



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

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APR 11 1980

Docket No.: 50-367

Mr. H. P. Lyle, Vice President  
Electric Production and Engineering  
Northern Indiana Public Service Company  
5265 Hohman Avenue  
Hammond, Indiana 46325

Dear Mr. Lyle:

SUBJECT: AGENDA FOR THE APRIL 17, 1980, MEETING REGARDING THE SAFETY-RELATED FOUNDATION PILES

Enclosed are draft regulatory staff positions (RSP) and draft requests for additional information which we intend to use as the agenda of our meeting with you on April 17, 1980. During the course of this meeting on the safety-related foundation piles, we anticipate that our discussion will lead to the subsequent issuance of these positions and questions on a formal basis.

Sincerely,

A handwritten signature in cursive script that reads "L. S. Rubenstein".

L. S. Rubenstein, Acting Chief  
Light Water Reactors, Branch No. 4  
Division of Project Management

Enclosure:  
As stated

cc: See next page

Northern Indiana Public Service Company

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REGULATORY STAFF POSITIONS  
AND  
REQUESTS FOR ADDITIONAL INFORMATION

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1.  
(RSP)

We require that you adopt an additional driving criteria for the safety-related production foundation piles; namely, that these piles be driven to a final resistance of at least 60 blows for the last three inches.

2.  
(RSP)

We require that you redrive all indicator and heave test piles driven in the 1978 indicator pile program so that they meet the driving criteria specified in Item 1 above, unless they originally met this criteria, and also all production piles redriven after heave. Additionally, we require you to submit, for our review and acceptance, your evaluation of the potential for relaxation and the corresponding reduction in load-bearing capability of these redriven piles. Production pile driving may be started, in a selected area, before you complete the entire redriving program for the indicator piles if the redriving is completed and a favorable evaluation of the redriving is made for that selected area.

3.  
(RSP)

We require that you submit sample driving records for the redriven indicator piles and of the production piles during the course of this work. We further require you to continuously review and modify, as necessary, the contours of the bearing layer.

4  
(RSP)

We require that you complete the pipe pile densification of those areas whose soil density was reduced due to pre-construction

# DRAFT

activities (i.e., either by jetting or by pulling of piles) prior to placing any production piles in the areas so affected. In particular, driving of production piles in these affected areas will not be permitted until after we have reviewed and approved your submittal demonstrating an acceptable level of densification has been achieved. Further, we require you, to the maximum extent practicable, to place the production piles in those areas affected by pre-construction activities prior to placing production piles in the unaffected areas of the site. In this regard, provide your proposed production pile driving sequence with due consideration for our positions in this item and in Item 2 above. Provide a detailed drawing of the site showing the pile locations, including a unique identification scheme for all safety-related piles. Submit your densification program and describe, by reference if possible, your proposed methods to determine whether the areas affected by pre-construction activities have been acceptably densified by the proposed pipe piles.

5.  
(RSP)

While we will accept slightly greater pile placement tolerances than those proposed (i.e.,  $\pm 3$  inches in horizontal location,  $\pm 10$  degrees in rotation and 2 percent out of plumb) on no more than ten percent of all safety-related piles, we require you to have each of the piles exceeding the above specified placement tolerances to be cited in a non conformance report (NCR) by your QA organization and to be reviewed and approved

by an appropriate structural engineer. In no foreseeable instance, however, will we accept pile placement tolerances which exceed  $\pm 12$  inches in horizontal location,  $\pm 20$  degrees rotation or 4 percent out of plumb. In this regard, we require you to submit a description of this structural engineer's technical background and experience for our approval.

6.  
(RSP)

We require that you provide a minimum vertical separation of three feet for field splices in adjacent piles. This requirement is in addition to our previous requirement prohibiting any field splices in the upper 30 feet of the safety-related piles.

7.  
(RSP)

We require that you perform field bending of reinforcing steel bars in the foundation mat, if this is necessitated by pile placement tolerances, in accordance with approved structural codes. In this regard, indicate the specific structural code which you will adopt for this matter.

8.  
(RSP)

We require that you abandon rather than pull, any pile which is driven greater than 10 feet but which does not comply with any of the required pile criteria. In abandoning such piles, we require you to cut these piles off at an elevation at least 12 inches below the bottom grade of the foundation mat. For those piles which are pulled, we require you to recompact the

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soil if the pulled pile disturbs the soil more than a few inches from the pile (i.e., the pile does not pull cleanly, thereby disturbing a typical cone of soil). In this regard, provide your proposed criteria for recompacting the soil down to a maximum depth of ten feet.

9.  
(RSP)

We require that you have a qualified inspector on duty, as described in your QC manual, for each pile driving rig in operation. We further require that you submit the qualifications of each such inspector(s) to NRC with copies to NRR for our approval prior to any driving of safety-related piles.

10.  
(RSP)

We require that you conduct inspections for pile heave at a distance of at least 50 feet from each pile being driven, including the piles being redriven. We further require that you monitor for heave the pipe piles used for densification in those areas affected by pre-construction activities.

11.  
(RSP)

We require that you monitor the settlements of all portions of the foundation mat during the construction of the Bailly plant. To facilitate unambiguous settlement measurements, we further require that you establish at least four permanent bench marks anchored into the underlying bedrock outside the construction area. The elevations of these bench marks are to be established prior to any pile driving. Finally, we require that you document and submit to the NRC with copies

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to NRR, periodic settlement measurements at significant stages of the plant's construction; e.g., prior to, during and after pouring of the foundation mat, partial construction of the buildings, placement of major internals such as the reactor pressure vessel and completion of the buildings. In this regard, provide a description of your proposed settlement monitoring program.

12.  
(RSP)

We require that you perform at least two tests designed to determine the long-term load bearing capacity of the safety-related piles. Specifically, we require that you perform these long-term load tests for a time period of at least 96 hours or until the rate of settlement is determined to be less than 0.01 inches per day measured over at least a 24 hour period. We require that the load in this particular test be twice the sum of dead load plus live load. Submit your proposed long-term load test program in conformance with our positions on this matter and modify your QC manual accordingly.

13.  
(RSP)

We require you to perform a number of load tests on the production piles in the manner presently described in your QC manual. These test piles must include:

- a. At least one pile with a Type "A" driving record (i.e., a rapid increase in driving resistance near the final elevation);

- b. at least one pile with a Type "B" driving record (i.e., an increase in driving resistance, followed by a decrease in driving resistance culminating in a rapid increase in driving resistance near the final elevation); and
  - c. at least two piles in those areas affected by pre-construction activity;
  - d. at least two piles redriven after having failed to meet the acceptance criteria for heave;
- In addition, we require you to perform:
- e. at least two lateral load tests; and
  - f. at least two uplift load tests.

These load tests must be scheduled to be performed in a periodic manner throughout the pile placement program. Where appropriate, a pile may be used for more than one of the required tests described above. In this regard, we require you to submit your basis for selecting the short-term load test piles to NRC with copies to NRR for our review and approval prior to performing these tests. Since additional short-term load tests may be required, depending on our review of the short-term load tests described above, you should provide the capability to perform these additional pile load tests.

14.  
(RSP)

We require that you include documentation of the pile cushion (i.e., the wire rope assemblage) behavior in the pile driving records established as part of your QC program. We also require you to modify your QC program and to submit your revised QC manual prior to starting placement of the production piles.

15.  
(RSP)

We consider it necessary to have a qualified NRC pile inspector on site during pile driving. The staff and its consultants also need to witness both typical and critical items of foundation construction. Accordingly, we require that you provide appropriate support facilities and services on the site for these activities.

16.

Describe your proposed construction sequence for the Bailly foundation, including excavation, pile driving, backfilling to mat subgrade, mat construction, dewatering and other significant activities. Discuss in detail, the following considerations:

- a. Closely spaced piles which will require special backfilling and compaction procedures;
- b. piles on or near construction slopes which will tend to move toward or down the slope;

- c. temporary sheeting and shoring measures;
- d. piles driven from an elevation above their final grade will be subject to a surcharge which will not be present during their service life.

17. In the indicator pile program, some piles were cased from ground surface down to the proposed mat subgrade elevation in order to eliminate frictional resistance in this zone. However, the surcharge effects (i.e., the increased effective confining pressures) on the piles at lower depths were present on indicator piles but will not be present during plant service. Provide analyses and calculations which demonstrate that after removal of the surcharge loading, the production piles will have an adequate factor of safety in service.

18. We are concerned that if the flanges of the piles are deformed during driving, the reduction in effective butt area may result in driving stresses exceeding the pile butt yield stress thereby reducing the effective driving energy reaching the pile tip. Accordingly provide criteria, including justification, which will ensure that during the last five feet of driving, the pile butts will be trimmed if the flanges at the butt are excessively deformed.