DEC 8 1986

Docket Nos.: 50-528, 50-529
and 50-530

LICENSEE: Arizona Public Service Company

FACILITY: Palo Verde, Units 1, 2 and 3

SUBJECT: SUMMARY OF MEETING ON MASONRY WALLS

A meeting was held in Bethesda, Maryland on August 28, 1986, with representatives of the licensee. The purpose of the meeting was to discuss the licensee's evaluation of the adequacy of certain masonry walls at Palo Verde. The meeting was a follow-up to the August 20, 1986 meeting on the same subject (see Meeting Summary, dated October 6, 1986). Enclosure 1 lists the meeting attendees and the meeting is summarized as follows:

Summary

The licensee's presentation was based on the viewgraphs provided as Enclosure 2. The licensee stated that, following the August 20, 1986 meeting, it has been performing further research and evaluations to address the staff's concerns regarding the adequacy of the masonry walls at the 74 foot elevation of the Palo Verde Control Building. The specific concerns and the licensee's additional efforts are identified in Enclosure 2.

The licensee indicated that it plans to submit additional information for staff review after the licensee completes its additional evaluations. The staff stated that it would review any material submitted by the licensee. The staff indicated, however, that based on its preliminary understanding of the additional efforts being undertaken, it did not expect that its concerns would be resolved solely by analysis of the as-built condition of the 74 foot elevation masonry walls.

/S/

E. A. Licitra, Project Manager
PWR Project Directorate No. 7
Division of PWR Licensing-B

Enclosures:
As stated

cc: See next page

PD7 EAL
EALicitra/yt
12/5/86

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GWKnighton
12/5/86

Mr. E. E. Van Brunt, Jr.
Arizona Nuclear Power Project

Palo Verde

cc:
Arthur C. Gehr, Esq.
Snell & Wilmer
3100 Valley Center
Phoenix, Arizona 85073

Mr. James M. Flenner, Chief Counsel
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

Charles R. Kocher, Esq. Assistant
Council
James A. Boeletto, Esq.
Southern California Edison Company
P. O. Box 800
Rosemead, California 91770

Mr. Mark Ginsberg
Energy Director
Office of Economic Planning
and Development
1700 West Washington - 5th Floor
Phoenix, Arizona 85007

Mr. Wayne Shirley
Assistant Attorney General
Bataan Memorial Building
Santa Fe, New Mexico 87503

Mr. Roy Zimmerman
U.S. Nuclear Regulatory Commission
P. O. Box 239
Arlington, Arizona 85322

Ms. Patricia Lee Hourihan
6413 S. 26th Street
Phoenix, Arizona 85040

Regional Administrator, Region V
U. S. Nuclear Regulatory Commission
1450 Maria Lane
Suite 210
Walnut Creek, California 94596

Kenneth Berlin, Esq.
Winston & Strawn
Suite 500
2550 M Street, NW
Washington, DC 20037

Ms. Lynne Bernabei
Government Accountability Project
of the Institute for Policy Studies
1901 Que Street, NW
Washington, DC 20009

Mr. Ron Rayner
P. O. Box 1509
Goodyear, AZ 85338

Mr. Charles B. Brinkman, Manager
Washington Nuclear Operations
Combustion Engineering, Inc.
7910 Woodmont Avenue Suite 1310
Bethesda, Maryland 20814

Enclosure 1

PALO VERDE MASONRY WALLS
MEETING ATTENDEES
(August 28, 1986)

Name	Affiliation
Manny Licitra	NRC/NRR/PBD7
Bill Quinn	ANPP Mgr. Licensing
Ken Schechter	Bechtel Civil/Struct. Eng.
Ahmad Hamid	Drexel University
Stephen Triolo	Franklin Research Center
John Ma	NRC/NRR/EB
Dennis Crutchfield	NRC/NRR/PWRB
C. Y. Cheng	NRC/NRR/PWRB/EB
Mark Hartzman	NRC/NRR/PWRB/EB
Mike Davis	NRC/NRR/PBD7
R. M. Butler	ANPP Director Technical Services
Lucien Hersh	Bechtel C/S Chief Eng.

Enclosure 2

PRESENTATION ON MASONRY WALLS
FOR THE
PALO VERDE NUCLEAR GENERATING STATION

UNITS 1, 2 AND 3

AUGUST 28, 1986

AGENDA

I. INTRODUCTION

II. CONCERNS

A. NRC

B. ANPP

III. RESOLUTION OF CONCERNS

IV. APPLICABILITY OF TEST DATA

V. RESULTS

VI. CONCLUSIONS

II. CONCERNS

A. NRC

-FREQUENCY SENSITIVITY TO ASSUMED PARAMETERS

-I 3-STAGE NOT SUPPORTED BY TESTS

-INADEQUATE MARGINS

-SCHEDULE

B. ANPP

-WALLS ARE SAFE BUT UNACCEPTABLE TO NRC

-APPLICATION OF CODE ALLOWABLES

-AGGRESSIVE CONSTRUCTION ACTIVITY

-CONSTRUCTION IMPACT ON SAFETY OF OPERATING PLANT

CONSTRUCTION IMPACT ON SAFE OPERATION

- MULTIPLE SAFETY RELATED COMPONENTS PENETRATING AND ATTACHED TO WALL, OR IN IMMEDIATE VICINITY.
- HOWEVER, MINIMAL SAFE SHUTDOWN RELATED COMPONENTS SUPPORTED FROM DIRECTLY OFF WALL OR PENETRATING WALL.
- STRINGENT WORKING CONDITIONS REQUIRED TO MINIMIZE THE RISK OF DAMAGE TO SAFETY RELATED COMPONENTS.
- CONSTRUCTION RISK IS ORDERS OF MAGNITUDE HIGHER THAN THE RISK ASSOCIATED WITH SSE.

III. RESOLUTION OF CONCERNS

-REVIEW AVAILABLE TEST DATA AND ITS APPLICABILITY

- ° A. HAMID'S PAPER
  - COMPARISON OF SPECIMENS TEST BY A. HAMID AND PVNGS WALLS
- ° ATKINSON, NOLAND & ASSOC. REPORT
  - MODULUS OF RUPTURE FROM WALL TESTS
- ° SONGS 1 DYNAMIC TESTING
  - COMPARISON OF PVNGS METHODOLOGY TO SONGS 1 TEST DATA

-REVIEW OF EXISTING ANALYSIS

- ° MAX. CALCULATED MOMENTS VERSUS CRACKING MOMENT
- ° WALL FREQUENCY

COMPARISON OF SPECIMENS TESTED BY A. HAMID AND PVNGS MASONRY WALLS

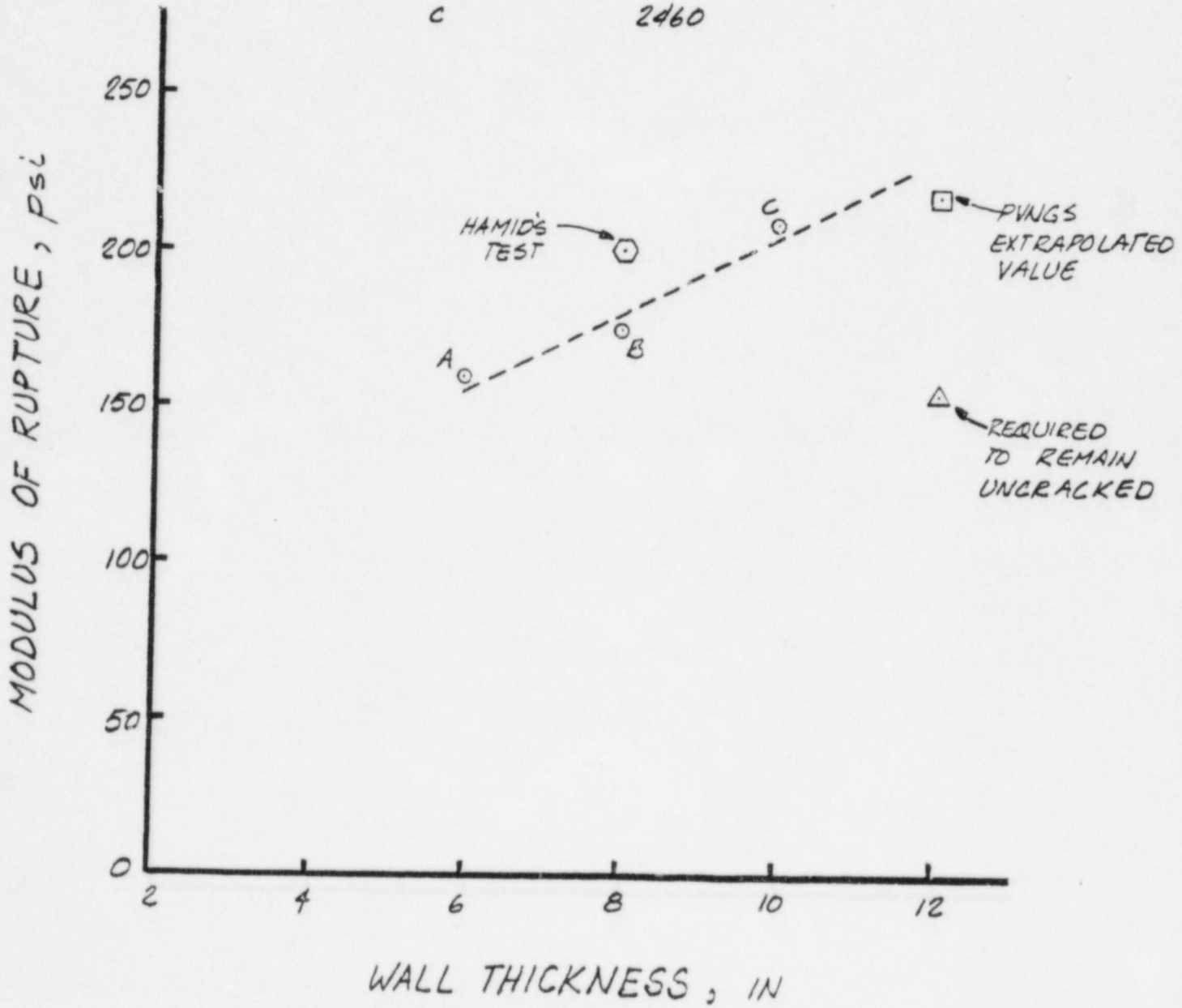
	TEST (1)	PVNGS	REMARKS
GROUT STRENGTH	3060 PSI	2600+ PSI	DIFFERENCE IN GROUT STRENGTH DOES NOT SIGNIFICANTLY AFFECT f_{rm} (TEST DATA).
MORTAR STRENGTH	2520 PSI	2200-2800 PSI	PVNGS VALUES ARE SIMILAR TO TEST DATA.
MASONRY STRENGTH	3640 PSI	2000 PSI	DIFFERENCE IN MASONRY STRENGTH DOES NOT AFFECT f_{rm} SINCE FAILURE OCCURS AT BED JOINTS.
REINFORCEMENT	NONE	REINFORCED	f_{rm} IS INDEPENDENT OF REINFORCEMENT.
BLOCK SIZE	8"x8"x16"	4"x12"x16"	LOWER HEIGHT OF PVNGS UNITS REDUCES STRESS CONCENTRATIONS.
MODULUS OF RUPTURE-MEAN (f_{rm})	203 PSI	APPLICABLE	FULLY GROUTED CELLS HAVE HIGHER f_{rm}.
STANDARD DEVIATION	34 PSI	APPLICABLE	ACCOUNTS FOR UNCERTAINTIES
MODULUS OF RUPTURE (f_{RM} - 1.0σ)	169 PSI	APPLICABLE	REALISTIC VALUE FOR PNVGS ANALYSIS

REFERENCE: (1): EFFECT OF GROUTING ON THE FLEXURAL TENSILE STRENGTH OF CONCRETE BLOCK MASONRY BY ROBERT G. DRYSDALE AND AHMAD A. HAMID.

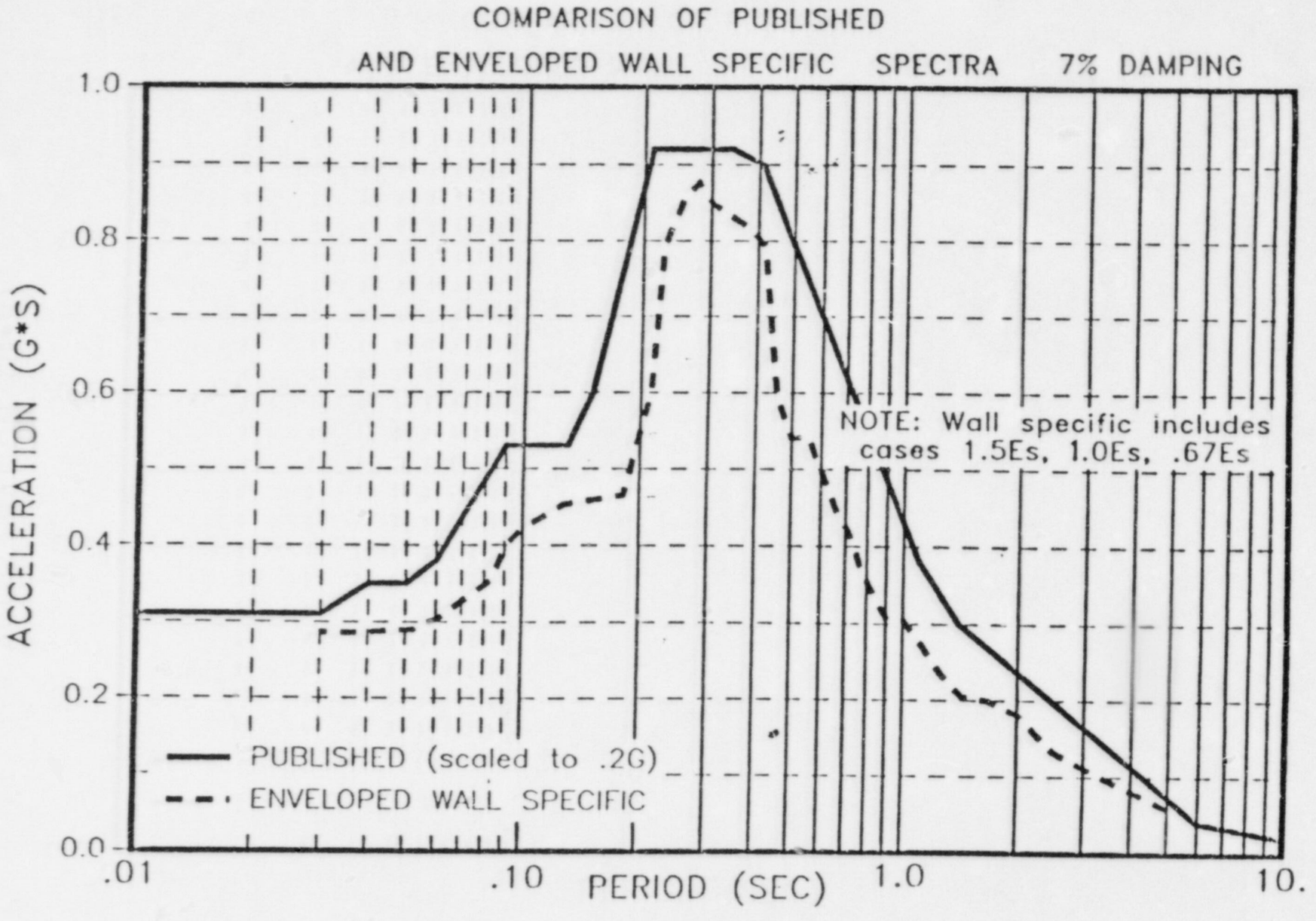
MODULUS OF RUPTURE FROM WALL TESTS VS. WALL THICKNESS

(BASED ON ATKINSON, NOLAND & ASSOCIATES REPORT)

POINT	f'_m, psi
A	3185
B	2595
C	2460



AVERAGE BETWEEN ELEVATIONS 74 & 100



IV. RESULTS

-TEST RESULTS SUPPORT $f_{rm} > 2.5\sqrt{f'_m}$

- A. HAMID'S PAPER: 203 PSI
- ATKINSON, NOLAND & ASSOCIATES' REPORT: 219 PSI FOR f'_m = 2000 PSI

-BASED ON USE OF REALISTIC f_{rm}

- $M_a < M_{cr}$
- MAXIMUM TENSILE STRESS = 155 PSI

-MARGINS TO ACCOUNT FOR UNCERTAINTIES

- MARGIN IN STIFFNESS IS 65% (F=6.8 VERSUS 5.3)
- MARGIN BETWEEN M_a AND M_{cr} TO ACCOUNT FOR UNCERTAINTIES

V. CONCLUSIONS

-WALLS ARE ACCEPTABLE BASED ON JUNE ANALYSIS

- ° CODE ALLOWABLES MET
- ° ANALYSIS INCLUDES CONSERVATISM

-JUNE ANALYSIS SUPPORTED BY CONFIRMATORY ANALYSIS

- ° CODE ALLOWABLES MET
- ° ADDITIONAL CONSERVATISM IS PROVIDED

-REVIEW OF TEST DATA VALIDATES ANALYSES

- ° CONSISTENT INDEPENDENT TEST DATA
- ° ANALYSIS IS CONSERVATIVE - HIGHER f_{rm} THAN CODE VALUE

-NRC CONCERNS RESOLVED

- ° WALL REMAINS UNCRACKED (3-STAGE MODEL IS NOT USED)
- ° FREQUENCY AWAY FROM AMPLIFIED REGION
- ° ADDITIONAL MARGIN IN FREQUENCIES AND CALCULATED MOMENTS

DEC 8 1986

MEETING SUMMARY DISTRIBUTION

Docket No(s): 50-528/529/530
NRC PDR
Local PDR
PBD-7 Reading
JPartlow
BGrimes
ACRS (10)
EJordan
Attorney, OELD
GWKnighton
Project Manager E. A. Licitra
JLee

NRC PARTICIPANTS

Manny Licitra
John Ma
Dennis Crutchfield
C. Y. Cheng
Mark Hartzman
Mike Davis

bcc: Applicant & Service List