Energy Technology Engineering Center
Energy Systems Group
P.O. Box 1449
Canoga Park, CA 91304
(213) 341-1000

Operated for U.S. Department of Energy

Rockwell International

July 30, 1980 80ETEC-DRF-3195

Mr. A. J. Cappucci, Jr.
Mechanical Engineering Branch
Division of Engineering
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Review of Underground Utilities Section of "Interagency Agreement No. NRC-03-79-167, Task No. 1 - Midland Plant Units 1 and 2, Subtask No. 1 - Letter Report".

References: 1) "Responses to the NRC 10 CFR 50.54(f) Request Regarding Plant Fill for Midland Plant Units 1 and 2, Consumer Power Company, Docket Numbers 50-329 and 50-330", Rev. 6, April 1, 1980

2) ETEC Ltr 80ETEC-DRF-0123, "Review of Response to 10 CFR 50.54 Request on Plant Fill for Midland Plant, Units 1 and 2", J. O. Bates to A. J. Cappucci, January 17, 1980

Dear Mr. Cappucci:

Per your request, we have reviewed Section g, Underground Utilities, of the subject report and in general concur with the concerns therein. Of the 8 items, (a) through (h), in the subject section the following comments are submitted on the 4 considered pertinent to the MEB.

ITEM	COMMENTS
g(a)	Methods of measuring in-situ stresses in the pipes should be investigated. Also, local crippling should be noted if visual examination is feasible.
g(c)	The calculation of the 130,000 p.s.i. stress based on the profile of the 26"-OHBC-54 Line, Figure 19-1 of Reference 1, is correct using the procedure described. However, item 3 of Reference 2 states that this method assumes that the curvature is constant over the length of the pipe and in general, this condition will not be met.

8406070360 840517
PDR FOIA
RICE84-96 PDR

CP Co. Depos. exhibit # 3
(Olsen) 1/21/81

ITEM COMMENTS

g(c) Cont. In an effort to determine a more realistic stress value for the 26"-OHBC-54 Line, the profile as shown in Fig. 19-1 of Reference 1 was analysed by an ETEC in-house piping computer program. The resulting maximum stress from this analysis was 212,200 p.s.i. and occurs at the dip approximately 50 feet from the left side of the diagram. In an attempt to verify the computer output, a simple hand calculation was made of the stresses in this area. The maximum stress from these calculations was 193,200 p.s.i. The maximum stress in this line per Table 17-2 is 22,000 p.s.i. Since there was such a discrepancy between the ETEC calculations and the applicant's calculations on Line 26"-OHBC-54, the stresses in several other Lines were determined based on the profiles of Figs. 17-2 and 19-1. These stresses were calculated assuming both fixed end and simply supported end conditions. If a line was attached to a much larger line, heavy equipment, or clamped in a building penetration, the end would tend to be fixed. The results of this analysis are shown below. The stresses shown are based on an elastic analysis and are not true stresses as in some cases they far exceed the yield stress of the piping material.

LINE NO.	FIG. NO.	MAX. STRESS (psi) FIXED ENDS	SIMPLY SUPPORTED ENDS	MAX. STRESS (psi) FROM TABLE 17-2
26"-OHBC- 54	19.1	212,200	212,200	22,000
8"-IHBC- 81	19.1	84,700	85,000	17,700
26"-OHBC- 55	17.2	180,000	46,000	27,000
20"-1HCD-169	17.2	192,000	192,000	22,000

The stresses shown are the maximum. The stresses in other areas of these lines also exceed those calculated by the applicant.

The bending stresses shown due to deflection are not the only stresses of concern in these lines. The external crushing loads required to cause the pipe deformations as shown in Figs. 17.2 and 19.1, especially in the areas of a sudden change in slope, will be quite high. The applicant's response to Question 34 concerning external loads does not consider the external loads required to deform the pipe as shown in Figs. 17.2 and 19.1.

In the response to Question 17, the applicant states: "pipe buckling due to compressive loads such as in the case of columns is not possible in this case." This

ITEM	COMMENTS
g(c) Cont.	in all probability is true, however, it would appear that there is a high probability of local crippling stresses occurring in the large diameter pipes in areas where there is a sudden change in the slope, such as at building penetrations, attachments to heavy equipment, and sharp dips in the pipe profile. More detail is required as to the applicants method of determining settlement stresses in the piping so that the above discrepancies in the stresses can be reconciled. Also, justification is required for not considering local crippling stresses, and crushing loads, required to deform the pipes per Figs. 17-2 and 19-1. The comment regarding the Stress Intensification Factor (S.I.F.), i, is not understood. The 52.5 ksi allowable stress in Table 17-2 is independent of the S.I.F. The S.I.F. is applicable only for calculated stresses and has the value 1.0 for straight pipe. However, the S.I.F. may be greater than 1.0 at elbows. ETEC agrees that more than one critical stress location is possible along a given pipeline in the sense that the allowable stress is exceeded. In general, only the maximum stress is of importance if the allowable stress is not exceeded anywhere. However, in this instance, since the calculated stresses are so high, portions of the piping where the allowable has been exceeded are of interest.
g(d)	This item is concerned with the rattle space at building penetrations. We share this concern. If the piping is hung up in the penetration area causing a sharp change in slope, some very high local stresses could occur causing local crippling or rupture. The pipe is sloping as it enters the building due to the settlement. The question arises as to how this sloping pipe is joined to the piping and/or components inside the building without causing excessive loads.
g(e)	The implications for Section 3.10 of the SRP should be evaluated.

Sincerely yours,

for R. F. Schmitz [signature]

J. O. Bates, Program Manager
Energy Programs Office
Energy Technology Engineering Center

cc: Mr. R. J. Bosnak - NRC
Mr. H. L. Brammer - NRC

Distribution

_Adler, KL	_Granger, RA	_Zweig, HR
_Akamine, KS	_Hall, J	_Zweng, DJ
_Anderson, WG	_Haroldsen, OO	X Wieseneck, HC
_Archbold, P	_Hinze, RB	X Brammer, JM
_Atz, RW	_Hoffman, NJ	
X Auge, LJ	_Holwager, TL	
_Baker, RS	_Homer, RS	
_Balkwill, JK	_Hutmacher, ES	
_Barber, HE	_Ingle, WB	
_Barrett, EM	_Jassak, RM	
X Bates, JO	_Johnson, Ron A	
_Bierfreund, AI	_Karwowski, A	
_Boise, MW	_Kern, AO	
_Bryan, RL	_Klea, JA	
_Budney, GS	_Klein, A	
_Burns, WE	_Larson, DA	
_Campbell, DR	_Leppard, JA	
_Carpenter, DM	_Mantle, JG	
X Chen, WP	_Marrazzo, NA	
_Cleveland, JR	_McCarty, JW	
_Cochran, JC	_McDowell, MW	
_Copeland, LB	_Meyer, JH	
_Cox, FJ	_Miller, AE	
_Cusimano, S	_Miller, NJ	
_Cygan, R	_Naish, RK	
_Darley, DK	_Neely, HH	
_Davis, KA	_Nicholson, JO	
_DeBear, WS	_Olson, PS	
_DeMuri, RJ	_Parks, JC	
_DeVita, V	_Penman, RB	
_DeWitt, HW	_Peters, WL	
_DeZotell, ML	_Pilling, BS	
_Dewart, WG	_Polino, DL	
_Donohue, HF	_Poucher, FW	
_Douglas, RE	_Roberts, JK	
_Drazich, NH	_Rock, WF	
_Droher, JJ	_Schmidt, GL	
_Eichelberger, RL	X Schnurstein, RE	
_Ervin, G	_Shepard, RC	
_Fenton, RE	_Shinnaman, S	
_Ferguson, E	_Skogstad, L	
_Fischer, BE	_Soucy, RC	
_Fletcher, FL	_Stafford, KT	
_Forster, EG	_Stearns, JD	
_Freede, WJ	_Sturtevant, WC	
_Garland, MD	_Tabor, W	
_Gaylord, GG	_Tessier, MJ	_A/C Coordinator
_Gilder, TE	_Thompson, EG	x DRF Control
_Gillies, BB	_Twa, GJ	_Library
_Glumace, RJ	_Wagner, RK	_Prog. Adm. (SS)
_Goggin, DE	_Weigand, MA	_Purchasing (SS)
_Gould, MI	_Werth, RL	_Safety (SS)
_Graner, SG	_Wiese, RW	x With enclosure

FORM 735-A-174 REV 8-79

ETEC LETTER REVIEW RECORD

Prepared by: J. M. Brammer (J.O. Bates)

Typed by: Cecilia

Addressee: Mr. A. J. Cappucci Jr.

TWX/Ltr No.: 80 ETEC-DRF-3195

Date: July 30, 1980

DOE Lead Branch: .

Completes action in: DRF-___-___

Subject: Review of Underground Utilities Section of "Interagency Agreement No. NRC-03-79-167, Task #1-Midland Plant Units 1 & 2, Subtask #1 - Letter Report."

Req. action: _ETEC _Other _None

Remarks:

Department/Unit	Rev./ Appr.	Signature
Vice President		
Mgr, Facil.Des.	X	[signature]
Mgr, Stress	X	W. Chen
Mgr, Test Eng.		
Mgr, QA		
Mgr, Construct.		
Mgr, Tech.Serv.		
Mgr, Operations		
Prog/Proj Mgmt	X	R.E. Schnurstein
Other		
Brammer, JM	X	J Brammer

ITEM	COMMENTS
g(c) Cont.	in all probability is true, however, it would appear that there is a high probability of local crippling stresses occurring in the large diameter pipes in areas where there is a sudden change in the slope, such as at building penetrations, attachments to heavy equipment, and sharp dips in the pipe profile. More detail is required as to the applicants method of determining settlement stresses in the piping so that the above discrepancies in the stresses can be reconciled. Also, justification is required for not considering local crippling stresses, and crushing loads, required to deform the pipes per Figs. 17-2 and 19-1. The comment regarding the Stress Intensification Factor (S.I.F.), i, is not understood. The 52.5 ksi allowable stress in Table 17-2 is independent of the S.I.F. The S.I.F. is applicable only for calculated stresses and has the value 1.0 for straight pipe. However, the S.I.F. may be greater than 1.0 at elbows. ETEC agrees that more than one critical stress location is possible along a given pipeline in the sense that the allowable stress is exceeded. In general, only the maximum stress is of importance if the allowable stress is not exceeded anywhere. However, in this instance, since the calculated stresses are so high, portions of the piping where the allowable has been exceeded are of interest.
g(d)	This item is concerned with the rattle space at building penetrations. We share this concern. If the piping is hung up in the penetration area causing a sharp change in slope, some very high local stresses could occur causing local crippling or rupture. The pipe is slopping as it enters the building due to the settlement. The question arises as to how this slopping pipe is joined to the piping and/or components inside the building without causing excessive loads.
g(e)	The implications for Section 3.10 of the SRP should be evaluated.

Sincerely yours,

J. O. Bates, Program Manager
Energy Programs Office
Energy Technology Engineering Center

CPCo Depos exhibit #4
C(em) 1/21/81

TO A. J. Cappucci COMPANY N.R.C.

DATE 7/24/80 NO. OF PAGES (EXCLUDING COVER SHEET) 1

FROM: ENERGY TECHNOLOGY ENGINEERING CENTER, CANOGA PARK, CA

Paul Chen PHONE EXTENSION

ETEC

TELECOPIER NO.: (213) 341-1000 EXT 6349 VERIFY: EXT 6534

WHEN TRANSMITTING TO THE ETEC PLEASE NOTE:
OUR MACHINE IS A XEROX 410 AUTOMATIC. PLEASE SEND AT YOUR 6 MIN/PAGE SETTING.
(Formerly Liquid Metal Engineering Center - LMEC)

XMTD BY
FAX 7/24/80
12:40 EO