



PHILADELPHIA ELECTRIC COMPANY

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(215) 841-4502

April 15, 1983

JOHN S. KEMPER
VICE PRESIDENT
ENGINEERING AND RESEARCH

Docket Nos. 50-352
50-353

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Request for Additional Information Regarding
Dynamic Qualification Specifications

Reference: Meeting of March 4, 1983 - PECO and NRC
Regarding Equipment Qualification

Dear Mr. Schwencer:

We are pleased to provide the information attached which was requested at the referenced meeting by Mr. G. Bagchi-NRC SQRT Group. We trust this will be helpful in your understanding of how the Limerick qualification program is implemented through the equipment specifications.

Should any additional information be required, please do not hesitate to contact us.

Very truly yours,

John S. Kemper

A048

Limited Dist

Attachment

Copy to: See attached service list

cc: Judge Lawrence Brenner (w/o enclosure)
Judge Richard F. Cole (w/o enclosure)
Judge Peter A. Morris (w/o enclosure)
Troy B. Conner, Jr., Esq. (w/o enclosure)
Ann P. Hodgdon (w/o enclosure)
Mr. Frank R. Romano (w/o enclosure)
Mr. Robert L. Anthony (w/o enclosure)
Mr. Marvin I. Lewis (w/o enclosure)
Judith A. Dorsey, Esq. (w/o enclosure)
Charles W. Elliott, Esq. (w/o enclosure)
Mr. Alan J. Noguee (w/o enclosure)
Robert W. Adler, Esq. (w/o enclosure)
Mr. Thomas Gerusky (w/o enclosure)
Director, Pennsylvania Emergency Management Agency (w/o enclosure)
Mr. Steven P. Hershey (w/o enclosure)
James M. Neill, Esq. (w/o enclosure)
Donald S. Bronstein, Esq. (w/o enclosure)
Mr. Joseph H. White, III (w/o enclosure)
Walter W. Cohen, Esq. (w/o enclosure)
Robert J. Sugarman, Esq. (w/o enclosure)
Rodney D. Johnson (w/o enclosure)
Atomic Safety and Licensing Appeal Board (w/o enclosure)
Atomic Safety and Licensing Board Panel (w/o enclosure)
Docket and Service Section (w/o enclosure)

Attachments and Explanatory Notes

Attachment 1 Material Requisition and Specification 8031-E-7 "Medium Voltage Metal-Clad Switchgear and Associated Bus Duct."

Note - Items 34, 35, and 36 of the requisition define environmental and dynamic qualification requirements for Class 1E switchgear. Also included are floor response spectra listed on Page 20 of 22 of the M/R.

Attachment 2 Material Requisition and Specification 8031-E-10 "480 Volt Load Center Unit Substations."

Note - Items 23, 24, 25, and 26 of the requisition define environmental and dynamic qualification requirements for the equipment items which are Seismic and QA Designation Class I (i.e. Class 1E).

Attachment 3 Material Requisition and Specification 8031-M-170 "Accumulator Tanks".

Note - Requirements for dynamic qualification are found in the M/R by reference to Specification 8031-G-19 and in the Specification paragraph 4.5. Design accelerations for the various load cases are provided on Attachment 16 to Specification 8031-M-170. Nozzle loads for various load cases are provided on Attachment 13 of Specification 8031-M-170.

Attachment 4 Specification 8031-M-66 "HVAC Instruments and Controls".

Note - Requirements for environmental and dynamic testing are included in paragraph 7.2, paragraph 9.4, and paragraph 9.7.

Attachment 5 Specification 8031-G-18 "Environmental Qualification of Class 1E Equipment Located in Harsh Environment."

Attachment 6 Specification 8031-G-19 "Design Assessment and Qualification of Seismic Category I Equipment and Equipment Supports and HVAC/Electrical Support Assessment for Seismic and Hydrodynamic Loads.

ATTACHMENT 1

PHILADELPHIA ELECTRIC COMPANY Page 1 of 22 pages
LIMERICK GENERATING STATION
UNITS 1 AND 2
POTTSTOWN, PENNSYLVANIA



MATERIAL REQUISITION

MATERIAL: Medium-Voltage Metal-Clad Switchgear and Associated Bus Duct

THIS MR COVERS Q-DESIGNATED ITEMS

10CFR21 IS APPLICABLE

BECHTEL AUDIT REQUIRED YES ☒ NO ☐

SHOP INSPECTION ☒ IS* ☐ IS NOT REQUIRED

COST CODE: See Items

JOB SITE DELIVERY DATE: See Notes

M/R STATUS

REV NO	DATE	REVISIONS	ORIGINATOR (NAME)	APPROVALS	T/NO
0	2/24/71	Issued for Quotation	K.J. CLARK	<i>[Signature]</i>	
1	5/5/71	Items 25, 26, 27, 28 added and issued for bids (pages 1 and 18 thru 20 only issued this Rev.)	K.J. CLARK	<i>[Signature]</i>	
2	12-7-71	Revised and Issued for Purchase	K.J. CLARK	<i>[Signature]</i>	
3	7-12-72	Revised sheets i, 1, 11, 13, 14, 15 and 16	K.J. CLARK	<i>[Signature]</i>	
4	2-2-73	Revised sheets i, 14, 15 & 16. Added Items 28, 29, 30, & Sheet 17.	K.J. CLARK	<i>[Signature]</i>	
5	6-27-73	Revised sheets i, 10, 11, 13, 14, 15, 16, 17, Released for Eng.-Items 17, 18, 19, 20, 25, 26	K.J. CLARK	<i>[Signature]</i>	
6	7-2-75	Revised Pages 2, 5, 6, 7, 8, 11, 15, 16, 17	K.J. CLARK	<i>[Signature]</i>	
7	5-10-75	Revised Pages 15, 16, 17	K.J. CLARK	<i>[Signature]</i>	
8	3/10/77	Revised Pages 15, 16, 17	K.J. CLARK	<i>[Signature]</i>	
9	5/27/77	Revised Pages 14, 15, 16	K.J. CLARK	<i>[Signature]</i>	
10	3/28/78	Added Item 31	K.J. Clark	<i>[Signature]</i>	
11	7/31/78	Added Item 32 and 10CFR21	L. LEW	<i>[Signature]</i>	
12	2/18/82	Added Items 33 thru 36	F. J. Lamb	<i>[Signature]</i>	

*Q-List: Items 7, 8, 9, 10, 11, 12, 13, 14, 33



MATERIAL REQUISITION

MATERIAL: Medium Voltage Metal-Clad Switchgear and Associated Bus Duct.

THIS MR COVERS Q-DESIGNATED ITEMS

SUPPLIER QUALITY SURVEILLANCE REQUIREMENTS

- ☐ 0 NONE ☒ 3 FULL SCOPE
☐ 1 FINAL ONLY ☐ 4 RESIDENT
☐ 2 LIMITED SCOPE BECHTEL AUDIT REQUIRED YES ☐ NO ☐

COST CODE: _____ JOB SITE DELIVERY DATE _____

M/R STATUS

REV. NO.	DATE	REVISIONS	ORIGINATOR (NAME)	APPROVALS
●	10/7/82	Quality Surveillance Requirements Added, Rev. Pg.21	F. J. Lamb	NES JBS WCM VLC B/RTM
△				
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Job 8031-E-7 Requisition No. 13
Rev. 13



PURCHASE ORDER NO.

REQUISITION NO.

8031-E-7	REV 13

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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A	1 Lot	Documentation as required by attached Forms 8031-DR. The documentation requirements set forth shall be satisfied and provided with each shipment as specified. Failure to do so will render the shipment as incomplete and payment will be adjusted accordingly.		\$	\$
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Included in itemized prices below

B	1 Lot	For each item Seller shall furnish to the expeditor, shown on page 1 of the Purchase Order, not later than thirty (30) days after release for engineering a complete schedule; forecasting engineering; material and/or sub-assembly acquisition; fabrication and/or labor; final assembly; testing, if any, and shipping date(s).			
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In addition, Seller shall furnish a progress report to the expeditor, each two weeks in sufficient detail to allow a realistic evaluation of all phases of progress toward purchase order completion.

C	1 Lot	Parts lists required shall contain the name and order number of every part for the equipment and its auxiliaries, including drawings in sufficient detail to locate and identify each part. In addition, where parts are manufactured by other than the Seller, the name of the original manufacturer and his part number shall be matched with the Seller's number on the parts lists.			
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FURNISH THE FOLLOWING MEDIUM-VOLTAGE METAL-CLAD SWITCHGEAR AND ASSOCIATED BUS DUCT EQUIPMENT PER APPLICABLE SPECIFICATIONS AS LISTED AT THE END OF THIS REQUISITION.

(Note: For revision numbers applicable to drawings and sketches referenced herein, see list of attachments toward the end of this requisition.)



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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- 1 1 Lot #10 Station Auxiliary Switchgear No. 10A103, consisting of indoor, 15 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-010
E-14

Tag for Shipment: Station Auxiliary
Switchgear No. 10A103.

Cost Code: 9E 7110.00

- 2 1 Lot #20 Station Auxiliary Switchgear No. 20A103, consisting of indoor, 15 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-010
E-14

Tag for Shipment: Station Auxiliary
Switchgear No. 20A103.

Cost Code: 9E 7110.00

- 3 1 Lot #11 Unit Auxiliary Switchgear No. 10A101, for Unit No. 1, consisting of indoor 15 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-010
E-12

Tag for Shipment: Unit Auxiliary
Switchgear No. 10A101

Cost Code: 9E 7110.00



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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- 4 1 Lot #12 Unit Auxiliary Switchgear No. 10A102, for Unit No. 1, consisting of indoor 15 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-010
E-12

Tag for Shipment: Unit Auxiliary
Switchgear No. 10A102

Cost Code: 9E 7110.00

- 5 1 Lot #21 Unit Auxiliary Switchgear No. 20A101, for Unit No. 2, consisting of indoor 15 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-010
E-13

Tag for Shipment: Unit Auxiliary
Switchgear No. 20A101

Cost Code: 9E 7110.00

- 6 1 Lot #22 Unit Auxiliary Switchgear No. 20A102, for Unit No. 2, consisting of indoor 15 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-010
E-13

Tag for Shipment: Unit Auxiliary
Switchgear No. 20A102

Cost Code: 9E 7110.00



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7 1 Lot #D11 Safeguard Switchgear No. 10A115 for Unit No. 1, consisting of indoor, 5 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011

E-15

E-20

Note: Equip all units with full height instrument compartment.

SEISMIC & QA DESIGNATION: CLASS I

Tag for Shipment: Safeguard Switchgear
No. 10A115.

Cost Code: 9E 7120.00

8 1 Lot #D12 Safeguard Switchgear No. 10A116, for Unit No. 1, consisting of indoor, 5 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011

E-15

E-20

Note: Equip all units with full height instrument compartment.

SEISMIC & QA DESIGNATION: CLASS I

Tag for Shipment: Safeguard Switchgear
No. 10A116.

Cost Code: 9E 7120.00



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ITEM NO	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
				\$	\$

- 9 1 Lot #D13 Safeguard Switchgear No. 10A117, for Unit No. 1, consisting of indoor, 5 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011

E-15

E-20

Note: Equip all units with full height instrument compartment.

SEISMIC & QA DESIGNATION: CLASS I

Tag for Shipment: Safeguard Switchgear
No. 10A117

Cost Code: 1G 7120.00

- 1 1 Lot #D14 Safeguard Switchgear No. 10A118, for Unit No. 1, consisting of indoor, 5 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011

E-15

E-20

Note: Equip all units with full height instrument compartment.

SEISMIC & QA DESIGNATION: CLASS I

Tag for Shipment: Safeguard Switchgear
No. 10A118.

Cost Code: 9E 7120.00



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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- 11 1 Lot #D21 Safeguard Switchgear No. 20A115, for Unit No. 2, consisting of indoor, 5kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011
E-16

Note: Equip all units with full height instrument compartment.

SEISMIC & QA DESIGNATION: CLASS I

Tag for Shipment: Safeguard Switchgear
No. 20A115.

Cost Code: 9E 7120.00

- 12 1 Lot #D22 Safeguard Switchgear No. 20A116, for Unit No. 2, consisting of indoor, 5 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011
E-16

Note: Equip all units with full height instrument compartment.

SEISMIC & QA DESIGNATION: CLASS I

Tag for Shipment: Safeguard Switchgear
No. 20A116.

Cost Code: 9E 7120.00



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ITEM NO	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO	UNIT PRICE	EXTENSION
				\$	\$

13 1 Lot #D23 Safeguard Switchgear No. 20A117, for Unit No. 2, consisting of indoor, 5 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011

E-16

Note: Equip all units with full height instrument compartment.

SEISMIC & QA DESIGNATION: CLASS I

Tag for Shipment: Safeguard Switchgear
No. 20A117.

Cost Code: 2G 7120.00

14 1 Lot #D24 Safeguard Switchgear No. 20A118, for Unit No. 2, consisting of indoor, 5 kV, metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011

E-16

Note: Equip all units with full height instrument compartment.

SEISMIC & QA DESIGNATION: CLASS I

Tag for Shipment: Safeguard Switchgear
No. 20A118.

Cost Code: 9E 7120.00



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
				\$	\$

- 15 1 Lot #10 Start-up Bus No. 10A105 for Units 1 and 2, consisting of 3000 amp., 15 kV, indoor, metal-enclosed, non-segregated phase bus-duct with disconnecting links, and with 1200 amp taps to switchgear assemblies No. 10A101, 10A102, 20A101, and 20A102 as shown on drawings:

Dwg. No.

SK-E-010

E-14

Tag for Shipment: Start-up Bus
No. 10A105

Cost Code: 9E 7320.00

- 16 1 Lot #20 Start-up Bus No. 20A105 for Units 1 and 2, consisting of 3000 amp., 15 kV, indoor, metal-enclosed, non-segregated phase bus-duct with disconnecting links, and with 1200 amp. taps to switchgear assemblies No. 10A101, 10A102, 20A101 and 20A102 as shown on drawings:

Dwg. No.

SK-E-010

E-14

Tag for Shipment: Start-up Bus
No. 20A105

Cost Code: 9E 7320.00



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
			\$	\$	

- 17 1 Lot #11 Transformer Bus No. 10A107 for Unit No. 1, consisting of 3000 amp., and 1200 amp., 15 kV metal-enclosed, non-segregated phase bus-duct for interconnection between Unit Auxiliary Transformer No. 10X102 and switchgear assemblies No. 10A101 and 10A102 as shown on drawings:

Dwg. No.

SK-E-010
SK-E-038
E-15
SK-E-036

Tag for Shipment: Transformer Bus
No. 10A107

Cost Code: 9E 7320.00

- 18 1 Lot #21 Transformer Bus No. 20A107 for Unit No. 2, consisting of 3000 amp., and 1200 amp., 15 kV metal-enclosed, non-segregated phase bus-duct for interconnection between Unit Auxiliary Transformer No. 20X102 and switchgear assemblies No. 20A101 and 20A102 as shown on drawings:

Dwg. No.

SK-E-010
SK-E-038
E-16
SK-E-037

Tag for Shipment: Transformer Bus
No. 20A107

Cost Code: 9E 7320.00



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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- 19 1 Lot #101 Safeguard Bus, No. 00A119, for Units No. 1 and 2, consisting of 3000 and 2000 amp., 5 kV metal-enclosed, non-segregated phase bus-duct for interconnection between Safeguard Transformer No. 0AX103 and switchgear assemblies 10A115, 10A116, 10A117, 10A118, 20A115, 20A116, 20A117, and 20A118 with 1200 amp. taps to the switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011
SK-E-038
E-15
E-16
SK-E-037

Tag for Shipment: Safeguard Bus
No. 00A119

Cost Code: 9E 7320.00

- 20 1 Lot #201 Safeguard Bus, No. 00A120, for Units No. 1 and 2, consisting of 3000 and 2000 amp., 5 kV, metal-enclosed, non-segregated phase bus-duct for interconnection between Safeguard Transformer No. 0BX103 and switchgear assemblies 20A115, 20A116, 20A117, 20A118, 10A115, 10A116, 10A117, and 10A118 with 1200 amp. taps to the switchgear assemblies as shown on drawings:

Dwg. No.

SK-E-011
SK-E-038
E-15
E-16
SK-E-037

Tag for Shipment: Safeguard Bus
No. 00A120

Cost Code: 9E 7320.00



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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- 21 4 Lots Switchgear Accessories for 15 kV metal-clad switchgear assemblies. Two lots for assemblies No. 10A103, 10A101 and 10A102, and two lots for assemblies No. 20A103, 20A101 and 20A102, per Spec. 8031-E-7, paragraph 8.1.14a, b.

Tag for Shipment: 15 kV
Switchgear Accessories

Cost Code: 9E 7110.00

- 22 4 Lots Switchgear Accessories for 5 kV metal-clad switchgear assemblies. Two lots for assemblies No. 10A115, 10A116, 10A117 and 10A118, and two lots for assemblies No. 20A115, 20A116, 20A117 and 20A118, per Spec. 8031-E-7, paragraph 8.1.14a, b.

Tag for Shipment: 5 kV
Switchgear Accessories

Cost Code: 9E 7120.00

- 23 6 EA. Grounding and Test Devices, with interchangeable contacts for 1200 and 2500 amp., 15 kV metal-clad switchgear assemblies per Spec. 8031-E-7, paragraph 8.1.14.c.

Tag for Shipment: 15 kV
Switchgear Accessories

Cost Code: 9E 7110.00



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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24 8 EA. Grounding and Test Devices, for 1200 amp., 5 kV metal-clad switchgear assemblies per Spec. 8031-E-7, paragraph 8.1.14.c.

Tag for Shipment: 5 kV
Switchgear Accessories

Cost Code: 9E 7120.00

25 1 Lot #122 and #222 Plant Services Switchgear Nos. 00A501 and 00A502 consisting of 2400 volt (5 kV Class), indoor metal-clad switchgear assemblies as shown on drawings:

Dwg. No.

E-19

E-5005 Sheets 1 and 2

Tag for Shipment: #122 Plant Services
Switchgear, 00A501,
#222 Plant Services
Switchgear, 00A502

Cost Code: 9L 7130.00

26 2 Lots #122 and #222 Transformer Bus No. 00A503 and 00A504 consisting of metal enclosed non-segregated phase bus duct, 2400 volt (5 kV class), 2000 ampere, for interconnection between Plant Services Bus Switchgear (Item 25) and 5000 KVA, Plant Services Transformers 0AX501 and 0BX501 respectively as shown on drawings:

E-5005 Sheets 1 and 2

Tag for Shipment: #122 Plant Services
Bus, 00A503
#222 Plant Services
Bus, 00A504

Cost Code: 9L 7340.00



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ITEM NO	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
27	1 Lot	Switchgear accessories for 2400 volt (5 kV class), metal-clad switchgear (Item 25) per Spec. 8031-E-7, paragraph 8.1.14a, b. Tag for Shipment: 2400 volt Switchgear Accessories Cost Code: 9L 7130.00		\$	\$
28	1 Lot	Circuit Breaker Certification Test in accordance with Section 17.0 of Specification 8031-E-7 for the following: 14 - 5kV Class, 1200 ampere Circuit Breakers Cost Code: 9E 7120.00			
29	1 Lot	Circuit Breaker Certification Tests in accordance with Section 17.0 of Specification 8031-E-7 for the following: 10 - 15kV Class, 1200 ampere Circuit Breakers Cost Code: 9E 7110.00			
30	1 Lot	Circuit Breaker Certification Tests in accordance with Section 17.0 of Specification 8031-E-7 for the following: 2 - 15kV Class, 2500 ampere Circuit Breakers Cost Code: 9E 7110.00			
31	1 Lot	Engineering services required for: a) Seismic analysis of 5 kV, 2000 amp. and 3000 amp., bus duct. (Reference: Bechtel letter to Gould-ITE dated 3/6/78 for initial information) b) Reduce elevation of 5 kV, 2000 amp., bus duct by 6 inches. c) All drawing revisions required by above. Cost Code: 9E7330			



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
32	1 Lot	Materials and instructions for field modification of Items 19 and 20 bus ducts to accomplish the followng: (a) Lower the 2000 amp. bus duct 6" (b) Support the 2000 amp. bus duct from the switchgear (c) Mount the 3000 amp. bus duct on top of the 2000 amp. bus duct. Tag for Shipment: Safeguard Bus Nos. 00A119 & 00A120 Cost Code: 9E7330		\$	\$
33	4 Lots	Each lot consisting of two units of Class 1E indoor metal-clad switchgear assemblies as shown on drawings 8031-E-12, Sh. 1 and 2 and 8031-E-13, Sh. 1 and 2. Tag for Shipment: 10A201 10A202 20A201 20A202			
34	1 Lot	Environmental Qualification for Item 33 per IEEE standard 323-1974 (Nureg 0588 Cat. I) based on existing data at time of qualification.			
35	1 Lot	Seismic/hydrodynamic qualification for Item 33 per IEEE standard 344-1975 based on existing data at time of qualification.			
36	1 Lot	Extension of items 34 and 35 to include Items 7 through 14 supplied on original P.O. LX 393907, M/R 8031-E-7.			

Notes:

1. Seismic and Quality Assurance Requirements.

- a. Items 7, 8, 9, 10, 11, 12, 13 14, and 33 are Seismic Category I Equipment and the following requirements shall apply:

- 1) Design basis events-seismic and hydrodynamic requirements in



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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accordance with Spec. 8031-G-19, with seismic/hydrodynamic accelerations at the switchgear mountings per Spectrum Response Curves, Specification 8031-G-19, Appendix F

- a) ATWS Switchgear (Item 33): pages F-29, F-41, F-101, F-113, F-125, F-137, F-179, F-180, F-193, F-260, F-261, F-274, F-287, F-288, F-301.
 - b) Existing Switchgear (Items 7 through 14): pages F-28, F-40, F-100, F-112, F-124, F-136, F-322, F-364, F-385.
- 2) Normal basis events - as outlined in Spec. 8031-E-7, under Conditions of Service.
 - 3) The Seller shall be responsible for proving by test and/or analysis that all Class 1E switchgear delivered under Spec. 8031-E-7 shall remain functional so a safe, orderly shutdown of the plant can be achieved and maintained during and after experiencing:
 - a) Five repetitions of tests to composite of OBE curves.
 - b) One test to composite of SSE curves.
 - c) One test to composite of worst case curve.
 - 4) Quality Assurance - Bidder shall furnish a program in accordance with Spec. 8031-E-7, paragraph 12.1.
 - 5) The Seller shall submit a proposed method for qualifying the equipment for use under conditions of items 1) and 2) above in accordance with Spec. 8031-E-7, paragraph 12.2.

BECHTEL

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REV.

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
				\$	\$

- 6) For each shipment of Seismic Category I equipment, Form 3295, statement of conformance, shall be completed and distributed as noted thereon.
 - 7) The documentation requirements are as stated in Spec. 8031-E-7, Form 8031-DR for Class 1E equipment. Included are requirements for documentation in accordance with IEEE Standard 323-1974, IEEE Standard 344-1975 and NUREG-0588, Category I.
 - 8) The equipment will be located in the Reactor Enclosure. Spec. 8031-G-19, Appendix F defines the seismic and hydrodynamic requirements.
2. Jobsite delivery dates:
 - a. 13.2 kV equipment - To be established by
 - b. 4.16 kV equipment - expedited
 - c. 2.3 kV equipment - expediting
 3. Environmental Requirements for Item 33.
 - a. Temperature
 - 1) Normal conditions: 104°F maximum (use 104°F for 40 year ambient temperature).
 - 2) Accident conditions: 105°F
 - b. Humidity
 - 1) Normal conditions: average 50% RH, maximum 90% RH (use 90% RH for 40 year RH)
 - 2) Accident conditions: 95% RH

P-128/10



PURCHASE ORDER NO.

REQUISITION NO.

	REV
8031-E-7	13

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
				\$	\$

c. Pressure

1) Normal conditions: -0.009 psig
(-0.25" w.g.)

2) Accident conditions: atmospheric

d. Radiation

40 year integrated plus accident (in operation) radiation dose 1.19×10^6 rads gamma and 5.91×10^2 rads beta.

e. Voltage, normal and accident conditions; minimum 770 V, maximum 3920 V.

f. Frequency, normal and accident conditions; minimum 11 Hz, maximum 56 Hz.

g. Safety Function

The safety function of the ATWS switchgear is to trip the recirculation system pump motor during an ATWS event and to de-energize the system under fault conditions. The switchgear will complete its safety function in less than one minute following an ATWS or LOCA event. The circuit breaker shall remain open for the balance of the 180 days of the DBE.

4. Environmental Requirements for Items 7 through 14.

a. Temperature, normal and accident conditions 104°F (use 104°F for 40 year ambient temperature).

b. Humidity

1) Normal Conditions: average 50% R.H., maximum 90% R.H. (use 90% R.H. for 40 year R.H.)

2) Accident conditions 95% R.H.



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
				\$	\$

- c. Pressure, normal and accident conditions, atmospheric.
- d. Radiation, 40 year integrated radiation dose, (40 year normal plus accident) 1.80×10^2 rads gamma.
- e. Voltage, normal and accident conditions: minimum 3436 V, maximum 4336 V.
- f. Frequency, normal and accident conditions: 60 Hz.
- g. Safety function. The switchgear shall remain energized and provide safeguard power and control for a balance of 180 days after occurrence of a DBE.

Attachments:

<u>Specification</u>	<u>Revision</u>	<u>Description</u>
8031-E-7	9	Technical Specification
8031-E-7 Attachment A	12	Summary of Proposal Part II, PP SP 10 thru SP-18, CT-1, CT-2
8031-G-1	7	General Project Requirements for Purchase Orders
8031-G-4	3	General Project Requirements for Shop Painting for Mechanical and Electrical Equipment
8031-G-13	3	General Project Requirements for Quality Assurance



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
				\$	\$

<u>Specification</u>	<u>Revision</u>	<u>Description</u>
8031-G-14	4	General Project Requirements for Seismic Design Analysis of Equipment and Equipment Supports
8031-G-5	2	General Project Requirements, Documentation Required from Suppliers
8031-G-18	2	General Project Requirements for Environmental Qualification of Class 1E Equipments
8031-G-19	2	General Project Requirements for Design Assessment and Qualification of Seismic Category I Equipment and Equipment Support for Seismic and Hydrodynamic Loads
8031-G-19 Appendix F		Pages: F-29 F-28 F-41 F-40 F-101 F-100 F-113 F-112 F-125 F-124 F-137 F-136 F-179 F-322 F-180 F-364 F-193 F-385 F-260 F-261 F-274 F-287 F-288 F-301
8031-E-7 Attachment B	0	Quality Surveillance Requirements




PURCHASE ORDER NO.

REQUISITION NO.

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
E-19	3	Single Line Meter & Relay Diagram, 2.3 kV Plant Services Power System, 1 and 2 Units		\$	\$
E-20	0	Single Line Meter & Relay Diagram, Diesel Generator - Common			
 E-146	0	Schematic Diagram, Reactor Recirculation RPT Breakers			

Note: Additional drawings required for detailed design will be submitted later by separate transmittal. These drawings include:

- Schematic Meter and Relay Diagram
- Control Schematic Diagrams
- Device Table
- Dimension and Interface Requirements for Bus Duct and External Connections

Engineering Release

- All items are released for basic engineering and scheduling.
- Deleted

Effectivity Information

"The Specifications, Forms, Drawings, Data Sheets, and General Project Requirements referenced in this Purchase Order revision are retroactive to the date of first issue of this Purchase Order and apply to all items to be manufactured under this Purchase Order."

Special Note Regarding Requirements of 10CFR21:

Seller shall comply with the provision of 10CFR21, Reporting of Defects and Noncompliances, for Class I items (Q-Listed).



PURCHASE ORDER NO.

REQUISITION NO.

8031-E-7

REV

13

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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Forms

Deleted 8031-DR 3295 ED-27	4	Documentation Requirements Statement of Conformance Supplier Deviation Disposition Request
-------------------------------------	---	--------------------------------------------------------------------------------------------------

Dwg. No.

SK-E-010	F	13.2 kV Auxiliary Switch-gear Room Arrangement
SK-E-011	E	4 kV Auxiliary Switch-gear Room Arrangement
SK-E-036	C	Electrical Layout, Main Transformer Area, Unit 1
SK-E-037	C	Electrical Layout, Main Transformer Area, Unit 2
SK-E-038	A	Iso-Phase Bus Layout, Gen. Area - Units 1 & 2, Plan and Sections
E-5005, Sh. 1 & 2	A	Tray and Conduit, Circulating Water Pump House
E-5006,	A	Tray and Conduit Details

Attachments:

<u>Dwg. No.</u>	<u>Revision</u>	<u>Description</u>
E-12	8	Single Line Meter & Relay Diagram, 13.2 kV Unit Auxiliary Power System, 1 Unit, Sheets 1 and 2
E-13	7	Single Line Meter & Relay Diagram, 13.2 kV Unit Auxiliary Power System 2 Unit, Sheets 1 and 2
E-14	5	Single Line Meter & Relay Diagram, 13.2 kV Station Auxiliary Power System, 1 and 2 Units
E-15	8	Single Line Meter & Relay Diagram, 4 kV Safeguard Power System, 1 Unit
E-16	8	Single Line Meter & Relay Diagram, 4 kV Emerg. Safeguard Power System 2 Unit

SUPPLEMENTARY SHEET

196-40058 REV'D, 10-77

PHILADELPHIA ELECTRIC COMPANY

2301 MARKET STREET

P.O. BOX 8699

PHILADELPHIA, PA. 19101

PREPARED BY

APPROVED BY

DATE 19

LX-393907

PAGE NO. 11 OF 18 PAGES

ITEM NO.	QUANTITY	UNIT	DESCRIPTION AND ARTICLE CODE	UNIT PRICE	AMOUNTS
			<p>This change order is issued to:</p> <p>1. Incorporate Revision 13 of M/R 8031-E-13 changes in the M/R are as follows:</p> <p>(a) Added Attachment B - Quality Surveillance Requirements</p> <p>(b) Added Drawing 8031-E-146 Sheets 1 & 2 as an attachment</p> <p>Price addition \$16,068.</p>	\$	\$
TOTAL				\$	\$

PREPARED BY _____
APPROVED BY _____
DATE _____ 19__

LX-393907
PAGE NO. 15 OF 18 PAGES

ITEM NO	QUANTITY	UNIT	DESCRIPTION AND ARTICLE CODE	UNIT PRICE	AMOUNTS						
			<p><u>SEISMIC AND QUALITY ASSURANCE</u></p> <p>Items 7, 8, 9, 10, 11, 12, 13 and 14 are Class I equipment and the following requirements shall apply:</p> <p>1) This equipment shall meet analyses and tests as required to meet commitments in the PSAR and possible subsequent commitments to the AEC with regard to seismic requirements as finally developed and Philadelphia Electric Company interpretation as to the adequacy of such analyses and tests, at no extra charge.</p> <p>2) Design basis events - Seismic and hydrodynamic requirements reference Spec. 8031-G-19, with seismic/hydrodynamic accelerations at the switchgear mountings per Spectrum Response Curves Spec. 8031-G-19, including Appendix F consisting of:</p> <p>a) ATWS Switchgear (Item 33) pages F-29, F-41, F-101, F-113, F-125, F-137, F-179, F-180, F-193, F-260, F-261, F-274, F-287, F-288, F-301.</p> <p>b) Existing Switchgear (Items 7 thru 14) pages F-28, F-40, F-100, F-112, F-124, F-136, F-322, F-364, F-385.</p> <p>3) Normal basis events - as outlined in Spec. 8031-E-7, under Conditions of Service.</p> <p>4) The Seller shall submit a proposed method for qualifying the equipment for use under conditions of items 2) and 3) above in accordance with Spec. 8031-E-7, paragraph 12.2.</p> <p><u>ATTACHMENTS</u></p> <table><thead><tr><th><u>Specification Number</u></th><th><u>Rev.</u></th><th><u>Description</u></th></tr></thead><tbody><tr><td>8031-E-7</td><td>13</td><td>Material Requisition Including Summary of Proposal Part II (Attachment A)</td></tr></tbody></table>	<u>Specification Number</u>	<u>Rev.</u>	<u>Description</u>	8031-E-7	13	Material Requisition Including Summary of Proposal Part II (Attachment A)	\$	\$
<u>Specification Number</u>	<u>Rev.</u>	<u>Description</u>									
8031-E-7	13	Material Requisition Including Summary of Proposal Part II (Attachment A)									
P-128/11				TOTAL	\$						

PHILADELPHIA ELECTRIC COMPANY
1000 CHESTNUT STREET
PHILADELPHIA, PA. 19108


PREPARED BY

APPROVED BY

DATE _____ 19 ____

LX-393907

PAGE NO. 17a OF 18 PAGES

ITEM NO	QUANTITY	UNIT	DESCRIPTION AND ARTICLE CODE		UNIT PRICE	AMOUNTS	
			<u>Dwg. No.</u>	<u>Rev.</u>	<u>Description</u>		
			E-19	3	Single Line Meter & Relay Diagram, 2.3 kV Plant Services Power System 1 and 2 Unit		
			E-20	0	Single Line Meter & Relay Diagram, D1 Diesel Generator, Common		
			 E-146 Sh. 1 & 2	0	Schematic Diagram - Reactor Recirculation RPT Breakers.		
			Note: Additional drawings required for detailed design will be submitted later by separate transmittal. These drawings include:				
			a) Schematic Meter and Relay Diagrams				
			b) Control Schematic Diagrams				
			c) Device Table				
			d) Dimension and Interface Requirements for Bus Duct and External Connections.				
TOTAL						\$	

SUMMARY OF PROPOSAL
FOR
MEDIUM-VOLTAGE METAL-CLAD
SWITCHGEAR AND ASSOCIATED BUS DUCT
FOR THE
LIMERICK GENERATING STATION
UNITS 1 AND 2
FOR THE
PHILADELPHIA ELECTRIC COMPANY

BIDDER I-T-E Imperial Corp.

PART II - TECHNICAL DATA

1.0 ERECTION INFORMATION

1.1 Weights

a) Switchgear Assemblies, less accessories:

<u>Ass'y No.</u>	<u>Net</u>	<u>Approx. (Same as Shipping net weights)</u>
10 (10A103)	16700 lbs.	lbs.
20 (20A103)	16700 lbs.	lbs.
11 (10A101)	47700 lbs.	lbs.
12 (10A102)	47700 lbs.	lbs.
21 (20A101)	47700 lbs.	lbs.
22 (20A102)	47700 lbs.	lbs.
110 (10A115)	17500 lbs.	lbs.
210 (10A116)	17500 lbs.	lbs.
310 (10A117)	17500 lbs.	lbs.
410 (10A118)	17500 lbs.	lbs.

<u>Ass'y No.</u>	<u>Net</u>	<u>Approx. Shipping</u>
120 (20A115)	17500 lbs.	lbs.
220 (20A116)	17500 lbs.	lbs.
320 (20A117)	17500 lbs.	lbs.
420 (20A118)	17500 lbs.	lbs.

b) Bus Duct Assemblies:

10 (00A105)	7520 lbs.	lbs.
20 (00A106)	7520 lbs.	lbs.
11 (10A107)	11080 lbs.	lbs.
21 (20A107)	11080 lbs.	lbs.
101 (00A119)	19700 lbs.	lbs.
201 (00A120)	20500 lbs.	lbs.

c) Heaviest Single
Piece to be
Shipped as a
Unit

6750 lbs. lbs.

1.2 Dimensions

a) Largest Section
to be Shipped
as a Unit

L 144 ins W 97 ins H 90 ins

b) Drawout space required:

15 kV indoor circuit breaker	66 ins
5 kV indoor circuit breaker	60 ins

	<u>Depth</u>	<u>Width</u>	<u>Height</u>
15 kV, 1200 amp. unit	89 ins.	36 ins.	90 ins
15 kV, 2000 amp. unit	89 ins.	36 ins.	90 ins
15 kV, 3000 amp. unit	114 ins.	46 ins.	90 ins
5 kV, 1200 amp. unit	56 ins.	26 ins.	90 ins

2.0 DESIGN DATA

2.1 13.8 kV Metal-Clad Switchgear
Circuit Breaker Characteristics
and Ratings

a) Operating time-closing	7.5 cycles
b) Operating time-opening	1.5 cycles

- c) Interrupting time-rating
- | | | |
|---------------------------|----------|--------|
| 25% or less fault current | <u>5</u> | cycles |
| 25-100% fault current | <u>5</u> | cycles |
- d) Rated maximum voltage 15000 volts
- e) Rated voltage range factor, K 1.3
- △ f) Rated short circuit interrupting current at maximum voltage 28900 amperes
- g) Maximum symmetrical interrupting capability 37500 amperes
- △ h) Short time current carrying capability for 3 seconds 37500 amperes
- △ i) Closing and latching capability 60000 amperes
- j) Control Power Requirements:
- | | <u>Trip Coil</u> | <u>Close Coil</u> |
|--------------------------|------------------|-------------------|
| Maximum voltage | <u>140</u> volts | <u>130</u> volts |
| Minimum voltage | <u>70</u> volts | <u>90</u> volts |
| Current at rated voltage | <u>6.7</u> amps | <u>6.7</u> amps |
- k) Stored-energy spring powered system:
- | | |
|------------------------------------------------------|--------------------------|
| Maximum voltage | <u>130</u> volts |
| Minimum voltage | <u>90</u> volts |
| Current at rated voltage | <u>10</u> amperes |
| Time to fully charge from fully discharged condition | <u>2</u> seconds or less |
- l) Average speed of contacts during travel from the point of arcing contact break to a point on the opening stroke designated by the manufacturer. Max. 15 Ft/Sec Min. 11 Ft/Sec
- m) Length of contact travel over the portion of opening stroke referred to in Item l (1) above. 2.2-3 Inches

- n) Point on the blade of hinge type movable contacts at which the speed and travel measurements are made. 7" from pivot
- o) Maximum permissible rebound on opening, measured at contact tips. 0.9 inches
- p) Impulse withstand voltage of the entire structure (based on 1-1/2 X 40 microsecond wave). 95 kV
- q) One minute 60 cycle test voltage for entire structure. 36 kV
- r) Bus material Aluminum

2.2 4.16 kV Metal-Clad Switchgear Circuit Breaker Characteristics and Ratings

- a) Operating time-closing 4.5 cycles
- b) Operating time-opening 1.5 cycles
- 12 c) Interrupting time-rating
Item 33 only (@ 45-56 Hz.)
25% or less fault current 135 milli-sec
25-100% fault current 5 cycles
5 cycles
- d) Rated maximum voltage 4.76 volts
- 12 e) Rated voltage range factor, K 250 MVA 1.24
350 MVA 1.19
- f) Rated short circuit interrupting current at maximum 250 MVA 30300 amperes
voltage 350 MVA 42400 amperes
- g) Maximum symmetrical interrupting capability 250 MVA 37500 amperes
350 MVA 50000 amperes
- h) Short time current carrying capability 250 MVA 37500 amperes
350 MVA 50000 amperes
- i) Closing and latching capability 250 MVA 60000 amperes
350 MVA 80000 amperes
- j) Closing power requirements
- | | <u>Trip Coil</u> | <u>Close Coil</u> |
|--------------------------|------------------|-------------------|
| Maximum voltage | <u>140 volts</u> | <u>130 volts</u> |
| Minimum voltage | <u>70 volts</u> | <u>90 volts</u> |
| Current at rated voltage | <u>6.7 amps</u> | <u>6.7 amps</u> |

k) Stored-energy spring powered system

Maximum voltage	<u>130</u>	volts
Minimum voltage	<u>90</u>	volts
Current at rated voltage	<u>10</u>	amperes
Time to fully charge from fully discharged condition	<u>2</u>	seconds

l) Average speed of contacts during travel from the point of arcing contact break to a point on the opening stroke designated by the manufacturer.

Max.	<u>13</u>	Ft/Sec
Min.	<u>10</u>	Ft/Sec

m) Length of contact travel over the portion of opening stroke referred to in Item l (1) above.

2-3 Inches

n) Point on the blade of hinge type movable contacts at which the speed and travel measurements are made.

Top

o) Maximum permissible rebound on opening, measured at contact tips.

10%

p) Impulse withstand voltage of the entire structure (based on 1-1/2 X 40 microsecond wave).

60 kV

q) One minute 60 cycle test voltage for entire structure.

19 kV

r) Bus Material Aluminum

s) Item 33 only Nominal Volts/Hz 70

2.3 12 Instrument Transformer Characteristics and Ratings

a) Bidder shall supply the following current transformer characteristic data based on tests or computations:

- A. Manufacturer
- B. Type
- C. Mechanical short time current rating.
- D. Thermal one second current rating.
- E. Relaying accuracy classification.

- F. Typical ratio-correction-factor curves for the standard B-2 burden from 0.25 to 22 times rated primary current for each turn ratio.
- G. Excitation curves for each turn ratio.
- H. Resistance of secondary winding for each turn ratio.
- I. Resistance of the secondary leads from the current transformer to the terminal facilities for Buyer's connections.
- b) Bidder shall supply above information on sheets CT-1 through CT-2 attached.
- c) Bidder shall supply the following potential transformer data:

	<u>13.8 kV</u> <u>Switchgear</u>	<u>4.16 kV</u> <u>Switchgear</u>
A. Manufacturer	<u>Westinghouse</u>	<u>Westinghouse</u>
B. Type	<u>PTM-110</u>	<u>PC-60</u>
C. Accuracy Class	<u>ANSI-Std.</u>	<u>ANSI-Std.</u>

2.4 13.8 kV Metal-Enclosed, Non-segregated Phase Bus Duct Details and Ratings

- a. Bidder shall supply the following information:

A. Nominal Voltage	<u>13.8</u> kV
B. Maximum Voltage	<u>15</u> kV
C. BIL	<u>95</u> kV
D. Maximum hottest-spot total temperature	<u>105°</u> C
E. Bus support insulation	<u>Porcelain</u>
F. Bus Material	<u>Aluminum</u>
G. Bus bar arrangement (sketch)	

- 1) 2000 ampere bus duct
- 2) 3000 ampere bus duct

- b. Seller shall guarantee that the performance of the metal-enclosed, non-segregated phase bus shall be at least as good as the following:

A. Loss in watts per three-phase foot of bus run	1200A-120 watts 3000A-260 "
B. Momentary short-circuit current rating (asymmetrical)	<u>60,000</u> amperes
C. Four-second short-circuit rating (symmetrical)	<u>37,500</u> amperes
D. Ten-second, 60 hertz dew withstand strength of insulation	<u>36</u> kV
E. One-minute, 60 hertz dry withstand strength of insulation	<u>36</u> kV
F. Impulse withstand voltage based on 1.5 X 40 micro-second wave	<u>95</u> kV

2.6 Cable entrance and termination data:

- a. Referring to SK-E-010, and drawing E-14, provision must be made for terminating and insulating the incoming power cables consisting of 6-2000 kcmil cables. The Bidder shall furnish with the proposal a sketch of the proposed termination arrangement, including room for necessary stress cones.

2.7 4.16 kV Metal-Enclosed, Non-segregated Phase Bus Duct Details and Ratings

- a. Bidder shall supply the following information:

A. Nominal voltage	<u>4.16</u> volts
B. Maximum voltage	<u>4.76</u> volts
C. BIL	<u>60</u> kV
D. Maximum hottest-spot total temperature	<u>105</u> C
E. Bus support insulation	<u>Porcelain</u>
F. Bus material	<u>Aluminum</u>

b. Seller shall guarantee that the performance of the metal-enclosed, non-segregated phase bus shall be at least as good as the following:

- | | |
|------------------------------------------------------------------|----------------------------------------|
| A. Loss in watts per three-phase foot of bus run | 2000A - 200 watts
3000A - 260 watts |
| B. Momentary short-circuit current rating (asymmetrical) | 60000 amperes |
| C. Four-second short-circuit current rating (symmetrical) | 37500 amperes |
| D. Ten-second, 60 hertz dew withstand strengt of insulation | 19 kV |
| E. One-minute, 60 hertz dry withstand strength of insulation | 19 kV |
| F. Impulse withstand voltage based on 1.5 X 40 micro-second wave | 60 kV |

3.0 DRAWINGS

3.1 Preliminary outline drawing furnished with proposal:

<u>Ass'y. No.</u>	<u>Dwg. No.</u>	<u>Ass'y. No.</u>	<u>Dwg. No.</u>
No. 00A103	SK-109999-1	No. 10A115	SK-109999-1
No. 00A104	"	No. 10A116	"
No. 10A101	"	No. 10A117	"
No. 10A102	"	No. 10A118	"
No. 20A101	"	No. 20A115	"
No. 20A102	"	No. 20A116	"
		No. 20A117	"
		No. 20A118	"

3.2 Firm channel base and floor plan arrangement drawings furnished with proposal:

No. 00A103	_____	No. 10A115	_____
No. 00A104	_____	No. 10A116	_____
No. 10A101	_____	No. 10A117	_____
No. 10A102	_____	No. 10A118	_____
No. 20A101	_____	No. 20A115	_____
No. 20A102	_____	No. 20A116	_____
		No. 20A117	_____
		No. 20A118	_____

Note: The above drawings shall be suitable for construction and shall show all foundation details.

3.3 Time requirement after award of order to furnish preliminary drawings requested on Form G-321-C (Guaranteed weeks):

a. Outlines	<u>14</u>	weeks
b. General arrangements	<u>14</u>	weeks
c. Plan and elevation details	<u>14</u>	weeks
d. Elementary diagrams	<u>14</u>	weeks
e. Wiring and connection diagrams	4 weeks after receipt of approved schematics	
f. Component data sheets	Prior to shipment	

4.0 QUALITY ASSURANCE

Has bidder submitted his quality assurance program as required by Section 12.1 of Specification 8031-E-7?

YES x NO

5.0 QUALIFICATION OF SWITCHGEAR

Has Bidder submitted a description of the method of qualifying switchgear as required by Section 12.2 of Specification 8031-E-7?

YES x NO

6.0 EXCEPTIONS

A detailed list of any and all exceptions taken to these specifications shall be furnished as a part of the Bidder's Proposal. In the absence of such a list, it shall be understood and agreed the Bidder's Proposal is based on strict conformance to these specifications in all respects.

List attached YES x NO

E. J. Bubb

Signature of Bidder

Field Application Engineer

Title

April 6, 1971

Date of Bid

Rev. 12

CURRENT TRANSFORMER DATA

As Used in 13.8 kV Switchgear:

- A. Manufacturer ITE - Imperial Corp.
- B. Type MC 15 A1
- C. Mechanical short time current rating 60000 amperes
- D. Thermal one second current rating 37500 amperes

Refer to Summary of Proposal, Part II, paragraph 2.3 a) for definition of the following letters:

<u>C.T. Ratio</u>	<u>E.</u>	<u>F. Curve No.</u>	<u>G. Curve No.</u>	<u>H.</u>	<u>I.</u>
50/5					
75/5	<u>10H10</u>			<u>.020</u>	<u>.015</u>
200/5	<u>10H20</u>			<u>.061</u>	<u>.015</u>
300/5	<u>10H50</u>			<u>.142</u>	<u>.015</u>
600/5	<u>10H100</u>			<u>.36</u>	<u>.015</u>
800/5	<u>10H100</u>			<u>.280</u>	<u>.015</u>
1000/5	<u>10H100</u>			<u>.562</u>	<u>.015</u>
1200/5	<u>10H200</u>			<u>.540</u>	<u>.015</u>
2000/5	<u>10H200</u>			<u>.752</u>	<u>.015</u>
2000/2.5	<u>10H200</u>			<u>1.84</u>	<u>.015</u>
3000/5	<u>10H200</u>			<u>1.20</u>	<u>.015</u>

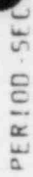
CURRENT TRANSFORMER DATA

As Used in 4.16 kV Switchgear

- A. Manufacturer I-T-E Imperial Corp.
- B. Type MC 5
- C. Mechanical short time current rating 60000 amperes
- D. Thermal one second current rating 37500 amperes

Refer to Summary of Proposal, Part II, paragraph 2.3a for definition of the following letters:

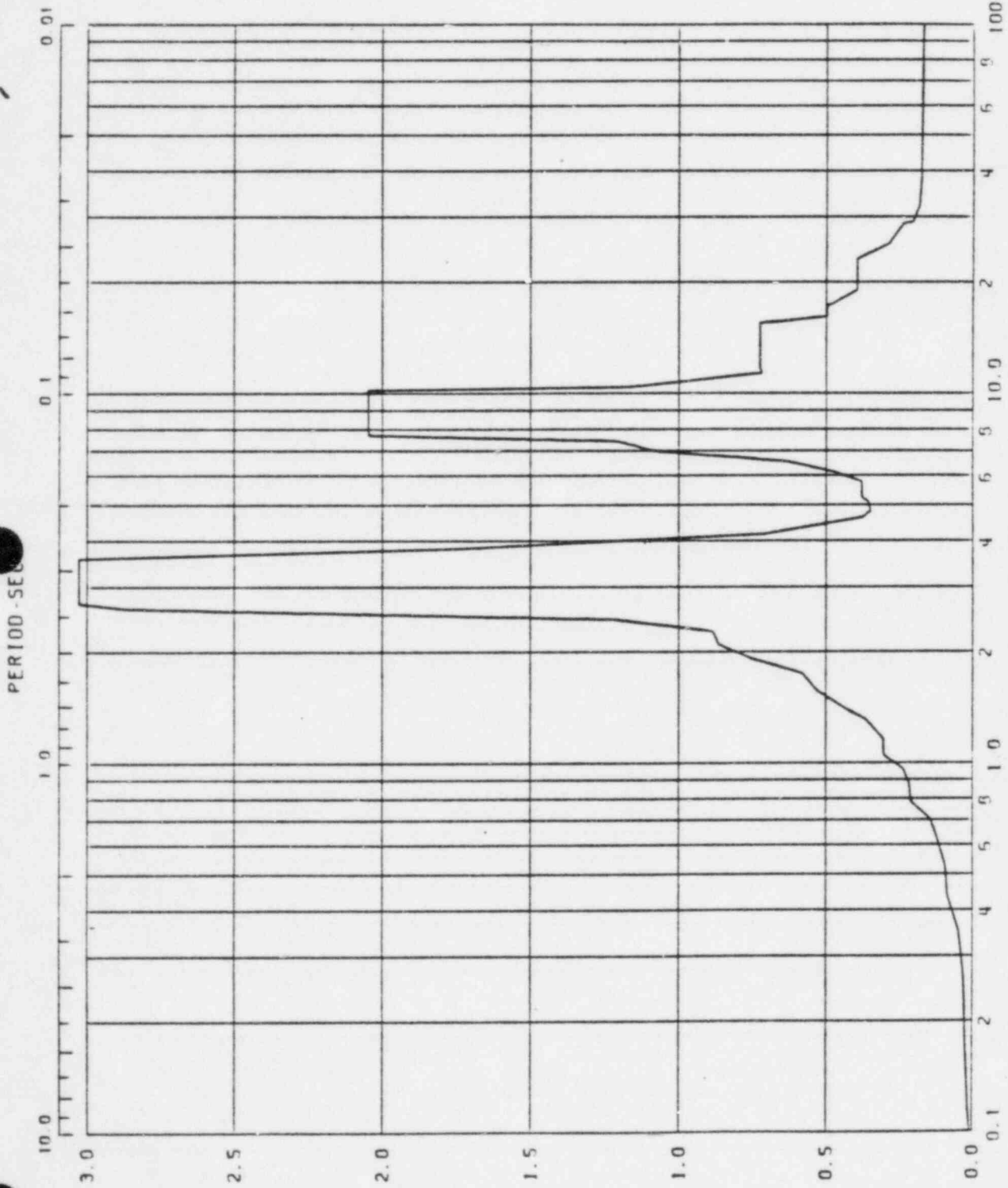
<u>C.T. Ratio</u>	<u>E.</u>	<u>F. Curve No.</u>	<u>G. Curve No.</u>	<u>H.</u>	<u>I.</u>
50/5					
75/5	10H10			.020	.015
100/5	10H10			.029	.015
200/5	10H20			.061	.015
300/5	10H50			.142	.015
800/5	10H100			.280	.015
1000/5	10H100			.562	.015
1200/5	10H200			.540	.015
2000/5	10H200			.752	.015



FREQUENCY - CPS

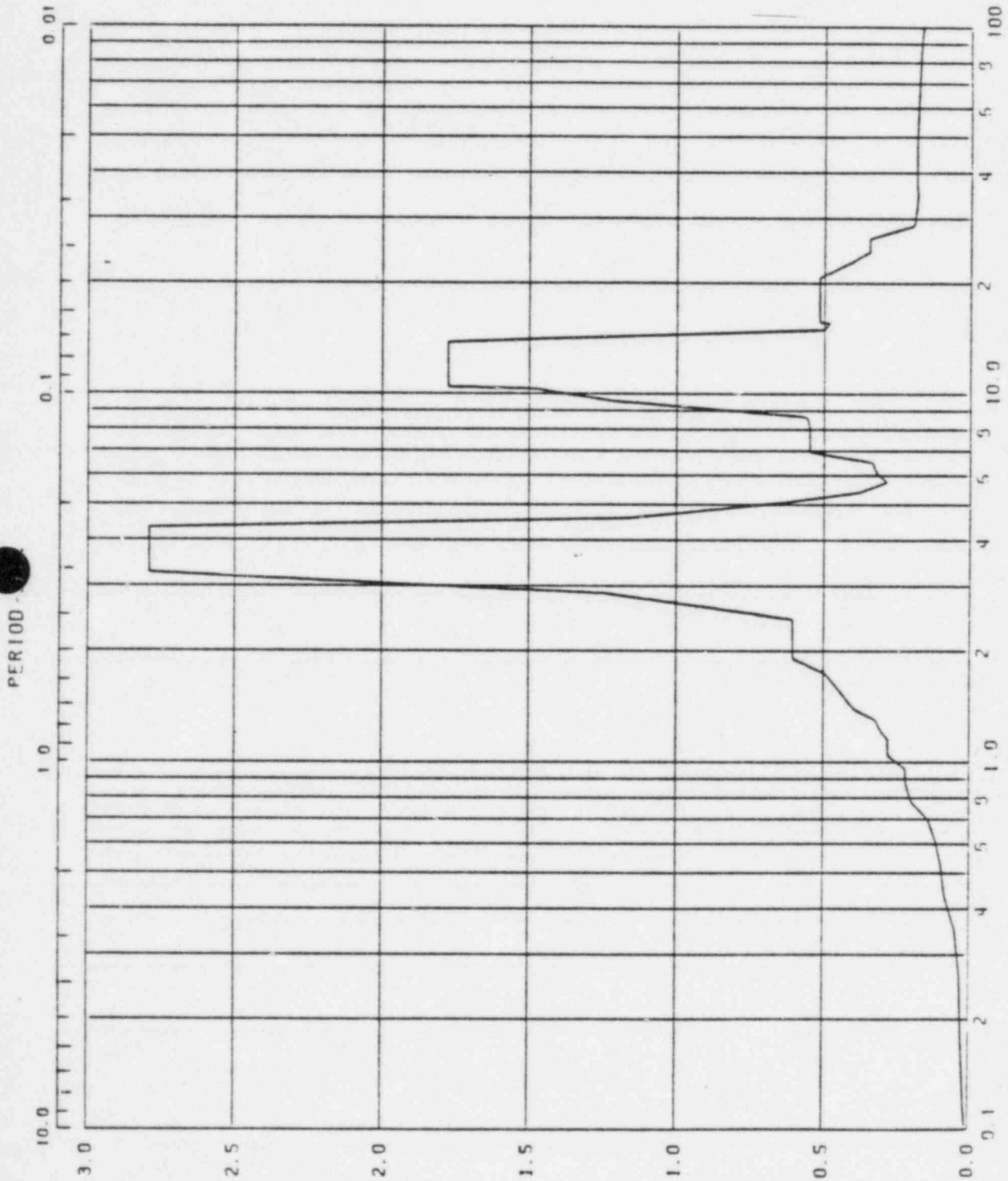
Load Case: ~~XXXXXXXXXX~~ 1B-VPSET

Domingo: AAAAAAAAAAAAAAAAAAAAAA
 Date: 2/13/94
 Check: 221
 Date: 8/29/81



F-29
SPECTRAL ACCELERATION, SA-C

Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
Load Case: 3 D IB - UPSET
Node: 5 Direction: N-S Elev: 253' Angle: _____
Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/18/81 Check: EL Date: 8/27/81



SPECTRAL ACCELERATION, SA-C

F-40

Fig. _____ Limerick Generation Station, Acceleration Spectra for REACTOR BLDG
 Load Case: UPSET 10
 Node: 4 Direction: E-W Elev: 239' Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/13/81 Check: FLY Date: 8/22/81

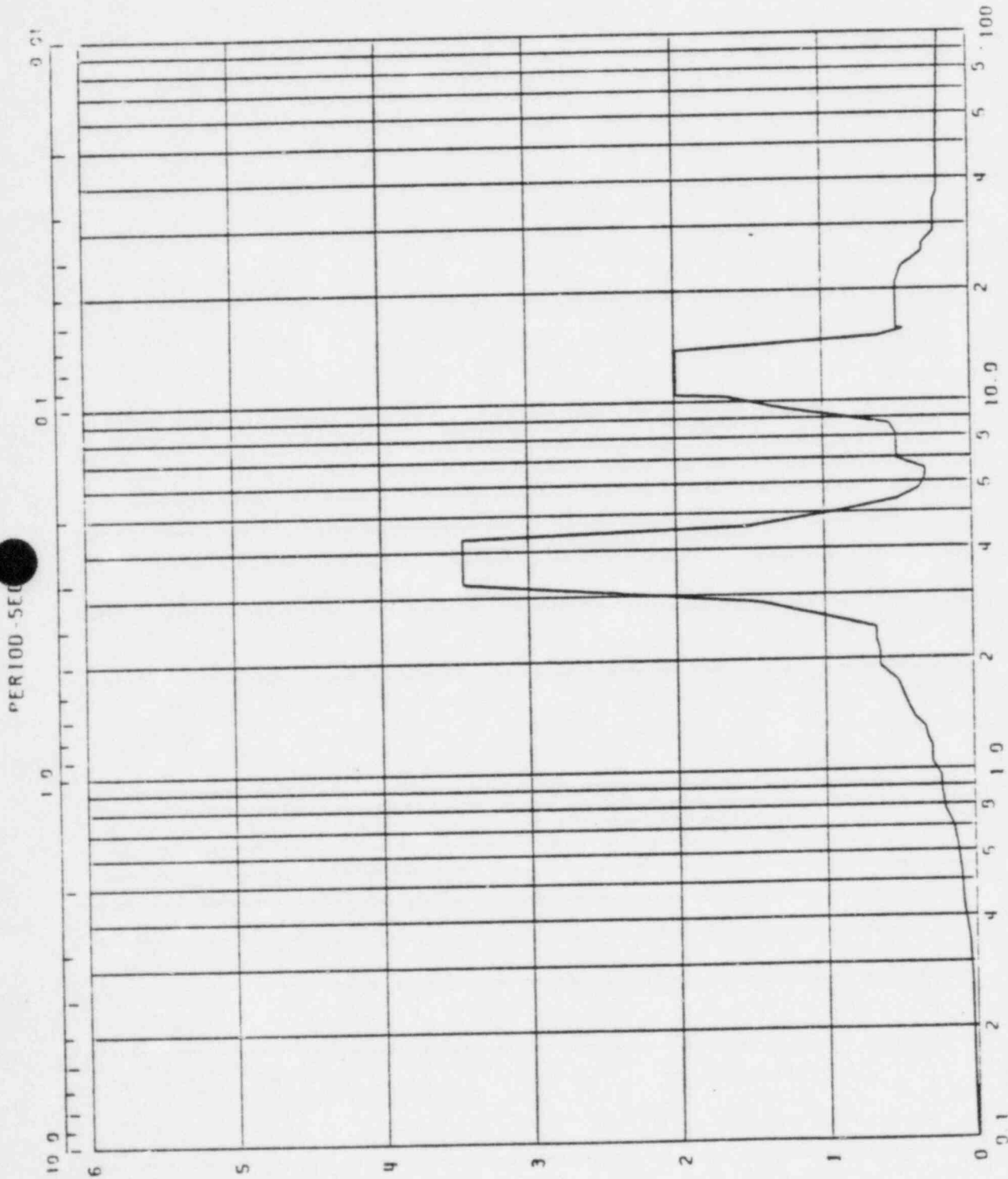


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: LB UPSET
 Node: 5 Direction: E-W Elev: 253' Angle: _____
 Damping: 0.005 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/18/81 Check: ELI Date: 8/22/81

001 - F
SPECTRAL ACCELERATION, SA-C

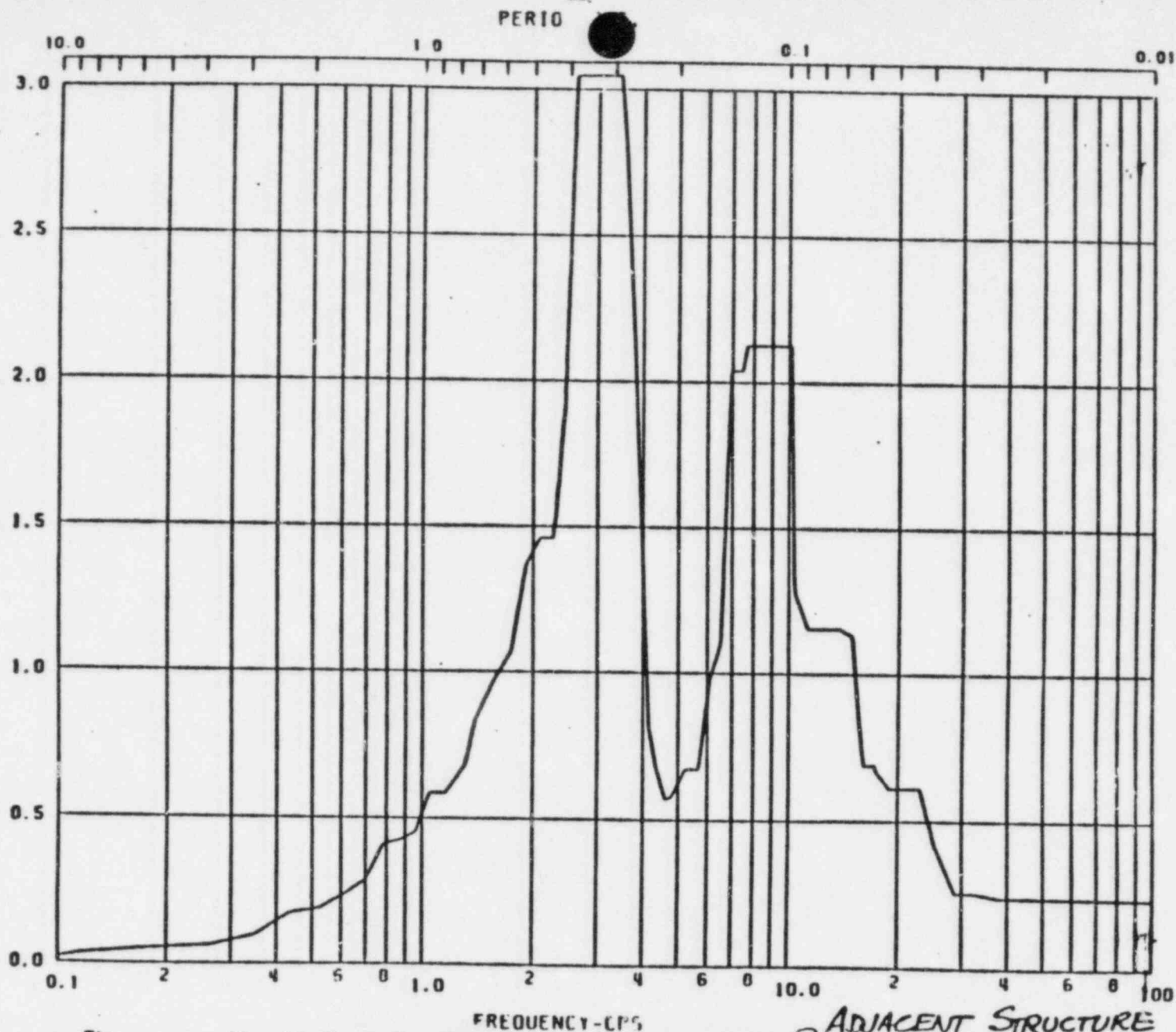


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: 3E FAULTED
 Node: 4 Direction: 1/4 N-S Elev: 239' Angle: _____
 Damping: 0.005 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/13/81 Check: FLY Date: 8/27/81

Spec 8031-G-19
APPENDIX-F

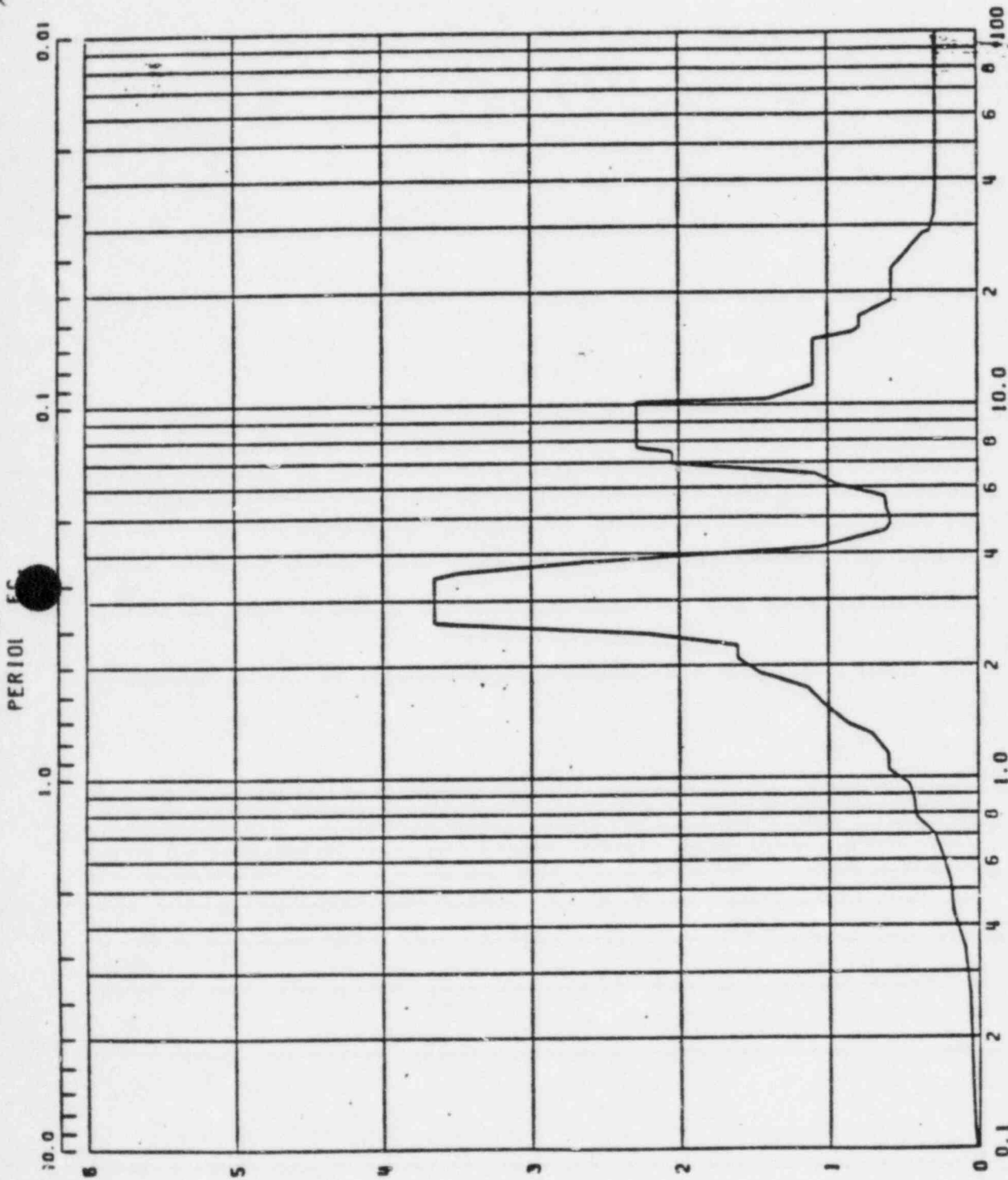


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: 3E - FAULTED
 Node: 5 Direction: N-S Elev: 253' Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/18/81 Check: FLY Date: 8/27/81

SPECTRAL ACCELERATION, SA-C

F-112

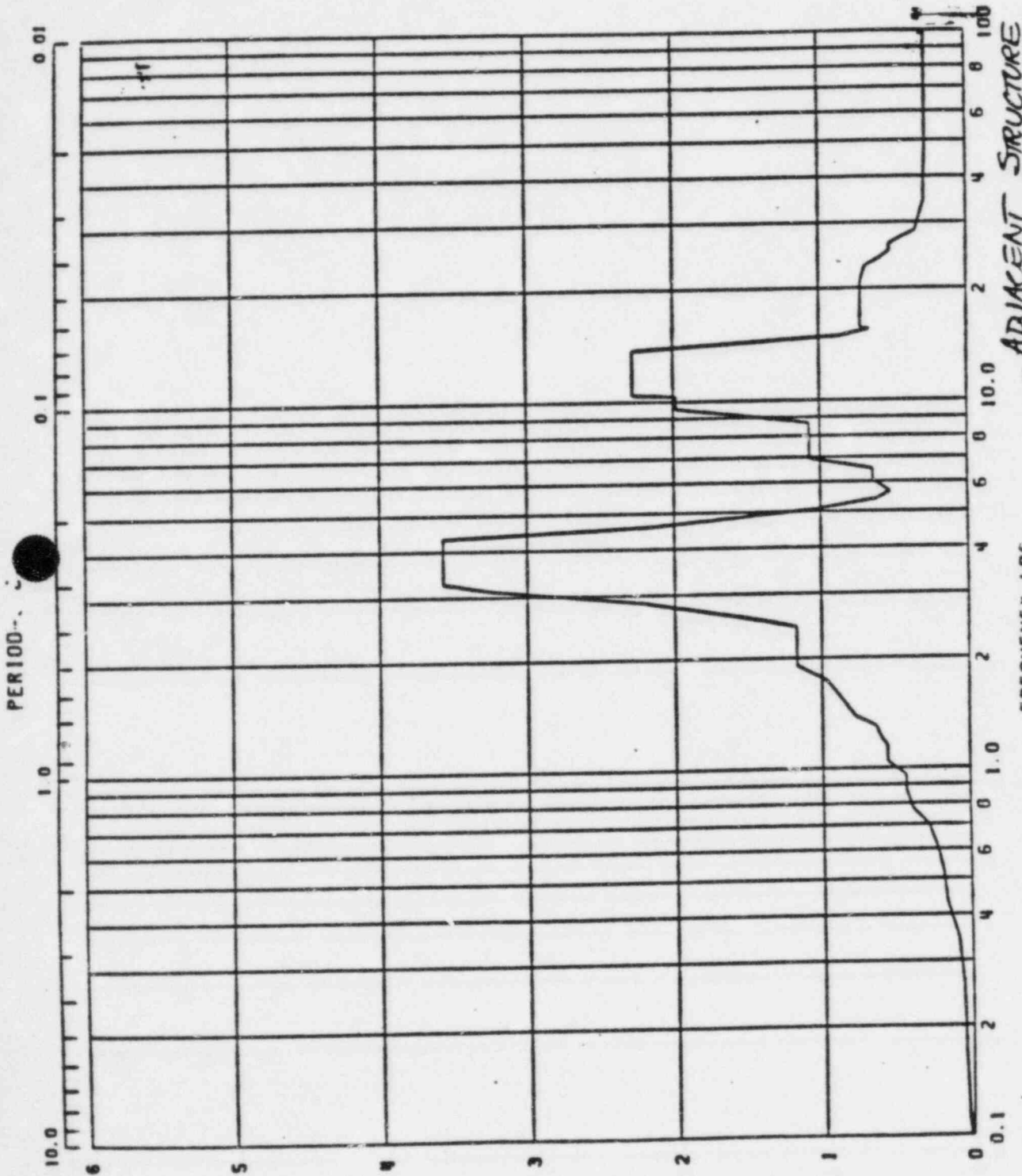


Fig. _____ Limerick Generation Station, Acceleration Spectra for _____
Load Case: FAULTED 3E
Node: 4 Direction: E-W Elev: 239' Angle: _____
Damping: 0.003, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/13/91 Check: FLY Date: 8/27/91

SPECTRAL ACCELERATION, SA-C

F-113

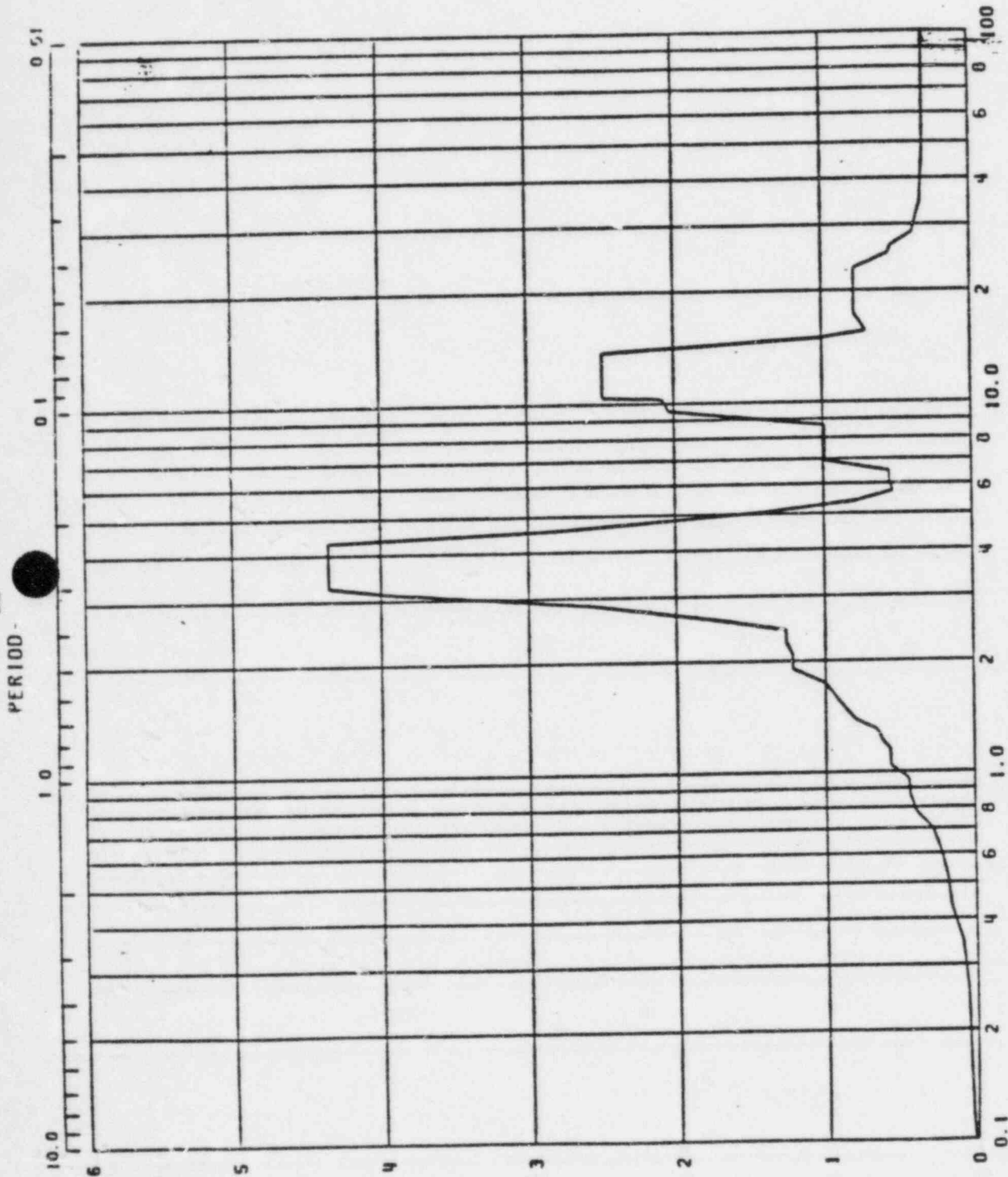


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: 3E-FAULTED
 Node: 5 Direction: E-W Elev: 253 Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/13/81 Check: FLY Date: 8/27/81

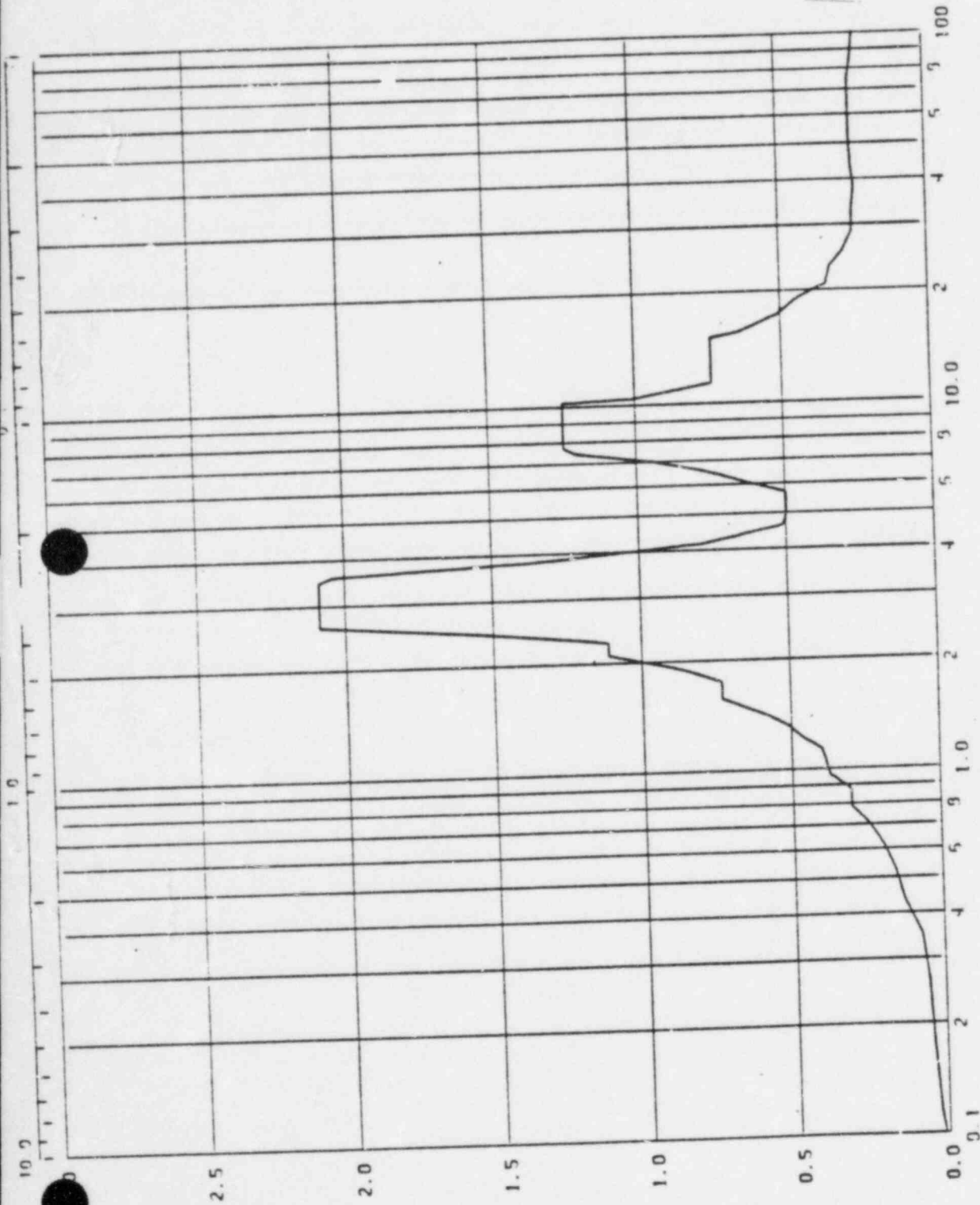


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: Worst Case
 Node: 4 Direction: NS Elev: 239 Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/26/81 Check: LLY Date: 8/27/81

SPEC. 8031-G-19

APPENDIX - F

SPECTRAL ACCELERATION, 50-C

F-125

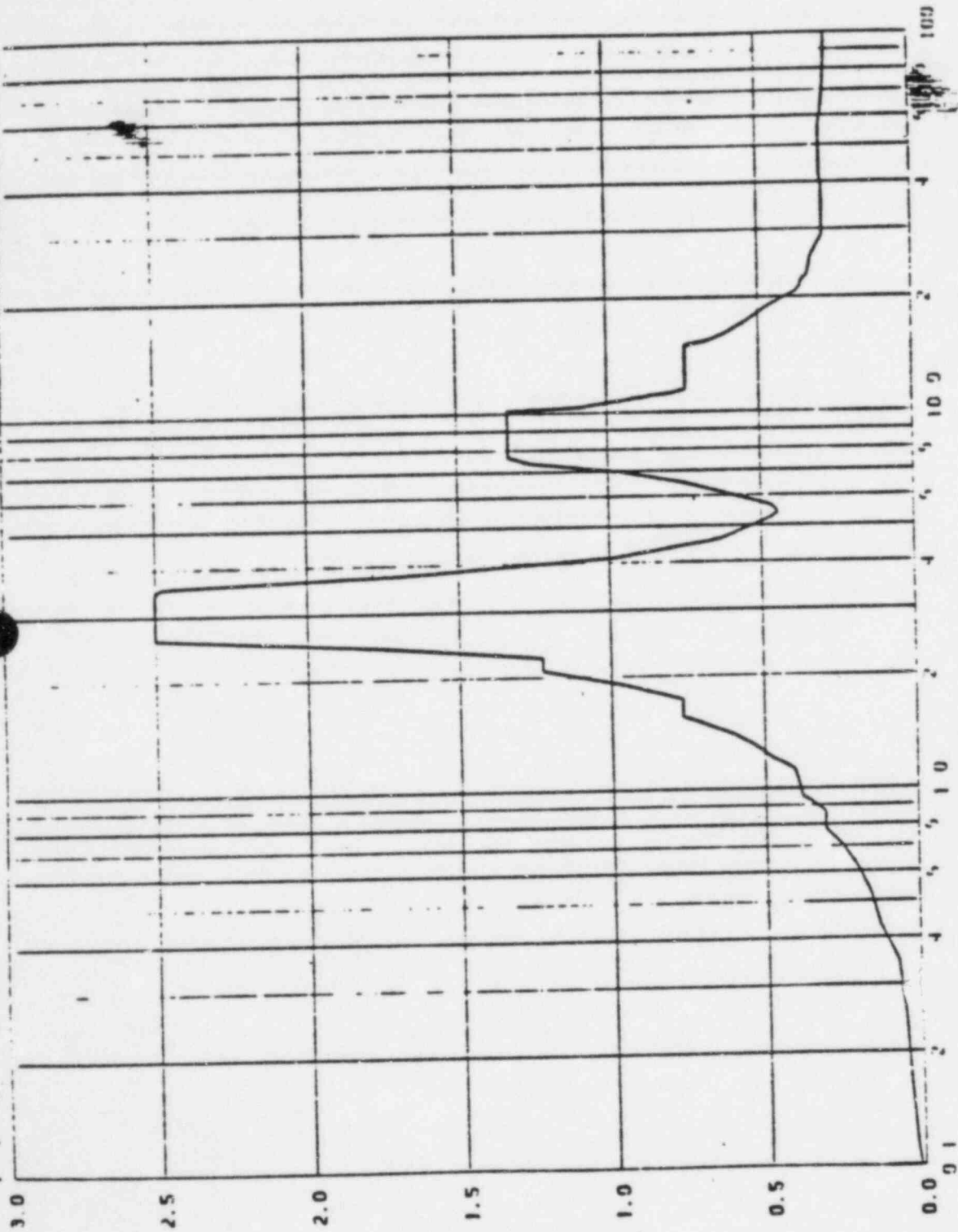


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: WIND CASE
 Node: 5 Direction: N-S Elev: 253 Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: JMP Date: 9/24/81 Check: JKY Date: 8/27/81

SPEC. 8031-6-19
APPENDIX - F

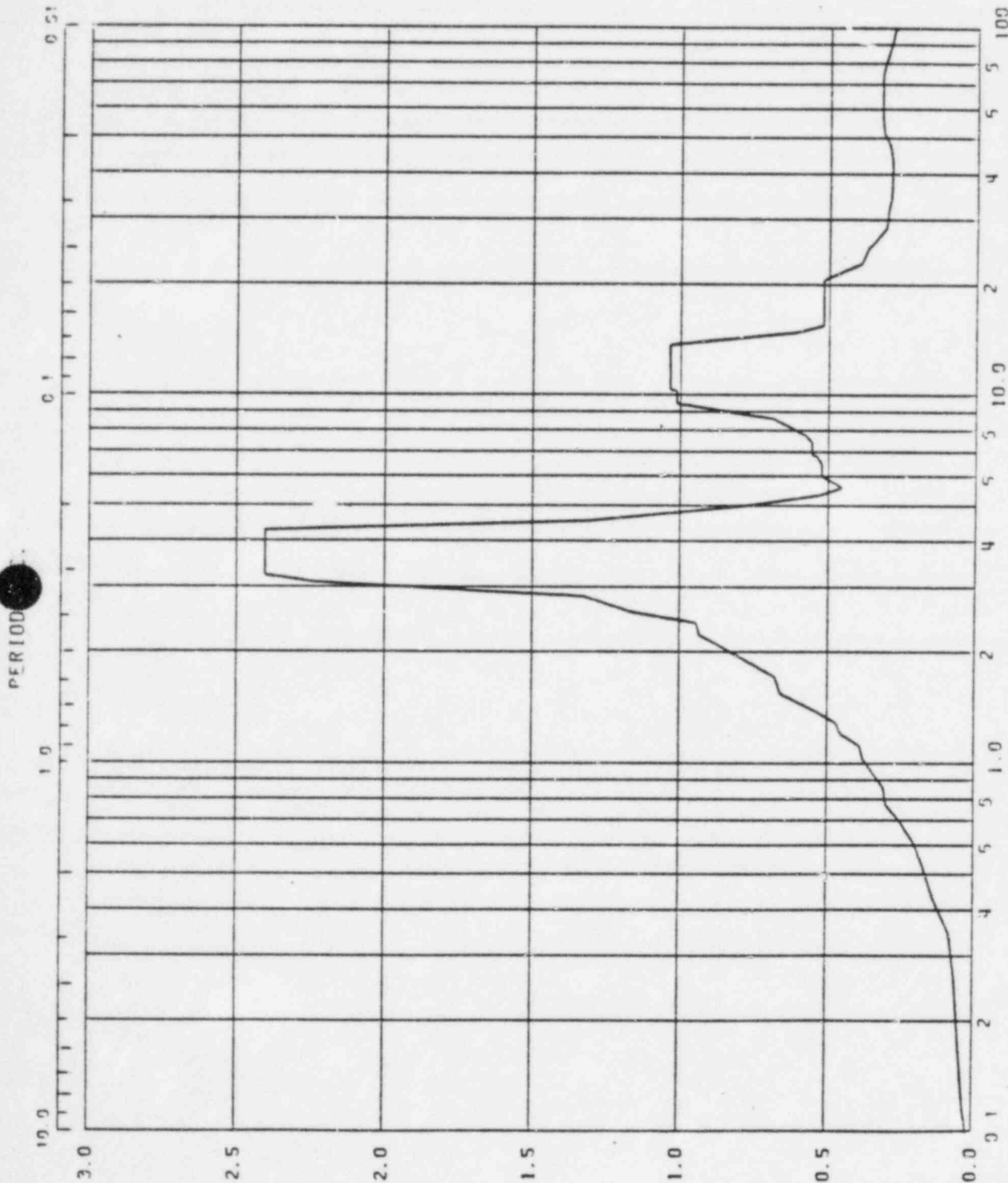


Fig. 1. Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: Worst Case
 Node: 4 Direction: E-W Elev: 239' Angle:
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/13/81 Check: FLY Date: 8/27/81

SPECTRAL ACCELERATION, 50-C

F-137

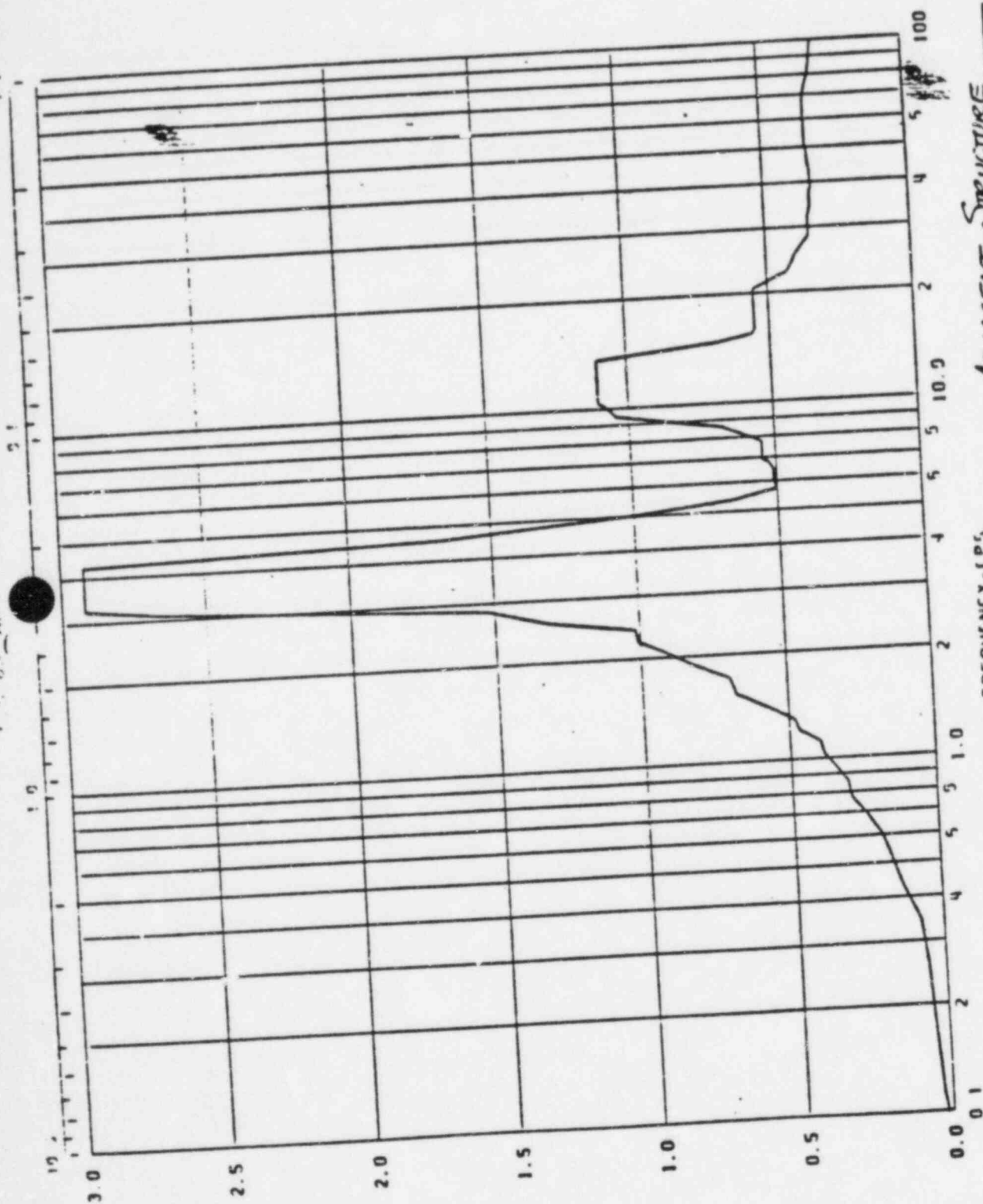


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE _____
 Load Case: Worst Case Elev: 253' Angle: _____
 Node: 5 Direction: E-W Date: 8/17/81 Check: FLY Date: 8/27/81
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: BAP

SPEC. 8031-G-19
APPENDIX - F

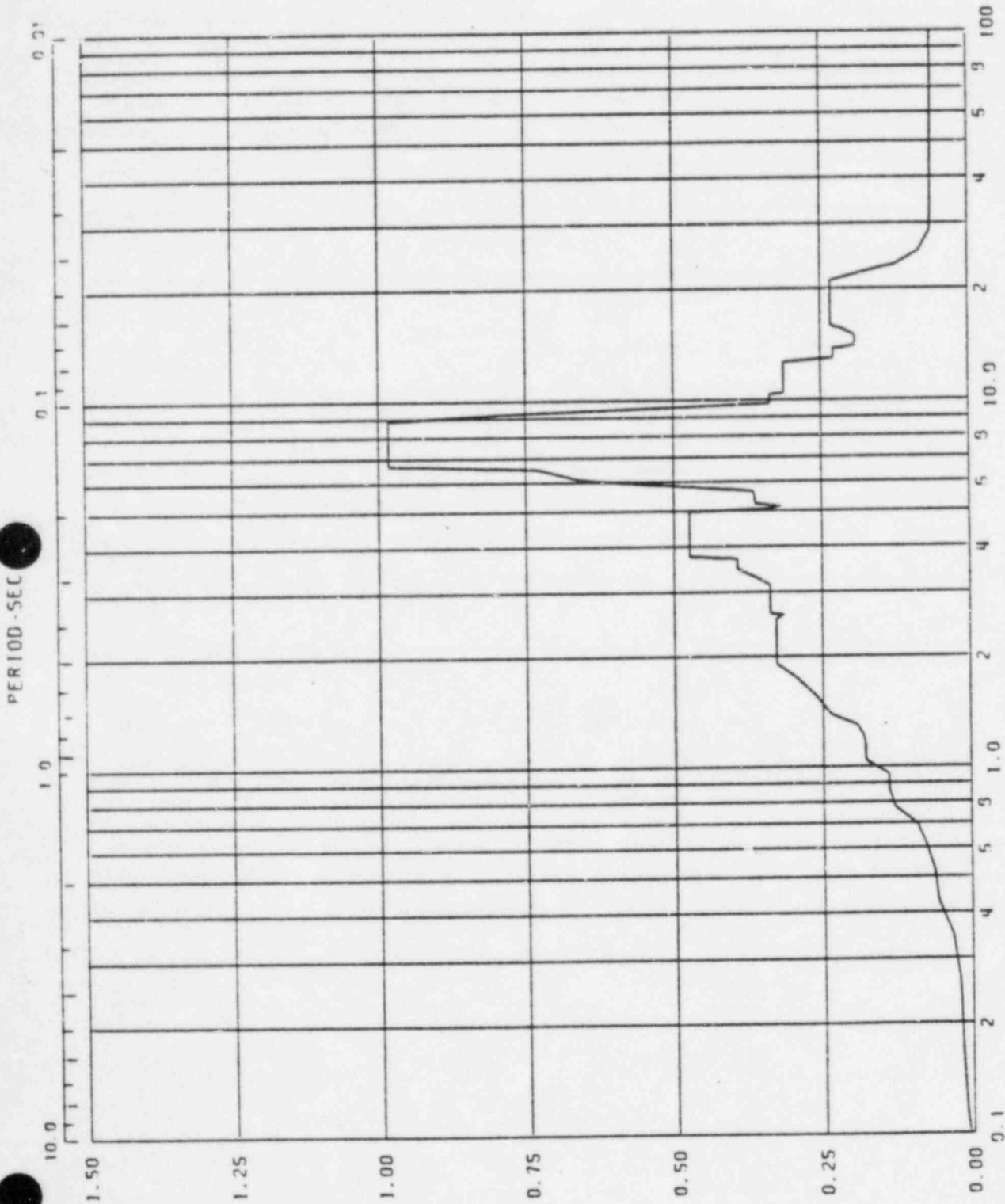
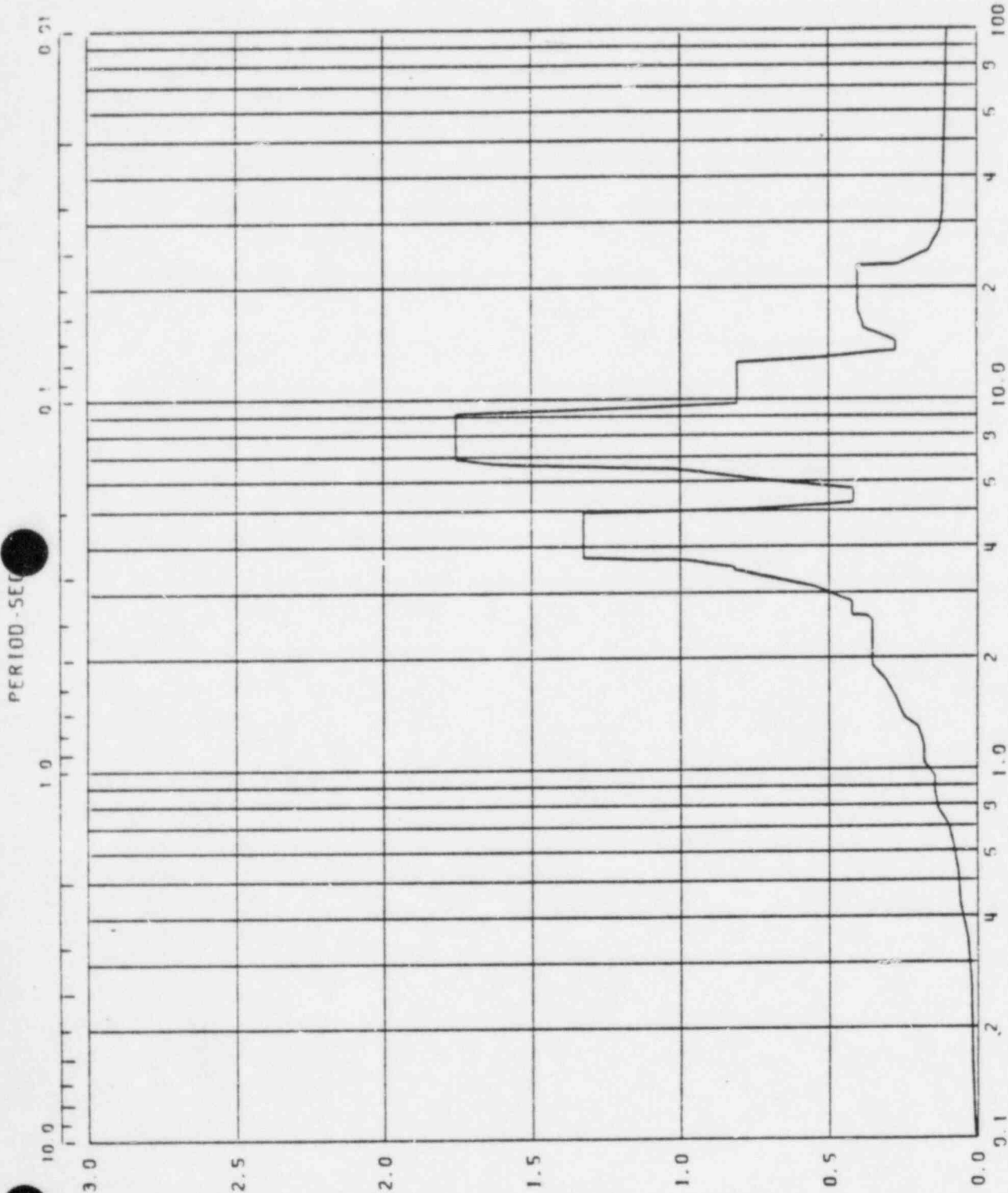


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Load Case: LB UPSET Elev: 253' Angle: _____
 Node: 37 Direction: VERTICAL Check: FLY Date: 8/27/81
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAF

SPEC. 8031-G-19

APPENDIX - F



SPECTRAL ACCELERATION, SA-C

F-180

Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Load Case: 1B UPSET

Node: 39 Direction: VERTICAL Elev: 253' Angle: _____

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/18/91 Check: FLY Date: 8/27/91

SPEC. 8031-G-19
APPENDIX - F

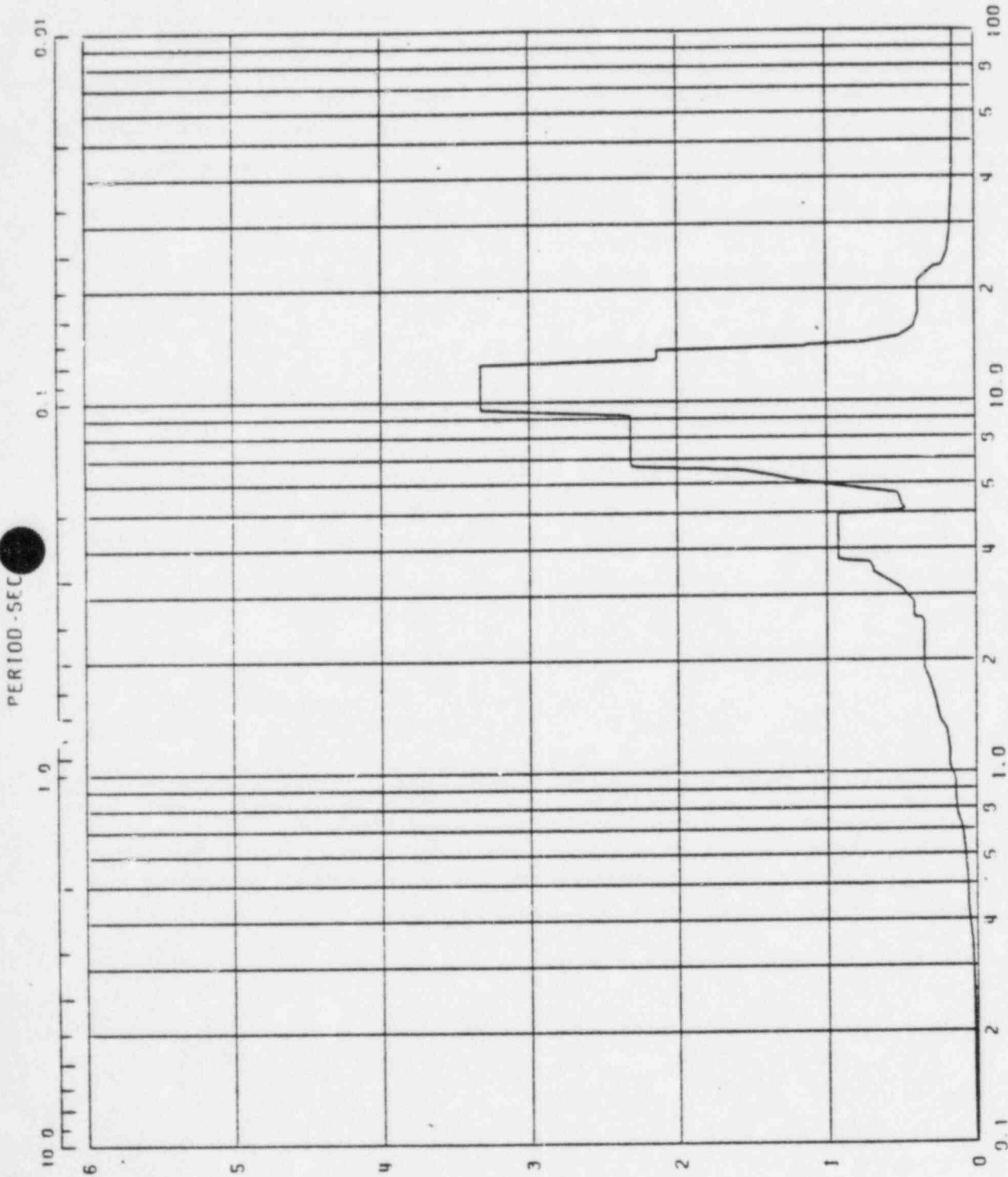
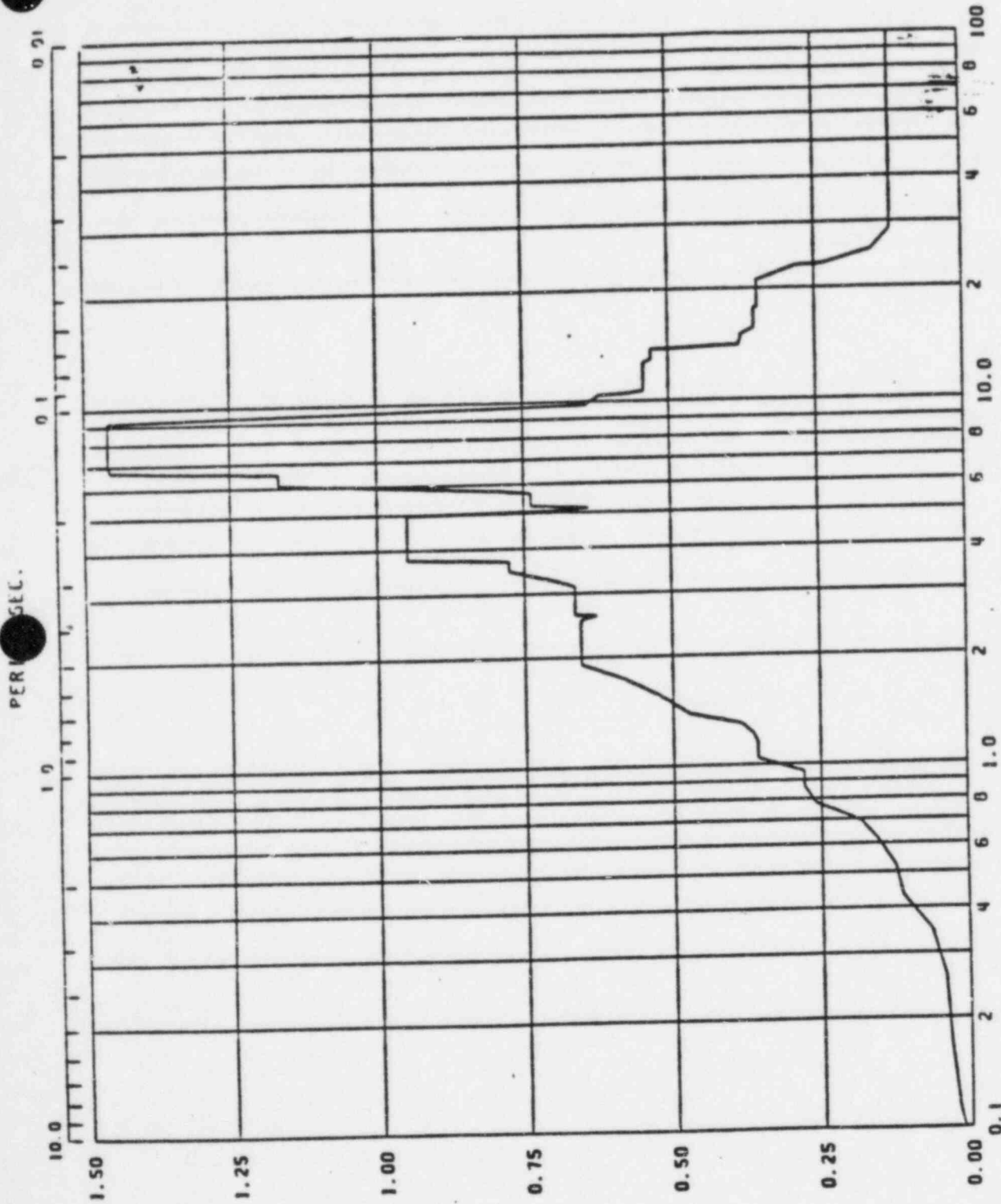


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: LB UPSET
 Node: 38 Direction: VERTICAL Elev: 253' Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/18/81 Check: FLY Date: 8/22/81

SPEC 8-31-61-19

APPENDIX - F



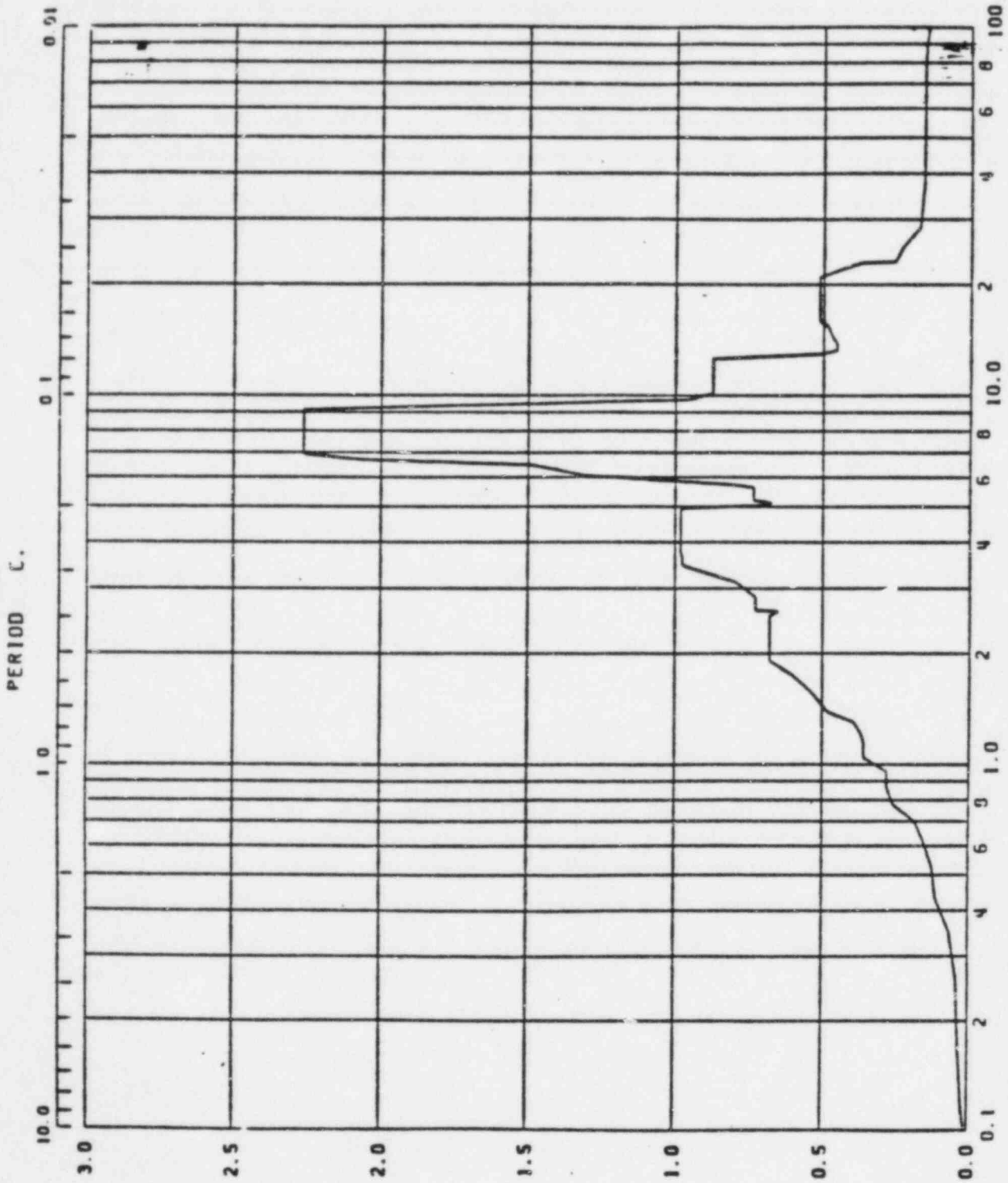
SPECTRAL ACCELERATION, SA-C

F-260

Fig. Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Load Case: 3E FAULTED
 Node: 37 Direction: VERTICAL Elev: 253' Angle:
 Damping: 0.005 0.01 0.02 0.03 0.05 By: RAP Date: 8/17/61 Check: FLY Date: 8/29/61

SPEC. 8031-G-19
APPENDIX-F



SPECTRAL ACCELERATION, SA-C

F-261

Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: 3E- FAULTED
 Node: 39 Direction: VERTICAL Elev: 253' Angle: _____
 Damping: 0.005 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/17/81 Check: FLY Date: 8/27/81

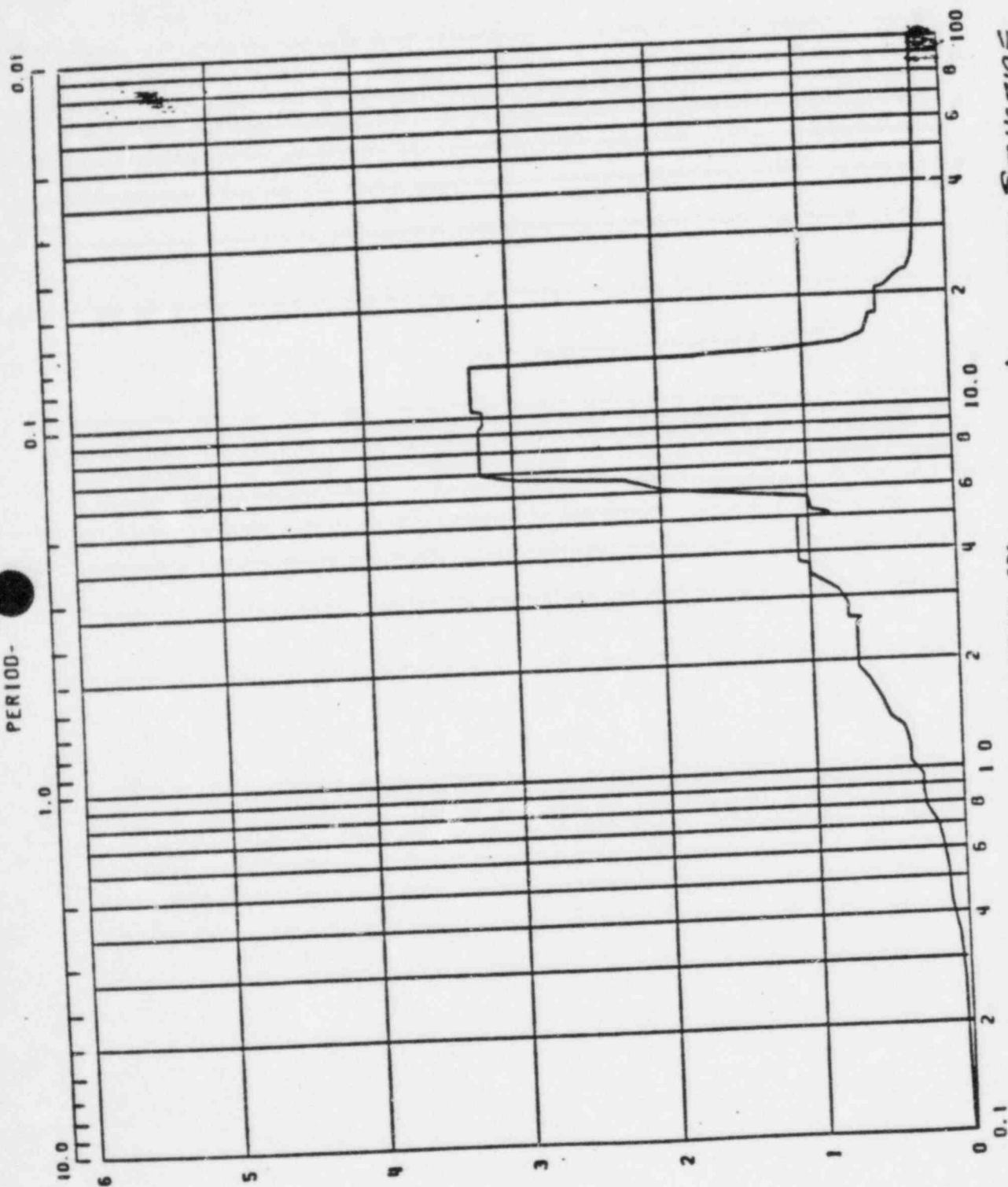


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Load Case: 3-E FAULTED Elev: 253' Angle: _____
 Node: 38 Direction: VERTICAL Check: PLH Date: 8/27/81
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/17/81

SPEC. 8031-G-19
APPENDIX - F

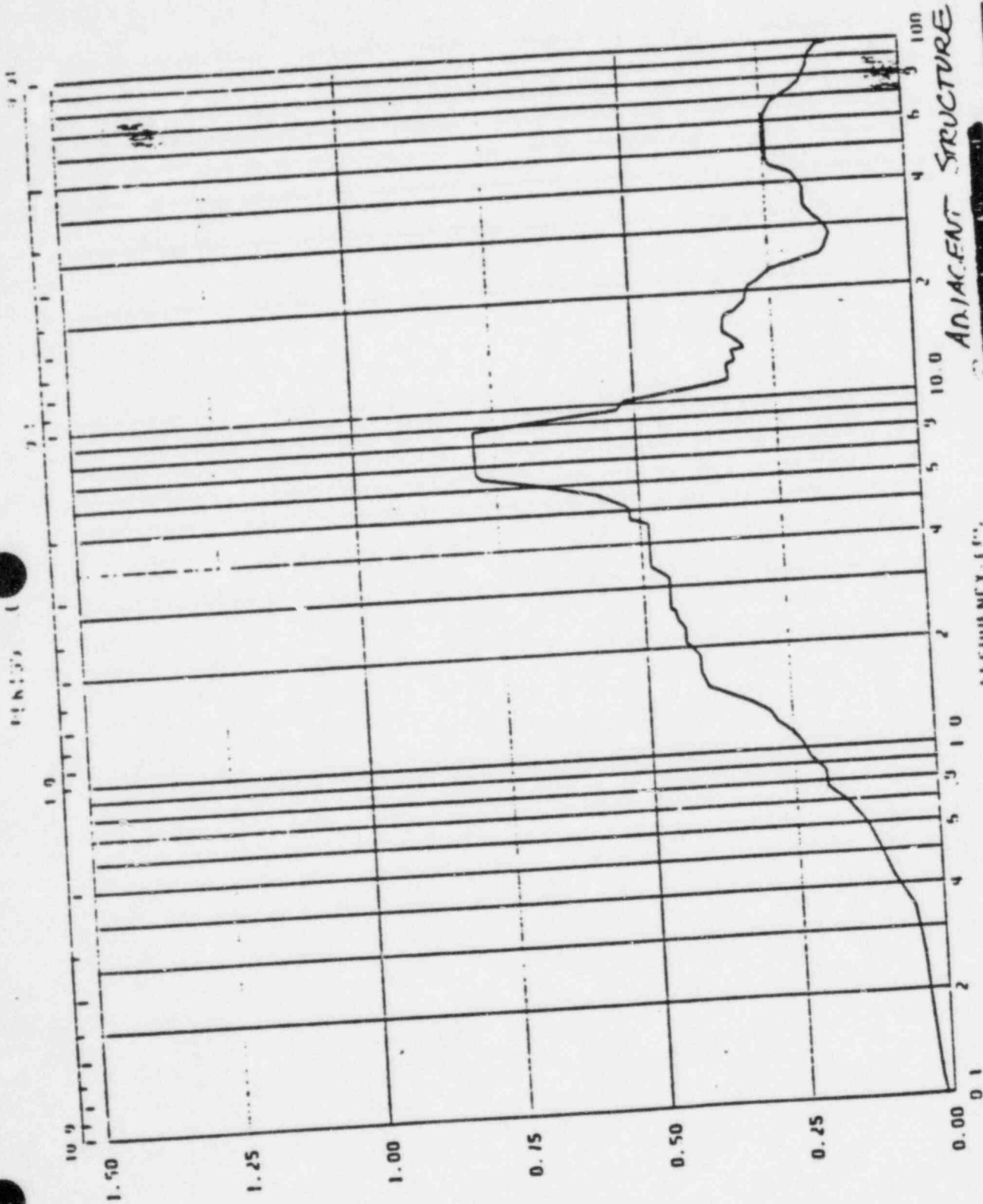


Fig. Limerick Generation Station, Acceleration Spectra for

Load Case: Worst Case Elev: 253' Angle: FL
Node: 37 Direction: VERTICAL Date: 8/17/91 Check: FL Date: 8/27/91
Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP

SPECTRAL ACCELERATION, SP-C

F-287

SPEC. 8031-G-19
APPENDIX - F

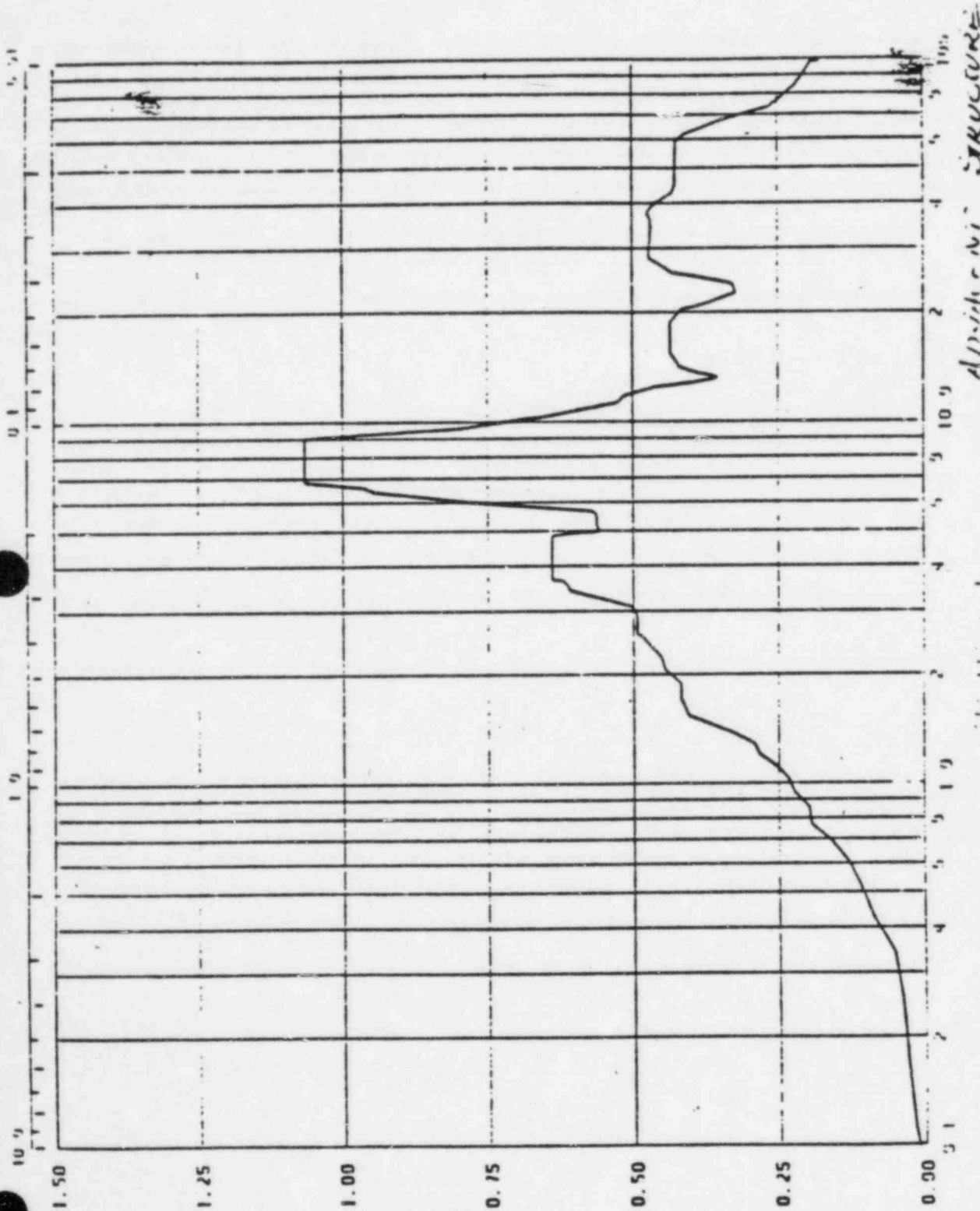
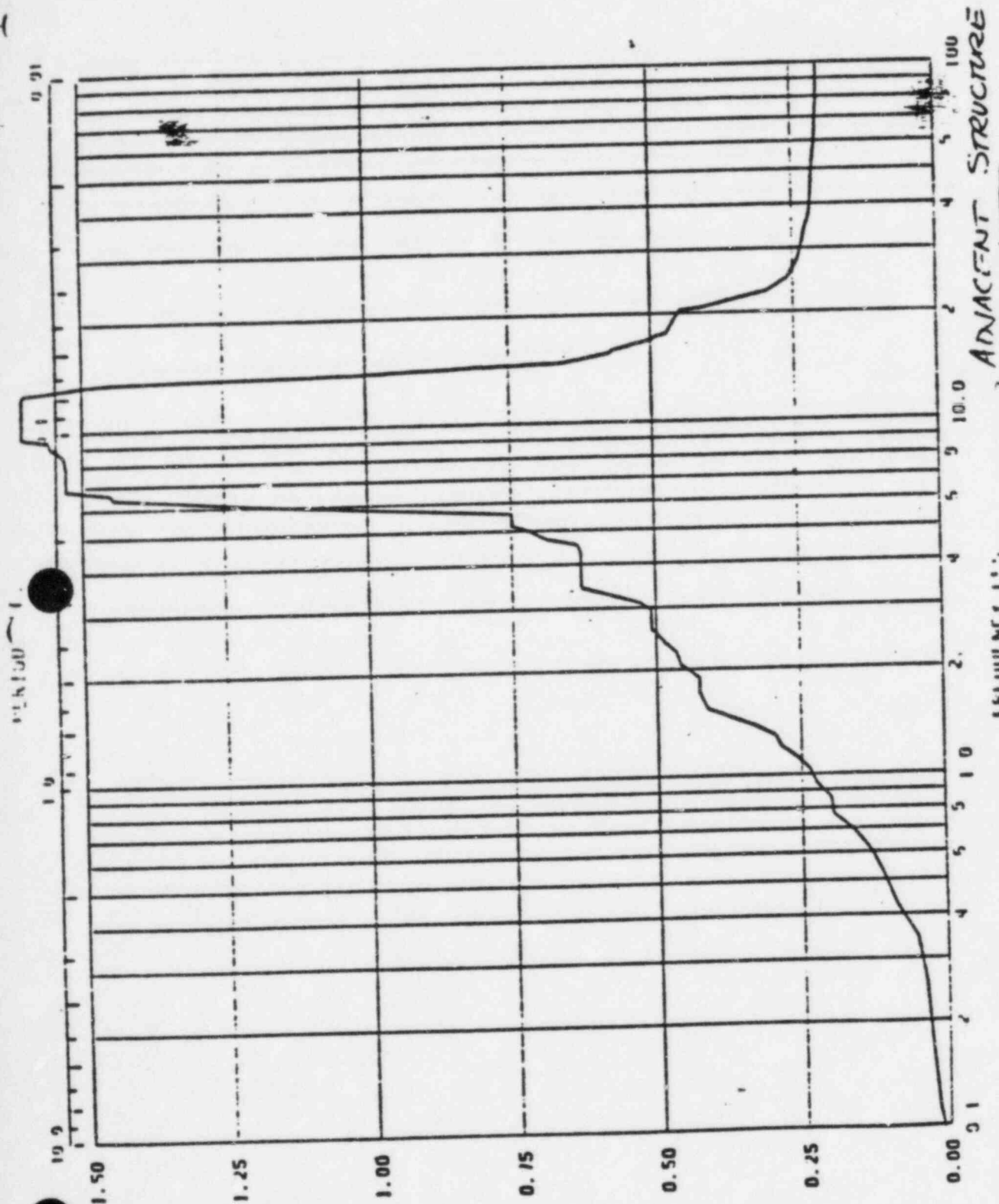


Fig. _____ Limerick Generation Station, Acceleration Spectra for STRUCTURE
Load Case: WIND CASE
Node: 99 Direction: VERTICAL Elev: 253' Angle: _____
Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 5/17/84 Check: FLY Date: 8/27/84

SPEC: 8031-G-19
APPENDIX - F



SPECTRAL ACCELERATION, SA-C

F-301

Fig. _____ Limerick Generation Station, Acceleration Spectra for _____
 Load Case: Worst Case
 Node: 38 Direction: VERTICAL Elev: 253 Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/17/84 Check: FLY Date: 8/21/84

SPEC. 8031-G-19
APPENDIX-F

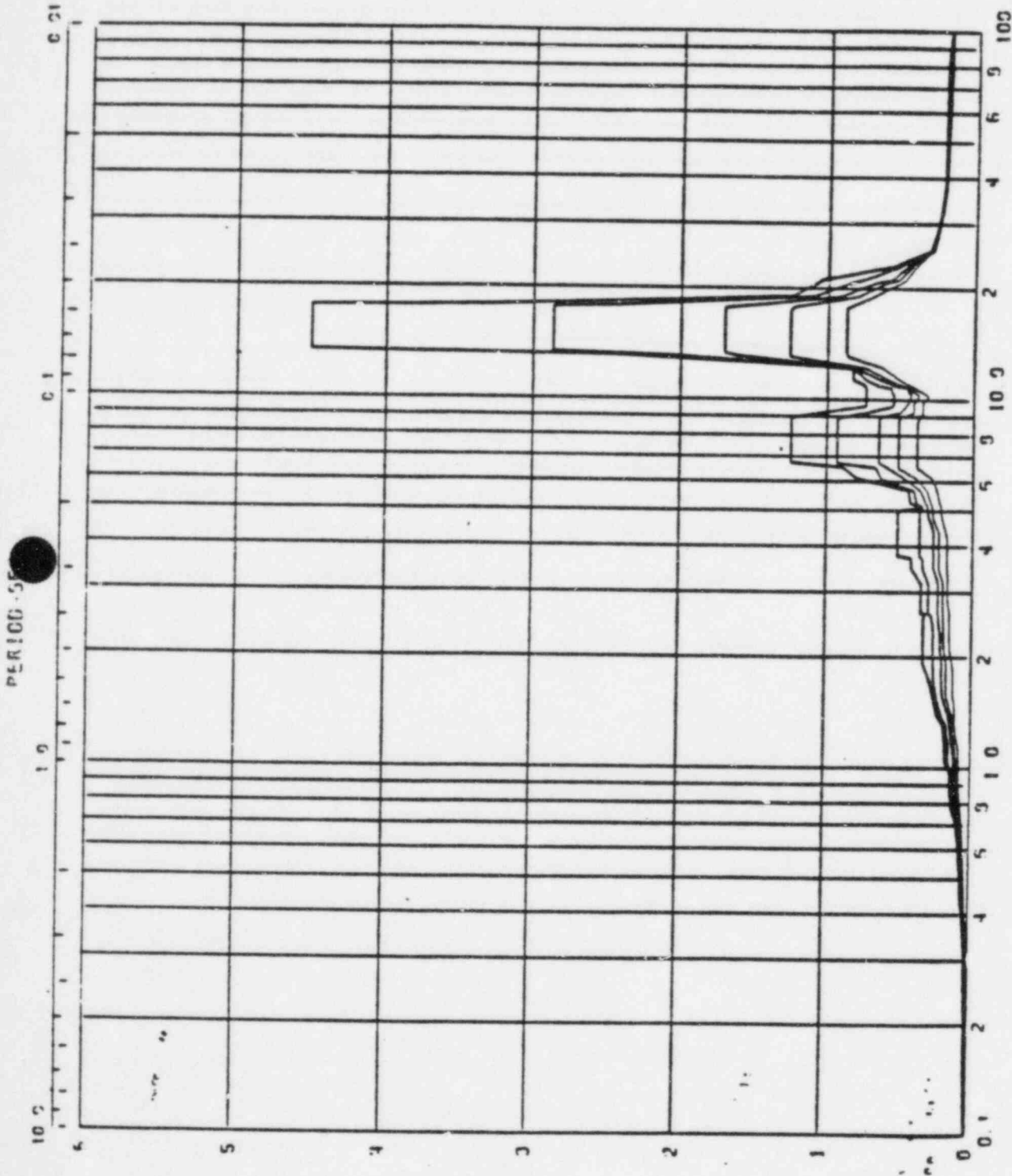


Fig. _____ Limerick Generation Station, Acceleration Spectra for CONTROL BLDG
 Load Case: SEISMIC D.B.E. UPSET IB SRSS
 Node: 7 Direction: VERT Elev: 239' Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 11/3/81 Check: QWC Date: 11/12/81

SPECTRAL ACCELERATION, SA-C

SPEC. 8031-G-19
APPENDIX - F

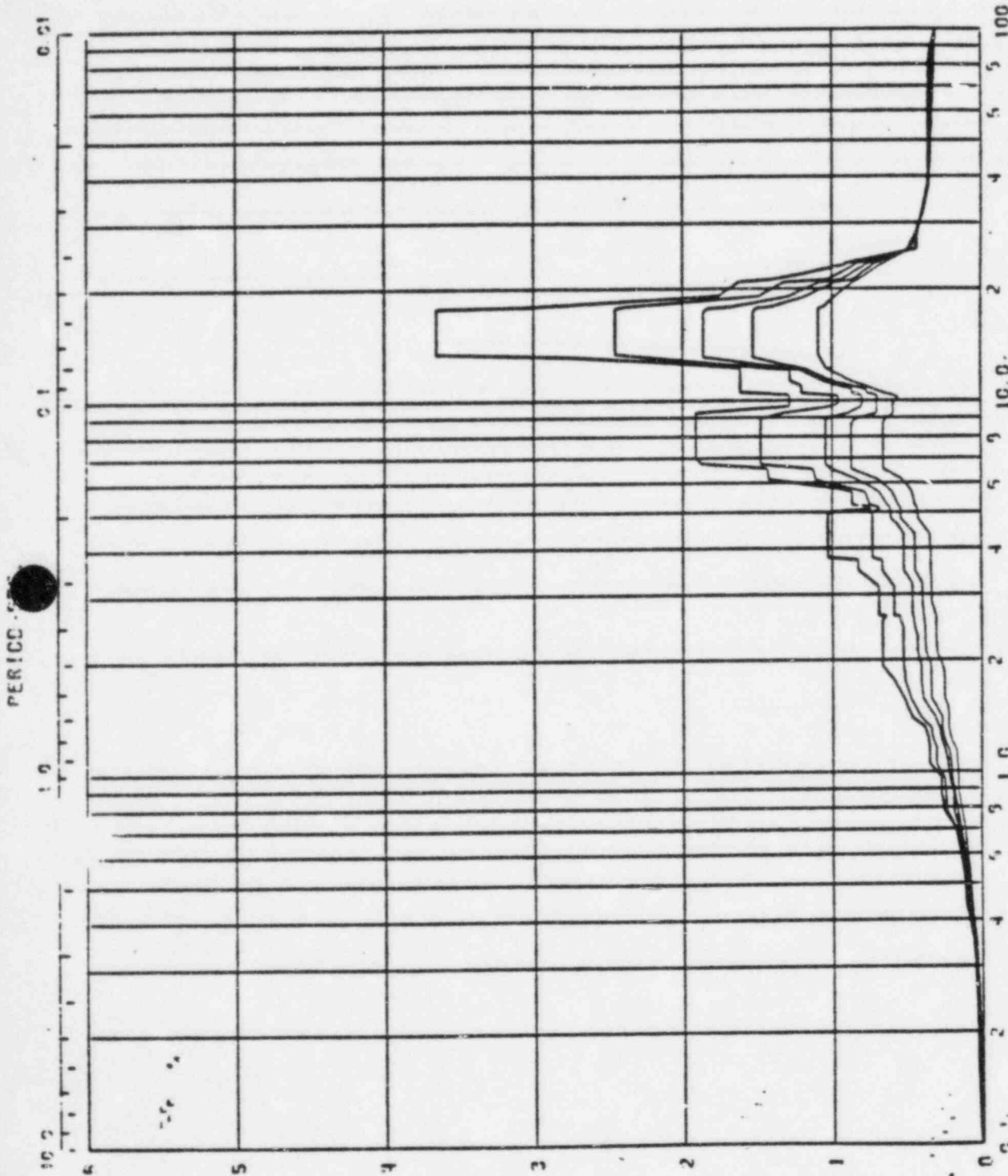


Fig. _____ Limerick Generation Station, Acceleration Spectra for CONTROL BLDG
 Load Case: SEISMIC D.B.E. FAULTED 3-E "SRSS"
 Node: 7 Direction: VERT Elev: 229' Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 11/3/84 Check: GA Date: 11/12/84

SPEC. 8031-G-19

APPENDIX-F

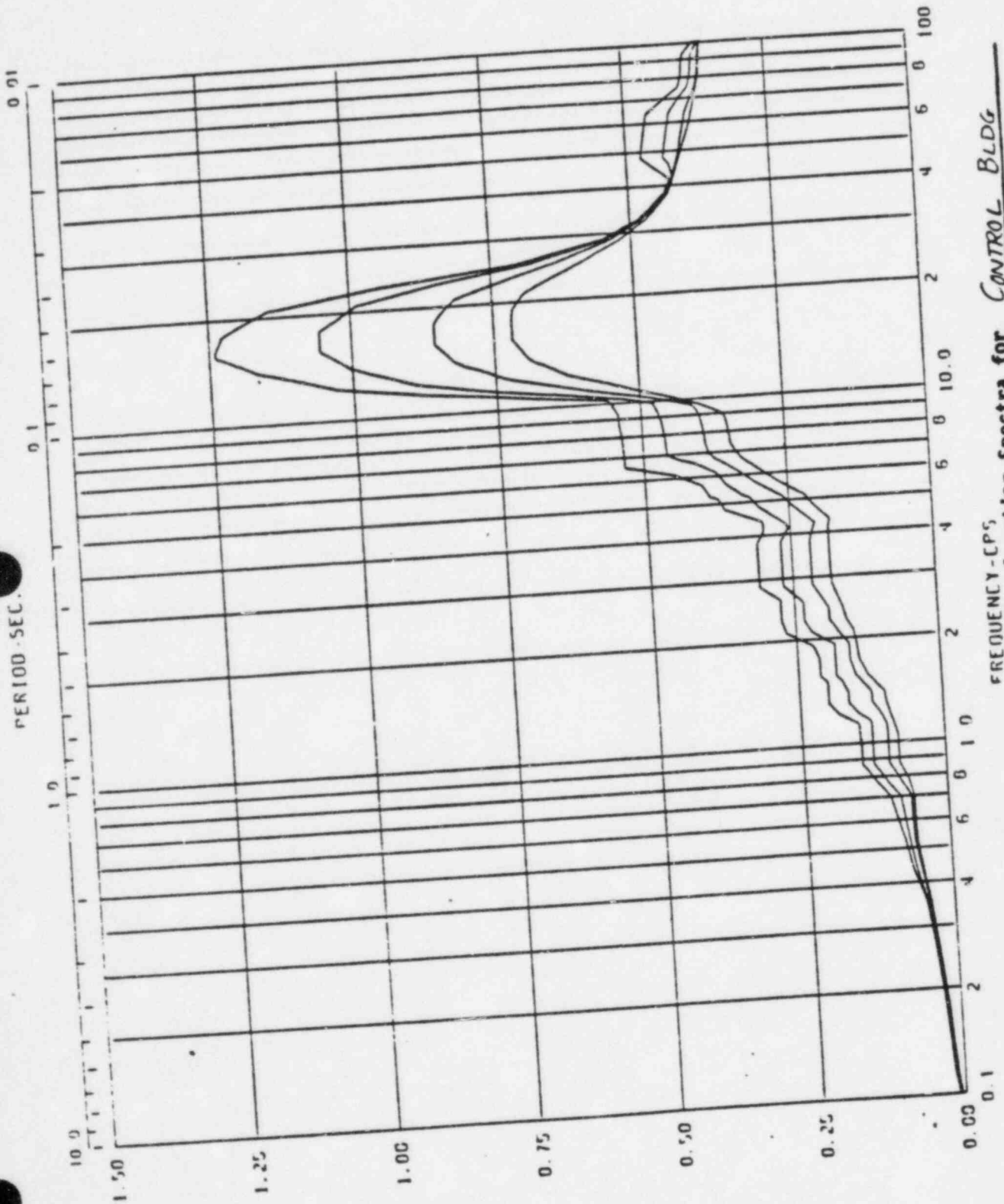


Fig. — Limerick Generation Station, Acceleration Spectra for CONTROL BLDG
 Load Case: 4 Worst Case "SRSS"
 Node: 19 Direction: VERT Elev: 239' Angle: 11/12/61
 Damping: 0.07, 0.10, 0.15, 0.20 By: RAP Date: 11/10/61 Check: JNK

QUALITY SURVEILLANCE REQUIREMENTS

1.0 SCOPE

This attachment describes Bechtel quality surveillance requirements including witness and hold points.

2.0 INITIAL QUALITY SURVEILLANCE VISIT

The Supplier shall furnish to the Bechtel Supplier Quality Representative (SQR) the names and addresses of lower tier suppliers with a description of the work to be subcontracted, when it falls under either of the following categories:

- a. Custom fabricated equipment involving fabrication processes, including examination or testing that will be shipped directly to the jobsite from the lower tier supplier's plant. This does not include off-the shelf equipment preengineered and manufactured for stock.
- b. Custom fabricated equipment that will be shipped to the Supplier for further assembly and inspection, but where the fabrication processes, including examination or testing specified to be witnessed are performed at the lower tier supplier's facilities and will not be repeated in the Supplier's shop. This does not include off-the-shelf equipment preengineered and manufactured for stock.

3.0 WITNESS AND HOLD POINTS

3.1 Witness and hold points are critical steps in manufacturing and testing to be observed by the SQR. The Supplier shall notify the SQR at least five (5) working days in advance of the start of operation/test to be witnessed. The Supplier may proceed with the work past a witness point if the SQR is not available at the appointed time. The Supplier may not proceed with the work past a hold point except by written waiver/agreement by the Bechtel SQR. Final release prior to shipment is a mandatory hold point.

3.2 Quality surveillance shall include, but not be limited to the witness and hold points listed in Table 1. Additional witness and hold points may be established by the SQR with mutual agreement of the Supplier.

4.0 ENGINEERING/QUALITY VERIFICATION DOCUMENTS

The Supplier shall provide evidence to the SQR that all documents requiring project engineering review have review status Code 1 or 2 prior to release for shipment. The 8031-DR Form shall be used as a cover sheet for the quality verification documentation as the package is presented to the SQR for review and sign-off prior to release for shipment.

TABLE

COMPLETED UNITS

WITNESS POINTS

<u>Description</u>	<u>Operation/Test/Examination</u>
Completed housing and supports	Surface preparation and visual examination prior to painting.
Completed housing and components	Finished surfaces and components prior to assembly
Completed units	Installation of component and wiring for type, crimping and separation.

HOLD POINTS

<u>Description</u>	<u>Operation/Test/Examination</u>
Completed Units	Final inspection for materials of construction, dimensions, general workmanship, cleanness, marking, tagging, and preparation for shipment
Suppliers quality verification documents	Review and signoff for completeness and accuracy
Completed Units	Functional Tests as described in Sec. 12.3 of Spec. 8031-E-7.

DISTRIBUTION AND ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED. . . (SEE COL. 6)

- | | | |
|-----------------|---|-------------------------------------------------|
| 1 = APPROVAL | { | BECHTEL POWER CORPORATION |
| 2 = INFO/REVIEW | | SAN FRANCISCO POWER DIVISION |
| | | P.O. BOX 3965, SAN FRANCISCO, CA. 94119 |
| | | Attn: A. Teller, Project Engineer |
| 3 = APPROVAL | { | BECHTEL POWER CORPORATION |
| 4 = INFO/REVIEW | | LIMERICK GENERATING STATION |
| | | P.O. BOX A, SANATOGA BRANCH |
| | | POTTSTOWN, PA. 19464 |
| | | Attn: J.H. Galley, Project Construction Manager |

- F = PRIOR TO FABRICATION
 S = PRIOR TO SHIPMENT
 C = PRIOR TO BALANCE OF PAYMENT (FINAL CERTIFIED COPY REQUIRED)

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED REFER TO SPECIFICATION 8031-G-5														
	DOCUMENT TITLE	DOCUMENTATION DISTRIBUTION & ACTION CODE													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
		DOCUMENT CODE	ACT CODE	TECH. SPEC. REF.											
Definitions and instructions pertaining to entries on the sheets of Form 8031-DR to follow															
<p>1. "Documentation" is defined as drawings, sketches, diagrams, procedures, reports, instructions, data sheets, manuals, certificates, samples or any other document requiring submittal to Bechtel. (See document title column)</p> <p>Documentation shall be one full-size reproducible unless Supplier is advised otherwise.</p> <p>2. Column 6 defines when documentation is required.</p> <p>3. Columns 7 & 8 defines where documentation is to be sent.</p> <p>4. Columns 9 thru 14 indicates the applicable section of a specification.</p> <p>5. Categories of documentation</p> <p>(a) Engineering documentation - general.</p> <p>That documentation which after review and approval by Bechtel no further submittals are required.</p> <p>(b) Engineering Documentation - specific.</p> <p>That documentation which after review and approval by Bechtel for fabrication, and after fabrication, one complete set shall be submitted annotated "Certified As-Built".</p> <p>(c) Procedures - such as testing procedures, welding procedures and etc.</p> <p>(d) Quality records - such as test reports, material certifications or other quality records generated during manufacturing cycle.</p> <p>6. (I) Bechtel Inspector release required for documentation as noted.</p>															

FORM 8031-DR
JULY 1973



BECHTEL
POWER
CORPORATION

MEDIUM VOLTAGE METAL-CLAD
SWITCHGEAR AND ASSOCIATED
BUS DUCT

PHILADELPHIA ELECTRIC COMPANY
LIMERICK GENERATING STATION UNITS 1 & 2

JOB
NO. 8031

ATTACHMENT TO
REQUISITION NUMBER
8031-E-7

Sheet 1 of 6

REV.

4

DISTRIBUTION / ID ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED... (SEE COL. 6)

1 = APPROVAL

2 = INFO/REVIEW

3 = APPROVAL

4 = INFO/REVIEW

BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Attn: A. Teller, Project Engineer

BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464

Attn: J.H. Galley, Project Construction Manager

F = PRIOR TO FABRICATION

S = PRIOR TO SHIPMENT

C = PRIOR TO BALANCE OF PAYMENT (FINAL
CERTIFIED COPY REQUIRED)

(I) = INSPECTOR RELEASE REQUIRED

PARTS OF EACH
ITEM, SYSTEM, SYSTEM COMPONENT,
ELEMENT, OR PORTION THEREOF
REQUIRING DOCUMENTATION

NON-CLASS I SWGR &
COMMON

1.0 Engineering Documentation

1.1 General

Unless otherwise noted
one copy of the documents
listed in this section
are required for the
action noted in Columns
6 & 7. After complete
review and/or approval
by Bechtel no further
transmittals are required.

1.2 Specific

One copy of documents
listed in this section
are required for the
action noted in Columns
6 & 7. After review and
approval and after fab-
rication, documents anno-
tated "Certified As-Built"
are required as follows:

- a) One set for action
noted in Col. 6&7. (I)

*Common to both Non-Class I
and Class I Swgr.

DOCUMENTATION REQUIRED
REFER TO SPECIFICATION 8031-G-5

DOCUMENT TITLE

DOCUMENTATION DISTRIBUTION &
ACTION CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14
DOCUMENT CODE					ACT CODE			TECH. SPEC. REF.					

1)* List of recommended spare
parts for one years operation,
with prices (6 copies required)

S 2 1 5.0

2)* Current transformer data

F 1 1 5.0

3)* Misc. detail drawings as
required

F 1 1 5.0

4)* Supplier Deviation Disposition
Requests, Form ED-27

F 1 1 8.0

1) General Arrangement Drawings
for each equipment item of M/R

F 1 1 5.0

2) Bill of Material

F 1 1 5.0

3) Nameplate Information

F 1 1 5.0

4) Wiring Diagrams

F 1 1 5.0

MEDIUM-VOLTAGE METAL-CLAD
SWITCHGEAR AND ASSOCIATED
BUS DUCT

PHILADELPHIA ELECTRIC COMPANY
LIMERICK GENERATING STATION UNITS 1 & 2

JOB
NO. 8031

ATTACHMENT TO
REQUISITION NUMBER

8031-E-7

Sheet 2 of 6

REV.

4

FORM 8031-DR
JULY 1973



BECHTEL
POWER
CORPORATION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

1 = APPROVAL

2 = INFO/REVIEW

3 = APPROVAL

4 = INFO/REVIEW

BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Artin, A. Teller, Project Engineer

BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464

Attn: J.H. Galley, Project Construction Manager

F = PRIOR TO FABRICATION

S = PRIOR TO SHIPMENT

C = PRIOR TO BALANCE OF PAYMENT (FINAL
CERTIFIED COPY REQUIRED)

(I) = INSPECTOR RELEASE REQUIRED

**Send 1 copy per sec. 17.7 of spec.



BECHTEL
POWER
CORPORATION

MEDIUM VOLTAGE METAL-CLAD
SWITCHGEAR AND ASSOCIATED
BUS DUCT

PHILADELPHIA ELECTRIC COMPANY
LIMERICK GENERATING STATION UNITS 1 & 2

JOB NO 8031

ATTACHMENT TO
REQUISITION NUMBER

8031-E-7

Sheet 3 of 6

REV.

4

DISTRIBUTION / ID ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED... (SEE COL. 6)

1 = APPROVAL
 2 = INFO/REVIEW
 3 = APPROVAL
 4 = INFO/REVIEW

BECHTEL POWER CORPORATION
 SAN FRANCISCO POWER DIVISION
 P.O. BOX 3965, SAN FRANCISCO, CA. 94119
 Attn. A. Teller, Project Engineer


BECHTEL POWER CORPORATION
 LIMERICK GENERATING STATION
 P.O. BOX A, SANATOGA BRANCH
 POTTSTOWN, PA. 19464
 Attn. J.H. Galley, Project Construction Manager

F = PRIOR TO FABRICATION
 S = PRIOR TO SHIPMENT
 C = PRIOR TO BALANCE OF PAYMENT (FINAL
 CERTIFIED COPY REQUIRED)

(I) = INSPECTOR RELEASE REQUIRED

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED REFER TO SPECIFICATION 8031-G-5													
	DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE								
						1	2	3	4	5	6	7	8	9
						DOCUMENT CODE						ACT CODE		TECH. SPEC. REF.
CLASS I SWGR.														
1.0 Engineering Documentation														
1.1 General														
Unless otherwise noted one copy of the documents listed in this section are required for the action noted in Columns 6 & 7. After complete review and/or approval by Bechtel no further transmittals are required.	1) Qualification for Service Conditions-IEEE-323											S 1		1 2.2
	2) Seismic Qualification Analysis/ Test Data, (May be part of (1) above)											S 1		5.3*
	3) Written documentation and/or certified test reports that the equipment meets the following applicable standards: (May be part of (1) and (2) above)											S 1		1 2.2
	a) ANSI C37.09, Std. Test Procedure for AC High Voltage Ckt. Bkrs.:													1 2.2a
	Sect. 09-4 Design Tests													
	b) ANSI C37.9, Std. Test Code Circuit Breakers													1 2.2b
	Sect. 9.2 Design Tests													
	c) ANSI C37.20, Std. for Swgr. Assemblies													1 2.2c
	Sect. 20-5.2 Design Tests													

*Also refer to page 15, Notes
1, 2, 3 & 4 of P.O. LX-
393907

FORM 8031-DR JULY 1973	 BECHTEL POWER CORPORATION	MEDIUM-VOLTAGE METAL-CLAD SWITCHGEAR AND ASSOCIATED BUS DUCT PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2	JOB NO. 8031	REV. 6
			ATTACHMENT TO REQUISITION NUMBER 8031-E-7 Sheet 4 of 6	

DISTRIBUTION / ID ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED. . (SEE COL. 6)

- 1 = APPROVAL } BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Attn. A. Teller, Project Engineer
- 2 = INFO/REVIEW }
- 3 = APPROVAL } BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
- 4 = INFO/REVIEW } Attn. J.H. Galley, Project Construction Manager


F = PRIOR TO FABRICATION

S = PRIOR TO SHIPMENT

C = PRIOR TO BALANCE OF PAYMENT (FINAL
CERTIFIED COPY REQUIRED)

(I) = INSPECTOR RELEASE REQUIRED

ITEMS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED REFER TO SPECIFICATION 8031-G-5													
	DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE								
						1	2	3	4	5	6	7	8	9
						DOCUMENT CODE					ACT CODE			TECH. SPEC. REF.
CLASS I SWGR. Cont'd														
1.0 Engineering Documentation														
1.2 Specific	1) General Arrangement Drawings for each equipment item of M/R										F 1			1 5.0
One copy of documents listed in this section are required for the action noted in Columns 6 & 7. After review and approval and after fab- rication, documents anno- tated "Certified As-Built" are required as follows:	2) Bill of Material										F 1			1 5.0
	3) Nameplate Information										F 1			1 5.0
	4) Wiring Diagrams										F 1			1 5.0
a) One set for action noted in Col. 6&7. (I)														
2.0 Procedures														
2.1 General	1) Quality Assurance Program										F 1			1 2.1
Unless otherwise noted one copy of each is re- quired.														

FORM 8031 OR JULY 1973	 BECHTEL POWER CORPORATION	MEDIUM VOLTAGE METAL-CLAD SWITCHGEAR AND ASSOCIATED BUS DUCT PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2	JOB NO. 8031	REV. 4
			ATTACHMENT TO REQUISITION NUMBER 8031-E-7 Sheet 5 of 6	

DISTRIBUTION / ID ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED... (SEE COL. 6)

- 1 = APPROVAL
2 = INFO/REVIEW
3 = APPROVAL
4 = INFO/REVIEW
- BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Attn. A. Teller, Project Engineer
- BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
Attn. J.H. Galley, Project Construction Manager

- F = PRIOR TO FABRICATION
S = PRIOR TO SHIPMENT
C = PRIOR TO BALANCE OF PAYMENT (FINAL
CERTIFIED COPY REQUIRED)
- (I) = INSPECTOR RELEASE REQUIRED

PARTS OF EACH
ITEM, SYSTEM, SYSTEM COMPONENT,
ELEMENT, OR PORTION THEREOF
REQUIRING DOCUMENTATION

DOCUMENTATION REQUIRED
REFER TO SPECIFICATION 8031-G-5

DOCUMENT TITLE

DOCUMENTATION DISTRIBUTION &
ACTION CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
DOCUMENT CODE					ACT CODE	TECH. SPEC. REF.								

CLASS I SWGR. Cont'd

3.0 Quality Records

3.1 Two complete sets of the documents of this section shall be submitted as a final documentation package with each equipment shipment. One copy to accompany the equipment and one copy per columns 6 & 7.

- 1) Quality Control Inspection and Test Reports, including the following: (I)
- a. ANSI C37.09, Section 09-5
Production tests
- b. ANSI C37.20, Section 5.3
Routine tests
- 2) Statement of Conformance, Form 3295. (I)
- 3) Paint certification. (I)
- 4) Supplier Deviation Disposition Requests, Form ED-27, (Copy only of those approved but not incorporated in M/R or Specification) (I)

C 3 1 2.3

C 3 1 2.5

C 3 G 4.5

1 8.0

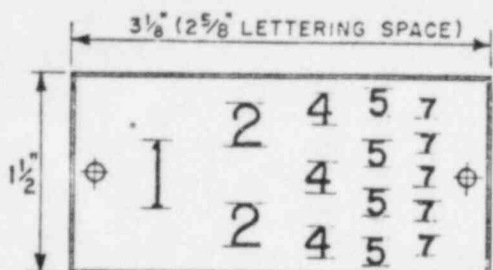
FORM 8031-DR
JULY 1973BECHTEL
POWER
CORPORATIONMEDIUM VOLTAGE METAL-CLAD
SWITCHGEAR AND ASSOCIATED
BUS DUCTPHILADELPHIA ELECTRIC COMPANY
LIMERICK GENERATING STATION UNITS 1 & 2JOB
NO. 8031ATTACHMENT TO
REQUISITION NUMBER

8031-E-7

Sheet 6 of 6

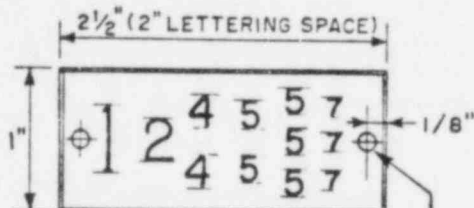
REV.

4



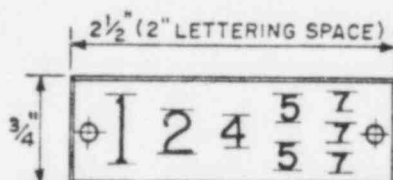
STYLE 1.

1/64" BEVEL, ALL PLATES

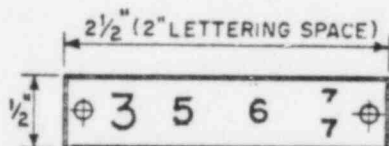


STYLE 2.

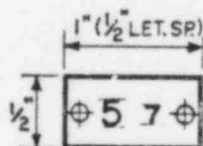
1/8" DRILL ON ϕ , ALL PLATES.
(SEE NOTE 2)



STYLE 3.



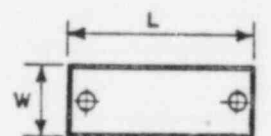
STYLE 4.



STYLE 5.

LETTER SIZE	1	2	3	4	5	6	7
HEIGHT (SEE DET. 'A')	1/2"	3/8"	5/16"	1/4"	3/16"	5/32"	1/8"
NO. PER 'INCH'	2-1/4	3	3-3/4	4-1/2	6-1/2	7-1/2	9-1/2
NO. { STY. 1	6	8	10	12	17	19	25
PER { STY. 2, 3 & 4	4	6	7	9	13	15	19
LINE { STY. 5			1	2	3	3	4
NO. OF { STY. 1	2	3	3	3	4	4	5
LINES { STY. 2	1	1	1	2	3	3	3
MAX. { STY. 3				1	2	2	3
					1	1	2
							2

3" { LETTER HEIGHT
MEASURED BETWEEN
CENTER LINES
— DETAIL 'A' —



SPECIAL STYLE

STYLE #	L	W	LETTER SIZE

NOTES:

1. Thickness of nameplate is 1/16"

2. Furnish plates with drilled holes unless specified otherwise.

(Alternative application: Attach nameplates to the board with Minnesota Mining Co. Cement "3M". In this case no holes will be required.

3. Nameplate material is 3-ply lamicoid #7031 plate. With white surface and black core. See nameplate schedule for other colors.

4. Engrave letters thru white face to black core. Using a rounded or square end cutter. V-shaped grooves are not acceptable.

5. All letters shall be condensed gothic.

△									
△	12-7-71	Issued for Purchase							
△	2-24-71	ISSUED FOR BIDS							
No.	DATE	REVISIONS	BY	CHK	DESIGN SUPV	ENGR	PROJ ENGR	APPR	
SCALE		DESIGNED	DRAWN		CHIEF ENGR				
ORIGIN P & I DIV.		PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2 NAMEPLATE STANDARDS				JOB No. 8031			
						DRAWING No.		REV.	
						Spec 8031-E-7 Figure 1		1	

STATEMENT OF CONFORMANCE

We certify that the listed equipment and required documentation for same meet the requirements of the purchase order and applicable specifications:

P.O. NO.: _____ REV. _____

SPECIFICATION: _____ REV. _____

PRIME VENDOR: _____

SUPPLIER: _____

ADDRESS: _____

DESCRIPTION OF EQUIPMENT: _____

IDENTIFICATION: _____

a. ITEM NOS. _____

b. EQUIPMENT NOS. _____

c. TAG NOS. _____

APPROVED EXCEPTIONS: _____

Signature (Supplier Representative) _____

Title _____

Date _____

Distribution:

Original: Supplier to transmit to Jobsite

CC: Purchasers Inspector (2)
Supplier



Supplier Deviation Disposition Request

FOR SUPPLIER USE		NOTE: The reverse side of this form contains the instructions for its preparation and use. Items marked with an asterisk (*) are for Bechtel entries only.		FOR BECHTEL USE	
Supplier SDDR No.	Date Submitted			Bechtel SDDR No.	Date Received

1. Supplier Name: _____ Address: _____ City & State: _____ Zip: _____					
2. Supplier's Order No.	3. Supplier's Part No.	4. Supplier's Part Name	5. Date Deviation Determined	6. Previous SDDR (No. & Date)	
7. Buyer's P.O. No.	8. Buyer's Part No.	9. Buyer's Part Name	10. Bechtel Inspector Notified	11. Bechtel Eng. Notified	
12. Qty or Serial No.	13. Deviation Description (Attach extra sheets, photographs, sketches, etc. as necessary)				
14. Supplier's Disposition Classification: <input type="checkbox"/> Accept As Is <input type="checkbox"/> Repair <input type="checkbox"/> Modify Buyer's Requirement					
15. Proposed Disposition and Technical Justification:					
16. Associated Supplier Document Change (s):					
17. Suppliers Authorized Representative					
Signature: _____			Title: _____		
Name: _____			Date: _____		
*18. Bechtel Engrg. Action:					
		Engrg. Follow-up:			
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected <input type="checkbox"/> Rejected-Resubmit		<input type="checkbox"/> Dwg Change <input type="checkbox"/> Spec/Req. Change <input type="checkbox"/> Discipline or Suppliers Affected		<input type="checkbox"/> Other	
*19. Bechtel Disposition Statement Including Justification (Attach extra sheets, sketches, etc. as necessary)					
*20. Bechtel Engineering Approval					
GS _____		Date _____		Verification Signatures	
QE _____				21. Supplier _____	
PE _____				*22. Bechtel Insp. _____	
				Date _____	

INSTRUCTIONS FOR COMPLETING SDDR FORM

This form is used by a supplier to:

- a) Notify Bechtel of deviations from established requirements and document the supplier's proposed disposition, and
- b) Record Bechtel's approval of the established resolution.

A deviation is any departure from the requirements of the procuring documents which the supplier intends to incorporate in the completed item or service provided. Deviation disposition can be classified as Repair, Use-As-is, or Modify Requirement.

Repair is defined as the process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though that item still may not conform to the original requirement. Repair includes alterations to the properties of the material through heat-treating, welding, metal deposition, chemical processing, etc. This form is not to be used for cases where Bechtel has previously provided authorization to proceed using an approved repair procedure covering a specific type of repair; however, records must be maintained for each specific repair.

Acceptance of the Supplier Deviation Disposition Request by Bechtel does not relieve the Supplier from responsibility for the accuracy, adequacy, or suitability of the item or service being provided as defined in the procuring documents.

NOTE: Items marked by an asterisk (*) are for Bechtel use only.

Block No.

Entry Information

1. Supplier's name and address. List lower-tier Supplier's name and location (City and State) if applicable.
2. Enter the Supplier's order number if one has been assigned.
3. Enter Supplier's Part No. as applicable from the drawing, catalog, internal specification, etc. If the Deviation Request applies to all parts and additional space is needed, a list of parts to which the request applies may be attached.
4. Enter Supplier's Part Name.
5. Enter the date and the method (Spec. review, NDE, dielectric test, etc.) used to determine the deviation.
6. List any previous SDDR's and their dates that have been submitted for similar deviations requested on this Purchase Order.
7. Enter the Bechtel Purchase Order Number.
8. Enter the Bechtel Requisition item number and the part, tag or code number as it appears in the requisition. If additional space is needed, a separate sheet may be attached.
9. Enter the Bechtel Part Name if one has been assigned.
10. Enter the date and the method (TWX, phone, letter, etc.) used to notify the Bechtel Inspector.
11. Enter the date and the method (TWX, phone, letter, etc.) used to notify Bechtel Engineering.
12. As applicable, enter quantities or serial numbers of the items to which the deviation applies. If not serialized, record lot, batch, heat or other applicable identifying information.
13. Describe the deviating characteristics and define the extent of the out-of-specification condition for each identified piece affected. Identify the location of the deviating characteristic by print coordinates or specific location, as applicable. Attach extra sheets, photographs, sketches, etc., as necessary.
14. Identify disposition classification.
15. Describe the proposed disposition and provide technical justification for Bechtel's evaluation. If the deviation is correctable by repair, submit a detailed repair procedure or reference the procedure previously approved (Level 1) by Bechtel for use in similar situations. Provide Bechtel control number, supplier control number and procedure title.
16. Identify the nature of changes that may result on associated supplier documents (drawings, specs., procedures, installation instructions, etc.).
17. Enter the name (typed or printed), signature and title of the supplier representative authorizing the disposition request and date signed.
- *18. Enter an X in the applicable boxes to define the action required by Bechtel Project Engineering.
- *19. Provide appropriate justification for the Bechtel action(s) indicated in Block 18. When changes to drawings, specifications, requisitions, or other Bechtel documents are involved, each document should be identified and the associated change briefly described. If other disciplines or suppliers are affected, indicate who they are and the document that initiated resolution of that involvement. "Other" follow-up action (e.g. the need for additional Bechtel calculations, additional drawings or sketches, inspection by a Project Engineering representative, etc.) should also be identified here.
- *20. GS - Signature of the responsible Discipline Group Supervisor approving the Engineering action and the approval date.
QE - Signature of the Quality Engineer who reviewed and concurred with the disposition and the date signed.
PE - Approval signature of the Bechtel Project Engineer and the date signed.
21. Signature of the supplier's inspector or other representative authorized to verify that the accepted disposition was correctly accomplished.
- *22. Signature of the Bechtel Inspector or other representative verifying that the accepted disposition was correctly accomplished.

ENCL. 1

Specification 8031-E-7

SPECIFICATION
FOR
MEDIUM-VOLTAGE METAL-CLAD
SWITCHGEAR AND ASSOCIATED BUS DUCT
FOR THE
LIMERICK GENERATING STATION
UNITS 1 AND 2
PHILADELPHIA ELECTRIC CO.

10	1/25/83	Revised Sheets i, 5, 6, 7, 24, A3	WJ	WJ	WJ
9	12/16/81	Revised sheet i & A5 of Appendix B	WJ	WJ	WJ
8	8/3/77	Revised Sheets i,iii,9,11,23, Addendum No. 1 to Rev. 6 incorporated as Appendix B	WJ	WJ	WJ
7	5/27/77	Revised Sheets i, 11	WJ	WJ	WJ
	3-30-77	Issued for Addendum No. 1	WJ	WJ	WJ
6	3/18/77	Rev. Shts.i,36,7,8,9,11,17,21,23,31,32, Sht. 4 Form 8031-DR	WJ	WJ	WJ
5	8/2/75	Revised Shts. i,4,27,31, 32	WJ	WJ	WJ
4	7/2/75	Revised Shts. i,ii,iii,3,4,7,9,15,21,22, 26,27,29,30, SP-11,SP-13, Added Forms 8031-DR	WJ	WJ	WJ
3	6-27-73	Revised shts. i,ii,iii,8,9,10,23,25, SP-15,16,8031-0A	WJ	WJ	WJ
2	2-2-72	Revised Sheets i, iii, and Added Section 17.0	WJ	WJ	WJ
1	12-7-71	Issued for Purchase	WJ	WJ	WJ
0	2-24-71	Issued for Bids	WJ	WJ	WJ
A	12-9-70	Issued for Client Approval	WJ	WJ	WJ
NO.	DATE	REVISIONS	APPROVALS		

SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.
i	10	22	4	A-1	8								
ii	4	23	8	A-2	8								
iii	8	24	10	A-3	10								
iv	0	25	3	A-4	8								
1	1	26	4	A-5	9								
2	1	27	5	A-6	8								
3	6	28	0										
4	5	29	4										
5	10	30	4										
6	10	31	6										
7	10	32	6										
8	6	Fig. 1	1										
9	8	Fig. 2	0										
10	3	Form 8031-DR											
11	8	Sh. 1	4										
12	1	2	4										
13	1	3	4										
14	0	4	6										
15	4	5	4										
16	0	6	4										
17	6												
18	0												
19	1												
20	0												
21	6												

5	5-2-75	Rev. Shts i, 4, 27, 31, 32	MC	AT	10	1-25-72	Revised Sheets 1, 5, 6, 7, 24, A3	MC	AT	W.C.	
4	7-2-75	Rev. Shts. i, iii, iii, 3, 4, 7, 9, 15, 21, 22, 26, 27, 29, 30, SP-11, SP-13, Added Forms 8031-DR	MC	AT	9	12-16-81	Rev. Shts. i, A5 of Appendix B	MC	AT	RHE	
3	6-27-73	Rev. Shts. 1, 11, 25, 23, 8, 9, 10, SP-15, 16, 8031-DR	MC	AT	8	8-3-77	Rev. Shts. 1, iii, 9, 11, 23, Addendum No. 1 inc. as App. B	MC	AT	RHE	
2	8-2-72	Rev. Shts. 1, iii, Added section 17.0	MC	AT	7	5-17-77	Rev. Shts. i, 11	MC	AT	RHE	
1	11-7-71	Issued for Purchase	MC	AT	6	3-20-77	Issued for Addendum No. 1	MC	AT	RHE	
D	1-14-71	ISSUED FOR BIDS	MC	AT	6	3-18-77	Rev. Shts. 1, 3, 6, 7, 8, 9, 11, 17, 21, 23, 31, 32, Sht. 4 Form 8031-DR	MC	AT	RHE	
A	11-9-70	ISSUED FOR CLIENT APP'VL	MC	AT							
NO.	DATE	REVISIONS	BY	CHK'D	APP'D	NO.	DATE	REVISIONS	BY	CHK'D	APP'D



POWER AND
INDUSTRIAL
DIVISION

FACING SHEET
LIMERICK GENERATING STATION, UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY
MEDIUM VOLTAGE METAL-CLAD SWITCHGEAR
AND ASSOCIATED BUS DUCT

JOB No 8031

Spec. 8031-E-7
Sheet i

REV.
10

SPECIFICATION
FOR
MEDIUM-VOLTAGE METAL-CLAD
SWITCHGEAR AND ASSOCIATED BUS DUCT
FOR THE
LIMERICK GENERATING STATION
UNITS 1 AND 2
PHILADELPHIA ELECTRIC COMPANY

Consisting of:

1. Specific Conditions
2. Deleted
3. Summary of Proposal, Part II
4. Specification 8031-G-1, General Project Requirements -
Purchase Orders
5. Specification 8031-G-4, General Project Requirements -
Painting Requirements for Mechanical and Electrical Equipment
6. Specification 8031-G-13, General Project Requirements -
Quality Assurance
7. Specification 8031-G-14, General Project Requirements -
Seismic Design and Analysis of Equipment and Equipment Supports
8. Specification 8031-G-5, General Project Requirements -
Documentation Required from Suppliers
9. Form 8031-DR - Documentation Requirements
10. Form 3295 - Statement of Conformance
11. Form ED-27 - Supplier Deviation Disposition Request

SPECIFICATION
FOR
MEDIUM-VOLTAGE METAL-CLAD
SWITCHGEAR AND ASSOCIATED BUS DUCT
FOR THE
LIMERICK GENERATING STATION
UNITS 1 AND 2

SPECIFIC CONDITIONS

TABLE OF CONTENTS

<u>Section No.</u>	<u>Subject</u>
1.0	SCOPE
2.0	WORK INCLUDED
3.0	WORK NOT INCLUDED
4.0	CONDITIONS OF SERVICE
5.0	SEISMIC REQUIREMENTS
6.0	INDUSTRY STANDARDS
7.0	RATINGS
8.0	DESIGN AND CONSTRUCTION DETAILS
9.0	FINISH
10.0	SCHEDULING
11.0	SHIPPING
12.0	QUALITY CONTROL REQUIREMENTS
13.0	INFORMATION SUPPLIED BY BUYER
14.0	DELETED
15.0	SUBMITTALS BY SELLER FOR APPROVAL
16.0	PHOTOGRAPHS
17.0	CIRCUIT BREAKER CERTIFICATION TESTS
18.0	DEVIATIONS
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Appendix B	4160 VOLT METAL CLAD SWITCHGEAR AND MOTOR CONTROLLERS

Section No.

Subject

Figure 1

NAMEPLATE STANDARDS

Figure 2

ES-33 CURRENT AND POTENTIAL TRANSFORMER
POLARITY AND NEUTRAL GROUNDING

SPECIFICATION
FOR
MEDIUM-VOLTAGE METAL-CLAD
SWITCHGEAR AND ASSOCIATED BUS DUCT
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

SPECIFIC CONDITIONS

1.0 SCOPE

This Specification covers the furnishing of all labor, materials and services in connection with the design, fabrication and delivery of medium-voltage metal-clad switchgear and associated metal-enclosed bus duct as listed in the accompanying material requisition.

2.0 WORK INCLUDED

- 2.1 The Seller shall furnish, and deliver, f.o.b. jobsite, the equipment completely assembled within shipping and handling limitations, wired, tested and ready for installation in accordance with these Specifications.
- 2.2 The Seller may be requested to furnish technical assistance as required to supervise unloading, storage, installation and placing into service. Such services will be ordered by the Buyer's jobsite construction superintendent. The costs of these services are to be billed separately and are not to be included in the equipment prices.

3.0 WORK NOT INCLUDED

- 3.1 The Buyer will provide the following:
 - a. Foundations and welding channels.
 - b. Installation of the switchgear and bus and re-establishment of connections between disassembled mechanical and electrical parts.
 - c. All external connections to the equipment.
 - d. Control power supplies.
 - e. Power supplies for space heaters, receptacles and lighting.

4.0 CONDITIONS OF SERVICE

- 4.1 Switchgear will be installed indoor, at an elevation of approximately 220 feet above sea level.
- 4.2 Maximum 24 hour ambient: 40°C.
- 4.3 The 15 kV switchgear assemblies and their associated bus duct will be energized from a nominal 13.8 kV, low-resistance grounded Y, 3 phase, 3 wire, 60 hertz system.
- 4.4 The 5 kV switchgear assemblies and their associated bus duct will be energized from a 4.16 kV, low-resistance grounded Y, 3 phase, 3 wire, 60 hertz system.
- 4.5 The 2.4 kV switchgear assemblies and their associated bus duct will be energized from a 2.4 kV, low-resistance grounded Y, 3 phase, 3 wire, 60 hertz system.

5.0 SEISMIC REQUIREMENTS

- 5.1 The switchgear shall be designed to withstand, without loss of function and without exceeding allowable stresses, seismic forces in accordance with the applicable requirements of Specification 8031-G-14, General Project Requirements - Seismic Design and Analysis of Equipment and Equipment Supports.
- 5.2 All switchgear equipment shall meet the requirements of Specification 8031-G-14 for Class II equipment.
- 5.3 In addition all switchgear equipment so designated in the Requisition shall meet the requirements of Specification 8031-G-14 for Class I equipment. Equipment designated as Class I in the Requisition shall be in compliance with IEEE No. 344, Guide for Seismic Qualification of Class I Electric Equipment for Nuclear Power Generating Stations.

6.0 INDUSTRY STANDARDS

All medium-voltage, metal-clad, switchgear assemblies and metal-enclosed, nonsegregated phase bus duct to be furnished under this specification shall be designed, fabricated, and tested in accordance with the latest applicable revisions and supplements of ANSI, IEEE, and NEMA Standards specifically modified only by the requirements herein.

7.0 RATINGS

- 7.1 Medium Voltage, Metal-Clad Switchgear

- 7.1.1 Switchgear shall be rated for application on a symmetrical current rating basis as defined by ANSI-C37.06 (1964).
- 7.1.2 Switchgear assemblies indicated as being in 15 kV class shall be rated:
 - a. Nominal Voltage 13.8 kV
 - b. Nominal Three Phase MVA:
 - 1. Circuit Breakers rated 2000 AMP or less 750 MVA
 - 2. Circuit Breakers rated 2500 AMP 750 MVA
 - c. Rated Continuous Current As shown on attached one-line diagrams
 - d. Interrupting Time 5 cycles
 - e. Close and Latch (minimum)
 - 1200-2000 AMP Breaker 58,000 amperes
 - 2500 " " 58,000 amperes
 - f. Operating Mechanisms Stored-energy operate (spring-powered)
- 7.1.3 Switchgear assemblies indicated as being in 5 kV class (2.4 kV service) shall be rated:
 - a. Nominal Voltage Class 2.4 kV
 - b. Nominal Three Phase MVA Class 250 MVA
 - c. Rated Continuous Current 1200 & 2000 amperes
As shown on attached one-line diagram
 - d. Interrupting Time 5 cycles
 - e. Close and Latch (minimum) 58,000 amperes
 - f. Control Voltage 125 volts dc
 - g. Operating Mechanisms Stored-energy operate (spring-powered)
- 7.1.4 Switchgear assemblies indicated as being in 5 kV class (4.16 kV service) shall be rated:
 - a. Nominal Voltage Class 4.16 kV

- b. Nominal Three Phase MVA Class 350 MVA
- c. Rated Continuous Current 1200 amperes
- d. Interrupting Time 5 cycles
- e. Close and Latch (minimum) 78,000 amperes
- f. Control Voltage 125 volts dc
- g. Operating Mechanisms Stored-energy operate (spring-powered)

7.2 Medium-Voltage, Metal-Enclosed, Nonsegregated Phase Bus

7.2.1 Switchgear bus duct indicated as being in 15 kV class shall be rated:

- a. Nominal Voltage 13.8 kV
- b. Rated Continuous Current As shown on attached one-line diagrams
- c. Rated Momentary Current 60,000 amperes
- d. Insulation Wet process porcelain

7.2.2 Switchgear bus duct indicated as being in 5 kV class shall be rated:

- a. Nominal Voltage 4.16 kV
- b. Rated Continuous Current As shown on one-line diagrams.
- c. Rated Momentary Current 60,000 amperes
- d. Insulation Wet process porcelain

8.0 DESIGN AND CONSTRUCTION DETAILS

8.1 Medium-Voltage, Metal-Clad Switchgear

8.1.1 Construction

- a. All medium-voltage switchgear assemblies shall be of standard metal-clad switchgear construction.
- b. Non-flammable materials shall be used wherever possible.

- c. Switchgear shall be designed so that additional units can be added to either end at a future date. End units shall be so constructed that future units can be placed in position and mechanically attached with safety without requiring deenergization of high voltage buses already in service.
- d. Switchgear shall be designed so that high voltage, low-voltage and control cables can enter at either the top or bottom.
- e. Terminals of high voltage cables will be attached directly to high voltage bus terminals in the switchgear without the use of potheads. Copper lugs are bolted directly to plated bus. Aluminum lugs will be attached directly to unplated bus.



Undrilled insulating cable supports shall be provided for all incoming cables, either bottom or top entry. Cable supports shall be arranged to provide for and allow straight runs of cable between the supports and the terminal connectors for at least 20-inches in 4.16 kV and for at least 30-inches in 13.8 kV service.

- f. High voltage cable connectors shall be equipped with bolts not less than 1/2-inch in diameter and lock washers or similar locking devices.
- g. Insulating material, preferably PVC covers, shall be furnished for the connection between the terminal bus bar of each unit and the power cable. The purpose of the cover is to eliminate taping of the bus to cable connections. Taping of this connection is not acceptable.

8.1.2 Enclosures

- a. Each switchgear assembly shall form a line-up of free standing metal enclosures suitable for indoor service as specified.
- b. Enclosures shall have adequate strength to withstand all stresses imposed by shipping, handling, installation, service conditions described elsewhere and operation without distortion or other damage.
- c. Metal separating barriers shall be provided

between breakers and switchboard panels, either mounted on breaker and removable where necessary, or mounted on stationary cubicle.

- d. Shutters shall be provided to cover automatically and completely, openings to primary disconnecting devices when breakers are withdrawn from operating position. The shutter operation shall be such that the stationary portion of primary disconnecting devices shall be inaccessible when the breaker is in the test position.
 - e. Bus sectionalizing and bus tie units shall be constructed so that the bus on one side of the breaker can remain energized and the deenergized bus on the other side can be uncovered without exposing live parts.
 - f. In addition to means for fastening the switchgear to floor steel with bolts, separate provision shall be made for spot welding the switchgear to floor steel.
 - g. For Class IE structures (see requisition) compartment doors in front of circuit breakers shall be equipped with pull handles and thumb screws, all others shall be equipped with door handles and latches. It shall be possible to completely close breaker compartment doors when the circuit breaker element is in the test and/or disconnected positions. Provision for locking compartment doors shall be made as follows:
 - ⑩ Equip doors with Yale locks having square or round bolts, designed so that the key is removable only when the bolt is extended. The locking assembly shall be arranged so that the door cannot be closed entirely nor locked without use of the key. Tumbler combinations shall be coordinated with other locks.
- One key is required for each lock. Keys are to be shipped separately from the switchgear.
- h. Ventilating openings on indoor switchgear through which water might accidentally enter shall be shielded with covers. The edges of the openings shall be turned up.
 - i. Space heaters shall be provided in all switchgear enclosures. Heater capacity

shall be such that the temperature inside the cubicles shall be maintained above the dew point temperature for the conditions of operation. Heaters shall be rated 125 volts minimum, suitable for operation from Buyers's Heaters shall not be located in main bus compartments, shall be readily accessible for replacement and shall be provided with protective screens to personnel. Each compartment heater shall be separately fused and fuses shall be coordinated to maintain selectively with the main protective device. Heater leads within primary compartments shall be in protective metal covering. Heaters will be energized only when switchgear is de-energized. Suitable switching shall be provided.

- j. The maximum unit depth dimensions, including required aisle space shall be:

13.8 kV, 750 MVA	=	158 inches
13.8 kV, 1000 MVA	=	169 "
2.4 kV, 250 MVA	=	158 "
4.16 kV, 350 MVA	=	158 "

8.1.3 Circuit Breaker Elements

- a. The circuit breakers shall be oilless, three-pole, magnetic blowout, electrically operated, of the stored-energy spring-powered type operated from a 125 volt dc source. Breakers shall be removable with self-coupling primary and secondary disconnecting contacts. They shall be electrically and mechanically trip free and have anti-pumping features.
- b. An operating, a test and a withdrawn position shall be provided for each breaker unit. The primary contacts shall be disconnected in the test position, but auxiliary contacts and control circuit contacts shall be maintained in this position for breaker and control circuit testing operations. All contacts shall be disconnected in the withdrawn position.
- c. Each circuit breaker shall be equipped with all necessary accessories, including at least:

- A. Manually operated mechanical tripping facilities, accessible only from inside the mechanism housing.
 - B. Manually operated mechanical closing facilities.
 - C. Mechanically operated "Close-Trip" position indicator.
 - D. Operation counter to record tripping operations.
 - E. Manual operating device for maintenance purposes.
 - F. Provision for attaching a Cincinnati recorder. One set of all necessary equipment for mounting the recorder shall be furnished.
- d. In addition to the auxiliary contacts required for the circuit breaker operating mechanism, control, indicating lamps and signals, not less than ten electrically separate sets of auxiliary contacts shall be provided in a rotary type auxiliary switch permanently mounted on the stationary part of the switchgear.
- e. Deleted
- f. All circuit breaker auxiliary switches shall have covers for protection of their contacts.
- g. Where vertical lift is required circuit breaker elements shall be raised into the connected position and lowered to the disconnected position by means of a motor operated mechanism.
- h. Removable breaker elements of identical current and interrupting rating shall be completely interchangeable.
- i. Removable breaker elements for the same installation which are not of identical current and interrupting rating shall be provided with mechanical devices to prevent incorrect application. Details of the devices shall be included in outline drawings submitted for approval.

8.1.4 Wiring

- a. All control wiring shall be 600 volt, type SIS, General Electric Company Vulkene; Cerro Corp. Rockbestos Firewall SIS or equal, Class B stranded, single conductor, No. 14 AWG minimum, except current transformer secondary circuits shall be wired with No. 10 AWG minimum. Wire shall meet IPCEA specifications for vertical flame resistance.
- b. Wiring shall be complete, with control, metering and relaying circuits requiring external connections brought out to conveniently located terminal blocks.
- c. Wiring terminal blocks shall be of Buchanan B100 series or Marathon 6000 DJ series with white marking strips for point identification. Not more than two wires installed by the Seller shall be connected to one terminal. Spare terminals equal in number to 10% or more of the active terminals are required. Arrangement of spares shall be such that each block or group of blocks will have its approximate proportion of spares. Terminal blocks shall consist of not more than 12 terminal points each, and shall be grouped by services and segregated according to circuit voltage and field destination. Terminal blocks shall be mounted to permit Buyer's cable entrance from either the top or bottom of the board. Terminal blocks, for interface with field wiring, shall be mounted not less than 12" above the floor line, or less than 6" from the top of the panel.
- d. The terminal blocks and terminal points, for interface with field wiring, shall be marked by the Seller with the identification as shown on the Buyer's wiring diagram. If this information is not available when required to permit marking by the Seller, the boards shall be shipped with unmarked terminal blocks for later marking by the Buyer.
- e. All internal wire terminals, including connections to current and potential transformers, except coaxial or triaxial cables, shall be made with ring-tongue compression-type connectors. Connectors shall be Burndy type YAV or approved equal.

- f. For units containing current transformers, the leads shall be connected through test blocks (States Co., Superior Switchboard & Device Co., or equal) located between the terminal blocks and instruments, meters or relays. One test block group shall be used for each current transformer to maintain shorting and grounding integrity. Terminal blocks used for current transformer leads shall contain no other circuits.

Test switches shall be wired with source wire connected to the bottom (hinged side). Current Transformer circuits shall be connected so that currents will enter the switch on the left hand blade and leave through the bottom of the adjoining blade, front view. Phases for potential and current circuits shall be connected A,B,C left to right, side by side, front view. Direct current circuits shall be connected positive, negative, left to right, front view on adjoining blades.

- g. Compression type terminal lugs, Burndy Type YA, long barrel, closed back or approved equal, and cable supports for single conductor copper cable shall be provided for all outgoing power connections.

Compression type aluminum alloy terminal lugs, Dossert DPL-N-P-AA series or approved equal, and cable supports for 2000 kcmil single conductor aluminum cable shall be provided for the incoming 13.8 kV power cables.

- h. Structures indicated for top entry of power cables shall be provided with removable top plates, suitable for drilling.
- i. Insofar as is possible, wiring terminations for a particular circuit in each compartment shall be made on terminal blocks mounted in the same location in each compartment.
- j. Isolating switches or pull-out fuse blocks for circuit breaker control shall be located on the breaker drawout side of the switchgear, in the compartment of the associated equipment, preferably toward the front and so that the tops of switch handles or fuse blocks are not more than 6-feet above the floor.

- k. All wiring shall be routed and held in place so that any relay, meter, instrument or switch can be removed without disturbing adjacent wiring.
- l. Where feasible, secondary circuits of current and potential transformers shall each be complete and separate in themselves, and isolation between leads from each set of current transformers shall be provided unless prohibited by space limitations.
- m. All secondary and control wiring within primary compartments shall be enclosed in protective metal covering.
- n. The following secondary and control wiring shall be grouped on terminal blocks. All terminal blocks with interconnecting wiring shall have removable terminal block covers.
 - (1) Current transformer circuit terminals, including neutrals, interconnected with other compartments.
 - (2) Relay tripping circuit terminals interconnecting with other compartments.
 - (3) Thru-wiring on terminal blocks at shipping splits.

Where possible, neutrals are to be grouped with phase leads. Wiring not in the above categories shall not be included in the group or placed under covers.

Safeguard and non-safeguard wiring shall be terminated on separate terminal blocks except where prohibited by space limitations.

- o. Fuse clips shall be wired with the source wire connected to the upper fuse clip. Fuse clips for each circuit shall be grouped so that fuses will be side by side. The fuses for each circuit shall be arranged positive, negative for dc circuits and A,B,C phase left to right, front view. Fuse circuits shall be individually marked by the Seller with proper identification as shown on the Buyer's Electrical Schematic Diagrams.

8.1.5 Current and Potential Transformer Neutral Grounding

Neutral ground of current and potential transformers shall be in accordance with Philadelphia Electric Co. standard ES-33, attached.

8.1.6 Control and Transfer Switches

- a. A spring-return to normal control switch with black, oval handle and pull-out latch feature shall be located on each breaker cubicle door for local circuit breaker control. This switch shall close the breaker when rotated clockwise and trip the breaker when rotated counter-clockwise. Each local control switch shall be connected and interlocked so that it will operate the associated circuit breaker when that breaker is in the test position only. Provision shall be made (by removal or addition of a jumper wire on an easily accessible terminal block) for operation of the circuit breaker while in the operating position by the local control switch. Each circuit breaker shall be wired to provide for close and trip operation by a remote control switch when that breaker is in the operating and test positions. Operation of a circuit breaker, when in its test position only, by a remote control switch shall be blocked by the pull-out-latch feature of the associated local control switch.
- b. A maintained contact instrument transfer switch, with black, round, knurled handle shall be furnished for each meter or instrument as required. This switch shall be located on the same cubicle door as the associated meter or instrument.
- c. Control and instrument transfer switches shall be General Electric Company, Type SB or approved equal.
- d. Circuit breaker control switches shall be mounted in a horizontal line not more than 5-feet, 6-inches nor less than 2-feet, 6-inches above the floor.

8.1.7 Relays, Meters and Instruments

- a. Relays, meters and instruments shall be installed on the front door of the cubicles.
- b. Protective relays shall be semi-flush mounted with relay elements on a removable chassis and shall have built-in test facilities. Acceptable relay types are given in Appendix A.
- c. Protective relays shall be mounted above indicating instruments and circuit breaker control switches unless sufficient space is not available. Primary relays shall be mounted at the top of the panel or to the observer's left when facing the panel. Backup relays shall be mounted below or to the observer's right of the primary relays.
- d. Hand-reset auxiliary relays shall be mounted on the front of the panel and in the same physical order as the associated primary and backup relays. Self-reset auxiliary relays involving tripping circuits shall not be mounted on hinged panels.
- e. On indoor switchgear the bottom of relays, instruments and auxiliary devices shall be at least 12-inches above the floor.
- f. All auxiliary relays shall have covers.
- g. General Electric Company Type PK-2 current cutout links, with auxiliary contacts (Catalog #6179685G3) semi-flush mounted, shall be provided in current transformer relaying circuits, where two or more current transformers are parallel or where current transformers are connected to differential relays.

Current transformer circuits shall be connected so that current will enter the PK block on the bottom side of the left hand terminal and leave through the bottom of the adjoining terminal, front view. Phases for current circuits shall be A, B, C left to right, side by side, front view.

- h. Indicating instruments shall be mounted on a horizontal line at eye level. Instrument

transfer switches shall be mounted on the vertical centerline of and below the associated instrument.

- i. Indicating instruments shall be General Electric Company, Type AB-40, 4-1/2 inch, switchboard type, semi-flush mounted with expanded 250° scales or equal. Movements shall be taut band type.
- j. "Test switches, flush mounted (Superior States, or approved equal), shall be used in instrument and meter circuits as shown on the drawings".

8.1.8 Indicating Lights

- a. A red and a green indicating light shall be provided on each circuit breaker cubicle door to indicate the breaker primary contact position when the breaker is in either the operating or test position. The red light, when energized, shall indicate that the breaker is closed. The green light, when energized, shall indicate that the breaker is open.
- b. Indicating lights shall be energized from 125 volt dc control bus.
- c. Connections from the indicating lights to the terminal blocks shall be provided for remote parallel indication.
- d. Indicating light lamps and lenses shall be replaceable from the front of the panel.

8.1.9 Control Source

- a. A continuous 125 volt dc wire control bus, insulated for 600 volts and not smaller than No. 10 AWG, shall be furnished and run the entire length of the switchgear with pressure type terminals provided at each end for connection to the supply source. The bus shall be tapped through fusible connecting switches of suitable capacity at each cubicle served. All required fuses, of the non-renewable type, shall be furnished.
- b. The main control feed to each breaker shall

be fused in accordance with the following table and shall be based on the sustained operating current at rated voltage:

<u>Amp Range</u>	<u>Fuse</u>
0-45	35
46-85	70
86-115	100
116-135	125
136-175	150
176-225	200
226-275	250

- c. The control circuit of all protective relays shall be fused with 35 ampere fuses except for direct trip circuits in which case the relay circuit will be protected only by the main breaker fuses.
- d. All fuses shall be of the non-renewable type.

8.1.10 Bus and Bus Taps

- a. Bus bars shall have a continuous rating same as the incoming feed to the bus, and shall be of copper or aluminum, with the bus of the latest standard design and guaranteed to withstand all mechanical stresses and heat due to short circuit currents at least equal to those specified for the circuit breakers.
- b. Buses and connections shall be completely insulated with flame-retardant material at the factory. PVC covers, or acceptable substitute shall also be furnished for insulating bus joints between groups of units of the switchgear in the field, as determined by shipping requirements. Taping of field-made joints is not acceptable.

8.1.11 Ground Bus

- a. A 1/4-inch x 2-inch copper ground bus shall be provided, bolted to and effectively grounding each structure, extending the length of each switchgear assembly. The ground bus shall have a momentary rating not less than the highest equivalent momentary rating of any circuit breaker in the assembly.

- b. The frame of each circuit breaker unit shall be grounded through heavy multiple finger silver-plated contacts at all times except when the contacts of the breaker primary disconnecting devices are separated a safe distance.
- c. Each end of each ground bus shall be provided with compression type terminals for Buyers 750 kcmil copper ground cable.
- d. Means of removing individual secondary circuits from ground without disturbing other circuits and their grounds shall be provided. Ground points shall be readily accessible for removal.
- e. The ground bus shall be readily accessible for grounding cable shields and high voltage cable ground conductors.

8.1.12 Instrument Transformers

- a. Current transformer mechanical and thermal ratings shall be coordinated with the short circuit ratings of the circuit breakers in accordance with the latest applicable NEMA Standards.
- b. Used current transformer taps shall be wired through the test blocks mentioned in 8.1.4.f as close to the CT as possible. Secondary terminals on current transformers shall be without short circuiting devices.
- c. Current transformers specified for use with watthour meters shall have an ANSI Standard metering accuracy classification of 0.3 at B-2 burden.
- d. Potential transformer high voltage windings shall be protected by current limiting fuses.
- e. Each potential transformer and associated primary fuses shall be mounted on a drawout carriage. When in the withdrawn position, the potential transformer, its primary fuses and secondary circuit shall be completely disconnected. The potential transformer and its primary fuses shall be visibly grounded when they are in the withdrawn

position. If practicable, potential transformer primary terminals shall remain grounded even when primary fuses are removed.

- f. Potential transformers shall have an ANSI Standard accuracy classification of at least 1.2Z for 4.16 kV and 0.6Z for 13.8 kV units. Where potential transformers are used to supply watthour meters they shall have an ANSI Standard accuracy classification of 0.3Y.
- g. Potential transformer secondary circuit fuses of the non-renewable type shall be provided. These fuses shall be located so as to permit replacement while the switchgear is energized. They shall be as close as possible to the source but not in the primary compartment. Circuits to relays and watthour meters shall be fused at 35 amperes. Circuits to other devices shall be fused at 6 amperes.
- h. Each potential transformer neutral shall be made available at the terminal blocks of the cubicle and shall be grounded at one point only.
- i. Current and potential transformers used to supply watthour meters shall be shipped to Philadelphia Electric Company for test and calibration at least two (2) weeks prior to shipment of the compartment. Shipment shall be made to:

Philadelphia Electric Company
Attn: J. F. McDevitt
950 Pulaski Ave.
King of Prussia, Pa. 19406

In addition to the requirements as described under SHIPPING, each instrument transformer shipped shall be identified in a manner which will insure its being returned to the correct compartment at the jobsite.

8.1.13 Nameplates

- a. Nameplates shall be provided for each device, each switchgear cubicle and each switchgear assembly. They shall be of Lamicoid, engraved through the white face to black core, in accordance with Nameplate Standard, Figure 1, except that internal relays shall be marked with Sellers standard markup.

- b. Equipment designated as Class I in the requisition may require nameplates of a different color. If required, the color will be indicated in the nameplate schedule.

8.1.14 Accessories

- a. Each set of accessory equipment shall consist of, but shall not necessarily be limited to the following:
 - A. One test cabinet for operating, testing and inspecting the circuit breakers when they are removed from the stationary structure.
 - B. One secondary test coupler.
 - C. One set of relay and meter test plugs.
 - D. One removable hand crank shall be supplied for racking the breaker into the operating position. If vertical lift equipment is supplied, a motor-operator is required.
 - E. One removable closing lever for manually closing the circuit breakers.
- b. Test cabinet specified above shall conform to the following:
 - A. Include a two-pole manually operated disconnecting device of the visible break type, fuses, indicating lamps, control switch, control relay (unless it is a part of each breaker) and necessary cable with polarized plug for attaching to circuit breaker. In addition to the equipment required for control of the breakers, this cabinet shall be equipped with three (3) external terminals for the purpose of connecting a breaker timing device. These terminals shall be connected to the positive bus, the close and the trip circuits.
 - B. Switchgear test cabinets, shall be suitable for wall mounting.
- c. Grounding and test devices will be used for

grounding either bus or line, and for potential testing of either or both, and shall conform to the following:

- A. Six primary bushings shall be included in the device, three to provide connection of the device to the switchgear bus in any cubicle in which the device is to be used, and the other three for connection to the outgoing conductors in the cubicle.

The 15 kV devices shall be furnished with interchangeable primary contacts to permit use in either 1200 or 2500 ampere units.

- B. One manually operated, three pole, double throw, selector switch shall be included in the device. The blades of this switch may connect the grounding contacts to either set of three primary bushings described above. The mechanical indicator, visible from the front, shall clearly indicate the position of the selector switch.

The indicator shall be marked "Bus" and "Line" for the two positions of the selector switch. In addition to the indicator, the actual position of the blade shall be readily visible when the grounding and test device is withdrawn from the switchgear.

- C. Three upper female test terminals shall be electrically connected to the primary bushings which connect the device to the bus, and a similar lower set shall be connected to the hinges of the selector switch. The test terminals shall be mounted behind an insulating panel with six openings, each approximately 1.5 inches in diameter, arranged on the front of the device. The openings to each set of three test terminals shall be protected with a suitable cover.
- D. An interlock shall be furnished so that the openings over the test terminals which connect to the bus can be exposed only when the selector switch is in the

"line" position. The cover over the other set of openings shall have provision for padlocking. A set of six test plugs with insulated sleeves shall be furnished suitable for making connections with the above test terminal.

- E. An electrically operated mechanism, of the stored-energy spring powered type, for closing the grounding contacts shall be furnished, so that the grounding and test device shall be capable of closing and latching against short circuit current equal to the maximum rating of the switchgear. Tripping facilities shall be of the manual type only, readily accessible from the front of the grounding and test device. This manual trip shall include an interlock to prevent the device from being tripped by unauthorized persons, or from tripping due to vibration or shock. A mechanical indicator visible from the front shall clearly indicate the position of the grounding contacts.
- F. The grounding and test device shall be equipped with a control cable, the length of which shall be approximately equal to the longest switchgear bus plus 10 feet. In no case, however, shall the control cable be less than 40 feet in length. The diameter shall be as small as practicable for the service and shall preferably have a maximum of three conductors. The other end shall be equipped with a suitable polarized plug which matches the polarized receptacle on the control station.
- G. A control box containing a polarized receptacle, a push button switch, and two cartridge fuses shall be furnished for use as a control station. This box shall be suitable for wall mounting by the Company. No source for operation of the grounding and test device is required in the switchgear.
- H. The grounding and test device shall be equipped with suitable means for storing and carrying the control cable. With

the cable so stored, no interference shall be encountered when inserting the device in the switchgear units, closing the unit door with the device inserted, or withdrawing the device from the unit. Where a storage cubicle is provided, conditions must be such that the grounding device with the cable in place can be readily and safely inserted and stored.

- I. An interlock shall be furnished to prevent the primary bushings of the ground test device from engaging with the stationary disconnecting contacts in the cubicle while the grounding switch is closed. An interlock shall be included to prevent closing when the grounding and test device is prepared for phase-out service. Restoration of this circuit shall not be possible unless the device is withdrawn from the switchgear. Keys and cylinders shall be identified so that operating functions can be readily defined and instructions easily followed.
- J. All high potential conducting parts, except as stated above with regard to the test terminals, shall be inaccessible when the device is fully inserted in the switchgear.
- K. Deleted
- L. Complete set-up and operating instructions engraved on or in laminated plastic panels, shall be mounted on the front of the device.

8.2 Medium-Voltage, Metal-Enclosed, Nonsegregated Phase Bus Duct

8.2.1 Construction

- a. All medium-voltage bus duct shall be of standard metal-enclosed, non-segregated phase construction. The enclosures shall be made of steel.
- b. Provision shall be made for expansion or

contraction, vibration, and deflection of the bus bars and the housing due to loading, temperature changes, indicated external normal forces and short circuit conditions. Bus bars, insulators, and supports shall be braced so as to withstand the mechanical and thermal effects of rated asymmetrical three-phase momentary currents. All flexible joints required by these criteria shall be incorporated into the design of the bus duct.

- c. Bus duct transitions to transformer terminal chambers shown on attached drawings shall have terminating flanges suitable to receive the matching flanges on the transformer terminal chambers. Flange bolts, gasket and flange gasket cover shall be furnished by the Seller.

8.2.2 Bus Conductors

- a. Bus conductors shall be of copper or aluminum and of a size to carry continuously, rated current without exceeding standard hottest-spot temperature rise above ambient.
- b. All electrical connections shall be silver surfaced and bolted when copper conductors are furnished. When aluminum conductors are used, they shall not be silverplated and the type of bolted or welded connections shall be subject to approval by the Buyer.
- c. Bus shown on the attached drawings as being connected to transformer terminals shall be furnished with flexible connectors which will allow up to 1-inch of movement in any direction. Copper terminal lugs will be furnished by others. Flexible links, insulated or uninsulated, to provide for correcting misalignment, for testing and for isolating purposes in case of an emergency shall be provided for all other terminations.
- d. Bus bar joints in field assembled bus and at terminations shall be bolted lap joints. Special connectors and bolts shall be furnished to prevent corrosion from the contact or dissimilar metals.

- e. Conductor support insulation shall be wet process porcelain.

8.2.3 Enclosures

- a. Bus duct designated as outdoor type on the attached drawings shall be non-ventilated except as specified herein. Gaskets, or other means, shall be employed at cover plates and joints to render the entire assembly weathertight. These joints shall be designed to protect the top edges of the gaskets from exposure to the sun and rain and to prevent water from collecting on the gasket.
- b. For door enclosures a filtered drain shall be provided at all low points where moisture may collect. At least one filtered breather to vent the upper part of each outdoor enclosure shall be furnished.
- c. Where bus duct enclosures terminate to a flange connection, flange bolts and flange gasket cover shall be provided by the Seller.
- d. Indoor type bus duct enclosures shall be non-ventilated, general purpose type.
- e. Enclosures of long bus duct runs requiring more than end support shall have support attachments suitable for hanger rods or wall brackets. Seller shall furnish drawings showing recommended details for each type of support and maximum allowable spacing between supports.
- f. Provision shall be made to correct for minor misalignments which may result from the use of separate foundations for the equipments at the bus duct terminations.
- g. Smoke-tight barriers to seal off the movement of air or ionized gases through the bus duct, shall be provided at each switchgear connection and at each structural wall passage. Flashing plates shall be furnished where the duct passes through walls, either indoor or indoor-outdoor.

- h. Removable plates to provide access to all bus connections shall be supplied. Preferred location of access plates is at the bottom of enclosure.
- i. A ground bus shall be provided along the entire length of the metal enclosed bus. The current carrying capacity of this bus shall be equivalent to a 1/4 x 2 inch copper bar. Provision shall be made for connecting this bus to ground at two or more places, with compression type terminals for 750 kcmil copper cable.
- j. Space heaters shall be provided in all outdoor bus duct enclosures if recommended by the Seller. Heater capacity shall be such that the temperature inside the duct shall be maintained above the dew point temperature for the conditions of operation. Heaters shall be rated 125 volts minimum, suitable for operation from Buyer's 120 volt, single phase, 60 hertz supply. Heaters shall be readily accessible for replacement and shall be provided with protective screens if located where they may be hazardous to personnel. These heaters shall be separately fused and shall be wired to have a common voltage supply with heaters in associated switchgear. Heater wiring shall be in protective metal covering.

8.2.4 Assembly

- a. The entire bus structure, or as much as Buyer deems necessary, shall be assembled in the factory to insure against any misfit of parts in the field. The bus duct shall be shipped in assembled sections which shall be as long as practicable to minimize the amount of field assembly.
- b. Except as provided elsewhere, the Seller shall supply all necessary accessories for terminating each set of bus at its associated switchgear and/or transformer.

9.0 FINISH

- 9.1 All surfaces normally painted shall be thoroughly cleaned of dust, rust, grease, weld spatter, and loose mill scale and shall be painted in accordance with

Specification 8031-G-4, General Requirements for Shop Painting for Mechanical and Electrical Equipment or an approved manufacturer's paint specification.

- a. Finish lacquer for all exterior surfaces shall be light gray ANSI No. 61 Munsel notation 8.3G6.10/0.54.

- 9.2 A sufficient quantity of touch-up finish paint shall be furnished to repair minor damage caused during installation.

10.0 SCHEDULING

- 10.1 The overall project construction program makes it imperative that switchgear and bus duct be delivered at the jobsite by not later than the date specified in the requisition.
- 10.2 The Seller shall coordinate with the Buyer to establish an engineering and fabricating schedule to meet jobsite requirement dates.

11.0 SHIPPING

- 11.1 Equipment shall be arranged and fabricated to provide convenient shipping sections. Each shipping section and all parts contained therein shall be properly protected against corrosion, weather and mechanical damage during transit.
- 11.2 Each shipping section shall be provided with supports in the form of suitable steel sections, lifting eyes, etc. to maintain alignment of parts during shipping, handling, hoisting, and installation. Location of lifting points shall be clearly identified on shipping containers and on drawings.
- 11.3 Necessary bus connections, wire jumpers, bolts, nuts, washers, etc. shall be furnished, suitably packaged and marked to facilitate field assembly. Each shipping container shall be identified with the name of contents, purchase order number and purchase order item number.

12.0 QUALITY CONTROL REQUIREMENTS-CLASS I EQUIPMENT

- 12.1 Equipment designated in the Requisition or Specific Condition as Class I is to perform critical functions in a nuclear power plant. For this equipment the Bidder shall submit his quality program in accordance with Specification 8031-G-13, General Project Requirements for Quality Assurance. The Seller shall furnish the

documentation as specified below in accordance with the applicable requirements of Specification 8031-G-13.

- 12.2 Each equipment item identified in the Requisition as Class I shall be qualified by analysis, successful use under similar conditions or by actual test to demonstrate its ability to perform its function under normal and design basis events as defined in the Requisition. The analysis/testing program shall meet or exceed the requirements contained in:

- (1) IEEE No. 323, Standard for Qualifying Class I Electric Equipment for Nuclear Power Generating Stations, and
- (2) IEEE No. 344, Seismic Qualification of Class I Electric Equipment for Nuclear Power Generating Stations. (Reference Section 5.C and Specification 8031-G-14 for requirements)

The above qualification data shall include, but not limited to, written documentation and/or certified test reports that the equipment meets the following applicable standards:

- a. ANSI, C37.09, Standard Test Procedure for AC High Voltage Circuit Breakers
 Section 09-4 Design Tests (Certification from breakers submitted to design tests only required)
- b. ANSI C37.9, Standard Test Code for Power Circuit Breakers
 Section 9.2 Design Tests (Certification from breakers submitted to design tests only required)
- c. ANSI C37.20, Standard for Switchgear Assemblies Including Metal-Enclosed Bus
 Section 20-5.2 Design Tests (Certification from equipment submitted to design tests only required)

- 12.3 Results from the following production tests shall be submitted with each switchgear section when shipped: (Applicable to both Class I and Non-Class I equipment)

- a. ANSI, C37.09, Standard Test Procedure for AC High Voltage Circuit Breakers

Section 09-5 Production Tests (Tests and certification required on each breaker furnished)

- b. ANSI C37.20, Standard for Switchgear Assemblies Including Metal-Enclosed Bus

Section 20-5.3 Production Tests (Tests and certification required on all switchgear furnished)

- 12.4 One copy of the associated quality control inspection and test reports shall be attached to each switchgear section when shipped. (Applicable to both Class I and Non-Class I equipment)
- 12.5 For each shipment of Class I Switchgear the supplier shall complete Form 3295, Statement of Conformance, and make distribution as noted thereon.

13.0 INFORMATION SUPPLIED BY BUYER

- 13.1 The Buyer will supply the following information to the Seller, when applicable.
- a. Switchgear cubicle nameplate schedule.
 - b. Transformer terminal flange details.

14.0 DELETED

15.0 SUBMITTALS BY SELLER FOR APPROVAL

The Seller shall submit to the Buyer, for approval, drawings and data in the quantities specified on "Documentation Requirements", Form 8031-DR attached.

16.0 PHOTOGRAPHS AND CURVES

The following photographs and curves shall be included in each instruction book.

- a. Close-up view of control panel of each typical unit.
- b. View of each size breaker in the withdrawn position, showing interior of the compartment.
- c. Overall view of each switchgear assembly.
- d. Typical time-travel chart of each breaker rating.
- e. CT accuracy curves.

17.0 CIRCUIT BREAKER CERTIFICATION TESTS

17.1 In addition to the written documentation and/or test reports required by Section 12.0, certification tests shall be performed on selected circuit breakers from the lot manufactured for use with the equipment covered by this specification.

17.2 Bechtel Corporation and Philadelphia Electric Co. personnel shall be responsible for selection of the individual circuit breakers to be tested.

17.3 Ratings of circuit breakers to be tested:

- a. 5 kV Class, 1200 ampere units.
- b. 15 kV Class, 1200 ampere units.
- c. 15 kV Class, 2500 ampere units.

The approximate quantities of each rating to be tested will be shown in the Material Requisition. The actual quantities to be tested may be adjusted on the basis of actual production batches.

17.4 Tests on each breaker shall consist of the following:

- a. At least two three phase interruptions per pole at the critical low current level to prove proper puffer operation. (The critical low current value shall be specified, on the basis of previous testing, by the Suppliers circuit breaker design engineers).
- b. At least one three phase interruption at the asymmetrical interrupting capability per breaker.
- c. All tests shall be performed at rated maximum voltage.

17.5 The tests shall be conducted in accordance with the requirements of ANSI Standard C37.09-1964 (R1969), particularly the following sections:

- a. C37.09-31.1 - Usual Service Condition
- b. C37.09-4.5.5.1 - Power Factor
- c. C37.09-4.5.5.2 - Frequency of Test Circuit
- d. C37.09-4.5.5.3 - Recovery Voltage

- e. C37.09-4.5.5.7 - Grounding of the Breaker and Test Circuit
 - f. C37.09-4.5.6 - Methods of Demonstrating the Short-Circuit Current Rating of a Circuit Breaker
 - g. C37.09-4.8 - Rated Interrupting Time
 - h. C37.09-Table 1 - Except for operating duty, the tests shall be conducted in accordance with Lines 1 and 6-3.
 - i. C37.09-Table 2 - If single phase tests are performed at the critical low current level, they shall be in accordance with Line 1, except for operating duty.
- 17.6 Acceptable performance shall be on the basis of meeting the interrupting time requirements as stated in C37.09 Section 4.8.
- 17.7 Copies of certified test data for each interrupting test performed shall be furnished promptly in accordance with the requirements of Form 8031-DR, and with one copy to:
- Mr. P. L. Kolarik
Philadelphia Electric Company
2301 Market Street - N3-1
Philadelphia, Pa. 19101
- Phone: 215-841-4646
- 17.8 The data shall consist of the following:
- a. Oscillograms which show current and voltage in each phase.
 - b. A table listing the magnitude of current, voltage, power factor, and total interrupting time.
 - c. The circuit transient recovery voltage of the test circuit as defined in C37.072-3.2 shall also be shown.
- 17.9 Following the tests, a complete inspection of the breakers shall be made to verify that the breaker is in substantially the same mechanical and electrical condition as before the performance of the tests. Bechtel Corporation personnel shall witness the inspections.
- 17.10 Bechtel Corporation and Philadelphia Electric Co. shall be notified prior to the test dates so that arrangements

can be made for witnessing the tests. The Philadelphia Electric notification should be directed to the person identified in Paragraph 17.7.

- 17.11 The Supplier shall prepare and submit to the Buyer, for approval, a proposed test procedure and test schedule.
- 17.12 A note shall be attached to each circuit breaker that has been tested per above requirements, and shall read as follows:

MAINTENANCE NOTE

"This circuit breaker has undergone short circuit interruption tests and may require replacement of parts after the total of the inservice short circuit current interruptions equals 50% of the capability specified in ANSI Standard C37.04 Section 4.5.3.3."

18.0 DEVIATIONS

All Supplier proposed deviations from the requirements of this Specification, the Material Requisition or other procurement documents, such as approved drawings, must be submitted to the Buyer for approval by use of Form ED-27, Supplier Deviation Disposition Request, or, an alternate form presenting equivalent information.

APPENDIX A
RELAY TYPES

13.8 kV Switchgear

<u>ANSI No.</u>	<u>Manufacturer</u>	<u>Type</u>	<u>Function</u>
86	G.E. Co. or Electro Sw.	HEA LOR	Lockout Relay
227	G.E. Co.	IAV	Voltage Relay
247	West.Co.	CVQ	Negative Sequence Voltage Relay
246M	G.E. Co.	IJC	Current Balance Relay
250G	G.E. Co.	PJC	Inst. Current Relay
250/251	G.E. Co.	IAC	Time Overcurrent Relay with Inst. Unit
250	West.Co.	SC	Bus Phase Fault Detector
251	G.E. Co.	IAC	Time Overcurrent Relay
251N, 251N-1, 251N-2	West.Co.	CO	Time Overcurrent Relay (Transf. grd.)
251	G.E. Co.	IAC	Time Overcurrent Relay (Bus grd.)
274/285	West.Co.	PM	Pilot Wire Monitor Relay
285	West.Co.	HCB	AC Pilot Wire Relay
287	G.E. Co.	PVD	Differential Voltage Relay
287	G.E. Co.	PJC	Motor Differential Relay
287T, 487	G.E. Co.	STD	Transf. Differential Relay
-	G.E. Co.	HFA OR HGA	Auxiliary Relay
-	West.Co.	SG OR MG	Auxiliary Relay

4.16 kV Switchgear

<u>ASA No.</u>	<u>Manufacturer</u>	<u>Type</u>	<u>Function</u>
127	Agastat	GP	Voltage Relay
127	G.E. Co.	NGV	Voltage Relay
150G	G.E. Co.	HFC	Inst. Current Relay
151	G.E. Co.	IAC	Time Overcurrent Relay
150/151	G.E. Co.	IAC	Time Overcurrent Relay with Inst. Unit

APPENDIX A

RELAY TYPES (Cont'd.)

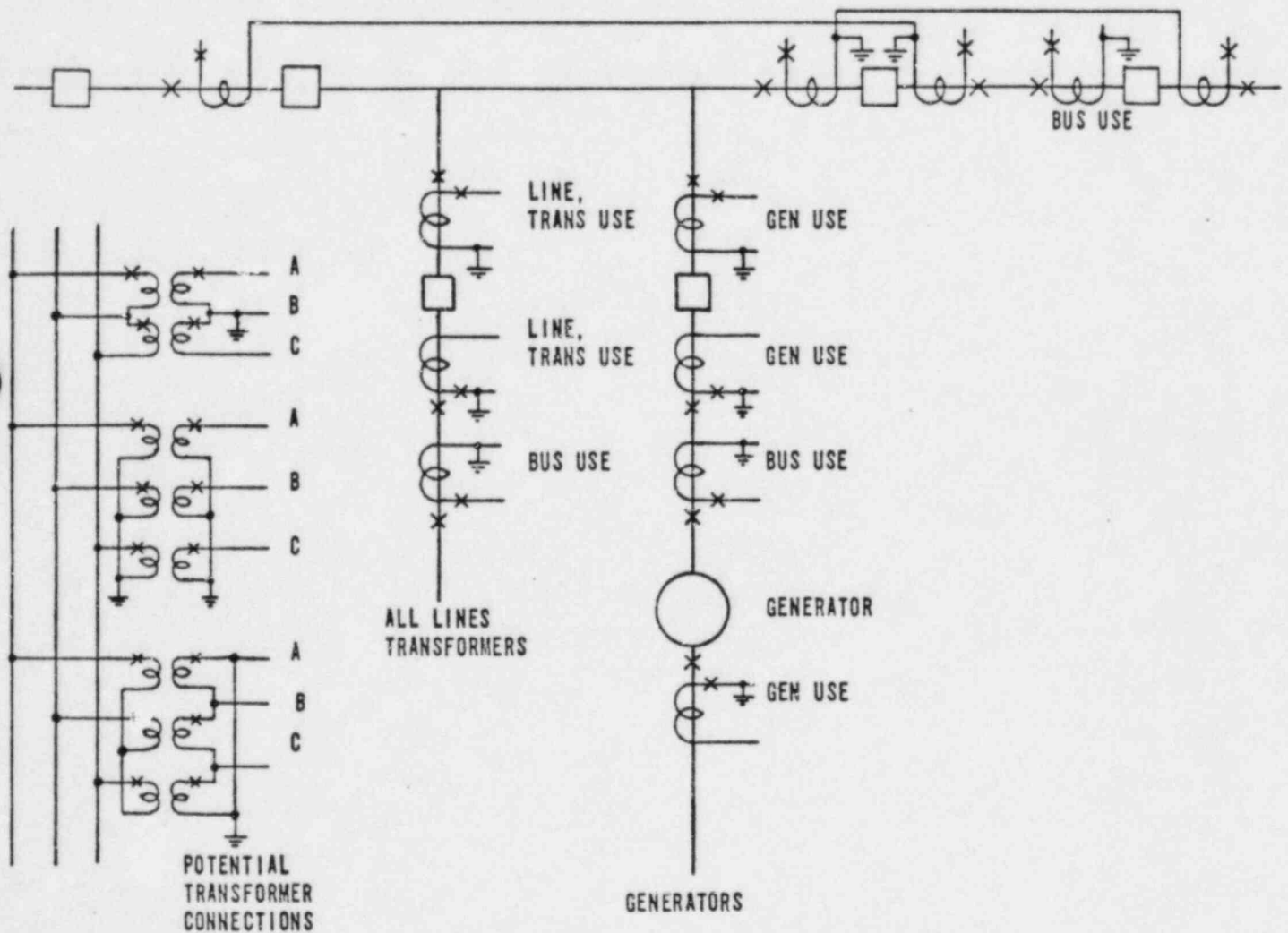
4.16 kV Switchgear

<u>ANSI No.</u>	<u>Manufacturer</u>	<u>Type</u>	<u>Function</u>
151N	G.E. Co.	IAC	Time Overcurrent Relay (Bus)
167	G.E. Co.	IBC	Phase Directional Overcurrent Relay
187	G.E. Co.	PVD	Bus Differential Relay
144	G.E. Co.	NGV	Sequence Starting Relay
187G	G.E. Co.	IJD	Diesel Gen. Differential Relay
186	Electro-Switch	LOR or LOR/ER	Lockout Relay

PHILADELPHIA ELECTRIC COMPANY
ELECTRICAL ENGINEERING DIVISION
STANDARD SPECIFICATION

* 33.00 CURRENT & POTENTIAL TRANSFORMER POLARITY AND NEUTRAL GROUNDING

.01 THESE STANDARDS MAY NOT APPLY TO ADDITIONS MADE TO EXISTING EQUIPMENT.



Issued as Part of Spec. 8031-E-7	JVC 4/14/71	12/1/70
Rechtel Rev. 0	ENG	DATE

PROTECTED SIDE NEUTRAL GROUNDING
(ADOPTED JANUARY, 1970)

FIGURE 2

ES-33

*REVISED 6-1-70

APPENDIX B

TABLE OF CONTENTS
SPECIFIC CONDITIONS

1.0	SCOPE
2.0	WORK INCLUDED
3.0	WORK NOT INCLUDED
4.0	CODES AND STANDARDS
5.0	SERVICE CONDITIONS
6.0	RATINGS
7.0	DESIGN AND CONSTRUCTION DETAILS
	SUMMARY OF PROPOSAL

APPENDIX B
SPECIFIC CONDITIONS

FOR

4160 VOLT METAL CLAD SWITCHGEAR AND MOTOR CONTROLLERS

FOR THE

PERKIOMEN PUMPING STATION

1.0 SCOPE

This Specification Appendix covers the furnishing of all labor, materials and services in connection with the design, fabrication and delivery of 4160 volt Metal Clad switchgear, 4160 volt motor controllers and compartments enclosing 4160 volt protective fuses for 4160/480 volt 300 kva three phase transformers, and as listed in the accompanying material requisition.

- 2.0 WORK INCLUDED See Specification 8031-E-7, Section 2.0
- 3.0 WORK NOT INCLUDED See Specification 8031-E-7, Section 3.0
- 4.0 CODES AND STANDARDS See Specification 8031-E-7, Section 6.0
and: a) NEMA IC-1-1965
b) ANSI-C37.30

5.0 SERVICE CONDITIONS

- 5.1 The equipment will be installed indoors at an elevation of approximately 220 feet above sea level.
- 5.2 The equipment will be subject to a maximum of 24 hour ambient temperature of 40 C.
- 5.3 The 4160 volt switchgear will be utilized in an auxiliary power system rated 4160 volts, three phase, 60 hertz, with a solidly grounded neutral.

6.0 RATINGS


6.1 Medium Voltage Metal-Clad Switchgear

- 7.1.1 Switchgear assemblies indicated as being in 5 kV class (4.16 kV service for Perkiomen Pumping Station) shall be rated:

a. Nominal Voltage 4.16 kV

b. Nominal Three Phase MVA Class	250 MVA
c. Rated Continuous Current	1200 amperes
d. Interrupting Time	5 cycles
e. Close and Latch	58,000 amperes
f. Control Voltage	120 volts dc
g. Operating Mechanisms	Stored-energy operate (spring- powered)

6.2 Motor Controllers

6.2.1  Motor Controllers shall be NEMA size H3
Class E-2, with fuses, full voltage, non-
reversing, and shall be rated:

a. Rated Voltage	5 kV
b. Voltage range	4 kV to 5 kV
c. Rated Continuous Current	360 Amps.
d. Control voltage	125 volts dc
e. Motor information	
1. Type	Squirrel-cage induction
2. Rated Voltage	4.16 kV
3. Horsepower	2000
4. Full load current	282 amps.
5. Locked rotor current	1700 amps.
6. Service factor	1.0
7. Accelerating time @ 75% volts	4 seconds
8. Accelerating time @ 100% volts	1.5 seconds

6.3 Transformer Feeder Unit

6.3.1 Load Center Transformer feeder unit shall be equipped as follows:

- a) Load break disconnect switch
 - 1) Rated voltage 5 kV
 - 2) Rated continuous current 600 amperes
 - 3) Rated interrupting current later
 - 4) Rated momentary current (3 seconds) 60,000 amperes
- b) Current limiting fuses Size 4.5 kV, 50E
- c) Current transformers Accuracy Class T-200

7.0 DESIGN AND CONSTRUCTION DETAILS

7.1 5 kV Class Metal Clad Switchgear

7.1.1 Refer to applicable sections of Specification 8031-E-7.

7.2 Motor Controllers

7.2.1 The motor controller unit shall contain as a minimum:

- a) The motor controller enclosure.
- b) Provision for the metal clad switchgear main bus.
- c) Connections from the adjacent metal clad unit to the line side of the motor controller.
- d) Provision for the load side connections, complete with terminal lugs and terminal covers in accordance with Sections 8.1.1g and 8.1.4g of Specification 8031-E-7. The Buyers connection material connection will consist of 15 kV Anaconda Unishield cable and Raychem Thermofit heat-shrinkable termination system.

- 7.2.2 Motor controller enclosures shall be built with separate low voltage and high-voltage compartments. The compartments shall be arranged and barriered so that the low-voltage compartment can be entered with controller energized without exposure of personnel to high voltage.
- 7.2.3 Each controller shall be isolated by an externally operated mechanism. Interlocks shall be provided to prevent (1) inadvertent operation of the isolating mechanism under load, (2) opening of the high-voltage compartment before the controller is isolated, (3) closing of the contractor while door is open, and (4) racking the contractor into the engaged position while the contractor is energized from a separate (test) source. An indication, either direct or by a mechanical indicator, shall be provided to show main contractor position, i.e. open or closed.
- 7.2.4 Contractor shall be draw-out type. The bus shall be automatically shuttered when the contractor is in the disconnected position. The disconnected position shall be clearly indicated. The bus shall be isolated from normally accessible compartments.

7.3 Fused Interrupter Switch Compartments

- 7.3.1 Each fused interrupter switch cubicle shall consist of three compartments. One shall contain the interrupter switch, group operated, 3PST complete with three S&C Electric Co. indoor non-disconnecting type fuses with mufflers and current rating as specified elsewhere. The second compartment shall contain the main bus and the third compartment shall have provision for terminating outgoing cables.
- 7.3.2 Smoke barriers will be provided between compartments of the switch cubicle.
- 7.3.3 The interrupter switch shall be a 3 position switch (closed-open-ground) equipped with a quick-make, quick-break mechanism operating on the switch shaft.
- 7.3.4 The fuse compartment shall have a hinged door with interlocking between this door and the disconnecting switch.

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- 7.2.2 Motor controller enclosures shall be built with separate low voltage and high-voltage compartments. The compartments shall be arranged and barriered so that the low-voltage compartment can be entered with controller energized without exposure of personnel to high voltage.
- 7.2.3 Each controller shall be isolated by an externally operated mechanism. Interlocks shall be provided to prevent (1) inadvertent operation of the isolating mechanism under load, (2) opening of the high-voltage compartment before the controller is isolated, (3) closing of the contractor while door is open, and (4) racking the contractor into the engaged position while the contractor is energized from a separate (test) source. An indication, either direct or by a mechanical indicator, shall be provided to show main contractor position, i.e. open or closed.
- 7.2.4 Contractor shall be draw-out type. The bus shall be automatically shuttered when the contractor is in the disconnected position. The disconnected position shall be clearly indicated. The bus shall be isolated from normally accessible compartments.

7.3 Fused Interrupter Switch Compartments

- 7.3.1 Each fused interruptor switch cubicle shall consist of three compartments. One shall contain the interrupter switch, group operated, 3PST complete with three S&C Electric Co. indoor non-disconnecting type fuses with mufflers and current rating as specified elsewhere. The second compartment shall contain the main bus and the third compartment shall have provision for terminating outgoing cables.
- 7.3.2 Smoke barriers will be provided between compartments of the switch cubicle.
- 7.3.3 The interrupter switch shall be a 3 position switch (closed-open-ground) equipped with a quick-make, quick-break mechanism operating on the switch shaft.
- 7.3.4 The fuse compartment shall have a hinged door with interlocking between this door and the disconnecting switch.

ATTACHMENT 2

PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2

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MATERIAL REQUISITION

MATERIAL: 480 Volt Load Center Unit Substations

See This M/R includes Q designated items. 10CFR21 is applicable.

Bechtel Audit Required Yes ☒ No ☐

SHOP INSPECTION ☒ IS ☐ IS NOT REQUIRED

COST CODE: See Item

JOB SITE DELIVERY DATE: See Page 7 for Details

M/R STATUS

REV NO.	DATE	REVISIONS	ORIGINATOR (NAME)	APPROVALS	T/NO.
	2/5/71	Issued for Bids	LESTER LEW J.V. Carlson	MC	
1	12/4/71	REVISED AND ISSUED FOR PURCHASE	J.V. Carlson	MC CWB	
2	4/29/72	REVISED DRAWING REFERENCES ON ALL ITEMS, TRANSFORMER RATINGS OF ITEMS 9-16, AND LIST OF SPECIFICATION AND DRAWING ATTACHMENTS. RELEASED ITEMS 9-16 FOR ENGINEERING.	L. LEW	MC CWB	
3	5-8-73	REVISED: DRAWING REFERENCES ON ALL ITEMS, NAMES OF ITEMS 13-16, AND ATTACHMENTS	L. LEW	MC	
4	7-2-73	REVISED SHEET 8	K.J. Clark	MC	
5	8-22-74	Revised Sheets 2, 3, 4, 5, 6, 8 & 9	L. Lew	MC AP	
6	8-15-75	Revised Sheets 4, 5, 6, 8, 9 & 10	L. Lew	MC AP	
7	7-6-76	Revised Sheets 2, 3, 4, 5, 6, 8 & 9	L. Lew	MC AP	
8	2-2-77	Revised Sheets 8	K.J. Clark	MC AP	
9	6/4/79	Revised Sheets 1, 6, 7, 8, 9 & 10	I.L. THAKUR	MC AP	
10	9/21/79	Revised Sheets 1, 2, 3, 4, 5 & 6	F.J. Lamb	MC AP	
	4/21/81	Added Sheet 6A and items 19 & 20 Revised Sheet 7	F.J. Lamb	MC AP	

Q List Items: 9, 10, 11, 12, 13, 14, 15, 16, 21 & 22

Job	Requisition No.
8031	8031-E-10 Rev. 13



MATERIAL REQUISITION

Page 1a of 10 Pages

MATERIAL:

480 Volt Load Center Unit Substations

SUPPLIER QUALITY SURVEILLANCE REQUIREMENTS

☐ 0 NONE

☒ 3 FULL SCOPE

☐ 1 FINAL ONLY

☐ 4 RESIDENT

☐ 2 LIMITED SCOPE

BECHTEL AUDIT REQUIRED YES ☒ NO ☐

10 CFR 21 APPLIES

YES ☒ NO ☐

COST CODE See Item

JOB SITE DELIVERY DATE

See Page 7 for Detail

M/R STATUS

REV. NO.	DATE	REVISIONS	ORIGINATOR (NAME)	APPROVALS
12	7/16/62	Added sheets 1a, 6B, 8A, 10A, 10B, 10C & 10D and Items 21 thru 26. Revised sheets 4, 5, 6, 8, 9 & 10	S.S. Talwar	WRT GCS WCH/
13	11/4/62	Revised sheets 8, 10, 10A, 10B	F.J. Lamb	WCH/

Job 8031 Requisition No. E-10 Rev. 1



PURCHASE ORDER NO.

REQUISITION NO.

8031-E-10-AC

REV

8031-E-10

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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MATERIAL: 480 VOLT LOAD CENTER UNIT
SUBSTATIONS

- | | | | Lot | Included itemized prices. |
|---|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------|
| A | 1 Lot | Documentation as required by attached Forms 8031-DR. The documentation requirements set forth shall be satisfied and provided with each shipment as specified. Failure to do so will render the shipment as incomplete and payment will be adjusted accordingly. | | |
| B | 1 Lot | Seller shall furnish to the Expediter, shown on Page 1 of the Purchase Order, not later than thirty (30) days after release for engineering a complete schedule, forecasting engineering; material and/or sub-assembly acquisition; fabrication and/or labor; final assembly; testing if any and shipping date(s). In addition, Seller shall furnish a progress report, to the Expediter, each two weeks, in sufficient detail to allow a realistic evaluation of all phases of progress toward Purchase Order completion. | | |
| C | 1 Lot | Parts lists required shall contain the name and order number of every part for the equipment and its auxiliaries including drawings in sufficient detail to locate and identify each part. In addition, where parts are manufactured by other than the Seller, the name of the original manufacturer and his part number shall be matched with the Seller's number on the part lists. | | |

FURNISH THE FOLLOWING LOAD CENTER UNIT SUB-
STATIONS PER APPLICABLE SPECIFICATIONS AS
LISTED AT THE END OF THIS REQUISITION

- 1 1 Lot #114A and #124A GENERATOR AREA LOAD CENTER. Double-ended unit substation with ventilated-dry transformers rated 1000 kVA, and 7.4% impedance. For Unit 1 as shown on Drawing No. 8031-E-17, Rev. 4.

Tag Switchgear Sections:
10B101 & 10B102
Tag Transformers (1 each):
1AX111, 1BX111
Cost Code: ~~44-0121~~

IF 7140.00



PURCHASE ORDER NO.

8031-E-10-AC

REQUISITION NO.

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
2	1 Lot	#214A and #224A GENERATOR AREA LOAD CENTER. For Unit 2, as shown on Drawing No. 8031-E-21, Rev. 3. Tag Switchgear sections: 20B101 & 20B102 Tag Transformers (1 each): 2AX111, 2BX111 Cost Code: 24-0121 2F 7140.00		\$	\$
3	1 Lot	#114C and #124C TURBINE AREA LOAD CENTER. Double-ended unit substation with ventilated-dry transformers rated 1000 kVA and 7.4% impedance. For Unit 1 as shown on Drawing No. 8031-E-18, Rev. 3. Tag Switchgear sections: 103105 & 10B106 Tag Transformers (1 each): 1AX112, 1BX112 Cost Code: 24-0121 1F 7140.00			
4	1 Lot	#214C and #224C TURBINE AREA LOAD CENTER. For Unit 2, as shown on Drawing No. 8031-E-22, Rev. 2. Tag Switchgear sections: 20B105 & 20B106 Tag Transformers (1 each): 2AX112, 2BX112 Cost Code: 24-0121 2F 7140.00			
5	1 Lot	#114B and #124B REACTOR AREA LOAD CENTER. Double-ended unit substation with ventilated-dry transformers rated 1000 kVA and 7.4% impedance. For Unit 1 as shown on Drawing No. 8031-E-17, Rev. 4. Tag Switchgear sections: 10B103 & 10B104 Tag Transformers (1 each): 1AX113, 1BX113 Cost Code: 24-0121 1F 7140.00			
6	1 Lot	#214B and #224B REACTOR AREA LOAD CENTER. For Unit 2, as shown on Drawing No. 8031-E-21, Rev. 3. Tag Switchgear sections: 20B103 & 20B104 Tag Transformers (1 each): 2AX113, 2BX113 Cost Code: 24-0121 2F 7140.00			



PURCHASE ORDER NO.

8031-E-10-AC

REQUISITION NO.

8031-E-10

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
7	1 Lot	#114D and #214D PLANT SERVICES LOAD CENTER. Double-ended unit substation with sealed-dry, gas-filled transformers rated 1000 kVA and 7.4% impedance, Common to Units 1 and 2 as shown on Drawing No. 8031-E-25, Rev. 4.			
		Tag Switchgear sections: 00B107 & 00B109 Tag Transformers (1 each): 0AX114, 0BX114 Cost Code: 44-0122 Unit 1 2F 7140.00			
8	1 Lot	#124D and #224D PLANT SERVICES LOAD CENTER. Double-ended unit substation with sealed-dry, gas-filled transformers rated 1000 KVA and 7.4% impedance. Common to Units 1 and 2 as shown on Drawing No. 8031-E-25, Rev. 4.			
		Tag Switchgear sections: 00B302 & 00B304 Tag Transformers (1 each): 0AX315, 0BX315 Cost Code: 44-0122 9C 7140.00			
9	1 Lot	#D114 SAFEGUARD LOAD CENTER. Single-ended unit substation with sealed-dry, gas-filled transformer rated 750 kVA and 5.75% impedance. For Unit 1 as shown on Drawing No. 8031-E-28, Rev. 5.			
		Seismic and QA Designation: Class I (See Notes on Pages 9 & 10)			
10	1 Lot	#D124 SAFEGUARD LOAD CENTER. Single-ended unit substation with sealed-dry, gas-filled transformer rated 750 kVA and 5.75% impedance. For Unit 1 as shown on Drawing No. 8031-E-28, Rev. 5.			
		Tag Switchgear sections: 10B201 Tag Transformer: 10X201 Cost Code: 44-0122 1B 7140.00			
		Seismic and QA Designation: Class I (See Notes on Pages 9 & 10)			
		Tag Switchgear sections: 10B202 Tag Transformer: 10X202 Cost Code: 44-0122 1B 7140.00			



PURCHASE ORDER NO.

8031-E-10-AC

REQUISITION NO.

8031-E-10

REV.

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
11	1 Lot	#D134 SAFEGUARD LOAD CENTER. Single-ended unit substation with sealed-dry, gas-filled transformer rated 1000 (kVA) and 7.4% impedance. For Unit 1 as shown on Drawing No. 8031-E-28, Rev. 5.			
Seismic and QA Designation: Class I (See Notes on Pages 9 & 10)					
Tag Switchgear sections: 10B203 Tag Transformer: 10X203 Cost Code: 24-0122 18 7140.00					
12	1 Lot	#D144 SAFEGUARD LOAD CENTER. Single-ended unit substation with sealed-dry, gas-filled transformer rated 1000 (kVA) and 7.4% impedance. For Unit 1 as shown on Drawing No. 8031-E-28, Rev. 5.			
Seismic and QA Designation: Class I (See Notes on Pages 9 & 10)					
Tag Switchgear sections: 10B204 Tag Transformer: 10X204 Cost Code: 24-0122 18 7140.00					
13	1 Lot	#D214 SAFEGUARD LOAD CENTER. Single-ended unit substation with sealed-dry, gas-filled transformer rated 750 (kVA) and 5.75% impedance. For Unit 2 as shown on Drawing No. 8031-E-29, Rev. 5.			
Seismic and QA Designation: Class I (See Notes on Pages 9 & 10)					
Tag Switchgear sections: 20B201 Tag Transformer: 20X201 Cost Code: 24-0122 28 7140.00					
14	1 Lot	#D224 SAFEGUARD LOAD CENTER. Single-ended unit substation with sealed-dry, gas-filled transformer rated 750 (kVA) and 5.75% impedance. For Unit 2 as shown on Drawing No. 8031-E-29, Rev. 5.			
Seismic and QA Designation: Class I (See Notes on Pages 9 & 10)					
Tag Switchgear sections: 20B202 Tag Transformer: 20X202 Cost Code: 24-0122 28 7140.00					



PURCHASE ORDER NO.

8031-E-10-AC

REQUISITION NO.

8031-E-10

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
15	1 Lot	#D 234 SAFEGUARD LOAD CENTER. Single-ended unit substation with sealed-dry, gas-filled transformer rated 750 kVA and 5.75% impedance. For Unit 2 as shown on Drawing No. 8031-E-29, Rev. 5. <u>Seismic and QA Designation: Class I</u> (See Notes on Pages 9 & 10) Tag Switchgear sections: 20B203 Tag Transformer: 20X203 Cost Code: 21-0122 28 7140.00		\$	\$
16	1 Lot	#D 244 SAFEGUARD LOAD CENTER. Single-ended unit substation with sealed-dry, gas-filled transformer rated 750 kVA and 5.75% impedance. For Unit 2 as shown on Drawing No. 8031-E-29, Rev. 5. <u>Seismic and QA Designation: Class I</u> (See Notes on Pages 9 & 10) Tag Switchgear sections: 20B204 Tag Transformer: 20X204 Cost Code: 21-0122 28 7140.00			
17	17 each	Traveling overhead lift device with removable hand-crank.	No charge (included in each item)		
		Cost Code: 21-0122 TO 7140.00			
18	1 Lot	#134D and #234D ADMINISTRATION BUILDING LOAD CENTER. Double-ended unit substation with ventilated dry transformers rated 1000 kVA and 7.4% impedance. Common to Units 1 & 2 as shown on Drawing No. 8031-E-25, Rev. 7 Tag Switchgear Sections: OOB547 & OOB548 Tag Transformers (1 each) OAX547, OBX547 Cost Code: 9J 7140.00			

ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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19 1 Lot Perkiomen Makeup Water System Load Center.
Double-ended unit substation with ventilated
dry transformer rated 300 kVA and 5% impedance
and with 2-2 1/2% + taps, all in accordance
with the following drawings:

Tag Switchgear Sections: 00B501 & 00B502
" Transformers : 0AX512 & 0BX512

Cost Code: 9V7150

Drawing No.	Rev.	Description
E-3000	E	Single Line Meter & Relay Diagram Perkiomen Makeup Water System
E-3006	E	Schematic Meter & Relay Diagram 480V Load Center 501 & 502 Perkiomen Makeup Water System
E-3007	E	Schematic Diagram - Phasing Perkiomen Makeup Water System
E-3011 Sh.1,2,3	E	Schematic Diagram - 480V LC Breakers Perkiomen Makeup Water System
E-3029	E	Perkiomen Makeup Water System Pumping Station Conduit.

20 1 Travelling overhead lift device (no charge - included with
item 19) with removable hand crank.

21 1 Safeguard load center transformer, 1000kVA, 80°C rise,
ventilated dry type with 8.0% impedance. For Unit 1 as
shown on Drawing No. 8031-E-28 Rev. 5.

Tag. No.: 10X201
Cost Code: 1B7150

[This transformer will replace the existing 750kVA, 150°C rise,
sealed-dry, gas filled transformer used for D114 safeguard load
center of item No. 9 of the original P.O. 8031-E-10]

BECHTEL

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REQUISITION NO.

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NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
22	1	Safeguard load center transformer, 1000kVA, 80°C rise, ventilated dry type with 8.0% impedance. For Unit 1 as shown on Drawing No. 8031-E-28, Rev. 5. Tag No. 10X202 Cost Code 1B7150 [This transformer will replace the existing 750kVA, 150°C rise, sealed-dry, gas-filled transformer used for D124 safeguard load center of Item No. 10 of the original P.O. 8031-E-10]			
23	1 Lot	Environmental Qualification for Items 21 and 22 per IEEE Std. 323-1974 (NUREG 0588 Category 1), Specification 8031-G-18, Rev. 4 and all other requirements listed in notes on Pages 9 & 10.			
24	1 Lot	Extension of environmental qualification for Items 9 through 16 of the original P.O. 8031-E-10 to meet IEEE Std. 323-1974 (NUREG 0588 Category 1), Specification 8031-G-18, Rev. 4 and all other requirements listed in notes on Pages 9 & 10.			
25	1 Lot	Seismic/Hydrodynamic Qualification based on previously qualified equipment for Items 21 and 22 per IEEE Std. 344-1975, Specification 8031-G-19, Rev. 2 and all other requirements listed in notes on Pages 9 & 10.			
26	1 Lot	Extension of seismic/hydrodynamic qualification based on previously qualified equipment for Items 9 through 16 of the original P. O. 8031-E-10 to meet IEEE Std. 344-1975, Specification 8031-G-19. Rev. 2 and all other requirements listed in notes on Page 9 of 10.			



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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
				\$	\$

Jobsite Delivery Dates (Required):Equipment for Unit 1 and CommonDates

1	1 Lot	Generator Area Load Center	Dec. 1, 1972
3	1 Lot	Turbine Area Load Center	Jan. 1, 1973
5	1 Lot	Reactor Area Load Center	Jan. 1, 1973
7	1 Lot	Plant Services Load Center	Nov. 1, 1972
8	1 Lot	Plant Services Load Center	Sept. 1, 1973
9	1 Lot	Safeguard Load Center	Jan. 1, 1974
10	1 Lot	Safeguard Load Center	Jan. 1, 1974
11	1 Lot	Safeguard Load Center	Jan. 1, 1974
12	1 Lot	Safeguard Load Center	Aug. 1, 1973

Equipment for Unit 2

2	1 Lot	Generator Area Load Center	Dec. 1, 1972
	1 Lot	Turbine Area Load Center	Jan. 1, 1974
6	1 Lot	Reactor Area Load Center	Jan. 1, 1974
13	1 Lot	Safeguard Load Center	Jan. 1, 1975
14	1 Lot	Safeguard Load Center	Jan. 1, 1975
15	1 Lot	Safeguard Load Center	Jan. 1, 1975
16	1 Lot	Safeguard Load Center	Aug. 1, 1973
18	1 Lot	Administration Building Load Centers	Aug. 1, 1980
19	1 Lot	Perkiomen Makeup Water System Load Centers	June 1, 1982



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8031-E-10

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QUANTITY

DESCRIPTION

CODE OR
EQUIP. NO.

UNIT PRICE

EXTENSION

\$

\$

Attachments:

1. <u>Specification Number</u>	<u>Rev.</u>	<u>Description</u>
8031-E-10	6	Technical Specification
8031-G-1	8	General Project Requirements for Purchase Orders
8031-G-4	5	General Project Requirements for Shop Painting for Mechanical and Electrical Equipment
8031-G-13	2	General Project Requirements for Quality Assurance
8031-G-14	4	General Project Requirements for Seismic Design and Analysis of Equipment and Equipment Supports
8031-G-18	4	General Project Requirements for Environmental Qualification of Class 1E Equipment
8031-G-19	2	General Project Requirements for Design Assessment and Qualification of Seismic Category I Equipment and Equipment Supports for Seismic & Hydrodynamic Loads

8031-G-19
Appendix D
and FRequired Response Spectra (RRS)
for Seismic & Hydrodynamic Loads.

Pages: OBE: D-35,D-37,D-39,D-60

D-62,D-64,D-137,D-138,
D-140,D-141,D-143,D-144SSE: F-101,F-103,F-105,F-113,
F-115,F-117,F-260,F-261,
F-263,F-264,F-266,F-267Worst Case: F-125,F-127,F-129,F-137,
F-139,F-141,F-287,F-288,
F-290,F-291,F-293,F-2942. Forms3295
8031-DRStatement of Conformance
Documentation Requirements

ED-27

Supplier Deviation Disposition
Request

BECHTEL

PURCHASE ORDER NO.

8031-E-10-AC

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REQUISITION NO.

8031-E-10

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
				\$	\$

Attachments (Cont'd):

3. <u>Drawing No.</u>	<u>Rev.</u>	<u>Description</u>
Figure 1	1	Nameplate Standards
Figure 2	0	480 Volt Load Center Switchgear Compartment Numbers
8031-E-17	4	Single Line Meter & Relay Diagram, 114A and 124A Gen. Area L.C. & 114B and 124B Reactor Area L.C. 440V 1 Unit.
8031-E-18	3	Single Line Meter & Relay Diagram, 114C and 124C Turbine Area I.C. 440V 1 Unit.
8031-E-25	7	Single Line Meter & Relay Diagram, 114D, 124D, 214D 224D, 134D and 234D Plant Services & Administration Building L.C. 440V Common.

P-135/14



PURCHASE ORDER NO.

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REV

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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<u>Drawing No.</u>	<u>Rev.</u>	<u>Description</u>
8031-E-28	5	Single Line Meter & Relay Diagram, D114, D124, D134, D144 Safeguard Load Centers 440V 1 Unit.
8031-E-21	3	Single Line Meter & Relay Diagram, 214A and 224A, Gen. Area L.C. & 214B and 224B Reactor Area L.C. 440V 2 Unit.
8031-E-22	2	Single Line Meter & Relay Diagram, 214C and 224C Turbine Area L.C., 440V 2 Unit
8031-E-29	5	Single Line Meter & Relay Diagram, D214, D224, D234 D244 Safeguard Load Centers 440V 2 Unit

4. Quality Surveillance Requirements (2 sheets).
Notes

1. Additional drawings required for detailed design will be submitted later by separate transmittals. These drawings include schematic meter and relay diagrams.
2. Normal basis events - as set forth in Section 4.0 of Specification 8031-E-10 under Service Conditions.

NO.	QUANTITY	DESCRIPT.	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
				\$	\$

3. Engineering Release

1. Items 1 through 8 only are released for basic engineering, and scheduling by Rev. 1, of this M/R.
2. Items 9 through 16 are released for basic engineering, and scheduling by Rev. 2, of this M/R.

4. Effectivity

The Specifications, Forms, Drawings, Data Sheets, and General Project Requirements referenced in this Purchase Order revision are retroactive to the date of first issue of this Purchase Order and apply to all items to be manufactured under this Purchase Order.

5. Special Note Regarding Requirements of 10CFR21

Seller shall comply with the provisions of 10CFR21, Reporting of Defects and Noncompliances, for Class 1 items (Q-listed).

6. Seismic and Quality Assurance Requirements:

Items 9 through 16, 21 and 22 are Seismic Category I Equipment and the following requirements shall apply

- a) Design basis events - seismic and hydrodynamic requirements in accordance with Specification 8031-G-19, with seismic/hydrodynamic accelerations at the load center mountings per Required Response Curves, Specification 8031-G-19, Rev. 2, Appendix D and F.
Pages:

13

OBE: D-35, D-37, D-39, D-60, D-62, D-64, D-137,
D-138, D-140, D-141, D-143, D-144

SSE: F-101, F-103, F-105, F-113, F-115, F-117,
F-260, F-261, F-263, F-264, F-266, F-267

Worst Case: F-125, F-127, F-129, F-137, F-139, F-141,
F-287, F-288, F-290, F-291, F-293, F-294

QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
			\$	\$

7. The Seller shall be responsible for proving by test and/or analysis that all Class 1E Load Center Assemblies delivered under Spec. 8031-E-10 (Items 9 through 16, 21 & 22) shall remain functional so a safe, orderly shutdown of the plant can be achieved and maintained during and after experiencing following tests for seismic/hydrodynamic loads in sequential order:
- a) Five repetitions of tests to composite of OBE curves.
 - b) One test to composite of SSE curves.
 - c) One test to composite of worst case curve.
8. For each shipment of Seismic Category I equipment, Form 3295, statement of conformance, shall be completed and distributed as noted thereon.
9. The documentation requirements are as stated in Specification 8031-E-10, Form 8031-DR for Class 1E equipment. Included are requirements for documentation in accordance with IEEE Standard 323-1974, IEEE Standard 344-1975 and NUREG-0588, Category I.
10. Class 1E Load Center Assemblies (Items 9 through 16, 21 & 22) will be located in the Reactor Enclosure Area. Spec. 8031-G-19, Appendix D and F defines the seismic and hydrodynamic requirements.
11. Class 1E Load Center Assemblies (Items 9 through 16, 21 & 22) shall withstand the effects of tornado depressurization. It has been established that the design basis tornado for the Limerick Generating Station Units 1 & 2 will result in a pressure drop of 3 psi (rate of pressure drop being 1 psi per second).
12. Environmental Requirements for Items 9 through 16, 21 and 22 shall be as under:
- a) Temperature
 - 1) Normal conditions: 104°F maximum (use 104° for 40 year ambient temperature)
 - 2) Accident conditions: 120°F

QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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b) Humidity

- 1) Normal conditions: 90% R.H. maximum (use 90% R.H. for 40 year R.H.)
- 2) Accident conditions: 100% R.H.

c) Pressure

- 1) Normal conditions: -0.009 psig (-0.25" W.G.)
- 2) Accident conditions: atmospheric

d) Radiation

13

40 year integrated radiation dose 3.51×10^4 rads
gamma and accident radiation dose 1.46×10^6 rads
gamma and 0.69×10^6 rads beta.

e) Voltage

Normal and accident conditions: $480V \pm 10\%$
Starting: $480V - 20\%$

f) Frequency

Normal and accident conditions: $60Hz \pm 5\%$

13. Ratings and connections of Safeguard load center transformers covered in Items 21 and 22 above shall be as follows:

- | | | | |
|----|------------------|---|-----------------------------------------------------------|
| a) | Output | : | 1000 kVA |
| b) | Temperature rise | : | 80° above 40°C
average 24 hours
ambient temperature |
| c) | Rated voltage | : | |
| | H.V. Winding | : | 4.16 kV |
| | L.V. Winding | : | 480/277 Volts |
| d) | Connection | : | |
| | H.V. Winding | : | Delta |
| | L.V. Winding | : | Wye (grounded in low |

NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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e) Taps, no load, full capacity

Above rated voltage : two 2 1/2%

Below rated voltage : two 2 1/2%

f) Impedance on rated kVA base : 8.0%

g) Phase relationship : Standard

h) X/R Ratio : 8.8 or less

14. Safeguard Load Center Transformers covered in Items 21 and 22 above shall conform to the following performance and mechanical data submitted with the bid (Brown Boveri Letter to Bechtel Neg. # 5607-B103797 dated 6/2/82 DCN. 128129).

i) PERFORMANCE DATA

1000 kVA Transformer

a. Efficiency at:	
100% load	98.74
75% load	98.83%
50% load	98.80%
b. No-load losses:	3800 watts
c. Total losses at 100% load:	12800 watts
d. Exciting current at rated voltage:	3.0 amperes
e. Impedance:	8.0%
f. Regulation at full load at:	
100% pf.	1.2%
80% pf.	6.9%

QUANTITY

DESCRIPTION

CODE OF
EQUIP. NO.

UNIT PRICE

EXTENSION

g. Winding BIL:
High Voltage Winding: 30 kV
Low Voltage Winding: 10 kV

h. X/R Ratio: 8.8

ii) MECHANICAL DATA

a. Weights
Net: 5700 lbs
Heaviest single piece
to be shipped as a
unit: 4700 lbs

b. Dimensions, overall: 78" L. 58" W. 90" H.
Largest section to be
shipped as a unit: 78" L. 42" W. 84" H

15. Safeguard load center transformers covered in Items 21 and 22 above shall be equipped with necessary buswork for connection to the existing stress cones in the 16" wide air terminal compartment on the 4.16 kV side and to the existing 5"x1/2" copper buses in the 14" wide transition compartment on the 480/277 Volt side.

GENERAL PROJECT REQUIREMENTS
FOR
ENVIRONMENTAL QUALIFICATION
OF CLASS 1E EQUIPMENT
LOCATED IN HARSH ENVIRONMENT
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

Bechtel Power Corporation
San Francisco, California

5	6/16/82	Incorporated PECO comments in PLB-3725E & PLB-3751E, Issued for Use.	GLS MT	ST JPC WCM
4	4/13/82	Incorporated the additional requirements in PLB-3612E, Issued for use	GLS MT	ST JPC WCM
3	3/23/82	Incorporated partial comments per PECO mark-up & issued to Brown Boveri for E-10.	MT	ST JPC WCM
2	2/18/82	Incorporated Rev. R & Rev. S Issued for use FOR P.O. 8031-E-7 ONLY	MT	ST JPC WCM
S	2/2/82	Revised to incorporate Chief Engineers' comments - Issued for Approval	MT	ST JPC WCM
R	11/6/81	Revised to incorporate NUREG-0588	MT	ST JPC WCM
1	5/15/78	Revised 6.1.3, 8.1.2 and 8.2.1 as noted. Reissued for use.	BPR DMS	ST JPC WCM
O	1-10-78	ISSUED FOR USE	BPR DMS	ST JPC WCM
A	8-17-77	ISSUED FOR APPROVAL	BPR DMS	ST JPC WCM
No.	Date	Revisions	Approvals	

4

SPECIFICATION
FOR
GENERAL PROJECT REQUIREMENTS
FOR
DESIGN ASSESSMENT AND QUALIFICATION
OF
SEISMIC CATEGORY I EQUIPMENT AND EQUIPMENT SUPPORTS
AND HVAC/ELECTRICAL SUPPORT REASSESSMENT
FOR
SEISMIC AND HYDRODYNAMIC LOADS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 AND 2
PHILADELPHIA ELECTRIC COMPANY

Bechtel Power Corporation

San Francisco, California

3	7/21/82	Revised pages E-vii, E-43 to E-56 E-71 to E-84, Added Appendix G	WJB	WJB	WJB
2	1/29/82	Revised pages 6, 12 and 14 Revised Appendix E, Added Appendix D&F	WJB	WJB	WJB
1	4/6/81	Revised Appendix A, added Appendix C and E	WJB	WJB	WJB
0	5/22/81	Issued for Use	WJB	WJB	WJB
NO.	DATE	REVISIONS	APPROVALS		

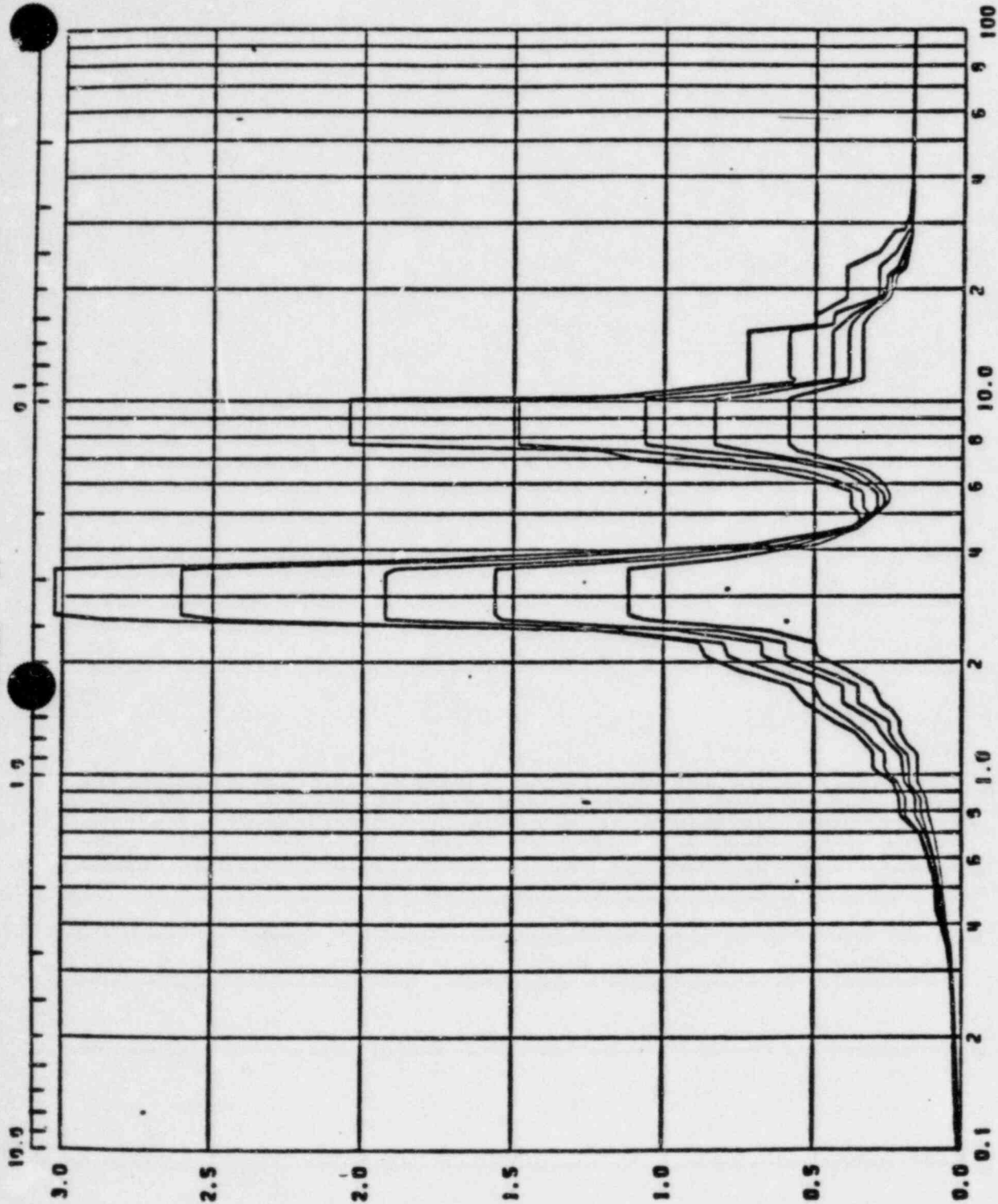
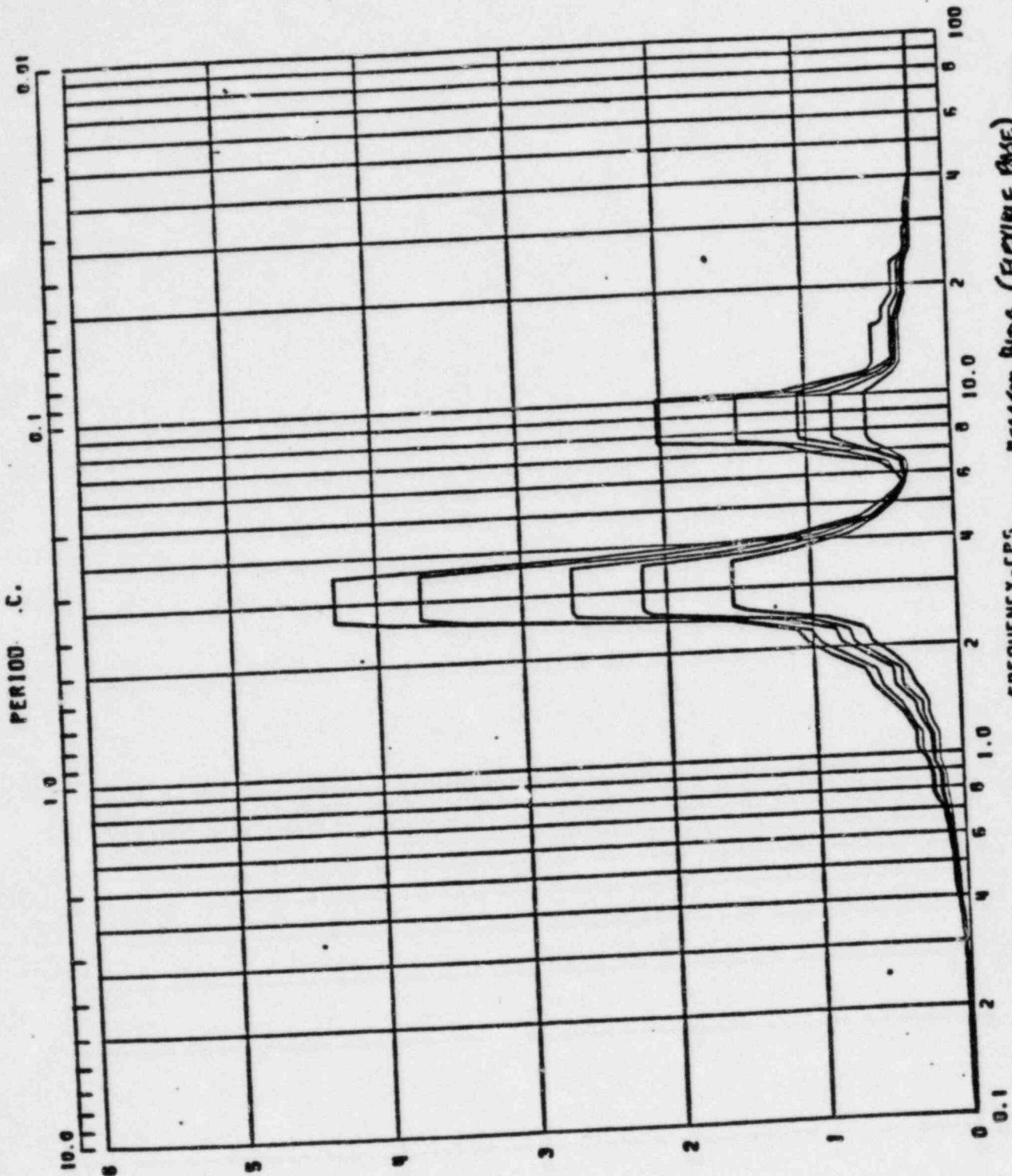


Fig. _____ Umerick Generation Station, Acceleration Spectra for REACTOR Bldg. (FLEXIBLE BASE)
 Load Case: N-S HORIZ. SEISMIC OBE
 Node: 5 Direction: N-S Elev: 253' Angle: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY Date: 7-24-81 Check: SLT Date: 8-4-81

SPECTRAL ACCELERATION, SA-C

D-37



FREQUENCY-CP'S
Acceleration Spectra for REACTOR Bldg. (FLEXIBLE BASE)

Fig. Limerick Generation Station, Acceleration Spectra for REACTOR Bldg. (FLEXIBLE BASE)

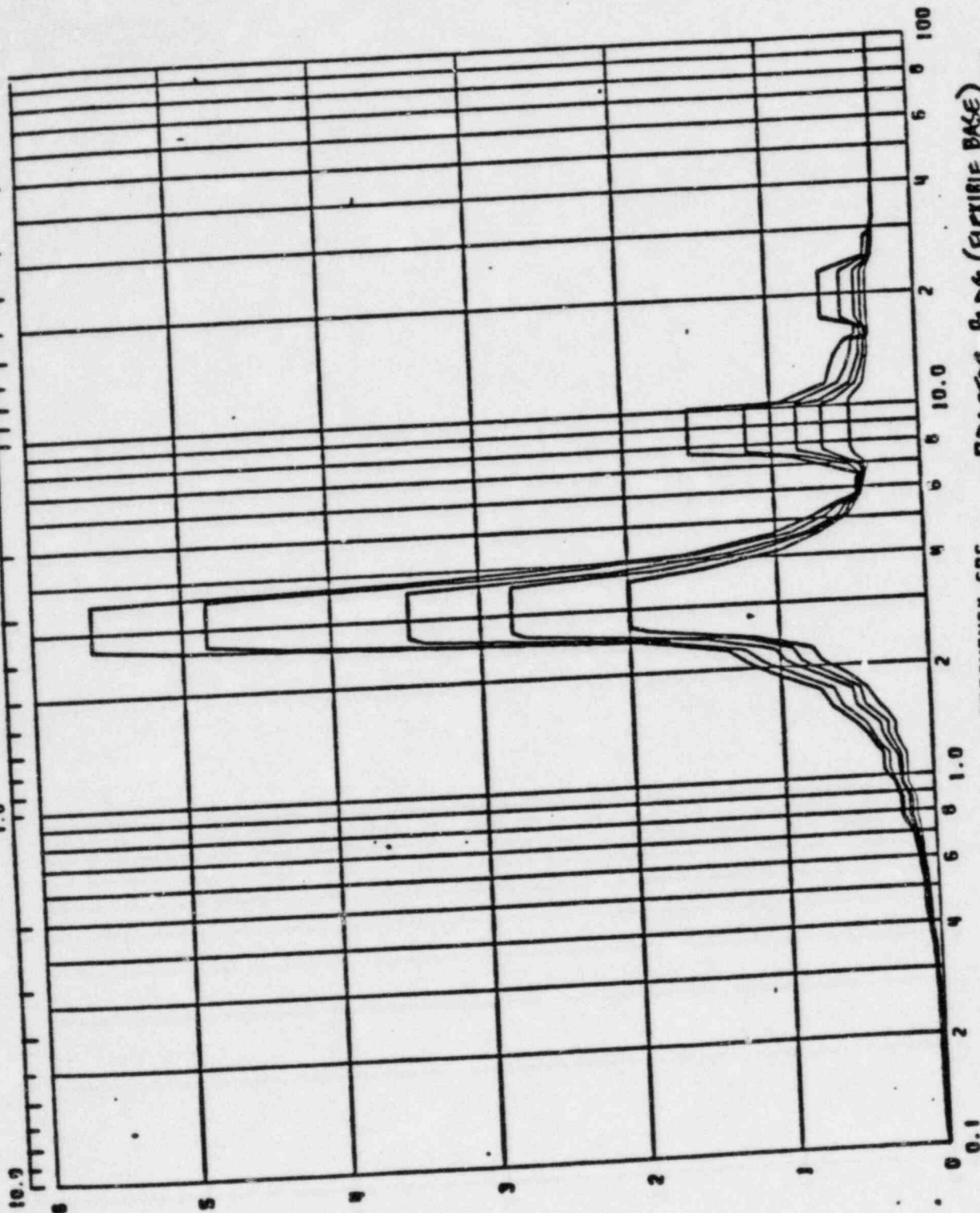
Load Case: N-S Horiz. Direction: N-S Elev: 283' Angle: /

Node: N-5 Date: 7-24-81 Check: D-37 Date: 8-4-81

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY

SPECTRAL ACCELERATION, 5A-C

D-39



FREQUENCY-CPS Acceleration Spectra for REACTOR BLDG. (FLEXIBLE BASE)

Fig. Limerick Generation Station, Seismic OBE
 Load Case: N-5 Horiz. 313' Elev: 313' Angle:
 Node: 9 Direction: N-5 Date: 7-24-81 Check: KLL Date: 8-4-81
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: W/HY

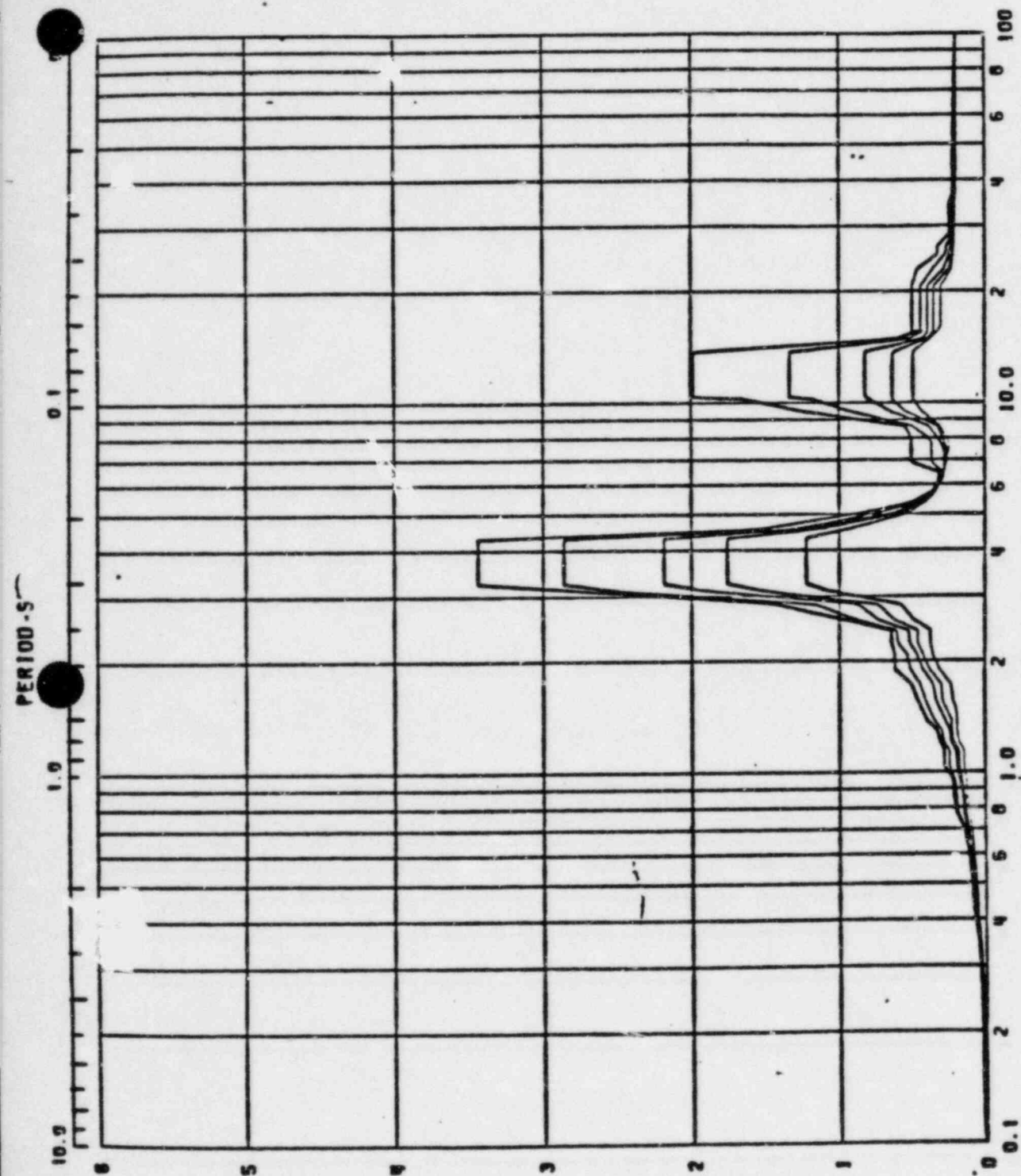


Fig. _____ Limerick Generation Station, Acceleration Spectra for REACTOR BLDG. (FLEXIBLE BASE)

Load Case: E-W Horiz. Seismic OBE

Node: 5 Direction: E-W Elev: 253' Angle: —

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY Date: 7-24-81 Check: LTZ Date: 8-13-81

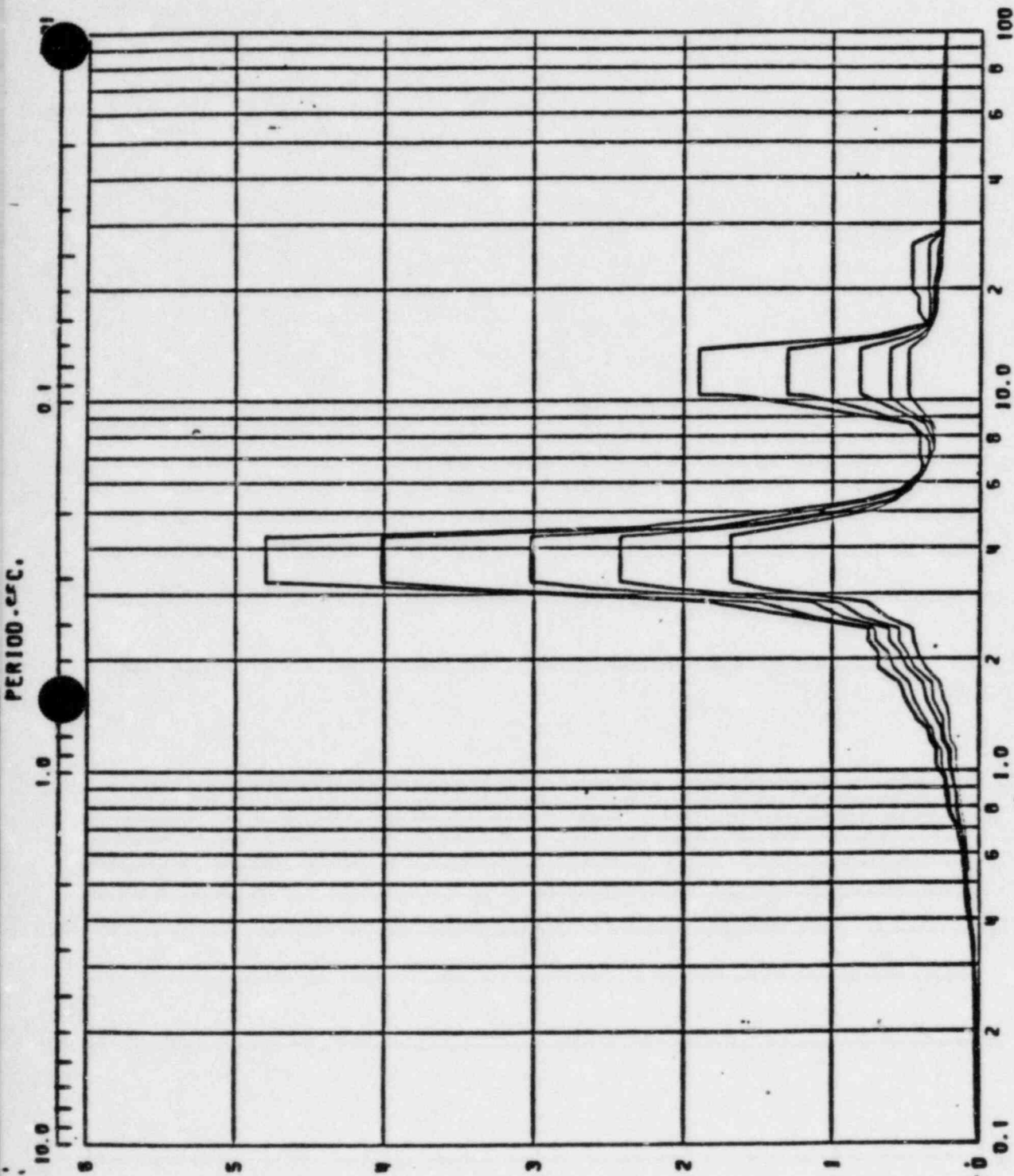


Fig. _____ Limerick Generation Station, Acceleration Spectra for Reaction Pile. (Pile Base)
 Load Case: E-W HORIZ. SEISMIC QBE
 Node: 7 Direction: E-W Elev: 283' Angle: —
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY Date: 7-24-81 Check: LTZ Date: 8-13-81

SPECTRAL ACCELERATION, SA-C

D-64

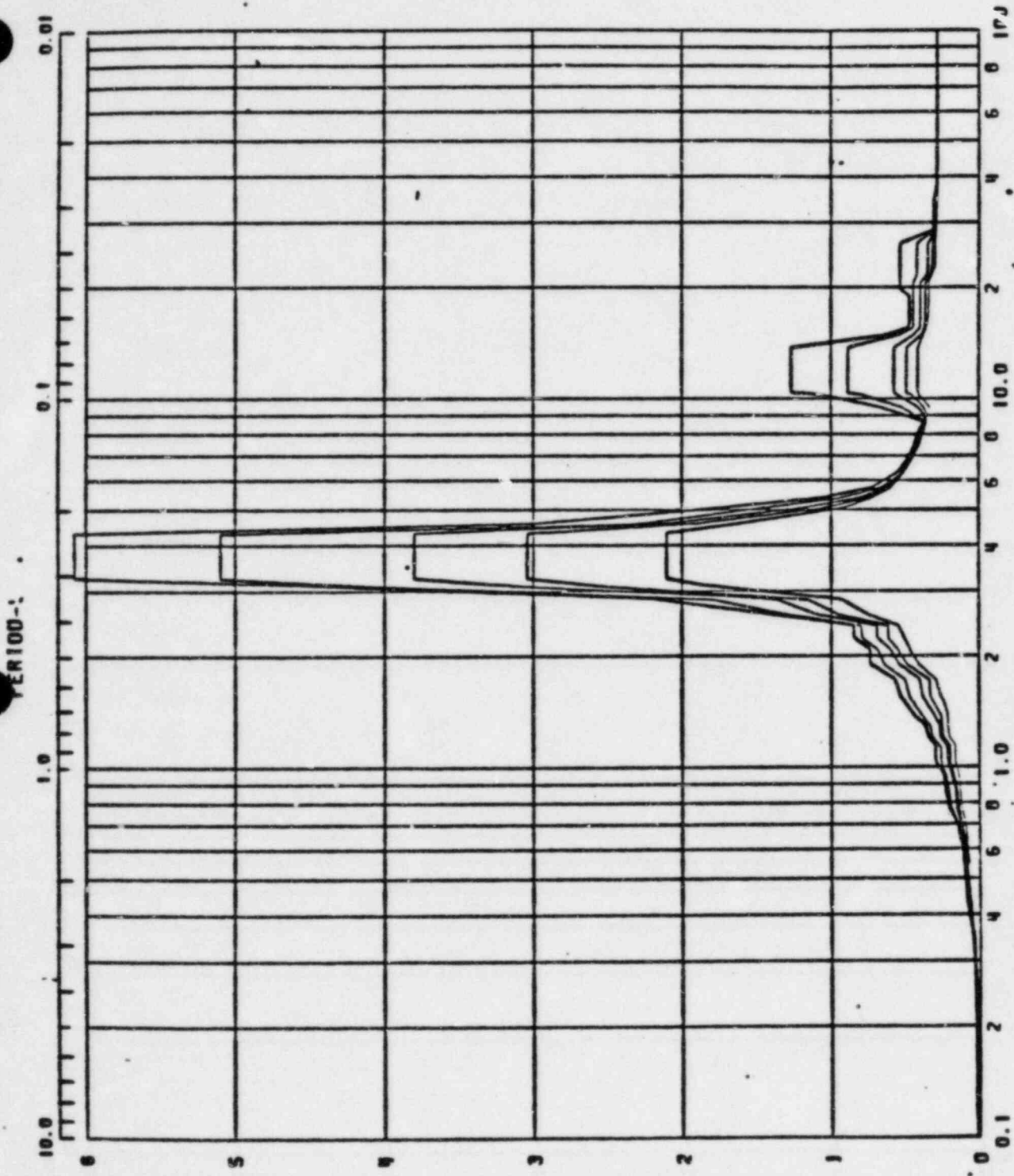


Fig. _____ Limerick Generation Station, Acceleration Spectra for REACTOR BLDG. (FLEXIBLE BASE)

Load Case: E-W Horiz. SEISMIC OBE

Node: 9 Direction: E-W Elev: 313' Angle: ✓

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY Date: 7-24-81 Check: ATZ Date: 8-13-81

SPECTRAL ACCELERATION, SA-C

D-137

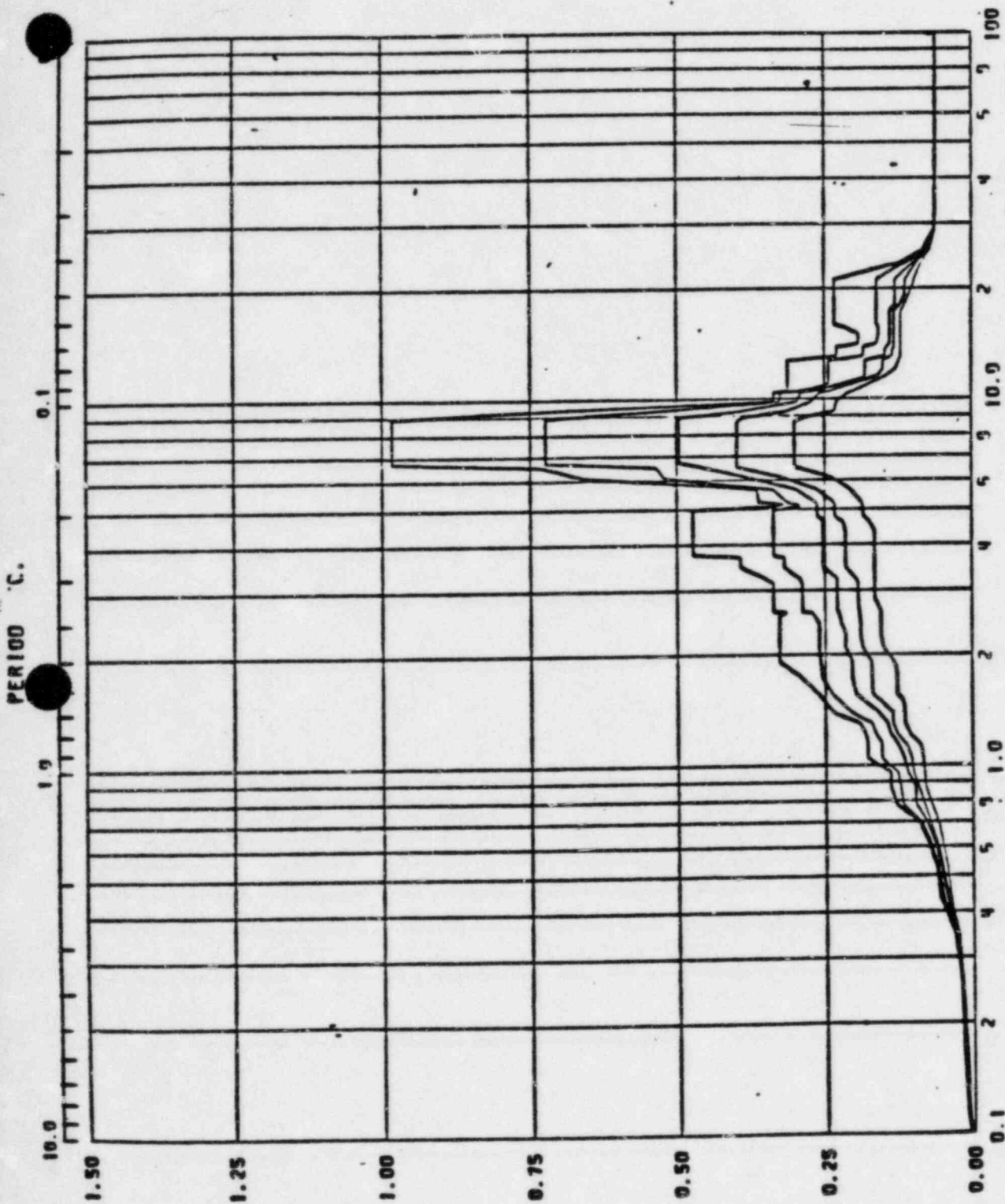


Fig. _____ Uimerick Generation Station, Acceleration Spectra for Reactor Bldg. (Flexible Base)

Load Case: VERTICAL Seismic DBE

VERT. MODE L
Node: 37 Direction: VERTICAL Elev: 253' Angle: ✓

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY Date: 7-31-81 Check: ALL Date: 8-12-81

SPECTRAL ACCELERATION, SA-C

D-13B

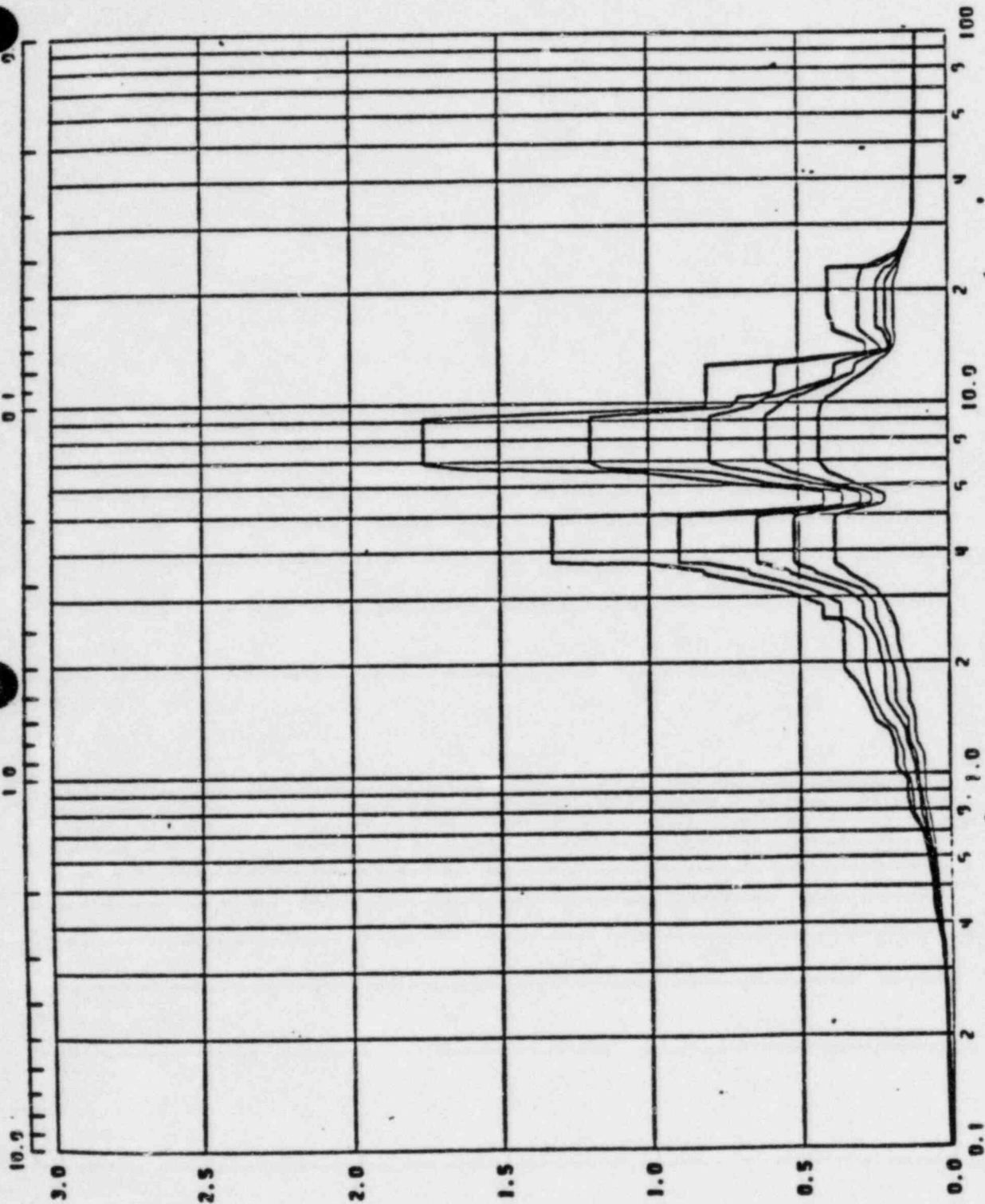


Fig. _____ Limerick Generation Station, Acceleration Spectra for REACTOR BLDG. (FLEXIBLE BASE)

Load Case: VERTICAL SEISMIC CBE

Node: 39 Direction: VERTICAL

Elev: 253'

Angle: ✓

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY Date: 7-31-81 Check: LZZ Date: 8-12-81

SPECTRAL ACCELERATION, SA-C

D-140

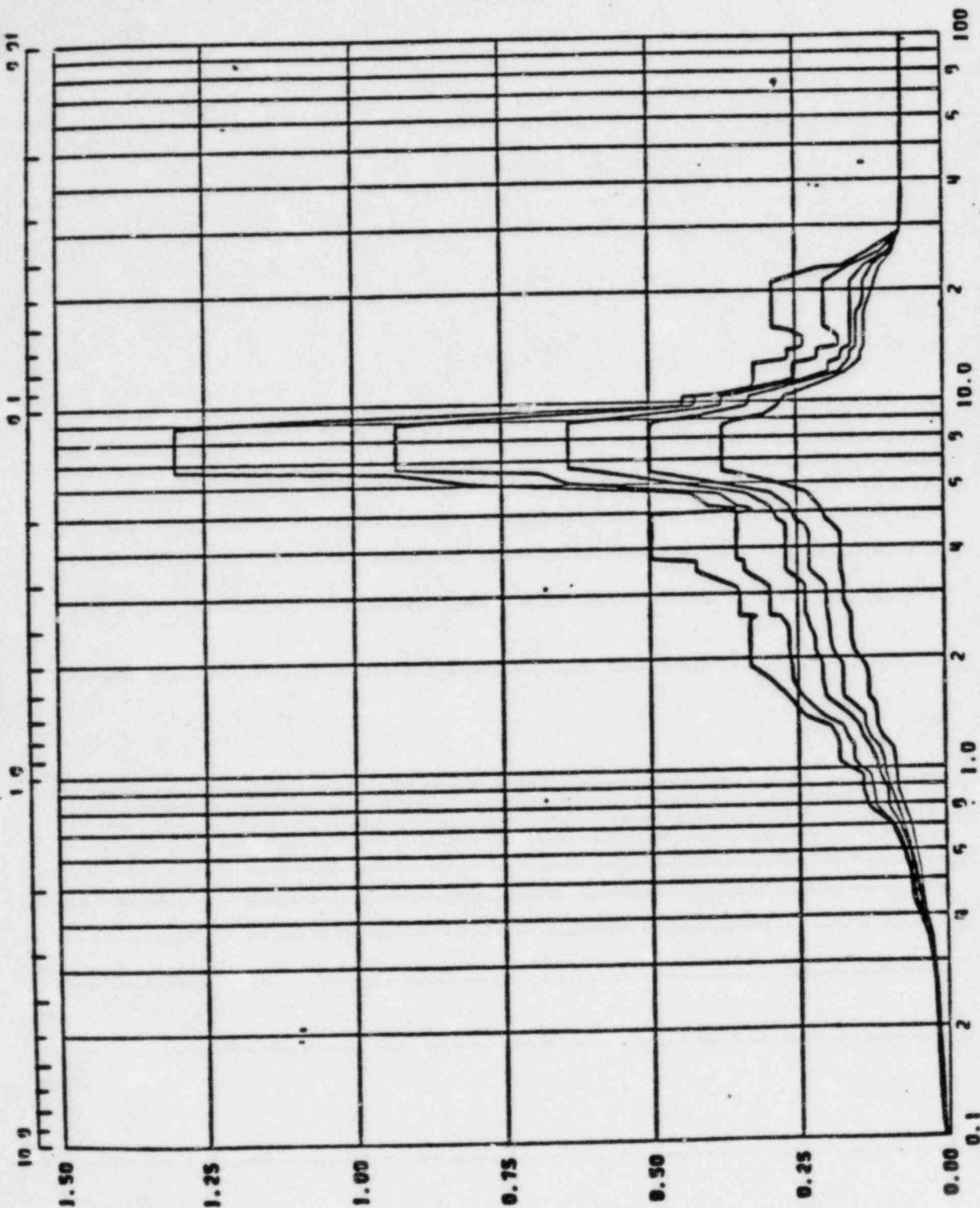


Fig. _____ Limerick Generation Station, Acceleration Spectra for Reactor Bldg. (Flexible Base)

Load Case: VERTICAL SEISMIC OBE
 Vertical Mode
 Node: 30 Direction: VERTICAL Elev: 283' Angle: ✓
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY Date: 7-31-81 Check: 6/22 Date: 8-12-81

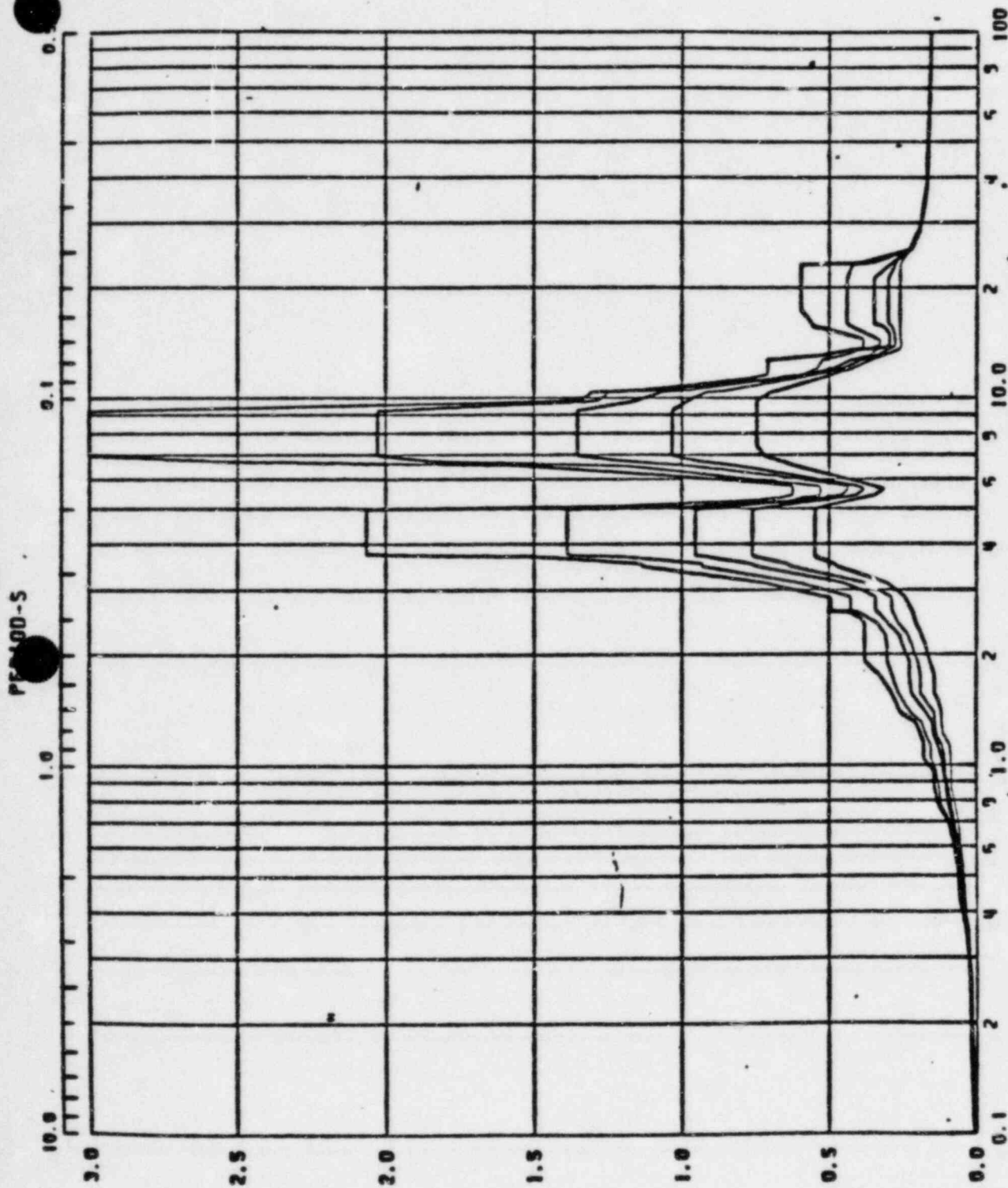


Fig. Limerick Generation Station, Acceleration Spectra for Reactor Bldg. (Flexible Base)

Load Case: VERTICAL SEISMIC OBE

Node: 32 Direction: VERTICAL

Elev: 28.3'

Angle: ✓

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: W.H.Y. Date: 7-31-81 Check: ADZ Date: 8-12-81

SPECTRAL ACCELERATION, 5A-C

D-142

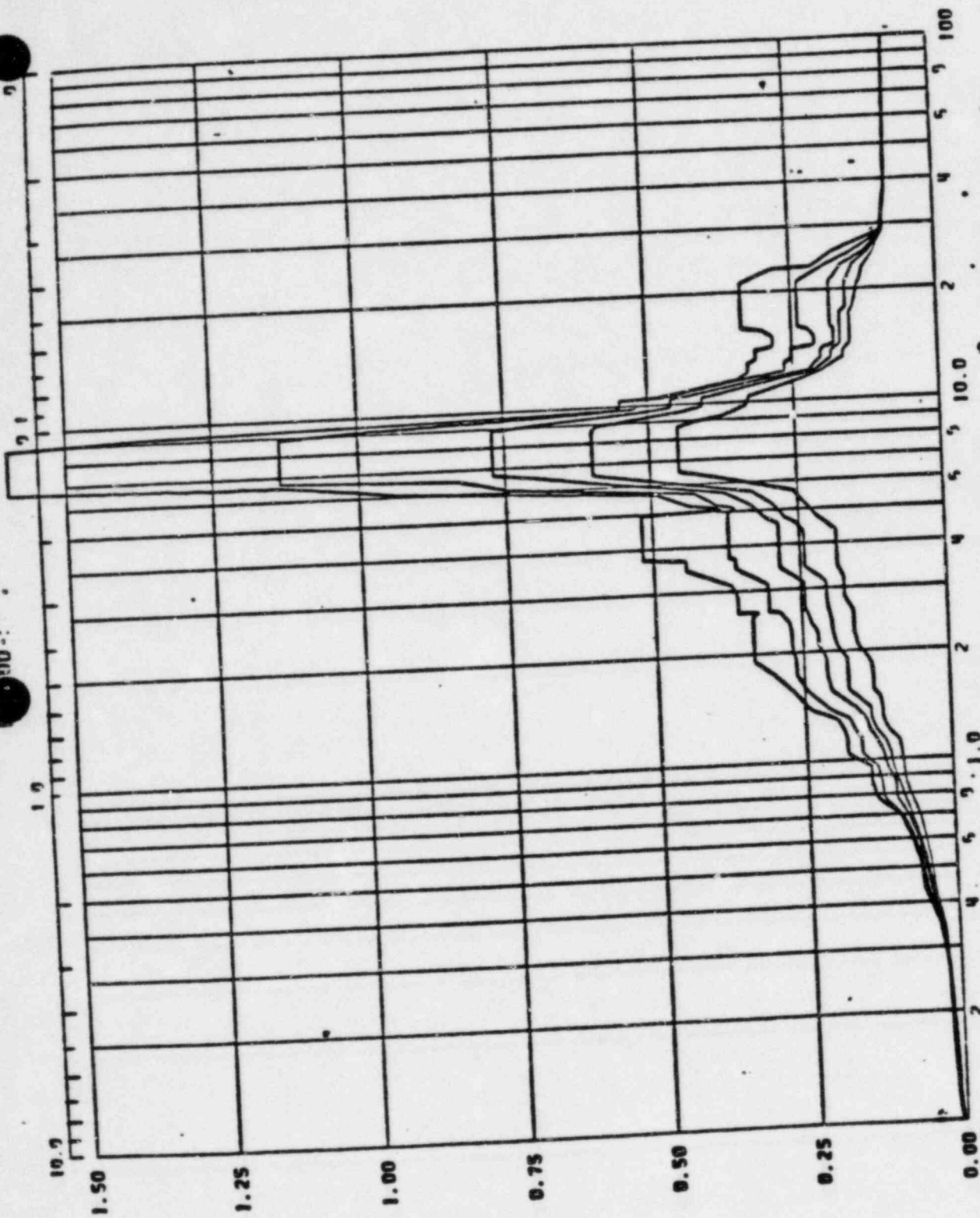


Fig. 1. Limerick Generation Station, Acceleration Spectra for REACTOR BLDG. (FLEXIBLE BASE)

Load Case: VERTICAL Seismic CBE Elev: 313' Angle: ✓
 Node: 2L Direction: VERTICAL Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY Date: 7-31-81 Check: 6/1/82 Date: 8-12-81

SPECTRAL ACCELERATION, SA-C

D-144

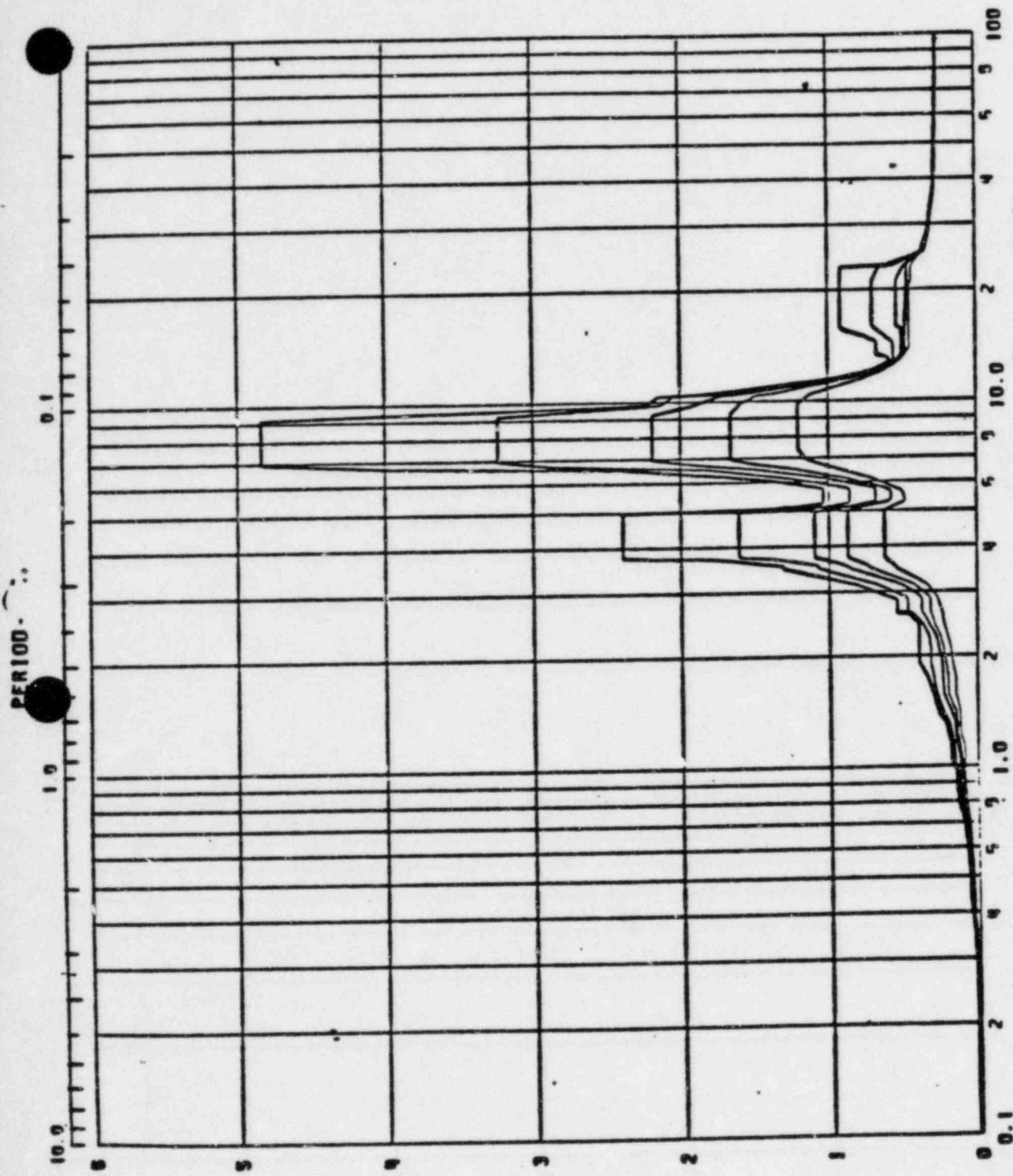


Fig. _____ Limerick Generation Station, Acceleration Spectra for Reactor Bldg. (FLEXIBLE BASE)

FREQUENCY-CPS

Load Case: VERTICAL Seismic OPE

Node: 25 Direction: VERTICAL Elev: 313' Angle: ✓

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: WHY Date: 7-31-81 Check: ADZ Date: 8-12-81

SPECTRAL ACCELERATION, SA-C
F-101

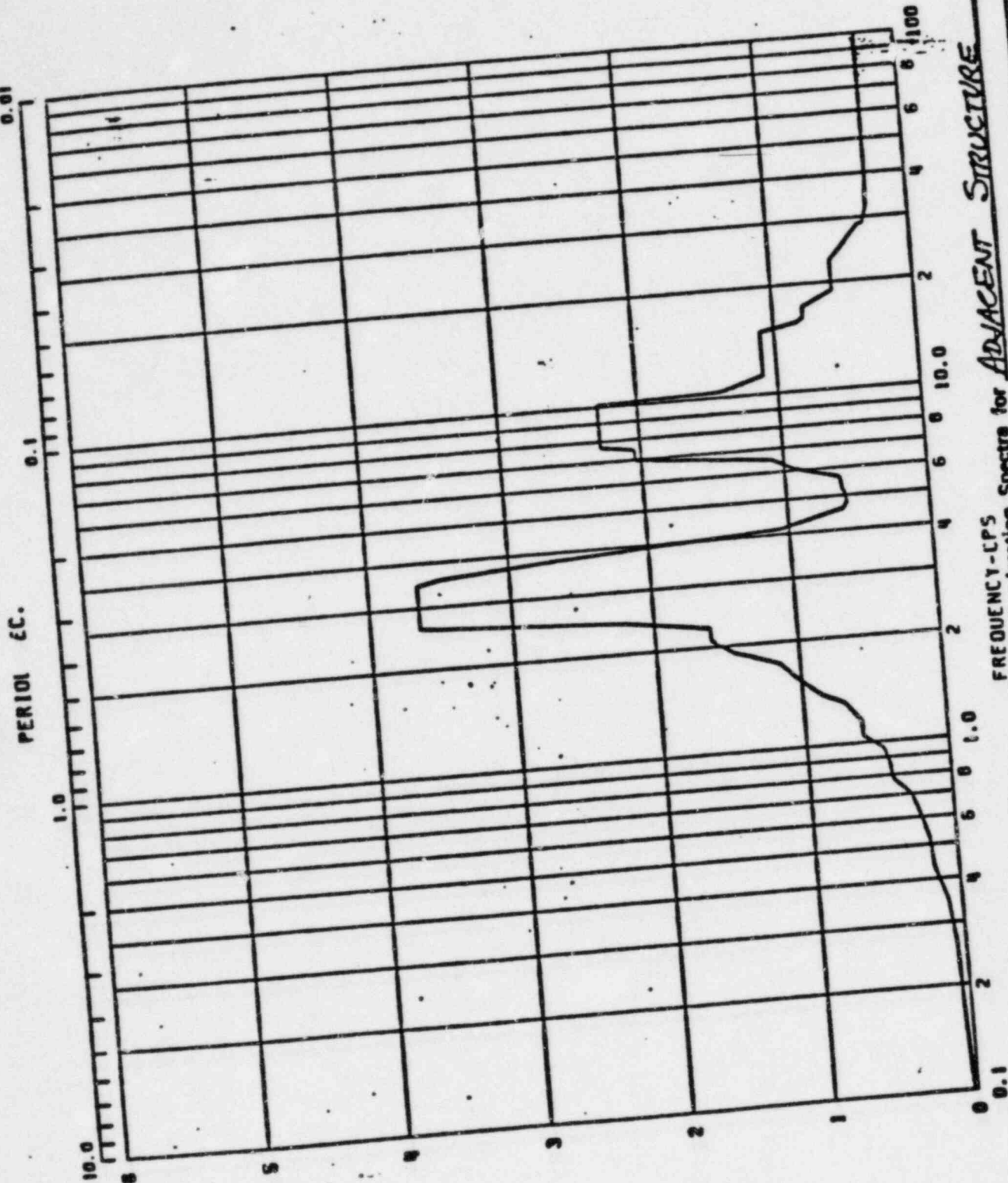


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: SE - FAULTED Elv: 253' Angle: 8/27/81
 Node: 5 Direction: N-S Date: 8/18/81 Check: FL
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP

SPECTRAL ACCELERATION, SA-C

F-103

PRO-D-SL

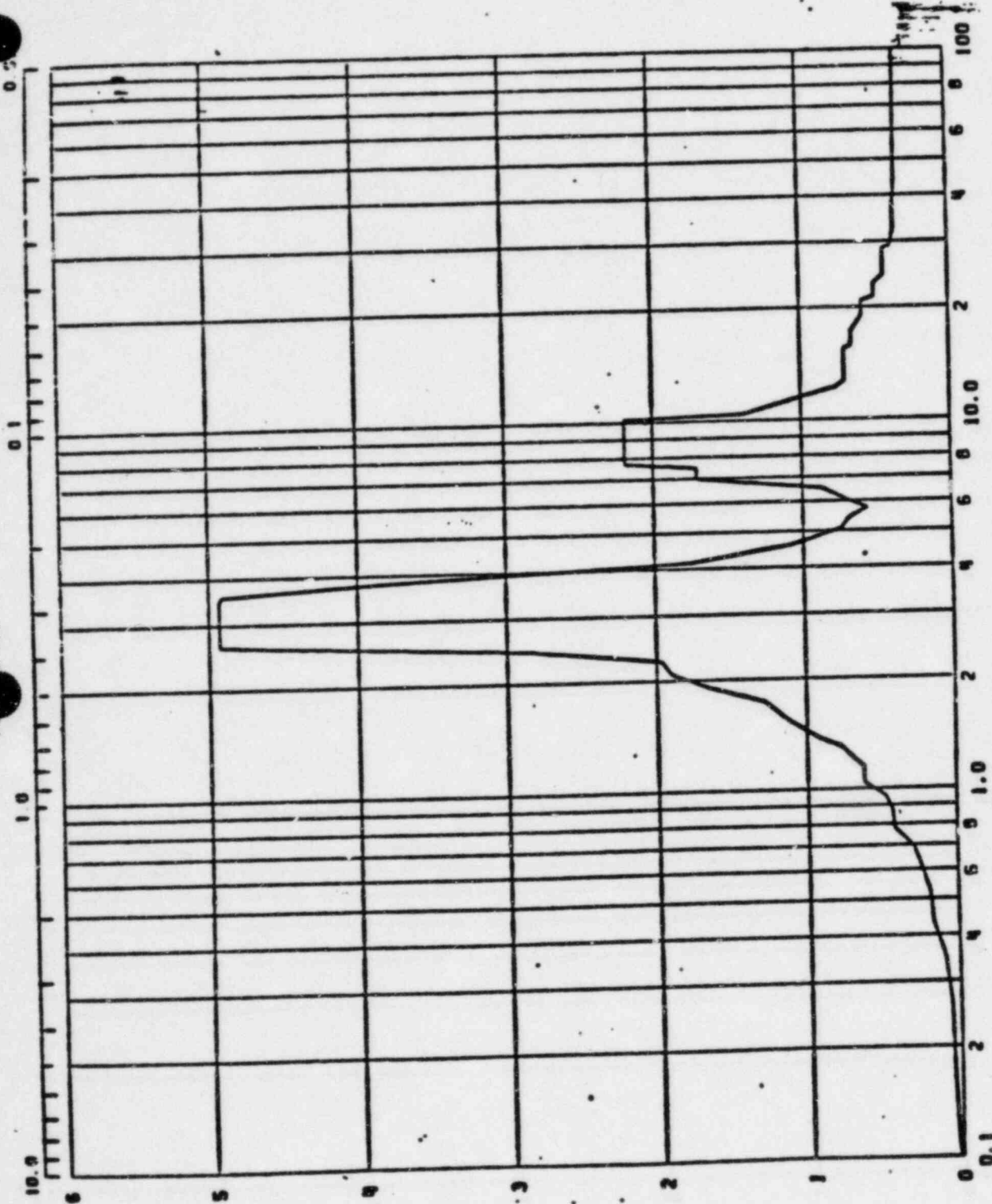


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: 3E FAULTED
 Node: 7 Direction: N-S Elev: 283' Angle: _____
 Damping: 0.03 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/18/81 Check: FLJ Date: 8/22/81

SPECTRAL ACCELERATION, SA-C

F-105

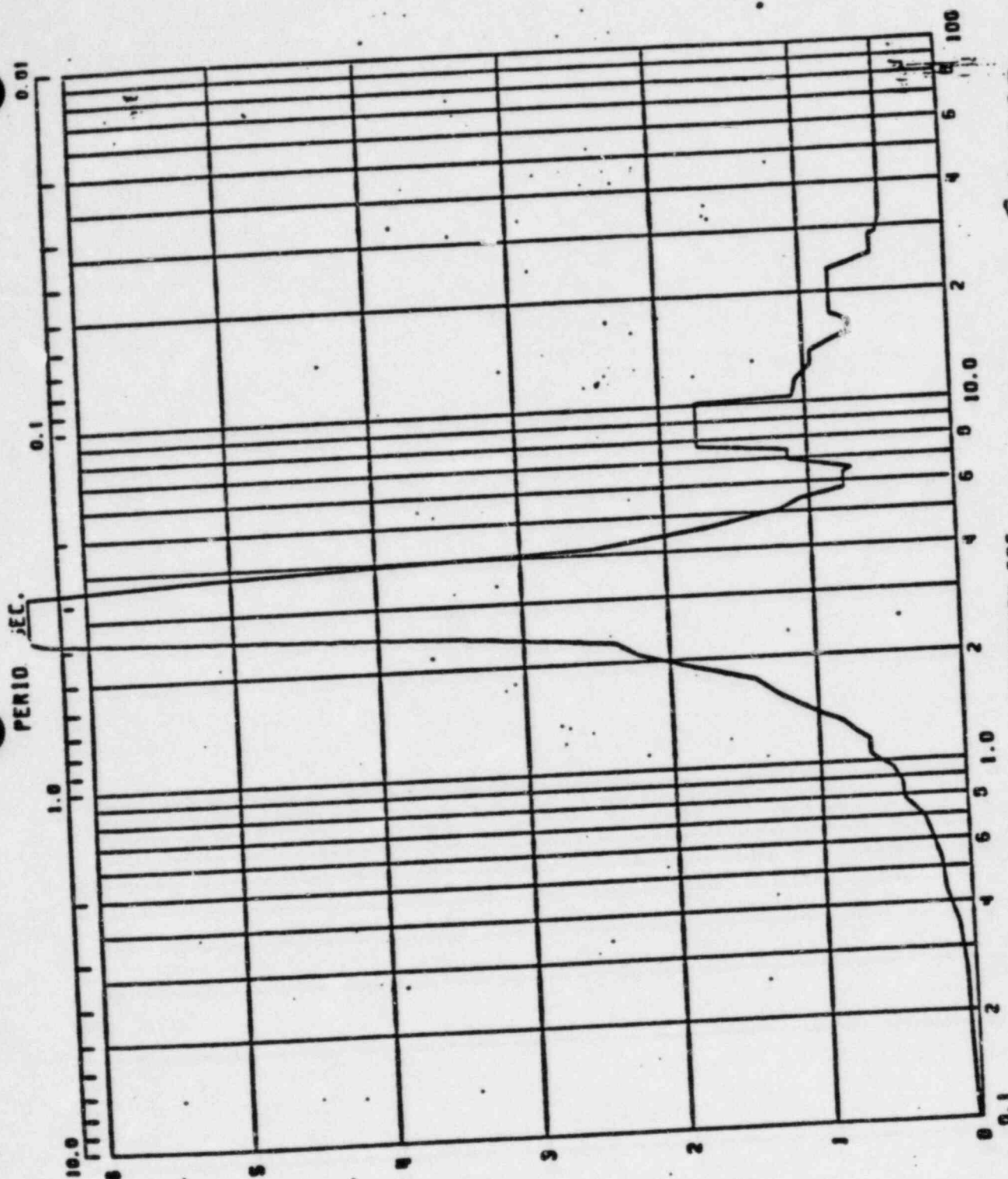


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: 3E - FAULTED
 Node: 9 Direction: N-S Elev: 313' Angle: FLY Date: 8/27/81
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/18/81 Check: FLY Date: 8/27/81

SPECTRAL ACCELERATION, SA-C

F-113

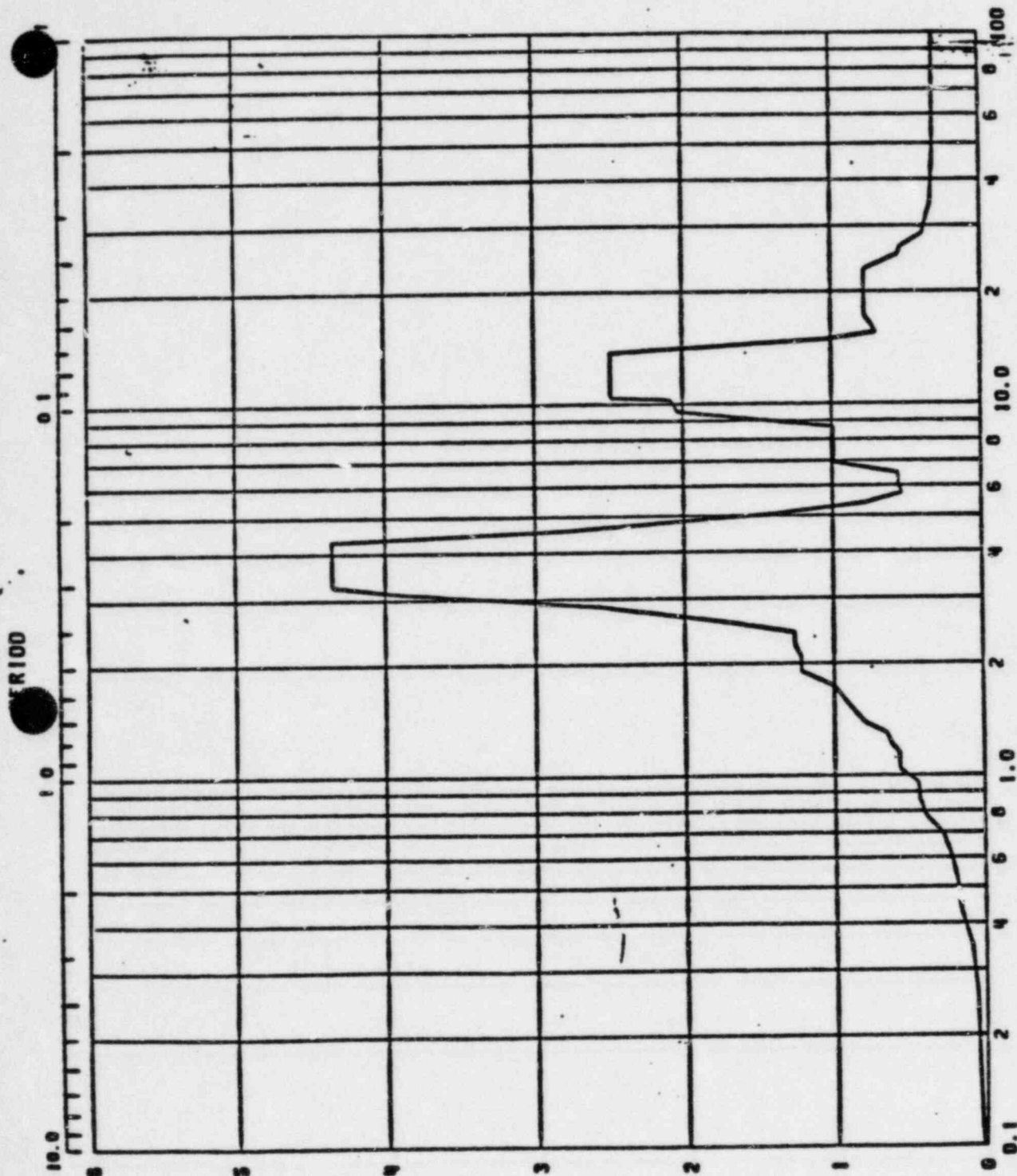


Fig. Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Load Case: 3E-FAULTED

Node: 5 Direction: E-W Elev: 253

Angle:

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/13/81 Check: FLY Date: 8/27/81

SPECTRAL ACCELERATION, SA-C

F-115

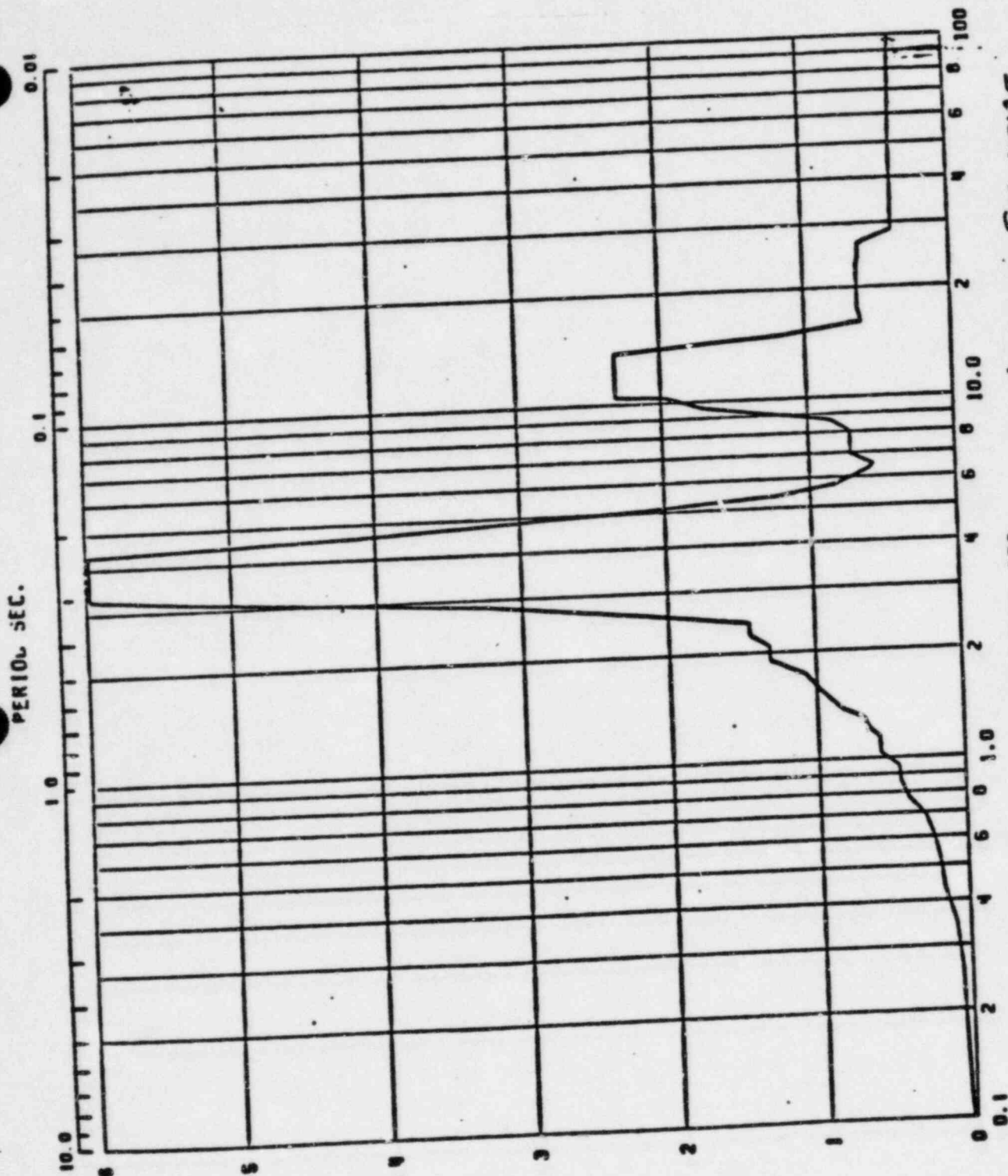


Fig. Umerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Load Case: 3E - FAULTED

Node: 7 Direction: E-W Elev: 283'

Damping: 0.003, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/18/61

Angle: FLY

Date: 8/29/61

SPECTRAL ACCELERATION, SA-C

F-117

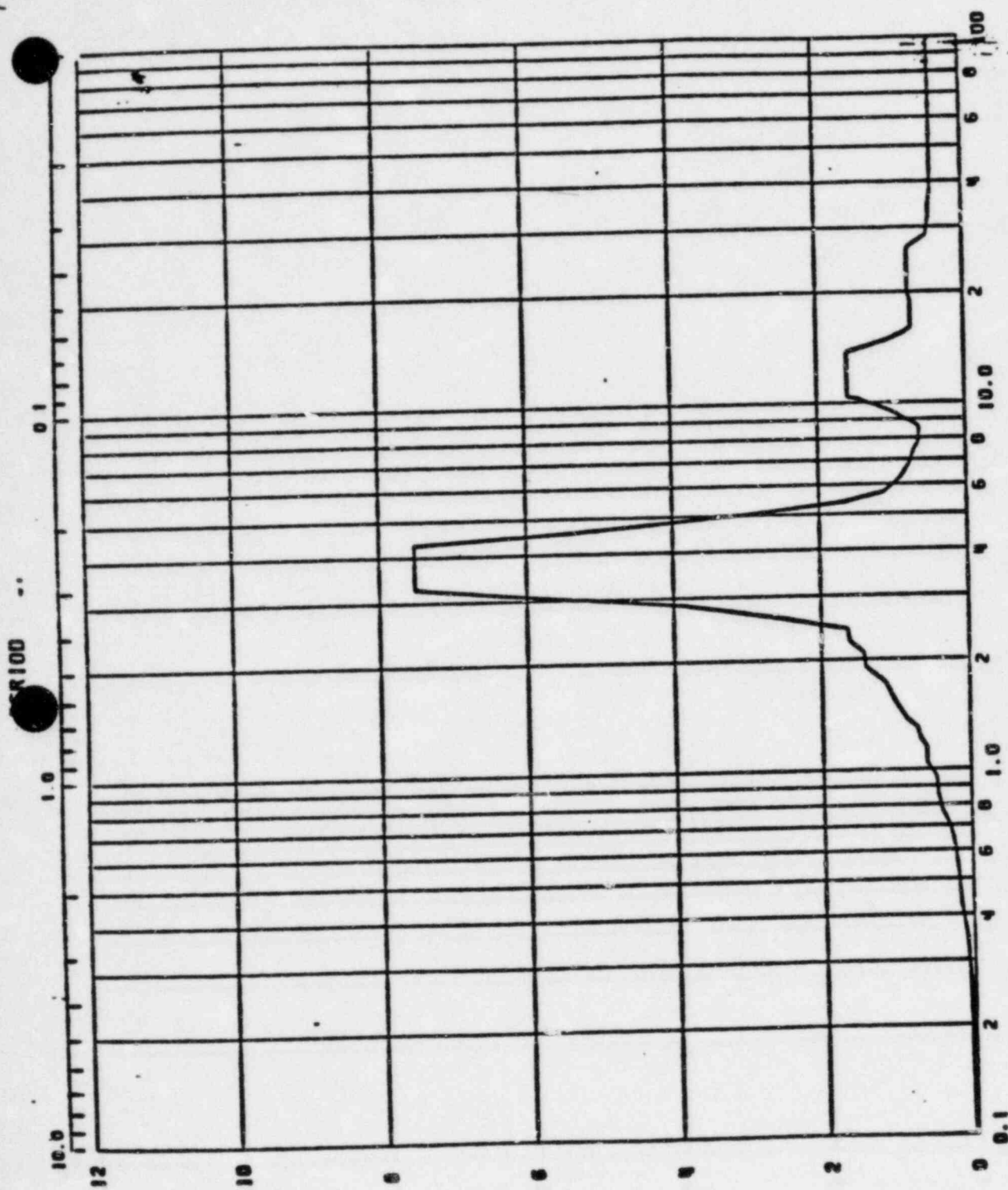


Fig. 1 Umerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Load Case: 3E-3

Node: 9 Direction: E-W

Ellev: 313'

Angle:

44

Date: 8/27/91

Check: RAP

Date: 8/18/91

By: RAP

SPECTRAL ACCELERATION, SA-C

F-260

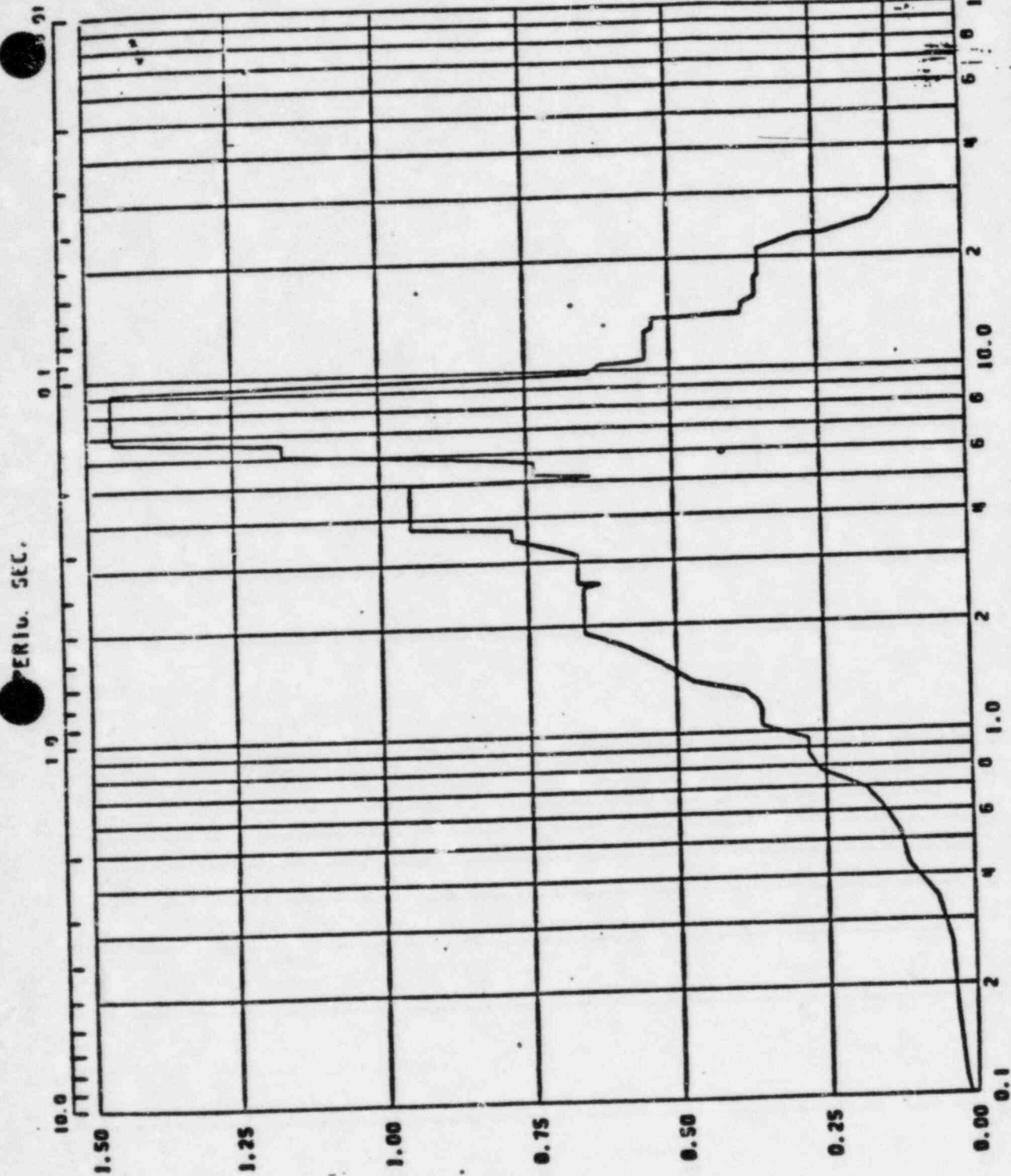


Fig. 1 Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
Load Case: 3E FAULTED Angle: 253'
Node: 37 Direction: VERTICAL Elev: 253' Date: 8/29/01
Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/17/01 Check: FLY

SPECTRAL ACCELERATION, SA-C

F-261

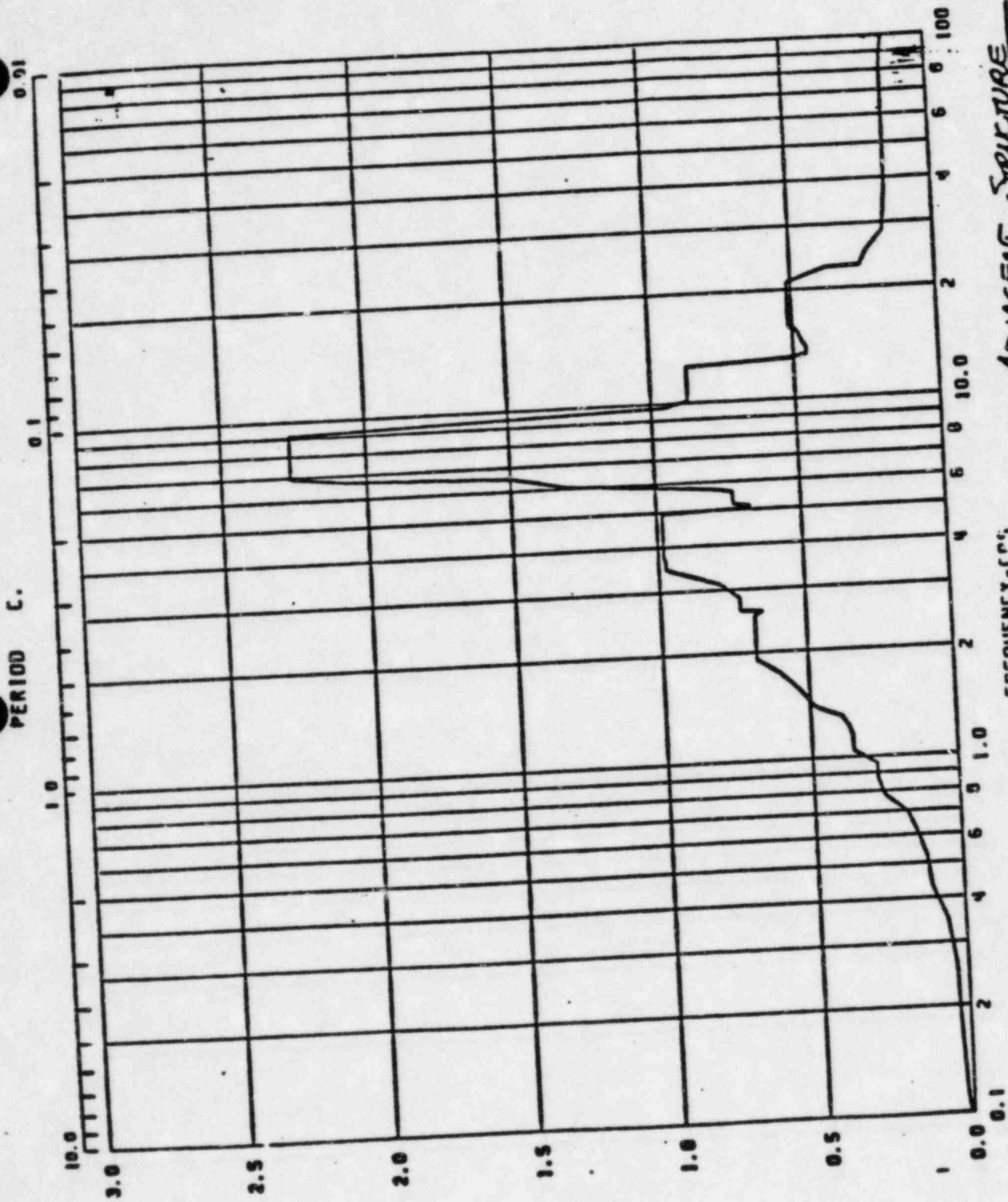


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Load Case: 3E- FAULTED Elev: 253' Angle: _____

Node: 37 Direction: VERTICAL Check: FLY Date: 8/27/81

Damping: 0.005 0.01, 0.02, 0.03, 0.05 By: BAP Date: 8/17/81

F - 263
SPECTRAL ACCELERATION, SR-C

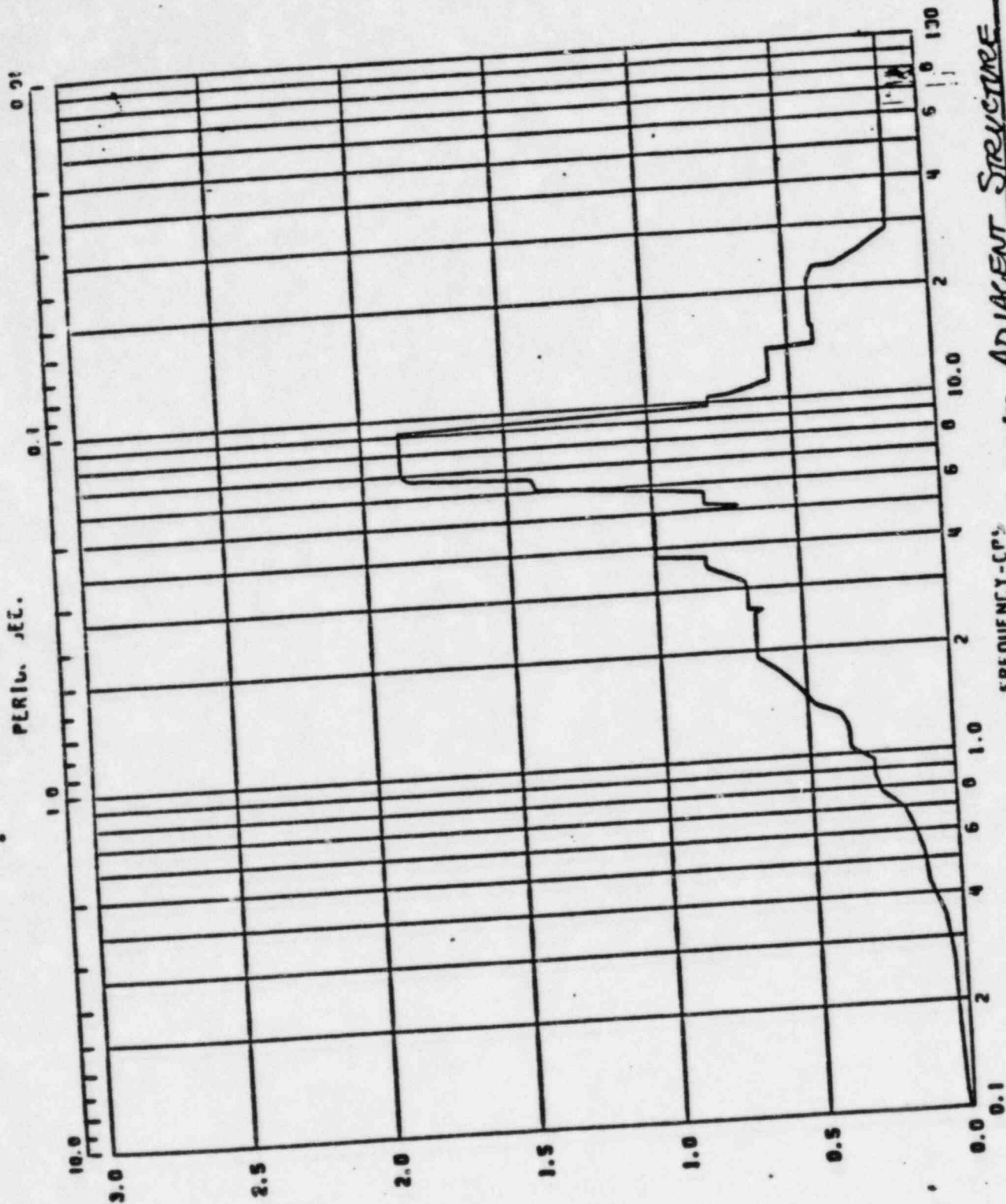


Fig. Umerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: 3-E FAULTED Elev: 283' Angle:
 Node: 30 Direction: VERTICAL Date: 8/17/81 Check: FLY Date: 8/27/81
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP

SPECTRAL ACCELERATION, SR-C

F-264

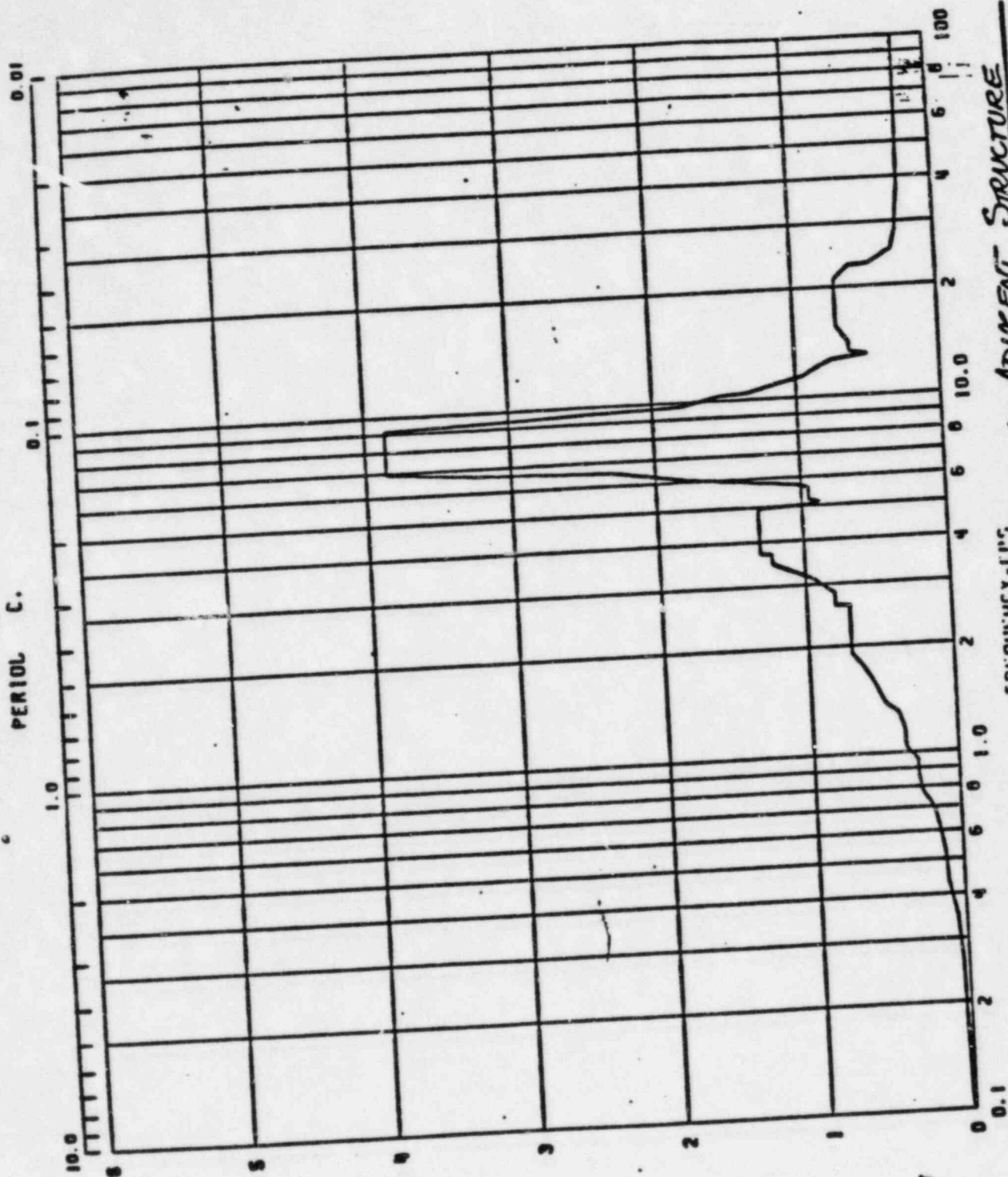


Fig. Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Frequency - C/P's
Load Case: 3E - FAULTED Elev: 283' Angle:
Node: 32 Direction: VERTICAL Check: RLY Date: 8/29/81
Damping: 0.003, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/17/81

PERIC JEC.

0.01

0.1

1.0

10.0

3.0

2.5

2.0

1.5

1.0

0.5

0.0

0.1

100

8

6

4

2

10.0

6

4

2

1.0

0.5

0.1

SPECTRAL ACCELERATION, SA-C

F-266

Fig. Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

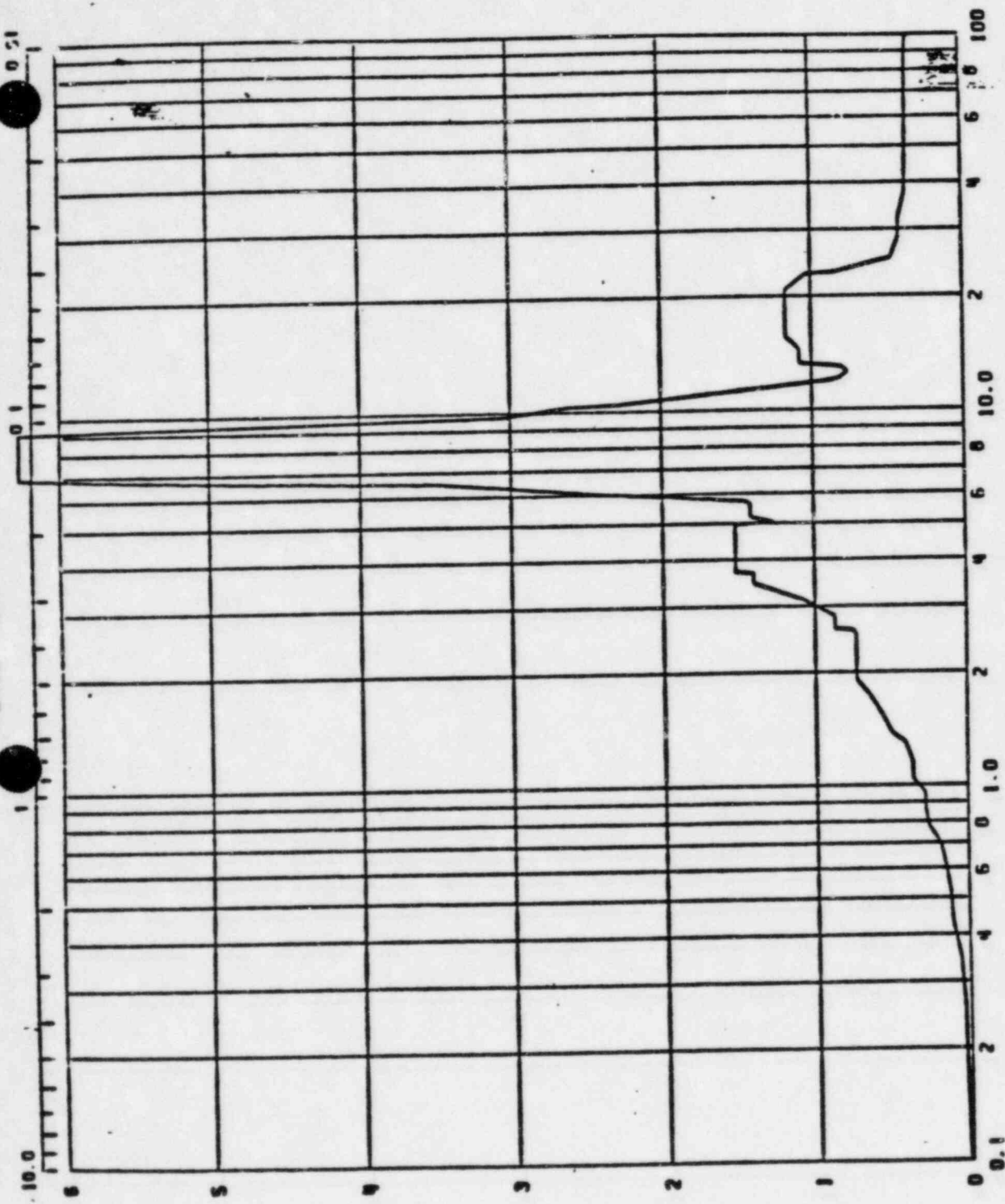
FREQUENCY - 1/1'S

Load Case: 3-E FAULTED Elev: 313' Angle: 313'

Node: 21 Direction: VERTICAL Date: 8/17/81 Check: ECI Date: 8/27/81

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP

PERIOD, SEC.



SPECTRAL ACCELERATION, SA-C

F-267

Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
Load Case: 3-E FAULTED
Node: 25 Direction: VERTICAL Elev: 313' Angle: _____
Damping: 0.005 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/17/81 Check: HL Date: 8/27/81

F-125
SPECTRAL ACCELERATION, SA-C

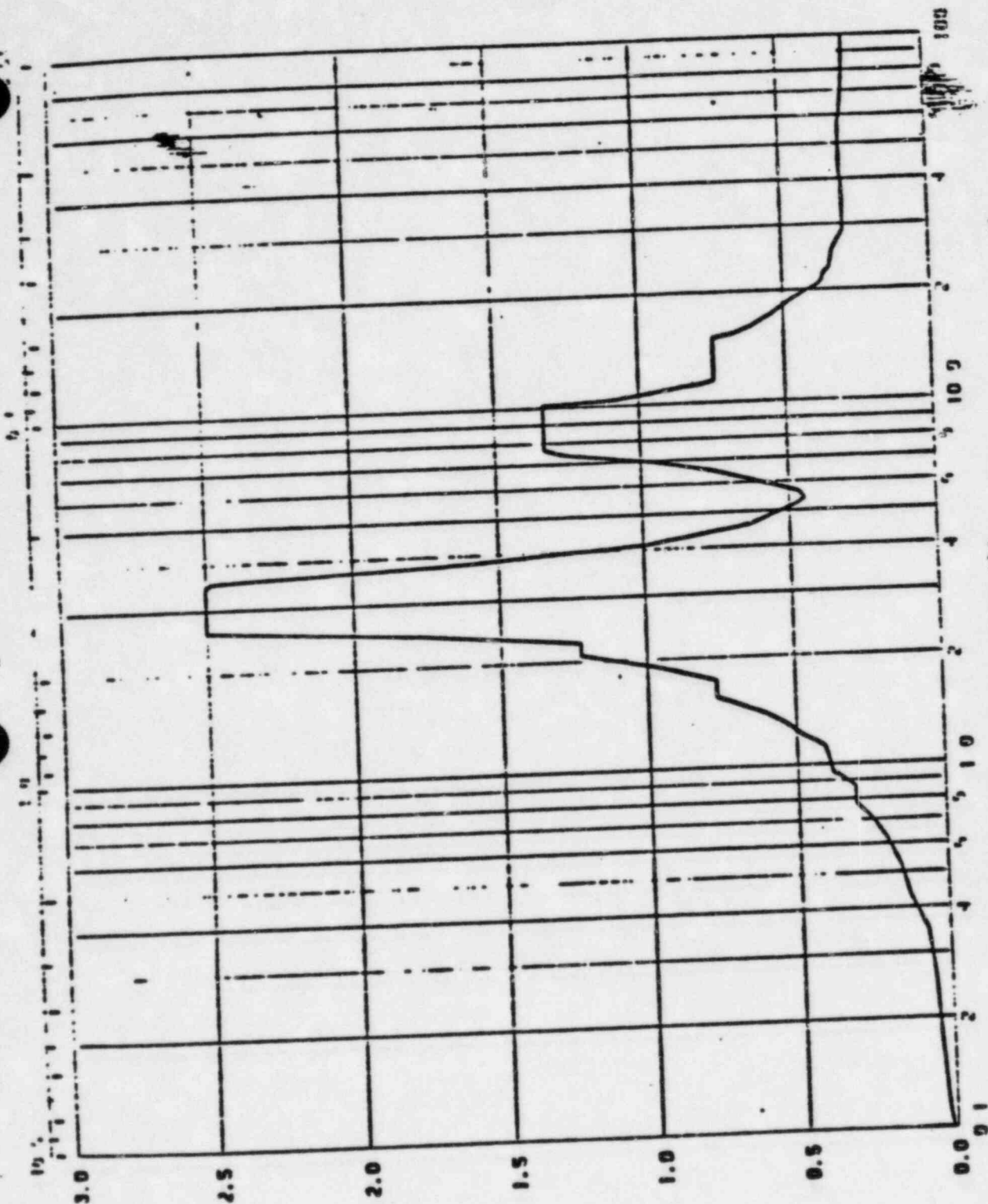


Fig. Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

UNIT: MFT - 1.0"

Load Case: WIND CASE

Node: 5 Direction: N-S Elev: 253 Angle: 0

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: JMP Date: 8/14/81 Check: FLY Date: 8/21/81

SPECTRAL ACCELERATION, 5R-C

F-127

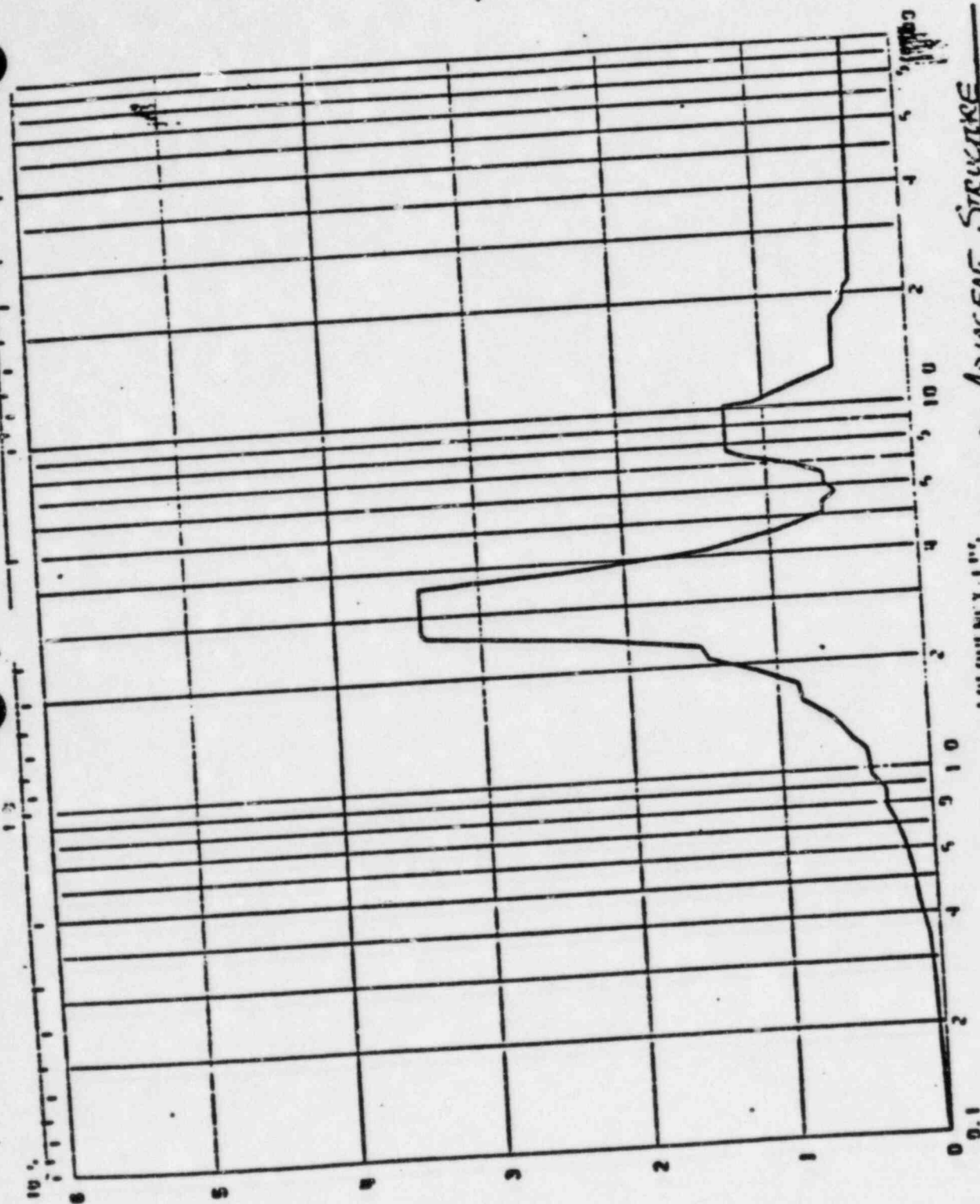


Fig. _____ Umerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Angle: _____

Elev: _____

Case: _____

Direction: _____

Damping: 0.005, 0.01, 0.02, 0.03, 0.05

By: RAY

Check: J.L.Y.

Date: 8/22/61

F-129
SPECTRAL ACCELERATION, SR-C

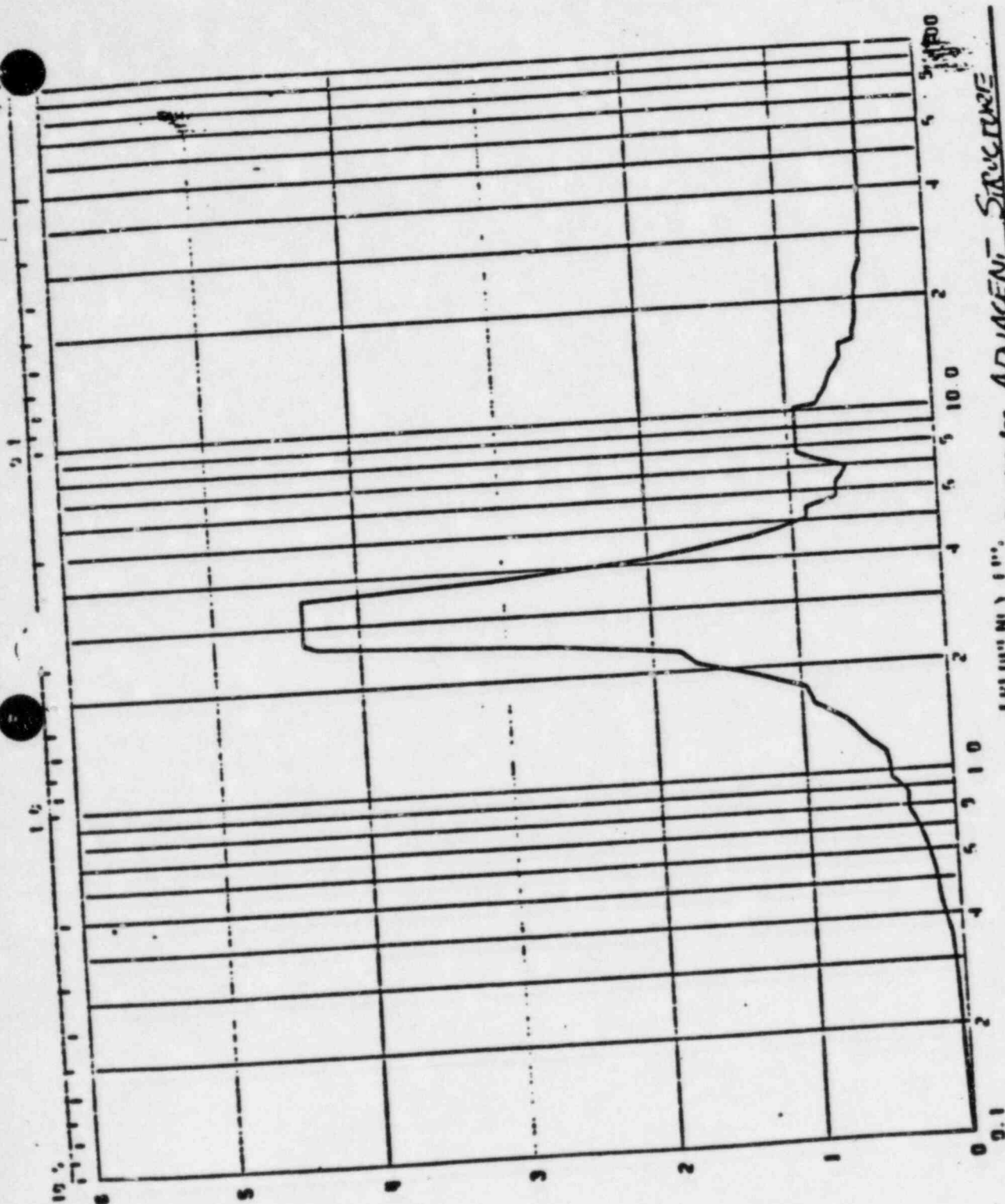
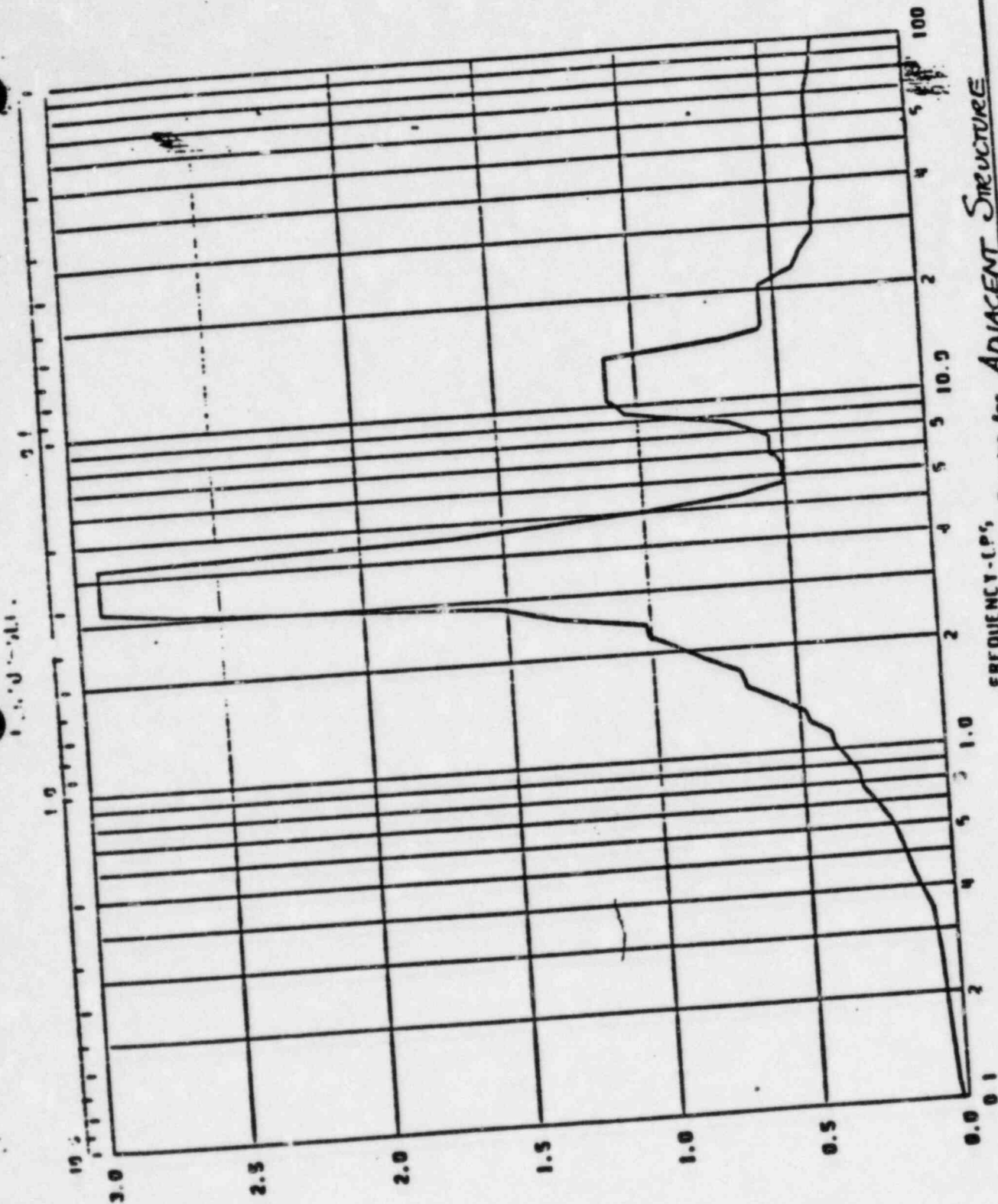


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADVANCE STRUCTURE
 Load Case: WIND CASE Elev: 313 Angle: _____
 Node: 9 Direction: N-S Date: 8/27/81 Check: ELK/BL
 Damping: 0.005, 0.01, 0.03, 0.05 By: RAP

SPECTRAL ACCELERATION, SA-C

F-137



FREQUENCY - (P), Acceleration Spectra for ADJACENT STRUCTURE

Fig. _____ Limerick Generation Station, Worst Case Elav: 253' Angle: _____
 Load Case: E-W Direction: E-W Date: 8/17/81 Check: FLY Date: 8/27/81
 Node: 5 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP

SPECTRAL ACCELERATION, SA-C
F-139

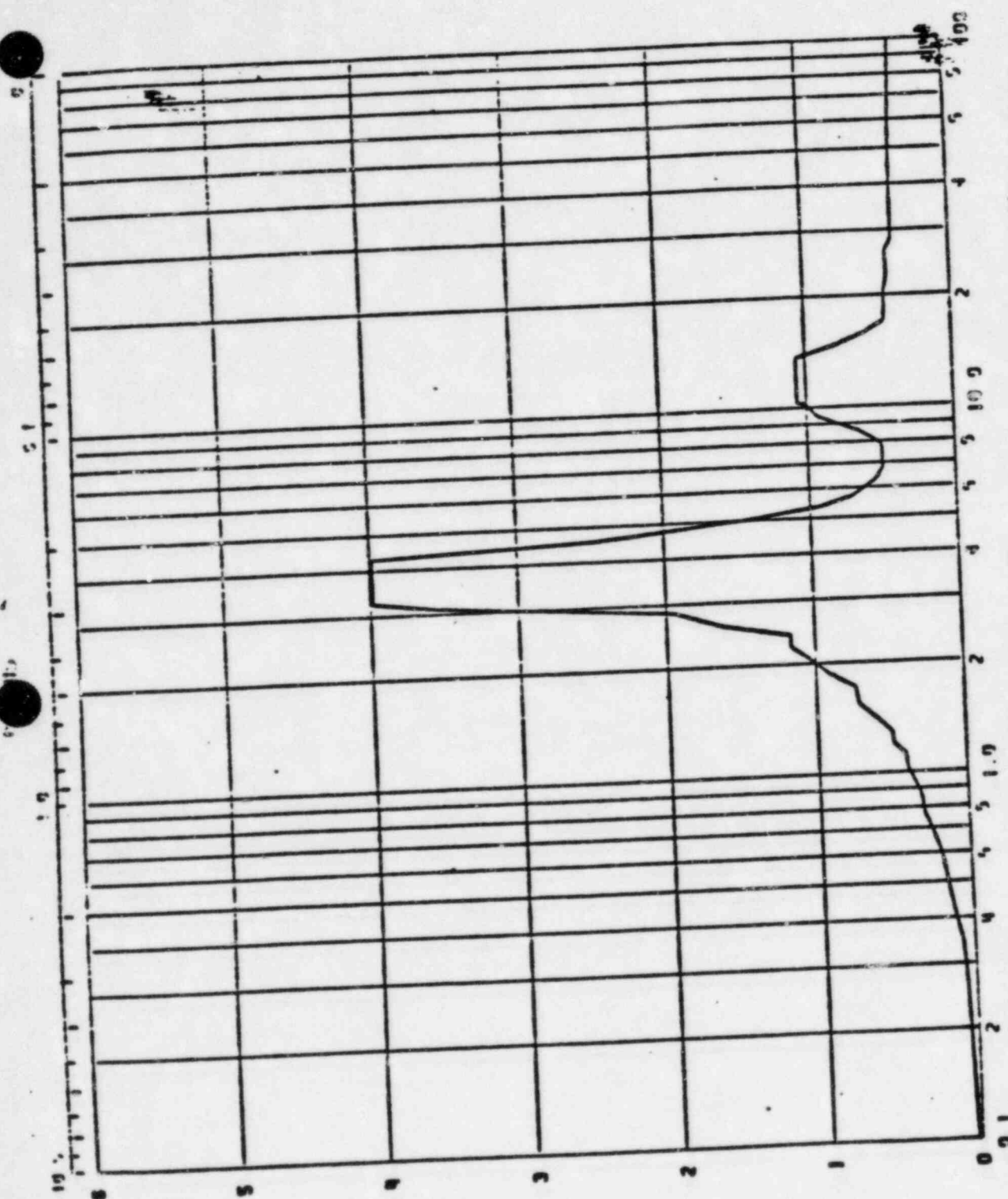


Fig. Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

FEMUR No. 1"

Load Case: WIND Case
Node: 7 Direction: E-W Elev: 28.5' Angle:
Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: SAP Date: 8/17/81 Check: FLY Date: 8/27/81

SPECTRAL ACCELERATION, SA-C
F-141

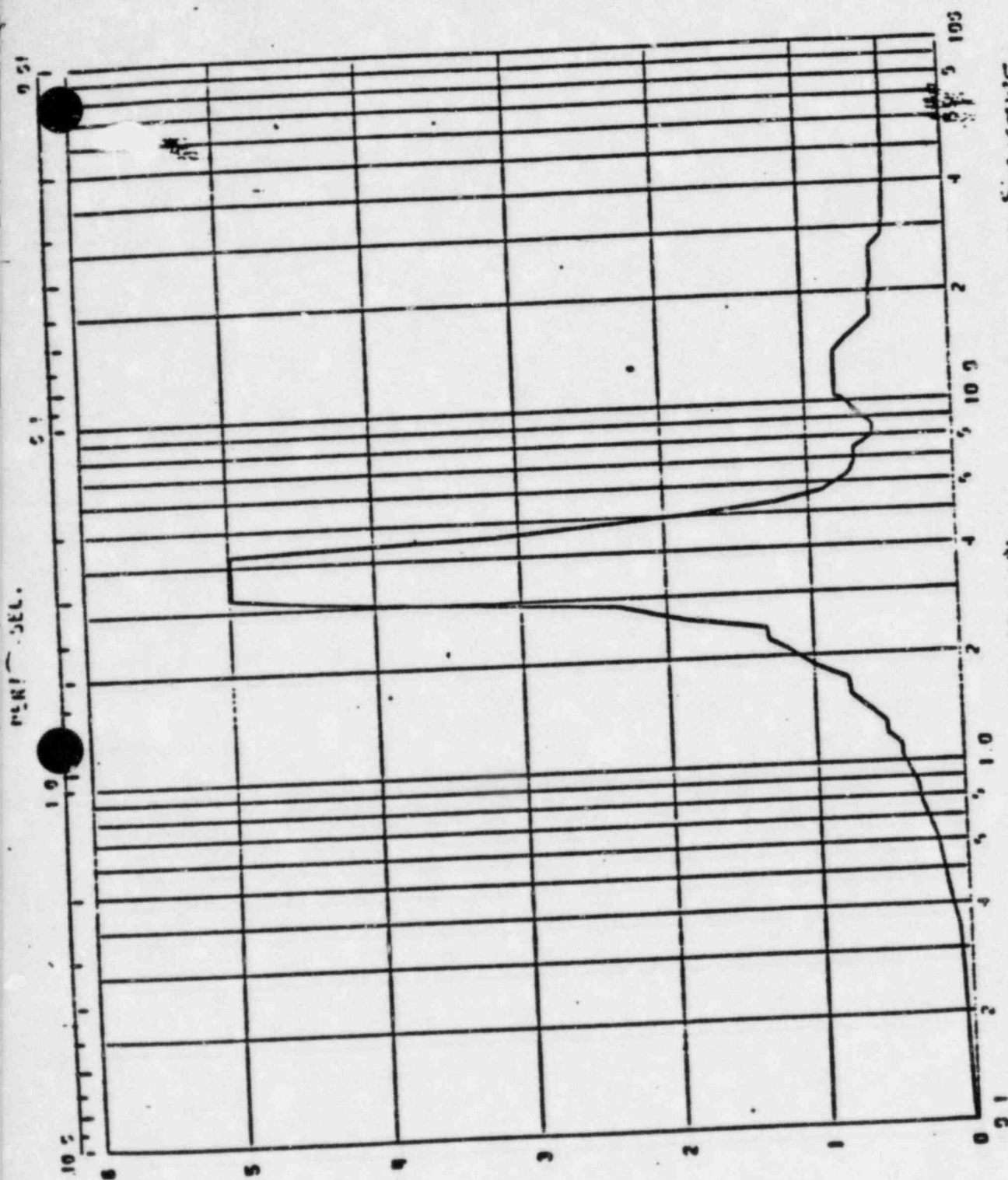


Fig. Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE

Load Case: WORST CASE Elev: 213' Angle: FLY

Node: 9 Direction: E-W Date: 4/17/91 Check: FLY Date: 4/27/91

Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: JAP



1. INSTRUMENTATION

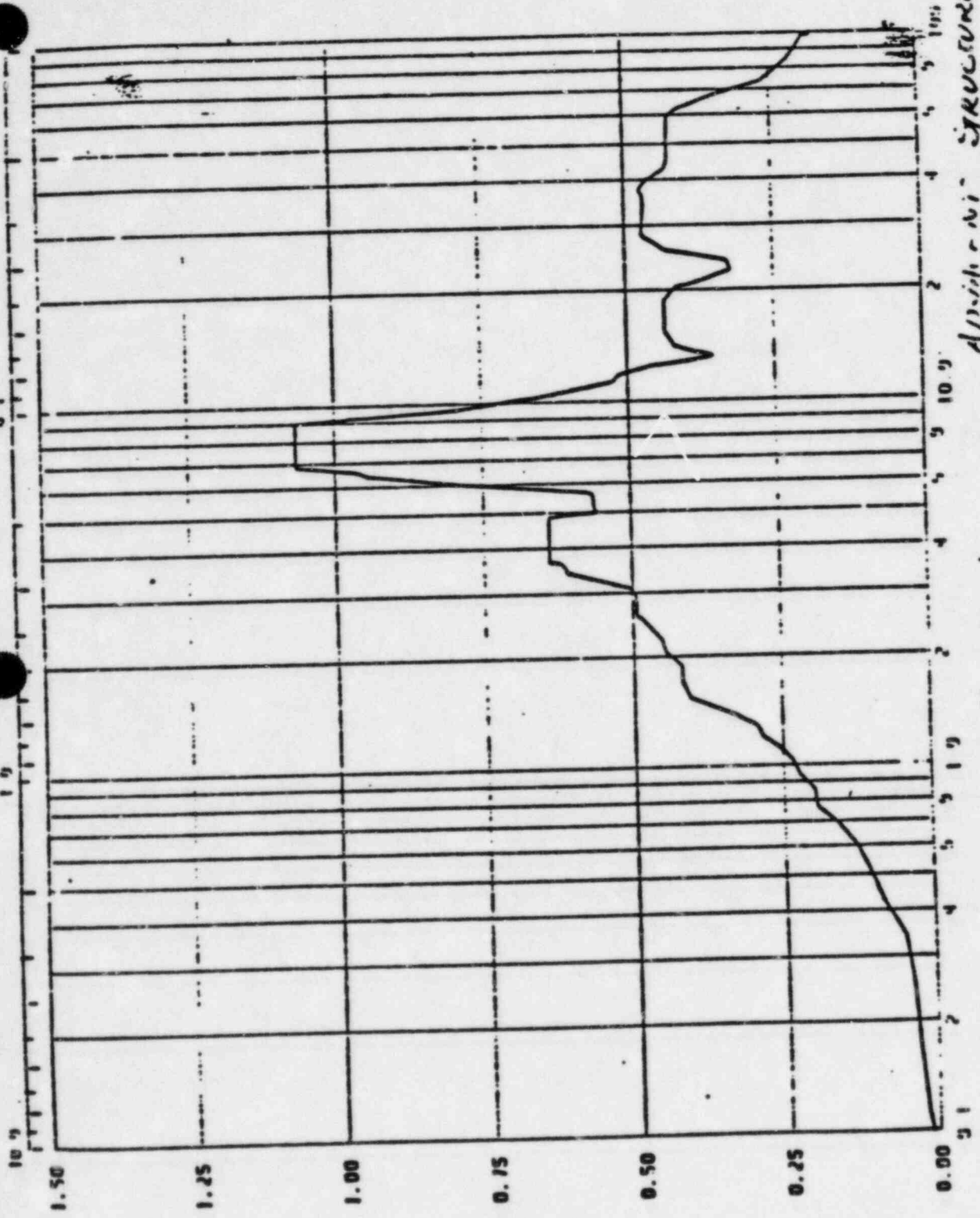
Load Case: Worst Case
Node: 37 Direction: VERTICAL Elev: 253' Angle: _____
Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/17/91 Check: FL-1 Date: 8/27/91

SECRET. NOFORN. 5A-C

F-287

SPECTRAL ACCELERATION, SP-C

F-288

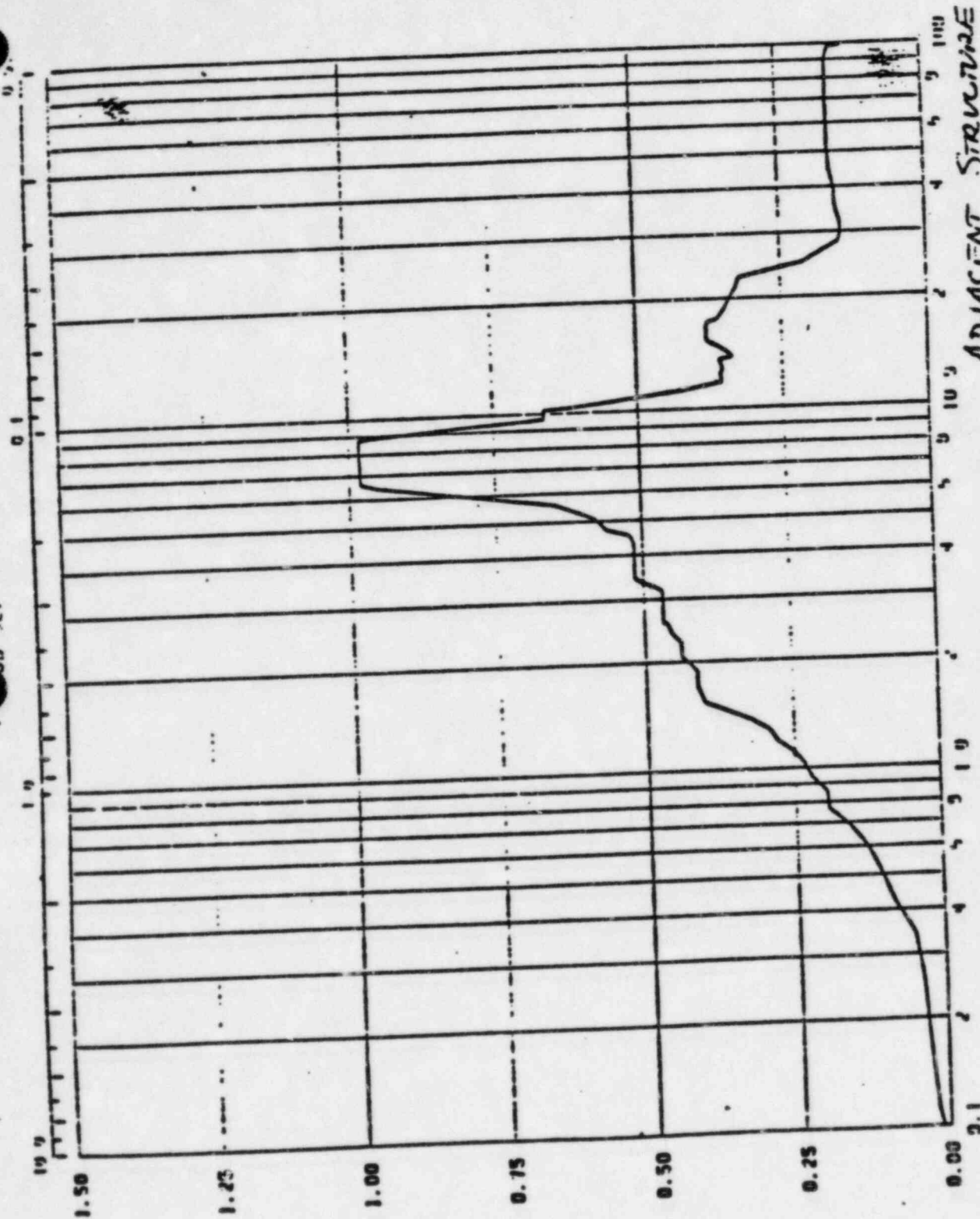


ADDITIONAL STRUCTURE

Fig. _____ Limerick Generation Station, Acceleration Spectra for _____
 Load Case: Worst Case Angle: 253°
 Node: 59 Direction: Vertical Elev: _____
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/12/81 Check: FLY Date: 8/22/81

SPECTRAL ACCELERATION, SP-C

F-290



ADJACENT STRUCTURE

Fig. Limerick Generation Station, Acceleration Spectra for

Load Case: Worst Case Elev: 223' Angle: 0°
Node: 30 Direction: VERTICAL Date: 8/17/91 Check: PL
Name: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/27/91

SPECTRAL ACCELERATION, SF-C

F-291

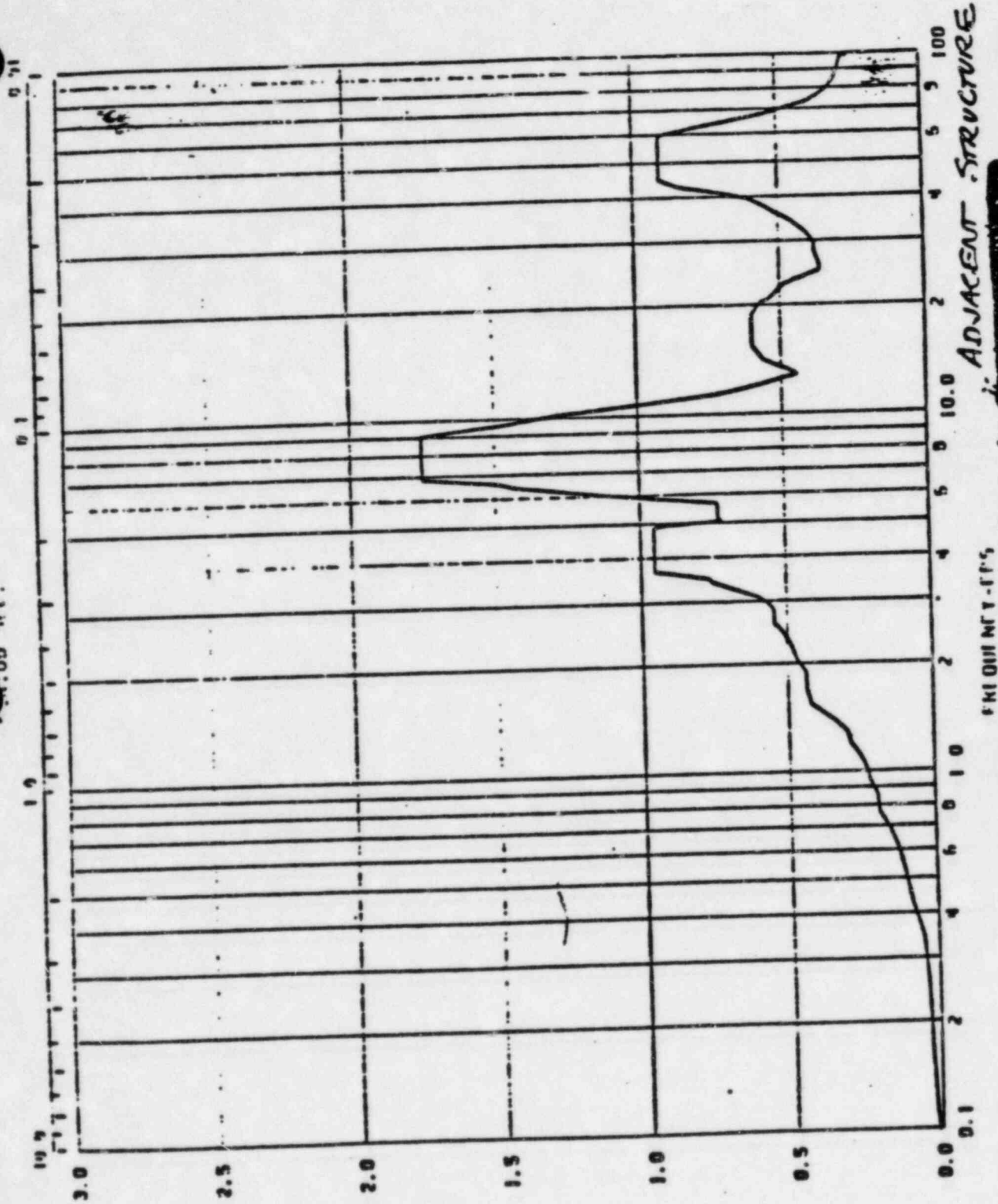


Fig. _____ Uimerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: Worst Case Angle: _____
 Node: 32 Direction: VERTICAL Elev: 285'
 Damping: 0.005, 0.01, 0.02, 0.03, 0.05 By: RAP Date: 8/17/81 Check: FLY Date: 8/27/81



Fig. Limerick Generation Station, Acceleration Spectra for **ADJACENT STRUCTURE**
 Load Case: **Worst Case**
 Node: **21** Direction: **VERTICAL** Elev: **311.0**

SPECTRAL ACCELERATION 50-50
 F-293

F-294
SPECTRAL ACCELERATION, SP-2

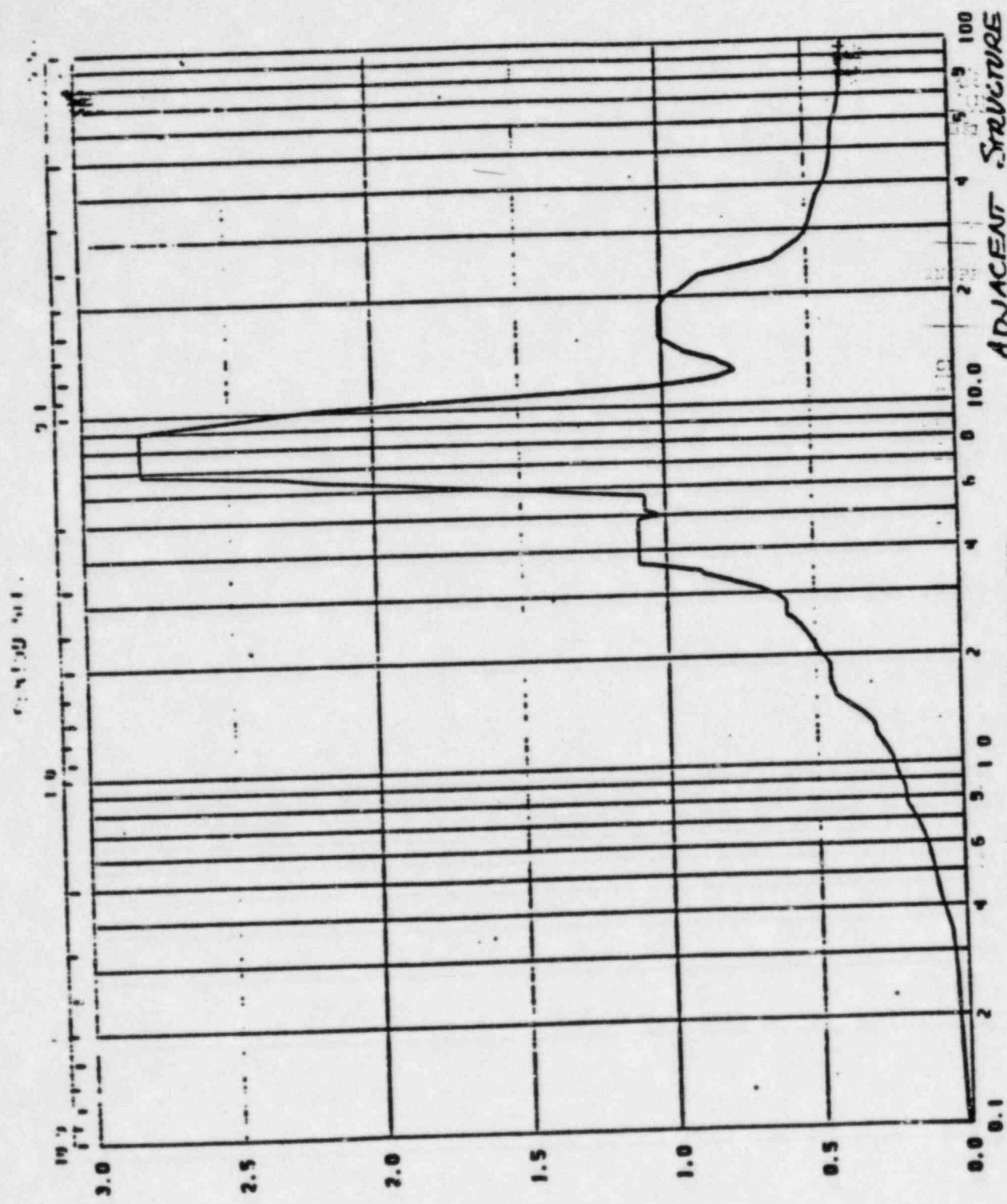


Fig. _____ Limerick Generation Station, Acceleration Spectra for ADJACENT STRUCTURE
 Load Case: Worst Case Date: 2/2 Author: _____

STATEMENT OF CONFORMANCE

We certify that the listed equipment and required documentation for same meet the requirements of the purchase order and applicable specifications:

P.O. NO.: _____ REV. _____

SPECIFICATION: _____ REV. _____

PRIME VENDOR: _____

SUPPLIER: _____

ADDRESS: _____

DESCRIPTION OF EQUIPMENT: _____

IDENTIFICATION: _____

a. ITEM NOS. _____

b. EQUIPMENT NOS. _____

c. TAG NOS. _____

APPROVED EXCEPTIONS: _____

Signature (Supplier Representative)

Title

Date

Distribution:

Original: Supplier to transmit to Jobsite

CC: Purchasers Inspector (2)

Supplier

DISTRIBUTION AND ACTION


ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED... (SEE COL. 6)

- 1 = APPROVAL { BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Attn. A. Teller, Project Engineer
- 2 = INFO/REVIEW
- 3 = APPROVAL { BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
Attn. J.H. Galley, Project Construction Manager
- 4 = INFO/REVIEW

- F = PRIOR TO FABRICATION
- S = PRIOR TO SHIPMENT
- C = PRIOR TO BALANCE OF PAYMENT (FINAL CERTIFIED COPY REQUIRED)

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED													
	DOCUMENT TITLE	DOCUMENTATION DISTRIBUTION & ACTION CODE												
		1	2	3	4	5	6	7	8	9	10	11	12	13
		DOCUMENT CODE				ACT CODE							TECH. SPEC. REF.	
Definitions and instructions pertaining to entries on the sheets of Form 8031-DR to follow														
<p>1. "Documentation" is defined as drawings, sketches, diagrams, procedures, reports, instructions, data sheets, manuals, certificates, samples or any other document requiring submittal to Bechtel. (See document title column)</p> <p>Documentation shall be one full-size reproducible unless Supplier is advised otherwise.</p> <p>2. Column 6 defines when documentation is required.</p> <p>3. Columns 7 & 8 defines where documentation is to be sent.</p> <p>4. Columns 9 thru 14 indicates the applicable section of a specification.</p> <p>5. Categories of documentation</p> <p>(a) Engineering documentation - general. That documentation which after review and approval by Bechtel no further submittals are required.</p> <p>(b) Engineering documentation - specific. That documentation which after review and approval by Bechtel for fabrication, and after fabrication, one complete set shall be submitted annotated "Certified As-Built".</p> <p>(c) Procedures - such as testing procedures, welding procedures and etc.</p> <p>(d) Quality records - such as test reports, material certifications or other quality records generated during manufacturing cycle.</p> <p>6. (I) Bechtel Inspector release required for documentation as noted.</p>														

FORM 8031-DR JULY 1973	 BECHTEL POWER CORPORATION	480 VOLT LOAD CENTERS	JOB NO. 8031	REV. 5
			ATTACHMENT TO REQUISITION NUMBER	
			8031-E-10	
PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2			Sheet 1 of 7	

DISTRIBUTION AND ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)


DOCUMENT REQUIRED... (SEE COL. 6)

- 1 = APPROVAL
 2 = INFO/REVIEW
 3 = APPROVAL
 4 = INFO/REVIEW
- BECHTEL POWER CORPORATION
 SAN FRANCISCO POWER DIVISION
 P.O. BOX 3965, SAN FRANCISCO, CA. 94119
 Attn. A. Teller, Project Engineer
- BECHTEL POWER CORPORATION
 LIMERICK GENERATING STATION
 P.O. BOX A, SANATOGA BRANCH
 POTTSTOWN, PA. 19464
 Attn. J.R. Reiney, Construction Manager

- F = PRIOR TO FABRICATION
 S = PRIOR TO SHIPMENT
 C = PRIOR TO BALANCE OF PAYMENT (FINAL CERTIFIED COPY REQUIRED)
 I = INSPECTOR RELEASE REQUIRED

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED													
	DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE								
						1	2	3	4	5	6	7	8	9
						DOCUMENT CODE	ACT CODE	TECH. SPEC. REF.						
<p><u>Non-Class I 480 Volt Load Centers</u></p> <p>1.0 Engineering Documentation</p> <p>1.1 General</p> <p>Unless otherwise noted one copy of documents listed in this section are required for the action noted in Columns 6 & 7. After complete review and approval by Bechtel no further transmittals are required.</p> <p>1.2 Specific</p> <p>One copy of documents listed in this section are required for the action noted in Columns 6 & 7. After complete review and approval by Bechtel and</p>	1)*List of Recommended Spare Parts for One Year's Operation, with Prices. (6 copies required)						S 2	1 5.0						
	2)*Typical drawings as required.						F 1	1 5.						
	1) General Arrangement Drawings for each equipment item of M/R						F 1	1 5.0						
	2) Bill of Material						F 1	1 5.0						
	3) Nameplate Information						F 1	1 5.0						
	4) Wiring Diagrams						F 1	1 5.0						
	5) Supplier Deviation Disposition Requests						F 1	1 7.0						

△ *Common to both Class I and Non-Class I equipment

FORM 8031-DR JULY 1973  BECHTEL POWER CORPORATION	480 VOLT LOAD CENTERS PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2	JOB NO. 8031	REV. 6
		ATTACHMENT TO REQUISITION NUMBER 8031-E-10 Sheet 2 of 7	

DISTRIBUTION AND ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED. . . (SEE COL. 6)

- 1 = APPROVAL } BECHTEL POWER CORPORATION
 SAN FRANCISCO POWER DIVISION
 P.O. BOX 3965, SAN FRANCISCO, CA. 94119
 Attn. A. Teller, Project Engineer
- 2 = INFO/REVIEW } BECHTEL POWER CORPORATION
 LIMERICK GENERATING STATION
 P.O. BOX A, SANATOGA BRANCH
 POTTSTOWN, PA. 19464
 Attn. J.R. Reiney, Construction Manager
- 3 = APPROVAL
- 4 = INFO/REVIEW

- F = PRIOR TO FABRICATION
 S = PRIOR TO SHIPMENT
 C = PRIOR TO BALANCE OF PAYMENT (FINAL
 CERTIFIED COPY REQUIRED)
 I = INSPECTOR RELEASE REQUIRED

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED														
	DOCUMENT TITLE	DOCUMENTATION DISTRIBUTION & ACTION CODE													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Non-Class I Cont'd	DOCUMENT CODE						ACT CODE					TECH. SPEC. REF.			
1.2 Specific Cont'd															
after fabrica- tion and delive- ry one complete set shall be submitted anno- tated "Certified As-Built for each M/R item.															
2.0 Procedures															
2.1 General															
Unless otherwise noted one copy of documents listed in this section are required for the action noted in Columns 6&7.															
3.0 Quality Records															
3.1 Two complete sets of the documents of this section shall be submit- ted as a final documentation package with each equipment shipment for each M/R item. One copy to accom- pany the equipment and one copy per Col. 6 & 7															
1)* Instructions for erection or installation, operation and maintenance including photograph requirements of Section 16.0 of Spec.8031- E-10. (25 copies required)							S	1				1	5.0		
2)* Paint Procedures							F	1				9.19.3			
1) Test reports, including the following:							C	3				1.0.5			
a. ANSI C37.20, Section 5.3 Production tests (I)															
b. ANSI C37.50, Section 6.0 Circuit Breaker Production Tests															
c. ANSI C57.12, Section 8.1.1 Routine Tests (I)															
2) Paint Certification (I)							C	3				G4.5			
3) Supplier Deviation Dispo- sition Requests, Copy only of these approved but not incorporated in the M/R or Specification (I)															
							C	3				17.0			
* Common to Class I and Non-Class I equipment															
480 VOLT LOAD CENTERS															
PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2															
JOB NO. 8031															
ATTACHMENT TO REQUISITION NUMBER 8031-E-10															
Sheet 3 of 7															
REV. 6															

FORM 8031-DR
JULY 1973



BECHTEL
POWER
CORPORATION

DISTRIBUTION AND ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED. . 'SEE COL. 6)

1 = APPROVAL
 2 = INFO/REVIEW
 3 = APPROVAL
 4 = INFO/REVIEW

BECHTEL POWER CORPORATION
 SAN FRANCISCO POWER DIVISION
 P.O. BOX 3965, SAN FRANCISCO, CA. 94119
 Attn. A. Teller, Project Engineer

BECHTEL POWER CORPORATION
 LIMERICK GENERATING STATION
 P.O. BOX A, SAN ANTONIO BRANCH
 POTTSTOWN, PA. 19464
 Attn. J.H. Galley, Project Construction Manager

F = PRIOR TO FABRICATION
 S = PRIOR TO SHIPMENT
 C = PRIOR TO BALANCE OF PAYMENT (FINAL
 CERTIFIED COPY REQUIRED)
 I = INSPECTOR RELEASE REQUIRED

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED													
	DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE								
						1	2	3	4	5	6	7	8	9
						DOCUMENT CODE					ACT CODE			TECH. SPEC. REF.
Class I 480 Volt Load Centers														
1.0 Engineering Docu- mentation														
1.1 General														
Unless otherwise noted one copy of documents listed in this section are required for the action noted in Columns 6 & 7. After complete review and ap- proval by Bechtel no further trans- mittals are re- quired.	1) Qualification for Service Conditions-IEEE-323										F 1			10.2
	2) Seismic Qualification Analysis Test Data (May be part of (1) above)										F 1			5.0
	3) Written documentation and/ or certified test reports that the equipment meets the following applicable standards:										F 1			10.4
	a. ANSI C37.90, Std. for Relay and Relay Systems													
	a1) Sec. 9 Dielectric Tests													
	a2) Deleted													
	b. ANSI C37.13, Std. for Low Voltage AC Power Ckt. Bkrs.													
	c. ANSI C37.16, Std. Pre- ferred Ratings & Re- lated Reqmts. for Low Voltage Ckt. Bkrs.													

FORM 8031-DR
JULY 1973



BECHTEL
POWER
CORPORATION

480 VOLT LOAD CENTERS

PHILADELPHIA ELECTRIC COMPANY
LIMERICK GENERATING STATION UNITS 1 & 2

JOB
NO. 8031

ATTACHMENT TO
REQUISITION NUMBER

8031-E-10

Sheet 4 of 7

REV.

5

DISTRIBUTION AND ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED. . . (SEE COL. 6)

- 1 = APPROVAL
 - 2 = INFO/REVIEW
 - 3 = APPROVAL
 - 4 = INFO/REVIEW
- BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Attn. A. Teller, Project Engineer
- BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
Attn. J.H. Galley, Project Construction Manager

- F = PRIOR TO FABRICATION
- S = PRIOR TO SHIPMENT
- C = PRIOR TO BALANCE OF PAYMENT (FINAL CERTIFIED COPY REQUIRED)
- I = INSPECTOR RELEASE REQUIRED

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED													
	DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE								
						1	2	3	4	5	6	7	8	9
						DOCUMENT CODE	ACT CODE	TECH. SPEC. REF.	10	11	12	13	14	
Class I 480 Volt Load Centers Cont'd	3)													
1.0 Engineering Docu- mentation Cont'd	d. Deleted													
1.1 General - Cont'd	e. ANSI C37.20 Std. for Swgr. Ass'y.													
	e1) Sec. 20-5.2 Design Tests (prototype test only)													
	e2) Sec. 20.6 Construc- tion													
	f. ANSI C57.12.00 Std. Gen. Req'm'ts for Dis- tribution Power Trans- formers.													
	f1) Sec. 8.1.1 Routine tests (Manuf. de- sign tests on iden- tical or similar transf. shall be furnished)													
	g. ANSI C57.12.10 Std. Req'm'ts for Transf.													
	h. ANSI C57.12.90 Std. Test Code for Transf. (for ref. only)													

DISTRIBUTION AND ACTION


ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED. . . (SEE COL. 6)

- 1 = APPROVAL } BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Attn. A. Teller, Project Engineer
- 2 = INFO/REVIEW } BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
Attn. J.H. Galley, Project Construction Manager
- 3 = APPROVAL
- 4 = INFO/REVIEW

- F = PRIOR TO FABRICATION
S = PRIOR TO SHIPMENT
C = PRIOR TO BALANCE OF PAYMENT (FINAL
CERTIFIED COPY REQUIRED)
I = INSPECTOR RELEASE REQUIRED

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED													
	DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE								
						1	2	3	4	5	6	7	8	9
Class I Cont'd						DOCUMENT CODE		ACT CODE		TECH. SPEC. REF.				10
														11
1.2 Specific	1) General Arrangement Drawings for each equip- ment item of M/R							F	1		15.0			
One copy of documents listed in this section are required for the action noted in Columns 6 & 7. After complete review and approval by Bechtel and after fabrication and delivery one complete set shall be submitted annotated "Certified As-Built" for each M/R item.	2) Bill of Material							F	1		15.0			
	3) Nameplate Information							F	1		15.0			
	4) Wiring Diagrams							F	1		15.0			
	5) Supplier Deviation Disposition Requests							F	1		17.0			
2.0 Procedures														
2.1 General	1) Quality Assurance Program							F	1		10.1			
Unless otherwise noted one copy of documents listed in this section are required for the action noted in Columns 6 & 7.														

FORM 8031-DR JULY 1973	 BECHTEL POWER CORPORATION	480 VOLT LOAD CENTERS	JOB NO. 8031	
			ATTACHMENT TO REQUISITION NUMBER	REV.
			8031-E-10	
PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2			Sheet 6 of 7	5

DOCUMENTATION REQUIREMENTS

DISTRIBUTION AND ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

DOCUMENT REQUIRED. . . (SEE COL. 6)


- 1 = APPROVAL
2 = INFO/REVIEW
3 = APPROVAL
4 = INFO/REVIEW
- BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Attn. A. Teller, Project Engineer
- BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
Attn. J.H. Galley, Project Construction Manager

- F = PRIOR TO FABRICATION
S = PRIOR TO SHIPMENT
C = PRIOR TO BALANCE OF PAYMENT (FINAL CERTIFIED COPY REQUIRED)
I = INSPECTOR RELEASE REQUIRED

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED													
	DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE								
						1	2	3	4	5	6	7	8	9
						DOCUMENT CODE	REV.	ACT CODE	TECH. SPEC. REF.					
Class I 480 Volt Load Centers Cont'd														
3.0 Quality Records	1) Quality Control Inspection and Test Reports including but not limited to the following:													
3.1 One complete set of the documents of this section shall be submitted as a final documentation package with each equipment shipment. One copy to accompany the equipment and one copy per Col. 6 & 7.	a. ANSI C37.20, Section 5.3 Production Tests (I)							C 3	1	0	5			
	b. ANSI C37.50, Section 6.0 Circuit Breaker Production Tests. (I)													
	c. ANSI C37.50, Section 8.1.1 Routine Tests (I)													
	2) Statement of Conformance Form 3295 (I)							C 3	1	0	6			
	3) Paint Certification (I)							C 3	G	4	5			
	4) Supplier Deviation Disposition Requests, Copy only of those approved but not incorporated in the M/R or Specification (I)							C 3	1	7	0			

A complete set of all documentation required up to the point of shipment to the construction site shall be sent with the shipment. Each document shall be annotated to state that it represents as-built conditions (e.g. "CERTIFIED AS-BUILT") for the Limerick Generating Station, Units 1 and 2. This set of documentation shall be available for review by the Bechtel inspector at the time of release for shipment.

At the same time this final documentation package is shipped to the construction site, an identical set shall be sent to Bechtel San Francisco, Project Engineer.

FORM 8031-DR JULY 1973	 BECHTEL POWER CORPORATION	480 VOLT LOAD CENTERS	JOB NO. 8031	REV.
			ATTACHMENT TO REQUISITION NUMBER 8031-E-10	
		PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2	Sheet 7 of 7	5

Supplier Deviation Disposition Request

[illegible]

INSTRUCTIONS FOR COMPLETING SDDR FORM

This form is used by a supplier to:

- a) Notify Bechtel of deviations from established requirements and document the supplier's proposed disposition, and
- b) Record Bechtel's approval of the established resolution.

A deviation is any departure from the requirements of the procuring documents which the supplier intends to incorporate in the completed item or service provided. Deviation disposition can be classified as Repair, Use-As-Is, or Modify Requirement.

Repair is defined as the process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though that item still may not conform to the original requirement. Repair includes alterations to the properties of the material through heat-treating, welding, metal deposition, chemical processing, etc. This form is not to be used for cases where Bechtel has previously provided authorization to proceed using an approved repair procedure covering a specific type of repair; however, records must be maintained for each specific repair.

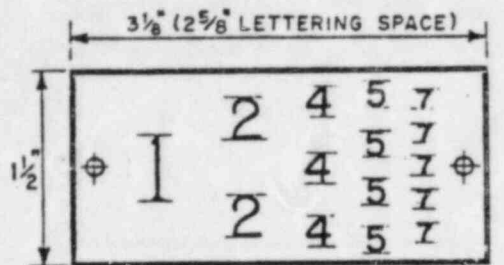
Acceptance of the Supplier Deviation Disposition Request by Bechtel does not relieve the Supplier from responsibility for the accuracy, adequacy, or suitability of the item or service being provided as defined in the procuring documents.

NOTE: Items marked by an asterisk (*) are for Bechtel use only.

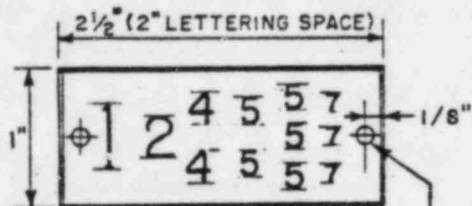
Block No.

Entry Information

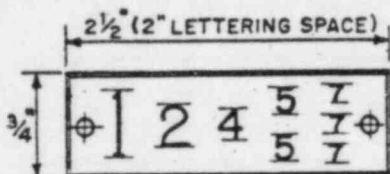
1. Supplier's name and address. List lower-tier Supplier's name and location (City and State) if applicable.
2. Enter the Supplier's order number if one has been assigned.
3. Enter Supplier's Part No. as applicable from the drawing, catalog, internal specification, etc. If the Deviation Request applies to all parts and additional space is needed, a list of parts to which the request applies may be attached.
4. Enter Supplier's Part Name.
5. Enter the date and the method (Spec. review, NDE, dielectric test, etc.) used to determine the deviation.
6. List any previous SDDR's and their dates that have been submitted for similar deviations requested on this Purchase Order.
7. Enter the Bechtel Purchase Order Number.
8. Enter the Bechtel Requisition Item number and the part, tag or code number as it appears in the requisition. If additional space is needed, a separate sheet may be attached.
9. Enter the Bechtel Part Name if one has been assigned.
10. Enter the date and the method (TWX, phone, letter, etc.) used to notify the Bechtel Inspector.
11. Enter the date and the method (TWX, phone, letter, etc.) used to notify Bechtel Engineering.
12. As applicable, enter quantities or serial numbers of the items to which the deviation applies. If not serialized, record lot, batch, heat or other applicable identifying information.
13. Describe the deviating characteristics and define the extent of the out-of-specification condition for each identified piece affected. Identify the location of the deviating characteristic by print coordinates or specific location, as applicable. Attach extra sheets, photographs, sketches, etc., as necessary.
14. Identify disposition classification.
15. Describe the proposed disposition and provide technical justification for Bechtel's evaluation. If the deviation is correctable by repair, submit a detailed repair procedure or reference the procedure previously approved (Level 1) by Bechtel for use in similar situations. Provide Bechtel control number, supplier control number and procedure title.
16. Identify the nature of changes that may result on associated supplier documents (drawings, specs., procedures, installation instructions, etc.).
17. Enter the name (typed or printed), signature and title of the supplier representative authorizing the disposition request and date signed.
- *18. Enter an X in the applicable boxes to define the action required by Bechtel Project Engineering.
- *19. Provide appropriate justification for the Bechtel action(s) indicated in Block 18. When changes to drawings, specifications, requisitions, or other Bechtel documents are involved, each document should be identified and the associated change briefly described. If other disciplines or suppliers are affected, indicate who they are and the document that initiated resolution of that involvement. "Other" follow-up action (e.g. the need for additional Bechtel calculations, additional drawings or sketches, inspection by a Project Engineering representative, etc.) should also be identified here.
- *20. GS — Signature of the responsible Discipline Group Supervisor approving the Engineering action and the approval date.
QE — Signature of the Quality Engineer who reviewed and concurred with the disposition and the date signed.
PE — Approval signature of the Bechtel Project Engineer and the date signed.
21. Signature of the supplier's inspector or other representative authorized to verify that the accepted disposition was correctly accomplished.
- *22. Signature of the Bechtel Inspector or other representative verifying that the accepted disposition was correctly accomplished.



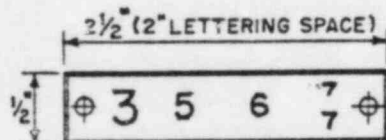
STYLE 1.
1/64" BEVEL, ALL PLATES



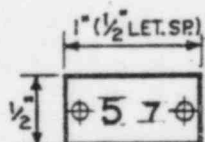
STYLE 2.
1/8" DRILL ON ϕ , ALL PLATES.
(SEE NOTE 2)



STYLE 3.



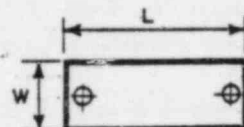
STYLE 4.



STYLE 5.

LETTER SIZE	1	2	3	4	5	6
HEIGHT (SEE DET. A)	1/2"	3/8"	5/16"	1/4"	3/16"	5/32"
NO. PER INCH	2-1/4	3	3-3/4	4-1/2	6-1/2	7-1
NO. OF STY. 1	6	8	10	12	17	19
PER STY. 2, 3 & 4	4	6	7	9	13	15
LINE STY. 5	1	1	1	2	3	3
NO. OF STY. 1	2	3	3	3	4	4
LINES STY. 2	1	1	1	2	3	3
STY. 3	1	1	1	1	2	2
MAX. STY. 4 & 5	1	1	1	1	1	1

3I { LETTER HEIGHT
MEASURED BETWEEN
CENTER LINES
— DETAIL 'A' —



SPECIAL STYLE

STYLE #	L	W	LETTER SIZE

NOTES:

1. THICKNESS OF NAMEPLATE IS 1/16"
2. FURNISH PLATES WITH DRILLED HOLES UNLESS SPECIFIED OTHERWISE.
(ALTERNATIVE APPLICATION: ATTACH NAMEPLATES TO THE BOARD WITH MINNESOTA M & CO. CEMENT "3M" IN THIS CASE NO TAP WILL BE REQUIRED.)
3. NAMEPLATE MATERIAL IS 3-PLY LAMICOR #7031 PLATE, WITH WHITE SURFACE AND BLACK CORE. SEE NAMEPLATE SCHEDULE FOR DETAILS.
4. ENGRAVE LETTERS THRU WHITE FACE TO BLACK CORE. USING A ROUNDED OR SQUARE END V-SHAPED GROOVES ARE NOT ACCEPTABLE.
5. ALL LETTERS SHALL BE CONDENSED GOTHIC.

12-14-71	Issued for Purchase	LL				
2-5-71	ISSUED FOR BIDD	LL				
11-74 -70	ISSUED FOR CLIENT APPROVAL	LL				
No.	DATE	REVISIONS	BY	CHK	DESIGN SUPV	ENG'R
SCALE		DESIGNED	DRAWN		CHIEF ENGR	
ORIGIN	PHILADELPHIA ELECTRIC COMPANY		JOB No.		8031	
P & I	LIMERICK GENERATING STATION UNITS 1 & 2		DRAWING No.			
DIV.	NAME PLATE STANDARDS		Spec. 8031-E		Figure 1	

SPECIFICATION
FOR
480 VOLT LOAD CENTER UNIT SUBSTATIONS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

Bechtel Power Corporation
San Francisco, California

△6	2-6-77	Rev. Sh. i, 15, Sheet 2, 3 of Form 8031-DR	KLC	MM	10/2/77
△5	8-18-75	Rev. Sh. i, ii, iv, v, 6, 9, 16, 18 & Form 8031-DR	1/1	KX	1/1
△4	8-22-74	Revised Sht. i, ii, v, 5, 17 & 18	2/1	KLC	1/1
△3	7-2-73	Revised sht. i, 15, Form 8031-OA, sh. 1	KX	2/1	1/1
△2	6-29-72	Revised Sh. i, ii, 3, 4 & 5	2/1	1/1	1/1
△1	12-10-71	Revised and Issued for Purchase	1/1	1/1	1/1
△0	2/5/71	Issued for Bids	1/1	1/1	1/1
NO.	DATE	REVISIONS	APPROVALS		

SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.
i	6	10	1										
ii	5	11	1										
iii	0	12	1										
iv	5	13	1										
v	5	14	0										
		15	6										
1	0	16	5										
2	1	17	4										
3	2	18	5										
4	1	Fig. 1	1										
5	4	Fig. 2	0										
6	5												
7	0	8031 DR											
8	1	Sh. 1	4										
9	5	Sh. 2	6										
		Sh. 3	6										
		Sh. 4	5										
		Sh. 5	5										
		Sh. 6	5										
		Sh. 7	5										

5	5-8-75	REV. SH. I, II, IV, V, 6, 9, 16, 18 + FORM 8031-DR	LL	KJC	AS								
4	8-22-74	Rev. Sh. 1, II, V, 5, 17 & 18	LL	KJC	AS								
3	7-2-73	Rev. sh. 1, 15, 8031 QA, St. 1	KJC		AS								
2	6-24-72	REV. SH. I, II, 3, 4 & 5	LL	MC	CWD								
1	12-14-71	ISSUED FOR PURCHASE & REV. ALL SH. EXCEPT SH. III, 1, 4, 7, 14 & 17; ADDED FIG. 2	LL										
0	2-5-71	ISSUED FOR BIDS	LL	MC									
A	11-28-70	ISSUED FOR CLIENT APPROVAL	LL	MC									
NO.	DATE	REVISIONS	BY	CHK'D	APP'D	NO.	DATE	REVISIONS	BY	CHK'D	APP'D		

FACING SHEET
 LIMERICK GENERATING STATION, UNITS 1 & 2
 PHILADELPHIA ELECTRIC COMPANY
 480 VOLT LOAD CENTER UNIT SUBSTATIONS

JOB No 8031
 Dwg. No.
 Specification No.
 8031-E-10
 Sheet i of 6



SPECIFICATION

FOR

480 VOLT LOAD CENTER UNIT SUBSTATIONS

FOR THE

LIMERICK GENERATING STATION

UNITS 1 & 2

PHILADELPHIA ELECTRIC COMPANY

Consisting of:

1. Specific Conditions
2. Form 3295 Statement of Conformance
3. Form 8031-DR Documentation Requirements
4. Specification 8031-G-1, General Project Requirements for Purchase Order.
5. Specification 8031-G-4, General Project requirements for Shop Painting for Mechanical and Electrical Equipment
6. Specification 8031-G-13, General Project Requirements for Quality Assurance
7. Specification 8031-G-14, General Project Requirements for Seismic Design and Analysis of Equipment and Equipment Supports
8. Drawing 8031-E-17, Single Line Meter & Relay Diagram, 114A and 124A Gen. Area L.C. & 114B and 124B Reactor Area L. C. 440V 1 Unit.
9. Drawing 8031-E-18, Single Line Meter & Relay Diagram, 114C and 124C Turbine Area L. C. 440V 1 Unit
10. Drawing 8031-E-25, Single Line Meter & Relay Diagram, 114D, 124D, 214D and 224D Plant Services L.C. 440V Common
11. Drawing 8031-E-28, Single Line Meter and Relay Diagram, D114, D214, D314, D414 Safeguard Load Centers 440V 1 Unit.
12. Drawing 8031-E-21, Single Line Meter & Relay Diagram, 214A and 224A Gen. Area L.C. & 214B and 224B Reactor Area L.C. 440V 2 Unit
13. Drawing 8031-E-22, Single Line Meter & Relay Diagram, 214C and 224C Turbine Area L.C. 440V 2 Unit
14. Drawing 8031-E-29, Single Line Meter & Relay Diagram, D124 D224, D324, D424 Safeguard Load Centers 440V 2 Unit
15. Form ED-27, Supplier Deviation Disposition Request

SPECIFICATION
FOR
480 VOLT LOAD CENTER UNIT SUBSTATIONS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

SPECIFIC CONDITIONS

TABLE OF CONTENTS

<u>Section No.</u>	<u>Subject</u>
1.0	SCOPE
2.0	WORK INCLUDED
3.0	WORK NOT INCLUDED
4.0	SERVICE CONDITIONS
5.0	SEISMIC REQUIREMENTS
6.0	CODES AND STANDARDS
7.0	TYPE AND RATINGS
.1	Transformer Type
.2	Ratings and Connections of Transformers for Double-ended Substations
.3	Ratings and Connections of Transformers for Single-ended Substations
.4	Circuit Breaker Ratings
8.0	DESIGN AND CONSTRUCTION DETAILS
.1	High Voltage Cable Compartment
.2	Transformer

<u>Section No.</u>	<u>Subject</u>
.3	Low Voltage Transition Compartment
.4	Switchgear Enclosure
.5	Ground Bus and Neutral Bus
.6	Bus and Bus Taps
.7	Control Power
.8	Power Air Circuit Breaker
.9	Instrument Panels
.10	Potential Transformers
.11	Control of Circuit Breakers
.12	Indicating Lights
.13	Wiring
.14	Nameplates
.15	Accessories
9.0	FINISH
10.0	QUALITY CONTROL REQUIREMENTS
11.0	SCHEDULING
12.0	SHIPPING
13.0	INFORMATION SUPPLIED BY BUYER
	DELETED
15.0	SUBMITTALS BY SELLER FOR APPROVAL
16.0	PHOTOGRAPH REQUIREMENTS FOR INSTRUCTION BOOKS
17.0	DEVIATIONS

ATTACHMENTS

Figure 1 Nameplate Standards
Figure 2 480 Volt Load Center Switchgear Compartment Numbers
Form 8031-DR Documentation Requirements
Form 3295 Statement of Conformance
Form ED-27 Supplier Deviation Disposition Request

SPECIFICATION
FOR
480 VOLT LOAD CENTER UNIT SUBSTATIONS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

SPECIFIC CONDITIONS

1.0 SCOPE

This specification covers the furnishing of all labor, materials and services in connection with the design, fabrication and delivery of single-ended and double-ended 480 volt load center unit substations as listed in the accompanying material requisition.

2.0 WORK INCLUDED

- 2.1 The Seller shall furnish, deliver f.o.b. jobsite, the equipment as completely assembled as possible within shipping and handling limitations, wired, tested and ready for installation in accordance with these specifications.
- 2.2 The Seller may be required to furnish technical assistance to supervise unloading, storage, installation and placing the equipment into service. The Seller will be notified when and if such services are required by the Buyer's Project Construction Superintendent. The costs of these services are to be billed separately and are not to be included in the equipment prices.

3.0 WORK NOT INCLUDED

- 3.1 The Buyer will provide the following:
 - a. Foundations and leveling channels.
 - b. Unloading and installation of the equipment and re-establishment of connections between disassembled mechanical and electrical parts.

- c. All external connections to the equipment.
- d. Space heater power supplies.

4.0 SERVICE CONDITIONS

- 4.1 The substations will be located indoors.
- 4.2 The substations will be used to provide power, switching and protection to 480 volt motor control centers and to individual motors.
- 4.3 The delta connected 13kV windings of the load center transformers will be energized from a nominal 13.8 kV, low-resistance grounded wye, three-phase, three-wire, 60 hertz system.
- 4.4 The delta connected 4kV voltage windings of the load center transformers will be energized from a 4.16kV, low resistance grounded wye, three-phase, three-wire, 60 hertz system.
- 4.5 The wye connected low voltage windings of all substation transformers will be solidly grounded.
- 4.6 All equipment nominally rated at 125 volts dc shall be suitable for continuous operation within a range of 102 volts to 135 volts. Control apparatus shall be capable of successful operation at 90 volts.
- 4.7 All equipment nominally rated at 120 volts ac shall be suitable for continuous operation within a range of 103 volts to 127 volts. Control apparatus shall be capable of successful operation at 95 volts.

5.0 SEISMIC REQUIREMENTS

- 5.1 Equipment shall be designed to withstand, without loss of function and without exceeding allowable stresses, seismic forces in accordance with the applicable requirements of Specification 8031-G-14, General Project Requirements for Seismic Design and Analysis of Equipment Supports.
- 5.2 All equipment shall meet the requirements for Class II Seismic equipment.
- 5.3 In addition, equipment which is so designated in the Requisition, shall meet the Specification 8031-G-14 requirements for Class I Seismic equipment.
- 5.4 Seismic test and/or analysis procedures shall agree with or exceed the requirements of IEEE No. 344, "Guide for Seismic Qualification of Class I Electric Equipment for Nuclear Power Generating Stations". In cases where the IEEE guide conflicts with the requirements of Specification 8031-G-14, the more conservative requirements will take precedence.

6.0 CODES AND STANDARDS

All equipment furnished under this specification shall be designed, fabricated, rated, tested and shall perform in accordance with the latest applicable revisions and supplements of IEEE, NEMA, and ANSI Standards unless specifically modified by the requirements herein.

7.0 TYPE AND RATINGS7.1 Transformer Type

Each transformer shall be either a sealed-dry, gas-filled type or a ventilated-dry type with three-phase, two-winding, 60 Hertz, self-cooled, non-explosive fire-resistant construction. The type of transformer will be indicated in the Requisition or drawings.

7.2 Ratings and Connections of Transformers for Double-ended Auxiliary Power Substation (Unless otherwise stated in the accompanying Requisition)

- | | | |
|----|---------------------------------|-------------------------------------------------------|
| a. | Output: | 1000 kVA |
| b. | Temperature rise: | 150C above 40C average
24 hour ambient temperature |
| c. | Rated voltage | |
| | H.V. Winding: | 13.2 kV |
| | L.V. Winding: | 480/277 volts |
| d. | Connection | |
| | H.V. Winding: | Delta |
| | L.V. Winding: | Grounded Wye |
| e. | Taps, no-load,
full capacity | |
| | Above rated voltage: | two 2-1/2% |
| | Below rated voltage: | two 2-1/2% |
| f. | Impedance on rated
kVA base: | 7.4% |
| g. | Winding BIL: | Standard |
| h. | Phase Relationship: | Standard |
| i. | X/R Ratio | 6.6 or less |

7.3 Ratings and Connections of Transformers for Single-ended Safeguard Power Substation (Unless otherwise stated in the accompanying Requisition)

- | | | |
|----|---------|---------|
| a. | Output: | 750 kVA |
|----|---------|---------|

- b. Temperature rise 150C above 40C average
24 hour ambient temperature
- c. Rated Voltage
H.V. Winding: 4.16 kV
L.V. Winding: 480/277 volts
- d. Connection
H.V. Winding: Delta
L.V. Winding: Grounded Wye
- e. Taps, no-load, full capacity
Above rated voltage: two 2-1/2%
Below rated voltage: two 2-1/2%
- f. Impedance on rated kVA base: 5.75%
- g. Winding BIL: Standard
- h. Phase Relationship: Standard

7.4 Circuit Breaker Ratings

<u>Frame Size</u> <u>Amperes</u>	<u>Interrupting Rating</u> <u>rms Sym. Amperes</u>		<u>Volts</u> <u>ac</u>
	<u>With Inst. Trip</u>	<u>Without Inst. Trip</u>	
225	22,000	14,000	480
600	30,000	22,000	480
1600	50,000	42,000	480

Control voltage shall be 120 volts ac.

8.0 DESIGN AND CONSTRUCTION DETAILS8.1 High Voltage Cable Compartment

An air-filled high voltage cable terminating compartment shall be integrally mounted on each transformer to provide for the following:

- a. Enclosing the high voltage hermetically sealed side wall bushings of the sealed-dry transformers and the high voltage terminals of the ventilated-dry type transformers.
- b. Provision for terminating high voltage cables of the sizes shown on Buyer's drawings. Seller shall furnish terminal lugs, Burndy Hydent Type YA with long barrel and closed back, or Buyer approved equal.
- c. Adequate space for Buyer's stress cones.
- d. Sufficient ventilation to insure protection for Buyer's incoming cables against the heat developed in the transformer. Cable support brackets shall be of a minimum-heat-conducting material.
- e. Provision for power cables entering the compartment in metal conduit from above or below as required.
- f. Bare power conductors and cable terminal lugs shall be adequately spaced so that taping will not be necessary.

8.2 Transformer

- a. Each sealed-dry transformer shall be equipped with an externally operated, manual no-load tap changer. The tap changer handle shall have provision for locking in any tap position. Each ventilated-dry transformer shall be equipped with Seller's standard tap changing provision.

- b. Accessories shall be supplied in accordance with NEMA and ANSI Standards and shall include at least the following:
 - 1. Winding temperature indicating device for ventilated-dry transformer with circuit closing contacts suitable for use with Buyer's 125 volts dc remote overtemperature alarm
 - 2. Top gas temperature indicator for sealed-dry transformer with circuit closing contacts suitable for use with Buyer's 125 volts dc remote overtemperature alarm. Temperature correlation information between the indicator reading and the winding temperature shall be included in the instruction manual.
 - 3. Over-under pressure indicating device for the sealed-dry transformer with circuit closing contacts suitable for use with Buyer's 125 volts dc remote over/under pressure alarm.
- c. Two ground pads shall be provided for attaching Buyer's 500 kcmil copper ground cable.
- d. The transformer low voltage neutral shall be brought out through an insulated bushing or terminal and connected to the switchgear ground bus. The neutral bushing or terminal shall also be connected to a neutral bus in cases where so required by the accompanying Requisition or single line diagrams.

8.3 Low Voltage Transition Compartment

An air-filled transition compartment shall be integrally mounted on the sealed-dry transformer case to the low voltage switchgear to provide connections between the 600 volt hermetically sealed side wall bushings of the transformer and the switchgear bus. Connecting bus shall be furnished. A transition compartment will not be required for the ventilated-dry transformers.

8.4 Switchgear Enclosure

- a. The switchgear shall be of the metal-enclosed, drawout, air circuit breaker type with bus bar construction. Enclosures shall form a line-up of freestanding self-contained housings having one or more individual breaker or instrument compartments and a full height rear compartment for the buses, instrument and control power transformers and outgoing cables. It shall have adequate strength to withstand all stresses imposed by shipping, handling, installation, and operation without distortion or other damage.

- b. The temperature rise of all main current carrying parts of the switchgear shall not exceed 65C above an ambient air temperature of 40C outside the enclosure. This temperature rise shall not be exceeded when the equipment is operating continuously at the rating specified with all units operating simultaneously.
- c. The air temperature in the cable compartment shall not exceed 50C with an ambient air temperature of 40C outside the compartment and with 50 watts total loss from the cables.
- d. The temperature rise of parts which can be readily touched when in service, such as instrument panels, control panels and doors, shall not exceed 30C when operating in an ambient air temperature of 40C.
- e. Each housing section shall be equipped with a space heater. All heaters installed in housings associated with each bus section shall be controlled by a properly rated and conveniently located toggle switch. Heaters shall be rated 125 volts, suitable for operation from Buyer's 120 volt, single phase, 60 hertz supply. Heaters shall be located in an accessible area of the rear of the switchboard, shall be located so that they can be serviced in the future when necessary without de-energizing the equipment in which the heater is installed, shall be located so that they do not interfere with incoming cables nor wiring terminations and shall be located so that, when energized, wiring and cables will not be subject to the direct effect of either radiant, convected or conducted energy. Heaters shall be provided with protective screens if located where they may be hazardous to personnel. Heater output shall be such that the temperature inside the section shall be maintained above the dew point temperature when equipment is not energized. Each space heater circuit shall be protected with a properly rated fuse of the nonrenewable type.
- f. In addition to means for fastening the switchgear to floor steel with bolts, separate provision shall be made for spot welding the switchgear to floor steel.
- g. Ventilating openings on top of switchgear through which water might accidentally enter shall be shielded with covers. The edges of the openings shall be turned up.
- h. Tie breaker vertical sections shall be constructed with a solid barrier extending vertically at least from the mid-point between tie breaker

terminals to the top of the switchgear on one side and to the bottom of the switchgear on the other side. A solid horizontal barrier, tying together the vertical barriers, shall be provided between the upper and lower tie breaker terminals. The completed assembly shall provide positive separation of one main bus section from the other main bus section so that both bus sections will not be exposed to a common source of contamination.

- i. The rear compartments of the switchgear enclosures shall be furnished with metal barriers which isolate the main bus from the Buyer's outgoing cables.
- j. The switchgear enclosures adjacent to the transformer or transition compartment shall have closures such that the transformer low voltage terminals are not exposed to the switchgear main bus.
- k. Breaker compartments indicated in the accompanying drawings as "space" shall be completely equipped for the future additions of 600A circuit breakers, including all necessary electrical connections. Other breaker compartments not indicated in the drawings as occupied by circuit breakers or other equipment shall be furnished with blank doors.
- l. Circuit breakers and other equipment shall be located in the specified compartments of the switchgear enclosure. The accompanying single line diagrams utilize an identification and location numbering system which is explained in Figure 2, attached.

8.5 Ground Bus and Neutral Bus

- a. A 1/4-inch by 2-inch copper or equivalent current carrying capacity aluminum ground bus shall be provided, bolted to and effectively grounding each structure. The bus shall extend the length of each load center and be connected to the transformer neutral. A clamp type terminal connector, suitable for Buyer's 500 kcmil copper ground cable, shall be provided at each end of the ground bus.

- b. When indicated in the accompanying Requisition or single line diagrams, a reduced capacity, insulated neutral bus shall be provided extending the full length of the specified load center. The bus shall be connected to the transformer neutral and provided with clamp type terminals suitable for connection to Buyer's neutral conductors.

8.6 Bus and Bus Taps

- a. Bus bars shall be of high conductivity copper or aluminum, of the latest standard design and shall be capable of continuous operation at the transformer maximum output.
- b. Bus shall be braced to withstand the mechanical stresses and heat due to short circuit currents at least equal to that specified for the smallest circuit breaker equipped with instantaneous trip.
- c. Joints and branch connections in buses shall be plated and high-pressure bolted.
- d. Deleted

8.7 Control Power

- a. A control power source, including a preferred-emergency throwover system, shall be provided for each double-ended load center switchgear. Equipment shall consist of at least two (2) control power transformers, control bus, voltage relay, transfer switch and throwover contactor to assure a continuous source of 120 volt, single phase, 60 hertz, ac control power. Operation shall be as follows:
 - (1) Under normal operation control buses for both left and right hand sides of the load center shall be fed from the control power transformer connected to the left-hand main breaker line terminals, the preferred source.
 - (2) Loss of the preferred source shall cause a transfer, following a delay of one (1) second (relay shall be adjustable from near 0 to approximately 5 seconds), to the control power transformer connected to the right-hand main breaker line terminals, the non-preferred source.
 - (3) Re-transfer to the preferred source shall be manual, locally controlled from a control switch on the left-hand instrument panel.

- (4) Control switch shall have a spring-return-to-center neutral position, left-hand position for re-transfer from non-preferred to preferred source and right-hand position for manual transfer from the preferred to non-preferred source.
- (5) Throwover contactor shall be both electrically and mechanically interlocked. Each side of the contactor shall have one (1) normally open (field convertible to NC) unused auxiliary contact wired out to terminal block. In addition each side of the contractor shall have a white light wired to indicate the control power source. These two lights shall have nameplates bearing the legend "Preferred Control Source" and "Non-Preferred Control Source" and shall be mounted above the control switch described above.
- b. A control power source shall be provided for each single-ended load center switchgear. Equipment shall consist of at least the necessary control power transformer and control bus.
- c. Control power transformers shall be dry type of adequate rating to serve the control power load and provided with fused overcurrent protection on both the primary and secondary sides.
- d. A continuous 120 volt, ac, 2 wire control bus, insulated for 600 volts and not smaller than No. 12 AWG, shall be furnished running the entire length of each load center switchgear. The control bus shall be connected to the control power transformer in single-ended switchgear and to the load terminals of the throwover contactor in double-ended switchgear. The control bus in each end of double-ended switchgear shall be fed through a conveniently located fused disconnecting device. The bus shall be tapped through fused disconnecting devices with 35 ampere fuses at each breaker served. Nonrenewable type fuses shall be furnished.

8.8 Power Air Circuit Breakers

- a. Power air circuit breakers shall be fully rated, drawout type, three pole (unless otherwise noted), spring operated, stored energy mechanisms, electrically and mechanically trip-free and suitable for electrical and manual operation. The breakers shall be furnished with 120 volt ac shunt trip coils wired to terminal blocks for remote control as described later.

- b. Bus tie breakers shall be provided without over-current tripping devices (non-automatic).
- c. Breakers used for other than bus tie and motor branch circuits shall be complete with solid state adjustable short time delay and long time delay overcurrent tripping devices.
- d. Each motor branch circuit breaker shall be furnished with:
 - 1) A 480 volt ac instantaneous undervoltage device set for pick-up at 80% nominal voltage and with drop-out adjustable between 30% and 60% nominal voltage. Undervoltage devices shall be connected to line-side breaker terminals.
 - 2) Solid state adjustable instantaneous and long time delay overcurrent tripping devices.
- e. Overcurrent tripping devices shall be suitable for fully selective coordinated tripping.
- f. Breakers shall be removable with self-coupling primary and secondary disconnecting contacts.

Each breaker and compartment shall have the same number of primary and secondary disconnecting contacts, including secondary contacts for the undervoltage device. An operating, a test and a withdrawn (disconnected) position shall be provided for each breaker unit. The primary contacts shall be disconnected in the test position, but auxiliary and control contacts shall be maintained in this position for breaker and control circuit testing operations. All connections shall be disconnected in the withdrawn position. Circuit breaker compartment doors shall be arranged so that they can be closed completely with the circuit breaker in the operating, test and disconnected positions.

- g. Provision shall be made for tripping the breakers manually. In order to prevent inadvertent tripping, a pivoted, drop-type cover shall be provided over the manual trip button. A mechanical "Close-Trip" indicator shall be provided on the front of each breaker.
- h. Not less than five electrically separate sets of field convertible auxiliary contacts shall be provided in addition to those required for the circuit breaker operating mechanism. In addition, two cell switches, one switch with two contacts which close in the breaker operate position only and one switch

with four contacts which close in the test or withdrawn positions only, shall be furnished and wired into the breaker control circuit. All unused auxiliary contacts shall be wired to the terminal blocks.

- i. A mechanical interlock shall be provided to prevent the removable elements from being inserted into or withdrawn from its operating position while the circuit breaker is closed.
- j. Removable elements of the same type and ratings shall be completely interchangeable.
- k. Each circuit breaker element shall be provided with an alarm switch that will close its contacts when the breaker is tripped by the series overcurrent device, but which is mechanically locked from closing when the breaker is tripped manually or by the shunt trip device. Contacts shall be suitable for use in a 125 volt dc annunciator circuit.
- l. Provision shall be made for padlocking breakers when power contacts are open, in the connected, test or disconnected positions. When padlocked the breaker shall be prevented from closing or changing positions.

8.9 Instrument Panels

- a. An instrument panel shall be provided in the upper vertical section containing the transformer secondary circuit breaker in each load center switchgear.
- b. Instrument panels in each transformer secondary breaker vertical section shall include a white indicating light, wired to indicate when the 480 volt bus is energized.

8.10 Potential Transformers

- a. Suitable potential transformers shall be furnished installed and wired as indicated on the drawings.
- b. Potential transformer high voltage windings shall be protected by current limiting fuses. Fuses rated 6 ampere shall be installed in the low voltage circuit. Low voltage fuses shall be located to permit replacement while the switchgear is energized.

8.11 Control of Circuit Breakers

- a. Each transformer secondary, bus tie, and motor branch feeder circuit breaker shall be wired to provide for close and trip operation by a remote

control switch when that breaker is in both the operating and test positions. Local control of these breakers shall be provided by pushbuttons mounted on the escutcheon of the breaker element. The pushbuttons shall be wired so that circuit breaker is operative only when the breaker is in the test position.

- b. Each motor control center and other distribution load feeder circuit breaker shall be wired to provide for close and trip operation by pushbuttons mounted on the escutcheon of the breaker element when that breaker is in both the operating and test positions. Remote control switches will not be used for control of these breakers.

8.12 Indicating Lights

- a. Deleted
- b. Deleted
- c. Indicating light lamps and lenses shall be replaceable from the front of the panel.

8.13 Wiring

- a. All control wiring shall be 600 volt, type SIS, General Electric Company Vulkene or equal, Class B stranded, single conductor, No. 14 AWG minimum. Wire shall meet IPCEA Publication No. S-61-402, Section 6.5 for vertical flame resistance.
- b. Wiring shall be complete with control, and relaying circuits requiring external connections and all unused terminals on relays and auxiliary contacts brought out to conveniently located terminal blocks.
- c. Terminal blocks shall be Buchanan 2B100 series or Marathon 6000 DJ series with white marking strips for point identification and with

dust covers. Terminal blocks shall have at least 10% spare, unused positions. Not more than two wires installed by the Seller shall be connected to one terminal.

- d. Identification of terminal blocks and terminal points shall be alpha-numeric. Each terminal block, consisting of not more than twelve (12) terminal points, in each switchgear cubicle shall be assigned an unique identifying letter. Terminal points shall be identified on the marking strip with the Buyer's wire numbers. If this information is not available when required to permit marking by the Seller, the substations shall be shipped with unmarked marking strips for later marking by the Buyer. Complete terminal block identification as well as wire identification shall be shown on Seller's wiring diagrams. The covers shall be left blank for later possible marking of Buyer's scheme numbers in the field.
- e. All wire terminations shall be made with compression type connectors, Solderless connectors shall be provided for all cable connections on the load side of the switchgear and on the bus. These connectors shall be either Burndy Hydent, Type YA (long barrel and closed back) or Penn Union Electric Corporation, Type FM (cone type). Burndy type YA is preferred. Connectors which use a screw bearing directly on the wire for contact pressure are not acceptable. "Snap-on" or similar types of lugs and connectors which depend on friction or spring action for their contact pressure shall not be used in secondary and control circuits.
- f. Clamp type terminals and cable supports braced for short circuit currents for single conductor cable shall be provided for all outgoing power connections.
- g. Structures indicated for top entry of power cables shall be provided with removable top plates, suitable for drilling.

8.14 Nameplates

- a. In addition to the standard metallic transformer nameplate each transformer shall be identified with a similar metallic nameplate bearing the Buyer's equipment number, purchase order number and purchase order item number.
- b. Nameplates shall be provided for each device, each switchgear cubicle and each switchgear assembly. They shall be of Lamicoid, engraved

through the white face to black core, in accordance with Figure 1, Nameplate Standard, except that internal relays shall be marked with Sellers standard markers. Equipment designated as Class I in the Requisition shall be provided with nameplates of a different color. The color will be selected later and will be indicated in the nameplate schedule.

- c. A nameplate schedule will be furnished to the successful bidder.

8.15 Accessories

A traveling overhead lift device including a removable hand-crank shall be furnished with each load center.

9.0 FINISH

- 9.1 All surfaces normally painted shall be thoroughly cleaned of dust, rust, grease, weld spatter and loose mill scale and shall be painted in accordance with attached Specification 8031-G-4, Sections G4.3.1 and G4.3.2 or approved manufacturer's paint specification. Finish color shall be light gray ANSI No. 61 Munsel Notation No. 8.3 G6.10/0.54.
- 9.2 A sufficient quantity of touch-up finish shall be furnished to repair minor damage caused during installation.
- 9.3 All manufacturer's paint specifications shall be submitted to the Buyer for approval prior to use.
- 9.4 The transformer bases shall not be undercoated with any material other than normal surface primer coats and paints. No oil-soluble materials are to be used. However, special attention is to be given to the transformer bases to ensure that they are properly primer-coated and painted.

10.0 QUALITY CONTROL REQUIREMENTS - CLASS I EQUIPMENT

- 10.1 Equipment designated in the Requisition or Specific Conditions as Class I is to perform critical functions in a nuclear power plant. For this equipment the Bidder shall submit his quality program in accordance with Specification 8031-G-13, General Project Requirements for Quality Assurance. The Seller shall furnish the documentation as specified below in accordance with the applicable requirements of Specification 8031-G-13.

- 10.2 Each substation identified on the Requisition as Class I shall be qualified by analysis, successful use under similar conditions or by actual test to demonstrate its ability to perform its function under normal and design basis events as defined in the Requisition. The analysis/testing program shall meet or exceed the requirements contained in IEEE No. 323, General Guide for Qualifying Class I Electric Equipment for Nuclear Power Generating Stations.

10.3 Deleted

- 10.4 In addition to the above, written documentation and/or certified test reports that the equipment meets the following applicable standards shall be submitted.

- a. ANSI C37.90, Standard for Relay and Relay Systems Associated with Electric Power Apparatus.
 - 1) Section 9 Dielectric Tests
 - 2) Deleted
- b. ANSI C37.13, Standard for Low-Voltage AC Power Circuit Breakers used in Enclosures.
- c. ANSI C37.16, Standard Preferred Ratings and Related Requirements for Low Voltage Power Circuit Breakers.
- d. ANSI C37.50, Test Procedure for low voltage AC Power Circuit Breakers.
 - 1) Section 6 - Production Tests (certification required on all circuit breakers).
- e. ANSI C37.20 Standard for Switchgear Assemblies including Metal Enclosed Bus.
 - 1) Section 20-5.2 Design Tests (Certification on prototype equipment tests only required.).
 - 2) Section 20-5.3 Production Tests (Tests and certification required on all switchgear furnished).
 - 3) Section 20-6 Construction
- f. ANSI C57.12.00 Standard General Requirements for Distribution, Power, and Regulating Transformers, and Shunt Reactors.

- 1) Section 8.1.1 Routine Tests (Tests and certification required on each transformer furnished). Manufacturers design tests performed on identical or similar transformers shall also be furnished.
 - g. ANSI C57.12.10 Standard Requirements for Transformers 67,000 Volts and Below, 501 through 5,000 KVA Single Phase, 501 through 10,000 KVA Three Phase.
 - h. ANSI C57.12.90 Standard Test Code for Distribution, Power, and Regulating Transformers, and Shunt Reactors.
- 10.5 One copy of the associated quality control inspection and test reports shall be attached to each section of load center when shipped.
- 10.6 For each shipment of Class I load center the supplier shall complete Form 3295, Statement of Conformance, and make distribution as noted thereon.

11.0 SCHEDULING

- 11.1 The overall project construction program makes it imperative that load center unit substations be delivered at the jobsite by not later than the dates specified in the requisition.
- 11.2 The Seller shall coordinate with the Buyer to establish an engineering and fabricating schedule to meet jobsite requirement dates.

12.0 SHIPPING

- 12.1 Equipment shall be arranged and fabricated to provide convenient shipping sections. Each shipping section and all parts contained therein shall be properly protected against corrosion, weather and mechanical damage during transit.
- 12.2 Each shipping section shall be provided with supports in the form of suitable steel sections, lifting eyes, etc. to maintain alignment of parts during shipping, handling, hoisting and installation. Location of lifting points shall be clearly identified on drawings.
- 12.3 Necessary bus connections, wire jumpers, bolts, nuts, washers, etc. shall be furnished, suitably packaged and marked to facilitate field assembly. Each shipping container shall be identified with the name of contents, purchase order number and purchase order item number.

13.0 INFORMATION SUPPLIED BY BUYER

13.1 The Buyer will supply the following information to the Seller, when applicable:

- a. Switchgear cubicle nameplate schedule.
- b. Buyer's wire numbers for terminal block marking.

14.0 Deleted

15.0 SUBMITTALS BY SELLER FOR APPROVAL

The Seller shall submit to the Buyer, for approval, drawings and data in the quantities and by not later than the dates specified on "Documentation Requirements", form 8031-DR attached.

16.0 PHOTOGRAPH REQUIREMENTS FOR INSTRUCTION BOOKS

16.1 Instruction books shall include photographs of the following views:

- a. Close-up view of control panel of each typical unit.
- b. View of each size breaker in the withdrawn position, showing interior of the compartment.
- c. Overall view of one double ended switchgear assembly.

17.0 DEVIATIONS

17.1 All Supplier proposed deviations from the requirements of this Specification, the Material Requisition or other procurement documents, such as approved drawings, must be submitted to the Buyer for approval by use of Form ED-27, Supplier Deviation Disposition Request, or, an alternate form presenting equivalent information.



ATTACHMENT 3 MATERIAL REQUISITION

Page 1 of 5 Pages

MATERIAL:

ACCUMULATOR TANKS

SUPPLIER QUALITY SURVEILLANCE REQUIREMENTS

☐ 0 NONE

☐ 3 FULL SCOPE

☐ 1 FINAL ONLY

☐ 4 RESIDENT

☒ 2 LIMITED SCOPE

BECHTEL AUDIT REQUIRED * YES ☒ NO ☐

10 CFR 21 APPLIES

YES ☒ NO ☐

COST CODE See M/R Item 2

JOB SITE DELIVERY DATE June 1, 1982

M/R STATUS

REV. NO.	DATE	REVISIONS	ORIGINATOR (NAME)	APPROVALS
●	6/1/81	Issue for Bid	Brian Kreitzberg	WCE/BAF LHS/10/1
△ 1	1/4/82	Issue for Purchase	Brian Kreitzberg	WCE/BAF WCE/10/1
△ 2	2/1/82	Revised and Reissued for Purchase	Brian Kreitzberg	WCE/BAF WCE/10/1
△ 3	4/2/82	Revised and Reissued	Brian Kreitzberg	WCE/BAF WCE/10/1
△ 4	12/8/82	Revised and Reissued	Brian Kreitzberg	WCE/BAF WCE/10/1
△				
△				
△				
△				
△				

*Q-Listed Components

Job Requisition No.
8031-170 Rev. 4

BECHTEL

PURCHASE ORDER NO.

REQUISITION NO.

8031-M-170

REV.

4

PAGE 2 OF 5 PAGES

ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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MATERIAL: ACCUMULATOR TANKS

- | | | |
|---|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A | 1 | Drawings, Data and Documentation as required by the specification and attached Form 8031-DR. |
| B | 1 | Seller shall furnish to the Expediter, shown on page 1 of the Purchase Order, not later than 30 days after date of Purchase Order, a complete schedule forecasting engineering, material and/or assembly acquisition, fabrication and/or labor, final assembly, testing if any, and shipping date(s). |

FURNISH THE FOLLOWING EQUIPMENT PER APPLICABLE SPECIFICATIONS, DRAWINGS, CODES, DATA, TABLES AND NOTES

			<u>Unit 1</u>	<u>Unit 2</u>
10	MSRV Accumulator tanks			
16	MSIV Accumulator tanks	COST CODE: 1A4569	2A4569	
1 Lot	Duplicate Name Tags			

MSIV Tag Nos.	
<u>UNIT NO. 1</u>	<u>UNIT NO. 2</u>
1AT001	2AT001
1BT001	2BT001
1CT001	2CT001
1DT001	2DT001
1AT002	2AT002
1BT002	2BT002
1CT002	2CT002
1DT002	2DT002

These tag numbers were previously:

<u>UNIT NO. 1</u>	<u>UNIT NO. 2</u>
1A001A	2A001A
1A001B	2A001B
1A001C	2A001C
1A001D	2A001D
1A002A	2A002A
1A002B	2A002B
1A002C	2A002C
1A002D	2A002D

BECHTEL

PURCHASE ORDER NO.

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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MSRV Tag No's.

UNIT NO. 1

1ET003
1HT003
1KT003
1MT003
1ST003

UNIT NO. 2

2ET003
2HT003
2KT003
2MT003
2ST003

These tag numbers were previously:

UNIT NO. 1

1A003E
1A003H
1A003K
1A003M
1A003S

UNIT NO. 2

2A003E
2A003H
2A003K
2A003M
2A003S

Delivery Required

Equipment shall be delivered not later than
June 1, 1982.

P-241/3

BECHTEL

PURCHASE ORDER NO.

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REV.

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NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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NOTES:

1. Delays in Equipment Procurement and Fabrication

The Seller shall not commence any design, procurement or manufacturing operations prior to receiving Buyer's final approval of Seller's Quality Assurance Program.

Upon receipt of Buyer's final approval, Seller shall proceed with engineering, preparation of drawings, procedures and material lists and their submittal to the Buyer for final approval. Actual procurement of materials and fabrication by the Seller shall then be delayed until released by the Buyer. The Seller shall establish latest release date to meet specified delivery date.

2. Deviations

Any departure from the requirements of the procurement documents which the Seller proposes to implement must be identified with the requirements of the governing document on either a Supplier Deviation Disposition Request Form ED-27 or an alternate form presenting equivalent information. Deviation requests from lower tier suppliers shall be through the Seller to the Buyer. Deviation requests must contain sufficient information supported by attached technical documents, sketches and data sheets as necessary. The Seller's estimate of cost, schedule, availability or other factors affected by the deviation shall be included.

3. The specification, forms, data sheets and general project requirements attached to this Material Requisition revision apply retroactively to the date of issue of the purchase order.

BECHTEL

PURCHASE ORDER NO.

REQUISITION NO.

8031-M-170

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ITEM NO.	QUANTITY	DESCRIPTION	CODE OR EQUIP. NO.	UNIT PRICE	EXTENSION
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ATTACHMENTS

<u>NO.</u>	<u>REV.</u>	<u>TITLE</u>
Deleted		Summary of Proposal
<u>FORMS</u>		
8031-DR	1	Documentation Requirements
8031-PCR		Deleted
3295		Statement of Conformance
ED-27	1	Supplier Deviation Disposition Request
P-2.6.1.11	2	Allowable Reactions on Equipment Nozzles
<u>SPECIFICATIONS</u>		
8031-M-170	4	Design Specification for Accumulator Tanks
8031-G-1	11	General Project Requirements for Purchase Orders
8031-G-3A	1	General Project Requirements for General Welding Requirements for Shop and Field Fabricated Nuclear Service Equipment and Tanks
8031-G-5	5	General Project Requirements for Documentation Required from Suppliers
8031-G-13	8	General Project Requirements for Quality Assurance
*8031-G-19	3	General Project Requirements for Design Assessment and Qualification of Seismic Category 1 Equipment and Equipment Supports

*On pg.E-vi, condition 1,2,3d and 3e should be used in case of analysis, while conditions 1b,3e,and 5 would be used in case of testing.

DESIGN SPECIFICATION
FOR
ACCUMULATOR TANKS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY
PREPARED BY

BECHTEL POWER CORPORATION
ENGINEERS-CONSTRUCTORS
SAN FRANCISCO, CALIFORNIA



CERTIFICATION

I certify that this Design Specification satisfies the requirements of the ASME Boiler and Pressure Vessel Code, Section III 1980 Edition with Addenda through Summer, 1981, Paragraph NCA-3250.

<u>Signature</u>	<u>Date</u>	<u>Revision</u>
<u>Stephen C. Lynch</u>	<u>8/28/81</u>	<u>0</u>
<u>Stephen C. Lynch</u>	<u>12/29/81</u>	<u>1</u>
<u>Stephen C. Lynch</u>	<u>2/1/82</u>	<u>2</u>
<u>Stephen C. Lynch</u>	<u>4/19/82</u>	<u>3</u>

3	4/2/82	Revised and Reissued	BAK	1-1-1	WCS
2	2/1/82	Revised and Reissued for Purchase	BAK	8/1/81	WCS
1	1/4/82	Issue for Purchase	BAK	8/1/81	WCS
0	9/1/81	Issue for Bid	BAK	8/1/81	WCS
NO.	DATE	REVISIONS	APPROVALS		

8031-M-170 P(R)

DESIGN SPECIFICATION
FOR
ACCUMULATOR TANKS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY
PREPARED BY

BECHTEL POWER CORPORATION
ENGINEERS-CONSTRUCTORS
SAN FRANCISCO, CALIFORNIA



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I certify that this Design Specification satisfies the requirements of the ASME Boiler and Pressure Vessel Code, Section III 1980 Edition with Addenda through Summer, 1981, Paragraph NCA-3250.

SignatureDateRevision

Daniel J. Schmit

12/7/82

4

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△					
4	12/6/82	Revised and Reissued	ROSE	ANT	UCM
NO.	DATE	REVISIONS	APPROVALS		

SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.
i	4		Sheet 1	0									
ii	4		Sheet 2	0									
iii	1	Attachment	12	1									
iv	1	Attachment	13	4									
1	3	Attachment	14	-									
2	1		Sheet 1	4									
3	1		Sheet 2	4									
4	1		Sheet 3	4									
5	3	Attachment	15	2									
6	2	Attachment	16	0									
7	4	Attachment	16	3									
8	3	Attachment	17										
9	1		Sheet 1	2									
10	1		Sheet 2	2									
11	1												
		Attachment 1	4										
		Attachment 2:	-										
		Sheet 1	2										
		Sheet 2	3										
		Sheet 3	1										
		Attachment 5:	-										
		Sheet 1	1										
		Sheet 2	1										
		Attachment 11:	-										

4	12/8/82	Revised & Reissued	FID 12/8/82	12/8/82									
3	4/1/81	Revised & Reissued	RAE 4/1/81	4/1/81									
2	2/1/81	Revised and Reissued for Purchase	RAE 2/1/81	2/1/81									
1	1/4/80	Issue for Purchase	RAE 1/4/80	1/4/80									
0	9/1/79	Issue for Bid	RAE 9/1/79	9/1/79									
NO.	DATE	REVISIONS	BY	CHK'D	APP'D	NO.	DATE	REVISIONS	BY	CHK'D	APP'D		



FACING SHEET
LIMERICK GENERATING STATION, UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

JOB No 8031

M-170
Sheet i

REV.

4

DESIGN SPECIFICATION
FOR
ACCUMULATOR TANKS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

Consisting of:

- I. Preface
- II. Specific Conditions
- III. Attachments
 - 1. ASME Criteria Locator
 - 2. Documentation Requirements, form 8031DR
 - 3. Deleted
 - 4. Statement of Conformance, form 3295
 - 5. Supplier Deviation Disposition Request, form ED-27
 - 6. General Project Requirements for Purchase Orders, 8031-G-1
 - 7. General Project Requirements for General Welding Requirements for Shop and Field Fabricated Nuclear Service Equipment and Tanks, 8031-G-3A.
 - 8. General Project Requirements for Documentation Required from Suppliers, 8031-G-5.
 - 9. General Project Requirements for Quality Assurance, 8031-G-13
 - 10. General Project Requirements for Design Assessment and Qualification of Seismic Category I Equipment and Equipment Supports for Seismic and Hydrodynamic Loads, 8031-G-19
 - 11. Quality Surveillance Requirements
 - 12. ASME Section III Procedural Requirements
 - 13. Allowable Reactions on Equipment Nozzles and Drains
 - 14. Accumulator Tank Data Sheets (3 Pages)
 - 15. Material Specification
 - 16. Design Accelerations
 - 17. Allowable Reactions on Equipment Nozzles

DESIGN SPECIFICATION
FOR
ACCUMULATOR TANKS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

PREFACE

This Design Specification consists of design information as prescribed by Section III of the ASME Codes and of design information that is not specifically related to the Code. Of necessity, the two categories are interspersed.

For those primarily concerned with ASME criteria, such as enforcement authorities, reference should be made to Attachment No. 1, "ASME Criteria Locator", which identifies that information prescribed by the Code.

TECHNICAL SPECIFICATION
FOR
ACCUMULATOR TANKS
FOR THE
LIMERICK GENERATING STATION
NOS. 1 AND 2 UNITS
PHILADELPHIA ELECTRIC CO.
PHILADELPHIA, PENNSYLVANIA

SPECIFIC CONDITIONS

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1.0 SCOPE

1.1 General

- a. It is not the intent to specify herein all details of design and construction. It shall be the responsibility of the Seller to ensure that the equipment has been designed and fabricated in accordance with all engineering codes, standards, and governmental regulations applicable to the specified service.
- b. The work done by the Seller shall include all necessary design, development, analysis, drawings, shop fabrication and testing, inspection and shipment.
- c. The Seller shall have full responsibility for compliance with the requirements of the Specification. Review and/or approval of drawings, data or specifications by the Buyer with regard to general design and controlling dimensions does not constitute acceptance of any designs, material or equipment which will not fulfill the functional or performance requirements established herein.
- d. This specification describes the requirements for Units 1 and 2.

1.2 Work Included

The work covered by the Specification shall include, without being limited to the following items:

- a. Accumulator tanks with support brackets that will function as a storage for instrument gas or compressed air for Main Steam Relief Valve or Main Steam Isolation Valve operation. The types and quantity of accumulators required are:
 - (i) 8ea 35 gallon (min.) MSIV accumulator tanks as shown by Accumulator Tank Data Sheet 1 of 3.
 - (ii) 8 ea 105 gallon (min.) MSIV accumulator tanks as shown by Accumulator Tank Data Sheet 2 of 3.
 - (iii) 10 ea 10 gallon (min.) MSRV accumulator tanks as shown by Accumulator Tank Data Sheet 3 of 3.
- b. Duplicate Nametags

1.3 Work Not Included

The buyer will furnish the following:

- a. Unloading, inspection and storage at jobsite.
- b. Erection labor.
- c. Foundations and anchor bolts.
- d. Labor and material for field connection of all services to and from Seller's equipment.
- e. The buyer will design and fabricate the accumulator support structures.

2.0 CODES AND STANDARDS

- a. The equipment, structures and components specified herein shall conform in all respects with applicable federal, state and local laws and regulations.
- b. The design, manufacture, examination, testing and inspection of the accumulators shall be in accordance with the ASME Boiler and Pressure Vessel Code, Section III, for Class 3 Nuclear Power Plant Components.
- c. The applicable standards and specifications, latest editions including addenda, of the following agencies shall apply to the design, construction and performance of the equipment supplied to the Specification. Latest issue of specifications, standards and codes means the issue, including latest published addenda, in force at date of purchase order. Adoption of any subsequent issue shall be subject to the Buyer's approval. The application of any published case ruling or interpretation without prior specific approval by the Buyer is prohibited.
 1. American Society of Mechanical Engineers, ASME Nuclear Power Plant Components, Section III, Class 3.
 2. American Society for Testing and Materials, ASTM
 3. Deleted
 4. ASME Welding and Brazing Qualifications, Section IX.

5. Occupational Safety and Health Act, OSHA
6. American National Standards Institute (ANSI):
 - (i) B16.25 Butt Welding Ends
 - (ii) N45.2.2 Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants
7. Deleted

- d. Should conflict between statutes, codes, standards and specifications exist, the more stringent requirements as determined by the Buyer shall govern. Such conflict shall be brought to the Buyer's attention in writing for disposition.

3.0 CONDITIONS OF SERVICE AND PERFORMANCE

3.1 General

- a. These accumulators function as a storage supply of pressurized air or nitrogen sufficient for several activations of an associated pneumatic operator, without replenishment from the compressed air system. All accumulator tanks are required for safe shutdown of the facility in the event of a faulted condition.

The accumulator tanks shall be designed for the following ambient temperature and pressure conditions. All of the MSRV accumulators are located in the drywell. The MSIV accumulators are located both in the drywell and the steam tunnel as noted below and shall be designed for the most severe conditions:

Ambient Conditions

Drywell - (inerted with nitrogen to 4% O₂ during operation & a normal atmosphere during shutdown). Applies to all the MSRV accumulators, and four MSIV accumulators per unit.

Normal Operation

Average Temperature	135°F
Average Pressure	.75 psig
Maximum Temperature	150°F
Maximum Pressure	2.0 psig

Abnormal Operation

Maximum Pressure during small steam leak	55 psig
Maximum Temperature during small steam leak	340°F

Maximum Pressure during LOCA 55 psig
 Maximum Temperature during LOCA 300°F

Steam Tunnel

The following conditions apply to the four MSIV accumulators per unit that are located in the steam tunnel:

Normal Operation

Maximum Temperature 120°F
 Maximum Pressure 0 psig

Abnormal Operation

Maximum Pressure during main steam line break 10.2 psig
 Maximum Temperature during main steam line break 314°F

3.2 Conditions of Service

- a. The accumulators shall be able to withstand an accumulated dose of 6.39×10^7 Rads Gamma, 1.8×10^{14} rads neutron, and 1.18×10^9 rads beta irradiation.
- b. The accumulator tanks shall be capable of withstanding an external pressure of 70 psig with 0 psig internal pressure.
- c. The accumulator tanks shall be demonstrated capable of withstanding the following loading conditions and associated loading combinations while stresses remain below the allowable stresses.

Condition	Design Loading Combinations	Allowable Stresses
a. Normal	PO + NL + DW	ND-3600
b. Upset	PO + NL + DW +*	ND-3600
c. Emergency	PO + NL + DW +**	ND-3600
c. Faulted	PO + NL + DW +***	ND-3600

Legend: PO - Operating Pressure

NL - Nozzle Loading (Note 1)

DW - Dead Weight

* Envelope of load combinations 1a and 1b as defined in 8031-G-19, Pg. E-Vi

** Load combination 2 as defined on Pg. E-Vi, G-19

*** Envelope of load combinations 3d and 3e as shown on page E-Vi, 8031-G-19

Note 1: Includes OBE and SRV piping loads in the Upset condition and SSE, SRV and LOCA piping loads in the Faulted condition.

- d. Additional environmental conditions are covered in the General Project Requirements for Purchase Orders, Specification 8031-G-1.

4.0 DESIGN AND CONSTRUCTION

4.1 General

- a. Seller's design shall incorporate materials of highest quality selected for the design life of the plant and fabricated to safely withstand the conditions within primary containment.
- b. All shop welding shall comply with General Project Requirements for General Welding Requirements for Shop and Field Fabricated Equipment and Tanks, 8031-G-3A. The delta ferrite content of welding electrodes shall range from 8% to 25%. The Seller (and any sub-contractors) shall prepare written welding procedures in accordance with the requirements of ASME Section IX, and Specification 8031-G-3A. The Seller shall submit the welding procedures and qualification records for review by the Buyer at least 3 weeks prior to fabrication. In addition, the seller shall submit weld rod material certificates with each shipment.
- c. Seller shall prepare written procedures describing the method used to control the receipt, testing, storage, baking, drying, and disbursal of all welding filler material employed in the construction of the accumulator tanks. This filler material control procedure shall be submitted to the Buyer for review prior to performing any welding.
- d. Welding procedures and procedure qualification test records shall be in the form of clear, sharp, reproducible prints and may be submitted on Forms QW-482, QW-483 and QW-484 as shown in the ASME Code, Section IX.

Buyer's inspector will review performance qualification records for individual welders.

- e. Seller's design shall comply with General Project Requirements for Purchase Orders, 8031-G-1 Rev. 11.
- f. The accumulator pressure retaining boundaries shall be designed, fabricated, tested and stamped as a part of a piping system, in accordance with ASME Section III, Class 3. These parts are classified as flow control devices, as defined in NCA-1273.
- g. The accumulators shall be equipped with supports. The required orientation is shown on the accumulator tank data sheets. These supports shall be designed according to ASME Section III Class 3 requirements, including requirements for Component Supports, Subsection NF, and paragraph ND-3111 of subsection ND.
- h. Each accumulator is equipped with only one drain, as shown on the accumulator tank data sheets.
- i. Major repairs shall not be made on any components without Buyer's consent. All repairs shall be fully documented, and approved by the buyer.
- j. Excess weld metal and spatter on interior or exterior surfaces shall be removed by grinding. Sharp edges shall be ground to a minimum radius of 1/8 inch.
- k. The seller shall submit his ASME Certificate of Authorization prior to fabrication.
- l. Results of the stress analyses shall be provided in a stress summary, to be submitted to the buyer prior to fabrication.
- m. Deleted

4.2 Drawings and Data

Seller shall submit drawings and data in accordance with Document Requirements, Form 8031-DR, Attachment 2.


- a. Seller shall submit outline and dimension drawing(s). These drawings shall include as a minimum:
 - 1. Key dimensions including head and shell thicknesses
 - 2. Materials of construction

3. Identification and design data including design and operating pressures, design and operating temperatures
 4. Accumulator tank weight and capacity
 5. Position and type of welds with identification of the type of examination to be performed and the weld procedure to be used.
 6. Accumulator tank cross section with the parts list and material designation.
 7. Proposed mounting bracket design and position on accumulator.
- b. Seller shall complete the accumulator tank data sheets in Attachment 14 of the Design Specification, and submit them prior to fabrication. If any subsequent changes are made, seller shall submit revised copies of each data sheet with each shipment of accumulators.
- c. Corrosion allowances are given on the accumulator tank data sheets, Attachment 14.

4.3 Materials of Construction

- a. The accumulators and their supports shall be made of ASME designated material. Certified mill test reports shall be obtained for all pressure retaining and structural components, and certified copies submitted with each shipment. Material codes and standards are summarized in Section 2.0.
- b. These accumulators will be made of type 304L austenitic stainless steel, meeting the ASME Boiler and Pressure Vessel Code requirements for Section III, Class 3 components. Additional material specifications are provided in attachment 15.

4.4 Nozzles and Connections

- a. All nozzles and connections shall meet the requirements of ASME Section III, Class 3.
- b. Allowable reactions on equipment nozzles and drains are shown in Attachment 13. Attachment 17 may be used in the calculation of nozzle forces and moments, to avoid considering peak forces and moments simultaneously. 

4.5 Seismic

The accumulator tanks, together with mounts, shall satisfy Seismic Category 1 design requirements. They shall be designed in complete accordance with Specification 8031-G-19, General Project Requirements for Design Assessment and Qualification of Seismic Category 1 equipment and Equipment Supports, for Seismic and Hydrodynamic loads.

The applicable accelerations are provided in Attachment 16. Supplier shall submit an outline describing the methods to assure compliance with the seismic and hydrodynamic requirements. As described in G-19, Section 10, the supplier shall submit the Qualification Summary of Equipment form in G-19, and an Analysis/Testing Qualification Report.

4.6 Design Life

The accumulator tanks shall be designed for a forty-year useful life.

5.0 INSPECTION AND TESTS

- a. The Seller shall conduct and be responsible for the shop tests called for in these specifications as well as in the applicable codes and standards, and shall furnish all facilities necessary for the performance of such tests. Prior to fabrication he shall submit, for approval, testing procedures that meet ASME Section III Class 3 code requirements.
- b. Impact testing is not required.
- c. The Buyer's and Owner's representatives shall be given full access to the shop at any time during working hours while the equipment is being manufactured. Buyer's representative may request notification from Seller for intermediate inspections of fabricated work. A final inspection will be made by the Buyer's representative before each item is shipped.
- d. Radiography (100% RT), meeting ASME Section III Class 3 code procedures, shall be performed on longitudinal seam welds, and shell to cap welds. NDE procedures on accumulator supports, nozzles, and drains shall meet ASME Section III Class 3 requirements. The procedures used shall be submitted for buyer approval prior to use. NDE Test results shall be forwarded with each shipment.
- e. The Seller shall give the Buyer at least 5 working days notice prior to testing so that arrangements can be made to have an authorized representative of the Buyer present to witness the tests.
- f. The Seller shall be responsible for proper protection of equipment to prevent damage during testing and shall bear all repair or replacement cost of any item directly or indirectly damaged as a result of the tests.
- g. Witness and hold points, as discussed in the Quality and Surveillance Requirements (Attachment II), shall be observed.

- h. The accumulator tanks shall be hydrostatically pressure tested in accordance with the applicable code requirements. Test results of each item should be reported on a Hydrostatic Test Results sheet, and submitted with each shipment.

6.0 PAINTING, IDENTIFICATION AND SHIPMENT

Stainless Steel accumulator tanks shall not be painted.

6.1 Nameplate

Each accumulator shall be provided with a permanently attached stainless steel nameplate. In addition to the requirements of ASME Section III, paragraph NCA-8220, the following information shall be on the nameplate:

Buyer's Equipment Tag No.
Buyer's Purchase order number
Test pressure

6.2 Shipment

- a. Seller shall prepare all articles for shipment in such a manner that they will be protected from any damage in handling and transit. Seller shall be responsible for any damaged equipment due to improper preparation for shipment. All openings shall be capped or covered to prevent the entry of foreign material and moisture. Threaded ends and furnished machine surfaces shall be protected. Seller shall satisfy ANSI N45.2.2 (Level D).
- b. All internal surfaces shall be thoroughly degreased prior to shipment. A cleaning and preparation for shipment procedure document must be submitted to the buyer 3 weeks prior to fabrication.
- c. The equipment shall be suitably protected against damage from handling and weather in transit, and shall be stored in a warehouse.
- d. Any material shipped loose shall be identified with durable tags securely attached, giving order number, equipment tag number and the equipment it is intended for.
- e. Each container shall have a complete packing list attached to the outside of the container in a weather proof envelope.

- f. Shipment of equipment and components from Seller's shop to the jobsite without specific release by Buyer's inspector is not permitted.
- g. The Seller shall submit instructions for handling, storage and preserving of equipment at the jobsite.

7.0 GUARANTEE

The guarantee requirements are defined by the Warranties-Guarantees section, paragraph 8 of the General Conditions of the Purchase Order, and supplemented by notes, if any, in the Purchase Order.

8.0 QUALITY ASSURANCE

8.1 General

- a. The Seller shall establish and maintain a quality assurance program throughout all phases including design, fabrication, construction, inspection, tests and shipment in accordance with the applicable requirements of General Project Requirements, 8031-G-13. A Quality Assurance Manual, detailing how the seller plans to conform to the quality assurance program, must be submitted and approved before fabrication on the accumulators begins.
- b. Work on the design and manufacture of the equipment shall commence only after the Seller has received the Buyer's final approval of his quality assurance program.
- c. The Buyer's and Owner's representatives shall have free access to all work locations. They shall have the authority to stop work or reject shipment in accordance with 8031-G-13, if any of the requirements for quality assurance have not been fulfilled.

8.2 Documentation

- a. The Seller shall generate and maintain all quality control records throughout all phases of the work from inception to completion. These records shall be made available for examination by the Buyer's and Owner's representatives in accordance 8031-G-13.

The Buyer's representative will not approve release of equipment for shipment from the Seller's shop unless:

- 1. All Engineering Documentation and Procedures required to be submitted for approval prior to

fabrication and/or shipment has been entirely submitted and approved by the Buyer in accordance with Documentation Requirements, Form 8031-DR.

2. All Quality Records documentation required to be submitted for approval prior to final payment is available and has been prepared as a final documentation package for transmittal to the Buyer in accordance with Documentation Requirements, Form 8031-DR.
- c. Seller shall comply with General Project Requirements for Documentation Required from Suppliers, 8031-G-5 Rev. 5, except that the reproduction quality requirements of documents other than drawings, shall be as follows:
 1. Documents shall be completely legible copies made from the original.
 2. Final reproduction shall be a black or white contact print on Vellum (translucent paper) made from the original.
 3. Sepias will not be accepted for final submittals.
- d. The Seller shall submit a completed Statement of Conformance, Form 3295, Attachment 4, with each shipment.
- e. The manufacturer shall certify to his compliance with requirements of the code in accordance with paragraph NCA-3600 of ASME Boiler and Pressure Vessel Code, Section III.
- f. NPT-stamping is required in accordance with Paragraph NCA-8232 of ASME Section III.

9.0 TECHNICAL DATA

- a. These specifications are not intended to be restrictive and the Seller may offer modifications in design of equipment if, in his judgement, such modifications will better serve the specified service requirements. However, any and all proposed changes shall be subject to Buyer's review and approval prior to incorporation in the design.
- b. A Supplier Deviation Disposition Request form (SDDR), Attachment 5, should be filled out by the Supplier to request a deviation from the technical requirements contained in approved procuring documents.
- c. Technical data is shown on the accumulator tank data sheets, Attachment 14.


Attachment 2

DOCUMENT REQUIRED . . . (SEE COL. 6)

F = PRIOR TO FABRICATION
S = PRIOR TO SHIPMENT
C = PRIOR TO BALANCE OF PAYMENT (FINAL
CERTIFIED COPY REQUIRED)
Z = WITHIN 48 HOURS OF SHIPMENT

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION		DOCUMENTATION REQUIRED REFER TO SPECIFICATION 8031-G-5														
		DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE									
							1	2	3	4	5	6	7	8	9	10
							DOCUMENT CODE	REQ	ACT CODE	TECH. SPEC. REF.						
1.0	Engineering Documentation															
1.1	General	Analysis Qualification Rpt.					M D - 5 4	F	- 1	4.5						
		Qualification Summary of Equipment (SQRT)					M D - 5 4	F	- 1	4.5						
		ASME Certificate of Authorization					M D 3 5 2	F	- 1	4.1k						
		Deleted														
		Completed Bechtel Data Sheets					M D - 5 2	F	- 1	4.2b						
		Stress Analysis Calculations					M D - 6 1	F	- 1	4.1 l						
		Deleted														
1.2	In addition to requirements listed in Column 6, one complete set of the documents of this section shall be submitted & annotated "Certified As-Built" when each piece of equipment is shipped.	Outline Dimensions					M D - - 1	F	- 1	4.2 a						
		Cross Section with parts List and Material Designation					M D 3 0 2	F	- 1	4.2 a						

ENGINEERING DOCUMENTATION (I.E. ENGINEERING DATA AND PROCEDURES) SPECIFIED TO BE SUBMITTED FOR APPROVAL SHALL NOT BE USED UNTIL SUCH DOCUMENTATION HAS RECEIVED A CODE 1, 2, OR 3 APPROVAL.

FORM 8031 DR	 BECHTEL POWER CORPORATION	ACCUMULATOR TANKS	JOB NO. 8031	
		PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2	ATTACHMENT TO REQUISITION NUMBER 8031-M-170 Sheet 1 of 3	REV. 2

DOCUMENTATION REQUIREMENTS DISTRIBUTION AND ACTION

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)

- 1 = APPROVAL } BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Attn. R. Elias, Project Engineer
- 2 = INFO/REVIEW } BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
Attn. J.R. Reiney, Jr., Field Construction Manager
- 3 = APPROVAL
- 4 = INFO/REVIEW

DOCUMENT REQUIRED ... (SEE COL. 6)

- F = PRIOR TO FABRICATION
S = PRIOR TO SHIPMENT
C = PRIOR TO BALANCE OF PAYMENT (FINAL
CERTIFIED COPY REQUIRED)
Z = WITHIN 48 HOURS OF SHIPMENT

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED REFER TO SPECIFICATION 8031-G-5													
	DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE								
						1	2	3	4	5	6	7	8	9
						DOCUMENT CODE	REQ CODE	ACT CODE	TECH. SPEC. REF.	10	11	12	13	14
2.0 Procedures A	— Deleted —													
	Quality Assurance Manual					M D	-	8	F	-	18	1	a	
	Cleaning & Preparation for Shipment Procedure					M D	-	9	F	-	16	2	b	
	Instructions for Handling, Storage, and Preservation on Site					M D3	1	1	S	-	16	2	g	
	Non-Destructive Examination Procedures					M D	-	27	F	-	1	5.0	a	
	Qualified Welding Procedures with Welding Procedures Qualification Records					M D	-	1	1	F	-	14	1	b
	Welding Filler Metal Control Procedure					M D	-	1	5	F	-	14	1	c
	Repair Procedure, if Necessary					M D	-	1	8	F	-	14	1	i
	Outline of Procedures for Compliance with Seismic and Hydrodynamic Require- ments					N/A		*			-	14	5	
	Radiographic Examination Procedures					M D	-	4	6	F	-	1	5.0	d
*Submit with Summary of Bid Proposal	Hydrostatic Test Procedures					M D	-	4	1	F	-	15	0	a

ENGINEERING DOCUMENTATION (I.E. ENGINEERING DATA AND PROCEDURES) SPECIFIED TO BE
SUBMITTED FOR APPROVAL SHALL NOT BE USED UNTIL SUCH DOCUMENTATION HAS RECEIVED A CODE 1,
2, OR 3 APPROVAL.

FORM 8031 DR



BECHTEL
POWER
CORPORATION

ACCUMULATOR TANKS

PHILADELPHIA ELECTRIC COMPANY
LIMERICK GENERATING STATION UNITS 1 & 2

JOB NO. 8031

ATTACHMENT TO
REQUISITION NUMBER

8031-M-170
Sheet 2 of 3

REV.

3

DOCUMENTATION REQUIREMENTS DISTRIBUTION AND ACTION

Attachment 2

ACTION REQUIRED & DESTINATION (SEE COL. 7 & 8)


- 1 = APPROVAL { BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3965, SAN FRANCISCO, CA. 94119
Attn. R. Elias, Project Engineer
- 2 = INFO/REVIEW { BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
Attn. J.R. Reiney, Jr., Field Construction Manager
- 3 = APPROVAL {
- 4 = INFO/REVIEW {

DOCUMENT REQUIRED ... (SEE COL. 6)

- F = PRIOR TO FABRICATION
S = PRIOR TO SHIPMENT
C = PRIOR TO BALANCE OF PAYMENT (FINAL
CERTIFIED COPY REQUIRED)
Z = WITHIN 48 HOURS OF SHIPMENT
(I) = INSPECTOR RELEASE REQUIRED

PARTS OF EACH ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF REQUIRING DOCUMENTATION	DOCUMENTATION REQUIRED REFER TO SPECIFICATION 8031-G-5													
	DOCUMENT TITLE					DOCUMENTATION DISTRIBUTION & ACTION CODE								
						1	2	3	4	5	6	7	8	9
						DOCUMENT CODE	ACT CODE	TECH. SPEC. REF.						
3.0 Quality Records One complete set of the documents of this section shall be submitted with each shipment	Weld Rod Material Certificates (I)					M D-	1 6 C	-3 4.1 b						
	Certified Mill Test Reports (I)					M D-	1 7 C	-3 4.3 a						
	Certified Repair Reports, if necessary (I)					M D-	1 9 C	-3 4.1 i						
	Non-Destructive Examination Results (I)					M D-	2 8 C	-3 5.0 d						
	Hydrostatic Test Results (I)					M D-	4 2 C	-3 5.0 h						
	Statement of Conformance (Form 3295) (I)					M D-	6 5 C	-3 8.2 d						
	ASME Code Data Report (I)					M D-	6 3 C	-3 8.2 e						
	Radiographic Examination Results (I)					M D-	4 7 C	-3 5.0 d						

ENGINEERING DOCUMENTATION (I.E. ENGINEERING DATA AND PROCEDURES) SPECIFIED TO BE
SUBMITTED FOR APPROVAL SHALL NOT BE USED UNTIL SUCH DOCUMENTATION HAS RECEIVED A CODE 1,
2, OR 3 APPROVAL.

FORM 8031 DR	 BECHTEL POWER CORPORATION	ACCUMULATOR TANKS PHILADELPHIA ELECTRIC COMPANY LIMERICK GENERATING STATION UNITS 1 & 2	JOB NO. 8031	ATTACHMENT TO REQUISITION NUMBER 8031-M-170 Sheet 3 of 3	REV. 1

STATEMENT OF CONFORMANCE

We certify that the listed equipment and required documentation for same meet the requirements of the purchase order and applicable specifications:

P.O. NO.: _____ REV. _____

SPECIFICATION: _____ REV. _____

PRIME VENDOR: _____

SUPPLIER: _____

ADDRESS: _____

DESCRIPTION OF EQUIPMENT: _____

IDENTIFICATION: _____

a. ITEM NOS. _____

b. EQUIPMENT NOS. _____

c. TAG NOS. _____

APPROVED EXCEPTIONS: _____

Signature (Supplier Representative) _____

Title _____

Date _____

Distribution:

Original: Supplier to transmit to Jobsite

CC: Purchaser's inspector (2)
Supplier

SUPPLIER DEVIATION DISPOSITION REQUEST

FORM

FOR SUPPLIER USE	
Supplier SDDR No.	Date Submitted

NOTE: The reverse side of this form contains the instructions for its preparation and use. Items marked with an asterisk (*) are for Bechtel entries only.

FOR BECHTEL USE	
• Bechtel SDDR No.	• Date Received

Supplier shall complete all blocks 1 through 18 with black ink or typewriter. Use NA for Not Applicable

1. Supplier Name: _____ Address: _____ City & State: _____ Zip: _____				
2. Supplier's Order No.	3. Supplier's Part No.	4. Supplier's Part Name	5. Date Deviation Determined	6. Previous SDDR #s. & Date
7. Bechtel P.O. No.	8. Bechtel Part No.	9. Bechtel Part Name	10. Bechtel Inspector Notified	11. Bechtel Eng. Notified
12. Qty or Serial No.	13. Deviation Description (Attach notes describing deviation)			

[illegible]

14. Supplier's Disposition Classification: ☐ Use As Is ☐ Repair ☐ Modify Bechtel Requirement

10. Proposed Disposition and Technical Justification: (Attach extra sheets, sketches, etc. as necessary)

16. Associated Supplier Document Change (s):

17. Cost Effects:

18. Suppliers Authorized Representative
Signature: _____ Title: _____
Name: _____ Date: _____

19. Bechtel Engr. Action: ☐ Proposed Disposition Accepted ☐ Proposed Disposition Rejected Engr. Follow-up: ☐ Drug Change ☐ Other ☐ Spec/Req. Change ☐ Other Suppliers Affected

20. Briefly Disposition Statement (Including Justification (Attach extra sheets, sketches, etc. as necessary))

Bechtel Acceptance	Date	Verification Signatures	Date
GS _____	_____	22. Supplier _____	_____
PE _____	_____	23. Bechtel Supplier _____	_____
_____	_____	Quality Representative _____	_____

INSTRUCTIONS FOR SDDR FORM

(Use Black Ink or Typewriter)

Attachment 3

This form is used by a supplier to:

- Notify Bechtel of deviations from approved technical requirements and document the supplier's proposed disposition, and with their technical justification
- Record Bechtel's disposition of the SDDR.

A deviation is any departure from the technical requirements of the procuring documents which the supplier proposes to incorporate in the completed item or service provided. Deviation disposition can be classified as Repair, Use-As-Is, or Modify Requirement.

Repair is defined as the process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though that item still may not conform to the original requirement. Repair includes alterations to the properties of the material through heat-treating, welding, metal deposition, chemical processing, etc. This form is not to be used for cases where Bechtel has previously provided authorization to proceed using an accepted repair procedure covering a specific type of repair; however, records must be maintained for each specific repair.

Bechtel's engineering action and disposition statement does not relieve the Supplier from responsibility for the accuracy, adequacy, or suitability of the item or service being provided as defined in the procuring documents, nor does it constitute waiver of the right to renegotiate the terms of the procuring documents.

NOTE: Items marked by an asterisk (*) are for Bechtel use only.

Entry Information

Block No.

- Supplier's name and address. List the order Supplier's name and location (City and State) if applicable.
- Enter the Supplier's order number if one has been assigned.
- Enter Supplier's Part No. as applicable from the drawing, catalog, internal specification, etc. If the Deviation Request applies to all parts and additional space is needed, a list of parts to which the request applies may be attached.
- Enter Supplier's Part Name.
- Enter the date and the method (Spec. review, NDE, electric test, etc.) used to detect the deviation.
- List any previous SDDR's and their dates that have been submitted for deviation request on this Purchase Order.
- Enter the Bechtel Purchase Order Number.
- Enter the technical requirement item, part, tag or code number as it appears in the requisition. If additional space is needed, a separate sheet may be attached.
- Enter the Bechtel Part Name if one has been assigned.
- Enter the date and the method (TWX, letter, etc.) used to notify the Bechtel Supplier Quality Representative.
- Enter the date and the method (TWX, letter, etc.) used to notify Bechtel Engineering.
- As applicable, enter quantities or serial numbers of the item to which the deviation applies. If not serialized, record lot, batch, heat or other applicable identifying information.
- Describe the deviating characteristic and define the extent of the out-of-specification condition for each identified piece affected. Identify the location of the deviating characteristic by print coordinates or specific location, as applicable. Attach extra sheets, photographs, sketches, etc., as necessary.
- Identify disposition classification.
- Describe the proposed disposition and provide technical justification for Bechtel's evaluation. If the deviation is correctable by repair, submit a detailed repair procedure or reference the procedure previously accepted (Level 1) by Bechtel for use in similar situations. Provide Bechtel control number, supplier control number and procedure title.
- Identify the nature of changes that may result on associated supplier documents (drawings, specs., procedures, installation instructions, etc.).
- Enter the cost impact of the subject deviation.
- Enter the name (typed or printed), signature and title of the supplier representative authorizing the disposition request and date signed.
- Enter an X in the applicable boxes.
- Provide appropriate justification for the Bechtel action(s) indicated in Block 19. When changes to drawings, specifications, requisitions, or other Bechtel documents are involved, each document should be identified and the associated change briefly described. If other suppliers are affected, indicate who they are and the document that initiated resolution of that involvement. "Other" follow-up action (e.g., the need for additional Bechtel calculations, additional drawings or sketches, inspection by a Project Engineering representative, etc.) should also be identified here.
- GS - Signature of the responsible Discipline Group Supervisor accepting the Engineering action and the date signed.
PE - Signature of the Bechtel Project Engineer and the date signed.
- Signature of the supplier's inspector or other representative authorized to verify that the accepted disposition was correctly accomplished.
- Signature of the Bechtel Supplier Quality Representative or other representative verifying that the accepted disposition was correctly accomplished.

NOTE: A copy of the completed SDDR form shall be included by the supplier in the QC data package for each item to which it applies.

QUALITY SURVEILLANCE REQUIREMENTS1.0 SCOPE

This attachment describes Bechtel quality surveillance requirements including witness and hold points.

2.0 INITIAL QUALITY SURVEILLANCE VISIT

The Supplier shall furnish to the Bechtel Supplier Quality Representative (SQR) the names and addresses of lower tier suppliers with a description of the work to be subcontracted, when it falls under either of the following categories:

- a. Custom fabricated equipment involving fabrication processes, including examination or testing that will be shipped directly to the Jobsite from the lower tier supplier's plant. This does not include off-the-shelf equipment preengineered and manufactured for stock.
- b. Custom fabricated equipment that will be shipped to the Supplier for further assembly and inspection, but where the fabrication processes, including examination or testing specified to be witnessed are performed at the lower tier supplier's facilities and will not be repeated in the Supplier's shop. This does not include off-the-shelf equipment preengineered and manufactured for stock.

3.0 WITNESS AND HOLD POINTS

3.1 Witness and hold points are critical steps in manufacturing and testing to be observed by the SQR. The Supplier shall notify the SQR at least five (5) working days in advance of the start of operation/test to be witnessed. The Supplier may proceed with the work past a witness point if the SQR is not available at the appointed time. The Supplier may not proceed with the work past a hold point except by a written waiver/agreement by the Bechtel SQR. Final release prior to shipment is a mandatory hold point.

3.2 Quality surveillance shall include, but not be limited to the witness and hold points listed in Table 1. Additional witness and hold points may be established by the SQR with mutual agreement of the Supplier.

4.0 ENGINEERING/QUALITY VERIFICATION DOCUMENTS

The Supplier shall provide evidence to the SQR that all documents requiring project engineering review have review status Code 1 or 2 prior to release for shipment. The 8031-DR Form shall be used as a cover sheet for the quality verification documentation as the package is presented to the SQR for review and sign-off prior to release for shipment.

Quality Plan
8031-M-170

Witness Points

<u>Tank Part or Assembly</u>	<u>Operation, Test, or Examination</u>
Pressure boundary parts and welds	In process nondestructive examination on a first operation basis for each examination required by the procurement documents and referenced codes and standards.
Welds	Fit-up and welding on a first operation basis for each Bechtel approved procedure.
Welds	Post-weld heat treatments on a first operation basis for each Bechtel approved procedure.
Weld Rod Control	Review testing, storage, baking and drying of welding filler materials.
Pressure boundary parts and welds	Major weld repairs

Hold Points

<u>Tank Part or Assembly</u>	<u>Operation, Test, or examination</u>
Welds	Review and signoff of all completed radiographs
Assembled vessel	Hydrostatic testing
Completed vessel	Final inspection for materials of construction, dimensions, general workmanship, cleanliness, marking, tagging and preparation for shipment
Supplier's quality verification documents	Review and signoff for completeness and accuracy.

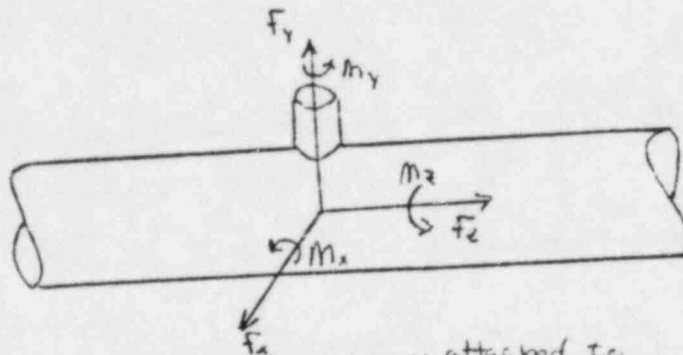
DESIGN SPECIFICATION
FOR
ACCUMULATOR TANKS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY
ASME Section III

Procedural Requirements

1.0 Data Report

The manufacturer shall send one copy of the Data Reports directly to his authorized inspector, two copies (one reproducible) to the Bechtel project engineer, and two copies to the Buyer's Field Construction Manager. One of the latter copies will be sent to the enforcement authority at the jobsite.

Allowable Reactions on Equipment Nozzles and Drains



*Secondary load term includes sustained loads. Δ axis orientation for nozzles attached to cylindrical sections of vessels & Heat Exchangers
For 1" drains, and for

1" Nozzles Connecting to 1" Sch. 40 S Pipe

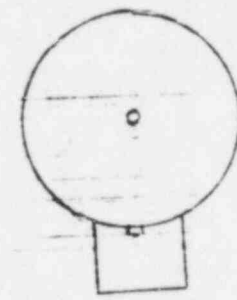
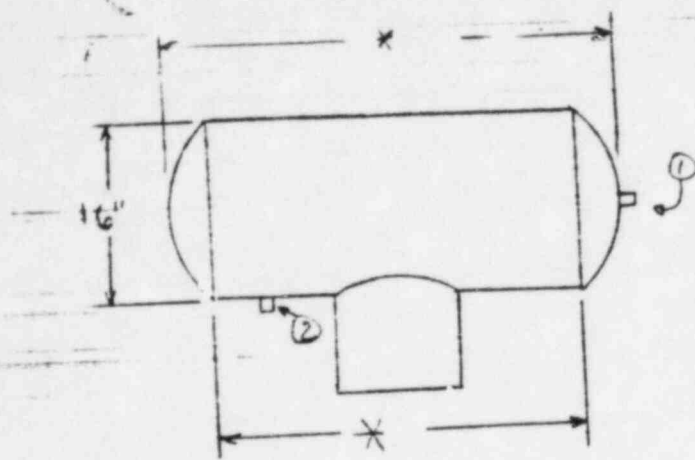
ASME Section III Piping	F_x	F_y	F_z	M_x	M_y	M_z
Loading Condition	Lb	Lb	Lb	ft-Lb	ft-Lb	ft-Lb
Normal	487	244	487	175	280	175
Upset	584	293	584	210	337	211
Emergency	877	438	877	316	505	316
Faulted	1168	584	1168	421	673	421
* Secondary	949	474	949	342	546	342

For 1 1/2" Nozzles connecting to 1 1/2" Sch. 40 S Pipe

ASME Section III Piping	F_x	F_y	F_z	M_x	M_y	M_z
Loading Conditions	Lb	Lb	Lb	ft-Lb	ft-Lb	ft-Lb
Normal	663	332	663	299	477	299
Upset	796	398	796	358	573	358
Emergency	1194	598	1194	537	860	537
Faulted	1592	796	1592	716	1147	716
* Secondary	1293	647	1293	582	931	582

MSIV Accumulators
A. Nozzle Size 1 1/2"
B. 1 1/2" Connecting Pipe thickness

MSRV Accumulators
A. Nozzle Size 1"
B. 1 1/2" Connecting Pipe thickness



One example of a support bracket. (Actual design by supplier)

1. 1 1/2" Air Inlet/Outlet
2. 1" Drain

35 Gallon Accumulators (Outboard)

The supplier's mounting bracket shall be located on the same side of the tank as its drain, as illustrated in the figure.

NOZZLE AND BOSS LOCATIONS ARE SCHEMATIC ONLY. FINAL ARRANGEMENT WILL BE MARKED ON VENDOR'S DRAWINGS.

SHELL: MTL/THICKNESS HEAD: MTL/THICKNESS INTERNALS (TRAYS ETC.) INSUL CLIPS?	304LSS/* (.25" min) 304LSS/* (.25" min) NONE NONE Capacity 35 gallons (min)	APPLICABLE CODE OPERATING PRESS (PSIG)/TEMP (F) DESIGN PRESS (PSIG)/TEMP (F) S.V. SETTING/HYDRO TEST PRESS CORROSION ALLOWANCE FLANGE RATING/FACING (ASA STD) FITTINGS RATING JOINT EFF: SHELL/HEAD STRESS RELIEVE?/RADIOGRAPH? WIND LOADING EARTHQUAKE BRACING STD. APPURTENANCE DWGS.	ASME Section III Class 3 100 PSIG/150°F 100 PSIG/150°F N/A .002" 1 LB 3000 # Sidel * #/Yes None By Buyer None
Seismic Category I Quality Assurance: ASME section III, Spec. HC-13. Coating System: None Non-Destructive Exam: Radiography on full thickness welds and inspection of welds on flange or support's verticals, and nozzles to verify full butt on III Class 3 requirements. (See section 5.0 D)	MANUFACTURER SERIAL NO WEIGHT: NET/FLOODED (NO NO) (REQ'D NO.) SPEC NO COST CODE	P&ID 8031-M-170 Equipment Tag Nos. used: 1A002A, 1A002E, 1A002G, 1A002H, 1A002I, 2A002A, 2A002B, 2A002C, 2A002D These have been revised to: 1A002E, 1E002F, 1E002G, 2A002H, 2E002I, 2E002J, 2E002K, 2E002L	* Seller Shall Furnish Info.

MR Item 2

ACCUMULATOR TANK DATA SHEET

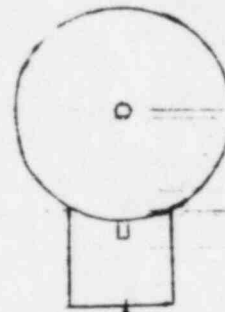
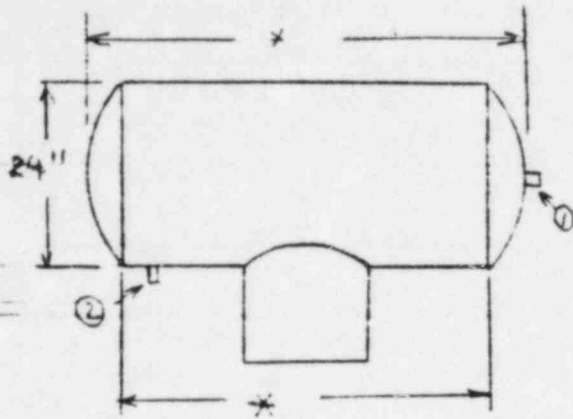
MSIV Accumulators - 35gal.

JOB No	8031	REV.	4
SHEET	1 OF 2		



POWER DIVISION
ENGINEERING

8031-M-170



One example of a
support bracket.
(Actual design by
supplier)

102. Gallon Accumulator:

The supplier's mounting bracket shall be located
on the same side of the tank as its drain.

- ① 1 1/2" Air Inlet/Outlet
- ② 1" Drain

NOZZLE AND BOSS LOCATIONS ARE SCHEMATIC ONLY. FINAL ARRANGEMENT WILL BE MARKED ON VENDOR'S DRAWINGS.

SHELL: MTL/THICKNESS	304LSS / X (.35" min)	APPLICABLE CODE	ASME Section III Div 1
HEAD: MTL/THICKNESS	304LSS / X (.35" min)	OPERATING PRESS (PSIG)/TEMP (F)	100 PSIG / 175 °F
INTERNALS (TRAYS ETC.)	None	DESIGN PRESS (PSIG)/TEMP (F)	100 PSIG / 350 °F
INSUL CLIPS?	None	S.V. SETTING/HYDRO TEST PRESS	N/A
	Capacity - 105 gal. (min)	CORROSION ALLOWANCE	.0024"
	Seismic Category	FLANGE RATING/FACING (ASA STD)	N/A
	Quality Assurance - ASME Section III	FITTINGS RATING	2000# S.W.
	Spec. 8031-G-13	JOINT EFF: SHELL/HEAD	X/X
	Coating System: None	STRESS RELIEVE?/RADIOGRAPH?	X/Yes
	Non-destructive Exam - Radiography	WIND LOADING	None
	on head to shell welds and longitudinal	EARTHQUAKE BRACING	By Buyer
	seam welds, NDE on supports, drains, and	STD. APPURTENANCE DWGS.	None
	nozzles to meet ASME Section III, Class 3	PDS 8031-M-41	
	requirements. (See Section 5.0.0)	Equipment Tag No. Weres	
MANUFACTURER	X	1A001A, 1A001B, 1A001C, 1A001D, 2A001A, 2A001B	
SERIAL NO	X	2A001C, 2A001D	
WEIGHT: NET/FLOODED	X	These numbers have been reviewed to: 1A001A, 1A001B	
(PG NO) (REQ'N NO.)	8031-M-170	1A001C, 1A001D, 2A001A, 2A001B, 2A001C, 2A001D	
SPEC NO	8031-M-170		
COST CODE			

See Part 102.1

* Seller Shall furnish Info.

ACCUMULATOR TANK DATA SHEET

105 Gallon Accumulator - 105 gal.

JOB No 8.31

Spec. 10-170

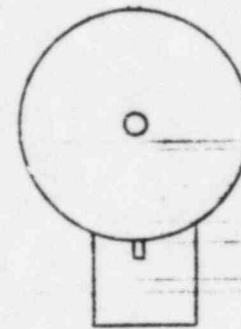
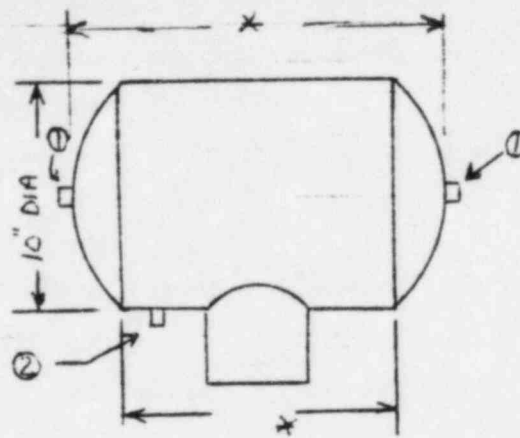
REV.

4

SHEET 2 OF 5



POWER DIVISION
ENGINEERING



One example of a
support Bracket.
(Actual design by
supplier)

- ① 1" Air Inlet/Outlet
② 1" Drain

The suppliers' mounting bracket shall be located on the same side of the tank as its drain, as illustrated in the figure.

NOZZLE AND BOSS LOCATIONS ARE SCHEMATIC ONLY. FINAL ARRANGEMENT WILL BE MARKED ON VENDOR'S DRAWINGS.

SHELL: MTL/THICKNESS	304 LSS/4	APPLICABLE CODE	ASME III Class 3
HEAD: MTL/THICKNESS	304 LSS/4	OPERATING PRESS(PSIG)/TEMP(F)	150 PSIG/150 °F
INTERNALS(TRAYS ETC.)	None	DESIGN PRESS(PSIG)/TEMP(F)	200 PSIG/340 °F
INSUL CLIPS?	None	S.V. SETTING/HYDRO TEST PRESS	NA/4
	Capacity-10gal.(min)	CORROSION ALLOWANCE	.0024"
Seismic Category: I		FLANGE RATING/FACING (ASA STD)	NA
Quality Assurance: ASME III,		FITTINGS RATING	3000 # S.W.
Spec. 8031-G-13		JOINT EFF: SHELL/HEAD	X
Coating System: None		STRESS RELIEVE?/RADIOGRAPH?	X/Y:-
Non-Destructive Exam: Radiography		WIND LOADING	None
on head to shell welds and longitudinal		EARTHQUAKE BRACING	By Buyer
seam welds, NDE on supports, flange and		STD. APPURTENANCE DWGS.	None
nozzles to meet ASME section III class 3		P&ID 8031-M-41	
requirements. (See Section 5.0 D)		Equipment Tag Nos. 1A003M, 1A003K,	
		1A003M, 1A003S, 2A003E, 2A003H, 2A003K,	
		2A003M, 2A003S	
MANUFACTURER	X		
SERIAL NO	X		
WEIGHT: NET/FLOODED	X		
(PO NO) (REQ'N NO.)	8031-M-170		
SPEC NO	8031-M-170		
COST CODE	See M/R Item 2		
		* Seller shall supply info	

ACCUMULATOR TANK DATA SHEET

MSRV Accumulators

JOB No 8031

Spec M-170

REV.

SHEET 3 OF 3



Material Specifications

	PIPE	Large Fittings	Small Fittings
M S I V	*16" Dia. - SA-358, Grade 304L, class 1 *24" Dia. - SA 358, Grade 304L, class 1	16" and 24" Dia.: SA-240, 304L. Note - Pipe caps to be formed per ASME Section III Class 3 code requirements.	1" and 1½" - 3000# Half-coupling or Sock-o-let. SA-182, F304L
M S R V	*10" Dia. - SA-358, Grade 304L, class 1.	10" Dia.: SA-240, 304L Note - Pipe caps to be formed per ASME Section III Class 3 code requirements.	1" - 3000# Half coupling or Sock-o-let. SA-182, F304L.

* SA-312, Grade 304L Seam welded pipe can be used. However, the supplier must verify that the pipe walls are thick enough to satisfy code requirements for pressure design of the piping products using 85% of the maximum allowable stress at the design temperature.

Design Accelerations

Acceleration (g's)

Case & Damping	Horizontal	Vertical
(OBE, SRV - 2%) 1A	1.35g	1.15g
(OBE - .5%) 1B	2.65g	1.15g
(OBE, SRV, SBA - 2%) 2	1.8g	1.2g
(Envelope @ 2%) 3D	1.95g	2.3g
(SSE @ .5%) 3E	1.65g	1.35g

ALLOWABLE REACTIONS ON EQUIPMENT NOZZLES

Attachment
8031-m-170
Sh. 1 of 2

A) EQUIPMENT IDENTIFICATION Accumulator Tanks

B) DATA

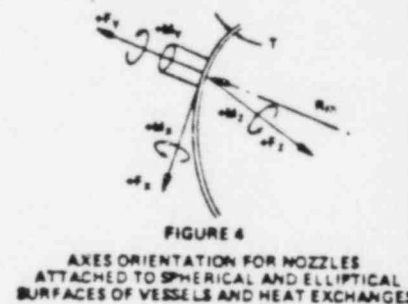
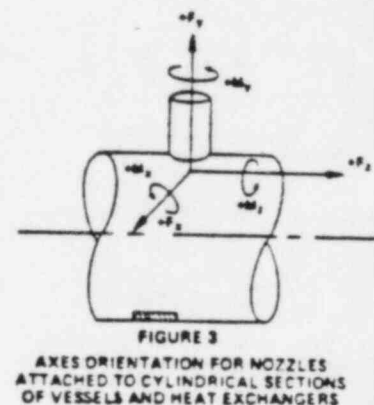
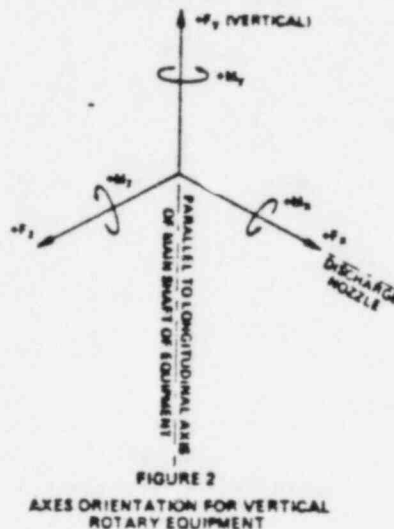
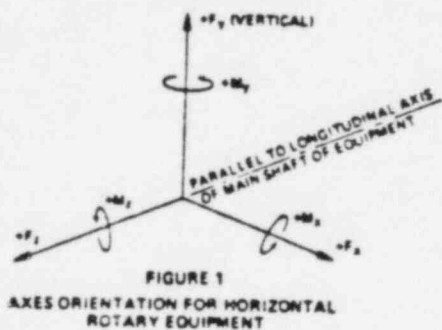
Nozzle size = 1 1/2" in; Connecting pipe thickness = 0.145 in

APPLICABLE CONDITIONS:

C) AXES ORIENTATION

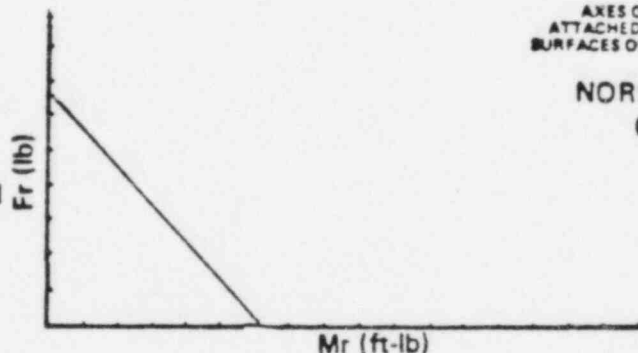
Use Figure No. _____ only.

(All reactions + or -)



D) ALLOWABLE LOADS

$$\frac{Fr}{Fr(max)} + \frac{Mr}{Mr(max)} \leq 1$$



NORMAL OPERATING
CONDITIONS.

$Fr(max) = 663$

$Mr(max) = 600$

$Fr(max)$ = Maximum Resultant force on Nozzle (lb) (due to Normal Operating condition) when all moments are zero.

$Mr(max)$ = Maximum Resultant moment on Nozzle (ft-lb) (due to Normal operating condition) when forces are zero.

E) OPERATING CONDITIONS OTHER THAN NORMAL

To calculate $Fr(max)$ and $Mr(max)$ for other operating conditions the values shown above shall each be multiplied by the following factors.

PRIMARY: Upset = 1.2; Emergency = 1.8; Faulted = 2.4; Dead Load = .267

SECONDARY: Thermal + Anchor Mvt's = 1.5

The components of forces and moments in X, Y, and Z directions shall not exceed the following values:

$$Fx(max) \leq 100\% Fr(max); Mx(max) \leq 50\% Mr(max)$$

$$Fy(max) \leq 50\% Fr(max); My(max) \leq 80\% Mr(max)$$

$$Fz(max) \leq 100\% Fr(max); Mz(max) \leq 50\% Mr(max)$$

EXHIBIT P-2.6.1.11-2
ALLOWABLE REACTIONS
ON EQUIPMENT NOZZLES

ALLOWABLE REACTIONS ON EQUIPMENT NOZZLES

Attachment 17
8031-M-170
Sh. 1 of 2

A) EQUIPMENT IDENTIFICATION Accumulator Tanks

B) DATA

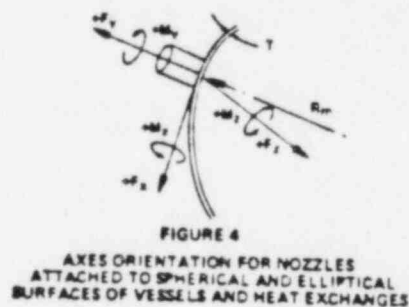
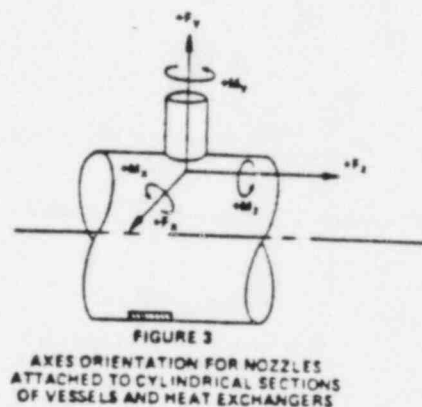
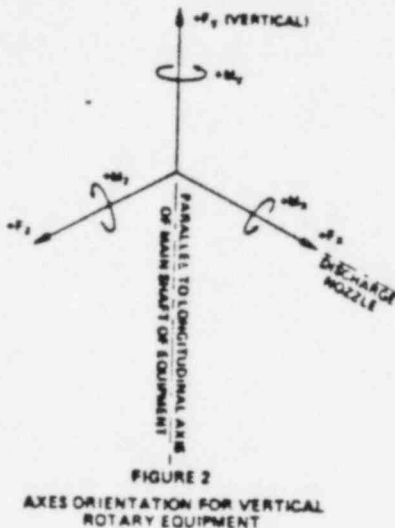
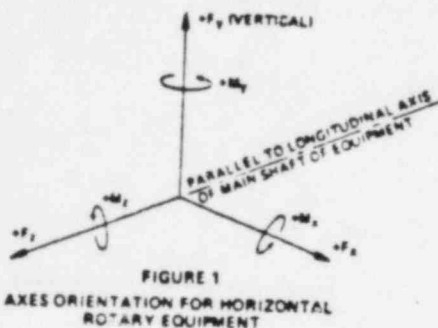
Nozzle size = 1 1/2" in; Connecting pipe thickness = .145 in

APPLICABLE CONDITIONS:

C) AXES ORIENTATION

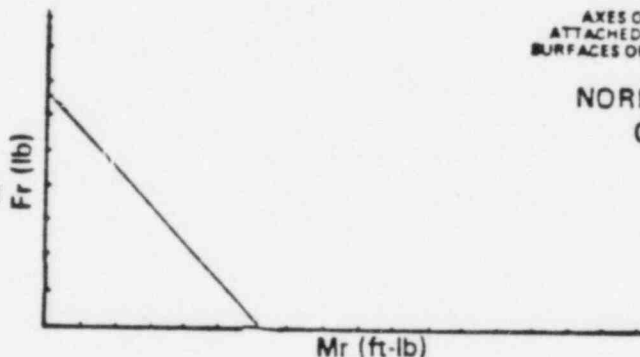
Use Figure No. _____ only.

(All reactions + or -)



D) ALLOWABLE LOADS

$$\frac{Fr}{Fr(max)} + \frac{Mr}{Mr(max)} \leq 1$$



NORMAL OPERATING
CONDITIONS.

Fr(max) = 663 lb.

Mr(max) = 600 ft-lb.

Fr(max) = Maximum Resultant force on Nozzle (lb) (due to Normal Operating condition) when all moments are zero.

Mr(max) = Maximum Resultant moment on Nozzle (ft-lb) (due to Normal operating condition) when all forces are zero.

E) OPERATING CONDITIONS OTHER THAN NORMAL

To calculate Fr(max) and Mr(max) for other operating conditions the values shown above shall each be multiplied by the following factors.

PRIMARY: Upset = 1.2; Emergency = 1.8; Faulted = 2.4; Dead Load = .267

SECONDARY: Thermal + Ancil. or Mvt's = 1.5

The components of forces and moments in X, Y, and Z directions shall not exceed the following values.

Fx(max) < 100 % Fr(max); Mx(max) < 50 % Mr(max)

Fy(max) < 50 % Fr(max); My(max) < 80 % Mr(max)

Fz(max) < 100 % Fr(max); Mz(max) < 50 % Mr(max)

EXHIBIT P-2.6.1.11-2
ALLOWABLE REACTIONS
ON EQUIPMENT NOZZLES

ATTACHMENT 4.
Specification 8031-M-66

SPECIFICATION
FOR
HEATING, VENTILATING AND AIR CONDITIONING
INSTRUMENTS AND CONTROLS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

Bechtel Power Corporation
San Francisco, California

△ 6	1/21/83	Revised and Reissued. Incorporated Additions 1 (FCR M12570F) and 2 (FCR M13850F) to Rev. 5.	DCG DHR	BAP A/M	WCA LOJ	
△ 5	7/14/82	Revised and Reissued Incorporated Addenda 1,2,3,4 Rev. 4	DCG R	BAP A/M	WCA LOJ	7-14-82
△ 4	6/5/80	Revised and Reissued	P/B	M/M	RUE A/M	6-5-80
△ R	4-15-79	Revised and Reissued	P/B	B	RUE A/M	11-15-79
△ 3	1/22/79	Revised and Reissued	DCG P/B	P/B	RUE A/M	12-29-78
△ 2	12-29-78	Revised and Reissued	DCG P/B	P/B	RUE A/M	12-29-78
△ 1	8-10-78	Incorporated Addenda 1 & 2 Rev. 0	DCG P/B	P/B	RUE A/M	8-10-78
	12/16/77	Issued Addendum 2 to Rev. 0	DCG EAT	P/B	RUE A/M	
	11-17-77	Issued Addendum 1 to Rev. 0	DCG EAT	P/B	RUE A/M	
△ 0	9/16/77	Issued for Bids	DCG EAT	P/B	RUE A/M	
△ B	5-26-77	Reissued for Approval	DCG EAT	P/B	RUE A/M	
△ A	7-20-73	Issued for Approval	DCG EAT	P/B	RUE A/M	
NO.	DATE	REVISIONS	APPROVALS			Effectivity Date

SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.
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R	4-15-70	Revised and Reissued	1/3	RHE									
3	1/22/70	Revised and Reissued	1/3	RHE									
2	12-21-69	Issued for Construction	1/3	RHE									
1	8-10-69	Incorporated Addenda 1 and 2 to Rev. 0	1/3	RHE									
0	9/26/67	Issued for Bids	1/3	RHE									
B	5-24-77	Reissued for Approval	1/3	RHE	6	1/15/78	Revised and Reissued	1/3	RHE				
A	7-28-78	Issued for Approval	1/3	RHE	5	7/19/78	Revised and Reissued	1/3	RHE				
NO.	DATE	REVISIONS	BY	CHK'D	APP'D	NO.	DATE	REVISIONS	BY	CHK'D	APP'D		



FACING SHEET
 LIMERICK GENERATING STATION, UNITS 1 & 2
 PHILADELPHIA ELECTRIC COMPANY
 HEATING, VENTILATING AND AIR CONDI-
 TIONING INSTRUMENTS AND CONTROLS

JOB No 8031

8031-M-66
 Sheet i

REV.

6

SPECIFICATION
FOR
HEATING, VENTILATING AND AIR CONDITIONING
INSTRUMENTS AND CONTROLS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 & 2
PHILADELPHIA ELECTRIC COMPANY

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HEATING, VENTILATING AND AIR CONDITIONING

INSTRUMENTS AND CONTROLS

FOR THE

LIMERICK GENERATING STATION

UNITS 1 AND 2

PHILADELPHIA ELECTRIC COMPANY

EXHIBIT "D"

TECHNICAL SPECIFICATIONS

<u>Specification No.</u>	<u>Rev.</u>	<u>Title</u>
8031-M-66	5	Specification for HVAC Instruments and Controls
8031-G-5	5	General Project Requirements for Documentation Required from Suppliers
8031-G-12	15	General Project Requirements for Standard Instruments, Control and Local Control Boards Supplied with Station Equipment.
8031-G-13	8	General Project Requirements for Supplier Quality Assurance
8031-G-14	6	General Project Requirements for Seismic Design and Analysis of Equipment and Equipment Supports
8031-G-18	5	General Project Requirements for Environmental Qualification of Class 1E Equipment Located in Harsh Environment
8031-G-19	2	General Project Requirements for Design Assessment and Qualification of Seismic Category I Equipment and Equipment Supports for Seismic and Hydrodynamic Loads
8031-C-64	12	Specification for Installation of Expansion Type Shell, Wedge and Sleeve Anchors
8031-G-Series		"General Project Requirements" are written for use in Purchase Orders. For the purposes of this subcontract when the term Buyer appears it shall be read as Contractor, and Seller, Vendor, Manufacturer shall be read as Sub-contractor.

SPECIFICATION FOR
HEATING, VENTILATING AND AIR CONDITIONING
INSTRUMENTS AND CONTROLS

1.0 WORK INCLUDED

Design, Fabrication, Delivery, Installation, and Testing of Heating, Ventilating and Air Conditioning Instruments, Controls and Panels and accessories necessary or required for a complete installation.

2.0 WORK NOT INCLUDED

- 2.1 Equipment foundations including anchor bolts.
- 2.2 Wiring and raceways external to the instrument panels and between instruments and panels.
- 2.3 Installation of supports on duct for duct mounted equipment.

3.0 CODES AND STANDARDS

- 3.1 The equipment and components specified herein shall conform to applicable federal, state and local laws and regulations.
- 3.2 The standards and specifications, latest editions including addenda, of the following agencies shall apply to design, construction and performance of the equipment supplied to the Specification. Latest issue of specifications, standards and codes means the issue, including latest published addenda, in force at date of subcontract award. Adoption of any subsequent issue shall be subject to approval.
 - 3.2.1 American National Standards Institute, ANSI
 - 3.2.2 American Society of Heating, Refrigeration and Air Conditioning Engineers, ASHRAE
 - 3.2.3 American Society of Mechanical Engineers, ASME
 - 3.2.4 American Society for Testing and Materials, ASTM
 - 3.2.5 Institute of Electrical and Electronic Engineers, IEEE
 - 3.2.6 Instrument Society of America, ISA
 - 3.2.7 National Electrical Code, NEC

- 3.2.8 American Society for Non-Destructive Testing, ASNT
- 3.2.9 Underwriter's Laboratories, Inc., UL
- 3.3 Should a conflict between codes, standards, and specifications exist, the Subcontractor shall notify the Contractor of such conflict in writing. The more stringent requirements, as determined by the Contractor, will govern.

4.0 DEFINITIONS

- 4.1 Module - Any assembly of interconnected components which constitutes an essential type of identifiable device, instrument or piece of equipment.
- 4.2 Components - Items from which the system is assembled (e.g. resistors, capacitors, wire, connectors, tubing, fittings, valves, diaphragms, transistors, tubes, switches, springs etc.)

5.0 DOCUMENTATION

- 5.1 Subcontractor shall provide submittals and documentation in accordance with the General Project Requirements for Documentation Required from Suppliers Specification 8031-G-5.
- 5.2 All requests for deviations from the Contract Documents shall be submitted to the Contractor on the Contractor's Supplier Deviation Disposition Request, Form ED-27 Rev.2) or an alternative form presenting equivalent information.

Deviation requests from lower tier Subcontractors shall be submitted through the Subcontractor to the Contractor. The Subcontractor's estimate of cost, schedule, availability or other factors affected by the deviation shall be included. All deviations shall be included in the documentation package for the affected item.
- 5.3 Subcontractor shall provide certified schematic wiring or control diagrams with functional description of the control circuitry including electronic modular components.
- 5.4 Subcontractor shall allow approximately 60 days for Contractor review of procedures and drawings.
- 5.5 Subcontractor shall provide parts lists consisting of all circuit components, a generic description of each component and identification of what parts are specially purchased or issued that would require repurchase from a lower tier Subcontractor.
- 5.6 Preliminary Isometric drawings of sensing and pneumatic lines showing routing, separation (if required) and slopes shall be prepared and submitted for approval. After installation, these drawings shall be updated, certified "As-built" and resubmitted.

Rev.

6.0 QUALITY ASSURANCE

6.1 General

All items which are to perform critical functions are designated as "Q" listed on the HVAC Instrument Data Sheets and the QAD Sheets. For such instruments Subcontractor shall establish and maintain a quality control and quality assurance program throughout all phases including design, fabrication, shipment, installation, inspection and testing in accordance with the applicable requirements of General Project Requirements for Supplier Quality Assurance, 8031-G-13.

6.2 Work on the design and manufacture of the equipment shall commence only after the Subcontractor has received the Contractor's final approval of its quality control and quality assurance and inspection programs.

6.3 The subcontractor shall submit plans and procedures for onsite inspection required by its quality assurance program. Such plans and procedures shall include hold points, and shall be subject to approval prior to use.

7.0 CONDITIONS OF SERVICE AND PERFORMANCE

7.1 General

The heating, ventilating and air conditioning instruments and controls will control and monitor the ventilation system in two nominal 1100 MWe boiling water nuclear reactor generating units at one station.

7.2 Operation

Operating conditions for the instruments and controls are as specified on the HVAC Instrument Data Sheets and in the following section. Class 1E equipment should be qualified for these conditions in accordance with Specification 8031-G-18 unless specified otherwise.

7.2.1 Primary Containment (Drywell)

Normal

Temperature	65-150F
Relative Humidity	20-100%
Pressure	0.75 psig
Radiation (integrated over 40 years)	1.80 x 10 ⁷ rads (gamma) 1.8 x 10 ¹⁴ neutrons/cm ² (neutrons)

Accident

Time	Temperature	Relative Humidity	Pressure
0-30 sec.	340F	100%	44 psig
30 sec. -3 hr	340F	100%	37 psig
3-6 hr.	310F	100%	37 psig
6-36 hr.	212F	100%	17 psig
36-288 hr.	212F	100%	10 psig
12 days-180 days	145	100%	4 psig
Radiation (integrated over 6 months)		4.59 x 10 ⁷ rads (gamma)	1.18 x 10 ⁹ Rads (Beta)

7.2.2 Secondary Containment

El. 177' Pump Rooms

Normal

Temperature	65 - 115F
Relative Humidity	50 - 90%
Pressure	-1/4" W.G.
Radiation (integrated over 40 years)	8.46x10 ⁵ rads

Accident (0-180 Days)

Temperature	115F
Relative Humidity	90%
Pressure	Atmospheric
Radiation (integrated over 6 months)	3.97x10 ⁷ rads (gamma)
	1.38x10 ⁶ rads (beta)

Reactor Enclosure (the following room locations will be qualified by the listed parameters:

Rooms 110, 111, 118, 200, 207, 210, 279, 284, 287, 304, 402, 475, 500, 506, 511, 519, 523, 580, 585, 594, 599, 602, 605, 612, 618, 638, 641, 651 & 653)

Normal

Temperature	65 - 104F
Relative Humidity	50 - 90%
Pressure	Atmospheric
Radiation (integrated over 40 years)	3.51x10 ⁴ rads (gamma)

Accident (0-180 Days)

Temperature	120F
Relative Humidity	90%
Pressure	Atmospheric
Radiation (integrated over 6 months)	3.44x10 ⁷ rads (gamma) 1.38x10 ⁶ rads (beta)

7.2.3 Outside Secondary Containment

Control Enclosure
(See Mild Environment - Section 9.7.4 for all areas except SGTS equipment compartment)

Normal

Temperature	
Battery Compartments	88-104F
Other Areas	65-104F
Relative Humidity	
Control Structure Chiller Areas	50-100%
Other Areas	50-90%
Pressure	
Control Room, Auxiliary Equipment Room	+1/4" W.G.
Other Areas	Atmospheric
Radiation (Integrated over 40 Years)	8.78x10 ² rads (gamma)

Accident (0-180 Days)

Temperature	
Cable Spreading Room	105F
Control Structure Chiller Areas	111F
Other Areas	104F
Relative Humidity	90%
Pressure	Atmospheric
Radiation (Integrated over 6 Months)	1.26x10 ² rads (gamma)

Control Enclosure
(SGTS Equipment Compartment)

Normal

Temperature	65 - 104F
Relative Humidity	50 - 90%
Pressure	Atmospheric
Radiation (integrated over a period of 40 years)	8.23x10 ³ rads (gamma)

Accident (0-180 Days)

Temperature	104F
Relative Humidity	90%
Pressure	Atmospheric
Radiation (integrated over 6 months)	3.22×10^5 Rads (gamma)

Diesel Generator and Spray Pond Pumphouse
(See Mild Environment - Section 9.7.4)

Normal

Temperature	65 - 115F
Relative Humidity	50 - 90%
Pressure	Atmospheric
Radiation (integrated over 40 years)	1.76×10^2 Rads (gamma)

Accident (0-180 Days)

Temperature	115F
Relative Humidity	50 - 90%
Pressure	Atmospheric
Radiation (integrated over 6 months)	0 Rads

8.0 STORAGE

- 8.1 The Subcontractor shall provide storage consisting of structurally sound metal buildings or trailers which are weather-tight, well-ventilated, heated, lighted, and protected against theft and vandalism. Storage environment shall be that specified by manufacturer of equipment. Heating shall be by approved hot water or steam unit heaters; American Gas Association-approved gas-fired space heaters; or UL-approved, enclosed, convection-type electric heaters.
- 8.2 Unless otherwise provided, the Subcontractor shall store equipment in its storage.
- 8.3 Storage areas shall provide segregation of materials.
- 8.3.1 The Subcontractor shall maintain an inventory system for all items in storage. Such system shall indicate current stock levels, order points, optimum order quantities, and location of items.
- 8.3.2 Materials and components found to be nonconforming at time of receipt shall be segregated in storage. The Subcontractor shall maintain control of such materials and components until final disposition is determined by the Contractor.
- 8.4 Storage areas shall be protected against fire, rodents, contamination, and uncontrolled access. Subcontractor

shall monitor storage areas to detect and correct loss of protection such as heating.

8.5 The Subcontractor shall perform periodic maintenance on equipment in storage in accordance with approved equipment manufacturer's written instructions, and as required. Such maintenance shall also be performed on all equipment between time of installation and final acceptance by the Contractor. Such maintenance shall be documented.

8.6 Contractor reserves the right to limit the storage of equipment and materials inside the permanent plant buildings, and enclosures.

9.0 DESIGN, FABRICATION, AND INSTALLATION

9.1 General

Manufacturer and model of items indicated on the HVAC Instrument Data Sheets and the substitutions specified in paragraph G12.6 of Specification 8031-G12 are suggested to establish a level of quality, performance, and function. Selection of such items will not relieve the Subcontractor of responsibility of redesign as required by Section 10.4.

Subcontractor shall propose specific components and instruments as necessary to meet the indicated requirements. If a single instrument cannot perform a particular function, multiple instruments that perform the same function may be proposed. Similarly, single devices that perform more than one function may be proposed. Accuracy shall be as defined on the HVAC Instrument Data Sheets.

Hand switches, pilot lights, annunciators, fuses and relays shall be as defined on the Electrical Schematic Drawings. No substitutions will be approved.

9.2 General Requirements

Unless otherwise provided, design, fabrication, and installation shall be in accordance with General Project Requirements for Standard Instruments, Controls and Local Control Boards Supplied with Station Equipment, 8031-G-12, and the Contract Drawings and shall include the following:

- a) Instrumentation, tubing, fittings, valves, wiring and supports internal to local control panels.
- b) Installing tubing, piping, supports, accessories and hardware in accordance with the installation details and Specification for Installation of Expansion Type Shell, Wedge and Sleeve Anchors, 8031-C-64. Additional external supports required for duct mounted instruments in addition to the standard installation detail as shown on Drawings 8031-M-1217 and M-1231 shall be furnished and installed by Subcontractor.

- c) Field mounted instrumentation and pneumatic tubing between control panels and field mounted instruments and between equipment provided by others, e.g. damper and valve operators, and between elements of local loops.
- d) Supply air piping from valved take-offs on the plant instrument air headers. The Contractor will provide a single take-off to supply all required locations within a 50 foot horizontal radius of the take-off. Such take-offs will be provided on each elevation (level) as required.
- e) Filter regulator sets.

9.2.1 Space heaters and telephone jacks specified in paragraph G12.11.4 of Specification 8031-G-12 will not be required. Lighting for wall mounted cabinets as specified in the above reference will not be required.

9.2.2 Wall mounted enclosures as specified in paragraph G12.7.3 of Specification 8031-G-12 shall not be subject to the finish requirements of paragraph G12.8 of Specification 8031-G-12, provided that they shall be repainted if necessary in accordance with paragraphs G12.8.4, G12.8.5 and G12.8.6 of Specification 8031-G-12.

9.2.3 All equipment designated as "Q" listed shall be considered Seismic Category I equipment and shall be subject to the requirements of Section 9.4. In addition, electrical equipment designated as "Q"-listed shall be considered Class 1E equipment and shall be in accordance with General Project Requirements for Environmental Qualification of Class 1E Equipment Located in Harsh Environment, Specification 8031-G-18 and Section 9.7.4 of this specification for Mild Environment.

9.3 Materials

9.3.1 Component materials not specified or shown shall be selected by the Subcontractor.

9.3.2 All major instrument and panel component materials used shall be in conformance with and identified by appropriate ASTM designations. Any non-ASTM standard material used shall be furnished with chemical analysis certificates to AISI, SAE or other nationally recognized standard requirements.

9.3.3 Piping, tubing, fittings and valves for the lines specified below shall be in accordance with the material requirements of Instrument installation details, Dwg. M-830, Sheet G006 or approved equal. All tubing connections shall be compression type Swagelok fittings. No soldered connections shall be used.

9.3.3.1 Class C-5 (Stainless Steel)

- (a) Sensing Lines
- (b) Pneumatic lines external to control panels and designated as "Q" listed on the QAD sheets.
- (c) The valves will be stainless steel and Swagelok connections will be used.

9.3.3.2 Class D-3 (Copper)

Pneumatic lines external to control panels and not designated as "Q" listed on the QAD sheets.

9.4 Dynamic Requirements - Seismic Category I Equipment

- 9.4.1 Unless specified otherwise, equipment designated as Seismic Category I shall be designed for dynamic loadings as defined in paragraphs 9.4.2 and 9.4.3 and shall be capable of operating during and after loadings due to such accelerations in addition to normal operating loads.
- 9.4.2 Seismic Category I Equipment located in the Reactor Enclosure or the Control Structure shall be designed to withstand the loadings described by the applicable RRS Curves of Specification 8031-G-19, General Project Requirements for Design Assessment and Qualification of Seismic Category I Equipment and Equipment Supports for Seismic and Hydrodynamic Loads.
- 9.4.3 Seismic Category I Equipment located in the Diesel Generator Enclosure or the Spray Pond Pump Structure shall be designed to withstand the loadings described by the applicable RRS curves of Specification 8031-G-14, General Project Requirements for Seismic Design and Analysis of Equipment and Equipment Supports.
- 9.4.4 Fulfillment of the above requirements shall be demonstrated either by test or analysis or a combination of both as described in Specification 8031-G-14 or 8031-G-19. Documentation should be submitted in accordance with Section G-14.6 or G-19.10.
- 9.4.5 Control panels designated as Seismic Category I and containing Seismic Category II instrumentation shall be partitioned in such a manner that damage to the Seismic Category II instruments will not impair operation of the Seismic Category I instruments.

9.5 Dynamic Requirements - Seismic Category IIA Equipment

9.5.1 Panels

Seismic Category IIA panels shall be non-Q and shall be constructed and mounted to withstand the applicable Seismic Category I seismic loads for the location given. Hydrodynamic loads need not be considered.

9.5.2 Instruments

Seismic Category IIA instruments shall be purchased as Seismic Category II - Non Q. The mounting or attachment of the instruments shall be designed to withstand the applicable Seismic Category I seismic loads for the location given. Hydrodynamic loads need not be considered.

9.5.3 General

Seismic Category IIA Equipment shall be analyzed by the Supplier as to the adequacy of design for the above requirement. The Supplier shall maintain the calculations in his files.

9.6 Dynamic Requirements - Seismic Category II Equipment

9.6.1 Instruments and panels not designated as Seismic Category I are Seismic Category II. Seismic Category II equipment shall be designed to withstand the

normal operating loads combined with horizontal seismic forces consisting of static forces equivalent to a horizontal acceleration of 0.05g.

9.7 Design Criteria

9.7.1 The instruments, controls and panels shall be suitable for long term, uninterrupted service and a 40 year useful life expectancy. For Class 1E equipment Seller shall provide recommended maintenance interval information as called for in specification 8031-G-18.5.4 for all identified components that have a useful life expectancy of less than 40 years. Minimum design life shall be 5 years.

9.7.2 Equipment shall be designed for an integrated radiation dose, as shown in Section 7.0 of this Specification, for 40 years of normal plus accident operating conditions.

9.7.3 Class 1E Electrical Equipment shall operate satisfactorily at the following voltage and frequency margins during both normal and accident conditions.

9.7.3.1 General

120 \pm 10% volts AC
 208 \pm 10% volts AC
 60 \pm 5% Hz
 120 \pm 10% volts DC (125 VDC nominal)
 240 \pm 10% volts DC (250 VDC nominal)

9.7.3.2 Motors

115 \pm 10% volts AC (120 VAC nominal)
 460 \pm 10% volts AC (480 VAC nominal)
 60 \pm 5% Hz
 on starting +10%, -20% volts AC or DC

9.7.3.3 Solenoids

Same as 9.7.3.1 but to activate:
 +10%, -15% volts AC and DC

9.7.4 Class 1E Mild Environment Application

9.7.4.1 Mild environment is classified as equipment located in an environment with atmospheric pressure, humidity less than 90% maximum with an average of 50%, and a radiation total integrated dose level less than 10^4 rads.



- 9.7.4.2 Equipment located in a mild environment is not required to be environmentally qualified by test, however, dynamic qualification to the appropriate requirements of Section 9.4 is required.

The Seller shall provide a certificate of compliance as specified on the 8031-DRS forms, based on test data and analysis, that the equipment will perform its functional requirements during the environmental conditions specified in Section 7.2.3 and Section 9.7.4.1.

- 9.7.4.3 When the subject equipment is to be installed in an environment as specified in Section 9.7.4.1 these parameters need not be addressed (except for electronic components which may be susceptible to lower radiation thresholds).
- 9.7.4.4 The Seller shall provide a recommended maintenance program to the buyer to ensure that the subject equipment will function for its design life.

9.8 Spare Parts

The Subcontractor shall furnish a list of recommended spare parts.

10.0 TESTS AND INSPECTIONS

10.1 General

10.1.1 Inspection and testing of the control panels shall be in accordance with General Project Requirements for Standard Instruments and Local Control Boards Supplied with Station Equipment, 8031-G-12 unless otherwise specified herein.

10.1.2 Subcontractor shall furnish certified copies of all test results to the Contractor.

10.2 Qualification Tests for Instruments, Controls and Panels

10.2.1 Qualification tests shall be made on one or more units of the same type to verify adequacy of design. Design specification for individual instrument modules as referenced on the HVAC Instrument Data Sheets and in Sections 7.0 and 9.4 of this specification form the basis for test requirements which must be met during qualification testing. The qualification test procedures and results shall be submitted for approval per the 8031-DR-S Forms.

10.2.1.1 Acceptance Test

Each instrument shall be tested for the verification of the anticipated operational function(s). Test data shall indicate the inputs applied and the corresponding output responses of the module. This test shall be performed under the environmental conditions and the power supply and instrument air supply conditions which are specified in each HVAC Instrument Data Sheet. Test results will be recorded on a test data sheet.

10.2.1.2 Pressure Test

Except to meet the requirements of ISA, RP7.1, bubble fluid inspection as specified in Paragraph G12.13.5 of Specification 8031-G-12 will not be required.

10.2.1.3 Certificate of Compliance

The certificate of compliance shall contain the following information:

- a) Equipment title, manufacturer, instrument model number, serial number (if required), project name, tag number, purchase order and its item number.
- b) Subcontractor's acceptance test procedure number used for testing the instrument.
- c) Certification that the instrument model defined by serial number, date code or lot number was tested to the qualification test procedure.
- d) Certification that the instrument was inspected and meets all dimensions of the manufacturer's design specification.
- e) Certification that the instrument has been tagged in accordance with Section 11.2 of this Specification.

10.3 Generic Module Testing

Only one generic module of a family or series need be tested to verify acceptability of the entire family. The data sheets generally identify individual members of such a family. Where significant variations in operational characteristics or span of measurement or control range exist between instruments of the same family the Subcontractor shall qualify the design variations as well. Previously conducted qualification tests may be submitted for review.

10.4 Test Failure

If the test data for any of the above tests prove that performance does not meet the requirements, an additional unit shall be tested for performance within limits. A second test failure performance shall require redesign and re-test.

10.5 Pressure Tests

Tubing external to control panels shall be leak tested in accordance with and shall meet the requirements of ISA, RP7.1, Pneumatic Control Circuit Pressure Test."

11.0 CLEANING AND IDENTIFICATION

11.1 Cleaning

All heating, ventilating and air conditioning instruments, tubing and control panels furnished herein shall be completely cleaned after installation and prior to acceptance by Contractor.

11.1.1 Completely cleaned shall be defined as follows:

11.1.1.1 Instruments and tubing shall be brushed clean or dry wiped clean using cloth wipers.

11.1.1.2 HVAC panel exteriors shall be wiped clean using a mild detergent and water. HVAC panel interiors shall be brushed clean or dry wiped clean using cloth wipers.

11.2 Nameplate

11.2.1 Each panel and remote mounted instrument shall have a metal tag in accordance with Form J-101. Line 2, as shown on the tag, containing the item number does not apply to the M-66 specification and is not required. Each instrument designated as "Q" listed in the HVAC instrument data sheets and each panel designated as "Seismic Class I" on the M-779 panel layout drawings shall be identified on the tag with the letter "Q".

11.2.2 Any instrument that is removed from its panel shall have a temporary tag attached containing the information required by Form J-101 as modified in paragraph 11.2.1.

12.0 SURVEILLANCE INSPECTION, WITNESS AND HOLD POINTS

WITNESS POINTS

Component Part
or Assembly

Operation, Test or Examination

Inprocess Inspection:

Electronic Instrument
and data function
components.

Operational and/or functional
testing as required in G12.13.1

Hold Points

Final Inspection:

Assembled Control Panel

Final inspection for materials
of construction, dimensions,
general workmanship, cleanliness,
marking, tagging and preparation
for shipment.

Supplier's Quality
Verification Documents

Review and signoff for completeness
and accuracy.

WHEN REQUIRED (COL. 6)

F = PRIOR TO FABRICATION
S = PRIOR TO SHIPMENT
I = PRIOR TO INSTALLATION
P = PRIOR TO FINAL PAYMENT
A = AT TIME OF SHIPMENT
T = PRIOR TO TURNOVER

ADDRESS (COL. 7)

1 = BECHTEL POWER CORPORATION
SAN FRANCISCO POWER DIVISION
P.O. BOX 3966, SAN FRANCISCO, CA. 94118
Attn. W.C. McDaniel, Project Engineer


2 = BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
Attn. T.M. Gwin, Field Construction Manager

ADDRESS (COL. 7 CONT.)

3 = BECHTEL POWER CORPORATION
LIMERICK GENERATING STATION
P.O. BOX A, SANATOGA BRANCH
POTTSTOWN, PA. 19464
Attn. M. Greenidge, Subcontracts Administrator

ACTION CODE (COL. 8)

A = FOR REVIEW
B = FOR INFORMATION

ITEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF	DOCUMENT TITLE	DOCUMENT CODE				REQ	ADD	ACT	TECH. SPEC. REF.						
		1	2	3	4				5	6	7	8	9	10	11
1.0 Engineering Documentation															
1.1 Documentation for ALL HVAC instruments and controls	Outline Dimensions and Foundation Requirements (if any)	M	D	-	-	1	F	1	A	-	-				
	Wiring Diagrams ** 	M	D	-	-	6	F	1	A	5.3					
** A deviation is being granted to the seller to commence field modification of existing panels or shop fabrication of new panels prior to the Bechtel approval of the seller's drawings. Any corrections as a result of the review of the seller's drawings shall be incorporated prior to turnover. (Effective 12-3-82)	Completed Bechtel Data Sheets	M	D	-	5	2	F	1	A	-	-				
	Performance Test Results	M	D	-	4	9	C	1	A	G12.13					
	List of Recommended Spare Parts for One Year's Operation, with Prices	M	D	-	-	3	C	1	B	9.8					
	Pressure Test Results	M	D	3	3	5	C	2	A	10.5&G.12.13.5					
1.2 Additional Documentation for HVAC control panels and associated instrumentation	General Arrangement including overall dimensions plus description list of all instruments using Contractor's I.D. numbers.	M	D	3	0	1	F	1	A	G12.15.2					
	When completed, photographs of panels	-	-	-	-	-	S	1	B	G12.15.2					
	"Back of Board" Tubing and Wiring Diagrams	M	D	3	0	8	F	1	A	G12.15.2					
	Cross Section with Fabrication Details	M	D	-	-	2	F	1	A	G12.15.2					
*In addition to the requirements in Col. 6, one complete set of these documents shall be submitted, annotated "Certified As Built" prior to final payment.	Paint Specification and Color Samples	M	D	3	4	3	F	1	A	G12.8.5					
	Electrical Insulating Test Results	M	D	3	4	1	N	1	B	G 12.1 3.4					
	Point to Point Continuity Test Results	M	D	3	3	9	A	1	A	G 12.1 3.4					

ENGINEERING DOCUMENTATION (I.E. ENGINEERING DATA AND PROCEDURES) SPECIFIED TO BE SUBMITTED FOR REVIEW SHALL NOT BE USED UNTIL SUCH DOCUMENTATION HAS RECEIVED A CODE 1, 2, OR 3 APPROVAL.

FORM 8031-OR-5



BECHTEL
POWER
CORPORATION

HVAC INSTRUMENTS AND CONTROLS
DOCUMENTATION REQUIREMENTS
PHILADELPHIA ELECTRIC COMPANY
LIMERICK GENERATING STATION UNITS 1 & 2

JOB
NO. 8031

SUBCONTRACT NUMBER

8031-M-66

-13-

REV.

6

WHEN REQUIRED (COL. 8)

ADDRESS (COL. 7)

ADDRESS (COL. 7 CON'T.)

F = PRIOR TO FABRICATION
 S = PRIOR TO SHIPMENT
 N = PRIOR TO INSTALLATION
 C = PRIOR TO FINAL PAYMENT
 A = AT TIME OF SHIPMENT
 T = PRIOR TO TURNOVER

1 - BECHTEL POWER CORPORATION
 SAN FRANCISCO POWER DIVISION
 P.O. BOX 9965, SAN FRANCISCO, CA. 94119
 Attn. W.C. McDaniel, Project Engineer

2 - BECHTEL POWER CORPORATION
 LIMERICK GENERATING STATION
 P.O. BOX A, SANATOGA BRANCH
 POTTSTOWN, PA. 19464
 Attn. T.M. Gwin, Field Construction Manager

3 - BECHTEL POWER CORPORATION
 LIMERICK GENERATING STATION
 P.O. BOX A, SANATOGA BRANCH
 POTTSTOWN, PA. 19464
 Attn. M. Greenidge, Subcontracts Administrator

ACTION CODE (COL. 8)

A = FOR REVIEW
 B = FOR INFORMATION

ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF	DOCUMENT TITLE	DOCUMENT CODE					REQ	ADD	ACT	TECH. SPEC. REF.					
		1	2	3	4	5				6	7	8	9	10	11
1.0 Engineering Documentation (Cont'd)															
1.3 Additional documen- tation for Seismic Category I instruments and control panels	Dynamic Qualification Report	M	D	-	5	4	F	1	A			1	0	2	
	Isometric Drawings	-	-	-	-	-	N	2	A			5	6		
1.4 IEEE 323 Documenta- tion	Environmental Qualification Report	-	-	-	-	-	F	1	A			G	1	8	3
	Qualified Life	-	-	-	-	-	C	1	B			G	1	8	5
2.0 Procedures															
2.1 General documentation for all HVAC instru- ments and controls	Operation & Maintenance Procedures	M	D	-	1	0	F	1	A			-	-		
2.2 Documentation for HVAC control panels and associated instrumentation	Point to Point Continuity Test Procedures	M	D	3	3	8	S	1	A			G	1	2	1
	Pressure Test Procedures	M	D	3	3	4	S	1	A			G	1	2	1
	Performance Test Procedures	I	D	-	4	8	S	1	A			G	1	2	1
	Electrical Insulating Test Procedures	M	D	3	4	0	F	1	A			G	1	2	1
2.3 Documentation for "Q" listed instru- ments and control panels	Quality Assurance Manual	M	D	-	-	8	F	1	A			G	1	3	2
	Qualification Test Procedures	I	D	5	2	8	F	1	A			1	0	2	

ENGINEERING DOCUMENTATION (I.E. ENGINEERING DATA AND PROCEDURES) SPECIFIED TO BE SUBMITTED FOR REVIEW SHALL NOT BE USED UNTIL SUCH DOCUMENTATION HAS RECEIVED A CODE 1, 2, OR 3 APPROVAL.

FORM 8031 DR-S



BECHTEL
 POWER
 CORPORATION

HVAC INSTRUMENTS AND CONTROLS
 DOCUMENTATION REQUIREMENTS
 PHILADELPHIA ELECTRIC COMPANY
 LIMERICK GENERATING STATION UNITS 1 & 2

JOB
 NO. 8031

SUBCONTRACT NUMBER

8031-M-66

14

REV.

5

WHEN REQUIRED (COL. 6)

F - PRIOR TO FABRICATION
 S - PRIOR TO SHIPMENT
 N - PRIOR TO INSTALLATION
 C - PRIOR TO FINAL PAYMENT
 A = AT TIME OF SHIPMENT
 T = PRIOR TO TURNOVER

ADDRESS (COL. 7)

1 - BECHTEL POWER CORPORATION
 SAN FRANCISCO POWER DIVISION
 P.O. BOX 3065, SAN FRANCISCO, CA. 94119
 Attn. W.C. McDaniel, Project Engineer
 2 - BECHTEL POWER CORPORATION
 LIMERICK GENERATING STATION
 P.O. BOX A, SANATOGA BRANCH
 POTTSTOWN, PA. 19464
 Attn. T.M. Gwin, Field Construction Manager

ADDRESS (COL. 7 CONT.)

3 - BECHTEL POWER CORPORATION
 LIMERICK GENERATING STATION
 P.O. BOX A, SANATOGA BRANCH
 POTTSTOWN, PA. 19464
 Attn. M. Greenidge, Subcontracts Administrator

ACTION CODE (COL. 8)

A = FOR REVIEW
 B = FOR INFORMATION

T = PRIOR TO TURNOVER		Attn. T.M. Gwin, Field Construction Manager													
ITEM, SYSTEM, SYSTEM COMPONENT, ELEMENT, OR PORTION THEREOF	DOCUMENT TITLE	DOCUMENT CODE				REQ	ADD	ACT	TECH. SPEC. REF.						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
3.0 Quality Records															
3.1 Panels	Statement of Conformance (Form 3295)	M	D	-	6	5	N	3	A		-	-	-		
	Certificate of Compliance	M	D	-	-	-	T	3	A	10.2.1.3					
										9.7.4.2					
3.2 Instruments Not in Panels	Statement of Conformance	M	D	-	6	5	N	3	A		-	-	-		
	Certificate of Compliance	M	D	-	-	-	T	3	A	10.2.1.3					
										9.7.4.2					
3.3 Tubing and Hardware	Statement of Conformance	M	D	-	6	5	N	3	A		-	-	-		
4.0 On-Site Inspection	On-site Inspection Plans & Procedures	M	D	-	-	-	N	2	A	6.3					

ENGINEERING DOCUMENTATION (I.E. ENGINEERING DATA AND PROCEDURES) SPECIFIED TO BE
 SUBMITTED FOR REVIEW SHALL NOT BE USED UNTIL SUCH DOCUMENTATION HAS RECEIVED A CODE 1,
 2, OR 3 APPROVAL.

FORM 8031-DR-5



BECHTEL
POWER
CORPORATION

HVAC INSTRUMENTS AND CONTROLS
 DOCUMENTATION REQUIREMENTS
 PHILADELPHIA ELECTRIC COMPANY
 LIMERICK GENERATING STATION UNITS 1 & 2

JOB
NO. 8031

SUBCONTRACT NUMBER

8031-M-66

15

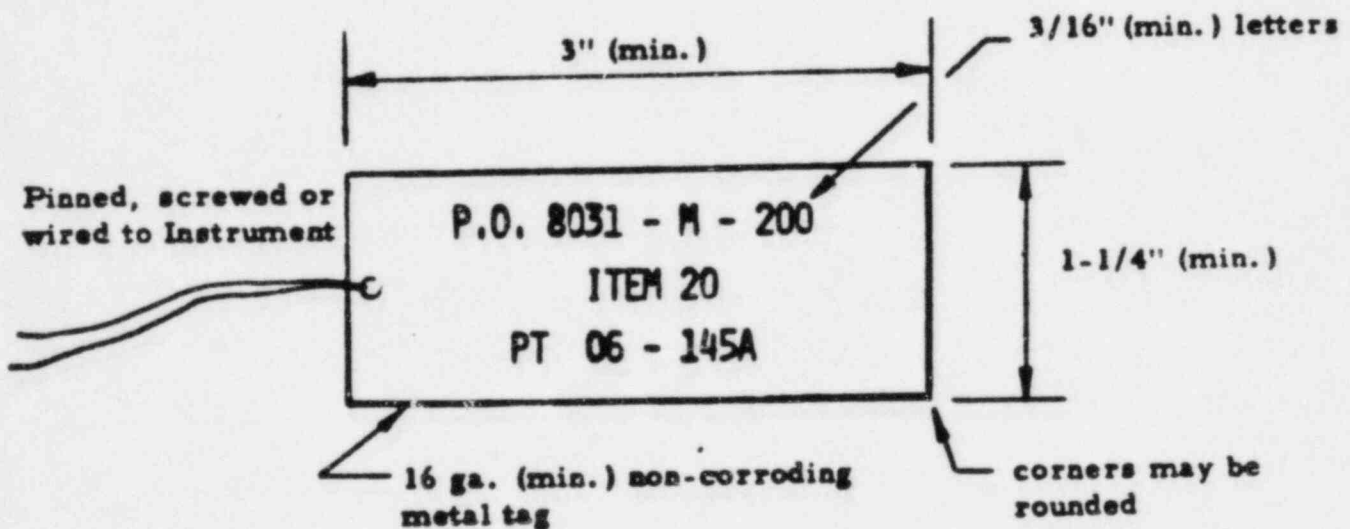
REV.

5

INSTRUCTIONS FOR INSTRUMENT TAGGING

Each instrument, control valve, electrical device and loose accessory shall be tagged with a non-corroding metal tag as shown below and securely affixed by pins, metal screws or wire of a material compatible with the metal tag.

Tagging information shall include the Buyer's Purchase Order number, P.O. item number and Buyer's identification number, stamped on the tag.



(This form is for attachment to material requisitions for instruments, control valves, mechanical package units and equipment containing instruments)

▲							
▲							
▲							
No	DATE	REVISIONS	BY	CHK'D	DESIGN SUPPLY	ENG'G	PROJ ENGR
SCALE		DESIGNED	DRAWN		CHK'D ENGR		
DESIGN P&I Div.			PHILADELPHIA ELECTRIC COMPANY LINERICK GENERATING STATION UNITS 1 & 2			APP No. 8031 Attachment to Requisition No. 8031-M-66	
						REV.	4

Supplier Deviation Disposition Request

NOTE:

1. COMPLETE INSTRUCTIONS ON BACK OF THIS SHEET
2. Items 1-18 below to be completed by supplier
3. Items 19-23 Bechtel entries only
4. Attach additional information whenever necessary

5. Bechtel must be notified within 5 days after detection of deviation
6. A copy of the completed SDDR form shall be included by the supplier in the quality verification data package for each item to which this SDDR applies

FOR SUPPLIER USE		PROJECT		FOR BECTEL USE	
Supplier SDDR No. _____		Date Submitted _____		Bechtel SDDR No. _____	
		JOB NO. _____		Date Received _____	
1. Supplier Name _____		Address _____		City & State _____ Zip _____	
2. Supplier's Order No. _____		3. Supplier's Part No. _____		4. Supplier's Part Name _____	
5. Deviation Detected _____		6. All Previous SDDR (Date's) _____		7. Bechtel P.O. & Rev. No. _____	
8. Bechtel Part No. _____		9. Bechtel Part Name _____		10. Bechtel SQR Notified _____	
11. Bechtel Engrg Noti _____		12. Deviation Description (Attach extra sheets, photographs, sketches, etc. as necessary and identify quantity and serial No.'s as applicable)		13. Suppliers Proposed Disposition <input type="checkbox"/> Use-As-Is <input type="checkbox"/> Repair <input type="checkbox"/> Modify Bechtel Requirement	
14. Cost Impact _____		15. Schedule Impact _____		16. Proposed Disposition and Technical (plus Cost/Schedule if applicable) Justification: Attach extra sheets, sketches, etc. as necessary	
17. Associated Supplier Document Change(s) _____		18. Suppliers Authorized Representative _____		19. Bechtel Engrg. Action _____	
20. Bechtel Disposition Statement Including Justification (Attach extra sheets, sketches, etc. as necessary)		21. Bechtel Acceptance/Signature _____		22. Supplier _____	
23. Bechtel Supplier Quality Representative _____		24. Construction Action Required <input type="checkbox"/> YES		25. Date _____	

INSTRUCTIONS FOR COMPLETING SDDR FORM

(Use Black Ink or Typewriter)

This form is to be used by a supplier to:

- Notify Bechtel when manufactured product or service does not meet established contract requirements and to document the supplier's proposed disposition, with their technical (and where appropriate, Cost/Schedule) justification
- Notify Bechtel when the supplier wants to propose changes to the contract documents unanticipated at time of award
- Record Bechtel's disposition of the SDDR.

A deviation is any departure from the requirements of the procuring documents, which the supplier has incorporated or proposes to incorporate in the completed item or service provided. Deviation disposition can be classified as Use-As-Is, Repair or Modify Requirement.

Repair is defined as the process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though that item still may not conform to the original requirement. Repair includes alterations to the properties of the material through heat-treating, welding, metal deposition, chemical processing, etc. The SDDR form is not to be used for cases where Bechtel has previously provided authorization to proceed using an accepted repair procedure covering a specific type of repair; however, records must be maintained for each specific repair.

Bechtel's engineering action and disposition statement does not relieve the Supplier from responsibility for the accuracy, adequacy, or suitability of the item or service being provided as defined in the procuring documents, nor does it constitute waiver of the right to renegotiate the terms of the procuring documents.

Entry Information

Block No.

- Supplier's name and address — city and state and zip. List same information for lower-tier Supplier's if applicable.
- Supplier's order number if one has been assigned.
- Supplier's Part No(s) as applicable from the drawing, catalog, internal specification, etc.
- Supplier's Part Name.
- Date deviation detected and method used to detect deviation (NDE, dimensional check, visual, etc.).
- List all previous SDDR's (and their dates) that have been submitted for similar deviations requested on this Purchase Order.
- Bechtel Purchase Order Number and Revision Number.
- Bechtel Material Requisition (item, part, tag or code) number(s).
- Bechtel Part Name, if one has been assigned.
- Date and method (TWX, letter, etc.) used to notify the Bechtel Supplier Quality Representative (SQR) whenever Bechtel Quality Surveillance is applicable.
- Date and method (TWX, letter, etc.) used to notify Bechtel Engineering.
- Describe the deviating characteristics and define the extent of the out-of-specification condition for each identified piece affected. Include quantities and serial, lot, batch, heat, or other numbers as appropriate. Identify the location of the deviating characteristic by print coordinates or specific location, as applicable. Attach reproducible quality extra sheets, sketches, photographs, etc., as necessary.
When proposing a change in either supplier or Bechtel documents; describe the change; identify the documents completely including title or subject, date and revision; and where appropriate, attach a copy of areas in question.
- State proposed disposition.
- Enter cost impact that would result from proposed changes and which will be reflected in appropriate Procurement documents.
- Enter delivery schedule impact that would result from proposed changes.
- Describe the proposed disposition and provide technical (and where appropriate Cost/Schedule) justification for Bechtel's evaluation. Attach reproducible quality copies whenever required. If the deviation is correctable by repair, submit a detail repair procedure or reference the procedure previously submitted and assigned Level 1 by Bechtel for use in similar situations. Provide Bechtel control number, supplier control number and procedure title. For documents, provide suggested corrective wording, procedures, documents, etc. Provide a copy of each SDDR attachment to the Bechtel SQR at the supplier's location.
- Identify the nature of changes that may be needed on associated supplier documents (drawings, specs., procedures, installation instruction, etc.).
- Enter the name (typed or printed), and title of the supplier representative authorizing the disposition request and appropriate signature and date signed.
- *19. Check all applicable boxes to define the action required by Bechtel Project Engineering. NOTE: Price adjustment requires Procurement Document (Purchase Order) Change.
- *20. Provide appropriate justification for the Bechtel action(s) indicated in Block 19. When changes to drawings, specifications, requisitions, or other Bechtel documents are involved, each document should be identified and the associated change briefly described. If other suppliers are affected, indicate who they are and the document that initiated resolution of that involvement. "Other" follow-up action (e.g., the need for additional Bechtel calculations, additional drawings or sketches, inspection by a Project Engineering representative, etc.) should also be identified here. If construction action is required, so indicate.
- *21. GS — Signature of the responsible Engineering Discipline Group Supervisor accepting the Engineering action and the date signed.
PE — Signature of the Bechtel Project Engineer (or designee) and the date signed.
— Other position and signature(s) if required by project and date signed.
- Signature of the supplier's inspector or other representative authorized to verify that the accepted disposition was correctly accomplished and the date signed.
- *23. Signature of the Bechtel SQR (when an SQR is assigned to the order) and date. This signature indicates that the accepted disposition was correctly implemented and verified (on a random sample basis if the SDDR applies to several parts).

M1000321-01

STATEMENT OF CONFORMANCE

We certify that the listed equipment and required documentation for same meet the requirements of the purchase order and applicable specifications:

P.O. NO.: _____ REV. _____

SPECIFICATION: _____ REV. _____

PRIME VENDOR: _____

SUPPLIER: _____

ADDRESS: _____

DESCRIPTION OF EQUIPMENT: _____

IDENTIFICATION: _____

a. ITEM NOS. _____

b. EQUIPMENT NOS. _____

c. TAG NOS. _____

APPROVED EXCEPTIONS: _____

Signature (Supplier Representative)

Title

Date

Distribution:

Original: Supplier to transmit to Jobsite

CC: Purchasers Inspector (2)
Supplier

ATTACHMENT 5

Specification 8031-G-18

GENERAL PROJECT REQUIREMENTS FOR ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT LOCATED IN HARSH ENVIRONMENT FOR THE LIMERICK GENERATING STATION UNITS 1 & 2 PHILADELPHIA ELECTRIC COMPANY

Bechtel Power Corporation
San Francisco, California

5	6/16/82	Incorporated PECO comments in PLB-3725E & PLB-3751E, Issued for Use.	ELS MT	98 J/LC WCM
4	4/13/82	Incorporated the additional requirements in PLB-3612E, Issued for use	G MT	98 J/LC WCM
3	3/23/82	Incorporated partial comments per PECO mark-up & issued to Brown Boveri for E-10.	MT	98 J/LC WCM
2	2/18/82	Incorporated Rev. R & Rev. S Issued for use FOR P.O. 8031-E-7 ONLY	MT	98 J/LC WCM
S	2/2/82	Revised to incorporate Chief Engineers' comments - Issued for Approval	MT	98 J/LC WCM
R	11/6/81	Revised to incorporate NUREG-0588	MT	98 J/LC WCM
1	5/15/78	Revised 5.1.3, 8.1.2 and 8.2.1 as noted. Reissued for use.	BPR J/LC WCM	98 J/LC WCM
O	1-10-78	ISSUED FOR USE	ELC J/LC WCM	98 J/LC WCM
A	8-17-77	ISSUED FOR APPROVAL	ELC J/LC WCM	98 J/LC WCM
No.	Date	Revisions	Approvals	

4

GENERAL PROJECT REQUIREMENTS
FOR
ENVIRONMENTAL QUALIFICATION
OF CLASS 1E EQUIPMENT
LOCATED IN HARSH ENVIRONMENT

1 △ 5

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FIGURES

1	Class 1E Equipment Qualification Procedure	19
	Flow Chart	

Limerick Generating Station
Units 1 and 2

GENERAL PROJECT REQUIREMENTS
FOR
ENVIRONMENTAL QUALIFICATION
OF CLASS 1E EQUIPMENT
LOCATED IN HARSH ENVIRONMENT

| △ 5

1. SCOPE

1.1 General

This specification establishes acceptable environmental qualification methods needed to verify that Class 1E equipment can perform the design safety functions when subjected to normal, anticipated abnormal and design basis event (DBE) environmental conditions. (See paragraph 6.1) This specification, along with all the other attachments to the purchase order, provides the requirements to meet NUREG-0588 December 1979.

| △ 5

1.2 Intent

The intent of this specification is to specify environmental qualification procedures and acceptance criteria which conform to IEEE 323-1974 as endorsed by Regulatory Guide 1.89, Qualification of Class 1E Equipment for Nuclear Power Plants, and as supplemented by NUREG-0588 December 1979, Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment. Such qualification shall comply with regulatory requirements for verification of design adequacy under the most adverse conditions.

| △ 5

Simply stated, the general requirements for environmental design and qualification are as follows: (1) The equipment shall be designed to have the capability of performing design safety functions under all normal and accident environments. (2) The equipment environmental capability shall be demonstrated by appropriate testing and analyses. (3) A quality assurance program shall be established in accordance with Bechtel Specification 8031-G-13, General Project Requirements for Supplier Quality Assurance, and implemented to provide assurance that these requirements are met. The environmental design of safety-related electrical equipment is acceptable when it can be ascertained that all three requirements are met.

| △ 5

This Specification is not intended to:

- (1) Require a 40 year warranty
- (2) Require a reliability study in which a large number of units must be tested
- (3) Require destructive tests

1.3 Responsibilities

1.3.1 Buyer

3 | The Buyer is responsible for including the specific equipment locations and service conditions in the technical specifications. The Buyer is responsible also for specifying appropriate performance or functional requirements; e.g. if function is required during and after a DBE, only after a DBE, or only for a limited time after a DBE. Unless otherwise specified in the technical specification, the equipment is required to function during and after a DBE for a period of 180 days.

1.3.2 Seller

Seller shall outline his qualification program and from it demonstrate a period of qualified life. Seller's qualification program shall consider at least but shall not be limited to all of the factors described herein.

A flow chart is attached as Figure 1 that describes typical qualification procedures. The Seller shall include a similar flow chart with his proposal that describes clearly the actual procedure proposed in response to this specification.

Equipment designated for Class 1E service shall be qualified by the Seller in accordance with this specification for the specified service conditions.

Selection of the test facility shall be the responsibility of the Seller, subject to Buyer review.

1.3.3 Others

3 | In some cases, devices will be purchased by the Buyer for inclusion in the Seller's equipment. When such devices are provided by the buyer for inclusion in Seller supplied equipment, the device purchaser shall be responsible for the device qualification.

2. DEFINITIONS

Technical terms used in this specification are defined in the codes and standards referenced below. Any conflict between those documents and the use in this specification shall be brought to the attention of the Buyer for resolution.

3. ABBREVIATIONS

ANSI	American National Standards Institute
CFR	Code of Federal Regulations
DBE	Design Basis Event
IEEE	Institute of Electrical and Electronics Engineers, Inc.
SRP	Standard Review Plan (NRC)



4. CODES, STANDARDS AND REFERENCE

Design, materials, manufacturer, examination, testing, inspection, certification, and documentation shall conform to applicable portions of the latest issue of the following codes and standards including interpretations and addenda. Latest issue of standards means the issue (including latest addenda) in force at the date of the purchase order. Adoption of any interpretations or any subsequent addenda issued shall be subject to Buyer's review prior to their use:

IEEE Std 317	Standard for Electrical Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations
IEEE Std 323	Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations
IEEE Std 334	Standard for Type Tests of Continuous Duty Class 1E Motors for Nuclear Power Generating Stations
IEEE Std 344	Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations
IEEE Std 381	Standard Criteria for Type Tests of Class 1E Modules used in Nuclear Power Generating Stations

IEEE Std 382	Standard for Qualification of Safety-Related Valve Actuators
IEEE Std 383	Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations
IEEE Std 387	Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Station
IEEE Std 535	Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations
IEEE Std 649	Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations
IEEE Std 650	Qualification of Class 1E Static Battery Chargers and Inverters

In addition to the above standards, the equipment shall meet the requirements of the following United States Nuclear Regulatory Commission (NRC) regulatory guide and staff position that implements and modifies certain provisions of the referenced standards:

RG 1.89	Qualification of Class 1E Equipment for Nuclear Power Plants	1 
NUREG-0588 December, 1979	Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment	1 

The following document is referenced for information:


NUREG-0800 SRP Section 3.11	NRC Standard Review Plan; Environmental Qualification of Mechanical and Electrical Equipment
--------------------------------	----------------------------------------------------------------------------------------------

5. GENERAL REQUIREMENTS

Class 1E equipment is required to perform the specified function when subjected to normal, anticipated abnormal, and DBE environmental conditions. The qualification information presented by the Seller to provide assurance that these requirements are met shall include identification of the nuclear safety service equipment, the environmental design basis, definition of normal and postulated environments and a copy of the qualification tests and analyses performed to demonstrate the required environmental capability.

5.1 Qualification Methods

Selection of methods


- (1) Qualification methods shall conform to the requirements defined in IEEE 323-1974 as implemented by Reg. Guide 1.89. | 
- (2) Qualification of equipment subjected to a DBE environment without test data is not adequate to demonstrate functional operability. Analysis in lieu of test data is not acceptable unless (a) testing of the component is impractical because of the size limitations, and (b) partial type test data are provided to support the analytical assumptions and conclusions reached.

5.2 Acceptable Qualification Methods

The Seller shall qualify each device by any of the following methods:

- (1) Tests, as described in Section 6.3 of this specification.
- (2) Analysis, as defined in Sections 5.3 and 6.5 of IEEE-323-1974 and Section 6.4 of this document.
- (3) Any acceptable combination of the above two methods.

5.3 Acceptable Qualification Procedures

The procedures for originating and maintaining technical information presented or referenced in the documentation submitted for qualification shall be organized in a readily understandable and traceable manner. This shall permit independent auditing of the conclusions based on this information. | 

5.4 Qualified Life

The nuclear plant in which the Class 1E equipment will be used has a design life of 40 years. The Qualified Life of the Equipment specified herein for this plant shall be 40 years or more. Any exceptions shall be identified and described clearly in a proposal section titled "Exceptions" and subtitled "Qualified Life".

5.4 Qualified Life (continued)

The "Qualified Life" shall be defined in the proposal as that operating period deduced from actual test data, during which the equipment can satisfactorily withstand normal vibration, seismic/hydrodynamic vibration (according to Specification 8031-G-19 or 8031-G-14), DBE and post-DBE operation. The tests for these are delineated by paragraph 6.3 of this specification. Extrapolation from previous test data must be supported by appropriate evidence.

Qualified Life shall start from the fuel load date of the plant. For the period between the delivery of the equipment to the jobsite and the fuel load date of the plant, the Seller shall establish long and short-term storage requirements which will not be detrimental to the qualified life of the equipment. Short-term storage is defined as a period less than 6 months and long-term storage as more than 6 months.

If the Seller determines that Qualified Life is affected prior to the fuel load date of the plant, then the Seller shall consider this period during qualification testing and address it in the qualification test procedure and report.

Seller shall identify all organic components which are replaceable and shall identify all components that have a useful life expectancy of less than 40 years. The Seller shall provide an associated recommended maintenance interval in order that the stated qualified life is maintained for each type of equipment supplied. This information shall be provided in the form of a list in accordance with Form 8031-DR which shall include the following:

- (1) Part name
- (2) Manufacturer's part number
- (3) Part material
- (4) Part qualified life
- (5) Recommended maintenance interval

The Seller shall identify any component procurement requirements associated with the parts identified above; for example, the Seller may endorse the procurement of commercial grade replacement parts or provide a JEDEC designation for replacement parts.

5.5 Quantity Tested

The type tests shall be applied to at least one unit or system, preferably a randomly selected production model. All of the different tests and conditions shall be applied to the same

5

5.5 Quantity Tested (continued)

piece of equipment. The equipment tested shall be subjected to all normal manufacturing procedures and shall pass all normal quality assurance and quality control requirements.

6. SPECIFIC REQUIREMENTS

6.1 Equipment Environment

6.1.1 Equipment Location and Environment

The specific environmental conditions for each item of equipment will be included in the equipment technical specification, or procurement documents.

The time-dependent temperature and pressure environmental profile shown in the equipment technical specification and adequate margins per paragraph 6.3.6 of this specification shall be used for environmental qualification of equipment.

The technical specification will define equipment subject to being submerged. Where equipment could be submerged, it shall be identified and demonstrated to be qualified by test for the duration required.

| 

6.1.2 Other Environmental Influences

The procurement documents shall specify environmental conditions that could affect performance such as: (1) continuous low level vibration, and (2) electromagnetic interference. The Seller shall be responsible for inclusion of these considerations into his test program.

6.2 Performance Characteristics

The performance characteristics required at the service conditions will be in the equipment technical specification. Performance characteristics of equipment should be verified before, after and periodically during testing throughout its range of required operability. The operability status of equipment should be monitored at a sufficient number of points during test. For long-term testing, however, monitoring at discrete intervals may be acceptable if justified.

6.3 Type Tests

Type testing of actual equipment using simulated service conditions is the preferred qualification method. The type test shall consist of planned test conditions in a preplanned sequence that meet or exceed the specified normal and specific DBE service conditions.

6.3 Type Tests (continued)

The same piece of equipment shall be subjected to all steps of the test sequence. Accessory components shall be tested as assembled in the basic equipment or justification provided for acceptance of separate test results.

6.3.1 Test Witness

Buyer shall have free access to the Seller's facilities to observe progress and inspect the work. Seller shall notify Buyer at least two weeks in advance of the start of any environmental qualification tests so that the Buyer may have his representative witness the tests should he so desire.

6.3.2 Test Procedure

The test procedure shall contain sufficient detail so that it can be used as an auditable link between the equipment specification and the test reports.

The test procedure (including schedule) shall be submitted to the Buyer for review and approval.

6.3.3 Test Sequence

The Type Tests shall be performed in the following sequence (the step numbers are referenced in Figure 1, Qualification Procedures Flow Chart) unless another sequence will be more severe for the specified equipment (Seller shall provide justification that the sequence used is the most severe for the item being tested):

- (1) Inspection to confirm that there is no shipping damage and that the equipment conforms to the specifications.
- (2) Operation at room conditions under normal service and environmental conditions through the entire operating range and recording base line data.
- (3) Aging, including thermal, mechanical cycling, etc, to put the equipment in the expected end-of-qualified-life condition; DBE radiation may be included in this step or (5) below. Data shall be recorded to confirm that functional requirements are met prior to subsequent testing.
- (4) Vibration to both seismic or seismic/hydrodynamic and plant mechanical service levels (Ref. attached seismic or seismic/hydrodynamic Qualification Specification 8031-G-14 or 8031-G-19) and recording data to confirm that functional requirements are met.

6.3.3 Test Sequence (continued)

- (5) Operation at the predetermined points while exposed to the simulated DBE(s) and recording data to prove that functions that must be performed during such conditions are performed to the required specifications. DBE radiation may be excluded if incorporated in (3) above.

If the Buyer requests that the equipment be qualified for the effects of demineralized water spray, then it should be incorporated during the simulated event testing at the maximum pressure and at the temperature conditions that would occur when the onsite spray systems actuate. Spray shall consist of demineralized water unless otherwise specified.

- (6) Operation through the predetermined periods while exposed to the post-DBE conditions immediately following the DBE conditions and recording data to prove that functions that must be performed during such conditions are performed to the required specifications. 5

- (7) Inspection and disassembly to the extent needed to determine the condition and status of the equipment and recording the findings.

6.3.4 Equipment Test Installation

Equipment shall be mounted and connected in a manner that simulates its installation when in actual use. Any deviation from actual use and connection shall be justified. Equipment that can be installed in more than one position shall be tested in all allowed installation positions unless justification is provided that position will not affect the equipment performance. If such justification is not provided, qualification will be acceptable only for the installation that was tested. Throughout the tests, the venting path of all pneumatic devices shall be via all components that are installed during normal operation.

6.3.5 Aging

The objective of aging is to put the equipment in a condition equivalent to end-of-qualified-life before performing the functional tests under DBE and post-DBE environments.

As an example, a typical aging procedure designed to put equipment into an advanced or end-of-qualified-life prior to DBE testing should include as appropriate:

6.3.5 Aging (continued)

- a) operational (functional) cycling at service loads
- b) expected extremes in power source (high and low voltage and frequency or air pressure) cycling
- c) ambient temperature and humidity increase
- d) ambient temperature and humidity cycling
- e) ionizing radiation exposure, both gamma and beta.
[Cobalt--60 is an acceptable gamma radiation source for environmental qualification]

The aging acceleration rate used during qualification testing and the basis upon which the rate was established shall be described and justified.

The Arrhenius methodology is considered the acceptable method of addressing accelerated thermal aging. Other thermal aging methods that can be supported by type test will be evaluated by the Buyer on a case-by-case basis.

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The Seller shall investigate to ensure that no known synergistic effects have been identified for materials that are included in the equipment being qualified. Any identified synergistic effects shall be accounted for in the qualification program.

The effects of relative humidity need not be considered in the aging of electrical cable insulation.

Further clarification of aging as it is applied to specific types of equipment is provided in individual IEEE Class 1E equipment qualification documents. IEEE Standards 317, 334, 381, 382, 383, 387, 535, 649 and 650 presently provide guidance for qualification of penetrations, motors, modules, valve operators, cables, diesel generators, batteries, motor control centers, and chargers and inverters, respectively. Aging effects on all equipment, regardless of its location in the plant, should be considered and included in the qualification program.

6.3.6 Margin

Margin is the difference between the most severe plant conditions that are postulated for specific equipment and the conditions used for qualification.

The qualification of Class 1E equipment shall include documented provision that adequate margin has been applied. Methods of including margin shall be the following:

- (1) increasing the levels of testing
- (2) increasing the number of test cycles
- (3) increasing test duration

6.3.6 Margin (continued)

- (4) increasing the number of stress reversals in analysis
- (5) increasing or decreasing (e.g. voltage) service conditions to provide more severe conditions.

Unless otherwise specified, all the environmental conditions provided in the Buyer's equipment technical specification do not include margin. The Seller shall determine and justify what margin must be added to allow for variations in production process, for inaccuracies in the test equipment and for errors associated with defining satisfactory performance. In lieu of margins justified by the Seller, the following shall be applied:

1  5

- (1) Temperature: +15°F (8°C). When qualification testing is conducted under saturated steam conditions, the temperature margin shall be such that test pressure will not exceed saturated steam pressure corresponding to peak service temperature by more than 10 psi. The temperature to which equipment is qualified, when exposed to the simulated accident environment, should be defined by thermocouple readings on or as close as practical to the surface of the component being qualified.
- (2) Pressure: + 10 percent of gauge, but not more than 10 psi
- (3) Radiation: + 10 percent.
- (4) Voltage: + 10 percent of rated value unless otherwise specified.
- (5) Frequency: + 5 percent of rated value unless otherwise specified.
- (6) Time: The equipment technical specification defines the time period for which the equipment will be required to perform its safety function into the DBE. Equipment required to perform its safety function within a short time period into the event (i.e. less than 10 hours) is required to remain functional in the DBE environment for a period of at least 1 hour longer than the time shown in the equipment technical specification. For all other equipment, a 10 percent time margin shall be used.

6.3.7 Disposition of the Tested Materials

Seller shall state the ultimate disposition of the materials subjected to tests and any associated costs.

6.4 Analysis

3 Analysis alone is not acceptable, however, when the Seller elects qualification by a combination of test and analysis, a complete justification shall be submitted for Buyer's review and approval prior to conditions of purchase becoming final, and shall include a detailed description of the analytical process.

The adequacy of these methods will be evaluated on the basis of the quality and detail of the information submitted in support of the assumptions made and the specific function and location of the equipment. These methods are most suitable for equipment where testing is precluded by the physical size of the equipment being qualified. It is required that, when these methods are employed, some partial type tests on vital components of the equipment be provided in support of these methods.

3 The qualification and analysis shall be applicable to the specific equipment and its application, and shall be in step-by-step form so that the reasoning and computations may be easily followed.

6.5 Previous Qualification

3 Sellers who have previously tested devices of the same design as those to be supplied for this purchase may submit copies of the previous qualification in lieu of requalifying the device. The previous qualification must have employed procedures which are consistent with the requirements of this specification, and must have subjected the device to environmental levels which equal or exceed in every aspect those required by this specification. Applicability of the test data to the supplied equipment shall be certified by the Seller.

6.5.1 Equipment Similarity

3 Where equipment of a similar design has been previously qualified, the Seller may submit previous qualification data in lieu of requalifying the equipment. In cases where minor differences exist between the previous qualification and the equipment technical specification, extrapolation of results of the previous qualification must be justified.

3 Such justification shall contain as a minimum:

- 1) Identification of differences in
 - a) Equipment design
 - b) Service conditions
 - c) Environmental conditions

- 2) Basis for extrapolation and its justification.

ACCEPTANCE CRITERIA

7.1 All equipment shall meet its performance requirements as specified in the technical specification. This shall include, but not be limited to consideration of criteria such as the following:

- (1) The equipment must operate in accordance with design intent without loss of performance characteristics, e.g. the ability of a circuit breaker to interrupt its load under transient conditions or the ability of an instrumentation device to maintain its state or maintain pressure boundary during a disturbance that might be expected during the service conditions stated in the procurement document.
- (2) The equipment must operate in accordance with the design intent without spurious or erroneous outputs or output variations greater than the required accuracy.
- (3) The equipment must operate in accordance with the design intent without moisture leakage into sealed enclosures.

7.2 If the above criteria cannot be met, the Seller shall identify and define any degradation during the DBE and post DBE conditions. The Seller shall list and describe clearly any such degradation in the proposal or report section titled "Exceptions" and subtitled "Acceptance Criteria."

7.3 Failure Criteria

The failure criteria shall be established before testing. Should a failure occur during the qualification test process, this does not necessarily constitute a failure to qualify. It must be determined if the failure was random, infant mortality, or an end-of-life failure. True random failures by definition do not impact qualified life. However, any failure to perform a Class 1E function during the test shall be reported to the Buyer in writing and the justification for continuing the test must be acceptable to the Buyer or the qualification will not be accepted.

If end-of-life is established as the cause of failure, the Seller shall recommend a replacement schedule for the component which failed if such replacement is feasible. If such component replacement is not feasible, then it shall be considered that the equipment has reached end-of-life.

If an appropriate component replacement schedule is implemented, the qualified life of the equipment is not degraded.

7.3 Failure Criteria (continued)

If infant mortality is established as the cause of failure, the Seller shall establish a test and inspection program, with documentation, to prevent this failure mode in the equipment being supplied.

8. DOCUMENTATION

8.1 Proposal Statement of Compliance

The Seller shall provide a statement of certification, with the proposal, that the equipment to be furnished will be in compliance with all of the requirements of this specification. The statement shall include the method of qualification and the proposed qualification program delineating the steps to establish and maintain qualification. A flow chart (similar to Figure 1) of the proposed qualification procedure shall be submitted.

Exceptions, where taken, shall be listed in the proposal section titled "Exceptions" with a detailed statement of justification for alternate procedures for each. In the absence of such a list the Seller shall agree that the Seller's proposal is based on strict conformance to these specifications.

8.1.1 Previous Qualification

Where Seller's published standard equipment specifications state that the equipment is suitable for environmental conditions at least as severe as those called for by the procurement documents accompanying this specification, Seller shall submit the certified test or analytical data on which his published specification is based.

8.1.2 Conformance to Requirements

The Buyer requires conformance to the requirements of IEEE 323-1974 and NUREG-0588 December 1979 and applicable daughter standards listed in Section 6.3.5 and reserves the right to evaluate and approve qualification programs for conformance. Unsatisfactory or incomplete responses may be grounds for rejection of bids.

Also, the Buyer will estimate the number of changes and additions to the submitted programs that will be necessary to satisfactorily qualify the equipment. This information will be used in evaluating bids for lowest costs.

The Buyer requests the Seller to investigate the possibility of sharing each approved qualification program's costs with other Buyers. If it is not a shared program, the Seller must notify the Buyer.

Rev. 5

8.2 Specific Information Required in the Proposal

The following information shall be submitted with the proposal. The information will be used to evaluate bidders.

1. The Seller must identify the qualified life of equipment. The Seller shall also identify the equipment maintenance, i.e. replacement of components required to reach the equipment qualified life. The total cost of parts necessary to reach qualified life, and an estimate of manhours to perform the required maintenance are also required.
2. The Seller shall identify the ultimate disposition of the tested equipment and any associated costs.
3. If the Seller proposes to perform qualification by means other than testing alone, a complete description and justification shall be submitted to the Buyer for review and approval.
4. The Seller shall investigate the possibility of sharing each approved qualification program cost with other Buyers. The results of this investigation should be reported to the Buyer.

8.3 Engineering Documentation

8.3.1 Qualification Program and Procedure

Before the purchase order award, the Seller shall submit to the Buyer a description of the method(s) of Qualification (section 5.1) that he intends to use. The Buyer reserves the right to reject the bid if this method is unacceptable.

After purchase order award, the Seller shall submit his qualification program and procedures for Buyer's review and approval before qualification. The Seller shall document the procedure in a report. Sufficient detail shall be used to demonstrate the adequacy of the selected method. The report shall demonstrate that the requirements of this specification will be met. As applicable, the report shall consist of, but not be limited to:

8.3.1.1 Buyer's Purchase order number and item number (as applicable).

8.3.1.2 A listing of all Class 1E equipment or devices being supplied by the Seller on the purchase order.

8.3.1.3 Identification number and name of each equipment or device being qualified and of the method of qualification selected.

8.3.1.4 The following detail shall be included, as applicable:

- 3
- (1) Test facility identification
 - (2) Test plan, equipment performance specification and objective(s) including identification of the specific feature(s) to be demonstrated by the test. Justification shall be provided to show that the test sequence is the most severe for the item being tested.
 - (3) Description of analytical method used, and analysis data including all extrapolations.
 - (4) Identification of critical components and materials subject to aging or wear.
 - (5) Specified tolerance of critical components and materials.
 - (6) A recommended preventive maintenance program that will provide assurance that the qualified life of the proposed equipment will equal or exceed the life of the reference equipment.

3 | 8.3.1.5 Report Index listing the page on which each of the above listed items may be found.

8.4 Environmental Qualification Data Report

3 | Qualification data for each safety-related equipment device type shall be provided to the Buyer for engineering review and approval prior to the shipment of the equipment. This documentation shall be in the form of a report and shall include but not be limited to the following:

8.4.1 Purchase order number and item number.

8.4.2 A listing of all Class 1E equipment or devices including manufacturer model number being supplied by the Seller on the purchase order.

8.4.3 Identification number and name of each equipment or device being qualified and of the method used for qualification.

8.4.3.1 The following detail shall be furnished, as applicable:

- (1) Test or operational facility identification.

8.4 Environmental Qualification Data Report (continued)

- (2) Test plan and objective(s) including identification of the specific feature(s) to be demonstrated by the test.
- (3) Test results (for each test) giving:
 - (a) Equipment tested including description and performance specification.
 - (b) Description of test facility (test set-up) and instrumentation including calibration records reference.
 - (c) Test procedures.
 - (d) Test data and accuracy.
 - (e) Inspection results.
 - (f) Qualified life
 - (g) Summary, conclusions and recommendations.

8.4.4 Description of analytical method used, and analysis data including all extrapolations.

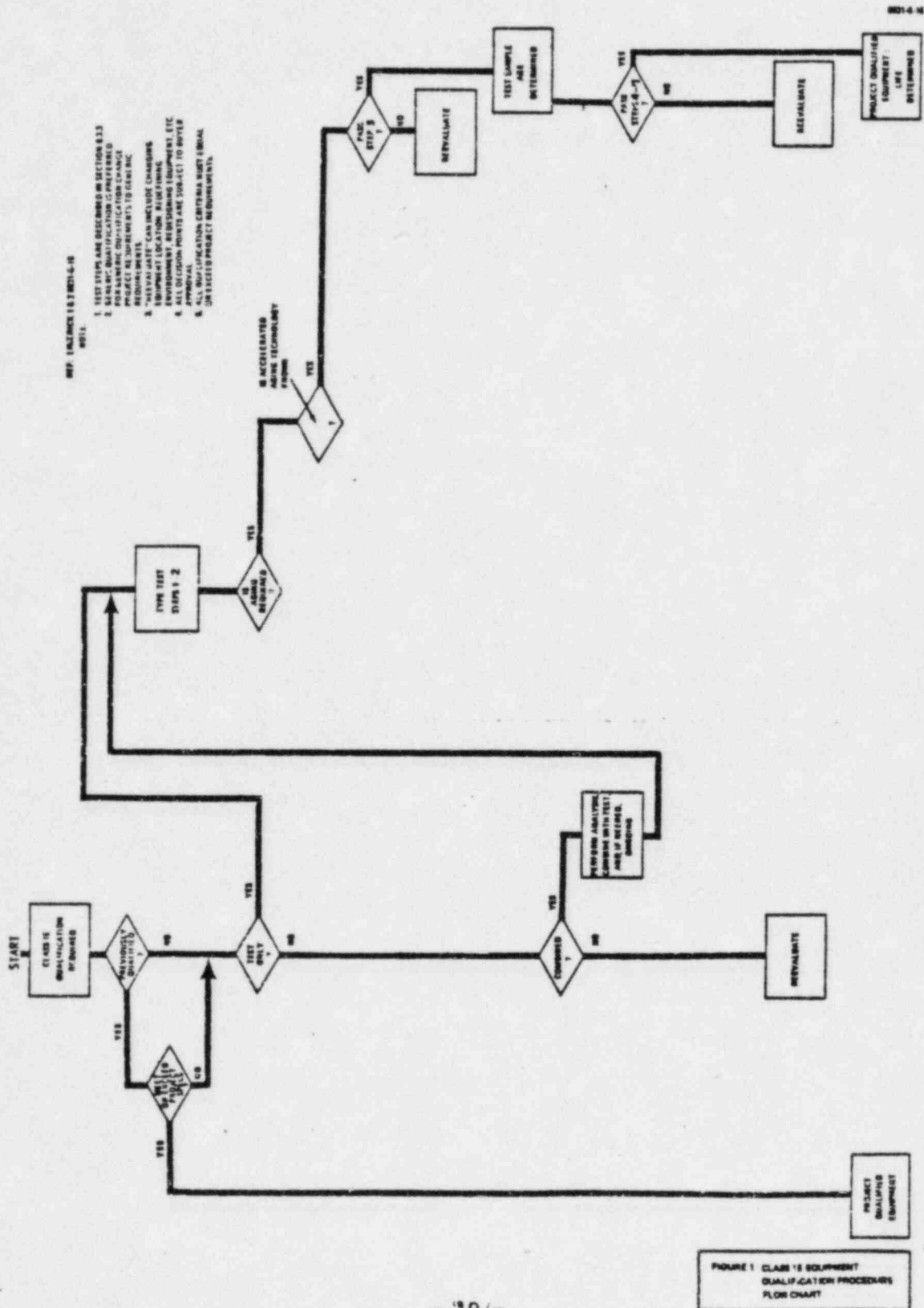
8.4.5 Identification of critical components and materials subject to aging or wear.

8.4.6 Specified tolerances of critical components and materials.

8.4.7 Seller's Environmental Data Report shall include a certification that the equipment meets the requirements. This certification shall be signed and dated by Seller's authorized company officer.

3

8.4.8 Report Index listing the page on which each of the above listed items may be found.




SPECIFICATION
FOR
GENERAL PROJECT REQUIREMENTS
FOR
DESIGN ASSESSMENT AND QUALIFICATION
OF
SEISMIC CATEGORY I EQUIPMENT AND EQUIPMENT SUPPORTS
AND HVAC/ELECTRICAL SUPPORT REASSESSMENT
FOR
SEISMIC AND HYDRODYNAMIC LOADS
FOR THE
LIMERICK GENERATING STATION
UNITS 1 AND 2
PHILADELPHIA ELECTRIC COMPANY

Bechtel Power Corporation
San Francisco, California

3	7/21/82	Revised pages E-vii, E-43 to E-56 E-71 to E-84, Added Appendix G	WAB	WAB	WAB
2	1/29/82	Revised pages 6, 12 and 14 Revised Appendix E, Added Appendix D&F	WAB	WAB	WAB
1	8/6/81	Revised Appendix A, added Appendix C and E	WAB	WAB	WAB
0	5/22/81	Issued for Use	WAB	WAB	WAB
NO.	DATE	REVISIONS	APPROVALS		

SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.
i	2					Appendix "A"	1	Appendix	"F"	2			
ii	3					Sheet i - iii		Sheet i -	xii				
iii	5					and		and					
iv	3					Sheet 1-8		Sheet 1-	408				
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5	1					Sheet i - iii		Sheet 1 -	xix				
6	1					and		and					
7	1					Sheet 1 -		Sheet 1 -	573				
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11	1					Appendix "C"	1						
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19	1					Appendix	"F"	3					
20	1					Sheet i -	x						
21	1					and							
22	1					Sheet 1 -	180						

NO.	DATE	REVISIONS	BY	CHK'D	APP'D	NO.	DATE	REVISIONS	BY	CHK'D	APP'D
3	7/2/82	Revised E-556, E-7 Added Appen. G	AS								
2	1/2/82	Revised 6, 12, 14 Revised Appendix Added Appendix D									
1	9/4/81	Revised Appendix Added Appendix C									
0	7/2/82	Issued for Use									

 POWER DIVISION	FACING SHEET LIMBROCK GENERATING STATION, UNITS 1 & 2 PHILADELPHIA ELECTRIC COMPANY General Project Requirements for Design Assessment & Qualification of Seismic Category I Equipment & Equipment Supports and HVAC/Elec. Support Reassessment for Seismic and Hydrodynamic Loads		JOB No 8031 8031-G-19 Specification	REV 3
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DESIGN ASSESSMENT AND QUALIFICATION
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- 1.0 Scope
- 2.0 Equipment Classification
- 3.0 Equipment Location
- 4.0 Dynamic Loads and General Design Criteria
- 5.0 Load Combinations and Allowable Stresses
- 6.0 Qualification Methods
- 7.0 Dynamic Analysis
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- 10.0 Evidence of Compliance
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- Appendix A Qualification Summary of Equipment (SQRT)
- Appendix B Response Spectra for OBE and SSE/DBE
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- Appendix D Response Spectra of Reactor Building and Control Room Structure
- Appendix E Required Response Spectra of Primary Containment for load combinations of seismic and hydrodynamic loads

Appendix F Required Response Spectra of Reactor and Control Room Structure for load combinations of Seismic and hydrodynamic loads.

Appendix G Required Response Spectra of Primary Containment Structure and Adjacent structure for HVAC/Electrical support reassessment.

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NOTE: The applicable RESPONSE SPECTRA, Load Combinations and Acceptance Criteria are included with the Material Requisition or Technical Specification covering that item.

GENERAL PROJECT REQUIREMENTS
FOR
DESIGN ASSESSMENT AND QUALIFICATION
OF
SEISMIC CATEGORY I EQUIPMENT AND EQUIPMENT SUPPORTS
FOR
SEISMIC AND HYDRODYNAMIC LOADS

1.0 SCOPE

1.1 General

This Specification covers design assessment and qualification of seismic Category I equipment, equipment supports and systems for seismic and hydrodynamic loads by analysis and/or testing for the Limerick Generating Station Units 1 and 2 in accordance with methods and procedures specified herein. Wherever the word "equipment" occurs, it shall include equipment, equipment supports, equipment anchorages, and systems furnished by the Seller.

1.2 Work Included

- 1.2.1 Submitting at the time of the bid proposal an outline of all methods, policies, and procedures to be employed to assure compliance with the seismic and hydrodynamic requirements as defined herein.
- 1.2.2 Furnishing of all labor, material, equipment, supervision, and the performance of all operations and incidentals necessary for dynamic analysis, design, and/or testing of the equipment as required herein.
- 1.2.3 Furnishing of calculations and/or dynamic test data for the equipment as required herein.
- 1.2.4 Furnishing the interface reactions due to all required load combinations at the support points where the Seller's items are supported.

1.3 Work Not Included

Furnishing of calculations or test data to insure the adequacy of equipment supports provided by the Buyer.

1.4 Definitions

Seismic Category I Equipment: Equipment that is essential to emergency reactor shutdown, or otherwise is essential in preventing significant release of radioactive material to the environment or is necessary to keep the plant in safe shutdown condition.

Safe Shutdown Earthquake (SSE)/Design Basis Earthquake (DBE): The earthquake which is based upon an evaluation of the maximum earthquake potential. It is that earthquake which produces the maximum vibratory ground motion for which Category I structures, systems and components are designed to remain functional.

Operating Basis Earthquake (OBE): That earthquake which could reasonably be expected to affect the plant site during the operating life of the plant; it is that earthquake which produces the vibratory ground motion for which those features of the nuclear power plant necessary for continued operation without undue risk to the health and safety of the public are designed to remain functional.

Response Spectrum: A plot of the maximum responses of single-degree-of-freedom linear systems of different natural frequencies of given damping values subject to the same specified base motion.

Floor Response Spectrum: The response spectrum of a floor motion. There are, in general, response spectra for two perpendicular horizontal directions and one vertical direction.

Required Response Spectrum (RRS): The response spectrum of a motion for which a piece of equipment or system is required to be qualified. This motion is that defined at the equipment support.

Test Response Spectrum (TRS): The response spectrum of the test input motion.

Uncracked Property: Structural properties are calculated based on gross area of concrete and steel.

Cracked Property: Structural properties are calculated based on area of steel, and concrete with tensile crack to the neutral axis.

Dynamic Degree-of-Freedom: Coordinates for which accelerations are considered in the equations of motion.

Narrow Band Response Spectrum (NBRS): A response spectrum which has a high peak caused by existence of a large amount of harmonic motion at some frequency, usually caused in floor spectra by the response of a building in one of its modes. Narrow band response spectra shall be designated as such by the Buyer on the spectra furnished by the Buyer to the Seller.

Natural Frequency: The frequency at which a body vibrates freely, without the application of external forces in one of its natural modes.

Natural Mode: One of the characteristic shapes of a body in which the free vibration at all points describes a synchronous motion.

Floor Acceleration: The acceleration of a particular building floor (or equipment mounting) resulting from a given motion applied to the building.

Zero Period Acceleration: The maximum floor acceleration can be obtained from the floor response spectrum, as the acceleration at high frequencies (in excess of 33 Hz. for seismic loads and 100 Hz. for hydrodynamic load).

Ground Acceleration: The acceleration of the ground resulting from a seismic event. The maximum ground acceleration can be obtained from the ground response spectrum as the acceleration at frequencies greater than 33 Hz.

Malfunction: The loss of capability to initiate or sustain a required function or the initiation of undesired spurious action.

Sine Beat: A continuous sinusoid of one frequency, amplitude modulated by a sinusoid of a lower frequency.

Transfer function: A complex function of frequency which represents the transmissibility of a system between the output motion at a given point and the input motion.

Device: Any single piece of equipment mounted, either singly or in a group with other devices, on a larger equipment unit or support.

Assembly: Two or more devices sharing a common mounting, or supporting structure.

1.5 References

1.5.1 "General Project Requirements for seismic Design and Analysis of Equipment and Equipment Supports for the Limerick Generating Station Units 1 and 2". Specification 8031-G-14.

1.5.2 "Seismic Qualification - Philosophy and Methods" by C. W. Roberts and G. D. Shipway. Journal of the Power Division, Proc. of ASCE, Vol. 102, No. P01, Jan. 1976 pp. 113-120.

2.0 EQUIPMENT CLASSIFICATION

All plant equipment is classified as either Seismic Category I or Non-Seismic Category I. The equipment technical specification will designate the classification of specific equipment.

3.0 EQUIPMENT LOCATION

Equipment are located within the several buildings which comprise the Limerick Generating Station. The Response Spectra corresponding to the equipment location are issued with the equipment technical specification.

4.0 DYNAMIC LOADS AND GENERAL DESIGN CRITERIA

All equipment under this specification shall withstand dynamic loads resulting from (a) Seismic Loads and (b) Hydrodynamic Loads in addition to all other applicable loads. The method of combination of these dynamic loads and acceptance criteria are provided in the equipment technical specification. The functions of the equipment instrumentation and controls or other parts, which are necessary for the functional requirements of the equipment shall not be impaired when these dynamic loads are applied simultaneously in accordance with the applicable load combinations. The functional requirements of the equipment are stated in the equipment technical specification.

4.1 Seismic Loads

Seismic Category I equipment shall withstand support motion caused by "Operating Basis Earthquake" (OBE) and the "Safe Shutdown Earthquake" (SSE).

The Seller shall be responsible for assuring that the equipment is designed for the following conditions:

- (a) To remain functional so that a safe and orderly shutdown of the plant can be achieved and maintained during and after experiencing an SSE which has been preceded by 5 OBE's.
- (b) To remain operational and to perform its functions as required for the continued operation of the plant during and after experiencing an Operating Basis Earthquake (OBE).

The functional requirements of the equipment during and after SSE or OBE are stated as above unless otherwise stated in the equipment technical specification.

Qualification (testing and/or analysis) shall be done for required load combinations specified in the equipment specification for both the OBE and SSE.

4.2 Hydrodynamic Loads

The equipment and equipment supports shall withstand dynamic loads associated with Main Steam Safety Relief Valve (MSRV) discharge thermo-hydrodynamic phenomena and Loss-of-Coolant Accident (LOCA) hydrodynamic phenomena in addition to seismic and all other applicable loads according to load combinations given in the equipment technical specification.

4.2.1 Loads Due to MSRV Actuation

Loads due to MSRV actuation are considered as a normal operating condition loading. Response spectra due to symmetric and asymmetric MSRV discharge loads shall be considered in the equipment assessment. 1/1

4.2.2 Loads Due to LOCA Related Loads

LOCA induced loads on the containment structure are characterized by loads associated with pool-

swell, condensation oscillation and chugging loads as well as long term LOCA loads. Response spectra due to all these conditions shall be considered in the equipment qualifications.

The above hydrodynamic loads are developed in the suppression pool of the containment structure; however, all structures that are in contact with the containment structure at the foundation or any other level will also be affected by these loads.

The appropriate response spectra for seismic and hydrodynamic loads for the subject equipment are contained in the equipment technical specification.

5.0

LOAD COMBINATIONS AND ALLOWABLE STRESSES

All Seismic Category I equipment shall be designed for the loads and load combinations given in the equipment technical specifications and Appendix E and F of Specification 8031-G-19. 2
For all load combinations involving dynamic loads, the effect of both horizontal and vertical dynamic loads shall be considered as arising from simultaneous excitation in all three principal directions and combined as specified for the particular method of qualification.

Stress and deformations due to the combined loads shall be within the limits specified in the equipment technical specifications. The stresses and deformations due to the maximum effect of the combined loads shall remain within such limits that the requirements of Section 4.0 regarding the dynamic loads and the functional requirements of the equipment as specified in the technical specification are met.

6.0

QUALIFICATION METHODS

In the absence of more specific directions in the equipment technical specification, the Seller shall prove the adequacy of the design of the equipment by one of the following methods:

- (a) Dynamic analysis (Section 7.0)
- (b) Testing under simulated conditions. (Section 8.0)
- (c) Combination of testing and analysis. (Section 9.0)

The choice shall be based on the practicality of the method for the function, type, size, shape, and complexity of the equipment and the reliability of the qualification.

The Seller shall justify the selection of the method of qualification. The Seller may elect to consult with the Buyer with respect to setting up a qualification program.

7.0 DYNAMIC ANALYSIS

7.1 Methods and Procedures

The dynamic analysis of various equipment can be classified into three cases according to the relative rigidity of the equipment based on the magnitude of first natural frequency as below.

- (a) Structurally simple equipment - that equipment which can be adequately represented by a single-degree-of-freedom system.
- (b) Structurally rigid equipment - that equipment whose fundamental frequency is:
 - (i) greater than 33 Hz for the consideration of seismic loads.
 - (ii) greater than 100 Hz for the consideration of hydrodynamic loads.
- (c) Structurally Complex equipment - that equipment which cannot be classified as structurally simple or structurally rigid.

When the equipment is structurally simple or rigid in one direction but complex in the other, each direction may be classified separately to determine the dynamic loads.

7.1.1 Response Spectrum Analysis

The appropriate response spectra for specific equipment are issued with the equipment specification for OBE, SSE, and hydrodynamic loads. Response spectra are based upon the dynamic analyses of the supporting structure and represent the dynamic response of a single-degree-of-freedom system at a particular location within the structure. Response spectra plotted in terms of acceleration versus

frequency, correspond to various locations within the buildings and are identified with respect to the points noted on the mathematical model for each direction of vibration to be considered. This may include the vertical as well as both the N-S and E-W horizontal directions. In addition, each response spectrum corresponds to a particular damping ratio, i.e., the ratio of damping of the single-degree-of-freedom system to critical damping.

7.1.1.1 Structurally Simple Equipment

For equipment which is structurally simple the dynamic loading (either seismic or hydrodynamic) shall consist of a static load corresponding to the equipment weight times the acceleration selected from the appropriate response spectrum.

The acceleration selected shall correspond to the equipment's natural frequency, if the equipment's natural frequency is determined by calculation. If the equipment's natural frequency is not known, the acceleration selected shall correspond to the maximum value of the response spectrum.

7.1.1.2 Structurally Rigid Equipment

For equipment which is structurally rigid the seismic load shall consist of a static load corresponding to the equipment weight times the acceleration at 33 Hz, selected from the appropriate response spectrum and the hydrodynamic loading shall consist of a static load corresponding to the equipment weight times the acceleration at 100 Hz., selected from the appropriate response spectrum.

7.1.1.3 Structurally Complex Equipment

- (a) For the purposes of analysis of structurally complex equipment, the equipment may be idealized by any mathematical model which adequately predicts the dynamic properties of the equipment. The model shall be adequate to define the dynamic behavior of the equipment within the frequency range of interest. The mass and stiffness of both equipment appendages and supports shall be considered in the mathematical model of the equipment. All properties shall reflect the in-service operating conditions as closely as possible. The frequencies and mode shapes shall be determined. The effects of vibrations of the equipment in all three global directions shall be considered.
- (b) The sloshing effect of any contained liquids shall be included.
- (c) The spectral acceleration per mode shall be obtained from the appropriate response spectrum. In determining the spectral acceleration from the response spectra, the value chosen shall be the largest value on the curve when the frequency in question is varied by $\pm 10\%$.
- (d) Dynamic response in terms of inertia forces, shears, moments, stresses, and deflections shall be determined for response to

dynamic excitation in each of the global directions for each mode. The results of the individual modes shall be combined by the square root of the sum of the squares method except the following procedure shall be used for closely spaced modes: for modes which have frequencies which do not differ by more than 10% of the lower frequency, the responses of these modes shall be combined by the sum of the absolute values method before combining with other modes by the square root of the sum of the squares method.

- (e) In the particular case where there is more than one equipment frequency located within the frequency range of widened narrow band response spectrum, the floor spectrum curve is to be applied in accordance with the criterion described below. This is based on the fact that the actual structural resonant frequency can possibly assume only one single value at one time, anywhere within the frequency range defined by $f_j \pm \Delta f_j$, but $1/1$ not a range of values. Consequently, only one, and not all of these equipment modes can be in resonant response at one time, with a magnitude indicated by the peak spectral value.

The criterion is illustrated by the following example:

Let there be three equipment frequencies, $(f_e)_1$, $(f_e)_2$, and $(f_e)_3$, that are within the frequency range of a spectral peak on the floor spectrum curve shown in Figure 7-1 (page 22). Following the reasoning previously

given, this spectrum curve is not to be used directly to obtain the modal accelerations, e.g., A_1 , A_2 , and A_3 , but is to be used according to one of the three possible ways indicated by Figures 7-1(b) to (d). The one that produces the largest total response shall be used for design.

7.1.1.4 Static Coefficient Analysis

This is an alternative method of analysis which is acceptable for verifying structural integrity of frame type structures such as members physically similar to beams and columns that can be represented by a simple model. No determination of natural frequencies is made but, rather, the response of the equipment is assumed to be the peak of the response spectrum at damping values as per Section 7.1.1.6. This response is then multiplied by a static coefficient of 1.5 to take into account the effects of both multifrequency excitation and multimode response. For equipment having configuration other than a frame-type structure, justification should be provided for use of a static coefficient.

In this analysis, the dynamic forces on each component of the equipment are obtained by multiplying the values of the mass and the acceleration. The resulting force should be distributed over the component in a manner proportional to its mass distribution. The stress analysis may then be performed in a normal manner.

7.1.1.5 Three Components of Dynamic Motions

The response such as internal forces, stresses and deformations at any point from the three principal orthogonal directions of the dynamic loads shall be combined as follows:

The response value used shall be the maximum value obtained by adding the response due to vertical earthquake

with the larger value of the responses due to one of the horizontal earthquakes by the absolute sum method.

For the other dynamic loads the response value shall be obtained by combining the response due to three orthogonal directions of an individual load by the square root of the sum of the squares method.

When responses are obtained by using RRS based on combination of seismic and hydrodynamic loads, the response value shall be obtained by combining the response due to three orthogonal directions by (i) adding the response due to vertical direction with the larger value of the responses due to one of the horizontal directions by the absolute sum method and (ii) combining the responses by the square root of the sum of the squares method and considering the larger of (i) and (ii).

7.1.1.6 Appropriate Damping Values

Unless otherwise approved by the buyer the following damping values shall be used for the design assessment:

- (a) Load Combinations involving OBE but not hydrodynamic loads. - 1/2%
- (b) Load Combinations involving SSE but not hydrodynamic loads. - 1/2%
- (c) Load Combinations involving hydrodynamic loads, or seismic and hydrodynamic loads. - 2%

The response spectra will be attached to the material requisition or the equipment specification.

If the Seller has evidence (such as test results) that the actual damping value of the equipment is different than that specified by the Buyer, the Seller may submit the evidence and request the Buyer's approval to use a different damping value.

7.1.2 Time History Analysis

This analysis shall be done by an applicable numerical integration technique. The dynamic input shall be the time history motion at the equipment support location(s). If a time history analysis is necessary, the Seller shall request the Buyer to furnish the time history at the required locations. Frequency variation in the structure and equipment shall be considered by varying the time step of the time history by a percentage which accounts for the broadening of the response spectrum plus 10%.

7.1.3 Non-Linear Systems

If a non-linear analysis is necessary, a request for permission to perform such an analysis shall be made by the Seller to the Buyer and procedure for the analysis shall be submitted to the Buyer for approval prior to the performance of such an analysis.

7.2 Equipment-Piping Interaction Effects

The interaction between the equipment and the attached piping can be significant under dynamic loadings.

To determine the effect of the equipment on the piping the Seller shall furnish the mathematical model(s) of the equipment as described in Section 7.1. The fundamental frequency of the equipment shall be furnished with the model.

The model shall include structural members at each piping connection of significance so that the stiffnesses of all six degrees-of-freedom at the pipe connection are described. The stiffness and mass matrices of the mathematical model shall also be included.

7.3 Nozzle Loads from Buyer Supplied Piping

In some cases piping furnished by the Buyer may attach to the equipment (such as pumps, tanks, heat exchangers, etc.) furnished by the Seller. The equipment shall be designed to withstand the loads imposed upon it by the attached piping. These loads shall be supplied by the Buyer.

8.0 TESTING

8.1 General Criteria

In lieu of performing dynamic analysis, dynamic adequacy may be established by providing dynamic test or previous dynamic environmental (performance) data which demon-

strates that the equipment meets the dynamic design criteria as described in Section 4.0 of this specification. Such data shall conform to one of the following:

- (a) Performance data of equipment which, under the specified conditions, has been subjected to equal or greater dynamic loads than those to be experienced under the specified dynamic conditions.
- (b) Test data from previously tested comparable equipment which, under similar conditions, has been subjected to equal or greater dynamic loads than those specified.
- (c) Actual testing of equipment in operating conditions simulating as closely as possible the actual installation, the required loadings and load combinations.

The sequence of testing is (i) as specified in Section 4.0 followed by (ii) the most severe case of Section 5.0. △
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In general, triaxial input motions shall be simultaneously used in all three principal directions. Alternatively, a series of biaxial or uniaxial tests may be used to simulate simultaneous input in all three principal directions.

The minimum time duration for each condition and direction shall be 20 seconds, and, in no case, less than required to produce desired amplification. The equipment selected for testing shall be typical of the manufacturers minimum minimum quality control program. Test equipment specimens shall not be released for installation unless it can be demonstrated that equipment to be installed in the plant has not had its useful life diminished below the requirements needed to insure safe functioning of the plant.

8.2 Acceptable Test Methods

The continuous sinusoidal test, sine beat test, or decaying sinusoidal test superimposed on random motion, is acceptable when the applicable floor acceleration spectrum is a narrow band response spectrum. Otherwise, random motion test (or equivalent) with broad frequency content shall be used. See Section 8.7 for test acceptability.

8.3 Mounting

The equipment to be tested shall be mounted in a manner that simulates the actual service mounting. The orientations of the equipment during the test shall be documented. The method of mounting the equipment to the vibration generator shall be documented and shall include a description of any interposing fixtures. The effects of such fixtures must be evaluated if they are only used during qualification and not for in-service mounting.

8.4 Monitoring

Sufficient monitoring equipment shall be used to evaluate the performance of the equipment before, during, and after the test. Additional instrumentation may be required by the Buyer on equipment assemblies for the purpose of determining transfer function. In addition, enough vibration monitoring equipment shall be provided at the location which simulates the base of the equipment mount to allow determination of the magnitude, frequency and/or time history of the applied motion depending on the type of test.

8.5 Assembly Testing

Assemblies may be tested in an inoperative mode with actual or simulated devices installed. The dynamic properties of the devices shall be simulated with sufficient accuracy to yield the same dynamic properties for the assembly with the actual devices installed. Assembly testing shall meet all the requirements for testing stated in this Section 8.0.

8.6 Device Testing

Devices shall be tested in an operational mode to levels at least as high as the levels dictated by service requirements. Devices may be tested either by itself on a shaking table, or as part of an assembly test.

If the device is tested by itself, the shaker table motion for the test shall be determined in one of the two following ways:

- (a) Direct monitoring of the device support motion in an assembly test in which the assembly support motions satisfy all of the requirements previously stated in this Section 8.0.

- (b) Determination of the assembly transfer function for the device support location and application of this transfer to an assembly support motion which satisfies all the requirements for a test motion previously stated in this Section 8.0.

8.7 Test Acceptability

With the appropriate test method selected in accordance with Section 8.2, the equipment can be qualified if the test response spectra (TRS) envelopes the required response spectra (RRS) attached with the equipment technical specification, for the appropriate damping values (see Section 7.1.1.6). The maximum acceleration of the shake table motion should be at least equal to the zero period acceleration (ZPA) of the RRS.

8.8 Post Test Inspection

The tested item shall be thoroughly inspected for any damage sustained during testing. A detailed description of damage and repair, accompanied by illustrations, and/or replacement shall be included in the test report.

8.9 Equipment Malfunction

If the equipment fails or malfunctions or will not operate during or after the test, the Seller shall redesign the system and resubmit to the Buyer drawings and data for approval. A new test shall be conducted on the redesigned equipment to show compliance with the specification at no additional expense to the Buyer. The Seller shall resubmit the test program to the Buyer for approval prior to retesting, if the testing program is altered.

9.0 COMBINED ANALYSIS AND TESTING

There are several instances where the qualification of equipment by analysis alone or testing alone, may not be practical or adequate because of its size, or its complexity, or large number of similar configurations. In these instances a combination of analysis and testing could be more practical. The following are general approaches:

- (a) An analysis could be conducted on the overall assembly to determine its stress level and the transmissibility of motion from the base of the equipment to the critical components. The critical components would be removed from the assembly and subjected to a simulation of the environment on a test table.
- (b) Testing methods may be used to aid in the formulation of the mathematical model for any piece of equipment. Mode shapes and frequencies may be determined experimentally and incorporated into a mathematical model of the equipment. The model and subsequent analysis shall meet all the requirements of Section 7.0.

For those equipment which have already been qualified for seismic loads, the combined analysis and testing approach can be used for qualifying the equipment for combined seismic and hydrodynamic loads. In such cases, the Seller shall submit a procedure to the Buyer for approval prior to adopting such a procedure.

10.0 EVIDENCE OF COMPLIANCE

The documentation for the seismic and hydrodynamic load qualification of equipment shall demonstrate in detail that the equipment meets its performance requirements when subjected to the seismic and hydrodynamic loads for which it is to be qualified. The evidence that the equipment satisfies the requirements of this specification is subject to review by the Buyer prior to fabrication of the equipment or prior to shipment of standard off-the-shelf items. The Seller shall submit the Qualification Summary of Equipment (SQRT) indicated in Appendix "A" with the qualification report. The evidence of compliance shall be in agreement with the following formats:

10.1 Analysis Qualification Report

The report for equipment qualified by analysis shall be presented in a step-by-step form which is readily auditable by persons skilled in such analysis.

(a) Description

A general description of the equipment shall be given with drawings, figures and photographs as necessary. The information shall include a description of how the equipment functions during operations.

(b) Design Criteria

The design criteria shall be documented, stating allowables and referencing applicable codes. The deformation limits required to keep the equipment functional shall also be stated where applicable.

(c) Loading Conditions

The specific loads and load combinations used in the analysis and the design of the equipment shall be stated.

(d) Mathematical Model

This section shall summarize the mathematical model, assumptions and properties. A justification shall be provided for any damping values used in the analysis that are different from those in Section 7.1.1.6. If the equipment is supported at two or more locations, a statement shall be made indicating how the effect of the differential support displacements is considered.

(e) Computer Programs

A description of all computer programs used in the analysis shall be provided, together with the program capabilities, its name and source.

(f) Analysis Techniques

The report shall state the techniques used to analyze the mathematical model of the equipment, and shall show calculations.

(g) Analysis Results

This section of the report shall summarize the individual loadings considered and also the combined results. A listing of potential failure modes considered in the analysis shall also be included in this section.

The applicable design response spectra, time histories, or maximum 'g' levels shall be identified for all three major directions, (two horizontal and one vertical). If modal analysis is used, mode shapes, frequencies and modal responses shall be presented.

(h) Summary of the Analysis

This section shall summarize why the equipment is acceptable, based on comparison or predicted responses and allowables. The calculated deformations which may affect equipment functions shall be compared to values which would cause malfunction. The section shall also include a summary and a conclusion with reference to the analysis where information for the conclusions can be reviewed.

10.2 Test Qualification Report

The report for equipment qualified by testing shall be presented in a step-by-step form which is readily auditable by persons skilled in the review of such reports.

(a) Description

A general description of the equipment shall be given with drawings, figures and photographs as necessary. The information shall include a description of how the equipment functions during operation.

(b) Design Criteria

The design criteria shall be documented, showing allowables and referencing applicable codes. The deformation limits required to keep the equipment functional shall also be stated where applicable.

(c) Loading Conditions

The specific loads and load combinations used in the qualification of the equipment shall be documented. If any of the loadings and load combinations of the equipment specification are not used, a justification shall be provided. The applicable design response spectra, time histories, or maximum 'g' levels shall be identified for all three major equipment directions (two horizontal and one vertical).

(d) Test Facility

The report shall include a description of the test facility which conducted the test and/or prepared the test report. It shall include the name and the location of the facility.

(e) Equipment Mounting

The mounting of the equipment on the vibration machine shall be described. This should include photographs.

(f) Equipment Location and Orientation

The equipment location and orientation relative to the forcing functions (response spectra, time histories, etc.) shall be described.

(g) Classification

Non-Seismic Category I devices and parts in Seismic Category I assemblies shall be identified by the Seller.

(h) Operational Settings

The operational settings (or range of settings) for adjustable type devices shall be described. Tests for different settings shall also be described.

(i) Monitoring System

The report shall include a full description of the monitoring system used during the test, including the location, type, calibration, etc. of all monitoring devices (accelerometers, strain gages, etc.).

(j) Test Method

The report shall include a complete description and justification of the test method used to qualify the equipment, including excitation durations, vibrational amplitudes, etc., as specified in Section 8.0.

(k) Test Data

The test data shall include calibration histories of the test equipment, photographs of the equipment during testing, test response spectra and other relevant data from the test.

(1) Results and Conclusions

The results and conclusions from the test shall be briefly summarized. The results shall be compared with performance requirements for the equipment.

10.3 Combined Analysis/Test Report

The report for combined analysis/test qualification of equipment shall meet all of the applicable requirements of Sections 10.1 and 10.2. The report shall be presented in a step-by-step form which is readily auditable by persons skilled in the review of such reports.

11.0 CERTIFICATION OF COMPLIANCE

All test data, design calculations, data, and certifications submitted shall be signed and approved for compliance to the specification under the seal of the registered professional engineer in the State of Pennsylvania or the state in which the equipment was manufactured prior to final acceptance.

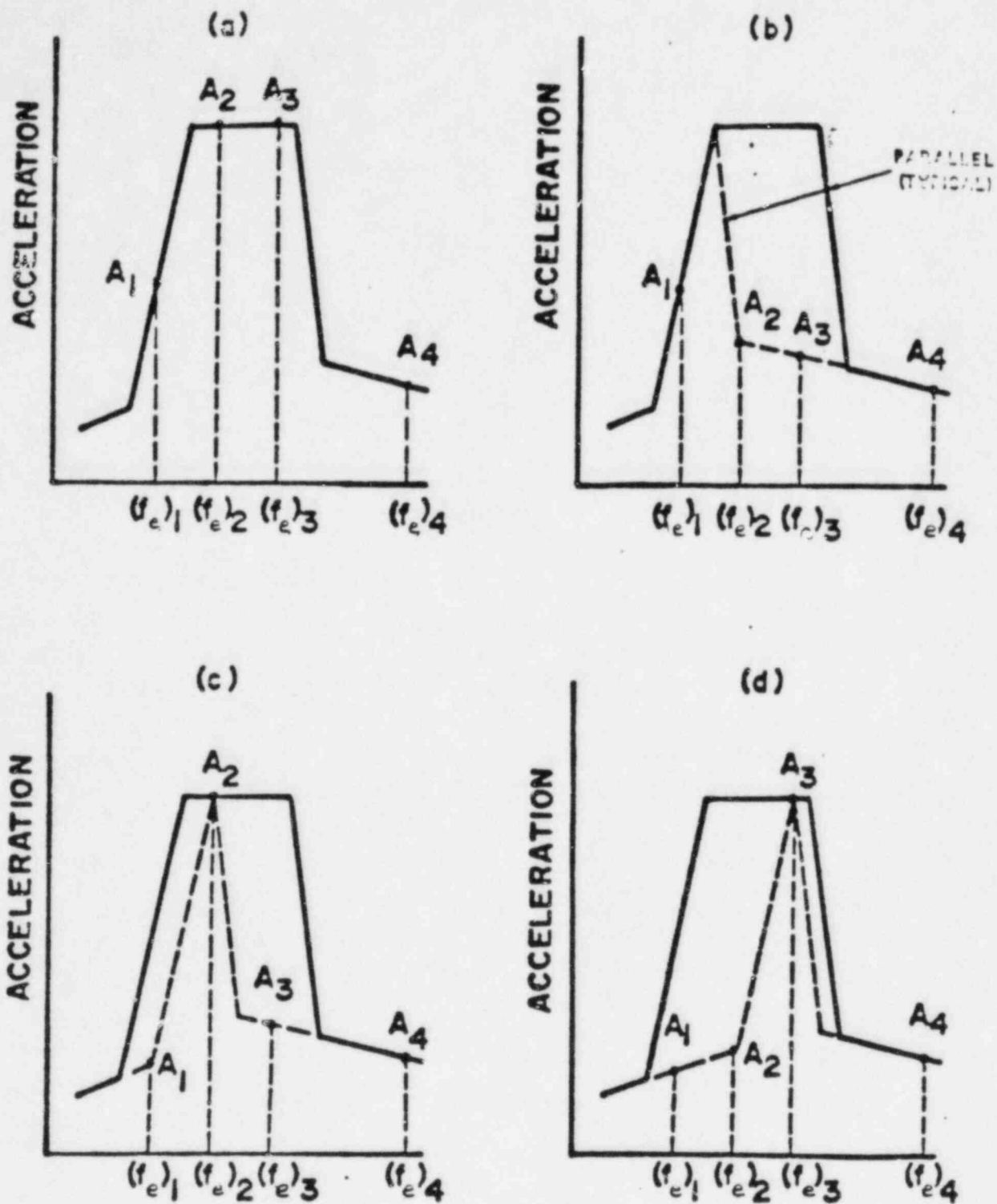


Figure 7-1 Diagrams Illustrating the Use of Floor Spectrum Curve When More Than One Equipment Frequency is Within the Widened Spectral Peak