August 9, 1995

Mr. Oliver D. Kingsley, Jr.
President, TVA Nuclear and
Chief Nuclear Officer
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: WATTS BAR UNIT 1 - CONDITION OF STRUCTURE AND CIVIL ENGINEERING FEATURES, TRIP REPORT (TAC M92765)

Dear Mr. Kingsley:

As indicated in a letter to you dated July 10, 1995, the staff conducted a site review of the condition of structures and civil engineering features at Watts Bar Unit 1 in July 18-19, 1995. The staff performed visual inspection to gain additional confidence that there is no age-related degradation evident. To achieve this objective, the staff performed an assessment of the existing condition and past performance of structures and civil engineering features, including buildings, tanks, cable tray and conduit supports, anchorages, buried piping, and the water intake structure.

The staff concluded that the structures and civil engineering features are in very good condition, and no age-related degradation was evident. There was no evidence of any soil settlement or local areas of unusual soil condition of subsidence or heaving. Details are set forth in the enclosed trip report.

This review was performed by Messrs. G. Bagchi, S. B. Kim and R. W. Wright. This completes our effort.

Sincerely,

Original signed by

Peter S. Tam, Senior Project Manager
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

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PDR ADOCK 05000390
Q PDR

Docket No. 50-390

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Mr. Oliver D. Kingsley, Jr.
Tennessee Valley Authority

cc:
Mr. O. J. Zeringue, Sr. Vice President
Nuclear Operations
Tennessee Valley Authority
3B Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Dr. Mark O. Medford, Vice President
Engineering & Technical Services
Tennessee Valley Authority
3B Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. D. E. Nunn, Vice President
New Plant Completion
Tennessee Valley Authority
3B Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. J. A. Scalice, Site Vice President
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

General Counsel
Tennessee Valley Authority
ET 11H
400 West Summit Hill Drive
Knoxville, TN 37902

Mr. P. P. Carier, Manager
Corporate Licensing
Tennessee Valley Authority
4G Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. B. S. Schofield
Site Licensing Manager
Watts Bar Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Spring City, TN 37381

TVA Representative
Tennessee Valley Authority
11921 Rockville Pike
Suite 402
Rockville, MD 20852

WATTS BAR NUCLEAR PLANT

Regional Administrator
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW., Suite 2900
Atlanta, GA 30323

Senior Resident Inspector
Watts Bar Nuclear Plant
U.S. Nuclear Regulatory Commission
1260 Nuclear Plant Road
Spring City, TN 37381

The Honorable Robert Aikman
County Executive
Rhea County Courthouse
Dayton, TN 37321

The Honorable Garland Lanksford
County Executive
Meigs County Courthouse
Decatur, TN 37322

Mr. Michael H. Mobley, Director
Division of Radiological Health
3rd Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

Ms. Danielle Droitsch
Energy Project
The Foundation for
Global Sustainability
P.O. Box 1101
Knoxville, TN 37901

Ms. Ann Harris
305 Pickel Road
Ten Mile, TN 37880

Ms. Beth Zilbert, Energy Campaigner
Greenpeace
20 13th Street, NE.
Atlanta, GA 30309

Mr. James P. Riccio
Public Citizen
4340 Georgetown Square, #612
Atlanta, GA 30338

WATTS BAR NUCLEAR POWER STATION UNIT 1

CONDITION OF SAFETY-RELATED STRUCTURES AND CIVIL ENGINEERING FEATURES

TRIP REPORT

Background

As stated in a letter, P. S. Tam (NRC) to O. D. Kingsley (TVA), July 10, 1995, the staff visited Watts Bar Unit 1 during July 18-19, 1995. The objective of the visit was to review the condition of plant structures and civil engineering features at the unit through visual inspection, and to gain additional confidence that there is no aging-related degradation evident. To achieve this objective, an assessment of the existing condition and past performance of structures and civil engineering features at Watts Bar was performed. Also, included in the review were the foundation settlement monitoring data and the structural integrity test reports. Any failures, degradations, maintenance, surveillance, modifications/repairs of safety-related structures were of interest. Structures and civil engineering features reviewed include buildings, tanks, cable tray and conduit supports, anchorages, buried piping, and the water intake structure.

It should be noted that for the past fifteen years since the completion of the civil structure construction, there have been numerous staff inspections and audits in the structural area. As a result, TVA has carried out several corrective action programs for the design and construction of seismic Category I structures, cable trays, HVAC and conduits.

Plant Visit Summary

This section of the trip report describes the various walkdown and review activities conducted during the visit and presents the results and major observations noted. A list of the structures and areas inspected is provided in Appendix 1.

July 18, 1995

NRC - TVA Meeting

At 7:00 a.m., the NRC audit team met with the TVA staff in the Watts Bar resident inspector's conference room. Participants are listed in Appendix 2.

After Mr. Bagchi gave a brief introduction, TVA staff made a formal presentation. A copy of the view graphs used in the TVA presentation is enclosed as Appendix 3. Among the major topics covered were a general overview of Category I structures, seismic design basis, soil liquefaction and safety-related slopes, foundation/structural settlement, concrete and steel buildings, containment corrosion, buried piping, the refueling water storage tank, cable tray/conduit supports and TVA's structural integrity test (SIT).

The TVA staff highlighted the following significant points:

(1) TVA observed a horizontal crack at the top of the waste packaging building wall. This is attributed to thermal expansion of the building roof which is subjected to daily fluctuation of temperature. TVA is repairing the wall (activity WBPER 950306)

(2) Building foundations and areas of engineered backfill have settled within allowables and expected values. The structures have good foundations.

(3) TVA observed water seepage at the turbine building, the auxiliary building and the control building. TVA is performing necessary repairs.

(4) TVA performed a conduit and cable tray walkdown, and stated that discrepancies were found and they are mainly of minor nature, such as missing paint and screws for the supports. These discrepancies remain to be corrected.

TVA provided documents which discuss settlement measurements and the SIT for NRC review. The audit of the documents was performed following the plant walkdown.

Plant Walkdown:

The plant walkdown commenced at 9:00 a.m. Several TVA personnel accompanied the team including Richard Cutsinger (Chief Civil Engineer), James Adair (Site Lead Civil Engineer), Tom Dean (TVA licensing), Tony Harrison (TVA project manager) and Craig Faulkner (TVA technical support). The walkdown team remained together throughout the plant walkdown activities. TVA personnel guided the NRC staff through the plant and answered questions as they arose. Any question that could not be answered immediately were recorded for followup by the plant staff.

The walkdown began with the intake structure situated in the southern part of the plant complex facing the Tennessee River. A channel connects the river to the intake structure (Photograph 1, Appendix 4). The intake structure is a Category I, reinforced concrete structure. The north exterior wall of the building exhibited some degree of what appears to be temperature and shrinkage related cracks. The size and length of the cracks are small enough so as not to be of any concern. The walls and floors of the interior of the structure did not exhibit any cracks or unusual signs of deterioration except for some discoloration of the concrete wall near elevation 741. The discoloration did not appear to be significant from a structural integrity point of view. The structure is generally in excellent condition.

The team then moved to the turbine building, which is not a seismic Category I building. In its earlier presentation, TVA informed the team that they observed some water seepage in the turbine building (near elevation 730). The team was told that similar seepage was observed in the auxiliary building and the control building. There was no indication that the extent of the seepage

threatens structural integrity. Corrective action and pressure grouting seems to have effectively stopped the seepage of ground water. Photograph 2, Appendix 4, shows the seepage effect for the turbine building.

The main control room was the next stop. Visual examination of the anchors for the control room cabinets did not uncover any anomalies. The staff observed that there had been extensive rework on the suspended ceiling where seismic restraints were installed.

The refueling room was visited next. The top of the spent fuel pool was covered by steel plates. TVA informed the team that there are new fuel assemblies stored in the pool and the pool is dry at the moment. No anomalies were found on the refueling floor.

TVA had informed the team in the meeting earlier that they observed horizontal cracks on the upper portion of the waste package building (WPB) wall. No safety-related equipment is housed by this building. Photograph 3, Appendix 4 shows the cracks. The team observed that there was ongoing repair work.

The afternoon visit started at the intake channel. Crushed rock was placed on the slope which has a 1 to 4 incline (mild slope). The slope appears to be stabilized with no apparent degradation (Photograph 4, Appendix 4). The team walked the entire length of the emergency raw cooling water (ERCW) pipe line (approximately one mile) to look for any subsidence or heaving of the soil surface which may indicate movement of the buried pipe (Photograph 5, Appendix 4). No anomalies were observed. Toward the end of the ERCW pipe path, close to the reactor building, several trailers were observed which may have the potential to exert overburden pressure on the pipe. The ERCW piping is buried under a soil layer of 5.5 to 7.5 feet of soil, an 18-inch-thick concrete shield plate and another 12-inch layer of soil. This is shown in a series of drawings starting with 17W302-1. Drawing #17W302-3 shows the general arrangement. In addition, the ERCW piping runs through pipe sleeves (somewhat like culverts) at areas of heavy loads. Watts Bar site-specific procedure (SSP) 12.13 controls the evaluation of heavy loads, and may be imposed during temporary construction or repair activities. This would ensure that the buried ERCW piping is not subjected to additional loading on the soil surface above the level of the pipe; consequently it is prudent to monitor any settlement of the soil surface near the buried pipe and to avoid additional loading on the pipe.

The north and south valve room exterior walls exhibited some minor shrinkage cracks (Photograph 6, Appendix 4 for the north valve room). Although the cracks appear to be more than hairline shrinkage cracks, the extent of the cracks does not cause any concerns regarding structural integrity. The cracks are very shallow. Site-specific procedure (SSP) 12.07, Item #3 ensures that structures, systems and components are kept in good condition. Adherence to this procedure is acceptable for preventing any future deterioration of the shrinkage cracks.

The refueling water storage tank is the only external Category I tank at Watts Bar. This is a 370,000 gallon capacity stainless steel tank. Anchor bolts are anchored into a 3-foot-6-inch thick, 57-foot diameter concrete pad. The

team did not observe any structural deterioration of the anchors. The exterior of the tank is covered by insulation materials.

The auxiliary building was visited next. There were several pieces of heavy equipment housed in this building. Foundations for the safety injection pump (Photograph 7, Appendix 4) and the residual heat removal pump were in good condition; there were no signs of deterioration or cracks in the concrete. On elevation 692 of the auxiliary building, the team observed several cracks on the floor (Photograph 8, Appendix 4). However, the TVA staff informed the team that the floor is founded on rock and no major load is carried by this floor. Later, back in the NRC resident inspector's office, Drawing 41N310-1 confirmed TVA's statement.

The team went next to the fuel transfer canal area which is adjacent to the spent fuel pool. The team observed a large area of discoloration and efflorescence on both the north and south walls of the canal (Photographs 9 and 10, Appendix 4). TVA could not provide a reason for the discoloration. TVA is investigating the cause of the discoloration. No structural integrity concerns were identified here.

The team then went inside the containment structure. Modification for allowance of thermal expansion of the steel platform was evident. This modification was needed to alleviate the effects of material growth from the elevated temperature due to the design basis accident condition. The steam generator support for the Number 3 steam generator is anchored into the concrete floor with cast-in-place bolts. No apparent degradation of the concrete floor near the support was observed (Photograph 11, Appendix 4). The team walked the entire length of the ice condenser, approximately a 300-degree arc length. Ice was in the ice condenser. Visual inspection of the steel containment revealed no anomalies; the surface was clean and free of corrosion and bulging. Next, the team went down to the lowest level of the annulus between the reactor building and the shield building. The annulus was clean and no corrosion was observed (Photograph 12, Appendix 4).

The team climbed to the roof of the auxiliary building. From there the team observed the dome of the shield building and saw that the paint was peeling. The surface of the concrete was not a problem, however. TVA staff informed the team that rework is planned for the dome paint. All other walls that can be observed from the roof, other than the ones mentioned earlier, were generally clean and in good condition.

The diesel generator building was the last building visited. The concrete floor, walls, tornado missile barriers and the ceiling were all in good condition and there was no sign of any degradation. The additional diesel generator building will not be in service until Unit 2 is licensed.

Throughout the walkdown, the team did not see any anomalies related to the masonry walls or the cable trays and their anchors. The team hand-twisted a number of anchors and checked the tightness of the bolts and nuts. No loose components were found.

Other Review:

The staff conducted several other audits as noted above (see note on entrance meeting):

Review of the soil settlement data was found to be satisfactory. Readings were all below the allowable or expected values. Verticality of the building is also sound.

The team was given the 1978 SIT data. Review indicated that this was essentially a leak test at the over pressure of 16.9 psig conducted in conformance with ASME Code Section III. There was a very limited amount of structural data recorded. However, unlike concrete, steel containment behavior for internal pressure is well understood and the capability of analytical prediction ensures structural integrity at the design pressure level. Therefore, the team found that the leak test associated with the SIT is acceptable. The TVA staff later provided the 1983 SIT data. This test was again concentrated on leakage of penetrations and the test was successful.

The team also reviewed the drawings for the spent fuel pool, including the liner and the leak chase channels. No anomalies were found.

July 19, 1995

Exit Meeting

After a brief meeting among the team members, the NRC staff held an exit meeting with TVA management and plant staff. A list of attendees is provided in Appendix 2. Goutam Bagchi provided a summary of the results of the staff review and walkdown and noted that TVA support for the staff review and responsiveness to staff enquiries is commendable.

Conclusion Based On Site Audit

The plant structures and civil engineering features, about fifteen years after construction of the civil structures, are in very good condition and no indication of any age-related degradation was evident. There was no evidence of any soil settlement or local areas of unusual soil condition of subsidence or heaving. Constructed soil slopes around the intake channel are stable. The data on differential settlement monitoring between structures founded on rock and crushed stone indicated a maximum movement of about 1/6 of an inch, compared to a value of 1/4 of an inch which is judged to be acceptable. Foundation settlement has reached a stable value; consequently, structures should provide continued long-term reliable performance.

Areas of shrinkage cracks outside the main steam valve rooms were observed. These are not structural cracks, and with the maintenance program in place, they are not detrimental to long-term plant operation. TVA had identified thermal cracks on a sloping concrete roof adjacent to the WPB and has undertaken remedial action. Thermal expansion produces self-limiting loads

that are relieved when the crack opens up. The remedial action undertaken by TVA is acceptable.

Some indication of past water seepage through concrete structural walls was evident. However, these are not active areas of degradation and do not present any hazard to future plant operation, but they do warrant surveillance.

Cable tray and conduit supports, and major equipment supports including anchorage of yard tanks, are in very good condition. This conclusion is based on the observation of thread engagement and visual verification of bolt tightness.

The steel containment vessel is designed for an internal pressure of 13.5 psig and a maximum internal pressure of 15 psig. In order to demonstrate the design adequacy of the SIT, the ASME Code requires an over pressure structural integrity test at 1.25 times the design pressure. There have been two SITs conducted - one in September, 1978 and another one in May, 1983. Both of these test reports were reviewed by the staff and judged to be acceptable. TVA's own assessment, under the Individual Plant Examination for severe accident vulnerabilities, is that the ultimate capacity of the Watts Bar containment shell is 100 psig of internal pressure at 300° F. This is consistent with the results of the staff study on ice condenser containments, which indicates that the ultimate capacity is substantially larger than the nominal design pressure. NUREG/CR-4273, "Crack Propagation in High Strain Regions of Sequoyah Containment" shows an ultimate capacity of 78 psig compared to a nominal design pressure of 15 psig.

Although a large number of discrepancies remain to be resolved, and some remedial actions need to be performed, the work in progress, within the scope of this review, is quite satisfactory.

Audit Team: Goutam Bagchi (Chief of the Civil and Structural Engineering Branch, NRR), team leader; Sang Bo Kim (Structural Engineer, ECGB); Robert W. Wright (Inspector, Region II)

Appendix 1: List of structures and area inspected

Appendix 2: List of meeting attendees

Appendix 3: View graph - TVA presentation

Appendix 4: Photographs

APPENDIX 1

LIST OF STRUCTURES AND AREAS VISITED

The following areas were walkdown:

Manhole No. 7
Main Control Room
Auxiliary Bldg.
Spent Fuel Pool Area
Ice Condenser
Condensate Demin. Evp. Bldg.
ERCW Buried Piping
Unit 1 RSWT
RHR Pump 1A-A Room
Safety Inj. Pump 1B-B Room
Fuel Transfer Outside Walls
Unit 1 RB Seal Table Area
Accumulator Room No. 4
Steam Gen. Supports
RHR HTX 1B & 1B-B Room
Unit 1 Intermediate Roof
Condensate Storage Tank
Intake Pumping Station
Control Bldg.
Refueling Floor
Upper Containment
Waste Packaging Area
Intake Channel
North Valve Room Outside Wall
Containment Spray Pump 1B Room
Charging Pump 1C Room
Charging Pump 1A-A Room
Turbine Driven Aux Feed Pump 1A S
Containment Raceway
Lower Containment
Annulus
Aux Building Roof
Diesel Generator Building

Appendix 2

List Of Meeting Attendees

July 18, 1995, 7:00 AM

Name	Title	Organization	Telephone
Goutam Bagchi	Branch Chief	NRC/NRR	301 415-2733
Sang Bo Kim	Structural Engineer	NRC/NRR	301 415-3301
Robert W. Wright	Project Engineer	NRC/RII	404 331-0345
Tony Harrison	Program Manager	TVA	615 365-3511
Robert D. Briggs	Princ. Mat'ls Engr.	TVA - NE	615 365-1757
Robert O. Enis	Corporate Civil Engr.	TVA - NE	615 751-8402
Kenneth R. Spates	Corp. Civil Engr.	TVA - NE	615 751-8412
R. D. Cutsinger	Chief, Civil Engr.	TVA - NE	615 751-8309
Craig S. Faulkner	Reactor Engr. Supv.	TVA - TSS	615 365-8123
James G. Adair	Lead Civil Engr.	TVA - NE - WBN	615 365-1759
Newton H. L. Perry	Principal Civil Engr.	TVA - NE - WBN	615 365-1281
Samuel D. Stone	TVA Consultant	A. T. J.	615 481-4844
Penny S. Britton	Civil Engr.	TVA	615 729-7647
Thomas L. Dean	Licensing	TVA - NLRA	615 365-8030
Larry A. Katcham	Principal Civil Engr.	TVA - NE WBN	615 365-1713

July 19, 1995, 11:00 AM

Name	Title	Organization	Telephone
K. R. Spates	Engr. Mech's Mgr.	TVA Engr. Civil/Corp.	615 751-8412
James G. Adair	Lead Civil Engr. WBN	NE - WBN	615 365-1759
Robert W. Wright	Project Engineer	NRC - RII	404 331-0345
Mark W. Peranich	Sr. Project Engr.	NRC - RII	615-365-1776
Goutam Bagchi	Branch Chief	NRC/NRR	301 415-2733
Sang Bo Kim	Structural Engineer	NRC/NRR	301 415-3301
O. L. Zerinque	VP OPS	TVA	615 365-8861
M. J. Singh	Mgr. PCG	TVA	615-365-1230
J. F. Lara	Resident Inspector	NRC	301 415-1776
D. Kehoe	Sr. Tech Quality Mgr	TVA	301 415-1967
S. W. Spencer	Quality Assurance Mgr.	TVA	615 365-3496
T. L. Dean	Licensing	TVA	615 365-8030
R. R. Baron	Acting NA &L Mgr.	TVA	615 365-3948
Tony Harrison	Prog. Mgr.	TVA	615 365-3511
Walter F. Skiba	Treading Mgr.	TVA	615 365-1681
R. D. Cutsinger	Chief Civil Engr.	TVA - NE	615 751-8309
D. L. Malone	QA Manager	TVA	615 365-8066
P. L. Pace	Compliance Mgr.	TVA	615 365-1824
Jon R. Rupert	Site Engr./Mat'ls. Mgr.	TVA	615 365-8766
Craig S. Faulkner	Reactor Eng. Supv.	TVA	615 365-8123
J. A. Scalice	Sr. VP	TVA	615 365-8767

APPENDIX 3

VIEW GRAPH - TVA PRESENTATION

SITE AUDIT OF STRUCTURES & CIVIL ENGINEERING FEATURES

General Overview	J. Adair
. Cat I Structures	
. Common Program	
Seismic Design Basis	K. Spates
Soils	S. Stone
. Liquefaction	
. Safety-related Slopes	
Foundation/Structural Settlement	N. Perry
Buildings	L. Katcham
. Concrete (Masonry Walls)	
. Steel (Containment)	
Containment/Corrosion	D. Briggs
Yard Area	J. Adair
. Buried Piping	
. Tanks	
Cable Tray/Conduit Supports	T. Harrison
Conclusion	R. Cutsinger

CATEGORY I STRUCTURES

Reactor Building

- Primary Containment
- Interior Concrete Structure
- Shield Building

Auxiliary Building

Control Building

Waste Packaging Structure (Contains no safety-related equiment)

Condensate Demineralizer Waste Evaporator Building (Contains no safety-related equipment)

Additional Equipment Building

Diesel Generator Building

Additional Diesel Generator Building (This structure built but not required for 1 Unit operation)

North Steam Valve Room

Intake Pumping Station and Retaining Walls

Refueling Water Storage Tank (RWST) and Pipe Tunnel

Class IE Electrical Systems Structures

- Manholes

Miscellaneous ERCW Structures

- Slabs and Beams
- Discharge Structure
- Missile Protection

PROGRAM

CAPS and Special Projects

- Seismic CAP
- Conduit and Conduit Supports CAP
- Cable Tray and Cable Tray Supports CAP
- Hanger Analysis and Update Program CAP
- HVAC CAP
- Equipment Seismic CAP
- Design Baseline Verification Program CAP
  - Civil Calculations
- ASRR (Additional Systematic Records Review) w/Field Verification
- Special Program
  - Concrete Quality
  - Soil Liquefaction

Construction

- Design Drawings
- General Construction Specifications
- Modifications and Additions Instructions (MAIs)

IN-PROGRESS/ Loose, Missing and Damage Program (MAI 1.9)

- Partition Wall Cracking (WBPER950287)
- Waste Packaging Area Wall Cracking (WBPER950306)

Equipment Foundation & Concrete Structure Walkdown

SPAE, SPOC

10 CFR 50.59

Maintenance

- General Construction Specs.
- Site Specific Instructions
- Surveillance Instruction
- Preventive Maintenance Procedures controlled by SSP 6.07

WATTS BAR NUCLEAR PLANT - UNIT 1

SEISMIC GROUND MOTION

Original Design Basis: Modified Newmark

	OBE	SSE
Horiz.	0.09 g.	0.18 g.
Vert.	0.06 g.	0.12 g.

Site-Specific Earthquake

1978-79 84th Percentile of 13 representative records without scaling for magnitude or distance.

Horiz	0.215 g.
Vert.	0.15 g.

June, 1982 SER

Approved Design Basis and Site-Specific earthquakes

WATTS BAR NUCLEAR PLANT - UNIT 1

SEISMIC DESIGN

Original Design

For Structures, Systems, and Component (SSC) design, used Original Modified Newmark ground motion, simplified building models, lower than SRP damping, 2-D directional combination, etc.

Seismic CAP R1 - June, 1989

Defines 3 Seismic Spectra:

Set A: Original Spectra. Modified Newmark ground motion, original building models and methods.

Set B: Evaluation Spectra. Site-Specific ground motion, updated building models and methods.

Set C: Reanalysis using original Modified Newmark ground motion with updated building models and methods.

Structures, Systems, and Components have been:

Evaluated to Set B.
For New designs and modifications to existing designs, use Set (B+C)

Status

SER Supplement 6 approved the above methodology for the use and application of Set B and C spectra.

Seismic CAP was closed June, 1992 by SER Supplement 9.

SOIL LIQUEFACTION

Concern:

Potential of soil liquefaction during earthquake and displacements of ERCW pipelines and Class 1E electrical conduits.

Corrective Action:

Construction of underground barriers that prevent unacceptable displacements of the piping and conduit banks.

Issues Resolved:

- Soil Liquefaction Special Program - SSER 9 and 11
- Additional Issue from Civil Calculations Program (Simultaneous application of both horiz. and vert. earthquake components) - SSER 14.

Monitoring Requirements:

None. Underground barriers are permanent passive systems that require no maintenance or monitoring.

SAFETY-RELATED SLOPES (INTAKE CHANNEL)

Concern:

- Some evidence of potential soil liquefaction exhibited by natural soils in flood plain area.
- Failure of slope creating a blockage of water to IPS.

Corrective Action:

Over-excavation (125. ft. Horizontally) of natural flood plain soil deposits.

1V on 4H Channel Slopes constructed of engineered fill.

- Earthfill at min. of 95% standard compaction.
- Crushed stone at average relative density of 85%.
- Rockfill (200 lbs).

Erosion protection using riprap and intermediate filter material.

Issues Resolved in Civil Calculations Programs Review:

1. Slope stability relative to as-built configuration and soil strengths.

   SSER 14

2. Simultaneous application of both horizontal and vertical earthquake components.

   SSER 14

Monitoring Program:

Silt accumulation monitoring, WBN PM-0-CHA-684-0001.

FOUNDATIONS

- The supporting material for Category I structures are: sound rock, 1032 compacted crushed stone, end bearing piles, and in-situ soil or compacted earthfill for small or lightstructures.

Rock-Supported Structures:

- Reactor Building
- Auxiliary/Control Building
- North Steam Valve Room
- Intake Pumping Station

Soil-Supported Structures:

- Diesel Generator Building (1032 compacted crushed stone)
- Waste Packaging Area (1032 compacted crushed stone)
- Refueling Water Storage Tank (1032 compacted crushed stone)
- ERCW Pipe Tunnels (Basal gravel over bedrock)
- Class 1E Buried Electrical Systems (Manholes, Conduit Banks) (In-situ soil or compacted earthfill)
- Miscellaneous ERCW Structures (In-situ soil or compacted earthfill)

Pile Supported Structures (End-Bearing Piles):

- Condensate Demineralizer Waste Evaporator Building
- Additional Diesel Generator Building

SUMMARY

- Structures are well-founded
- Major structures are founded on sound rock or compacted 1032 crushed stone.
- Sound rock is 40 feet or less from plant grade.
- There are no potential soil liquefaction concerns associated with these structures.

OTHER FOUNDATION-RELATED ISSUES

Groundwater Inleakage

- Groundwater Inleakage repairs made in Turbine Building, Auxiliary Building, Control Building, 1E, and non-1E manholes
- PM's issued to inspect manholes for flooding and corrosion of components
- Housekeeping Procedure SSP 12.07 has checklist for inspecting for any accumulation of water from groundwater inleakage

STRUCTURAL SETTLEMENT

- Initial Program to monitor settlement began in 1973. (Total settlement and differential settlement between buildings).

- The total settlement and differential settlement between buildings was small.

- Updated the differential settlement monitoring program in 1983 to monitor future differential settlements.

- 12 years of monitoring data indicates approximately 1/8" or less differential settlement for all stations.

- Currently assessing the program.

- Systems passing between adjacent structures have been evaluated and determined acceptable, for 1-inch differential settlement.

BUILDINGS

CONCRETE BUILDING STRUCTURES

- Originally controlled by General Construction Spec G-2
- Reinforced Concrete Slabs and walls
- Patching and Concrete Repairs are done using MAI 5.4

Sub Structures (Divider Walls)

Un-reinforced block walls

Reinforced block walls

Partition walls

IE Bulletin 80-11 was addressed by Watts Bar

NRC closed 80-11 for WB on IR 95-46.

- MAI 1.9 Walkdowns review the surface condition of the concrete.
- ASSR reviewed the category I concrete structures for cracking and identified cracks which were reviewed and dispositioned.

  Minor temp and shrinkage cracks have been observed in reviews of walls.

- SSP 12.07 Housekeeping Program

STEEL

CONTAINMENT VESSEL

- Designed by CB&I
- 48N400 & CB&I Drawings
- Material A516 GR 60 & 70
- Structural Integrity Tests
  - 1st test in Aug 1978 all SCV Boundary welds performed by CB&I.
  - 2nd test in 1983 by TVA.
- Integrated Leak Rate Test was performed in 1994. Watts Bar Vessel Leak rate was 16.5 vs. an allowable of 187.
- SSER 12 allowed Watts Bar relief from rerunning the overpressure test.
- A walkdown and reanalysis of the containment attachments was performed by TVA.

SPENT FUEL POOL

- Size approximately 30′ x 40′ x 48′ deep
- A276 & A167 Type 304 Stainless 1/4" Liner
- Each Seam Weld has a leak channel which drains to a tell-tell drain valve and then to the floor drain collector tank.
  - Welds utilized E308 and 309 electrodes.
- Drawings 48N1233 thru 1241
- Power ascention test will check any leakage.

EQUIPMENT ANCHORAGE

- Large Equipment Anchorage is ductile anchorage

  Many utilize embedded plates and Nelson studs
- Small equipment & suspended systems utilize surface-mounted plates and drilled concrete anchors.
- ASRR reviewed plant anchorage
- ESQ CAP resolved anchorage issues.

CONTAINMENT/CORROSION

1. Original Requirements -- Zinc Coating/Zinc Primer - Epoxy Topcoat

2. IE Notice 89-79 -- Containment Vessel Corrosion

3. Containment Vessel External Coating Repairs

4. Modifications and Additions Instruction (MAI) - 1.9, "Walkdown Verification for Modifications System/Area Completion and Damaged, Loose, or Missing Hardware"

5. Site Standard Practice (SSP) - 12.07, "Housekeeping/ Temporary Equipment Control"

6. Preventive Maintenance Instruction (PM) 1-COAT-271-0076, "Protective Coatings (Level 1)"

7. Preventive Maintenance Instruction (PM) 1-INSL-064-MASS/Q, "Inspection of Sheetmetal Flashing in Reactor Building Raceway"

BURIED PIPE

ERCW PIPING AND HIGH PRESSURE FIRE PROTECTION PIPING

- ERCW runs from Intake Pumping Station (IPS) to DGB, ADGB, and AB
  - Mortar-lined - Monitoring Program tracks status of mortar lining
  - Annual visual inspection
  - Sampling with atomic absorption test for calcium depletion every five years
- HPFP runs from IPS to AB
- Rust inhibitors and Anti-biofouling agents added to all raw water systems

REFUELING WATER STORAGE TANK (RWST)

- Only WBN external Category I tank
- 370,000 gallon capacity
- Stainless steel - no corrosion
- Foundation: 3' 6" thick, 57' diameter concrete on 1032 compacted crushed stone
- Cruciform on bottom to resist shear loads (sliding)
- Heavily anchored at 48 points to anchor bolt ring
- Barrier wall that retains sufficient water in the event of the tank rupture
- Lower shell courses thicker due to buckling considerations
- Original design fabrication, and erection by PDM. Considered seismic, buckling sloshing, and soil-structure interaction
- Re-evaluated by Bechtel in 1990 for stress and stability.

CABLE TRAY AND CABLE TRAY SUPPORTS

- WBN has ~ 100,000 LF of cable tray and 5,200 cable tray supports.
- Cable trays supports were walked-down.
- Grouping and bounding analysis was performed.
- 430 cable tray supports mods were issued.
- 40 cable tray support mods remaining.
- Cable trays are being walked-down for:
  - 1/4" bolts
  - Electrical attributes
  - RB, DG's, IPS and Annulus complete.
- ~ 800 LF of cable tray required Thermolag.
  - ~30 LF Thermolag remaining
  - Supports were re-analyzed.

CONDUIT AND CONDUIT SUPPORTS

- WBN has ~ 1,300,000 LF conduit and >100,000 conduit supports.
- Existing configuration were sampled; grouping and bounding analysis was performed.
- 1,700 conduit support mods were implemented.
- 1E conduit was walked-down for LMDH
  - 32,000 discrepancies (misaligned spring nuts, torque)
  - 10,000 discrepancies remaining.
- 8,000 LF of conduit required coated Thermolag.
  - Supports were re-analyzed for loadings.
  - ~800 LF remaining.

CONCLUDING REMARKS

- WBN re-validated structural design basis
- TVA Staff reviews/interactions
- NRC Staff & Region reviews/interactions
- Instituted design control processes
- Adequate level of site staff

EXPECTATIONS

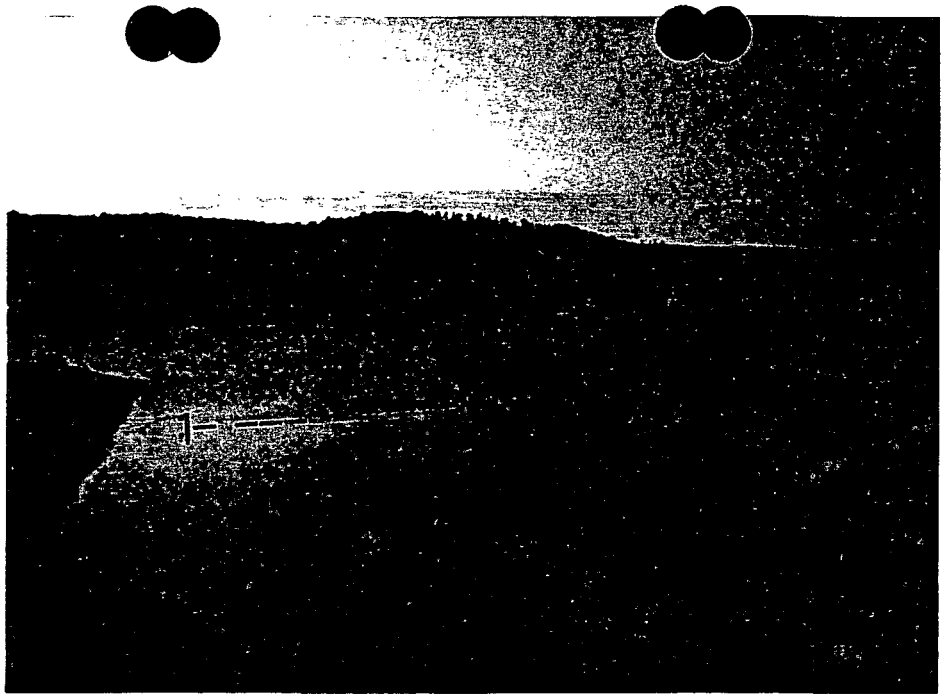
- Lead Civil and Staff walk spaces
- Maintain questioning attitude

CONCLUSION

- WE ARE READY TO MOVE FORWARD AND START-UP

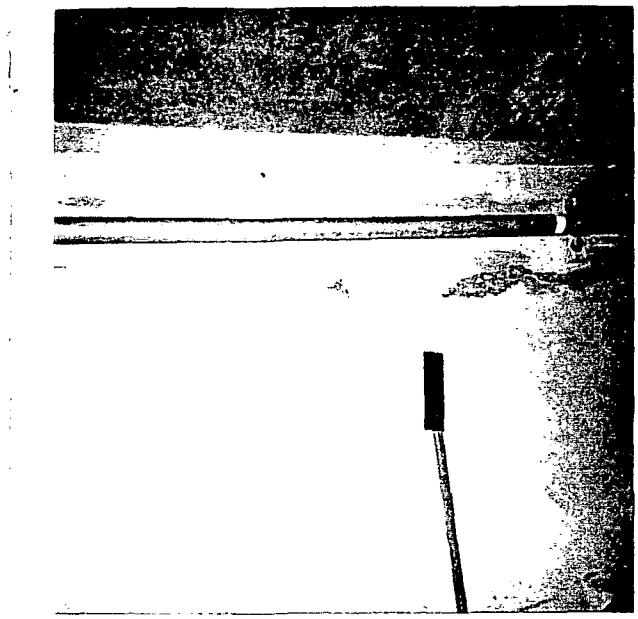
APPENDIX 4

PHOTOGRAPHS



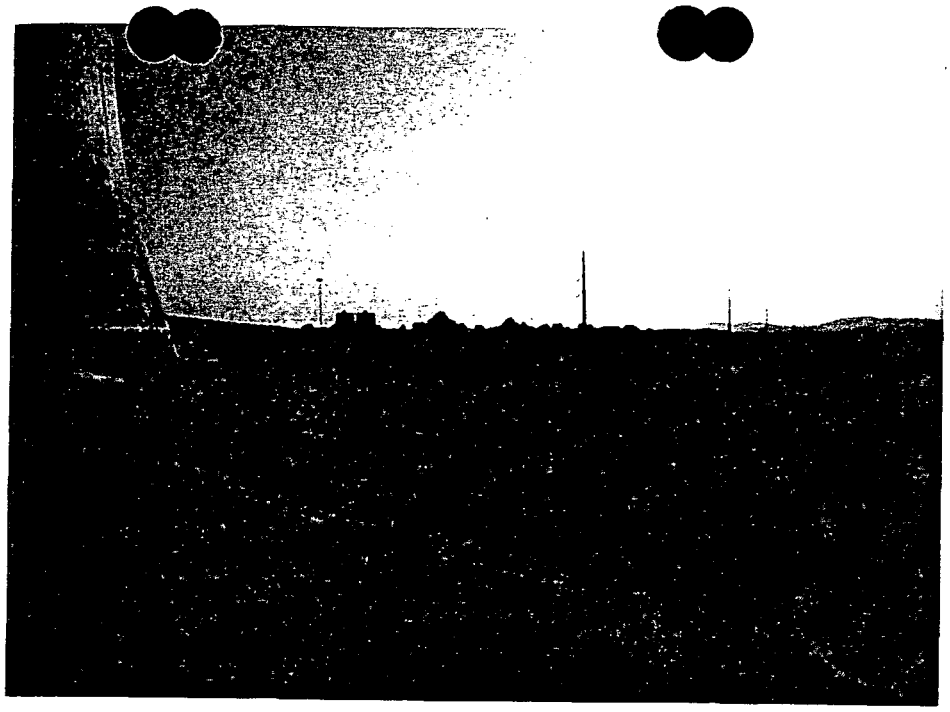
(1) INTAKE CHANNEL

(2) TURBINE BUILDING - WATER SEEPAGE

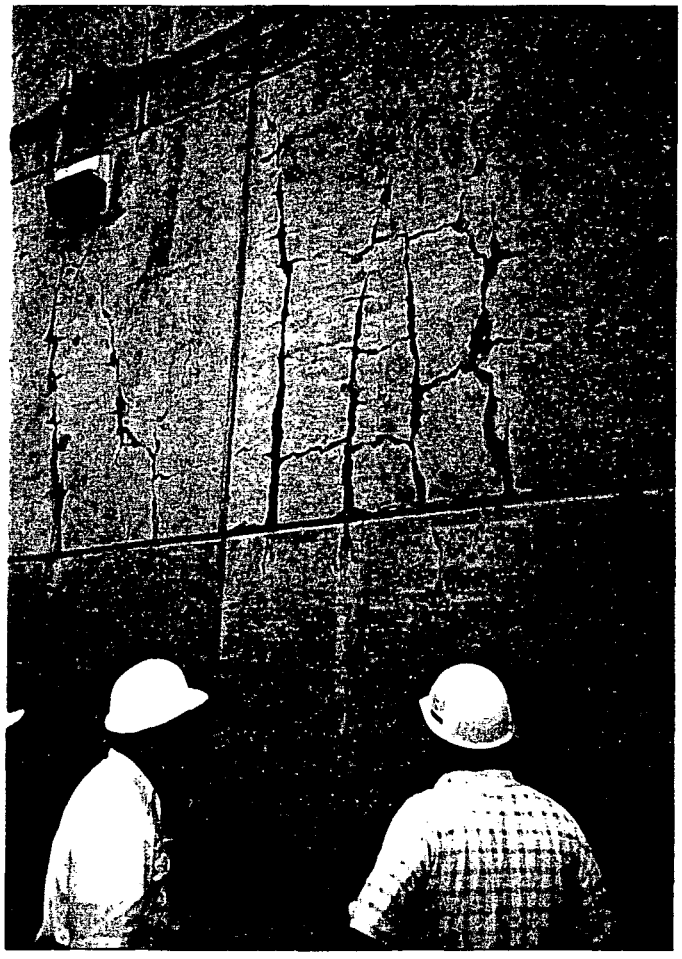


(3) WASTE PACKAGE BUILDING - HORIZ. CRACKS

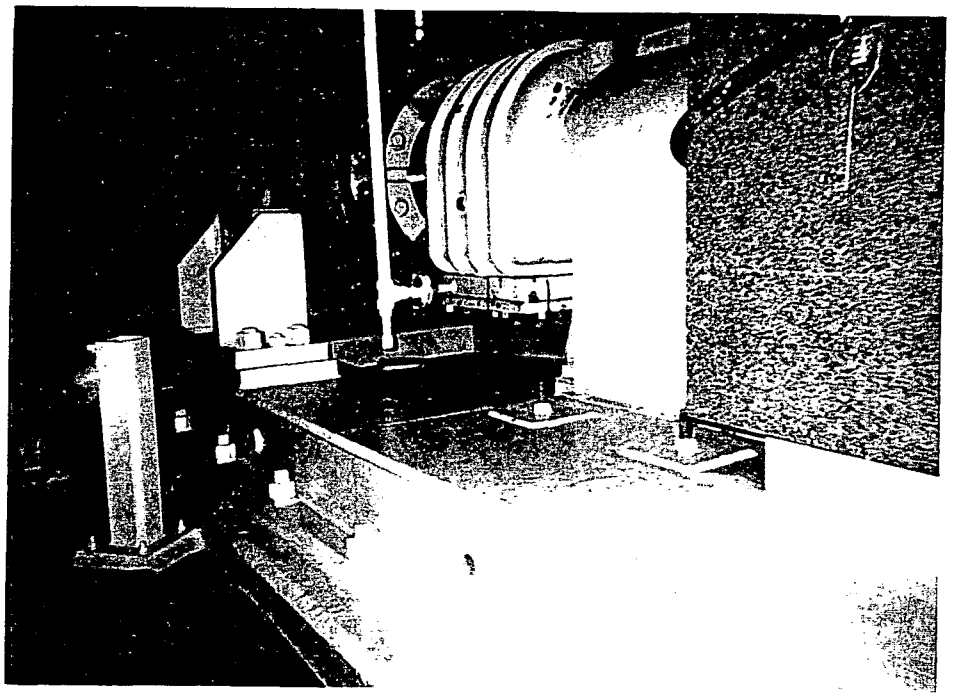
(4) INTAKE CHANNEL SLOPE



(5) AREA FOR ERCW BURIED PIPING



(6) N. VALVE ROOM OUTSIDE WALL

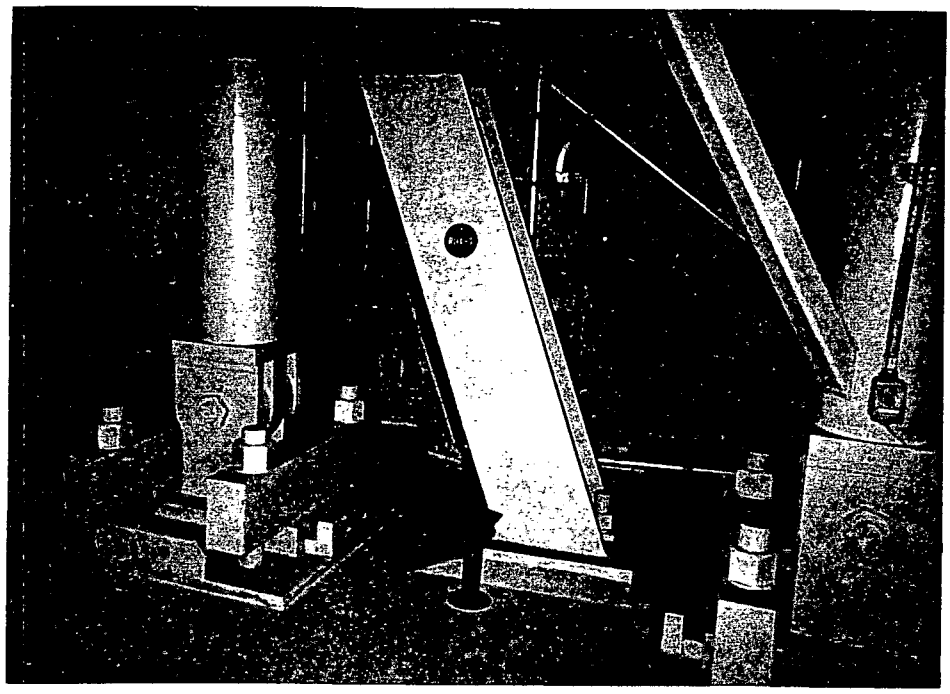


(7) SAFETY INJECTION PUMP FOUNDATION

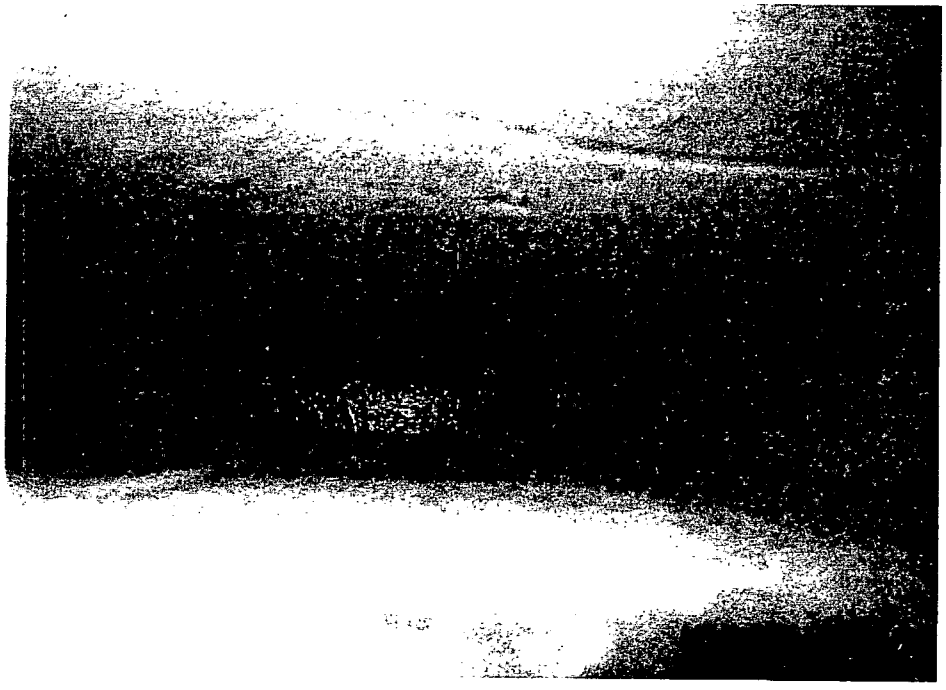
(8) AUX. BUILDING FLOOR CRACKS - ELEV. 692

(9) SPENT FUEL TRANSFER CANAL (SOUTH WALL)

(10) SPENT FUEL TRANSFER CANAL (NORTH WALL)



(11) #3 STEAM GENERATOR SUPPORT



(12) LOWER CONTAINMENT ANNULUS