

Georgia Power Company
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201
Telephone 205 877-7122

C. K. McCoy
Vice President, Nuclear
Vogtle Project



Georgia Power

the southern electric system

September 4, 1992

ELV-03903
002023

Docket Nos. 50-424
50-425

TAC 80515
80516

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

VOGTLE ELECTRIC GENERATING PLANT
DIFFERENTIAL SETTLEMENT OF BURIED PIPE

The August 23, 1991, letter from the NRC to Mr. W. G. Hairston, III transmitted the Safety Evaluation Report (SER) regarding the Vogtle Electric Generating Plant (VEGP) settlement monitoring program. In section 2.4 of the SER, "Differential Settlement of Buried Pipe," the staff stated their concern that the values reported for actual differential settlement of markers 132, 145, 252, and 292 exceeded the calculated differential settlement and that the values reported for the actual differential settlement of markers 196 and 249 exceeded both the calculated as well as the allowable differential settlement. The staff requested that Georgia Power Company (GPC) perform an evaluation to determine why these actual differential settlements exceeded design values.

At a September 26, 1989, meeting with Georgia Power Company at the VEGP site, the staff initiated this issue and requested additional information regarding safety related buried piping. Letters of March 19, 1990, and August 30, 1990, from Mr. W. G. Hairston, III to the NRC provided this additional information and supporting data relative to the differential settlements experienced by safety related buried piping at their interfaces between compacted backfill and Category I structures. The differential settlement experienced by buried piping is not addressed by the VEGP settlement monitoring program; therefore, no survey points exist in the backfill free field for collecting data regarding changes in backfill elevations. In the absence of this data, GPC took the most conservative approach by assuming zero settlement of the backfill which resulted in the reported differential settlements for buried pipes equal to the total structure settlements.

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A complete evaluation of all safety related buried piping is in progress and the results will be reported later. The purpose of this letter is to respond to the SER request by reporting the evaluation of those lines specifically associated with the markers of concern as listed below.

<u>Line</u>	<u>Marker</u>
1-2403-044-4"	132-R
1-2403-053-2"	132-R
1-2403-043-4"	132-R
1-2403-066-3"	145-R
1-2403-069-2"	145-R
1-1202-029-6"	196
2-2403-053-2"	249-R
2-2403-043-4"	252-R
2-1202-029-6"	292
2-1202-030-6"	292

Table 1 (attached) summarizes the results of the evaluation which was conducted as follows:

1. ACTUAL DIFFERENTIAL SETTLEMENTS

- A. Continue to conservatively assume zero settlement of the compacted backfill and the buried portions of the pipe.
- B. Determine the installation date of the pipe and/or support. The plant's construction data bases were re-examined for additional information on the welding of spool pieces and installation of supports to reconfirm the installation dates. Where additional information was found, the latest relevant modification dates were used for the installation dates.
 - o Whenever the pipe penetrates a sleeve in the structure foundation, and movement is allowed, the differential settlement stresses were not induced in the pipe until the support was installed. The installation date used is that of the earliest installed support near the penetration.
 - o Whenever the pipe is embedded in concrete or grout, the installation date used is that of the last spool piece weld connection of the buried pipe.

- C. The settlement of the structure, subsequent to the installation date of the pipe/support, is taken from the survey data of the marker in the area where the pipe enters the structure. A straight line method of interpolation between two actual survey reading dates (taken at either 60-day or 6-month intervals) was used to determine the "initial" elevation of the structure on the specific installation date of the pipe support or spool piece weld. This "initial" elevation was subtracted from the subsequent elevations of the structure to determine the actual settlement of the structure.
- D. The actual differential settlement of the buried pipe is the actual settlement of the structure (as discussed in C above) minus the settlement of the compacted backfill (assumed to equal zero as discussed in A above). In other words, the differential settlement between the pipe and the structure will equal the settlement of the structure from the date the pipe or support was installed.

2. ALLOWABLE DIFFERENTIAL SETTLEMENT

The allowable differential settlement is the maximum differential settlement that can be permitted without exceeding the applicable allowable stresses in the pipe or in the support structure. This value is always equal to, or greater than, the design differential settlement. The allowable differential settlement values are shown under either the pipe or support column of Table 1 to depict which is controlling.

In those cases where the support is controlling, more refined calculation evaluations were performed using the actual support qualification calculation to determine the controlling stresses resulting from the load combinations imposed on the piping system. These stresses were compared to the applicable code allowable stresses to determine the reserve load capacity. The allowable differential settlement values for supports were computed where appropriate to utilize this reserve capacity.

3. DESIGN DIFFERENTIAL SETTLEMENT

Table 7 of design criteria DC-1017 includes the maximum differential building settlements used in the original design. These were previously applicable to both nonsafety related and safety related piping whether buried or exposed between structures. Because of inherent conservatism of these original values and our historical data of the actual settlement of buildings, we have established new design differential settlement values for safety related buried piping. Design criteria DC-1017 has been revised by change notice DMCN-1017-2 (attached) to reference design criteria DC-2144-B specifically for safety related buried piping. Change notice DMCN 2144-B-1

(attached) now includes the new values for each of the pipe lines listed above. These new design differential settlement values were established based on the following:

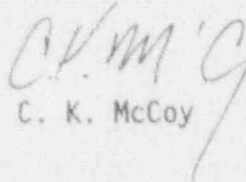
- o The design differential settlement value is sufficiently greater than the actual differential settlement (25 percent where possible or more) to minimize any concern for additional future settlement.
- o The design differential settlement value must be less than or equal to the allowable differential settlement.

Each of the lines associated with the markers of concern referenced above has been reanalyzed by performing pipe stress calculations using the new design differential settlement values. Also, the affected supports have been reanalyzed by performing calculations to confirm adequacy using the loads associated with the new design differential settlement values.

This addresses the geotechnical concerns expressed in the SER of August 23, 1991, related to markers 132, 145, 196, 249, 252, and 292 and verifies that the actual differential settlements do not exceed either the allowable or design differential settlements.

Should you have additional questions please inquire.

Sincerely,


C. K. McCoy

CKM/JLL/gmb

Enclosures

xc: Georgia Power Company
Mr. W. B. Shipman
Mr. M. Sheibani
NORMS

U. S. Nuclear Regulatory Commission
Mr. S. D. Ebnetter, Regional Administrator
Mr. D. S. Hood, Licensing Project Manager, NRR
Mr. B. R. Bonser, Senior Resident Inspector, Vogtle

TABLE 1
DIFFERENTIAL SETTLEMENT FOR
SAFETY RELATED BURIED PIPES INTERFACING
WITH CATEGORY 1 STRUCTURES
UNITS 1 AND 2

PIPE IDENTIFICATION NUMBER	SYSTEM INSTALLATION DATES		MARKER DATA		DESIGN DIFFERENTIAL SETTLEMENT PER DC-1017 TABLE 7 (DCMN NO. 1017-2)	ACTUAL DIFFERENTIAL SETTLEMENT (INCHES)		ALLOWABLE DIFFERENTIAL SETTLEMENT (INCHES)	
	PIPE	SUPPORT	MARKER NUMBER	BUILDING LOCATION	DIFFERENTIAL SETTLEMENT (INCHES)	PIPE	SUPPORT	PIPE	SUPPORT
1-1202-029-6"	N/A ⁽²⁾	1-13-85	196	Tunnel	0.50	N/A ⁽²⁾	0.37	N/A	0.60
1-2403-044-4"	3-11-84	N/A ⁽¹⁾	132-R	DG-1	0.80	0.54	N/A ⁽¹⁾	0.85	N/A
1-2403-053-2"	10-14-84	N/A ⁽¹⁾	132-R	DG-1	0.80	0.35	N/A ⁽¹⁾	1.46	N/A
1-2403-043-4"	1-27-85 (3)	N/A ⁽¹⁾	132-R	DG-1	0.41	0.30	N/A ⁽¹⁾	0.41	N/A
1-2403-066-3"	N/A ⁽²⁾	2-3-85	145-R	DFOST-1	0.50	N/A ⁽²⁾	0.34	N/A	0.58
1-2403-069-2"	2-3-85	N/A ⁽²⁾	145-R	DFOST-1	0.50	0.34	N/A ⁽²⁾	0.60	N/A
2-1202-029-6"	N/A ⁽²⁾	5-7-86	292	Tunnel	0.80	N/A ⁽²⁾	0.46	N/A	0.80
2-1202-030-6"	N/A ⁽²⁾	5-5-86	292	Tunnel	0.80	N/A ⁽²⁾	0.46	N/A	0.80
2-2403-053-2"	1-21-87 (3)	N/A ⁽¹⁾	249-R	DG-2	0.44	0.23	N/A ⁽¹⁾	0.64	N/A
2-2403-043-4"	5-25-86 (3)	N/A ⁽¹⁾	252-R	DG-2	1.00	0.40	N/A ⁽¹⁾	1.93	N/A

NOTES: 1) PIPE IS EMBEDDED IN BUILDING SLAB.
2) NO SUPPORTS ARE AFFECTED OR PIPE PENETRATES A SLEEVE.
3) REVISED INSTALLATION DATES BASED ON RE-EXAMINATION OF PLANT'S CONSTRUCTION DATABASES.

N/A: NOT APPLICABLE

ALVIN W. VOGTLE NUCLEAR PLANT
DESIGN MANUAL CHANGE NOTICE (DMCN)

DMCN NO. 1017-2
DATE 6/17/92

INSERT THIS CHANGE NOTICE FOLLOWING THE COVER PAGE OF THE APPLICABLE DESIGN CRITERIA OR SECTION AND RETAIN UNTIL CHANGE NOTICE IS REPLACED BY A REVISION

DM SECTION
OR DC NO. DC-1017 TITLE Pipe Stress and Pipe Supports REV. NO. 6

PRINCIPAL RESPONSIBILITY: Civil Q LIST: (X)YES ()NO

SYSTEM CLASSIFICATION: (X)SAFETY RELATED ()SAFETY IMPACT ()OTHER

CHANGE REQUESTED BY: ()CLIENT (X)ENGINEERING ()SUPPLIER/CONTRACTOR

REASON FOR CHANGE:

Maximum differential settlement values for items 14, 18, 33, and 38 in Table 7 have been revised as a result of REA VC-2002.

DESCRIPTION OF CHANGE:

Revise Table 7 to add Items 14a, 18a, 33a, and 38a.

APPROVAL SIGNATURES - SCS ENGINEERING

DATE

ORIGINATOR [Signature] 6-17-92

INTERDISCIPLINE REVIEW: PT 6/19/92 Jack 6-19-92 [Signature]
CDM/DATE EGM/DATE MDM/DATE

OTHER _____ N/A _____ N/A

**SAR CHANGE ()REQUIRED (X)NOT REQUIRED

NUCLEAR SAFETY ENGINEER [Signature] 6-17-92

PROJECT QUALITY ENGINEER L.C. Simpson 6-19-92

PROJECT DESIGN MGR. [Signature] 6-21-92

PROJECT ENGINEERING MGR. [Signature] 6/22/92

**COMPLETED BY NUCLEAR SAFETY ENGINEER

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VP04-92

Add the following items to Table 7, "Maximum Differential Building Settlement".

<u>Item</u>	<u>Description</u>	<u>Differential Settlement (Inches)</u>
14(a)	DG bldg/buried FO piping (Category 1 piping)	See DC-2144-B
18(a)	DFOE tank pumphouse/ buried FO piping (Category 1 piping)	See DC-2144-B
33(a)	Tunnel 1T2B/buried NSCW transfer line (Category 1 piping)	See DC-2144-B
38(a)	NSCW valve house train A/ buried piping (Category 1 piping)	See DC-2144-B

ALVIN W. VOGLE NUCLEAR PLANT
DESIGN MANUAL CHANGE NOTICE (DMCN)

DMCN NO. 2144-B-1
 DATE 6/17/92

INSERT THIS CHANGE NOTICE FOLLOWING THE COVER PAGE OF THE APPLICABLE DESIGN CRITERIA OR SECTION AND RETAIN UNTIL CHANGE NOTICE IS REPLACED BY A REVISION

DM SECTION
 OR DC NO. DC-2144-B TITLE Seismic Category 1 Buried Pipe
 REV. NO. 3

PRINCIPAL RESPONSIBILITY: Civil Q LIST: (X)YES ()NO

SYSTEM CLASSIFICATION: (X)SAFETY RELATED ()SAFETY IMPACT ()OTHER

CHANGE REQUESTED BY: ()CLIENT (X)ENGINEERING ()SUPPLIER/CONTRACTOR

REASON FOR CHANGE:

Maximum differential settlement values for category 1 buried pipe are required as a result of REA VC-2002.

DESCRIPTION OF CHANGE:

Add section 3.1.6.C to text and Table 1, "Maximum Differential Settlement Category 1 Buried Piping".

APPROVAL SIGNATURES - SCS ENGINEERING		DATE
ORIGINATOR	<u>[Signature]</u>	<u>6-17-92</u>
INTERDISCIPLINE REVIEW:	<u>PT 6/19/92</u> <u>[Signature]</u> <u>6-19-92</u> <u>[Signature]</u> <u>6/19/92</u>	
	CDM/DATE EDM/DATE MDM/DATE	
OTHER	<u>N/A</u>	<u>N/A</u>
**SAR CHANGE	()REQUIRED (X)NOT REQUIRED	
NUCLEAR SAFETY ENGINEER	<u>[Signature]</u>	<u>6-17-92</u>
PROJECT QUALITY ENGINEER	<u>[Signature]</u>	<u>6-19-92</u>
PROJECT DESIGN MGR.	<u>[Signature]</u>	<u>6-21-92</u>
PROJECT ENGINEERING MGR.	<u>[Signature]</u>	<u>6/22/92</u>

**COMPLETED BY NUCLEAR SAFETY ENGINEER

DC-2144-B

Revise Section 3.1.6. by adding section C as follows:

- C. Maximum anticipated differential settlement values for buried seismic Category 1 piping are provided in Table 1.

Add Table 1

TABLE 1
MAXIMUM DIFFERENTIAL SETTLEMENT
CATEGORY 1 BURIED PIPING

<u>Line No.</u>	<u>Interface</u>	<u>Design Differential Settlement (Inches)</u>
1-1202-029-6"	Tunnel 1T2B	0.50
1-2403-044-4"	Diesel Generator Bldg	0.80
1-2403-053-2"	Diesel Generator Bldg	0.80
1-2403-043-4"	Diesel Generator Bldg	0.41
1-2403-066-3"	DFOST Pumphouse	0.50
1-2403-069-2"	DFOST Pumphouse	0.50
2-1202-029-6"	Tunnel 2T2B	0.80
2-1202-030-6"	Tunnel 2T2B	0.80
2-2403-053-2"	Diesel Generator Bldg	0.44
2-2403-043-4"	Diesel Generator Bldg	1.00