TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

December 14, 1982

Director of Licensing
Attention: Mr. Domenic B. Vassallo, Chief
Operating Reactors Branch No. 2
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Vassallo:

In the Matter of the	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
		50-296

By your letter dated July 22, 1982 to H. G. Parris, TVA received the draft technical evaluation report (TER) entitled "Control of Heavy Loads - NUREG-0554," on Browns Ferry Nuclear Plant. As a result of our review of the TER, a conference call was held with Fred Clemenson of the NRC staff on October 27, 1982. Specifically, Section 4.3, "Overall Evaluation and Recommendation," pages 32-34 of the TER was reviewed in the conference call to determine TVA compliance. Enclosed is an item-by-item description of TVA's responses which were presented to Mr. Clemenson in the conference call. It is our understanding these responses will fulfill the requirements of NUREG-0554 for the Browns Ferry Nuclear Plant.

If you have any questions, please call Jim Domer of my staff at FTS 858-2725.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Licensing

Subscribed and sworn to before
me this 14th day of December 1982.

Paulette H. White
Notary Public

My Commission Expires 9-5-84

Enclosure
cc: See page 2

A033

cc (Enclosure):
U.S. Nuclear Regulatory Commission
Region II
ATTN: James P. O'Reilly, Regional Administrator
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Mr. R. J. Clark
Browns Ferry Project Manager
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20814

ENCLOSURE

NRC REQUIREMENTS	TVA RESPONSE
Brake modifications Bridge and trolley braking systems should be modified, as proposed by the Licensee, to provide control and holding brakes rated at 100% of maximum motor torque.	Brake Modification--A Design Change Request (DCR) will be initiated by April 1, 1983 to update the reactor building crane bridge and trolley braking systems.
Test program The Licensee has agreed to perform a cold-proof test of the crane to satisfy NUREG-0554 requirements pertaining to brittle fracture. An expanded test program should be conducted which includes the verification of other aspects of crane design. Such a test should address:	
1. Acceptable protection against brittle fracture by complying with the provisions of NUREG-0612, Article 2.4.1.	1. Cold-proof test--This test will be performed by March 1983.
2. Verification that, following the failure of an active component of the drive system (bridge, trolley, or hoist drive motor or brake), either suitable procedures and physical features are available to repair or replace the failed component while the MCL is maintained in a stable condition or that, without repair, the MCL can be moved and placed in a safe laydown area. (Articles 3.4-1 and 8.2-3)	2. This was performed during preoperational testing of the crane and is documented in Preoperational Test No. TVA-21 (attached).
3. Verification of redundancy of electrical components (limit switches, relays) provided to prevent two-blocking and overload in the event of a load hangup. (Article 4.5-2)	3. This was performed during preoperational testing of the crane and is documented in Preoperational Test No. TVA-21A (attached).
4. Verification that maximum hoist stopping distance is acceptable (approximately 3 in). (Article 8.1-2)	4. This will be performed in conjunction with the cold-proof test.

NRC REQUIREMENTS	TVA RESPONSE
5. Verification that braking system design precludes inadvertent bridge, trolley, or hoist motions upon restoration of electrical power following an electrical power failure. (Article 5.1-3)	5. TVA will review the design calculations and drawings to determine if any active components can be removed while suspending the MCL. Alternate mechanical applications to accomplish this requirement will also be reviewed. If no acceptable solution is derived from the above analysis, a system for moving the disabled bridge and/or trolley with MCL to a safe setdown area and mechanically lowering the load will be pursued. TVA expects to complete the above actions by April 1, 1983.
Post-test examination Following the operational/cold-proof test, a one time examination should be conducted to increase the assurance of future integrity of critical structural elements including the following:	
1. A surface examination of accessible weldments in load-bearing joints.	1. TVA will identify the critical load bearing welds and develop a procedure for visually inspecting all accessible load bearing welds. Also, TVA will perform nondestructive tests on some of the critical welds as necessary. TVA expects to complete the above actions by February 1, 1983, before cold-proof testing.
2. A surface examination of the hook assembly to detect flaws affecting structural integrity.	2. The hooks are inspected during the periodic inspection by means of magnetic particle testing (MT).
Routine inspection The Licensee should institute an inspection program complying with the requirements of ANSI B30.2-1976, Chapter 2-2, enhanced to compensate for variations from NUREG-0554 requirements in certain areas.	
1. Rope replacement criteria of ANSI B30.2-1976, Article 2-2.4.2, should be made more stringent to accommodate the differential between the NUREG-0554 requirement concerning the ratio of maximum load to breaking strength and that provided in the Browns Ferry crane.	1. MMI-117 will be revised by April 1, 1983 to include the more stringent requirements.

NRC REQUIREMENTS	TVA RESPONSE
2. The periodic inspection requirements of ANSI B30.2-1976, Article 2-2.1.3, should be enhanced to include a visual inspection of accessible welded joints associated with load-bearing members to detect cracking in areas subject to potentially high residual stresses.	2. MMI-117 will be revised by April 1, 1983 to include this inspection.
Lifting devices The acceptability of lifting devices, both those specially designed and general purpose devices (e.g., slings) should be established on the basis of conformance with ANSI N14.6-1978 or ANSI B30.9-1971, as appropriate, in accordance with the requirement of NUREG-0612. Dual attachment points should be provided for loads which, if dropped, could result in effects in excess of the criteria provided in NUREG-0612.	This item is being deferred as a response to NUREG-0612, pending TVA's review of the lifting devices.
Miscellaneous	
1. A label plate should be provided on the crane to clearly identify the MCL.	1. A label plate will be provided by April 1, 1983.
2. The Browns Ferry unit 1 crane cannot be found to satisfy single-failure-proof criteria for loads in excess of approximately 75 tons due to the lack of seismic analysis for such loads. The acceptability of this situation should be evaluated on the basis of additional information which should be required of the Licensee to identify: o The weights of each load in excess of 75 tons expected to be carried. o The duty cycle, or hours per year, each load in excess of 75 tons is expected to be carried.	2. The original seismic analysis of the reactor building crane was performed by idealizing the crane as a lumped-mass mathematical model. The stiffness of the model is the stiffness of the crane girders. The trolley was assumed to be rigid and was idealized in the mathematical model as rigid links connecting the crane girders. The trolley was assumed to be pinned to the crane girders in order to maximize the inertial affects of the trolley. The maximum load on the crane during a seismic event was assumed to be 150 kips, which is 60 percent of the design rated load.

NRC REQUIREMENTS

- The estimated total duty cycle of the crane (i.e., hours/year the crane is expected to be under load).

- The accleration forces or recurrence interval associated with the seismic event during which the crane has been evaluated to be capable of carrying the MCL.

TVA RESPONSE

Seismic responses were calculated by use of the response spectrum method of analysis. Acceleration response spectra at the eleva- of the runway were taken from the seismic analysis of the reactor building and used as input to the mathematical model. A damping value of one percent of critical damping was used in the response analysis for both the operating base earthquake and design base earthquake events.

The seismic loads were combined on an absolute basis with other loads in the appropriate loading combinations. Seismic loads from only one horizontal direction at a time were considered to occur simultaneously with the vertical direction.

Reanalyses of the crane and suporting structure were performed for 16 load cases in the vertical direction (four positions of crane on the supporting structure, two positions of trolley, and loaded and unloaded) and 8 cases in longitudinal (horizontal) (four positions on supporting structure and two positions of trolley).

The analyses were performed for a hook load of 105 tons which is 84 percent of design load. Damping values, load combinations and stress allowables are the same as original analyses. The results of the reanalysis revealed the crane is capable of maintaining the 105-ton hook load.

TVA BROWNS FERRY

UNIT(S) 1, 2, and 3

PREOPERATIONAL TEST NO. TVA- 22

TITLE: Reactor Building Crane

REVISION: 0

PREPARED BY: L. J. Johnson and L. E. Clark

SUBMITTED BY: R. T. Bathcote — April 26, 1971 Date

Date

TEST PROCEDURE APPROVALS:

W P Kelleghan
TVA Construction Project Manager — 9/10/71 Date

SITE AUTHORIZATION TO PERFORM TEST:

W P Kelleghan
TVA Construction Project Manager — 10/4/71 Date

H J Green
TVA Plant Superintendent — 10/5/71 Date

CERTIFICATION OF TEST COMPLETION AND RESULTS

This test has been conducted in accordance with this procedure, and the system and equipment have met the requirements contained herein. Exceptions, if any, are listed in Appendix B.

Preop Test Engineer, TVA — Dann Given Jr. — Date 2-22-72

Construction Project Manager, TVA — W P Kelleghan — Date 2-22-72

Plant Superintendent, TVA — H J Green — Date 5/20/72

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[redacted]

PREOPERATIONAL TEST NO. [redacted]

REACTOR BUILDING CRANE

TABLE OF CONTENTS

[redacted]

See change sheet 4 → 1.0 PURPOSE

This test is designed to verify that the 125-ton Reactor Building crane will operate in good mechanical and electrical condition and that it handles its rated capacity.

This preop test will be scheduled concurrently with the acceptance test and the data necessary for acceptance on the 125-ton crane will also satisfy requirements of the preop test. Only the full load portion of the acceptance test is applicable to this preop.

In addition to the acceptance requirements, an inspection of mechanical and electrical equipment will be made.

2.0 REFERENCES

(See Appendix A)

3.0 PREREQUISITES

3.1 Construction testing complete and permanent power available.

Verified Linda H Clark Date 6/23/71

* 3.2 The crane emergency stop stations along north wall should be checked for proper operation. See Appendix B.

Verified Gerald E Young Date 8/30/72

* See exception sheet #4

4.0 PRECAUTIONS

4.1 All tests will be made in an area away from the reactor pressure vessel and the fuel storage pool.

4.2 During the pendant control test, an operator should be in the crane cab.

4.3 Test area roped off and warning signs posted.

5.0 SPECIAL EQUIPMENT

5.1 Stopwatch

5.2 50' tape

5.3 Optical level

5.4 4 ft. steel scale

5.5 Voltmeter

5.6 Clamp on AC and DC ammeter

5.7 Bridge stops and limit switch tabs

5.8 Test weights

6.0 TEST PROCEDURE

6.1 Preoperational Inspection

6.1.1 Mechanical

Mechanical features to be inspected and tested for proper function shall include wire ropes, rope anchors, main hoist lower block and upper sheave nest, main hoist equalizing cylinder system, gear reducers, couplings, hold down bolts and shear bars for bearing, and tie down cables for trolley and bridge.

Verified Ronald E. Young Date 9/4/71

Test Change 6.1.8
No. 1 →

Electrical systems inspected and tested for proper function shall include limit switches, emergency power breaking, all motor brakes, primary control fuses and, accessory control from pendant of all motions except the main hoist, and lights.

Verified Linda H Clark Date 9/14/71

6.2 Preoperational Test

Perform acceptance test as described in acceptance test procedure attached to this document as appendix C.

7.0 CERTIFICATION

This certifies that the Reactor Building crane has been tested in accordance with this procedure and satisfactorily performed its designed functions during all modes of testing.

Verified Gerald E Young Date 9/14/71
Linda H Clark 9/14/71

8.0 RETURN SYSTEM TO NORMAL CONDITIONS

After the preoperational test is completed, the crane should be returned to normal conditions; either to normal operation or shutdown. If crane is shut down, pendant hoist should be raised to stored position. lights turned off, and main power switch turned off.

9.0 DATA SHEETS

The data required for this test will be recorded on data sheets included in acceptance test procedure (appendix C).

BROWNS FERRY NUCLEAR PLANT

PREOPERATIONAL TEST NO. TVA-21

REACTOR BUILDING CRANE

AS-CONSTRUCTED DRAWING LIST

GE Drawing	36D-874821	Operating Notes, Sheet 1
	"	One Line Dwg., Sheet 1
	"	Main & Aux. Hoist Control, Sheet 2
	"	Main & Aux. Regulator, Sheet 3
	"	Bridge Control, Sheet 4
	"	Trolley Control, Sheet 5
	"	Interconnection, Sheet 6
	"	Main & Aux. Hoist Connection, Sheet 7
	"	Bridge Connection, Sheet 8
	"	Trolley Connection, Sheet 9
	"	Main & Aux. Hoist Reg. Connection, Sheet 10
	"	Bridge Reg. Connection, Sheet 11
	"	Trolley Reg. Connection, Sheet 12

ATTACHMENT A

REACTOR BUILDING CRANE REFERENCES

A. TVA Specification 9963

B. TVA Test Procedure for Acceptance Tests for 125-ton Reactor Building Crane

C. Contractor Instruction and Maintenance Manual

D. TVA Contract 69C37-64542

E. TVA Drawing 44E220 - Reactor Building 125-Ton Crane

F. TVA Drawing 44E221 - Reactor Building 125-Ton Crane

G. TVA Drawing 44E222 - Reactor Building 125-Ton Crane

[redacted]

[redacted] NUCLEAR POWER PLANT

UNIT 2-3

TEST PROCEDURE FOR ACCEPTANCE TESTS

FOR

125-TON REACTOR BUILDING CRANE

Submitted I. S. Doughtie
Supervisor, Heavy Equipment

Reviewed J. B. Cook
Principal Mechanical Engineer
(Heavy Equipment)

Approved S. Kaler
Head Mechanical Engineer
(Heavy Equipment)

All tests are to be made in an area away from the reactor pressure vessel and the fuel storage pool. Before beginning any tests, the emergency power disconnects along the north wall should be checked for operation. An operator is to be in the crane cab when the crane is being tested from the pendant control station.

NO LOAD - PENDANT CONTROL

With no load on the hooks, test operation of the following functions.

1. Bridge travel - Each direction
2. Trolley travel - Each direction
3. Auxiliary hoist - Raise and lower
4. Pendant hoist - Raise and lower
5. Crane bridge lights
6. Main supply switch

NO LOAD - CAB CONTROL

With no load on the hooks and the pendant control in its storage position, test operation of the following functions.

1. Main hoist - Raise and lower
2. Auxiliary hoist - Raise and lower
3. Bridge travel - Each direction
4. Trolley travel - Each direction
5. Crane bridge lights
6. Pendant hoist - Lower and raise

[illegible]

Operate each travel drive and cross travel drive individually for 30 minutes. During and immediately after the operating period for each motor, check all parts subject to heating to detect any excessive heating. All overheating conditions found during the checks should be corrected before beginning the loaded tests. During the operating periods, check all movements for smooth acceleration, deceleration, and braking. Check each hook for its minimum high hook position and total hook travel as shown on TVA drawing 44N220RO. Check the main hoist equalizing cylinder during maximum travel of main hook to see that the piston does not bottom-out.

Operate trolley for total length of bridge and check hook approach at extreme travel at each end. The minimum hook coverage should be as shown on TVA drawing 44N220RO. During this operation, check trolley for skewing by measuring each side of the trolley from a fixed point before and after traversing the bridge. Stop the trolley at the north end of the bridge and check the emergency tiedown device on both sides of the trolley. Check the trolley travel limit switch on each side of the trolley for operation at maximum travel at each end of bridge.

Operate bridge over the available length of the reactor building and check hook approaches at extreme travel. The minimum hook coverage should be as shown on TVA drawing 44N220RO. During this operation, check bridge for skewing by measuring each end of the bridge from a fixed point before and after the crane travels the maximum distance in both directions. Stop the crane at the west end of the reactor building and check the

emergency tiedown device on either end of the bridge. Check the bridge travel limit switch on each end of the bridge for operation at maximum bridge travel.

Test each hoist for empty hook speed for both raising and lowering. The contract specifications require that the maximum empty hook hoisting and lowering speed of each hoist be not less than 3 times its full-load hoisting speed.

Check the bridge and trolley for travel speed. Determine the lowest and highest speed for each motion.

Check operation of lights in cab and under crane girder walkways.

Check operation of electrically operated horn. This horn is to sound whenever the bridge travel circuit is energized or when the horn button on the pendant control or in the cab is actuated.

WITH LOAD

Hoists

Each hoist brake is to be set for 150 percent of the rated full-load torque of the connecting motor, and the secondary brake for each hoist is to be timed to set only after the hoist motor has stopped. The suggested initial setting for the timer for each hoist secondary brake is 1-1/2 seconds. The final setting for the timer is to be determined by operation. After testing each hoist at rated capacity, the first electric holding

brake is to be released so that it cannot hold, and each hoist is to be stopped using only the secondary brake while operating at rated capacity.

Each main and auxiliary hoist is to be tested with loads of 85, 100, and 125 percent rated capacity. For the main hoists, these loads are 93.75, 125, and 156.25 tons respectively. For the auxiliary hoists, these loads are 1.25, 5, and 6.25 tons respectively. Each hoist is to be tested for the following with the three listed loads (except as noted).

1. Maximum speed, hoisting and lowering.
2. Minimum vertical movement when starting from rest, hoisting.
3. Minimum vertical movement when starting from rest, lowering.
4. Smooth acceleration and deceleration.
5. Speed control when lowering at intermediate speeds.
6. Float of load for 75 seconds (for rated load only).

Also, all elements of both hoists are to be checked for excessive heating after raising and lowering the rated load two times in succession from the operating floor to high hook position.

Section 61 of the contract specifications requires that the vertical movement of each hoist be controllable within 1/16 inch when starting from rest for lowering or hoisting.

During the hoist tests the motor and generator current readings for each MG set are to be recorded.

Bridge and Trolley Travel

Each trolley travel brake is to be set at 75 percent of the rated full-load torque of the drive motor, and the secondary brake is to be timed to set only after the motor has stopped. The suggested initial setting for the timer for the secondary brake is 1-1/2 seconds. After testing the crane with main hook rated capacity, the first trolley drive brake is to be blocked so that it cannot set and the trolley drive motor is to be stopped using only the secondary brake while operating with main hook rated capacity.

The brake for the bridge drive motor, located on the west girder, is to be set at 50 percent of the rated full-load torque of its drive motor. The brake for the other bridge drive motor is to be set at 100 percent of the rated full-load torque of its drive motor, and this brake is to be timed to set only after the crane has stopped . The suggested initial setting for this timer is 3 seconds. After testing the crane with main hook rated capacity, the brake on the west side drive is to be blocked so that it cannot set and the bridge is to be stopped using only the secondary brake while operating with main hook rated capacity.

Each travel motion is to be tested with the main hook loaded with the three listed loads for smooth acceleration and braking, for the maximum speed in both directions, and for minimum movement when starting from rest. Section 61 of the contract specifications requires that each travel motion be controllable within 1/4 inch when starting from rest.

[redacted]

During each travel test, [redacted] are to be recorded for the trolley drive motor and each bridge drive motor.

Check bridge and trolley for skew by measuring each end of bridge and trolley from a fixed point before and after the loaded tests.

Check deflection of bridge girders at the mid-point with rated load on main hook and with trolley at quarter-point and mid-point.

Data Sheet 9.1

1.0 PENDANT CONTROL

1.1 Initial Conditions

1.1.1 No load on hooks

1.1.2 Operator in cab

Verified Ronald E. Young Date 9/14/71

1.2 Verify that the following features operate satisfactorily from the pendant control

Feature	Operates Properly	Checked By:	Remarks
Bridge Travel (Each direction)	Yes		
Trolley Travel (Each direction)	Yes		
Auxiliary Hoist (Raise and lower)	Yes		
* Pendant Hoist (Raise and lower)	Motor does not work on lower		Electricians to check 3-phase wiring
Crane Bridge Lights	Yes		
Main Supply Switch	Yes		
Horn	Yes		

Verified Ronald E. Young Date 9/14/71

1.3 Verify that cab controls are inoperative when the pendant control is lowered from its storage position.

Verified Ronald E. Young Date 9/14/71

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* see exception sheet #2

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Data Sheet 9.2

2.0 CAB CONTROL

2.1 Initial Conditions

2.1.1 No load on hooks

2.1.2 Pendant control in stored position

2.2 Verify that the following features operate satisfactorily and show no evidence of excessive heating during operation from the cab.

Feature	Checked By:	Operates Properly	Remarks
Trolley Travel	RCY	✓	None
Bridge Travel	"	✓	"
Main Hoist Travel	"	✓	"
Auxiliary Hoist Travel	"	✓	"

2.3 Trolley Operation

2.3.1 Trolley operates smoothly during acceleration, deceleration, and braking.

Verified Ronald E. Young Date 6/8/71

2.3.2 Minimum hook coverage.

Hoist	NORTH END Distance from centerline of bridge rail to centerline of hook.	SOUTH END Distance from centerline of bridge rail to centerline of hook.
Main	7'-6"	6'-6"
Auxiliary	3'-3"	11'-0"

Verified Ronald E. Youngate 6-8-71

2.3.3 Check trolley for shoving

	East Side	West Side	Difference (West-East)
Prior to Run	12'	12'-1/2"	1/2"
After Run	12'	12'-3/4"	3/4"

1/4" Amount of Shove

Verified Ronald E. Young Date 6/8/71

2.3.4 Trolley emergency tie-down devices are present and operable.

Verified Ronald E. Young Date 6/8/71

2.3.5 Trolley limit switches operate properly.

Verified Ronald E Young Date 6/8/71

2.3.6 Trolley speed (design 10 to 15 fpm)

Distance 10 ft. Time 1 min. Rate 10 fpm

Verified Ronald E Young Date 6/8/71

2.4 Bridge Operation

2.4.1 Bridge operates smoothly during acceleration, deceleration, and braking.

Verified Ronald E Young Date 6/8/71

2.4.2 Minimum hook coverage

WEST END		EAST END	
Distance from R 1-1/4 Line		Distance from R 6-3/4 Line	
Design	Actual	Design	Actual
16'9"	16'9"	15'0"	15'0"

crane travel with maximum load.

Verified Ronald E. Young Date 6/8/71

2.4.3 Check bridge for sheving

	North End	South End	Difference (North-South)
Prior to Run	6'-0"	6'-2-1/2"	2-1/2
After Run	6'-0"	6'-3-1/2"	3-1/2

1" Amount of Skew

Verified Ronald E. Young Date 6/8/71

2.4.4 Bridge emergency tie-down devices are present and operable.

Verified Ronald E. Young Date 6/8/71

2.4.5 Bridge limit switches operate properly.

Verified Ronald E. Young Date 6/8/71

2.4.6 Bridge travel speed (design 50 to 60 fpm).

Distance 10 ft. Time 10 sec. Rate 60 fpm

2.5 Hoist Operation

2.5.1 Hoist Speeds

2.5.1.1 Main hoist (design 15 to 18 fpm)

Hoisting Distance 5'-6" Time min. Speed 5'-6" fpm

Lowering Distance 6'-0" Time min. Speed 6 fpm

Verified Ronald E. Young Date 6/8/71

2.5.1.2 Auxiliary hoist (design 60 to 75 fpm)

Hoisting Distance 22 ft. Time min. Speed 22 fpm

Lowering Distance 22 ft. Time min. Speed 22 fpm

Verified Ronald E. Young Date 6/8/71

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2.5.2 High Hook Position

2.5.2.1 Main hoist (distance above 565' elev.) ____ (design 30')

2.5.2.2 Auxiliary hoist (distance above 565' elev.) 30' (design 30')

2.5.2.3 Upper hoist limit switches set and operate properly.

Hoist	Rotary	Counterweight
Main	✓	✓
Auxiliary	✓	✓

Verified Ronald E. Young Date 6/8/71

2.5.3 Total Hook Travel

2.5.3.1 Main hoist: extreme lower elevation 565'0 (design 565')

2.5.3.2 Auxiliary hoist: extreme lower elevation 565'0 (design 565')

2.5.3.3 Lower hoist limit switches set and operate properly.

Verified Ronald E. Young Date 6/8/71

2.5.4 Lower main hook to its lowest point and insure cabling is free from interference and/or rubbing at each access hatch opening and hoist drum area.

Verified Ronald E. Young Date 6/8/71

Data Sheet 9.3

LOAD TESTS

3.0 BRAKE TEST (125 ton rated load used)

3.1 Hoist brakes operate satisfactorily.

Hoist	Brakes Holding	Brakes Secondary
Main	✓	✓
Auxiliary	✓	✓

Verified Ronald E. Young 6/8/71

3.2 Bridge and trolley brakes operate satisfactorily.

	Drive Brake	Secondary Brake
Bridge	✓	✓
Trolley	✓	✓

Verified Ronald E Young Date 6/8/71

3.3 Hoist Test

3.3.1 Main hoist

3.3.1.1 Hoisting speed - design 5 to 6 fpm

Distance 6 ft. Time ___ min. Speed 6 fpm

3.3.1.2 Lowering speed - design 5 to 6 fpm

Distance 8 ft. Time ___ min. Speed 8 fpm

3.3.1.3 Minimum vertical movement

(design 1 16") Up 1/16" Down 1/16"

3.3.1.4 Float load (design 75 sec min.) 2 sec.

Remarks: None

3.3.1.5 [illegible]

3.3.1.6 Current readings: Motor [illegible] Generator [illegible]

Verified Luther H. Clark Date 6/25/71

* 3.3.2 Auxiliary hoist

3.3.2.1 Hoisting speed - design 20 to 25 fpm

Distance 18 ft. Time ___ min. Speed 18 fpm

3.3.2.2 Lowering speed - design 20 to 25 fpm

Distance 30 ft. Time ___ min. Speed 30 fpm

3.3.2.3 Minimum vertical movement

(design 1/16") Up 1/16" Down 1/16"

3.3.2.4 Float load: Time 90 sec. (75 sec min.)

Remarks: None

3.3.2.5 Auxiliary hoist accelerated and decelerated smoothly.

3.3.2.6 Current readings: Motor 39 amps (max. load) Generator 48 amps

Verified Luther H. Clark Date 6/25/71

4.0 BRIDGE AND TROLLEY

4.1 Travel Speed

	Distance	Time	Speed Actual	Speed Design
Bridge	60	min	60 fpm	60 fpm
Trolley	50	min	50 fpm	50 fpm

Verified Ronald E. Young Date 6/8/71

4.2 Minimum movement (starting from rest, design 1/4").

Bridge 1/4 in.

Trolley 1/4 in.

* see exception sheet #4

4.3 Skewing

4.3.1 Bridge

	North End	South End	Difference (North-South)
Prior to Run	6'-0"	6'-1/2"	1/2"
After Run	6'-0"	6'-1-1/2"	1-1/2"

1" Amount of Skew

Verified Ronald E. Young Date 6-8-71

4.3.2 Trolley

	East Side	West Side	Difference (East-West)
Prior to Run	6'-0"	6'-1/2"	1/2"
After Run	6'-0"	6'-3/4"	3/4"

1/4 Amount of Skew

Verified Ronald E. Young Date 6/8/71

4.4 Current Readings

4.4.1 Trolley drive motor 2 amps - max load

4.4.2 Bridge drive motor Right 2 amps, left 10 amps max load

Verified Luke W. Clark Date 6/25/71

5.0 BRIDGE DEFLECTION

5.1 No Load Readings

5.1.1 End of girder .086"

5.1.2 quarter point .24"

5.1.3 Mid-point .673"

Mid [illegible]	.065	.849	[illegible]
Quarter[illegible]-point	.085	.380	[illegible]

Maximum deflection at mid-point: .729" with 156.25 knots
Design .729"

Maximum deflection at quarter point .456" with 156.25 knots Design N/A

Verified Ronald E. Yeager 6/8/71

PREOPERATIONAL TEST NO. TVA-214

[redacted]

SUBMITTED BY: M.N. Sawyer 1-9-75
Date

TEST PROCEDURE APPROVALS:

R.J. Hubbard 1/13/75
TVA Construction Project Manager Date

SITE AUTHORIZATION TO PERFORM TEST:

W.J. Green 2-31-75
TVA Plant Superintendent Date

R.J. Hubbard 2/3/75
TVA Construction Project Manager Date

CERTIFICATION OF TEST COMPLETION AND RESULTS

This test has been conducted in accordance with the procedure, and the systems and equipment have met the requirements contained herein. Exceptions, if any, are listed in the appendix sheet.

Preop Test Engineer, TVA — Frank E. Young Date 4/18/75

Construction Project Manager, TVA — R.J. Hubbard Date 4/30/75

Plant Superintendent, TVA — O.J. Zeringue Date 4/30/75

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1.0 [redacted]

This test is designed to verify that the additional safety features for the [redacted] overhead traveling crane for the reactor building, [redacted] and that the crane is in good mechanical and electrical condition.

2.0 REFERENCES

(See Appendix A)

3.0 PREREQUISITES

3.1 Electric power must be available to operate crane equipment.

Verified By D. N. Jent Date 4/10/75

3.2 Modifications to crane in accordance with contract 72C33-75467 shall be complete in its entirety before the preoperational safety test is performed.

Verified By D. N. Jent Date 4/10/75

3.3 Visual inspection is to be performed prior to the operational tests.

3.3.1 The inspection should include inspection of the main hoist equalizing cylinders, backup brake, lower block and upper sheave nest, and the auxiliary hoist backup brake to see that holddown bolts, shear keys, dowel pins, keeper plates, and similar parts are in place and are not loose or damaged.

Verified By Jimmy Robinson Date 4/10/75

3.3.2 Inspect for damage

a. Main and auxiliary hoist backup brakes.

b. Main hoist ropes.

c. Main hoist blocks.

d. Equalizer system.

e. Main hoist drum and reeving.

f. All bolted parts and connections of modifications.

g. Drum dropdown plates.

Verified By Jimmy Robinson Date 4/10/75

corrections.

4.2 All personnel should remain clear of the crane during tests, and the tests should be conducted in an area that will cause the least interference with other plant operations.

4.2 After adjustments and tests have been made, all guards must be replaced and all safety devices reactivated before the crane is operated.

5.0 SPECIAL TEST EQUIPMENT

5.1 Test instruments required for this test will be standard equipment from project supply room.

5.2 Accuracy of stock instruments will be adequate.

6.0 TEST PROCEDURE

6.1 All functions of the crane modifications related to safe operation will be tested or checked.

6.2 Verify the following:

6.2.1 Verify the ability of each hoist backup brake to independently stop a rated load from full lowering speed within a distance of 6 inches. The emergency dynamic braking is to be disabled for this test. NOTE: The regenerative braking is still operable in this test.

Verified By Frank E. Denny Date 4/17/75

6.2.2 Verify the ability of the mechanical overspeed switch to cut the hoist power and set hoist brakes if speed reaches 125 percent of rated speed in either direction. NOTE: See GE instructions 36A348166AB, item 2.

Verified By Frank E. Denny Date 4/16/75

Verify that max. hoist pot P1 is returned to normal setting and speed is correct.

Verified By Frank E. Denny Date 4/16/75

6.2.3 Verify the ability of the phase reversal relay to prevent the manual magnatic disconnect switch from being energized when the 480 volt AC supply line phase is reversed.

Verified By Frank E. Denny Date 4/18/75

6.2.4 Verify the functioning of the drive stop or reverse command backup circuits for each drive. NOTE: See GE instruction 36A348166AB, item 3.

Verified By Frank E. Denny Date 4/18/75

5 seconds thereafter

Verified By Frank E. Denny 4/18/75

6.2.6 Verify the trip setting and functioning of the [illegible] relays. REF: See GE Instruction [illegible]

Verified By Frank E. Denny Date 4/18/75

6.3 Measurements shall be taken to verify:

a. Hoist backup brakes adjusted to their design settings. Each backup brake adjusted to the percentage of its drive motor rated full load torque as follows:

(1) Main hoist backup brake set at 150 percent or 490 ft/lbs.

Verified By Frank E. Denny Date 4/18/75

(2) Auxiliary hoist backup brake set at 150 percent or 70 ft/lbs.

Verified By Frank E. Denny Date 4/18/75

7.0 RETURN SYSTEM TO NORMAL

After the preoperational test is completed, the crane should be returned to normal conditions; either to normal operation or shutdown. If crane is shutdown, pendant hoist should be raised to stored position, lights turned off, and main power switch turned off.

8.0 ACCEPTANCE CRITERIA

This verifies that the 125-ton reactor building crane has been tested in accordance with this procedure and satisfactorily performed its designed functions during all modes of testing.

Verified By Frank E. Denny Date 4/18/75

9.0 DATA SHEETS

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1.1 Main backup brake (Main) (125 ton rated load used)

Lowering speed - design 60 to 70 fpm

Distance ½ inches to stop from full speed

1.2 Hoist backup brake (Main) (125 ton rated load used)

Lowering speed - design 5 to 6 fpm

Distance ½ inches to stop from full speed

1.3 Hoist backup brake (Auxiliary) (5 ton rated load used)

Lowering speed - design 60 to 70 fpm

Distance ½ inches to stop from full speed

TVA Drawings

Reactor Building, 125-Ton Crane, Hoist Modifications, SH-1	44N224-1
Reactor Building, 125-Ton Crane, Hoist Modifications, SH-2	44N224-2

TVA Contracts and Specifications

TVA Contract Numbers	69C37-64542 and 72C33-75467
TVA Specification Numbers	9563 and 33-75467

TVA Test Procedures

Acceptance Test Procedures for the Additional Safety Features for the 125-Ton Reactor Building Crane.

Contractor and Subcontractor Information

Instructions and Maintenance Manual TVA Contract 69C37-64542.

Contractor Instruction TVA Contract 72C33-75467.

General Electric Field Testing Instruction GE Drawing 36A348166AB.

[redacted]

None Required

[redacted]

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[redacted]

Not Required

*Verification by the file custodian that the instrument calibration record is on file.

Certification by the test engineer that the file custodian verified that instrument calibration records are on file.

Certified By_____ Date_____

PRECOMPLETIONAL TEST NO. TVA-21A, UNIT 1

REACTOR BUILDING CRANE

EXCEPTIONS

This system fulfills all requirements as indicated in the preliminary test procedure, and each variance to the procedure as approved [illegible] for exception has been accounted for either with an approved change or has been listed on this exception sheet.

Frank E. Denny
Test Engineer

NONE

DISPOSITION OF EXCEPTIONS

_____ Project Manager, DEC

_____ Plant Superintendent, DPP

PREOPERATIONAL TEST NO. TVA-21A, [illegible]

SPECIAL TEST EQUIPMENT LIST

EQUIPMENT TO BE CALIBRATED	INSTRUMENT NUMBER	CALIBRATION VERIFIED * VERIFIED BY/DATE	CERTIFIED BY/DATE
Stopwatch	IS-TVA 320441	Frank E. Denny 4-15-75	Frank E. Denny 4-15-75

*Verification by the file custodian that the instrument calibration record is on file per BP-57.

**Certification by the test engineer that the file custodian verified that the instrument calibration record is on file.

PREOPERATIONAL TEST NO. TVA-27A, UNIT 3

REACTOR BUILDING CRANE

SPECIAL MAINTENANCE INSTRUCTIONS

1. GE-36A346164GB - Attached.

1. INSTANTANEOUS OVERCURRENT RELAYS.

THE TRIP SETTING OF THE INSTANTANEOUS OVERCURRENT RELAYS MAY BE CHECKED OR ADJUSTED WITH THE FOLLOWING PROCEDURE.

1.1 DISCONNECT THE BRAKE COIL.

1.2 DISCONNECT THE MOTOR SHUNT FIELD.

1.3 SHORT OUT THE CONTACT OF THE FIELD LOSS RELAY.

1.4 HOIST-DISCONNECT THE REGULATOR FLOAT RELAY COIL FRX (RX228).
BRIDGE-DISCONNECT THE REGULATOR CREEP SPEED RELAY COIL CS (RX227).
TROLLEY-DISCONNECT THE REGULATOR CREEP SPEED RELAY COIL CS (RX227).

1.5 ADJUST THE INSTANTANEOUS OVERCURRENT RELAY SPRING UNTIL THE POINTER ON THE UPPER LEFT HAND SIDE IS AT THE 100% POSITION.

1.6 MOVE THE MASTER SWITCH SLOWLY IN ONE OPERATING DIRECTION AND OBSERVE ARMATURE AMPERE AT PICK-UP OF THE RELAY. (NOTE: EXTERNAL TEST INSTRUMENTS MUST BE ADDED TO THE CIRCUIT TO MEASURE CURRENT). DO NOT PERMIT STALLED CURRENT TO FLOW IN THE MOTOR FOR MORE THAN 15 SECONDS WITHOUT RETURNING THE MASTER SWITCH TO OFF.

1.7 USING THE PICK-UP CURRENT OBTAINED ABOVE, CALCULATE THE POSITION OF THE POINTER ON THE OVERCURRENT RELAY TO PROVIDE THE PICK UP INDICATED ON THE ELEMENTARY DIAGRAMS. FOR EXAMPLE ON THE MAIN HOIST, ASSUME THAT THE RELAY PICKS UP AT 170 AMPS WITH THE SPRING ADJUSTED AT 100%. THE REQUIRED PICK UP IS 425 AMPS. WHICH IS 250% OF 170 AMPS. ADJUST THE SPRING UNTIL THE POINTER ON THE SIDE OF THE RELAY IS AT 250%.

1.8 RECONNECT THE HOIST REGULATOR FLOAT RELAY COIL AND THE BRIDGE AND TROLLEY REGULATOR CREEP SPEED RELAY COILS.

1.9 REMOVE THE JUMPER ACROSS THE FIELD LOSS RELAY CONTACT AND RECONNECT THE SHUNT FIELD AND BRAKE COIL LEADS.

2. HOIST OVERSPEED SWITCH

2.1 THE OVERSPEED TRIP SHOULD BE CHECKED WITH A TACHOMETER OR WITH AN OSCILLOSCOPE.

2.2 MOVE THE MASTER SWITCH TO THE MAXIMUM HOIST POSITION. WHILE OBSERVING SPEED TACHOMETER, TURN POT #1 CLOCKWISE TO INCREASE VOLTAGE TO SPEED REGULATOR TO A MOTOR SPEED OF 2150 R.P.M.

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3. OPERATIONAL CHECK RELAYS

3.1 THE OPERATIONAL CHECK TIME DELAY RELAY SHOULD BE ADJUSTED TO TIME OUT APPROX. 1/2 SECOND LONGER THAN THE NORMAL STOPPING TIME.

3.2 OPERATE EACH DRIVE AT TOP SPEED NO LOAD. RETURN THE MASTER SWITCH QUICKLY TO THE "OFF" POSITION, AND OBSERVE THE TIME REQUIRED FOR THE DRIVE TO DECELERATE AND SET THE MECHANICAL BRAKE. (NOTE A SPEED RECORDER CONNECTED TO ARMATURE VOLTAGE IS A CONVENIENT METHOD OF MEASURING DECELERATION TIME.) TWO OR THREE STOPS SHOULD BE CHECKED TO INSURE OBTAINING A REPRESENTATIVE TIME.
1.6 sec. 2.5 sec. 2 sec.

3.3 MANUALLY PICK UP THE TIME DELAY RELAYS AND ADJUST THE HOIST, BRIDGE AND TROLLEY RELAYS (H-TD, B-TD & T-TD) TO OBTAIN A DROP OUT WHICH 1/2 TO 1 SECOND LONGER THAN THE RESPECTIVE DECELERATION TIMES.
2.1 sec 3.2 sec 3.2 sec for timers