PVORT NO.______ Spec. No. P304R

NINE MILE POINT
NUCLEAR STATION
UNIT 2

EQUIPMENT DYNAMIC QUALIFICATION

COMPONENT NAME: 12-in., 150-lb Motor-Operated Gate Valve

MARK NUMBERS: 2CCP*MOV18A

STONE & WEBSTER ENGINEERING CORPORATION

C3/12177/244/5YH

REVIEWER'S SUMMARY AND EVALUATION

1. COMPONENT NAME: 12-in., 150-lb Motor-Operated Gate Valve

2. TAG NUMBERS: 2CCP*MOV18A

3. QUALIFICATION DOCUMENTATION

A. Qualification Summary of Equipment (PVORT form)

Enclosed

B. Referenced Documents in this Package

Ref. ID No.	Date	Organization/Title/Subject
1) Spec. P304R Rev. 2 incl. Addenda 1 through 6	11/30/83	SWEC/Specification for Motor-Operated Carbon Steel Valves ASME III, Classes 1, 2, and 3
2) E&DCR No. P01,895	11/02/83	SWEC/Hydrostatic Test Clarification
3) E&DCR No. P12,356	06/16/83	SWEC/Seismic Requirements
4) 0005.521.122.039J	11/23/82	Velan/Mfr's drawing, 8 in.-16 in. Gate Valve Bolted Bonnet Forged Motor Operator
5) 12177-EP-72F-7	---	SWEC/Piping drawing, Closed Loop Cooling Water Piping Reactor Bldg.
6)	(LATER)	
7) No File Number	11/23/73	Velan/Seismic Analysis Theory, App. A, Revision C
8) SR6393 Rev. 0	10/12/79	Velan/Seismic Analysis
9) ST-7003 Rev. 2	11/02/81	Velan/Operability Test Procedure
10) STRS 05.321.5008B	03/01/84	Velan/Operability Test Results at the Extremes of Voltage
11) STRS 05.321.5008A	10/12/82	Velan/Operability Test Results (Lo G)
12) STRS 05.321.5007B	03/01/84	Velan/Operability Test Results (Hi G)
13) IEEE 05.321.5001C	---	Limitorque/Qualification Test Report B0058

14) STRS 05.312-5000B	08/27/82	Acton-SWEC/Actuator Test Report No. 16573-81N, Revision 3
14a) No File Number	06/10/82	NTS-SWEC/Actuator Test Report No. 548-9291, Revision 2, Volumes 1 through 3 (T47,622; 06/10/82)
15) VEL-NDT-640A(HT) Rev. 8	09/19/77	Velan/Testing of Nuclear Valves
16) INST 05.321.5000A	09/13/82	Limitorque/Instruction and Maintenance Manuals
17) INST 05.320.5006C	12/11/84	Velan/Maintenance Manual VEL-FBBM
18) No File Number	---	Motor Operator Sizing Calculation
19) W800004	---	Documentation Package - includes test results for Hydrostatic Testing and Limitorque Motor Tests
20) No File Number	---	SWEC/Electrical Test Procedure AO.G20.09, ED.GENE.014 (Draft)

4. NINE MILE REQUIREMENTS (dynamic loads, functional requirements)

This motor-operated valve is located in the reactor building closed loop cooling water system (CCP). The functional requirement of this valve is to permit isolation of CCP flow from the spent fuel - fuel pool cooling and cleanup (SFC) heat exchanger E1A.

This valve assembly is required to withstand an acceleration value of approximately 1.5 g for SSE and 1.4 g for OBE conditions along each of the three axes together with the deadweight and valve operating loads (i.e., pressure, temperature, and torque).

5. QUALIFICATION RATIONALE

The operability and structural integrity of the valve assembly was assured through an evaluation of all the parameters affecting its function. These include the temperature, pressure, deadweight, operating loads, fluid flow, piping end loads, seismic loads, and the normal and accident environmental parameters. The effects of each of these loads are discussed below.

The thermal effects are considered to be insignificant since the operating temperature range is only between 40°F and 160°F. A conservative design pressure of 720 psi was used in the analysis, which is more than the specification requirement of 200 psi. The fluid flow is 2250 gpm, i.e., about 6.5 ft/sec through a 12 in. diameter pipe, which is small and is not expected to have any effect on the ability of the valve to close. The stresses in the valve body due to the piping end loads were shown to be very small

(13,000 psi due to SSE) and are not considered significant in demonstrating operability of the valve assembly.

The normal and accident environmental parameters are evaluated for all valve body nonmetallic components and the electrical motor operator, and were found acceptable.

Based on the above, it was concluded that the significant loads to be considered for operability are the deadweight, operating and seismic loads. These loads were addressed through a combination of analysis and testing.

The structural adequacy of the valve assembly was ensured through a static analysis (Reference 8).

The functional adequacy of the valve assembly is demonstrated through a combination of tests. The description of each test is as follows:

1. Static Deflection Test: This test demonstrated that there was no bending of the valve stem or any other internal components to jeopardize operability. An identical valve assembly was also statically deflected up to 11.6 g for further assurance of operability (References 10, 11, and 12).

2. Valve Operator Test: The motor operator's functional adequacy was demonstrated through an extensive dynamic testing program of similar operators. These tests consisted of aging, which simulated the normal plant vibration, a series of single frequency tests in the seismic frequency range, and a series of random multifrequency, multiaxis, dynamic tests (References 13, 14, and 14a).

3. Preoperational and Performance Tests: These tests consist of seat leakage, hydrostatic shell, and cyclic tests of the valve assembly (References 15 and 19).

6. QUALIFICATION RESULTS

The static stress analysis demonstrated the valve assembly's adequacy to a level of 5.83 g for seismic loading together with the deadweight and operating loads. The static deflection tests of the valve assembly established operability within the specified time and leakage requirements to an acceleration load of 11.6 g. The valve operator's dynamic testing program successfully demonstrated the adequacy of the operator to function to a level of 14.0 g (Reference 14a).

The valve operator's testing program indicated that modifications are required for tightening of screws within the limit switch housing and gap adjustment procedures. These modifications are being addressed by the implementation of Reference 20.

7. FIELD VS. QUALIFICATION MOUNTING

(LATER)

REVIEWER'S CONCLUSIONS:

Based on the evaluation of all the applicable parameters, the valve's structural adequacy and functional operability were demonstrated. The results of the seismic analysis, the valve operability tests, and the motor-operator dynamic tests show that the functional capability of the valve will be maintained during and after the seismic test.

The following programs will also be implemented to ensure operability of the valve assembly:

1. As-built verification of all loading values.

2. Modifications to Limitorque operators in accordance with Reference 20.

3. In-situ testing of valve assembly.

Spec. No. P304R
Revision 0

PUMP AND VALVE

OPERABILITY ASSURANCE REVIEW

I. PLANT INFORMATION

1. Name: Nine Mile Point Unit No. 2 2. Docket No.: 50-410
3. Utility: Niagara Mohawk Power Corporation
4. NSSS: General Electric Co. ( ) PWR (X) BWR
5. A/E: Stone & Webster Engineering Corporation
6. C.P. and/or O. L. SER date 6/24/74 -

II. GENERAL COMPONENT* INFORMATION

1. Supplier: ( ) NSSS (X) BOP
2. Location: a. Building/Room Reactor Bldg.
   b. Elevation ℄ Pipe 217'-0"
   c. System Closed Loop Cooling
3. Component I.D. No. 2 CCP*MOV18A
4. If component is a ( ) Pump complete II.5.
   If component is a (X) Valve complete II.6.
5. General Pump Data (Not Applicable)

a. Pump	b. Prime mover
Name	Name
Mfg.	Mfg.
Model	Model
S/N	S/N
Type	Type

*The component, whether pump or valve, is considered to be an assembly composed of the body, internals, prime-mover (or actuator) and functional accessories.

a. Pump (Continued) (Not Applicable)	b. Prime mover (Continued)
Overall Dimensions ______	Overall Dimensions ______
Weight ______	Weight ______
Mounting Method ______	Mounting Method ______
Required B.H.P. ______	H.P. ______

Parameter	Component Design	System Normal/Accident
Press	______	______/______
Temp	______	______/______
Flow	______	______/______
Head	______	______/______
Media	______	______/______

Required NPSH at maximum flow ______

Available NPSH ______

Operating Speed ______

Critical Speed ______

Prime Mover Requirements: (include normal, maximum and minimum)

Motor(Voltage) ______

______

______

Turbine (pressure) ______

______

If MOTOR list:

Duty cycle ______

Stall Current ______

Class of insulation ______

______

List functional accessories:* ______

______

______

______

______

*Functional accessories are those sub-components not supplied by the manufacturer that are required to make the pump assembly operational, (e.g., coupling, lubricating oil system, speed control sys., feedback, etc).

6. General Valve Data

a. Valve

Name 12 in.-150 lb Motor-Operated Gate

Mfg. Velan

Model No. B18-0054B-02WN (VGW-015 P-3ZQ)

S/N MFG No. 004

Type Bolted Bonnet Gate

Size 12 in.-150 lb

Weight 1975 lb

Mounting Method Butt Weld Ends

Max. Required Torque 152 ft-lb

Parameter	Component Design	System Normal/Accident
Press(PSIG)	200	49/36
Temp(°F)	250	118/33-90
Flow(GPM)	2250	2410/0
Media	Water	Water/Water

Max P across valve 150 psi

Closing time @ max P 67 sec @ 460 V

Opening time @ max P 67 sec @ 460 V

b. Actuator (if not an integal unit)

Name Motor Operator

Mfg. Limitorque

Model SMB-0-25

S/N 293419

Type Motor Operated

Size SMB-0-25

Weight 320 lb

Mounting Method Bolted to Valve

Max. Delivered Torque 749 ft lb stall torque @ 110% voltage

Power Requirements: (include normal, maximum and minimum).

Electrical 3 phase, 60 hertz, 575 V

Min - 460 V

Normal - 575 V

Max. - 633 V

Other: ( )Pneumatic ( ) Hydraulic

List functional accessories:* None

*Functional accessories are those sub-components not supplied by the manufacturer that are required to make the valve assembly operational, (e.g., limit switches, solenoid valves, accumulators, etc).

C3/12177/244/5YH

III. FUNCTION

1. Briefly describe components' normal and safety functions (include accident initiating signals).

Normal: Permits isolation of CCP flow from SFC Heat Exchanger (EIA)

Safety: Same - except when CCP is not available

2. The components normal state is: (X)Operating ( )Standby

3. Safety function:

a. ( ) Emergency reactor shutdown
b. ( ) Containment heat removal
c. ( ) Containment isolation
d. ( ) Reactor heat removal
e. ( ) Reactor core cooling
f. ( ) Prevent significant release of radioactive material to environment
g. ( ) Does the component function to mitigate the consequences of one or more of the following events? ( )Yes (X)No
( ) LOCS ( ) HELB ( ) MSLB
(X) Other Removes decay heat from spent fuel pool

4. Safety requirements:

( ) Intermittent Operation
( ) During postulated event
( ) Continuous Operation
(X) Following postulated event

If component operation is required following an event, give approximate length of time component must remain operational 100 days (e.g., hours, days, etc).

5. For VALVES:

Does the component ( )Fail open ( )Fail closed (X)Fail as is

Is this the fail safe position? (X) Yes ( ) No

Is the valve used for throttling purposes? ( ) Yes (X) No

What is the maximum acceptable internal and external leakrate?

120 cc/hr -

C3/12177/244/5YH

IV. QUALIFICATION

1. Reference by specific number those applicable sections of the design codes and standards applicable to the component: ASME, Sect. III, Class 2 and 3, 1974 ed. w/add. through Winter '75

2. Reference those qualification standards, used as a guide to qualify the component: IEEE 323-1974, 344-1975, NRC Reg Guides 1.48, 1.61, 1.92, 1.100

3. Have acceptance criteria been established and documented in the test plan(s) for the component?
   (X) Yes ( ) No

4. Are the margins* identified in the qualification documentation?
   (X) Yes ( ) No

5. Was the component that was qualified a model or an actual assembly? (see below). If a model, what was its scale? ______. If an actual assembly, was it qualified as an assembly or by sub-assemblies? (i.e., valve, actuator, pump, driver) see below**

6. List all component tests performed or to be performed that demonstrate qualification:

   1. Static Deflection Test (Valve Assembly Operability Test)
   2. Valve Actuator Dynamic Testing and Load Tests
   3. Valve Actuator's Motor Tests
   4. Hydrostatic Tests - Shell, Wedge, Seat, Backseat and Packing Tests
   5. Valve Actuator's Envt. Testing

*Margin is the difference between design basis parameters and the test parameters used for equipment qualification.

**Operability Test, Limitorque Actuator - Similar Model for Seismic Loading (Assembly)
Hydrostatic Tests - Actual Assembly (Assembly)
Limitorque Actuator and Motor - Actual Actuator for Motor and Actuator Load Tests (Subassembly)

7. List all component analyses performed that demonstrate qualification:

Static analysis of valve assembly

8. As a result of any of the tests (or analysis), were any deviations from design requirements identified?
(X) Yes ( ) No If "Yes", briefly describe any changes made in tests (or analyses) or to the component to correct the deviation.

Limit switch screws and bolt torques were adjusted

Limit switch finger assembly gaps were adjusted

9. Was the tested component precisely identical (as to model, size, etc) to the in-plant component? ( ) Yes (X) No. If "No", is installed component ( ) oversized or ( ) undersized? Same type but not identical

10. Is component orientation sensitive? (X) Yes ( ) No ( ) Unknown. If "Yes", does installed orientation coincide with test/analysis orientation? (X) Yes ( ) No.

List all loads and numerical values used during tests or analysis and indicate whether applied individually or in combination:

a. Static analysis - seismic load 5.83 g's acceleration, pressure 720 psi, operating torque 5684 in.-lb, applied in combination

b. Static deflection test - seismic load 11.6 g's, differential pressure 108 psi, applied in combination

c. Limitorque actuator dynamic test - 14.0 g's maximum fragility level

d. Limitorque actuator envt. test - temperature 250°F
pressure 25 psi humidity 100%
radiation 2×10^7 rads gamma

e. Hydrostatic testing - shell 425 psi for 10 min., wedge 300 psi for 1 min., seat 150 psi for 1 min., backseat 425 psi for 1 min., packing 300 psi for 2 min.

f. Limitorque motor test - normal 10900 load 460 V
max 14400 load 460 V
stall 28700 load 572 V

11. Does the component have a unique design or utilize unique materials in its construction? (Examples are special gaskets or packings, one of a kind components, limitations on non-ferrous materials, special coatings or surfaces, etc.)

( ) Yes (X) No If "Yes" identify: ________________

12. What is the design (qualified) life of the component, exclusive of normal maintenance items such as packings, bearings, seals, diaphragms, gaskets, and other elastomers?

40 Years - Valve

7 Years - Limitorque Actuator

13. Which of the components normal maintenance items requires the most frequent replacement? Gaskets, grease, packing rings

What is the normal time interval between replacements of this item?

Based on ISI and Maintenance Programs currently being developed

14. What is the harshest (accident/post-accident) external environment that the component could be exposed to during its qualified life? (e.g., temp., press., humidity, submergence, radiation type and dose, etc.)

50% RH (normal) -.25 in/H20 (normal) 2.8 psig (accident)

100% RH (accident) 104°F (normal) 200°F accident

2.0×10^6 rads gamma 40 yr/TID (normal)

3.2×10^7 rads gamma 100 day (accident)

1.3×10^7 rads beta 100 day (accident)

No submergence

15. Information Concerning Qualification Documents for the Component

Report Number	Report Title	Date	Company/ Organization Preparing Report	Company/ Organization Reviewing Report
---	Specification No. P304R, Rev. 2 Including Addenda 1 through 6	11/30/83	SWEC	SWEC/NMPC
E&DCR P01,895	Hydrostatic Test Clarification	11/2/83	SWEC	SWEC
E&DCR P12,356	Seismic Requirements	6/16/83	SWEC	SWEC
.0005 .521.122 .039J	Mfr's Drawing 8- 16-in. Gate Valve Bolted Bonnet Forged Motor Operator	11/23/82	Velan	Velan/SWEC
12177-EP-72F-7	Piping Drawing Closed Loop Cooling Water Piping RB	---	SWEC	SWEC
---	Seismic Analysis Theory Appendix A Revision C	11/23/73	Velan	Velan/SWEC
SR 6393 Rev. 0	Seismic Analysis	10/12/79	Velan	Velan/SWEC
ST-7003 Rev. 2	Operability Test Procedure	11/2/81	Velan	Velan/SWEC
STRS 05.321 .5008B	Operability Test Results at the Extremes of Voltage	3/1/84	Velan	Velan/SWEC
STRS 05.321 .5008A	Operability Test Results (Lo G)	10/12/82	Velan	Velan/SWEC
STRS 05.321 .5007B	Operability Test Results (Hi G)	3/1/84	Velan	Velan/SWEC
IEEE 05.321 5001B	Qualification Test Report B0058	---	Limitorque/ Velan	Limitorque/ Velan/SWEC
STRS 05.321 5000B	Actuator Test Report 16573-81N Revision 3	8/27/82	Acton/SWEC	SWEC

Report Number	Report Title	Date	Company/ Organization Preparing Report	Company/ Organization Reviewing Report
---	Actuator Test Report 548-9291 Rev. 2, Volumes 1 through 3	6/10/82	NTS/SWEC	SWEC
---	Testing of Nuclear Valves VEL-NDT-640A (HT) Revision 8	9/19/77	Velan	SWEC
INST 05.321 .5000A	Actuator's Instr. and Maintenance Manuals	9/13/82	Limitorque/ Velan	Limitorque/ SWEC
INST 05.320 .5006C	Valve's Maintenance Manual VEL-FBBM	12/11/84	Velan	SWEC
---	Motor Operator Sizing Calc.	---	Limitorque/ Velan	SWEC
---	Valve's Documentation Package W.80004	---	Velan	SWEC
---	Electrical Test Procedure ED.GENE.014 (Draft)	---	SWEC	SWEC