OCT 02 1984

Docket No. 50-410

APPLICANT: Niagara Mohawk Power Corporation (NMPC)

FACILITY: Nine Mile Point Unit 2 (NMP2)

SUBJECT: SUMMARY OF MEETING WITH NMPC CONCERNING EQUIPMENT QUALIFICATION FOR NINE MILE POINT UNIT 2

On September 25, 1984 the NRC staff met with representatives from NMPC, Stone and Webster Engineering Corporation (SWEC), and General Electric (GE) to discuss equipment qualification for Nine Mile Point Unit 2.

The equipment qualification master list and the Equipment Qualification Data Report are scheduled to be submitted in December 1984. Approximately 70% of the BOP qualification paperwork and 80-90% of the NSSS qualification paperwork was complete at the time of the meeting. The installation level of equipment was not known. The NRC stated that installation levels should be included in the information to be submitted in December.

The master list to be submitted in December will include instrumentation under Regulatory Guide 1.97.

The NRC staff requested that the methodology used to determine the completeness of the Equipment Qualification list be provided in detail in the December submittal. In addition the correlation to Table 3.2.1 in the FSAR should be included.

Seismic margins for NSSS equipment are at least 10%. Seismic margins for BOP equipment are generally 10% but this is not a design requirement. SWEC will review seismic design margins for equipment to assure any margins less than 10% are justified.

Plant Specific profiles will be used for inside containment (included in FSAR).

NMPC does not intend, at this time, to request exemption for any equipment required to be qualified under 10CFR 50.49.

The NRC staff stated the maintenance and surveillance program should be included in the environmental submittal. Also I & E notices and bulletins that pertain to equipment qualification and the applicant's evaluation of these documents should be included and retrievable in the applicant's file. This will be verified as part of the equipment qualification audits.

NMPC was requested to submit sample qualification packages for SQRT (Seismic Qualification Review Team) and PVORT (Pump and Valve Operability Review Team) to be reviewed by NRC consultants.

NRC staff stated that equipment to be identified for audit will be identified subsequent to scheduling an audit, approximately 6 weeks prior to the audit. Typically 25 pieces are reviewed as part of the SQRT and 10 pieces as part of the PVORT.

NMPC gave a presentation on the equipment qualification program for Nine Mile Point 2. Enclosure 1 includes a copy of the information presented during that presentation. Enclosure 2 is a copy of a handout on "Equipment Qualification for Hydrodynamic Loads" provided during the meeting.

A list of meeting attendees is included as Enclosure 3.

Original signed by:

Mary F. Haughey, Project Manager
Licensing Branch No. 2
Division of Licensing

Enclosures: As stated

cc: All NRC meeting attendees

Distribution:
Docket File
NRC PDR
Local PDR
PRC System
NSIC
LB#2 Reading
EHylton
MHaughey
Bordenick
ACRS (16)
EJordan
NGrace

M. Haughey
LB#2/DL/PM
MHaughey/lb
10// /84

LB#2/DL/BC
ASchwencer
10/ /84

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Nine Mile Point 2

Mr. B. G. Hooten
Executive Director, Nuclear Operations
Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, New York 13202

cc: Mr. Troy B. Conner, Jr., Esq.
Conner & Wetterhahn
Suite 1050
1747 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

Richard Goldsmith
Syracuse University
College of Law
E. I. White Hall Campus
Syracuse, New York 12223

Ezra I. Bialik
Assistant Attorney General
Environmental Protection Bureau
New York State Department of Law
2 World Trade Center
New York, New York 10047

Resident Inspector
Nine Mile Point Nuclear Power Station
P. O. Box 99
Lycoming, New York 13093

Mr. John W. Keib, Esq.
Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, New York 13202

Jay M. Gutierrez, Esq.
U. S. Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

Norman Rademacher,
Licensing
Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, New York 13202

ENCLOSURE 1

AGENDA

NINE MILE POINT - UNIT 2

EQUIPMENT QUALIFICATION PROGRAM PRESENTATION

DATE: SEPTEMBER 25, 1984

TIME: 1:00 - 4:00 P.M.

LOCATION: NRC OFFICES, BETHESDA, MD.

INTRODUCTION
PROGRAM OVERVIEW
ENVIRONMENTAL CONDITIONS
ENVIRONMENTAL QUALIFICATION METHODOLOGY
- MILD ENVIRONMENT
- HARSH ENVIRONMENT
  - BOP + NSSS ELECTRICAL
  - MECHANICAL

SEISMIC/DYNAMIC CONDITIONS
- SEISMIC QUALIFICATION METHODOLOGY
- PUMP AND VALVE OPERABILITY ASSURANCE

QUALIFICATION DOCUMENTATION
QUESTION AND ANSWER SESSION

GENERAL DESCRIPTION

FOR NINE MILE POINT - UNIT 2 (NMP2)

- o BWR/5 MARK II CONTAINMENT DESIGN (3323 MWT)
- o NSSS AND TURBINE-GENERATOR SUPPLIER - GENERAL ELECTRIC CO.
- o BOP IS DESIGNED AND CONSTRUCTED BY A/E - STONE AND WEBSTER
- o LOCATED 33 MILES NNW OF SYRACUSE, NEW YORK
- o UTILIZES LAKE ONTARIO FOR ITS MAJOR WATER REQUIREMENTS

NMP2 MILESTONES

CP ISSUANCE	JUNE 1974
FSAR DOCKETED (SRP NUREG-75/087)	APRIL 1983
SER ISSUANCE	DECEMBER 1984 (S)
FSAR UPDATE	DECEMBER 1984
FULL ACRS MEETING	JANUARY 1985 (S)
EQ/SQRT/PVORT AUDITS	MAY 1985
EQB SER SUPPLEMENT	OCTOBER 1985
FUEL LOAD	FEBRUARY 1986 (S)
COMMERCIAL OPERATION	OCTOBER 1986 (S)

(S) - SCHEDULED

NMP2 COMMITMENTS

IEEE STANDARD 323-1974

"QUALIFYING CLASS 1E EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS"

NUREG-0588 - CATEGORY II PLANT

"INTERIM STAFF POSITION ON ENVIRONMENTAL QUALIFICATION OF SAFETY RELATED ELECTRICAL EQUIPMENT"

IEEE STANDARD 344-1975

"SEISMIC QUALIFICATION OF CLASS 1E EQUIPMENT FOR NUCLEAR POWER GENERATING STATIONS"

10CFR 50.49

FSAR QUES F 270.3 - MECHANICAL EQUIPMENT

BASES

FOR

ENVIRONMENTAL CONDITIONS

NORMAL, ABNORMAL, ACCIDENT CRITERIA

TEMPERATURE, PRESSURE, HUMIDITY

REG GUIDE 1.46
MEB 3 - 1
APCSB 3 - 1
LOOP

CHEMICAL ENVIRONMENT

NO CHEMICAL ADDITIVES

SUBMERGENCE AND SPRAYS

RADIATION

NUREG - 0016
NUREG - 0588
RECIRCULATING LOCA FLUIDS
SOURCE TERMS REG GUIDE 1.89 + NUREG 0737

RADIATION ENVIRONMENT DEFINITIONS FOR EQUIPMENT QUALIFICATION

- CRITERIA
- RADIATION SOURCES
- METHODOLOGY

RADIATION SOURCES

NORMAL

- o DESIGN BASIS FAILED FUEL SOURCES

ACCIDENT/POST-ACCIDENT

- o GOVERNED BY LOCA SOURCES

CASE-SPECIFIC ACCIDENT SCENARIOS

- o HIGH--ENERGY LINE BREAK
- o CONTROL ROD DROP ACCIDENT
- o FUEL-HANDLING ACCIDENT
- o ANTICIPATED TRANSIENT WITHOUT SCRAM

METHODOLOGY

SOURCE DISTRIBUTION

- INSTANTANEOUS MIXING BETWEEN DRYWELL AND WETWELL
- TIME-DEPENDENT TRANSPORT MODELS ARE USED TO DISTRIBUTE ACTIVITY TO STRUCTURES OUTSIDE THE CONTANIMENT
- EFFECT OF VENTILATION

  PRIMARY AND SECONDARY CONTAINMENT - NO EXHAUSE VENTILATION

  OTHER BUILDINGS - MAXIMUM EXHAUST VENTILATION FROM CONTAINMENT

METHODOLOGY (CONTD)

- TREATMENT OF HALOGENS - DRYWELL/WETWELL (PRIMARY CONTAINMENT)

  GAMMA - DOSE IS CALCULATED AS THE LARGER OF EITHER AN AIRBORNE OR PLATEOUT SOURCE IN ADDITION TO THE DOSES FROM THE SUPPRESSION POOL AND RECIRCULATING REACTOR COOLANT

  BETA - DOSE IS CALCULATED ASSUMING THAT THE 50 PERCENT OF THE CORE INVENTORY THAT IS INITIALLY AIRBORNE IS PLATED OUT

  HALOGENS DECONTAMINATION FACTOR OF 10 IS APPLIED FOR SUPPRESSION POOL SCRUBBING EFFECTS

METHODOLOGY (CONTD)

DOSE CALCULATION MODELS

- O GAMMA AIRBORNE

  PRIMARY CONTAINMENT - CYLINDRICAL MODEL (QAD MOD COMPUTER CODE)

  SECONDARY CONTAINMENT FINITE HEMISPHERE MODEL BASED ON EQUIVALENT BUILDING VOLUME

- O GAMMA WATERBORNE

  ACTUAL PIPING CONFIGURATIONS ARE MODELED IN PRIMARY CONTAINMENT

  A CONSERVATIVE MODEL HAS BEEN USED IN THE SECONDARY CONTAINMENT

- O BETA

  AIRBORNE - SEMI-INFINITE CLOUD MODEL

  PLATEOUT - INFINITE PLANAR SOURCE MODEL

ACCIDENT/POST-ACCIDENT
SOURCE TERMS

PRIMARY CONTAINMENT ATMOSPHERE, INSTANTANEOUS RELEASE

- 100 PERCENT CORE NOBLE GASES
- 50 PERCENT CORE HALOGENS

SUPPRESSION POOL/RECIRCULATING REACTOR COOLANT, INSTANTANEOUS RELEASE

- 50 PERCENT CORE HALOGENS
- 1 PERCENT CORE CESIUMS - REQUIRED;
  50 PERCENT CORE CESIUMS - GOAL
- 1 PERCENT REMAINING FISSION PRODUCTS

ENVIRONMENTAL QUALIFICATION - MILD ENVIRONMENT

A MILD ENVIRONMENT IS LOCATED OUTSIDE OF PRIMARY AND SECONDARY CONTAINMENT AND IS NOT SUBJECT TO ACCIDENT ENVIRONMENTS DUE TO A LOCA OR PIPE BREAKS.

A MILD ENVIRONMENT IS AN ENVIRONMENT THAT WOULD AT NO TIME BE SIGNIFICANTLY MORE SEVERE THAN THE ENVIRONMENT THAT WOULD OCCUR DURING NORMAL PLANT OPERATION, INCLUDING ANTICIPATED OPERATIONAL OCCURRENCES.

- NO COMMON MODE ENVIRONMENTAL CHANGES DUE TO ACCIDENT

ENVIRONMENTAL QUALIFICATION MILD ENVIRONMENT

- SERVICE CONDITIONS AND SAFETY FUNCTION MUST BE SPECIFIED AND ENVELOPED BY DESIGN

- MANUFACTURER MUST CERTIFY EQUIPMENT AGAINST SPECIFICATION

I BOP HARSH ELECTRICAL EQ PROGRAM

DEFINITION: ALL PLANT AREAS NOT DEFINED AS MILD ENVIRONMENT AREAS

A. 10 CFR 50.49 REQUIREMENTS
   - SAFETY-RELATED ELECTRICAL EQUIPMENT - CLASS 1E
   - NONSAFETY-RELATED ELECTRICAL EQUIPMENT WHOSE FAILURE COULD PREVENT THE FUNCTION OF SAFETY-RELATED ELECTRICAL EQUIPMENT - ASSOCIATED EQUIPMENT R.G. 1.75
   - POST-ACCIDENT MONITORING EQUIPMENT - R.G. 1.97

B. NUREG 0588 (CATEGORY II GUIDELINES)

C. 10 CFR 21

D. PROCUREMENT SPECIFICATION - IEEE 323 - 1974 (SWEC ONLY)

E. VENDOR DOCUMENTS

1. TEST PLANS

2. TEST REPORTS

F. SWEC DOCUMENTATION

1. CHECKLIST

2. SUPPLIER DOCUMENT DATA FORM (SDDF)

3. SYSTEM COMPONENT EVALUATION WORK (SCEW) SHEETS

NINE MILE POINT - UNIT 2
DOCKET NUMBER 50-410

SYSTEM COMPONENT EVALUATION WORK SHEET

QUAL REF #___________ REV _

EQUIPMENT DESCRIPTION	ENVIRONMENTAL CONDITIONS AND QUALIFICATION							
	PARAMETER	SPECIFIED VALUE	QUALIFIED VALUE	DOCUMENT REFERENCE SPECIFIED	DOCUMENT REFERENCE QUALIFIED	QUAL METHOD	MARGIN DEMO	REMARKS
EQUIP NO.:	OP. TIME:			3	2			
SPEC NO.:	TEMP (F):	------	------	------	------	------	---	- NOTE 1
SYSTEM:	NORMAL			1	2		NA	
	ABNORMAL			1	2		NA	
TYPE: (DESCRIPTION)	ACCIDENT			1	2			
	PRESS (PSIG)	------	------	------	------	------	---	- NOTE 1
	NORMAL			1	2		NA	
	ABNORMAL			1	2		NA	
MANUFACTURER:	ACCIDENT			1	2			
	RH (%):	------	------	------	------	------	---	- NOTE 1
MODEL NO.:	NORMAL			1	2		NA	
	ABNORMAL			1	2		NA	
SAFETY FUNCTION: ---	ACCIDENT			1	2			
	RADIATION:	------	------	------	------	------	---	- NOTE 1
	NORM GAMMA			1	2		NA	
	ACC GAMMA			1	2			
OP. CODE:	NORM BETA			1	2		NA	
	ACC BETA			1	2			
	NEUTRON			1	2			
	SPRAY						NA	
ACCURACY --	SUBMERGENCE						NA	

ACCURACY --
SPEC:
DEMO:

ZONE NO.:
FLOOD LEVEL ELEVATION:
ABOVE FLOOD LEVEL?
ABOVE SPRAY/ FROTH LEVEL?

DOCUMENTATION ACCEPTABILITY:
___________ NUREG 0588, CATII

MAINT/SURVEILL --- REFERENCE:

QUALIFIED LIFE --- (YEARS):
REFERENCE:

PREPARED BY:_________________________________ DATE___________
REVIEWED BY:_________________________________ DATE___________

DOCUMENT REFERENCE:
1. EQUIPMENT QUALIFICATION ENVIRONMENTAL DESIGN CRITERIA, EQEDC-1, REV 1, 1984.
2. VENDOR ENVIRONMENTAL QUALIFICATION REPORT, SDDF #
3. POST-ACCIDENT OPERABILITY PERIOD:

NOTES: 1. FOR COMPLETE ENVIRONMENTAL CONDITIONS, SEE THE DOCUMENT REFERENCED.

II QUALIFICATION METHODS

A. TYPE TESTING IDENTICAL EQUIPMENT

B. TYPE TESTING SIMILAR EQUIPMENT

   1. ADDITIONAL ANALYSIS REQUIRED

C. EXPERIENCE WITH IDENTICAL OR SIMILAR EQUIPMENT (INDUSTRY DATA)

   1. SIMILAR CONDITIONS OF SERVICE

   2. ADDITIONAL ANALYSIS MAY BE REQUIRED

D. ANALYSIS OF IDENTICAL OR SIMILAR EQUIPMENT SUPPORTED BY TYPE TEST DATA

III METHODOLOGY

A. AGING

1. ARRHENIUS METHODOLOGY
2. OTHER METHODS IF ADEQUATELY JUSTIFIED
3. PRIOR TO SEISMIC AND/OR DBA EVENT
4. SYNERGYSTIC EFFECTS (WHERE IDENTIFIED)
5. MAINTENANCE AND/OR REPLACEMENT SCHEDULES

B. TEST SEQUENCE (IF TYPE TEST USED)

SPECIFIED SEQUENCE

1. IEEE 323-74 - SAME UNIT
2. ALTERNATE IF JUSTIFIED

C. MARGIN

1. DIFFERENCE BETWEEN MOST SEVERE SPECIFIED SERVICE CONDITIONS AND CONDITIONS IN TYPE TESTING
2. MINIMUM 1 HOUR QUALIFICATION TEST TIME

D. RADIATION

1. GAMMA RADIATION

2. BETA RADIATION

3. NEUTRON RADIATION

4. LOCATION SPECIFIC CALCULATIONS
(IF REQUIRED)

I NSSS HARSH ELECTRICAL EQ PROGRAM

A. IEEE-323-1974

B. ANSI N45.2

C. IEEE-344-1975

D. NUREG 0588

E. NEDE - 24326-1-P

II QUALIFICATION METHODS

A. TESTING IS PREFERRED

B. OTHER APPLICABLE APPROACHES

1. PARTIAL TEST WITH ANALYSIS
2. OPERATING EXPERIENCE
3. ANALYSIS

ENVIRONMENTAL QUALIFICATION

OF

MECHANICAL EQUIPMENT IN HARSH ENVIRONMENTS

I. NSSS + BOP PROGRAM

A. FSAR QUESTION 270.3

B. THE MECHANICAL EQUIPMENT QUALIFICATION PROGRAM ESTABLISHES THE QUALIFIED LIFE OF SAFETY RELATED NONMETALLIC COMPONENTS

II. QUALIFICATION METHODS

A. DEVELOP ENVIRONMENTAL CONDITIONS

B. IDENTIFICATION OF SAFETY RELATED MECHANICAL EQUIPMENT

C. IDENTIFICATION OF ORGANIC MATERIALS

D. DEVELOPMENT OF COMPONENT THERMAL SERVICE LIFE

E. DEVELOPMENT OF COMPONENT RADIATION SERVICE LIFE

F. REVIEW MECHANICAL ENVIRONMENTAL CONDITIONS VERSUS CAPABILITY

G. DOCUMENT REVIEW

III DOCUMENTATION

1. QUALIFICATION REPORT SUMMARY
2. SUBCOMPONENT DATA SHEETS
3. ENGINEERING ANALYSIS SHEETS
4. RADIATION RESISTANCE OF MATERIALS
5. THERMAL AGING ANALYSIS

I. SEISMIC/DYNAMIC QUALIFICATION PROGRAM.

A. CRITERIA

1. NUREG-0800, REVISION 2
2. NUREG-0484, REVISION 1 (LOAD COMBINATION)
3. REGULATORY GUIDES 1.29 (CLASSIFICATION OF SEISMIC CATEGORY I STRUCTURES, SYSTEM, AND COMPONENTS)
   - 1.48 (CRITERIA FOR ASME COMPONENTS)
   - 1.60 (DEVELOPMENT OF GROUND RESPONSE SPECTRA)
   - 1.61 (DAMPING)
   - 1.92 (SPATIAL AND MODAL RESPONSE COMBINATION)
   - 1.100 (SEISMIC QUALIFICATION OF CLASS 1E EQUIPMENT)
   - 1.122 (MODIFICATION OF RESPONSE SPECTRA),
   - 1.148 (FUNCT SPEC FOR ACTIVE VALVES)
4. IEEE 344-1975
5. ASME CODE, SECTION III (PRESSURE BOUNDARY)
6. ADDITIONAL REQUIREMENTS FOR HYDRODYNAMIC LOADS (NRC LETTER)

B. SCOPE

1. SAFETY-RELATED MECHANICAL EQUIPMENT
   PUMPS (ACTIVE, NONACTIVE)
   VALVES (ACTIVE, NONACTIVE)
   OTHER MECHANICAL EQUIPMENT (I.E., CRANES, HVAC, ETC.)

2. ELECTRICAL EQUIPMENT AND INSTRUMENTATION
   SWITCHGEAR
   MOTOR CONTROL CENTERS
   STANDBY BATTERIES AND BATTERY CHARGERS
   STANDBY DIESEL GENERATOR SYSTEM
   MISCELLANEOUS CONTROL AND RELAY BOARDS
   INSTRUMENTATION (I.E., TRANSMITTERS, SWITCHES, RTD'S, ETC.)

II. QUALIFICATION METHODS

A. ANALYSIS

1. STATIC ANALYSIS - RIGID AND FLEXIBLE (EQUIVALENT STATIC) EQUIPMENT

2. DYNAMIC ANALYSIS - MODAL ANALYSIS, TIME HISTORY

3. STRESS CYCLES, CUMULATIVE USAGE FACTOR

4. SUPPLEMENTAL ANALYSIS FOR EQUIPMENT PREVIOUSLY QUALIFIED FOR SEISMIC LOADS ONLY

B. TESTING

1. MULTIFREQUENCY, MULTIAXIS

2. SINGLE FREQUENCY, SINGLE AXIS WHERE JUSTIFIED (REG 1.100)

3. VIBRATION AGING - OBE, HYDRODYNAMIC

4. MARGIN - GENERALLY 10%

C. COMBINED ANALYSIS/TESTING

SIMILARITY ANALYSIS

III. QUALIFICATION METHODOLOGY

A. EXAMPLE LIST

EQUIPMENT	ANALYSIS	TEST
POLAR CRANE	X	
VALVES	X	X
PUMPS	X	
HVAC (MISCELLANEOUS)	X	
FIRE DAMPER	X	X
HIGH DENSITY FUEL RACKS	X	
HEAT EXCHANGERS	X	
TANKS	X	
HYDROGEN RECOMBINER	X	X
I & C DEVICES -		X
ELECTRICAL PENETRATIONS	X	X
MOTORS (MISCELLANEOUS)	X	X
MOTOR CONTROL CENTERS		X
SWITCHGEAR		X
BATTERIES AND RACKS	X	X
BATTERY CHARGERS		X
TRANSFORMERS (MISC.)		X
DUCT HEATERS	X	X
DIESEL GENERATOR SYSTEMS	X	X
UNINTERRUPTIBLE POWER SUPPLY		X
PANELS AND RACKS (MISC.)	X	X

B. EQUIPMENT - SUPPORT INTERACTION

INTERMEDIATE SUPPORT STRUCTURE IS DESIGNED TO BE RIGID TO PRECLUDE DYNAMIC INTERACTION

IF IMPRACTICAL TO DESIGN RIGID STRUCTURE, QUALIFICATION ANALYSIS INCLUDES SUPPORT STIFFNESS

C. PUMP AND VALVE OPERABILITY ASSURANCE PROGRAM

1. ACTIVE VALVES
   - LOADS - SEISMIC, HYDRODYNAMIC, FLUID TRANSIENTS
   - ANALYSIS - STRESS, DEFLECTION
   - DYNAMIC TESTING - COMPONENTS (OPERATOR, LIMIT SWITCH, SOLENOID VALVE)
   - STATIC/DYNAMIC TESTING OF ASSEMBLY
   - SPECIFIC PROGRAMS - MSIV, PURGE VALVES, FEEDWATER CHECK VALVES

2. ACTIVE PUMPS
   - LOADS - SEISMIC
   - ANALYSIS - STRESS, DEFLECTION, LOWER ALLOWABLE LIMITS
   - PROTOTYPE TESTING OF MOTORS (IEEE 334)

3. SUPPLEMENTAL PROGRAMS
   - PREINSTALLATION/POSTINSTALLATION TESTING
     A. PERFORMANCE TESTING
     B. PREOP. TESTING
   - PERIODIC TESTING AND INSPECTION
     A. ISI PLAN/TECH SPECS
     B. PREVENTATIVE MAINTENANCE

D. SQRT/PVORT FORM

- NRC RECOMMENDED FORMAT
- COMPREHENSIVE PRESENTATION OF QUALIFICATION RESULTS
- "ROADMAP" TO QUALIFICATION DOCUMENTATION
- DOCUMENTED EVIDENCE OF QUALIFICATION REVIEW

SQRT/PVORT FORMS WILL BE PREPARED AS REQUESTED BY THE NRC

LS-5/15/84

I QUALIFICATION DOCUMENTATION MASTER LIST

A. WILL BE PROVIDED FOR: 10CFR50.49 EQUIPMENT - (SCEW SHEET) SAFETY-RELATED MECHANICAL EQUIPMENT SEISMIC CATEGORY I EQUIPMENT

B. LISTS EQUIPMENT BY MARK NUMBER

C. IDENTIFIED MANUFACTURER AND MODEL NUMBER

D. PROVIDES STATUS OF QUALIFICATION AND INSTALLATION

ENCLOSURE 2

EQUIPMENT QUALIFICATION FOR HYDRODYNAMIC LOADS
NINE MILE POINT - UNIT 2

ESTABLISHMENT OF STRESS CYCLES AND DETERMINATION OF TEST DURATIONS

Establishment of Stress Cycle Requirements

The hydrodynamic loadings which contribute significantly to the potential fatigue damage are those due to SRV actuations and LOCA loadings A total of 5200 SRV events and 1000 chugs are postulated during the 40-year plant life. Stress cycles for both SRV and LOCA loadings were calculated as follows:

a. The responses of several SDOF systems were calculated by subjecting them to acceleration time-history motions at representative reactor building locations. SDOF systems, ranging in frequency from 2 to 100 Hz, at no more than 1/3-octave spacing, were analyzed. A total of 21 time-histories at five different locations of the reactor building for the critical loading cases of the SRV actuation were considered. Ten time-histories of LOCA-chugging loading, and nine time-histories of LOCA-Basic Condensation Oscillation (Basic CO) loading from four different locations were considered in the analysis.

b. For each response time-history obtained in Step a above, the equivalent number of stress cycles, normalized to the peak response, were determined.

c. For each SDOF system, an equivalent stress cycle number was established. This number is based on a 99-percent confidence limit for the mean of all data analyzed.

d. Of all the SDOF systems analyzed, the highest equivalent stress cycle number from Step c above is taken to be the equivalent stress cycle for the loading event, i.e., one SRV actuation or one chug.

e. Due to the stochastic nature of the loading, not all the 5200 SRV actuations and 1000 chugs are expected to occur at their respective peak magnitudes. Since the peak magnitudes are used as the design loads for equipment qualification, equivalent occurrence factors (EOFs) for both SRV and chugging are determined. The methodology and the basis are documented in Reference a.

f. The total number of equivalent stress cycles, Neq, for SRV, chugging and Basic CO are calculated as:

Neq = (Number of postulated events) x (number of stress cycles from Step d) x (EOF)

From the above equation:

Neq (SRV) = 5950 cycles
Neq (chugging) = 1125 cycles
Neq (Basic CO) = 200 cycles

These numbers compare favorably with the numbers from Limerick, Grand Gulf, and LaSelle nuclear stations, which have been previously accepted by the NRC staff.

The cycles for loading combination of various dynamic events were established by considering how many cycles of a particular loading can occur concurrently with an equal number of cycles of another loading. The remaining cycles of a load that cannot simultaneously occur with another load are addressed as cycles for that individual load case.

Determination of Test Duration

The objective in determining test durations was that the expected fatigue damage from the tests equals or exceeds the fatigue damage due to the postulated loading.

The same method discussed above was used in determining the expected stress cycles from test table motions. Eleven different random multifrequency test input motions from two different test facilities were analyzed. Here again, the equivalent stress cycles from the responses of several SDOF systems of frequencies up to 100 Hz were calculated, when subjected to these time-histories. It was concluded that when conducting a test in which spectra due to hydrodynamic loads (having frequency content typically in the range 10 to 100 Hz) are enveloped, a 30-second duration test using random multifrequency input motion will result in a minimum of 200 equivalent stress cycles corresponding to the required response level of the equipment. The results are similar to those from Reference b, which recommends 190 equivalent peak stress cycles induced by stationary random motion, for a filtered motion center frequency of 40 Hz. In addition, the expected stress cycles in the equipment response due to single frequency test input motions, e.g., sine beat, were also determined.

Having established the expected stress cycles from a specific test, test plans were developed which would yield equivalent stress cycles equal to or greater than the required stress cycles from all the dynamic loads and load combinations. For equipment already tested for seismic loading, the expected fatigue cycles from these tests were compared with the required cycles to determine whether the existing tests were adequate or whether additional testing would be needed.

References

a. Mark II Generic Techniques for Fatigue Evaluation of the SRVDLs and Downcomers in the Wetwell. Prepared by the Mark II Subcommittee on Structural/Mechanical Problems, August 13, 1981.

b. Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations, 4th draft of IEEE Standard 344-198(-) dated March 1984.

Enclosure 3

September 25, 1984 Meeting on Equipment Qualification Nine Mile Point - Unit 2
List of Attendees

NRC
Mary F. Haughey
A. S. Masciantonio
Robert J. Wright
Norman D. Romney
Goutam Bagchi
George Hubbard

NMPC
Norman Rademacher
Don Hill
A. Loveland
D. L. Pike
R. L. Anderson (NYSEG)

GE
H. P. Williams
P. C. Yin
Noel Shirley
Richard W. Hardy

SWEC
Richard H. Pinney
Michel S. Stocknoff
T. L. Wang
M. K. Allen
L. Illy
D. L. Hobman
S. M. Feldman
Narendra Moni