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USNRC REGION II  
ATLANTA, GEORGIA

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Vogtle Project

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United States Nuclear Regulatory Commission  
Office of Inspection and Enforcement  
Region II - Suite 3100  
101 Marietta Street  
Atlanta, Georgia 30303

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Reference: Vogtle Electric Generating Plant - Units 1 and 2  
50-424, 50-425; Embeds - 1982 *lc*

Attention: Mr. James P. O'Reilly

Gentlemen:

On April 26, 1982, Mr. C. W. Hayes of Georgia Power Company notified Mr. Virgil Brownlee of the USNRC of a potential deficiency concerning the lack of anchor bolt thread engagement for embeds.

Georgia Power Company has conducted an evaluation and concluded that this condition represents a significant deficiency and substantial safety hazard. Based upon guidance in NUREG-0302, Rev. 1, Georgia Power Company is reporting this condition under 10CFR50.55(e). Enclosed is a copy of our evaluation.

This document does not contain any proprietary information and may be placed in the NRC Public Document Room upon receipt.

Yours truly,

*D. O. Foster*  
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DOF/CWH/skr

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EVALUATION FOR A SUBSTANTIAL SAFETY HAZARD  
EVALUATION FOR A SIGNIFICANT DEFICIENCY

Embeds 1982 - Anchor Bolt Thread Engagement

Initial Report:

On April 26, 1982, Mr. C. W. Hayes of Georgia Power Company notified Mr. Virgil Brownlee of the USNRC of a potential deficiency concerning the lack of anchor bolt thread engagement in certain types of embed assemblies. Interim reports were also filed with the NRC.

Background Information:

During an inspection of previously accepted threaded anchor embed assemblies in safety-related Class I structures, it was noted that thread engagements less than that required on the design drawings existed on some of the embed assemblies. This was reported to the NRC as a potential deficiency (see above).

Embed assemblies are placed in concrete to provide a surface for attaching structural steel used for various purposes, including such items as piping, HVAC ducts, platforms, or electrical tray supports. The capability of the threaded anchor embed assembly to support its attachments under the applicable load combinations is partially dependent upon the engagement of the anchor bolt threads into the plate nut welded to the back of the embed plate. Measurement of the thread engagement of the bolt into the nut after placement into concrete is possible through an inspection hole in the embed plate. The inspection hole is provided at each bolt location. Inspections at Georgia Power Company's Vogtle Electric Generating Plant indicated that two-hundred and twenty-two (222) assemblies had the potential of anchor bolt thread engagement problems.

### Engineering Evaluation:

The threaded anchor embed assemblies issued on the Vogt Project are based on a standard design. This design assumes that a threaded anchor bolt is screwed into a plate nut on the back of an embed plate so that full development of the bolt capacity is obtained. (Full development means that if tested to destruction the bolt will fail in tension before the threads are stripped from either the nut or the bolt.) The embed design assumes full tensile capacity of the bolt is achievable. The bolts do not have to be threaded fully within the plate nut to achieve the full tensile strength of the bolt. The amount of reduction in "full" thread engagement that is allowable depends on the bolt diameter. The acceptable reductions were incorporated into the embed design and an allowable reduction in full thread engagement was shown on the design drawing.

All embed assemblies using the threaded nut attachment details were investigated resulting in 222 embed plates with potentially deficient thread engagement problems. Of these plates, 82 have been eliminated as containing no thread engagement deficiencies. These are listed in Attachment 1 as use-as-is (75), or void (7).

The remaining 140 embed assemblies in their as-built condition are not capable of withstanding the full load rating of the standard design. Although these embed plates contain deficient bolts, seventy-five (75) are repairable, and can be restored to their full design capacity. The remaining sixty-five (65) embed assemblies cannot be restored to their full design capacity and have been derated. Engineering analyses on these 65 embed plates show that twenty (20) embeds are not capable of fulfilling their design function and forty-five (45) embeds are capable of fulfilling their design function after repair work. These 45 embeds will be derated. The remaining 20 embeds will be modified to ensure that the load ultimately applied to the embed assemblies is within the actual capacity of the plate.

### Evaluation of Reportability:

The potential failure of the embed assemblies to fulfill their design functions could have affected adversely the safety of operations of the Vogtle Electric Generating Plant. The potential failure of these embeds could have affected safety-related systems supported by the embeds. This represents a significant deficiency in the construction of safety-related systems. Since safety-related systems may not have been able to perform their intended safety function, this concern also represents a potential safety hazard.

### Corrective Action:

Briefly, seventy-five (75) embed plates were dispositioned use-as-is and seven (7) embed plates were classified void. There are no problems associated with these eighty-two (82) embed assemblies.

Of the remaining one-hundred and forty (140) embed plates, seventy-five (75) embed assemblies with bolts that are repairable will be restored to 100 percent of their design capacity. This repair is accomplished by drilling a hole equal to the bolt diameter through the embed plate and nut to the end of the bolt. The bolt is then welded to the nut and embed plate by plug welding. For the bolts to be repairable, the bolts should have at least 40 percent of specified thread engagement. The 40 percent cutoff was determined by applying conservative judgement to the effectiveness of the type of welding.

An engineering evaluation of the sixty-five (65) embed assemblies containing at least one non-repairable or inaccessible bolt has been performed. These embed assemblies may also contain repairable bolts. These bolts are repaired to regain 100 percent of their design capacity. The bolts with less than 40 percent of specified thread engagement are assumed to have no capacity and no repairs are performed on them. Calculations have been completed that

indicate that forty-five (45) of these embed assemblies are adequate for present but not necessarily design loads after repair work on bolts is completed. The remaining twenty (20) embed assemblies are inadequate for present loads. Design modifications are in progress on these twenty (20) assemblies to modify the embed assemblies or the support attachments to ensure that the load ultimately applied to the embed assemblies are within the actual capacity of the assembly. The 65 embed plates will remain derated throughout the plant life. A control system is being implemented to control the use of these embed plates for the life of the plant. This system will prevent any change in load or attachment from being made without prior evaluation and concurrence from the responsible engineering group. The system consists of notes on embed drawings (individual embed plates are specifically identified), a control stamp on all related attachment design drawings using the embed plates and a control log.

Additionally, Georgia Power Company has conducted the following programs:

- Completed training program for all GPC engineering and inspection personnel in the fall of 1982.
- Training sessions held for all craft supervision and foremen in the summer of 1982.
- Emphasized in training sessions past history and implications if problems are not avoided for further installations.
- Followups in craft "gang box meetings" and inspector group meetings are being carried out and documented.
- Specific certification for embed inspection has been developed for all inspectors involved with embed installation.
- Followup audits by QA, QC, Civil groups are being performed.
- New practice of assuring removal of all blast sand from inspection hole and verification that full thread engagement can be obtained is being carried out prior to issuance of embeds to the field installation crews.

DISPOSITION OF EMBED PLATES

ATTACHMENT 1

Embed  
Sequential Number

Disposition

1	Derate
2	Derate
3	Use as is
4	Use as is
5	Use as is
6	Use as is
7	Use as is
8	Use as is
9	Repairable
10	Repairable
11	Use as is
12	Use as is
13	Use as is
14	Derate
15	Use as is
16	Use as is
17	Void
18	Use as is
19	Derate
20	Derate
21	Use as is
22	Use as is
23	Use as is
24	Use as is
25	Derate
26	Use as is
27	Use as is
28	Derate
29	Use as is
30	Derate
31	Derate
32	Use as is
33	Use as is
34	Derate
35	Derate
36	Derate
37	Derate
38	Repairable
39	Use as is
40	Use as is
41	Repairable
42	Derate
43	Derate
44	Repairable
45	Repairable
46	Use as is
47	Use as is
48	Use as is
49	Use as is
50	Use as is
51	Use as is
52	Use as is
53	*
54	*
55	*

Embed  
Sequential Number

Disposition

56	*
57	*
58	*
59	Repairable
60	Use as is
61	*
62	*
63	*
64	*
65	*
66	*
67	Use as is
68	Use as is
69	Derate
70	Use as is
71	Use as is
72	Use as is
73	Derate
74	Derate
75	Use as is
76	Derate
77	Derate
78	Repairable
79	Void
80	Use as is
81	Use as is
82	Void
83	Void
84	Void
85	Repairable
86	Repairable
87	Use as is
88	Use as is
89	Use as is
90	Use as is
91	Repairable
92	Derate
93	Repairable
94	Repairable
95	Repairable
96	Use as is
97	Use as is
98	Use as is
99	Use as is
100	Use as is
101	Use as is
102	Repairable
103	Use as is
104	Repairable
105	Use as is
106	Derate
107	Repairable
108	Derate
109	Derate
110	Repairable
111	Derate
112	Derate

Embed  
Sequential Number

Disposition

113	Derate
114	Derate
115	Derate
116	Derate
117	Derate
118	Derate
119	Derate
120	Derate
121	Use as is
122	Repairable
123	Repairable
124	Repairable
125	Use as is
126	Use as is
127	Use as is
128	Repairable
129	Repairable
130	Repairable
131	Repairable
132	Use as is
133	Repairable
134	Derate
135	Repairable
136	Repairable
137	Repairable
138	Repairable
139	Repairable
140	Repairable
141	Repairable
142	Repairable
143	Use as is
144	Repairable
145	Repairable
146	Repairable
147	Repairable
148	Repairable
149	Repairable
150	Use as is
151	Repairable
152	Use as is
153	Repairable
154	Use as is
155	Repairable
156	Repairable
157	Repairable
158	Repairable
159	Repairable
160	Void
161	Void
162	Repairable
163	Repairable
164	Repairable
165	Repairable
166	Repairable
167	Repairable

Embed  
Sequential Number

Disposition

168	Derate
169	Repairable
170	Repairable
171	Repairable
172	Derate
173	Repairable
174	Repairable
175	Derate
176	Use as is
177	Use as is
178	Use as is
179	*
180	*
181	*
182	*
183	*
184	*
185	*
186	*
187	Derate
188	Derate
189	Derate
190	Repairable
191	Repairable
192	Repairable
193	Repairable
194	Derate
195	Repairable
196	Repairable
197	Use as is
198	Repairable
199	Repairable
200	Use as is
201	Use as is
202	Repairable
203	Repairable
204	Use as is
205	Use as is
206	Use as is
207	Repairable
208	Repairable
209	Derate
210	Use as is
211	*
212	Derate
213	Repairable
214	Repairable
215	Repairable
216	Use as is
217	Repairable
218	Repairable
219	Use as is
220	Use as is

Embed  
Sequential Number

Disposition

221  
222

Use as is  
Use as is

Note: Void indicates no problems associated with an embed.

\* - Indicates that embed plates will be derated to an acceptable capacity by either modifying supports or by adding plate stiffeners.

A listing of embeds by sequential number is maintained at the construction site by Mr. John Stanley or Mr. Nelson Brooks.