

Seismic Qualification of Nuclear Power Plant Equipment: Test and Analysis of Large Scale Panels

†
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1. 4.16kV MCSG
MCSG
4.16kV MCSG
MCSG
Prototype
Prototype
RRS()

< 1 > MCSG
13,090 psi Prototype 20,137
psi Prototype
MCSG Prototype

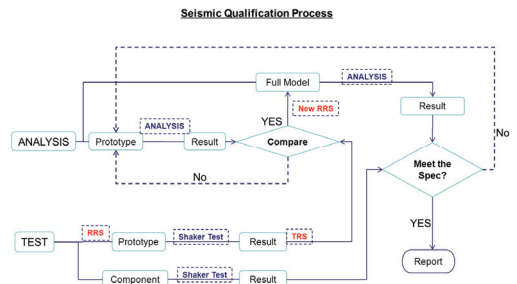


Fig. 1 Flow Chart of Seismic Qualification

2. 2.1
(1) Prototype MCSG
Prototype MCSG Modal
ANSYS 6 3
MCSG
17.81Hz Prototype 14.95Hz
Prototype MCSG
Prototype MCSG SSE()
ANSYS 5g

Table 1 Principal Stress of MCSG and Prototype

Principal Stress (Max)	XSW - 2B MCSG(psi)	Prototype(psi)
σ_1	13,090	20,137
σ_2	3,717	4,563
σ_3	38	79

2.2
(1) Prototype OBE()
, SSE()
가
가

(2) Prototype IEEE 344-1987, IEEE C37.81-1989, IEEE C37.82-1987

3 3 가 가

3 가

MCSG Prototype MCSG ANSYS

Block

40 (4) MCSG

33Hz

TRS() OBE

2% SSE 5%

TRS RRS

TRS RRS

1Hz 50Hz 1/6 OBE() SSE()

MCSG ANSYS

(3) Prototype MCSG 3.

RRS MCSG Prototype FEM

FRS MCSG < 2 >

g MCSG Modal Participation 가

Factor, Mode Shape, Modal Frequency

Table 2 Total Masses of Actual Model and FEM Model

Equipment	Actual Model(lbs)	FEM Model(lbs)	Error(%)
XSW -2A (8 Sections)	33,510 (=15200 kg)	33,729	+0.6
XSW -2B (9 Sections)	37,037 (=16800 kg)	37,078	+0.1
PROTOTYPE (3 Sections)	12,348 (=5600 kg)	12,382	+0.3

2.3

(1) MCSG Prototype

MCSG

(2) MCSG Assembly Shell < 3 > Side-to-Side MCSG

Prototype Prototype MCSG

FEM 4.16kV MCSG Prototype

Baseplate

(3)

Table 3 Natural Frequencies of Three Different Models

Equipment	Natural Frequencies, Hz		
	Side-to-Side	Front-to-Back	Vertical
XSW-2A(8 Sections)	22.6	27.5	31.4
XSW-2B(9 Sections)	22.6	27.5	31.4
PROTOTYPE(3 Sections)	18.0	23.5	23.3

Prototype MCSG < 2>
 Prototype MCSG
 MCSG

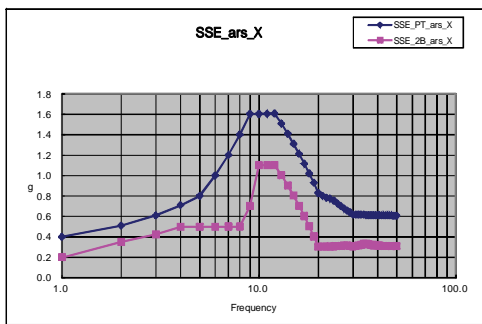
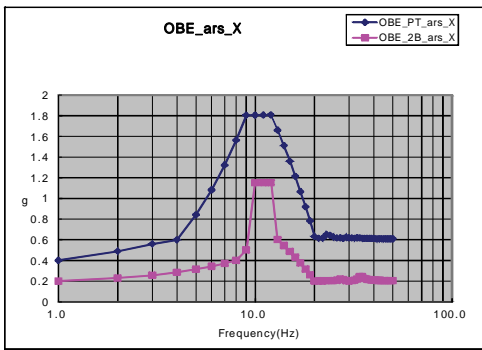


Fig. 2 Comparison of Seismic Response between the Prototype & MCSG