02	-0.2800E+00
1	9	0.1064E+02	0.2340	C.L. 1	-0.1917E+00	0.0280	H.L. 6	0.1490E+02	-0.2683E+00
1	25	0.1245E+02	0.0730	H.L. 1	-0.1917E+00	0.0280	H.L. 6	0.1743E+02	-0.2683E+00
1	26	0.1237E+02	0.0730	H.L. 1	-0.4250E+00	2.5020	C.L. 6	0.1731E+02	-0.5950E+00
1	27	0.1113E+02	0.0640	H.L. 1	-01917E+00	0.0280	H.L. 6	0.1557E+02	-0.2683E+00
1	28	0.1236E+02	0.0730	H.L. 1	-0.4250E+00	2.5020	C.L. 6	0.1730E+02	-0.5950E+00
1	33	0.1119E+02	0.0550	H.L. 1	-0.2458E+01	0.1450	H.L. 6	0.1567E+02	-0.3442E+01
1	34	0.1238E+02	0.0730	H.L. 1	-0.4167E+00	2.6280	C.L. 6	0.1732E+02	-0.5833E+00
********************									
2	1	0.5517E+01	0.0190	H.L. 2	-0.7158E+01	0.0190	H.L. 1	0.7723E+01	-0.1002E+02
2	3	0.6350E+01	0.0640	H.L. 1	-0.4767E+01	0.0280	H.L. 3	0.8890E+01	-0.6673E+01
2	10	0.7783E+01	0.2880	C.L. 2	0.0	0.0100	C.L. 6	0.1090E+02	0.0
2	11	0.8867E+01	0.2340	C.L. 2	0.0	0.0100	C.L. 6	0.1241E+02	0.0
2	12	0.8117E+01	0.2340	C.L. 2	0.0	0.0100	C.L. 6	0.1136E+02	0.0
2	25	0.8775E+01	0.1270	C.L. 2	0.0	0.0100	C.L. 6	0.1228E+02	0.0
2	26	0.8583E+01	0.0910	H.L. 1	-0.4333E+00	2.4840	C.L. 6	0.1202E+02	-0.6067E+00
2	27	0.7192E+01	0.0460	H.L. 2	-0.1500E+00	2.4840	C.L. 6	0.1007E+02	-0.2100E+00
2	28	0.8567E+02	0.0910	H.L. 1	-0.4333E+00	2.4840	C.L. 6	0.1199E+02	-0.6067E+00
2	33	0.6975E+01	0.0370	H.L. 2	-0.1992E+01	0.0910	H.L. 5	0.9765E+02	-0.2788E+01

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	Design Diff Pressure (= 1.4 x Diff Pressure) MAXIMUM	MINIMUM
********************									
3	2	0.4767E+01	0.0280	H.L. 3	-0.6350E+01	0.0640	H.L. 1	0.6673E+01	-0.8890E+01
3	4	0.4675E+01	0.0280	H.L. 3	-0.5725E+01	0.0190	H.L. 4	0.6545E+01	-0.8015E+01
3	13	0.5850E+01	0.2880	C.L. 3	-0.3333E-01	0.0010	C.L. 3	0.8190E+01	-0.4667E-01
3	14	0.7083E+01	0.2520	C.L. 3	-0.3333E-01	0.0010	C.L. 3	0.9917E+01	-0.4667E-01
3	15	0.6583E+01	0.2520	C.L. 3	-0.3333E-01	0.0010	C.L. 3	0.9217E+01	-0.4667E-01
3	25	0.6700E+01	0.0640	H.L. 3	-0.3333E-01	0.0010	C.L. 3	0.9380E+01	-0.4667E-01
3	27	0.6550E+01	0.0550	H.L. 3	-0.5583E+00	2.2140	C.L. 1	0.9170E+01	-0.7817E+00
3	28	0.6717E+01	0.2700	C.L. 3	-0.4083E+00	2.5380	C.L. 6	0.9403E+01	-0.5717E+00
3	29	0.7317E+01	0.2880	C.L. 3	-0.4333E+00	2.5380	C.L. 6	0.1024E+02	-0.6067E+00
3	30	0.6667E+01	0.0640	H.L. 3	-0.4167E+00	2.5560	C.L. 6	0.9333E+01	-0.5833E+00
3	33	0.5683E+01	0.0370	H.L. 3	-0.1183E+01	0.0820	H.L. 6	0.7957E+01	-0.1657E+01
3	35	0.6858E+01	0.2700	C.L. 3	-0.4000E+00	2.5380	C.L. 6	0.9602E+01	-0.5600E+00
********************									
4	3	0.5725E+01	0.0190	H.L. 4	-0.4675E+01	0.0280	H.L. 3	0.8015E+01	-0.6545E+01
4	5	0.5717E+01	0.0190	H.L. 4	-0.5558E+01	0.0190	H.L. 5	0.8003E+01	-0.7782E+01
4	16	0.6217E+01	0.2880	C.L. 4	-0.3917E+00	0.0550	C.L. 4	0.8703E+01	-0.5483E+00
4	17	0.7500E+01	0.2340	C.L. 4	0.0	0.0010	C.L. 6	0.1050E+02	0.0
4	18	0.6900E+01	0.2340	C.L. 4	0.0	0.0010	C.L. 6	0.9660E+01	0.0
4	25	0.6783E+01	0.0460	H.L. 4	0.0	0.0010	C.L. 6	0.9497E+01	0.0
4	29	0.7383E+01	0.3060	C.L. 4	-0.5083E+00	2.5200	C.L. 1	0.1034E+02	-0.7117E+00
4	30	0.6908E+01	0.2880	C.L. 4	-0.4917E+00	2.5200	C.L. 1	0.9672E+01	-0.6883E+00
4	31	0.6758E+01	0.0370	H.L. 4	-0.4417E+00	2.4120	C.L. 6	0.9462E+01	-0.6183E+00
4	33	0.6475E+01	0.0370	H.L. 4	-0.1317E+01	0.0730	H.L. 2	0.9065E+01	-0.1843E+01

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	Design Diff Pressure (= 1.4 x Diff Pressure) MAXIMUM	MINIMUM
4	36	0.6950E+01	0.2520	C.L. 4	-0.4750E+00	2.5200	C.L. 1	0.9730E+01	-0.6650E+00
*********************									
5	4	0.5558E+01	0.0190	H.L. 5	-0.5717E+01	0.0190	H.L. 4	0.7782E+01	-0.8003E+01
5	6	0.5367E+01	0.0190	H.L. 5	-0.7433E+01	0.0190	H.L. 6	0.7513E+01	-0.1041E+02
5	19	0.7458E+01	0.2880	C.L. 5	0.0	0.0010	C.L. 6	0.1044E+02	0.0
5	20	0.8567E+01	0.2340	C.L. 5	0.0	0.0010	C.L. 6	0.1199E+02	0.0
5	21	0.7817E+01	0.2160	C.L. 5	0.0	0.0010	C.L. 6	0.1094E+02	0.0
5	25	0.8617E+01	0.1180	C.L. 5	0.0	0.0010	C.L. 6	0.1206E+02	0.0
5	30	0.8417E+01	0.1000	H.L. 6	-0.5333E+00	2.3940	C.L. 1	0.1178E+02	-0.7467E+00
5	31	0.7025E+01	0.0460	H.L. 5	-0.1667E+00	2.3760	C.L. 1	0.9835E+01	-0.2333E+00
5	32	0.8417E+01	0.1000	H.L. 6	-0.5250E+00	2.4300	C.L. 1	0.1178E+02	-0.7350E+00
5	33	0.6758E+01	0.0370	H.L. 5	-0.2125E+01	0.0910	H.L. 2	0.9462E+01	-0.2975E+01
*********************									
6	5	0.7433E+01	0.0190	H.L. 6	-0.5367E+01	0.0190	H.L. 5	0.1041E+02	-0.7513E+01
6	22	0.9958E+01	0.2700	C.L. 6	-0.2250E+00	0.0370	C.L. 1	0.1394E+02	-0.3150E+00
6	23	0.1521E+02	0.3040	C.L. 6	-0.2100E+00	0.0360	C.L. 1	0.2129E+02	-0.2940E+00
6	24	0.1023E+02	0.0460	C.L. 6	-0.1833E+00	0.0370	C.L. 1	0.1431E+02	-0.2567E+00
6	25	0.1210E+02	0.0730	H.L. 6	-0.1833E+00	0.0370	C.L. 1	0.1694E+02	-0.2567E+00
6	30	0.1201E+02	0.0730	H.L. 6	-0.5250E+00	2.5200	C.L. 1	0.1682E+02	-0.7350E+00
6	31	0.1091E+02	0.0550	H.L. 6	-0.1833E+00	0.0370	C.L. 1	0.1527E+02	-0.2567E+00
6	32	0.1201E+02	0.0730	H.L. 6	-0.5250E+00	2.4300	C.L. 1	0.1681E+02	-0.7350E+00
6	33	0.1090E+02	0.0550	H.L. 6	-0.2842E+01	0.1450	H.L. 1	0.1526+02	-0.3978E+01
6	37	0.1199E+02	0.0730	H.L. 6	-0.3833E+00	2.4660	C.L. 1	0.1679E+02	-0.5367E+00

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	Design Diff Pressure (= 1.4 x Diff Pressure) MAXIMUM	MINIMUM
********************									
7	1	0.2167E+00	0.0370	C.L. 6	-0.1040E+02	0.2700	C.L. 1	0.3033E+00	-0.1456E+02
7	2	0.1550E+01	0.0280	H.L. 1	-0.7950E+01	0.2700	C.L. 1	0.2170E+01	-0.1113E+02
7	8	0.3275E+01	0.0460	H.L. 1	-0.9333E+00	0.4860	H.L. 1	0.4585E+01	-0.1307E+01
7	10	0.4592E+01	0.0460	H.L. 1	-0.3425E+01	0.0460	H.L. 2	0.6428E+01	-0.4795E+01
7	25	0.8242E+01	0.0820	H.L. 1	-0.2417E+01	0.2520	H.L. 1	0.1154E+02	-0.3383E+01
7	27	0.6550E+01	0.0730	H.L. 1	-0.5875E+01	0.2340	H.L. 1	0.9170E+01	-0.8225E+01
7	34	0.8125E+01	0.0820	H.L. 1	-0.3025E+01	2.1600	C.L. 2	0.1137E+02	-0.4235E+01
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8	1	0.2000E+00	0.0280	H.L. 6	-0.1168E+02	0.2340	C.L. 1	0.2800E+00	-0.1634E+02
8	7	0.9333E+01	0.4860	H.L. 1	-0.3275E+01	0.0460	H.L. 1	0.1307E+01	-0.4585E+01
8	9	0.2408E+01	0.0640	H.L. 1	-0.1558E+01	0.6300	C.L. 1	0.3372E+01	-0.2182E+01
8	11	0.3500E+01	0.0640	H.L. 1	-0.2892E+01	0.1990	H.L. 1	0.4900E+01	-0.4048E+01
8	25	0.5850E+01	0.0820	H.L. 1	-0.2592E+01	0.2340	H.L. 1	0.8190E+01	-0.3628E+01
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9	1	0.1917E+00	0.0280	H.L. 6	-0.1064E+02	0.2340	C.L. 1	0.2683E+00	-0.1490E+02
9	8	0.1558E+01	0.6300	C.L. 1	-0.2408E+01	0.0640	H.L. 1	0.2182E+01	-0.3372E+01
9	12	0.2450E+01	0.0730	H.L. 1	-0.1975E+01	0.1990	H.L. 1	0.3430E+01	-0.2765E+01
9	25	0.3608E+01	0.1270	H.L. 2	-0.1442E+01	0.2340	H.L. 1	0.5052E+01	-0.2018E+01
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10	2	0.0	0.0100	C.L. 6	-0.7783E+01	0.2880	C.L. 2	0.0	-0.1090E+02
10	7	0.3425E+01	0.0460	H.L. 2	-0.4592E+01	0.0460	H.L. 1	0.4795E+01	-0.6428E+01
10	11	0.2567E+01	0.0460	H.L. 2	-0.6583E+00	0.4860	H.L. 2	0.3593E+01	-0.9217E+00
10	13	0.4583E+01	0.0910	H.L. 1	-0.3658E+01	0.0550	H.L. 3	0.6417E+01	-0.5122E+01

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	Design Diff Pressure (= 1.4 x Diff Pressure) MAXIMUM	MINIMUM
10	25	0.6825E+01	0.1090	H.L. 1	-0.1525E+01	0.2520	H.L. 2	0.9555E+01	-0.2135E+01
10	27	0.4858E+01	0.0550	H.L. 2	-0.4492E+01	0.2880	C.L. 2	0.6802E+01	-0.6288E+01
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11	2	0.0	0.0100	C.L. 6	-0.8867E+01	0.2340	C.L. 2	0.0	-0.1241E+02
11	8	0.2892E+01	0.1990	H.L. 1	-0.3500E+01	0.0640	H.L. 1	0.4048E+01	-0.4900E+01
11	10	0.6583E+00	0.4860	H.L. 2	-0.2567E+01	0.0460	H.L. 2	0.9217E+00	-0.3593E+01
11	12	0.2108E+01	0.1000	H.L. 1	-0.1383E+01	0.6840	C.L. 2	0.2952E+01	-0.1937E+01
11	14	0.3575E+01	0.1000	H.L. 1	-0.2900E+01	0.0730	H.L. 3	0.5005E+01	-0.4060E+01
11	25	0.5208E+01	0.1180	H.L. 1	-0.1783E+01	0.2340	H.L. 2	0.7292E+01	-0.2497E+01
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12	2	0.0	0.0100	C.L. 6	-0.8117E+01	0.2340	C.L. 2	0.0	-0.1136e+02
12	9	0.1975e+01	0.1990	H.L. 1	-0.2450E+01	0.0730	H.L. 1	0.2765E+01	-0.3430E+01
12	11	0.1383E+01	0.6840	C.L. 2	-0.2108E+01	0.1000	H.L. 1	0.1937E+01	-0.2952E+01
12	15	0.2408E+01	0.1180	H.L. 1	-0.2017E+01	0.0820	H.L. 3	0.3372E+01	-0.2823E+01
12	25	0.3392E+01	0.1270	H.L. 1	-0.9667E+00	0.2520	H.L. 2	0.4748E+01	-0.1353E+01
********************									
13	3	0.3333E-01	0.0010	C.L. 3	-0.5850E+01	0.2880	C.L. 3	0.4667E-01	-0.8190E+01
13	10	0.3658E+01	0.0550	H.L. 3	-0.4583E+01	0.0910	H.L. 1	0.5122E+01	-0.6417E+01
13	14	0.2308E+01	0.0460	H.L. 3	-0.2417E+00	0.4500	H.L. 3	0.3232E+01	-0.3383E+00
13	16	0.3575E+01	0.0550	H.L. 3	-0.4200E+01	0.0550	H.L. 4	0.5005E+01	-0.5880E+01
13	25	0.5592E+01	0.0820	H.L. 3	-0.6417E+00	0.9720	H.L. 3	0.7828E+01	-0.8983E+00
13	27	0.4817E+01	0.0640	H.L. 3	-0.3725E+01	1.2600	C.L. 2	0.6743E+01	-0.5215E+01
13	29	0.5625E+01	0.0820	H.L. 3	-0.2508E+01	1.7460	C.L. 4	0.7875E+01	-0.3512E+01
13	35	0.5525E+01	0.0820	H.L. 3	-0.2583E+01	1.2780	C.L. 2	0.7735E+01	-0.3617E+01

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

								Design Diff Pressure (= 1.4 x Diff Pressure)	
COMP	**BETWEEN AND COMP**	**MAXIMUM DIFF PRESSURE**	**TIME (SEC)**	**ELEMENT**	**MINIMUM DIFF PRESSURE**	**TIME (SEC)**	**ELEMENT**	**MAXIMUM**	**MINIMUM**
********************									
14	3	0.3333E-01	0.0010	C.L. 3	-0.7083E+01	0.2520	C.L. 3	0.4667E-01	-0.9917E+01
14	11	0.2900E+01	0.0730	H.L. 3	-0.3575E+01	0.1000	H.L. 1	0.4060E+01	-0.5005E+01
14	13	0.2417E+00	0.4500	H.L. 3	-0.2308E+01	0.0460	H.L. 3	0.3383E+00	-0.3232E+01
14	15	0.1783E+01	0.0730	H.L. 3	-0.1267E+01	0.7920	C.L. 3	0.2497E+01	-0.1773E+01
14	17	0.2833E+01	0.0730	H.L. 3	-0.3275E+01	0.0730	H.L. 4	0.3967E+01	-0.4585E+01
14	25	0.4333E+01	0.0910	H.L. 3	-0.1392E+01	0.7920	C.L. 3	0.6067E+01	-0.1948E+01
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15	3	0.3333E-01	0.0010	C.L. 3	-0.6583E+01	0.2520	C.L. 3	0.4667E-01	-0.9217E+01
15	12	0.2017E+01	0.0820	H.L. 3	-0.2408E+01	0.1180	H.L. 1	0.2823E+01	-0.3372E+01
15	14	0.1267E+01	0.7920	C.L. 3	-0.1783E+01	0.0730	H.L. 3	0.1773E+01	-0.2497E+01
15	18	0.1975E+01	0.0820	H.L. 3	-0.2317E+01	0.0820	H.L. 4	0.2765E+01	-0.3243E+01
15	25	0.2817E+01	0.0910	H.L. 3	-0.6417E+00	0.2340	H.L. 3	0.3943E+01	-0.8983E+00
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16	4	0.3917E+00	0.0550	C.L. 4	-0.6217E+01	0.2880	C.L. 4	0.5483E+00	-0.8703E+01
16	13	0.4200E+01	0.0550	H.L. 4	-0.3575E+01	0.0550	H.L. 3	0.5880E+01	-0.5005E+01
16	17	0.2558E+01	0.0370	H.L. 4	-0.3583E+00	0.4680	H.L. 4	0.3582E+01	-0.5017E+00
16	19	0.3800E+01	0.0460	H.L. 4	-0.3883E+01	0.0820	H.L. 6	0.5320E+01	-0.5437E+01
16	25	0.5733E+01	0.0730	H.L. 4	-0.7417E+00	0.8280	H.L. 4	0.8027E+01	-0.1038E+01
16	29	0.5750E+01	0.0730	H.L. 4	-0.2508E+01	1.7820	C.L. 3	0.8050E+01	-0.3512E+01
16	31	0.4900E+01	0.0550	H.L. 4	-0.3767E+01	1.0440	C.L. 5	0.6860E+01	-0.5273E+01
16	36	0.5667E+01	0.0730	H.L. 4	-0.2558E+01	1,2600	C.L. 6	0.7933E+01	-0.3582E+01
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17	4	0.0	0.0010	C.L. 6	-0.7500E+01	0.2340	C.L. 4	0.0	-0.1050E+02

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	Design Diff Pressure (= 1.4 x Diff Pressure) MAXIMUM	MINIMUM
17	14	0.3275E+01	0.0730	H.L. 4	-0.2833E+01	0.0730	H.L. 3	0.4585E+01	-0.3967E+01
17	16	0.3583E+00	0.4680	H.L. 4	-0.2558E+01	0.0370	H.L. 4	0.5017E+00	-0.3582E+01
17	18	0.1925E+01	0.0640	H.L. 4	-0.1342E+01	0.7020	C.L. 4	0.2695E+01	-0.1878E+01
17	20	0.2942E+01	0.0640	H.L. 4	-0.3042E+01	0.1000	H.L. 6	0.4118E+01	-0.4258E+01
17	25	0.4500E+01	0.0820	H.L. 4	-0.1458E+01	0.2160	H.L. 4	0.6300E+01	-0.2042E+01
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18	4	0.0	0.0010	C.L. 6	-0.6900E+01	0.2340	C.L. 4	0.0	-0.9660E+01
18	15	0.2317E+01	0.0820	H.L. 4	-0.1975E+01	0.0820	H.L. 3	0.3243E+01	-0.2765E+01
18	17	0.1342E+01	0.7020	C.L. 4	-0.1925E+01	0.0640	H.L. 4	0.1878E+01	-0.2695E+01
18	21	0.2033E+01	0.3040	H.L. 6	-0.2240E+01	0.3760	C.L. 3	0.2814E+01	-0.3136E+01
18	25	0.2992E+01	0.0910	H.L 4	-0.7583E+00	0.2340	H.L. 4	0.4188E+01	-0.1062E+01
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19	5	0.0	0.0010	C.L. 6	-0.7458E+01	0.2880	C.L. 5	0.0	-0.1044E+02
19	16	0.3883E+01	0.0820	H.L. 6	-0.3800E+01	0.0460	H.L. 4	0.5437E+01	-0.5320E+01
19	20	0.2533E+01	0.0460	H.L. 5	-0.6750E+00	0.3060	H.L. 5	0.3547E+01	-0.9450E+00
19	22	0.3300E+01	0.0460	H.L. 5	-0.4683E+01	0.0460	H.L. 6	0.4620E+01	-0.6557E+01
19	25	0.6708E+01	0.1090	H.L. 6	-0.1558E+01	0.2520	H.L. 5	0.9392E+01	-0.2182E+01
19	31	0.4733E+01	0.0550	H.L. 5	-0.4442E+01	0.2880	C.L. 5	0.6627E+01	-0.6218E+01
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20	5	0.0	0.0010	C.L. 6	-0.8567E+01	0.2340	C.L. 5	0.0	-0.1199E+02
20	17	0.3042E+01	0.1000	H.L. 6	-0.2942E+01	0.0640	H.L. 4	0.4258E+01	-0.4118E+01
20	19	0.6750E+00	0.3060	H.L. 5	-0.2533E+01	0.0460	H.L. 5	0.9450E+00	-0.3547E+01
20	21	0.2050E+01	0.1000	H.L. 6	-0.1400E+01	0.6840	C.L. 5	0.2870E+01	-0.1960E+01
20	23	0.2983E+01	0.1900	H.L. 6	-0.3542E+01	0.0640	H.L. 6	0.4177E+01	-0.4958E+01

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	Design Diff Pressure (= 1.4 x Diff Pressure) MAXIMUM	MINIMUM
20	25	0.5100E+01	0.1180	H.L. 6	-0.1850E+01	0.2340	H.L. 5	0.7140E+01	-0.2590E+01
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21	5	0.0	0.0010	C.L. 6	-0.7817E+01	0.2160	C.L. 5	0.0	-0.1094E+02
21	18	0.2083E+01	0.1090	H.L. 6	-0.2033E+01	0.0730	H.L. 4	0.2917E+01	-0.2847E+01
21	20	0.1400E+01	0.6840	C.L. 5	-0.2050E+01	0.1000	H.L. 6	0.1960E+01	-0.2870E+01
21	24	0.2042E+01	0.1999	H.L. 6	-0.2492E+01	0.0730	H.L. 6	0.2858E+01	-0.3488E+01
21	25	0.3300E+01	0.1270	H.L. 6	-0.9750E+00	0.2340	H.L. 5	0.4620E+01	-0.1365E+01
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22	6	0.2250E+00	0.0370	C.L. 1	-0.9958E+01	0.2700	C.L. 6	0.3150E+00	-0.1394E+02
22	19	0.4683E+01	0.0460	H.L. 6	-0.3300E+01	0.0460	H.L. 5	0.6557E+01	-0.4620E+01
22	23	0.3317E+01	0.0460	H.L. 6	-0.1008E+01	0.4860	C.L. 6	0.4643E+01	-0.1412E+01
22	25	0.8183E+01	0.0820	H.L. 6	-0.2492E+01	0.2340	H.L. 6	0.1146E+02	-0.3488E+01
22	31	0.6508E+01	0.0640	H.L. 6	-0.5850E+01	0.2340	H.L. 6	0.9112E+01	-0.8190E+01
22	37	0.8033E+01	0.0820	H.L. 6	-0.3217E+01	1.7280	C.L. 5	0.1125E+02	-0.4503E+01
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23	6	0.2000E+00	0.0370	C.L. 1	-0.1095E+02	0.2160	C.L. 6	0.2800E+00	-0.1533E+02
23	20	0.3542E+01	0.0640	H.L. 6	-0.2983E+01	0.1900	H.L. 6	0.4958E+01	-0.4177E+01
23	22	0.1050E+01	0.2500	H.L. 6	-0.3450E+01	0.1080	H.L. 5	0.1470E+01	-0.4830E+01
23	24	0.2417E+01	0.0640	H.L. 6	-0.1533E+01	0.6120	C.L. 6	0.3383E+01	-0.2147E+01
23	25	0.5850E+01	0.0820	H.L. 6	-0.2567E+01	0.2340	H.L. 6	0.8190E+01	-0.3593E+01
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24	6	0.1833E+00	0.0370	C.L. 1	-0.1023E+02	0.0460	H.L. 6	0.2567E+00	-0.1431E+02
24	21	0.2492E+01	0.0730	H.L. 6	-0.2042E+01	0.1990	H.L. 6	0.3488E+01	-0.2868E+01
24	23	0.1533E+01	0.6120	C.L. 6	-0.2417E+01	0.0640	H.L. 6	0.2147E+01	-0.3383E+01

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

								Design Diff Pressure (= 1.4 x Diff Pressure)	
COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MAXIMUM	MINIMUM
24	25	0.3583E+01	0.0910	H.L. 6	-0.1433E+01	0.2340	H.L. 6	0.5017E+01	-0.2007E+01
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25	25	0.0	2.9520	C.L. 6	0.0	2.9520	C.L. 6	0.0	0.0
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26	1	0.4250E+00	2.5020	C.L. 6	-0.1237E+02	0.0730	H.L. 1	0.5950E+00	-0.1731E+02
26	27	0.2917E+00	2.5920	C.L. 6	-0.4700E+01	0.2520	C.L. 1	-.4083E+00	-0.6580E+01
26	28	0.2083E+00	0.5040	C.L. 3	-0.2417E+00	0.3240	C.L. 2	0.2917E+00	-0.3383E+00
26	32	0.6417E+00	0.4860	C.L. 3	-0.5583E+00	0.2700	H.L. 2	0.8983E+00	-0.7817E+00
26	34	0.2000E+00	0.3060	H.L. 2	-0.6667E-01	0.9180	C.L. 5	0.2800E+00	-0.9333E-01
********************									
27	1	0.1917E+00	0.0280	H.L. 6	-0.1113E+02	0.0640	H.L. 1	0.2683E+00	-0.1557E+02
27	2	0.1500E+00	2.4840	C.L. 6	-0.7192E+01	0.0460	H.L. 2	0.2100E+00	-0.1007E+02
27	3	0.5583E+00	2.2140	C.L. 1	-0.6550E+01	0.0550	H.L. 3	0.7817E+00	-0.9170E+01
27	10	0.4492E+01	0.2880	C.L. 2	-0.4858E+01	0.0550	H.L. 2	0.6288E+01	-0.6802E+01
27	26	0.4700E+01	0.2520	C.L. 1	-0.2917E+00	2.5920	C.L. 6	0.6580E+01	-0.4083E+00
27	28	0.4648E+01	0.2340	C.L. 1	-0.2917E+00	2.5920	C.L. 6	0.6522E+01	-0.4083E+00
27	34	0.4792E+01	0.2700	C.L. 1	-0.2750E+00	2.6460	C.L. 6	0.6708E+01	-0.3850E+00
27	35	0.4475E+01	0.2700	C.L. 1	-0.2750E+00	2.6460	C.L. 6	0.6256E+01	-0.3850E+00
********************									
28	2	0.4333E+00	2.4840	C.L. 6	-0.8567E+01	0.0910	H.L. 1	0.6067E+00	-0.1199E+02
28	3	0.4083E+00	2.5380	C.L. 6	-0.6717E+01	0.2700	C.L. 3	0.5717E+00	-0.9403E+01
28	26	0.2417E+00	0.3240	C.L. 2	-0.2083E+00	0.5040	C.L. 3	0.3383E+00	-0.2917E+00
28	27	0.2917E+00	2.5920	C.L. 6	-0.4658E+01	0.2340	C.L. 1	0.4083E+00	-0.6522E+01
28	29	0.1833E+01	1.0260	C.L. 1	-0.3333E-01	1.8180	C.L. 4	0.2567E+01	-0.4667E-01

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

								Design Diff Pressure (= 1.4 x Diff Pressure)	
COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MAXIMUM	MINIMUM
28	30	0.4417E+00	0.2520	H.L. 5	-0.4833E+00	0.2700	H.L. 2	0.6183E+00	-0.6767E+00
28	35	0.5500E+00	0.5940	C.L. 6	-0.2417E+00	0.2340	H.L. 1	0.7700E+00	-0.3383E+00
********************									
29	3	0.4333E+00	2.5380	C.L. 6	-0.7317E+01	0.2880	C.L. 3	0.6067E+00	-0.1024E+02
29	4	0.5083E+00	2.5200	C.L. 1	-0.7383E+01	0.3060	C.L. 4	0.7117E+00	-0.1034E+02
29	13	0.2508E+01	1.7460	C.L. 4	-0.5625E+01	0.0820	H.L. 4	0.3512E+01	-0.8050E+01
29	16	0.2508E+01	1.7820	C.L. 3	-0.5750E+01	0.0730	H.L. 4	0.3512E+01	-0.8050E+01
29	28	0.3333E-01	1.8180	C.L. 4	-0.1833E+01	1.0260	C.L. 1	0.4667E-01	-0.2567E+01
29	30	0.3333E-01	2.0520	H.L. 4	-0.1850E+01	0.7560	C.L. 1	0.4667E-01	-0.2590E+01
29	35	0.3333E-01	2.5920	C.L. 6	-0.1542E+01	0.5940	C.L. 1	0.4667E-01	-0.2158E+01
29	36	0.4167E-01	2.9160	C.L. 1	-0.1483E+01	0.5580	C.L. 6	0.5833E-01	-0.2077E+01
********************									
30	3	0.4167E+00	2.5560	C.L. 6	-0.6667E+01	0.0640	H.L. 3	0.5833E+00	-0.9333E+01
30	4	0.4917E+00	2.5200	C.L. 1	-0.6908E+01	0.2880	C.L. 4	0.6883E+00	-0.9672E+01
30	5	0.5333E+00	2.3940	C.L. 1	-0.8417E+01	0.1000	H.L. 6	0.7467E+00	-0.1178E+02
30	28	0.4833E+00	0.2700	H.L. 2	-0.4417E+00	0.2520	H.L. 5	0.6767E+00	-0.6183E+00
30	29	0.1850E+01	0.7560	C.L. 1	-0.3333E-01	2.0520	H.L. 4	0.2590E+01	-0.4667E-01
30	31	0.3667E+00	2.5560	C.L. 1	-0.4642E+01	0.2340	C.L. 6	0.5133E+00	-0.6498E+01
30	32	0.9167E-01	0.6840	C.L. 1	-0.1000E+00	0.4860	C.L. 2	0.1283E+00	-0.1400E+00
30	36	0.5750E+00	0.5760	C.L. 1	-0.2667E+00	0.2340	C.L. 6	0.8050E+00	-0.3733E+00
********************									
31	4	0.4417E+00	2.4120	C.L. 6	-0.6758E+01	0.0370	H.L. 4	0.6183E+00	-0.9462E+01
31	5	0.1667E+00	2.3760	C.L. 1	-0.7025E+01	0.0460	H.L. 5	0.2333E+00	-0.9835E+01
31	6	0.1833E+00	0.0370	C.L. 1	-0.1091E+02	0.0550	H.L. 6	0.2567E+00	-0.1527E+02

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	Design Diff Pressure (= 1.4 x Diff Pressure) MAXIMUM	MINIMUM
31	16	0.3767E+01	1.0440	C.L. 5	-0.4900E+01	0.0550	H.L. 4	0.5273E+01	-0.6860E+01
31	19	0.4442E+01	0.2880	C.L. 5	-0.4733E+01	0.0550	H.L. 5	0.6218E+01	-0.6627E+01
31	22	0.5850E+01	0.2340	H.L. 6	-0.6508E+01	0.0640	H.L. 6	0.8190E+01	-0.9112E+01
31	30	0.4642E+01	0.2340	C.L. 6	-0.3667E+00	2.5560	C.L. 1	0.6498E+01	-0.5133E+00
31	32	0.4592E+01	0.2340	C.L. 6	-0.3667E+00	2.4480	C.L. 1	0.6428E-01	-0.5133E+00
31	36	0.4425E+01	0.2160	C.L. 6	-0.3500E+00	2.5560	C.L. 1	0.6195E+01	-0.4900E+00
31	37	0.4408E+01	0.2340	C.L. 6	-0.2167E+00	2,7900	C.L. 1	0.6172E+01	-0.3033E+00
*******************									
32	5	0.5250E+00	2.4300	C.L. 1	-0.8417E+01	0.1000	H.L. 6	0.7350E+00	-0.1178E+02
32	6	0.5250E+00	2.4300	C.L. 1	-0.1201E+02	0.0730	H.L. 6	0.7350E+00	-0.1681E+02
32	26	0.5583E+00	0.2700	H.L. 2	-0.6417E+00	0.4860	C.L. 3	0.7817E+00	-0.8983E+00
32	30	0.1000E+00	0.4860	C.L. 2	-0.9167E-01	0.6840	C.L. 1	0.1400E+00	-0.1283E+00
32	31	0.3667E+00	2.4480	C.L. 1	-0.4592E+01	0.2340	C.L. 6	0.5133E+00	-0.6428E+01
32	37	0.1500E+00	0.5760	C.L. 3	-0.4833E+00	0.6120	C.L. 4	0.2100E+00	-0.6767E+00
*******************									
33	1	0.2458E+01	0.1450	H.L. 6	-0.1119E+02	0.0550	H.L. 1	0.3442E+01	-0.1567E+02
33	2	0.1992E+01	0.0910	H.L. 5	-0.6975E+01	0.0370	H.L. 2	0.2788E+01	-0.9765E+01
33	3	0.1183E+01	0.0820	H.L. 6	-0.5683E+01	0.0370	H.L. 3	0.1657E+01	-0.7957E+01
33	4	0.1317E+01	0.0730	H.L. 2	-0.6475E+01	0.0370	H.L. 4	0.1843E+01	-0.9065E+01
33	5	0.2125E+01	0.0910	H.L. 2	-0.6758E+01	0.0370	H.L. 6	0.2975E+01	-0.9462E+01
33	6	0.2842E+01	0.1450	H.L. 1	-0.1090E+02	0.0550	H.L. 6	0.3978E+01	-0.1526E+02
33	25	0.6075E+01	0.2340	C.L. 1	-0.2000E+00	0.0370	H.L. 6	0.8505E+01	-0.2800E+00
*******************									
34	1	0.4167E+00	2.6280	C.L. 6	-0.1238E+02	0.0730	H.L. 1	0.5833E+00	-0.1732E+02

MCGUIRE NUCLEAR STATION CONTAINMENT SUBCOMPARTMENT PRESSURES
CALCULATED VALUES OF DIFFERENTIAL PRESSURE (PSI) – ACROSS COMPARTMENTS

								Design Diff Pressure (= 1.4 x Diff Pressure)	
COMP	BETWEEN AND COMP	MAXIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MINIMUM DIFF PRESSURE	TIME (SEC)	ELEMENT	MAXIMUM	MINIMUM
34	7	0.3025E+01	2.1600	C.L. 2	-0.8125E+01	0.0820	H.L. 1	0.4235E+01	-0.1137E+02
34	25	0.2758E+01	1.7100	C.L. 3	-0.1058E+01	0.3060	H.L. 2	0.3862E+01	-0.1482E+01
34	26	0.6667E-01	0.9180	C.L. 5	-0.2000E+00	0.3060	H.L. 2	0.9333E-01	-0.2800E+00
34	27	0.2750E+00	2.6460	C.L. 6	-0.4792E+01	0.2700	C.L. 1	0.3850E+00	-0.6708E+01
********************									
35	3	0.4000E+00	2.5380	C.L. 6	-0.6858E+01	0.2700	C.L. 3	0.5600E+00	-0.9602E+01
35	13	0.2583E+01	1.2780	C.L. 2	-0.5525E+01	0.0820	H.L. 3	0.3617E+01	-0.7735E+01
35	27	0.2750E+00	2.6460	C.L. 6	-0.4475E+01	0.2700	C.L. 1	0.3850E+00	-0.6265E+01
35	28	0.2417E+00	0.2340	H.L. 1	-0.5500E+00	0.5940	C.L. 5	0.3383E+00	-0.7700E+00
35	29	0.1542E+01	0.5940	C.L. 1	-0.3333E-01	2.5920	C.L. 6	0.2158E+01	-0.4667E-01
********************									
36	4	0.4750E+00	2.5200	C.L. 1	-0.6950E+01	0.2520	C.L. 4	0.6650E+00	-0.9730E+01
36	16	0.2558E+01	1.2600	C.L. 6	-0.5667E+01	0.0730	H.L. 4	0.3582E+01	-0.7933E+01
36	29	0.1483E+01	0.5580	C.L. 6	-0.4167E-01	2.9160	C.L. 1	0.2077E+01	-0.5833E-01
36	30	0.2667E+00	0.2340	C.L. 6	-0.5750E+00	0.5760	C.L. 1	0.3733E+00	-0.8050E+00
36	31	0.3500E+00	2.5560	C.L. 1	-0.4425E+01	0.2160	C.L. 6	0.4900E+00	-0.6195E+01
********************									
37	6	0.3833E+00	2.4660	C.L. 1	-0.1199E+02	0.0730	H.L. 6	0.5367E+00	-0.1679E+02
37	22	0.3217E+01	1.7280	C.L. 5	-0.8033E+01	0.0820	H.L. 6	0.4503E+01	-0.1125E+02
37	25	0.2842E+01	1.6380	C.L. 4	-0.8750E+00	0.3060	H.L. 4	0.3978E+01	-0.1225E+01
37	31	0.2167E+00	2.7900	C.L. 1	-0.4408E+01	0.2340	C.L. 6	0.3033E+00	-0.6172E+01
37	32	0.4833E+00	0.6120	C.L. 4	-0.1500E+00	0.5760	C.L. 3	0.6767E+00	-0.2100E+00
********************									

Table 3-30. Design Loading Conditions

The operating condition categories are defined as follows from ASME III, NB 3113.

Normal Conditions - Normal conditions are any conditions in the course of system startup, operation in the design power range, hot standby and system shutdown, other than Upset, Emergency, Faulted or Testing Conditions.

Upset Conditions (Incidents of Moderate Frequency) - Any deviations from Normal Conditions anticipated to occur often enough that design should include a capability to withstand the conditions without operational impairment. The Upset Conditions include those transients which result from any single operator error or control malfunction, transients caused by a fault in a system component requiring its isolation from the system and transients due to loss of load or power. Upset Conditions include any abnormal incidents not resulting in a forced outage and also forced outages for which the corrective action does not include any repair of mechanical damage. The estimated duration of an Upset Condition shall be included in the Design Specifications.

Emergency Conditions (Infrequent Incidents) - Those deviations from Normal Conditions which require shutdown for correction of the conditions or repair of damage in the system. These conditions have a low probability of occurrence but are included to provide assurance that no gross loss of structural integrity will result as a concomitant effect of any damage developed in the system. The total number of postulated occurrences for such events shall not cause more than 25 stress cycles having an S_a value greater than that for 10^6 cycles from the applicable fatigue design curves of Figures 1-9.0.

Faulted Conditions (limiting Faults) - Those combinations of conditions associated with extremely-low-probability, postulated events whose consequences are such that the integrity and operability of the nuclear energy system may be impaired to the extent that considerations of public health and safety are involved. Such considerations require compliance with safety criteria as may be specified by jurisdictional authorities.

Note:

Definition of Terms from the ASME Boiler and Pressure Vessel Code, Section III, 1971

Table 3-31. Codes and Specifications for Design of Category 1 Structures and Equipment Supports

Structural Component	Design Codes and Specifications
Concrete	ACI 318-63 ACI 307-69[1] Regulatory Guide 1.15
Concrete Reinforcement	ASTM A615, Grades 40 and 60
Cadwelds	Regulatory Guide 1.10[2]
Structural Steel and Plates	ASTM A-36 AISC, 7th Edition[3]
Containment Vessel Shell	Subsection B Section III of the ASME Code 1968 Edition Including all the addenda through the Summer of 1970. (The high strength embedded anchor bolts for the steam generator enclosure walls meet the requirements of Section A for normal operation and 1986 Code, Appendix 'F', for faulted condition.)
Steel Pipes	USS T-1

Note:

1. For the design of the Reactor Building for Temperature effects.
2. Valid test results are used. A test is not considered valid if a failure occurs in the bar or near testing machine grips. Test samples for B Series Splices are sister splices only.
3. For visual inspection of structural welds, reference the “Visual Weld Acceptance Criteria For Structural Welding at Nuclear Power Plants”, NCIG-01, Rev. 2 dated 5/7/85.

Table 3-32. Reactor Building Loading Combinations and Code Requirements

Loading Combination	Code or Stress Requirements
1. DL + CL 2. DL + OL + OBE 3. DL + OL + DBA 4. DL + OL + W	WSD, stresses in reinforcement and concrete are in accordance with Chapter 10, ACI 318 - 1963 Code. AISC with allowable stresses of F_s.
5. DL + OL + SSE 6. DL + OL + W_t 7. DL + OL + SSE + DBA + Y	ACI-318, USD with no factors applied to loadings. AISC with allowable stress of 1.5 F_s or 0.9 F_y whichever is less.
DL = Dead Load, including weight of permanent equipments attached to the Reactor Building.	
CL = Construction Loads.	
OL = Normal Loads on the Reactor Building due to plant operation such as thermal loads and normal penetration loads due to pipe reactions on the building. OL also includes Live Loads during plant operation.	
OBE = Operating Basis Earthquake Load, inertia forces due to base excitation of 8 percent G.	
SSE = Safe Shutdown Earthquake Load, inertia forces due to base excitation of 15 percent G.	
DBA = Design Basis Accident, includes the differential pressures on the Reactor Building and the associated thermal loads.	
W = Normal wind loads.	
Y = Loading on structure due to pipe rupture.	
W_t = Tornado Loading as defined in Section 3.3.2.2.	
ACI-318 = "Building Code Requirements for Reinforced Concrete," June 1963.	
AISC = "Specification for the Design, Fabrication and Erection of Structural Steel Buildings," 1969.	
F_s = Steel allowable stresses as specified in AISC, Part 1.	
WSD = "Working Stress Design" Method.	
F_y = Steel specified yield stress.	
USD = "Ultimate Strength Design" method.	

As a minimum, the margin of safety as specified in the above codes and specifications is met in the design of the Reactor Building.

AISC is used for the design of structural steel embedments and pipe sleeves through the Reactor Building wall.

In addition to the Design conditions defined above, the roof has been investigated, spot checked, and found structurally adequate for the following loading condition: U = DL + OL + SL

where SL = Severe snow and ice loads and is defined in Section 2.4.10.

Table 3-33. Containment Vessel Loading Combination and Code Requirements

Loading Combination	Code Reference
DL + CL	ASME - Normal Condition
DL + OL + DBA	ASME - Normal Condition
DL + OL + OBE	ASME - Normal Condition
DL + OL + OBE + P'	ASME - Normal Condition
DL + OL + SSE	ASME - Emergency Condition
DL + OL + SSE + DBA	ASME - Emergency Condition
DL + OL + SSE + P'	ASME - Emergency Condition

ASME	=	ASME Boiler and Pressure Vessel Code, Section III, Subsection B, 1968, including all addenda through Summer of 1970.
DL	=	Own weight of the Containment Vessel and all the permanent attachments to the Containment.
CL	=	Construction Loads.
DBA	=	Design Basis Accident which includes temperature and pressure effects.
OBE	=	Operating Basis Earthquake, 8 percent G.
SSE	=	Safe Shutdown Earthquake, 15 percent G.
OL	=	Normal Operating Loads of the Containment Vessel, including Live Loads, thermal loads and operating pipe reactions.
P'	=	External pressure due to the internal vacuum created by accidental trip of the Containment Spray System.

Stress limits of the Containment Vessel are as prescribed in Figure N-414 of the ASME, Section III, Nuclear Vessels, 1968, including all the addenda up to the Summer of 1970. Buckling is considered in all loading combinations.

Table 3-34. Containment Materials

Material Location	Material Specification
Base Liners	SA-516, Grade 60 or 70
Base Liner Embedments	SA-516, Grade 60 and/or ASTM A36
Knuckle Plate	SA-516, Grade 60 or 70
Shell and Dome Plate	SA-516, Grade 60 or 70
Penetrations (Piping and Electrical)	SA-106, Grade B and/or SA-516, Grade 60
Personnel Locks	SA-516, Grade 60 and/or Grade 70
Stiffeners	SA-516, Grade 60 or 70
Equipment Hatch	SA-516, Grade 60 and/or Grade 70
Anchor Bolts	SA 320-L43
Anchor Bolt Anchor Plates	SA-516, Grade 60

Table 3-35. Deleted Per 1998 Update

Table 3-36 Factors of Safety Against Buckling of Shell Panels for the McGuire Containment Vessel

Point*	Axial kips/inch	Shearing Load kips/inch	Safety Factor Against Buckling	
			Shell Panels Treated as Flat Plates	Shell Panels Treated as Curved Plates
1	-5.70	5.28	6.00	3.27
2	-3.99	5.31	8.60	4.43
3	-3.02	4.47	11.42	5.93
4	-4.49	1.75	8.36	4.93
5	-4.53	1.08	8.33	4.97
6	-4.13	1.22	9.13	5.43

* See Figure 3-132

Table 3-37. Comparison Between the Actual Design Differential Pressures and the Latest Design Differential Pressures For the Major Structural Barriers of the Interior Structure

Structural Barrier	Actual Design Diff. Pressures (psi) (= 1.4 X Diff. Press.)	Latest Calculated Diff. Pressures (psi)	Pressure Values Used for Design
Ice Condenser Floor	11.37	8.12	12.74
	6.80	5.67	12.74
	6.74	4.60	7.84
	6.74	4.52	7.84
	7.88	6.52	12.74
	8.05	6.79	12.74
	7.93	7.15	12.74
	6.86	6.40	7.84
	6.63	4.44	7.84
	9.11	4.55	12.74
	11.25	7.97	12.74
Operating Floor	17.43	14.13	15.51
	12.28	11.35	15.51
	9.38	9.19	15.51
	9.49	9.53	15.51
	12.06	11.25	15.51
	16.94	13.57	15.51
Wingwalls	6.71	5.74	10.00
	6.27	7.36	10.00
	2.16	5.16	10.00
	2.08	5.20	10.00
	6.19	7.17	10.00
	6.17	5.55	10.00
Crane Wall	See Note 1.		

Note:

1. The Crane Wall is designed to sustain several critical loading combinations. The differential pressures comprise part of these combinations, hence it is not practical to single out these differential pressures on the crane wall for comparison purposes.

Table 3-38. Comparison Between Kalnin's Program Results and Finite Elements Results w (cps)

	Mode	Kalnin's	Finite Elements
Reactor Building			
N = 1	1	4.964768	4.9748
	2	13.66	13.729
Containment Vessel			
N = 0	1	24.9259	24.97
N = 1	1	9.284	9.3234
	2	25.69	25.660

Table 3-39. Containment Interior Structures Loading Combinations and Code Requirements

Loading Combination	Code or Stress Requirements
1. DL + CL 2. DL + OL + Pa 3. Deleted 4. DL + OL + OBE	WSD, stresses in reinforcement and concrete are in accordance with Chapter 10, ACI-318 - 1963 Code. AISC with allowable stresses of F_s.
5. DL + OL + SSE 6. DL + OL + SSE + Ta 7. DL + OL + SSE + Pa + Y	ACI-318, USD with no factors applied to loadings, AISC with allowable stress of 1.5 F_s or 0.90 Fy whichever is less.

DL	=	Dead Load, including weight of permanent equipment.
CL	=	Construction Loads.
OL	=	Normal Operating Loads, these loads are associated with the plant operation, including Live Loads.
Pa	=	Differential Pressure across the individual Internal Structures due to a Loss-of-Coolant Accident.
Y	=	Loading on structure due to pipe rupture.
Ta	=	Thermal loads on the Internal Structures Components due to a Loss-of Coolant Accident.
OBE	=	Operating Basis Earthquake Load, inertia forces due to base excitation of 8 percent G.
SSE	=	Safe Shutdown Earthquake Load, inertia forces due to base excitation of 15 percent G.
ACI-318	=	"Building Code Requirements for Reinforced Concrete," June 1963.
AISC	=	"Specification for the Design, Fabrication and Erection of Structural Steel Buildings," 1969.
WSD	=	"Working Stress Design" Method.
USD	=	"Ultimate Strength Design" method.
F_y	=	Yield stress of steel.
F_s	=	Allowable stresses in steel as specified in AISC, Part 1.

Note:

Pa and Ta do not act simultaneously on the structure

Table 3-40. Design Properties of Seals

	Durometer	Tensile	Elongation	Compression Set
1. Membrane Seals:				
Initial	65 (approx.)	2260 psi	470%	14.1%
2. Compressible Seals:				
Initial	40	1400 psi	800%	12.88%

Note:

1. All tests are in accordance with ASTM D-2000-XX. XX = The current ASTM D-2000 revision at the time of procurement.

Table 3-41. Divider Barrier Seals Minimum Acceptable Physical Properties

Membrane Type Seals	Tensile Strength		
Mk 10	39.7 lbs.		
Mk 11	39.7 lbs.		
Mk 12	10.6 lbs.		
Mk 13	288 lbs.		
Mk 20	42.4 lbs.		
Compression Type Seals	**Tensile Strength**	**Elongation**	**Durometer**
40 Duro	575 psi	350%	+5 pts. from initial
60 Duro	1333 psi	387%	+5 pts. from initial

Table 3-42. Auxiliary Building Loading Conditions

Area	Loading Conditions	Remarks
Compartments at El. 695	A, G, H	Soil and water pressure. See Note [1].
Compartments at El. 716	A, G, H	Soil and water pressure. See Note [1].
Compartments at El. 733 and Equipment Rooms and Switchgear Rooms	A, G, H	Soil and water pressure. See Note [1].
Diesel Generator Rooms	A, B, C, F, G, H	Soil and water pressure.
Fuel Pool	A, B, C, G, H.	*See Note [2].
Fuel Pool Racks	A, G, H	See Note [1].
Control Room	A, B, C, F, G, H	
Hot Machine Shop	A	
Laboratory Area	A	
Personnel Decontamination	A	
Waste Shipping Area	A	
Fuel Shipping Area	A	
Isolation Valve Area	A, B, C, F, G, H, I	Soil and water pressure.
New Fuel Racks	A, G, H	

Area	Loading Conditions	Remarks

Note:

1. Enclosed by enveloping structure designed for wind, tornado wind, tornado missiles and turbine missile, as applicable.
2. Designed for thermal stresses and cask drop accident.

A = All normal dead, equipment, live and wind loads.

B = Normal dead and equipment loads plus tornado loadings

C = Tornado missiles.

F = Turbine-Generator missile (or Diesel-Generator missile).

G = Normal dead and equipment loads plus operating seismic loads.

H = Normal dead and equipment loads plus design seismic loads.

I = Normal dead and equipment loads plus design seismic loads plus pipe rupture and pressure loads.

* = Soil and water pressure, pressure due to equipment or railroad ramp.

Table 3-43. Auxiliary Building Loading Combinations

Loading Conditions[5]	Load Combination
A,G	U = 1.5D + 1.8L U = 1.25 (D + L + W) U = 0.9D + R +1.1E U = 1.25 (D + R + E)
B,H	U = 1.25 (D + R) + E' U = 1.25D + W_t
C,F	Analyzed on bases of "Design of Protective Structures," Amirikian, A., Bureau of Yards and Docks, Department of the Navy, NAVDOCKS P-51, 1950.
I	U = 1.25 (D + R) + P + E' + Y

U	=	Required Ultimate Load Capacity of Section
D	=	Dead Load (including equipment load and normal operating pipe loads)
L	=	Operating Live Load
W	=	Wind Load
W_t	=	Tornado Loading
E	=	Operating Basis Earthquake Load
E'	=	Safe Shutdown Earthquake Load
R	=	Piping Seismic Reactions
P	=	Peak compartment pressure generated by a postulated pipe break
Y	=	Equivalent static load on structure from pipe break (including a dynamic load factor of 2.0)
F_s	=	Allowable stresses in steel in accordance to AISC, Part 1.
F_y	=	Allowable yield stress in steel

Loading Conditions[5]	Load Combination

1. Design Strengths are in accordance with ACI 318-63, Sections 1504 and 1505 for concrete and reinforcing steel.
2. Concrete design is based on the Ultimate Strength Method in accordance with the June 1963 version of ACI 318. For design of those structural elements not covered in ACI 318-63, the ACI Standard 318-71 is used.
3. Structural Steel design is based on Part 1 of the February, 1969 version of the AISC Specification except that for those loading conditions including W_t, E', P and Y, the maximum allowable steel stress is permitted to be 1.5 F_s or 0.9 Fy, whichever is less.
4. In addition to the Design conditions as defined above, the roof has been investigated, spot checked, and found structurally adequate for the following loading condition: $U = D + L + SL$

   where SL = severe snow and ice loads and is defined in Section 2.4.10.
5. See UFSAR Table 3-42, (Page 2 of 2) for the explanation of the Symbols (A thru I) used in Loading Conditions.

Table 3-44. New Fuel Storage Vault Loading Combinations

Loading Conditions[4]	Load Combination
A, G	U=1.5D + 1.8L U=1.25 (D + L + W) U=0.9D + R + 1.1E U=1.25 (D + R + E)
B, H	U=1.25 (D + R) + E' U=1.25D + W_t
C	Analyzed on bases of "Design of Protective Structures," Amirikian, A., Bureau of Yards and Docks, Depart of the Navy, NAVDOCKS P-51, 1950.
I	U=1.25 (D + R) + P + E' + Y

U	=	Required Ultimate Load Capacity of Section
D	=	Dead Load (including equipment load and normal operating pipe loads)
L	=	Live Load
W	=	Wind Load
W_t	=	Tornado Loading
E	=	Operating Basis Earthquake Load
E'	=	Safe Shutdown Earthquake Load
R	=	Piping Seismic Reactions
P	=	Peak compartment pressure generated by a postulated pipe break
Y	=	Equivalent static load on structure from pipe break (including a dynamic load factor of 2.0)

1. Design Strengths are in accordance with ACI 318-63, Sections 1504 and 1505 for concrete and reinforcing steel.
2. Concrete design is based on the Ultimate Strength Method in accordance with the June 1963 version of ACI 318. For design of those structural elements not covered in ACI 318-63, the ACI Standard 318-71 is used.
3. Structural Steel design is based on Part 1 of the February, 1969 version of the AISC Specification except that for those loading conditions including W_t, E', P and Y, the maximum allowable steel stress is permitted to be 1.5 F_s or 0.9 F_y.
4. See UFSAR Table 3-42 (Page 2 of 2) for the explanation of the Symbols (A through I) used in Loading Conditions.

Table 3-45. Factors of Safety for Category 1 Structures Against Overturning and Sliding

	Factor of Safety	
Structure	**Overturning**	**Sliding**
Reactor Building Complex	2.3	2.24
Main Auxiliary Building	9.23	2.82
Diesel Generator Building	8.2	3.7
Main Steam Line Isolation Valve Enclosure	1.10	1.22
New Fuel Vault	1.23	1.15
SNSW Intake	2.44	1.18
SNSW Discharge	2.72	1.24
SNSW Overflow Spillway	1.05	1.28

Table 3-46. Piping Systems Included in Vibration Test Program

System
Reactor Coolant System
Safety Injection System
Residual Heat Removal System
Containment Spray System
Chemical and Volume Control System
Boron Recycle System
Boron Thermal Regeneration System
Component Cooling System
Liquid Waste Disposal System
Fuel Pool Cooling and Cleanup System
Diesel Generator Fuel Oil System
Diesel Generator Cooling Water System

System
Diesel Generator Lube Oil System
Nuclear Service Water System
Refueling Water System
Main Steam System
Feedwater System
Auxiliary Feedwater System
Steam Dump System
Containment Ventilation Cooling Water System
Control Area Chilled Water System
Steam Generator Blowdown Recycle System
Recirculated Cooling Water System

Table 3-47. Design Conditions, Load Combinations, and Code Compliance Criteria for Duke Classes B, C, and F Piping

Condition	Loads	Code Compliance Criteria
1. Sustained Loads[5]	Pressure Weight Other Sustained Mechanical loads	Σ Primary stresses ≤ S_h [3], [7], [8]
2. Thermal Expansion	Thermal Expansion Thermal Anchor Movements	Maximum Secondary Stress Envelope [3], [7], [8]
3. Upset Loads	Pressure Weight OBE (Inertia) OBE (Anchor Movements)[1] DFL [2] Wind[4]	Σ (Primary Stresses) ≤ 1.2 S_h [7], [8]
4.		
a. Faulted Loads	Pressure Weight SSE (Inertia) DFL [2] Tornado [4]	Σ (Primary Stresses) ≤ 2.4 S_h [7], [8]
b. Faulted Loads	Pressure Weight Pipe Rupture [6]	Σ (Primary Stresses) ≤ 2.4 S_h [7], [8]

Condition	Loads	Code Compliance Criteria

Notes:

1. Stresses due to seismic displacements such as anchor movements may alternatively be considered as secondary stresses and combined with thermal expansion.
2. Dynamic Internal Fluid Loads are occasional loads such as relief valve thrust, steamhammer, waterhammer or loads associated with Plant Upset or Faulted Condition where appropriate.
3. The allowable stress, S_A, may be increased when primary stresses due to sustained loads are less than S_h per ASME Section III, Subsection NC-3611.1(b)^4(a).
4. Wind as defined in UFSAR Section 3.3.1.1 is applicable to the Upset Condition, but not concurrent with seismic loads inertia or anchor movement loadings per ASME III 1971, Subsection NC-3622.

   Tornado as defined in UFSAR Section 3.3.2.1 is applicable to the Faulted Condition, but not concurrent with seismic loads inertia or anchor movement loadings per ASME III 1971, Subsection NC-3622.
5. If, during operation, the system normally carries a medium other than water (air, gas, steam), sustained loads should be checked for weight loads during hydrotest as well as normal operation weight loads.
6. Pipe rupture loadings include LOCA and MSLB as applicable.
7. ASME Code Case N-318-4, "Procedure for Evaluation of the Design of Rectangular Cross Section Attachments on Class 2 or 3 Piping, Section III, Division 1", may be used in case of pipe welded attachment qualification. It should be documented in appropriate calculations.
8. ASME Code Case N-392-1, "Procedure for Evaluation of the Design of Hollow Circular Cross Section Welded Attachments on Class 2 or 3 Piping, Section III, Division 1", may be used in case of pipe welded attachment qualification. It should be documented in appropriate calculations

Table 3-48. Stress Criteria For Reactor Containment Mechanical Penetrations Duke Class B

Condition	Piping Loads	Criteria
1. Normal	Thermal Displacement Pressure Weight	ASME III, Class 2
2. Upset	Thermal Displacement OBE (Displacement) Pressure Weight OBE (Inertia)	(Secondary Stresses) $\leq S_A$ (Primary Stresses) $\leq 1.2\ S_h$
3. Faulted	Thermal Displacement[1] SSE (Displacement)[1] Pressure Weight SSE (Inertia) Pipe Rupture	(Primary Stresses) $\leq 2.4\ S_h$

Note:

1. For the faulted condition, the displacement induced stresses are considered primary stresses.

Table 3-49. Stress Criteria For Supports, Restraints, and Anchors Duke Class A

Condition	Piping Loads	Criteria
1. Normal	Thermal Displacement Pressure (As Applicable) Weight	ASME III, Class 1
2. Upset	Thermal Displacement OBE (Displacement) Pressure (As Applicable) Weight OBE (Inertia)	ASME III, Class 1
3. Faulted	Thermal Displacement SSE (Displacement) Pressure (As Applicable) Weight SSE (Inertia) Pipe Rupture	(Primary Stresses) ≤ Yield Stress At Operating Temperature or ASME III, Class 1[1]
4. Faulted	Thermal Displacement SSE (Displacement) Pressure (As Applicable) Weight SSE (Inertia) Pipe Rupture	(Primary Stresses) ≤ Yield Stress At Operating Temperature or ASME III, Class 1[1]

Note:

1. ASME III, Class 1 allowables (i.e. Level D) may be used for standard vendor supplied pipe support components provided a certified Design Report Summary (DRS) or Load Capacity Data Sheet (LCDS) is available for the component.

Table 3-50. Stress Criteria For Supports, Restraints, and Anchors Duke Classes B, C, and F

Condition	Piping Loads	Criteria
1. Normal	Thermal Displacement Pressure (As Applicable) Weight	ASME III, Class 2
2. Upset	Thermal Displacement OBE (Displacement) Pressure (As Applicable) Weight OBE (Inertia) wind[1]	ASME III, Class 2
3. Faulted	Thermal Displacement SSE (Displacement) Pressure (As Applicable) Weight SSE (Inertia) tornado[1]	(Primary Stresses) ≤ Yield Stress At Operating Temperature or ASME III, Class 2[2]
4. Faulted	Thermal Displacement SSE (Displacement) Pressure (As Applicable) Weight SSE (Inertia) Pipe Rupture Tornado[1]	(Primary Stresses) ≤ Yield Stress At Operating Temperature or ASME III, Class 2[2]

Note:

1. Wind as defined in UFSAR Section 3.3.1.1 is applicable to the Upset Condition, but not concurrent with seismic loads inertia or anchor movement loadings per ASME III 1971, Subsection NC-3622.

   Tornado as defined in UFSAR Section 3.3.2.1 is applicable to the Faulted Condition, but not concurrent with seismic loads inertia or anchor movement loadings per ASME III 1971, Subsection NC-3622.

2. ASME III, Class 2 allowables (i.e. Level D) may be used for standard vendor supplied components provided a certified Design Report Summary (DRS) or Load Capacity Data Sheet (LCDS) is available for the component.

Table 3-51. Stress Criteria For Safety Class 2 and 3 Cylindrical Shell Type Equipment and Components And Their Supports

Condition	Loads	Criteria
1. Normal & Upset (includes Normal Operating Effects Plus OBE Effects)	Nozzle Loads Pressure Weight Support Reactions	ASME Section III Class 2 or 3 (See Table 3-4)
2. Faulted (includes Normal Operating Effects Plus SSE Effects)	Nozzle Loads Pressure Weight Support Reactions	Pressure Boundary - ASME Section III, Class 2 and 3 and Par. NB-3225
		Supports - (Primary Stresses) ≤ Yield Stress At Operating Temperature

Table 3-52. Westinghouse Design Criteria for ASME Class 2 and 3 Components

Condition	Vessels/Tanks	Pumps
Normal	$P_m \leq 1.0S$	ASME Section III Subsection NC-3400 and ND-3400
	$P_m + P_b \leq 3.0S$	
Upset	$P_m \leq 1.0S$	$P_m \leq 1.0S$
	$P_m + P_b \leq 3.0S$	$P_m + P_b \leq 1.5S$
Faulted	$P_m \leq 1.5S$	$P_m \leq 1.2S$
	$P_m + P_b \leq 3.0S$	$P_m P_b \leq 1.8S$

S = Allowable stress for the material at temperature as given in ASME Section III

P_m = Membrane stress, i.e., the component of normal stress which is uniformly distributed across the thickness of the solid section under consideration.

P_b = Bending stress, i.e., the linearly variable component of normal stress across the thickness of the solid section under consideration.

ASME CLASS	LOADING COMBINATION	CONDITION CLASSIFICATION
2	1. Pressure + Deadweight + Thermal (Nozzle loads only)	Normal
	2. Pressure + Deadweight + OBE	Upset
	3. Pressure + Deadweight + SSE	Faulted
3	1. Pressure + Deadweight + Thermal (Nozzle loads only)	Normal
	2. Pressure + Deadweight + SSE	Faulted

Table 3-53. Guard Pipe Designs Relying on ASME Code Case 1606

Penetration Mk. No.	Process Pipe Size (NPS)	System	Energy Classification of Process Pipe	Ratio: Design Pressure Pressure Rating Note [1]
154	34"	SM - Main Steam - A	High Energy	1.22
261	34"	SM - Main Steam - B	High Energy	1.22
393	34"	SM - Main Steam - C	High Energy	1.22
441	34"	SM - Main Steam - D	High Energy	1.22
329	3"	NV - Charging Pumps to Regenerative Hx.	High Energy	1.55
339	2"	NV - Sealwater Injection	High Energy	1.56
343	2"	NV - Sealwater Injection	High Energy	1.56
344	2"	NV - Sealwater Injection	High Energy	1.56
350	2"	NV - Sealwater Injection	High Energy	1.56
316	4"	NI - Safety Injection - A	Moderate Energy	1.56
319	4"	NI - Safety Injection - B	Moderate Energy	1.56
348	2"	NI - UHI Check Valve Flush	Moderate Energy	1.56
351	3"	NI - From Boron Injection Tank	Moderate Energy	1.56
352	4"	NI - Safety Injection - A & B	Moderate Energy	1.56
N/A Note [2]	34"	SM - Main Steam	High Energy	1.43
N/A Note [2]	18"	CF - Feedwater	High Energy	1.39

Note:

1. Design Pressure refers to the maximum operating pressure during normal plant conditions. Pressure rating refers to allowable pressure utilizing Eq (3) of Paragraph NC-3641-1 of ASME Section III, 1971 Edition through Winter 1971 Add.
2. This guard pipe encloses process pipe in areas other than penetrations.

Table 3-54. Comparison of Predicted PWHIP Response - Inelastic Pipe Element. (Example Problem: Figure 3-117)

Response	Theoretical Prediction [1]	PWHIP Prediction [2]	Conclusion
Maximum Displacement y_{max} @ t_m	0.8041" @ 0.0668 sec.	0.8038" @ 0.067 sec.	Predicted y_{max} and t_m are "exact" within three significant figures of accuracy.
Peak-to-Peak Elastic Displacement Range $y_{max} - y_{min}$	0.3669"	0.3679"	Predicted response is within 0.3% of theoretical.
Elastic Natural Period of Free Vibration T_n	0.1107 sec.	0.112 sec.	Predicted response is within 1.2% of theoretical.

Note:

1. Theoretical response based on the solution by Biggs, *Introduction to Structural Dynamics*, McGraw-Hill, 1964, recomputed with intermediate calculations to 5 significant figures.
2. PWHIP response calculated using a numerical integration time step of 0.001 seconds and output at that time interval.

[HISTORICAL INFORMATION – NOT REQUIRED TO BE REVISED]

Table 3-55. Comparison of Predicted PWHIP Response - Inelastic Yield Element. (Example Problem: Figure 3-118)

Response	**Theoretical Prediction[1]**	**PWHIP Prediction[2]**	**Conclusion**
Maximum Displacement y_{max} @ t_m	0.8041" @ 0.0668 sec.	0.8051" @ 0.067 sec. (0.8043" when corrected for initial gap[3]	PWHIP response exact within 3 significant figures of accuracy.
Peak-to-Peak Elastic Displacement Range y_{max} - y_{min}	0.3669"	0.3670"	PWHIP response exact within 3 significant figures of accuracy.
Elastic Natural Period of Free Vibration T_n	0.1107 sec.	0.1105 sec.	PWHIP response exact within 3 significant figures of accuracy.

Note:

1. Theoretical response based on the solution by Biggs, *Introduction to Structural Dynamics*, McGraw-Hill, 1964, recomputed with intermediate calculations to 5 significant figures.
2. PWHIP response calculated using a numerical integration time step of 0.0005 seconds
3. PWHIP model included an initial gap of 0.0005". It is calculated that initial kinetic energy at the time of impact (0.0015 seconds) increases maximum displacement by 0.0003". Therefore, the initial gap resulted in a maximum displacement 0.0008" greater than that of a zero gap model.

[HISTORICAL INFORMATION – NOT REQUIRED TO BE REVISED]

Table 3-56. Comparison of Predicted PWHIP Response - Inelastic Yield Element. (Example Problem: Figure 3-120)

Response	Theoretical Prediction [1]	PWHIP Prediction [2]	Conclusion
Time of initial impact (y = h) t_o	0.07198 sec.	y = .9867" @ t = 0.072 sec. y = 1.0145" @ t = 0.073 sec.	PWHIP response is within one integration time step of theoretical.
Velocity at initial impact y_o	27.785 in/sec.	$\frac{1.0145" - .9867"}{.001\text{sec.}} = 27.70 \text{ in/sec}$	PWHIP response is exact within three significant figures of accuracy.
Time to zero velocity t_m	0.10037 sec.	0.101 sec.	PWHIP response is within one integration time step of theoretical.
Maximum displacement y_m	1.5506 in.	1.5514 in.	PWHIP response is exact within three significant figures of accuracy.

Notes:

1. Theoretical response based on the solution by Thomason, *Vibration Theory and Application*, Prentice-Hall, 1965.
2. PWHIP response calculated using a numerical integration time step of 0.001 seconds.

[HISTORICAL INFORMATION – NOT REQUIRED TO BE REVISED]

Table 3-57. HVAC Design Codes

Component	Design Code
1. Standard for Installation of Air Cond'g. & Ventilation Systems	NFPA 90A
2. Central Station Air Handling Units	ARI 430-66
3. Chillers:	ASHRAE 30-60 ARI 555-63 ARI 550-66
4. Coils:	ARI 410-64 ASHRAE 33-64
5. Fans:	AMCA 99 AMCA 210-67
6. Fire Dampers	UL 555-1968
7. Electric Coils:	UL 499-1968 NEMA HE-1-1966
8. Carbon Filters	ANSI/ASME N509-1976
9. Dampers	Refer to system purchase specification

Table 3-58. Maximum Deflections for Reactor Internals Under Blowdown and Seismic Excitation (1-Millisecond Double-Ended Break)
[HISTORICAL INFORMATION – NOT REQUIRED TO BE REVISED]

Component	Blowdown Deflection (Inches)		Seismic Deflection, (Inches)	Direction	Maximum Total Deflection, (Inches)	Allowable Deflection, (Inches)	Deflection for No Loss of Function, (Inches)
	Cold Leg	Hot Leg					
Upper Barrel							
Radial Inward	0.0	0.057	0.002	Horizontal	0.059	4.1	8.2
Radial Outward	0.431	0.029	0.002	Horizontal	0.460	0.5	1.0
Upper Core Plate	0.016	0.015	0	Vertical	0.016	0.100[1]	0.150
Rod Cluster Control							
Guide Tubes (deflection as a beam)							
(54)		<Allowable	0.010	Horizontal	<Allowable	1.0	1.60 to 1.75
(2)		<N.L.F >Allowable	0.010	Horizontal	<N.L.F >Allowable	1.0	1.60 to 1.75
(5)		>N.L.F.	0.010	Horizontal	>N.L.F	1.0	1.60 to 1.75
Fuel Assembly	~0	~0	~0	Horizontal	~0	0.036	0.072
Thimble (Cross section distortion)							

Note:

1. Only to assure that the plate will not touch a guide tube.

Table 3-59. Maximum Stress Intensities for Reactor Internals (1-Millisecond Pipe Break and Seismics) [HISTORICAL INFORMATION – NOT REQUIRED TO BE REVISED]

	BLOWDOWN STRESSES, PSI					
	Hot Leg Break		Cold Leg Break			
Component	**Maximum Membrane**	**Maximum Total**	**Maximum Membrane**	**Maximum Total**	**Direct Seismic[1] Stress, psi Vertical/horiz**	**Maximum Total Blowdown Plus Seismic psi**
Barrel (Grith Weld)	21,440	31,340	38,900	46,200	100/400	46,700
Barrel (Flange Weld)	19,820	29,720	18,430	47,400	410/600	48,710
Upper Support Columns (1)	6,200	39,200	---	---	---/---	39,200
(55)	6,200	<20,300	---	---	---/---	<20,300
Fuel Assembly - Top Nozzle Plate	---	28,700	---	8,000	0/0	28,700
Fuel Assembly - Bottom Nozzle Plate	---	38,700	---	40,800	400/---	41,200
Fuel Assembly Thimbles	6,600	6,600	2,300	2,300	---/---	6,600
Allowable Stress						
Maximum Membrane	$P_m + 2.4\ S_m + 39{,}800$ psi					
Maximum Total	$P_m + P_b = 3.0\ S_m = 48{,}000$ psi					
S (evaluated at 588°F) = 16,600 psi (per Winter Addenda ASME Section III Code)						

Note:

1. Values are for high level seismic plant.

Table 3-60. Electrical Systems & Components Seismic Criteria [HISTORICAL INFORMATION – NOT REQUIRED TO BE REVISED]

Equipment[4]	Base Load Levels[3]	Freq. Range (Hz)[1]
Air Conditioning System (Control, Equipment & Cable Room)		
Compressor Motors	Note 2	-
Vent Fan Motors	Note 2	-
Chill Water Pump Motors	Note 2	-
Control Room Makeup Fan Motor	Note 2	-
Equipment & Cable Room Makeup Fan Motor	Note 2	-
Annulus Vent System		
Fan Motors	Note 2	-
Air Operated Valves (Solenoids)	0.5g	1 to 33
Aux. Bldg. Vent System		
EFS Air Handling Unit Motors	Note 2	-
Chemical & Volume Control System		
Selected M.O. Valve Motors	0.5g	5 to 200
Containment Air Return System		
Air Return Fan Motors	Note 2	-
H_2 Skimmer Fan Motors	Note 2	-
Containment Spray System		
Containment Spray Pump Motors	Note 2	-
Selected M.O. Valve Motors	0.5g	5 to 200
Containment Isolation System		
Containment Isolation Valve Motors	0.5g	5 to 200
Component Cooling Water System		
Comp. Cooling Pump Motors	Note 2	-
Selected M.O. Valve Motors	0.5g	5 to 200
Deisel Bldg. Vent. System		
Diesel Room Supply Fan Motors		
Emergency diesel Aux. Systems		
Emerg. Diesel Generator	Note 2	-
Dsl. Crank Case Vac. Pump Motor	0.25g	0.5 to 40

Equipment[4]	Base Load Levels[3]	Freq. Range (Hz)[1]
Dsl. F.O. Transfer Pump Motor	0.25g	0.5 to 30
Dsl. L.O. Filter	0.25g	0.5 to 40
Dsl. 600/120V Pnl. Board	0.25g	0.5 to 40
Dsl. Lube Oil Pump Motors	0.25g	0.5 to 40
Dsl. Jacket & Intercoolant Pump Motor	0.25g	0.5 to 40
Dsl. Air Compressor Motors	0.25g	0.5 to 40
Auxiliary Feedwater System		
Aux. Feedwater Pump Motor	Note 2	-
Penetrations	0.25, 2.1 or 3.75g depending on location	0.5 to 40
4KV ES Aux. Power System		
4KV Metalclad ES Switchgear	0.8g	0.5 to 50
4160/600V Transformers	0.8g	0.5 to 50
600V Essential Aux. Power System		
600V ES Motor Control Centers	1.2g	1 to 40
600/208V Essential Transformers	0.4g	0.5 to 40
125V DC Vital Inst. & Cont. Power System		
125V DC Battery Chargers	0.4g	0.5 to 40
125V DC Batteries	0.4g	0.5 to 40
125V DC Distribution Centers	1.2g	1 to 40
125V DC Panelboards	1.2g	1 to 40
120V AC Vital Power System		
125VDC/120V AC Static Inverters	0.4g	0.5 to 40
120VAC Vital Pwr Panelboards	1.2g	1 to 40
Radioactive Waste Systems		
RHR & CS Pump Room Sump Pump Motor	Note 2	-
Residual Heat Removal System		
Selected M.O. Valve Motors	0.5g	5 to 200
Safety Injection System		
Motor Operated Valve Motors	0.5g	5 to 200
Steam Supply System		

Equipment[4]	Base Load Levels[3]	Freq. Range (Hz)[1]
Main Steam Iso. Valve Solenoids	Note 2	-

Notes:

1. Hertz
2. Seismic qualification being accomplished by analyses
3. Meaning maximum horizontal ground or floor acceleration level for SSE
4. For other equipment see references sited in Section 3.1

Table 3-61. Post-Accident Equipment (Inside Containment) Operational Requirements

Equipment Name	Operating Mode	Required Duration of Operation
INSTRUMENTATION		
Pressurizer pressure channels (4)	Continuous	SI Initiation
Pressurizer level channels (3)	Continuous	Two weeks
Steam generator level channels N/R (16)	Continuous	Four months
Reactor Coolant system pressure W/R (2)[1]	Continuous	Two weeks
Reactor Coolant RTD N/R	Continuous	Reactor Trip
Reactor Coolant System RTD W/R	Continuous	Two weeks
Containment Sump Level[1]	Continuous	Four months
Containment Pressure[1]	Continuous	Three months
VALVES & OPERATORS		
SIS motor operated valves, high head injection line (4)	Continuous	Five minutes
Containment isolation valves, motor operated & solenoid operated	Operate on signal	Five minutes
Containment air return & H_2 skimmer system valves	Open on signal	Five minutes
OTHER EQUIPMENT		
Deleted Per 2008 Update		
Safeguard equipment power, control and instrument cable	Continuous	4 mo.
Containment Air Return and H_2 Skimmer Fans and Motors	Continuous	2 mo.
Penetrations	As indicated for above listed equipment	As indicated for above listed equipment
Containment High Range Radiation Monitor Detections	Continuous	Two weeks
Acoustical Valve Position Monitor Sensors & Amps	Continuous	Two weeks

Equipment Name	Operating Mode	Required Duration of Operation
Limit Switches	Continuous	Five minutes
Pressure Switches	Continuous	Five minutes

Note:

1. Transmitters for these signals are located outside of the Containment.
2. See FSAR Figure 1-9 through Figure 1-16 for location of Equipment.

Table 3-62. Control Complex Areas Ventilation Systems Analysis Results

Control Complex Area	Temperature[1]	Relative Humidity[1]
Control Room	75°F	45%
Cable Room	85°F	30%
Battery and Equipment Room	80°F	50%
Switchgear Rooms	85°F	30%
Motor Control Center Rooms	85°F	30%
Ventilation Equipment Rooms	100°F	30%
Electrical Penetration Rooms (EL 767)	85°F	30%

Note:

1. The temperature and relative humidity values are nominal and may vary by ±5°F and ±10% RH respectively.

Table 3-63. Structures, Systems and Components Included in TORMIS Analysis Not Designed for Design Basis Tornado Generated Missiles[3]

Category 1 SSC
Unit 1 & 2 Main Steam Safety Valves (MSSVs) Exhaust Piping and associated supports[1 2]
Unit 1 & 2 Steam Generator Power Operated Relief Valves (PORVs) and associated piping and supports[1 2]
Unit 1 & 2 Turbine Driven Auxiliary Feedwater (TD AFW) Exhaust (TE) Pipe[2]
Unit 1 & 2 Control Room Air Ventilation System (CRAVS) Intakes (VC/YC Intakes)[2]
Unit 1 & 2 Spent Fuel Building (north facing wall)

Notes:

1. The SSCs located in the Unit 1 Exterior Doghouse are not included as they have positive tornado missile protection.
2. Only the portion of the Structure that is not protected from the Design Basis tornado generated missiles are included. The Design Basis tornado generated missiles have a horizontal only projection.
3. Additional details and target areas can be found in Section 3.5.6 Reference 7.