ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Monday, August 23, 2010 4:56 PM
To: Tesfaye, Getachew
Cc: DELANO Karen (AREVA); ROMINE Judy (AREVA); BENNETT Kathy (AREVA); CORNELL Veronica (EXTERNAL AREVA)
Subject: Response to U.S. EPR Design Certification Application RAI No. 320, FSAR Ch 3, Supplement 2, Part 2 of 2
Attachments: RAI 320 Supplement 2 Response US EPR DC (Part 2 of 2) - INTERIM.pdf

Getachew,

Attached is part 2 of 2 for RAI 320 Supplement 2, which contains the remainder of the FSAR markups for responses to questions 3.7.2-63 and 3.7.3-37.

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (External RS/NB)
Sent: Monday, August 23, 2010 4:36 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen (RS/NB); ROMINE Judy (RS/NB); BENNETT Kathy (RS/NB); CORNELL Veronica (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 320, FSAR Ch 3, Supplement 2, Part 1 of 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI 320 on November 24, 2009. AREVA NP submitted Supplement 1 on June 21, 2010, to provide a revised schedule for responding to RAI 320.

The attached file, “RAI 320 Supplement 2 US EPR DC (Part 1 of 2) – INTERIM.pdf” andthe file “RAI 320 Supplement 2 US EPR DC (Part 2 of 2) – INTERIM.pdf” in subsequent email, provide technically correct and complete INTERIM responses to Question 03.07.02-63 and Question 03.07.03-37, as committed.

The following table indicates the respective pages in the response document, “RAI 320 Supplement 2 US EPR DC (Part 1 of 2) – INTERIM.pdf,” that contains AREVA NP’s INTERIM response to Question 03.07.02-63 and Question 03.07.03-37.

Question #	Start Page	End Page
RAI 320 — 03.07.02-63	2	3
RAI 320 — 03.07.03-37	4	4

The schedule for technically correct and complete FINAL responses is unchanged and provided below:

Question #	Interim Response Date	Final Response Date
RAI 320 — 03.07.02-63	August 23, 2010 (Actual)	January 13, 2011
RAI 320 — 03.07.03-37	August 23, 2010 (Actual)	January 13, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: BRYAN Martin (EXT)
Sent: Monday, June 21, 2010 7:09 PM
To: 'Tesfaye, Getachew'
Cc: DELANO Karen V (AREVA NP INC); ROMINE Judy (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); VAN NOY Mark (EXT); CORNELL Veronica (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 320, FSAR Ch 3, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to RAI No. 320 on November 24, 2009.

Based upon the civil/structural re-planning activities and revised RAI response schedule presented to the NRC during the June 9, 2010, Public Meeting, the schedule for Questions 03.07.02-63 and 03.07.03-37 has been changed.

Prior to submittal of the final RAI response, AREVA NP will provide an interim RAI response that includes:

(1) a description of the technical work (e.g., methodology)
(2) U.S. EPR FSAR revised pages, as applicable

The revised schedule for an interim response and the technically correct and complete response to these questions is provided below.

Question #	Interim Response Date	Final Response Date
RAI 320 — 03.07.02-63	August 23, 2010	January 13, 2011
RAI 320 — 03.07.03-37	August 23, 2010	January 13, 2011

Sincerely,

Martin (Marty) C. Bryan
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
Tel: (434) 832-3016
702 561-3528 cell
Martin.Bryan.ext@areva.com

From: WELLS Russell D (AREVA NP INC)
Sent: Monday, November 30, 2009 10:15 AM
To: 'Getachew Tesfaye'; 'Michael Miernicki'
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 320, FSAR Ch 3

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 320 Response US EPR DC.PDF" provides a schedule for a technically correct and complete response to the 2 questions.

The following table indicates the respective pages in the response document, "RAI 320 Response US EPR DC.PDF," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 320 — 03.07.02-63	2	2
RAI 320 — 03.07.03-37	3	3

A complete answer is not provided for 2 of the 2 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 320 — 03.07.02-63	June 21, 2010
RAI 320 — 03.07.03-37	June 21, 2010

Sincerely,

(Russ Wells on behalf of)

Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
AREVA NP, Inc.
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694
Cell: 434-841-8788

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Friday, October 30, 2009 2:10 PM
To: ZZ-DL-A-USEPR-DL
Cc: Chakravorty, Manas; Hawkins, Kimberly; Miernicki, Michael; Patel, Jay; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 320 (3881, 3880),FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 22, 2009, and on October 30, 2009, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 1880

Mail Envelope Properties (BC417D9255991046A37DD56CF597DB71074C901D)

Subject: Response to U.S. EPR Design Certification Application RAI No. 320, FSAR Ch 3, Supplement 2, Part 2 of 2
Sent Date: 8/23/2010 4:56:00 PM
Received Date: 8/23/2010 4:58:02 PM
From: BRYAN Martin (EXTERNAL AREVA)

Created By: Martin.Bryan.ext@areva.com

Recipients:
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"BENNETT Kathy (AREVA)" <Kathy.Bennett@areva.com>
Tracking Status: None
"CORNELL Veronica (EXTERNAL AREVA)" <Veronica.Cornell.ext@areva.com>
Tracking Status: None
"Tesfaye, Getachew" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

Post Office: AUSLYNCMX02.adom.ad.corp

Files	**Size**	**Date & Time**
MESSAGE	6460	8/23/2010 4:58:02 PM
RAI 320 Supplement 2 Response US EPR DC (Part 2 of 2) - INTERIM.pdf	5863552	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Figure 3.7.2-10—~~Stick Model STICK-2T for Balance of NI Common Basemat Structures - Plan View~~

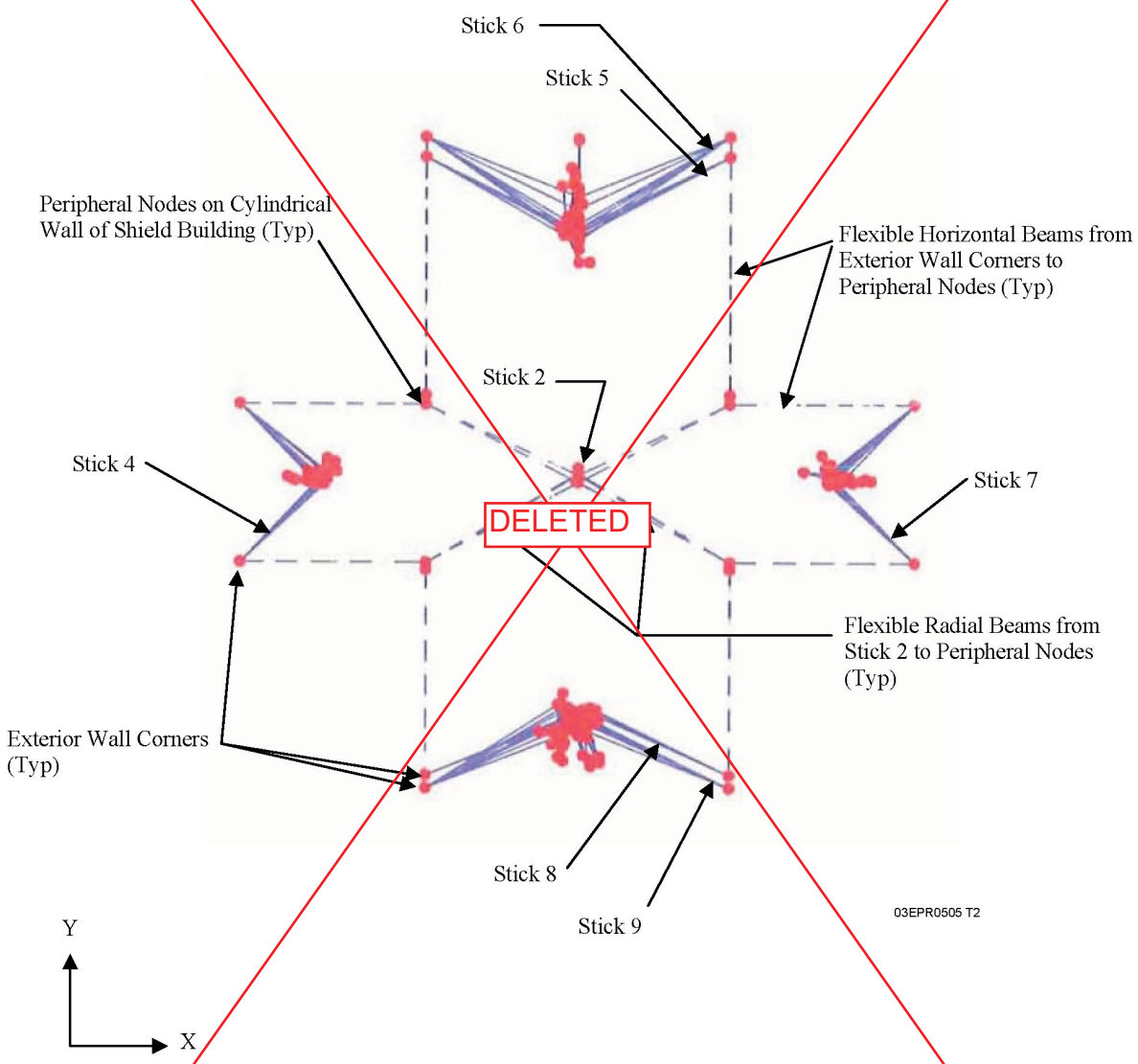


Figure 3.7.2-11—~~Stick Model STICK-2T for Balance of NI Common Basemat Structures - Perspective View~~

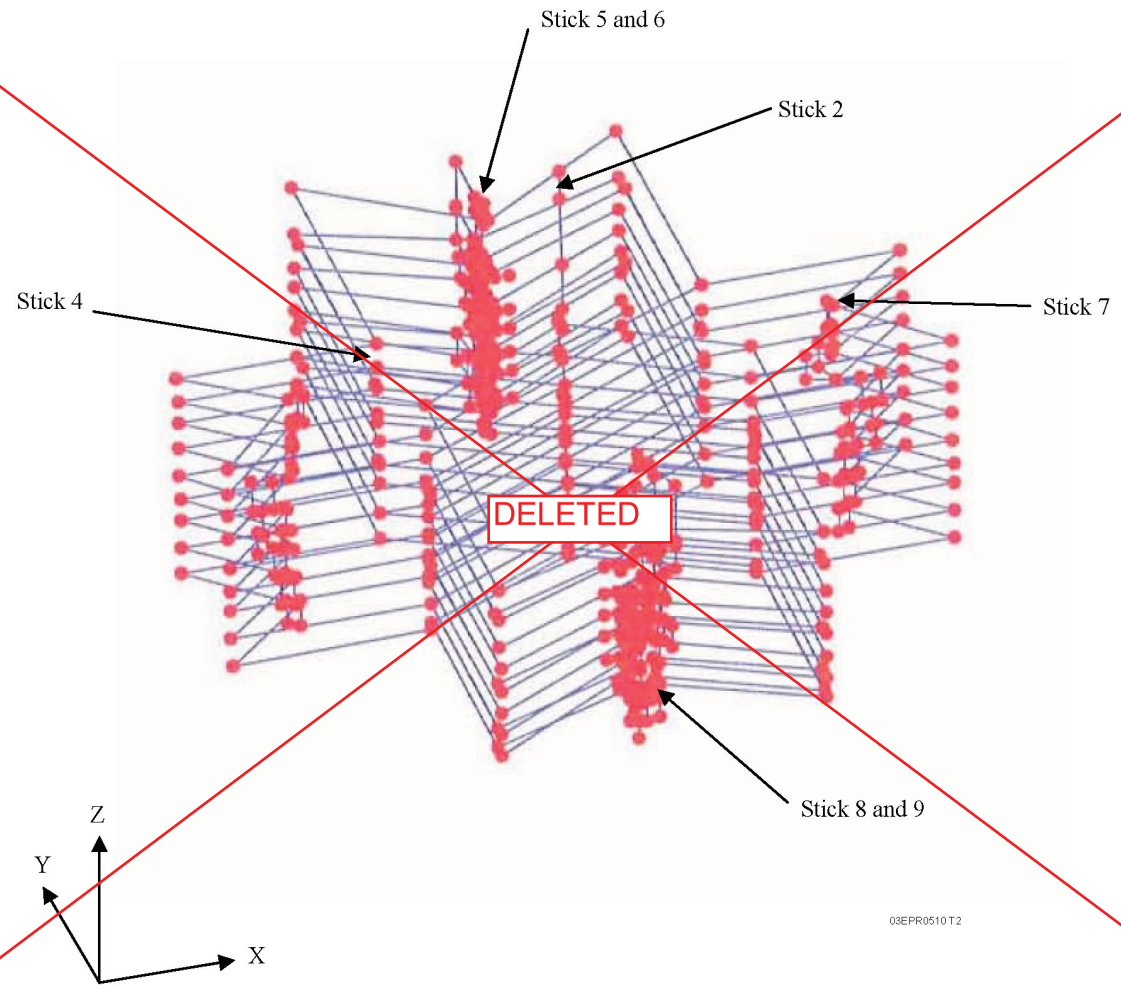


Figure 3.7.2-12—~~Stick Model STICK-3T for Reactor Containment - Perspective View~~

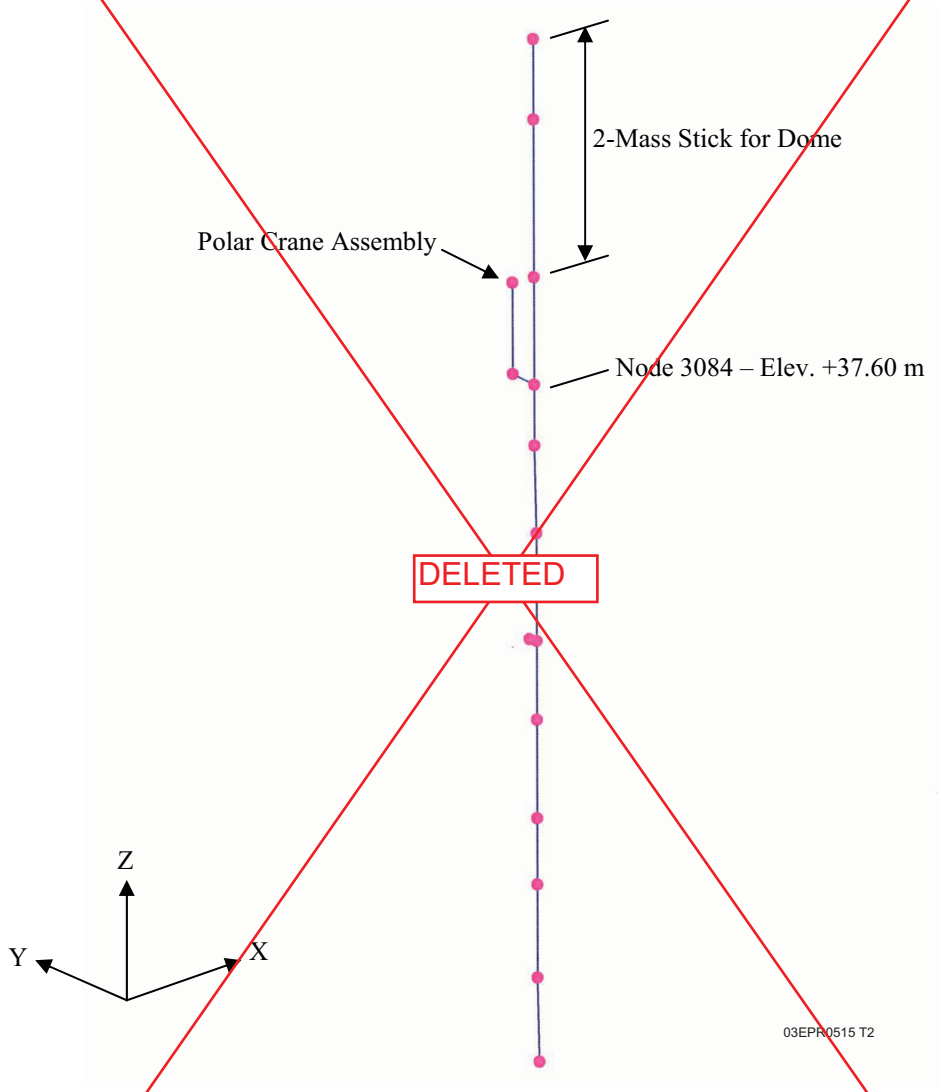
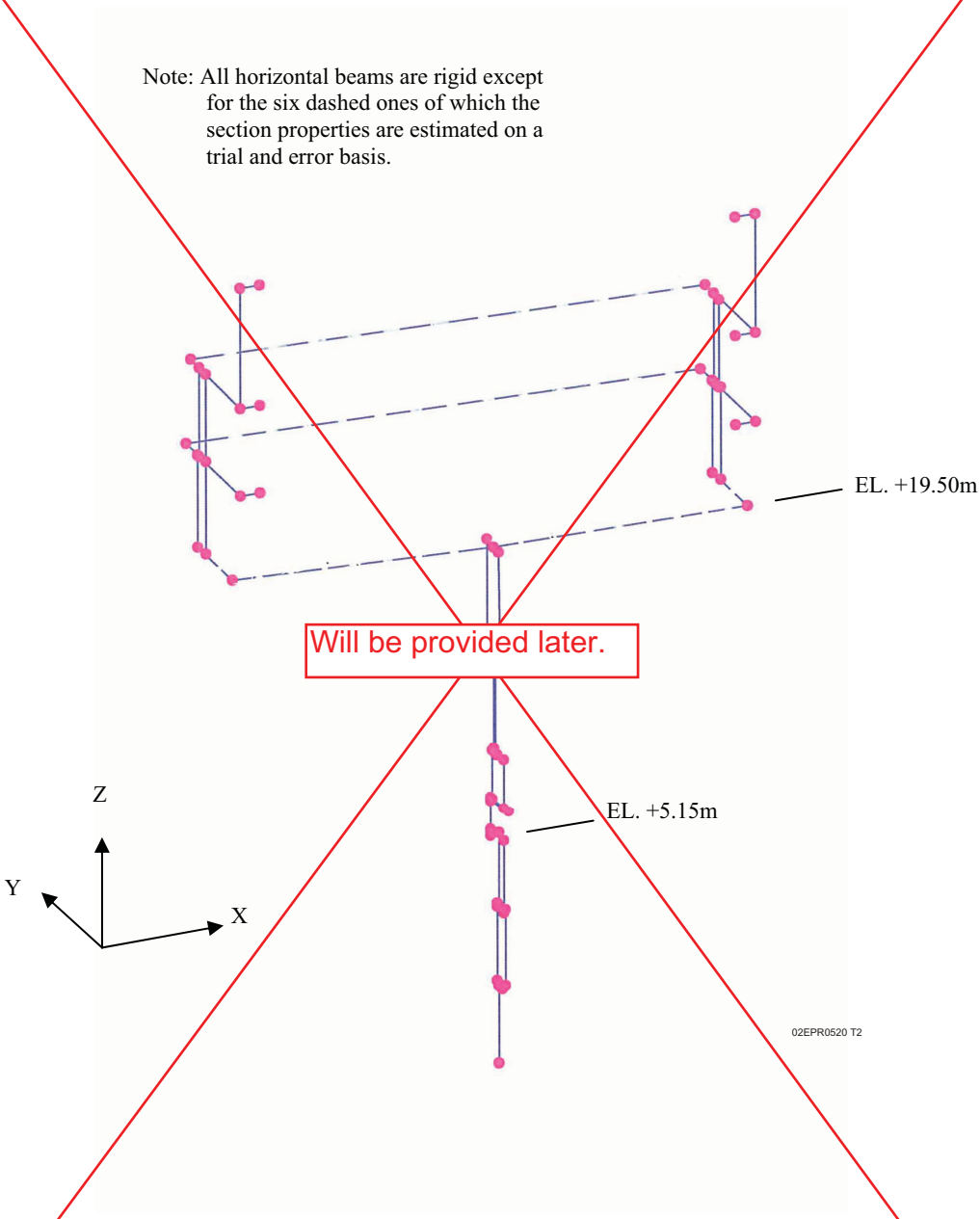


Figure 3.7.2-13—Stick Model STICK-1T for Reactor Building Internal Structure - Perspective View



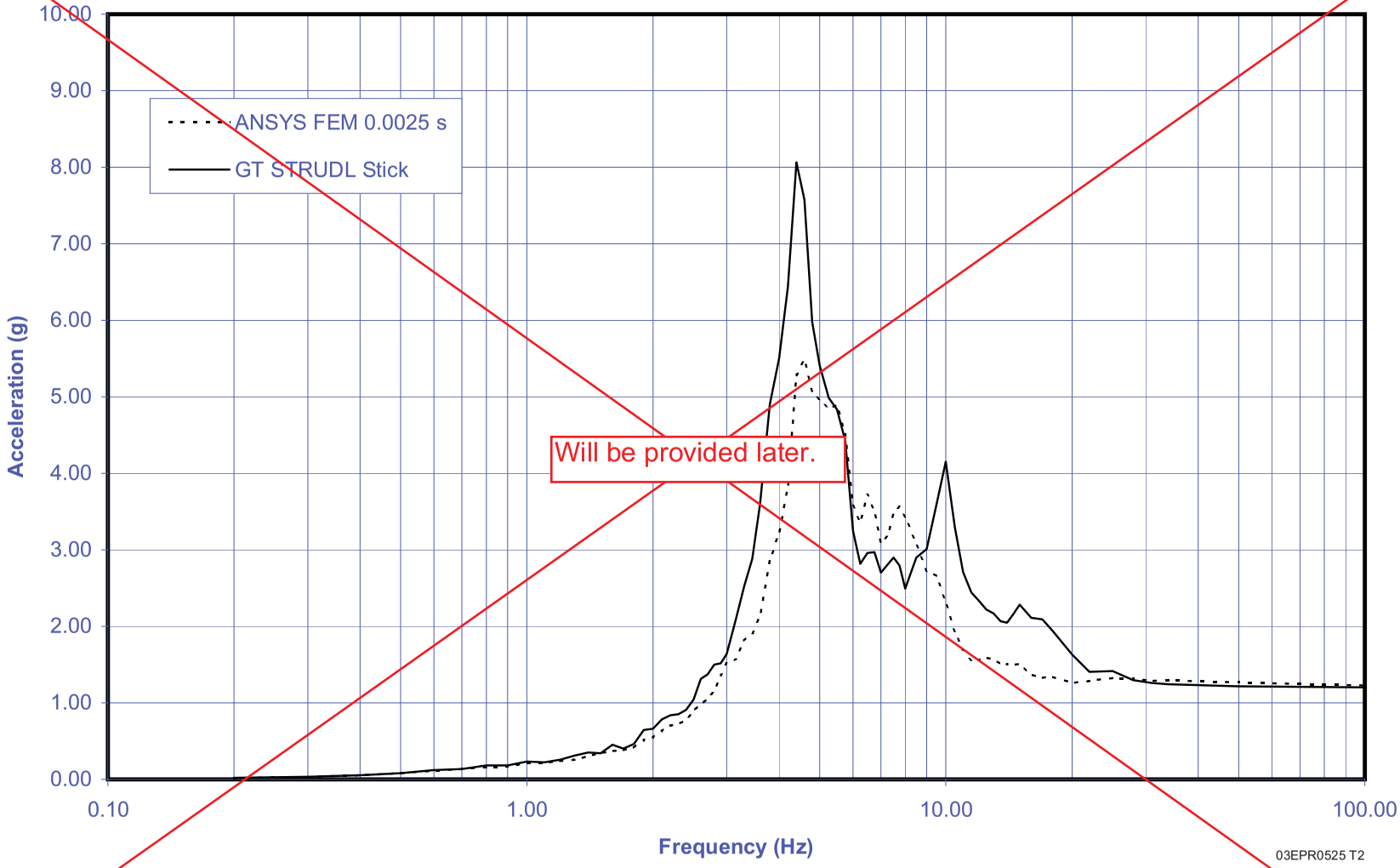
Will be provided later.

Static FEM

ft

Figure 3.7.2-14—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +200, 5 in (+61.09m) (Dome Apex) of Reactor Shield Building, 5% Damping, X-Direction

Dynamic

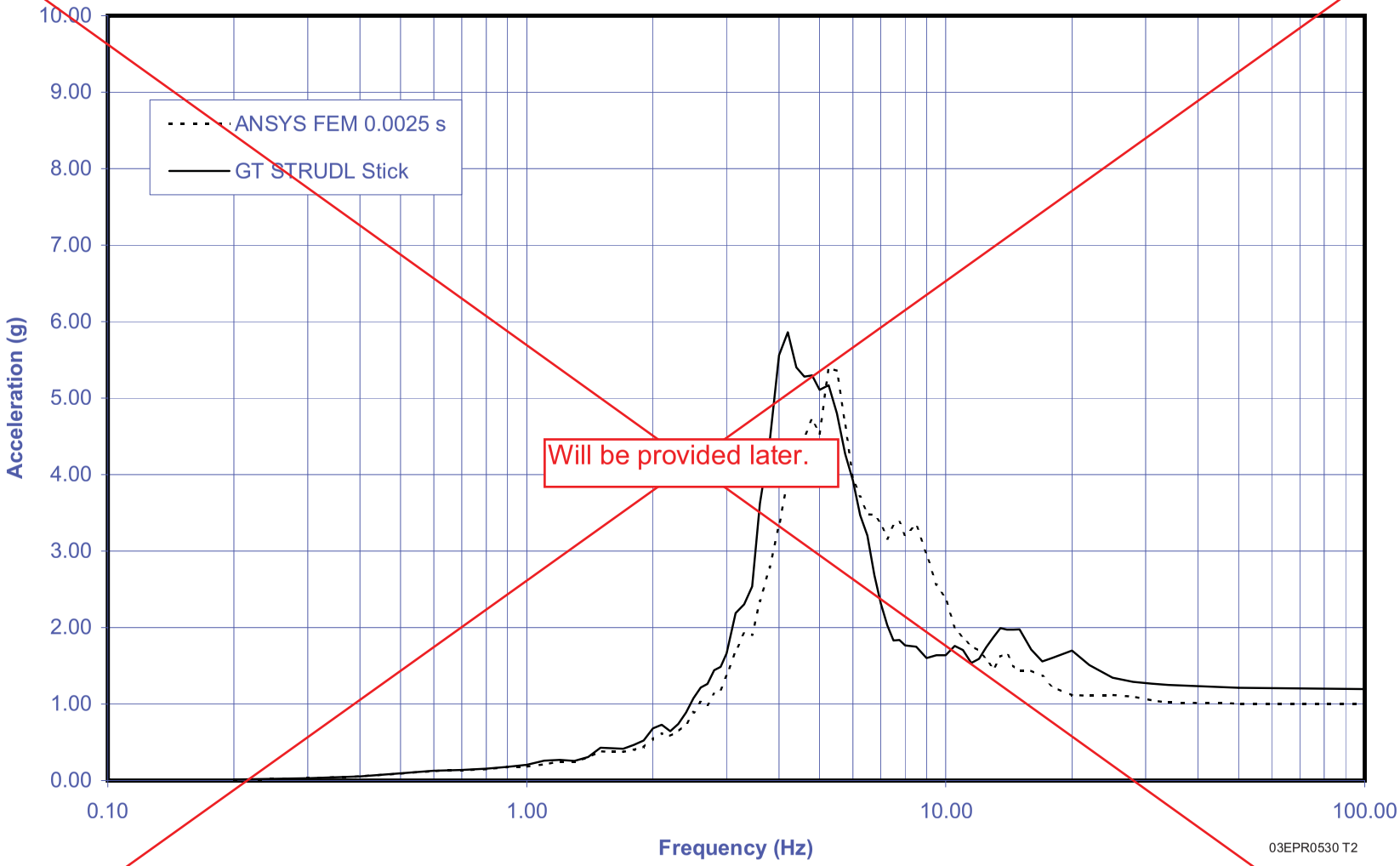


Will be provided later.

Static FEM

Figure 3.7.2-15—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +200 ft, 5 in (+61.09m) (Dome Apex) of Reactor Shield Building, 5% Damping, Y-Direction

Dynamic

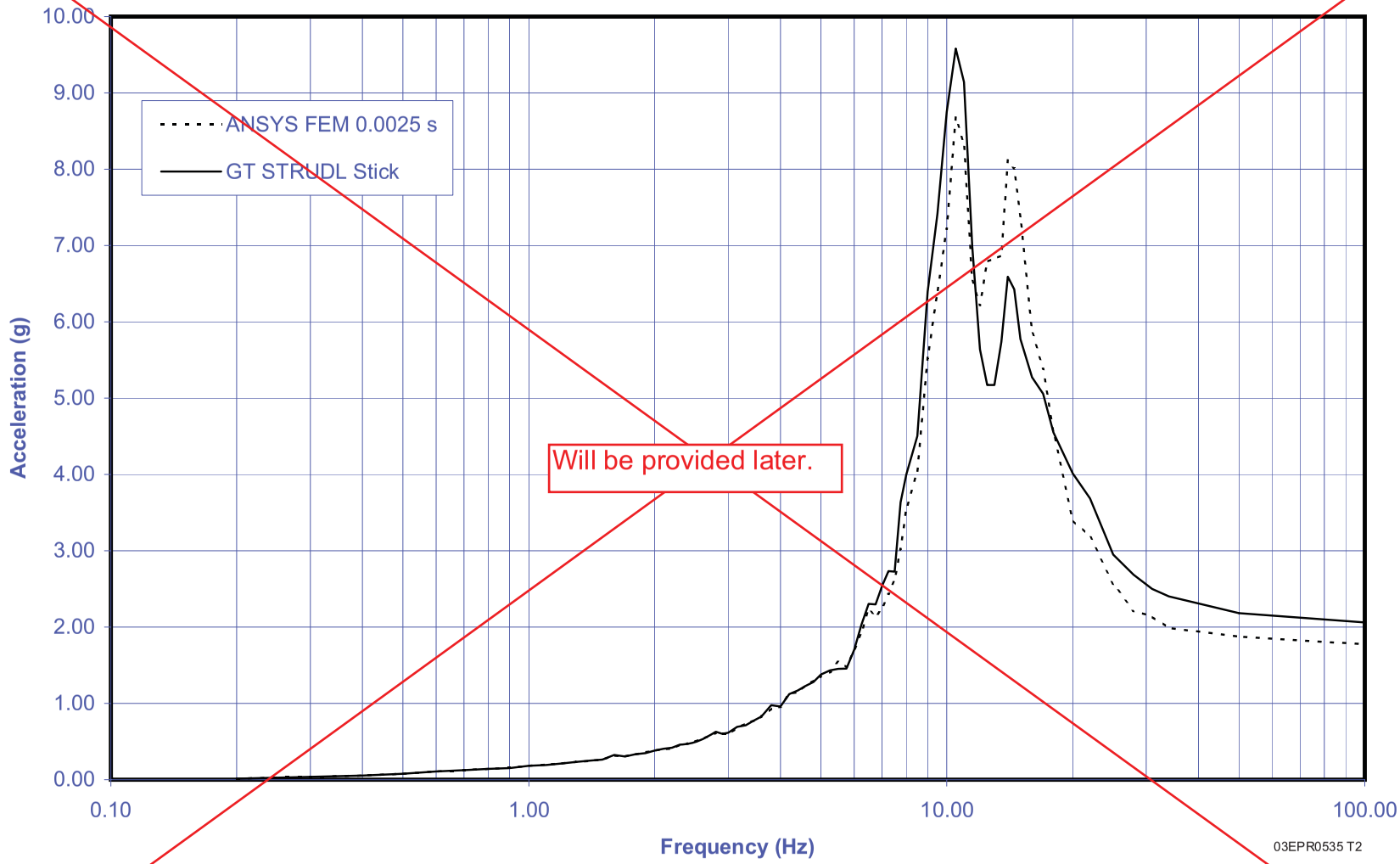


Will be provided later.

Static FEM

Figure 3.7.2-16—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +200ft, 5 in (+61.09m) (Dome Apex) of Reactor Shield Building, 5% Damping, Z-Direction

Dynamic

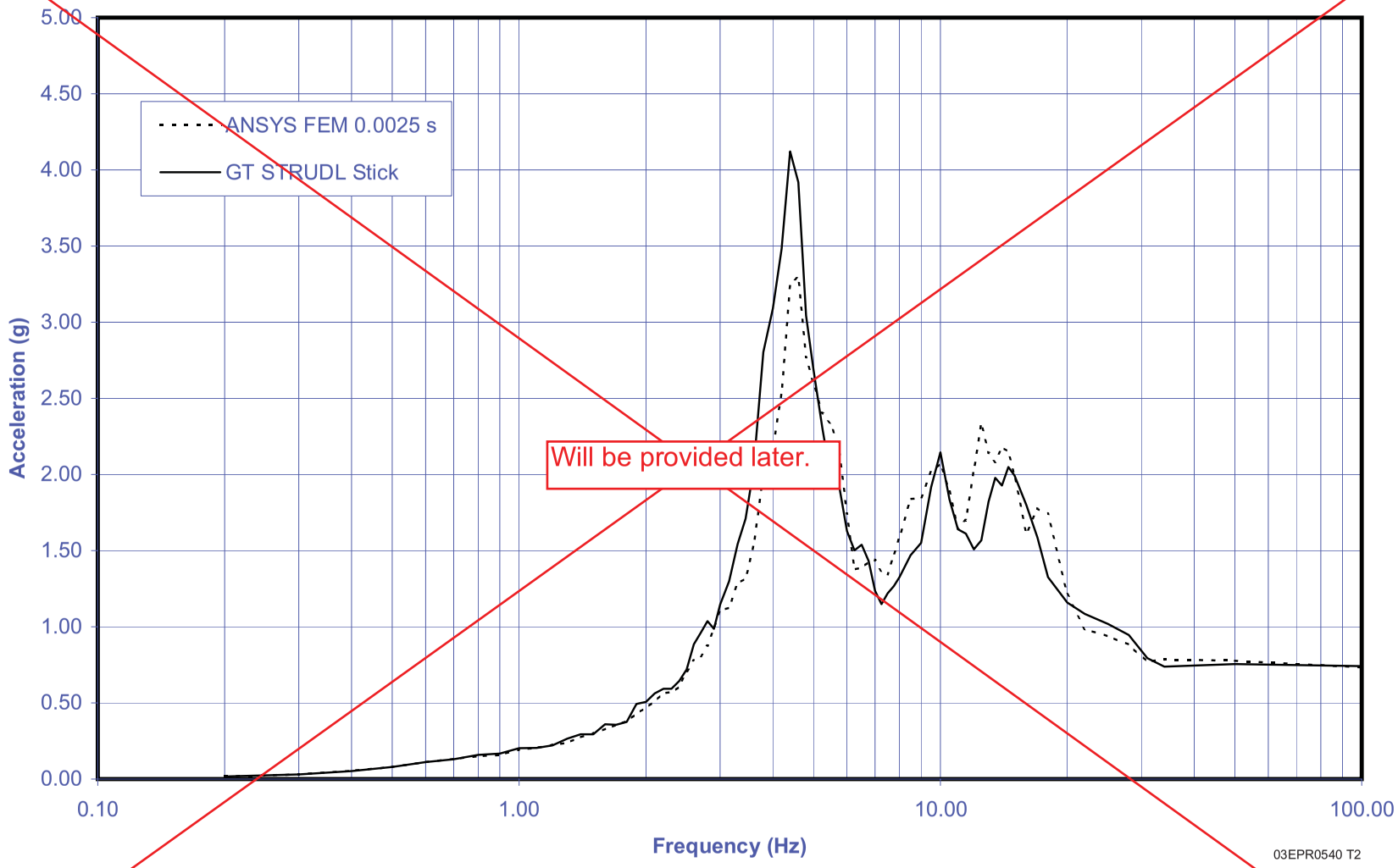


Will be provided later.

Static FEM

Figure 3.7.2-17—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 1, 5% Damping, X-Direction

Dynamic

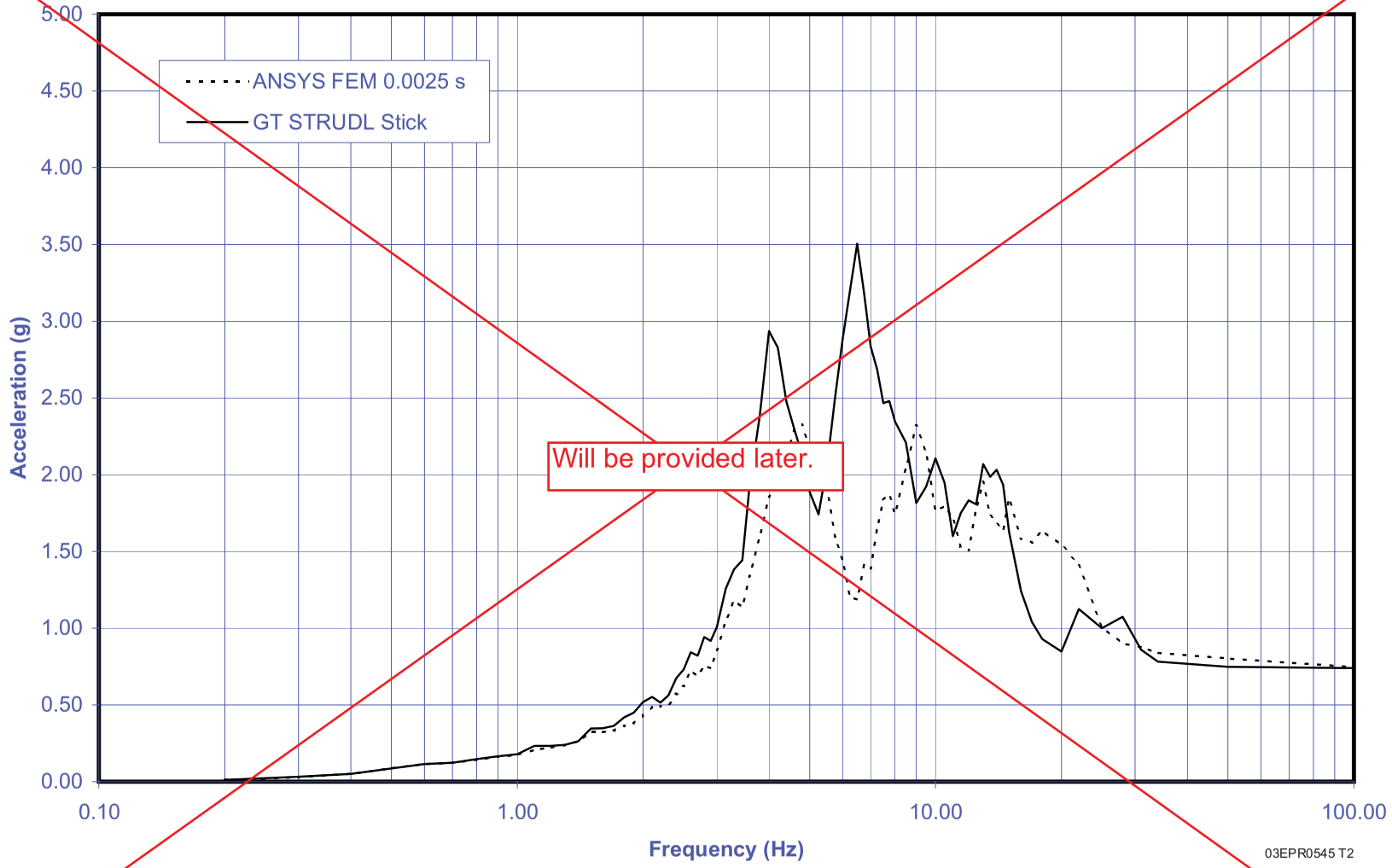


Will be provided later.

Static FEM

Figure 3.7.2-18—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 1, 5% Damping, Y-Direction

Dynamic

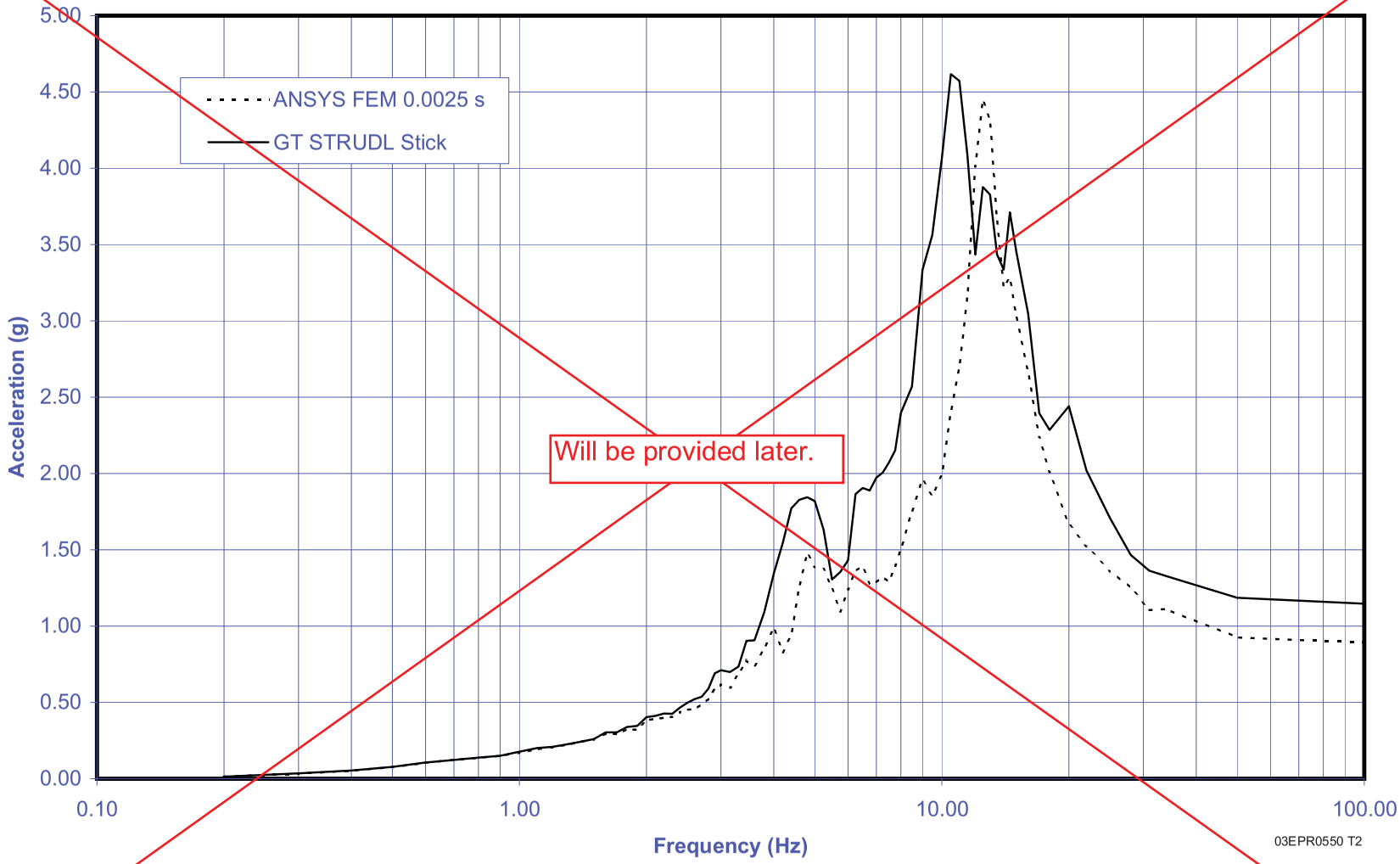


Will be provided later.

Static FEM

Figure 3.7.2-19—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 1, 5% Damping, Z-Direction

Dynamic

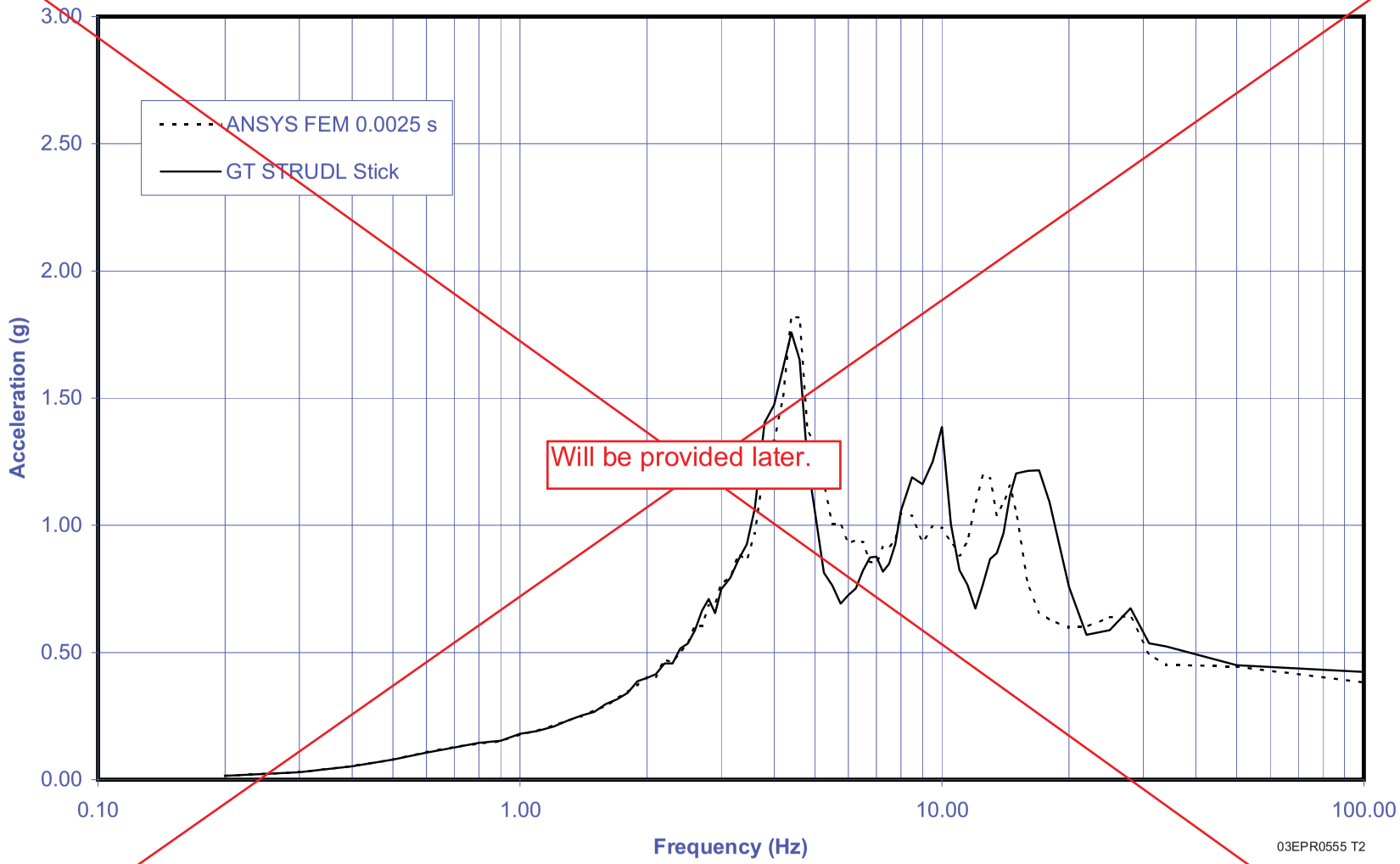


Will be provided later.

Static FEM

Figure 3.7.2-20—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 1, 5% Damping, X-Direction

Dynamic

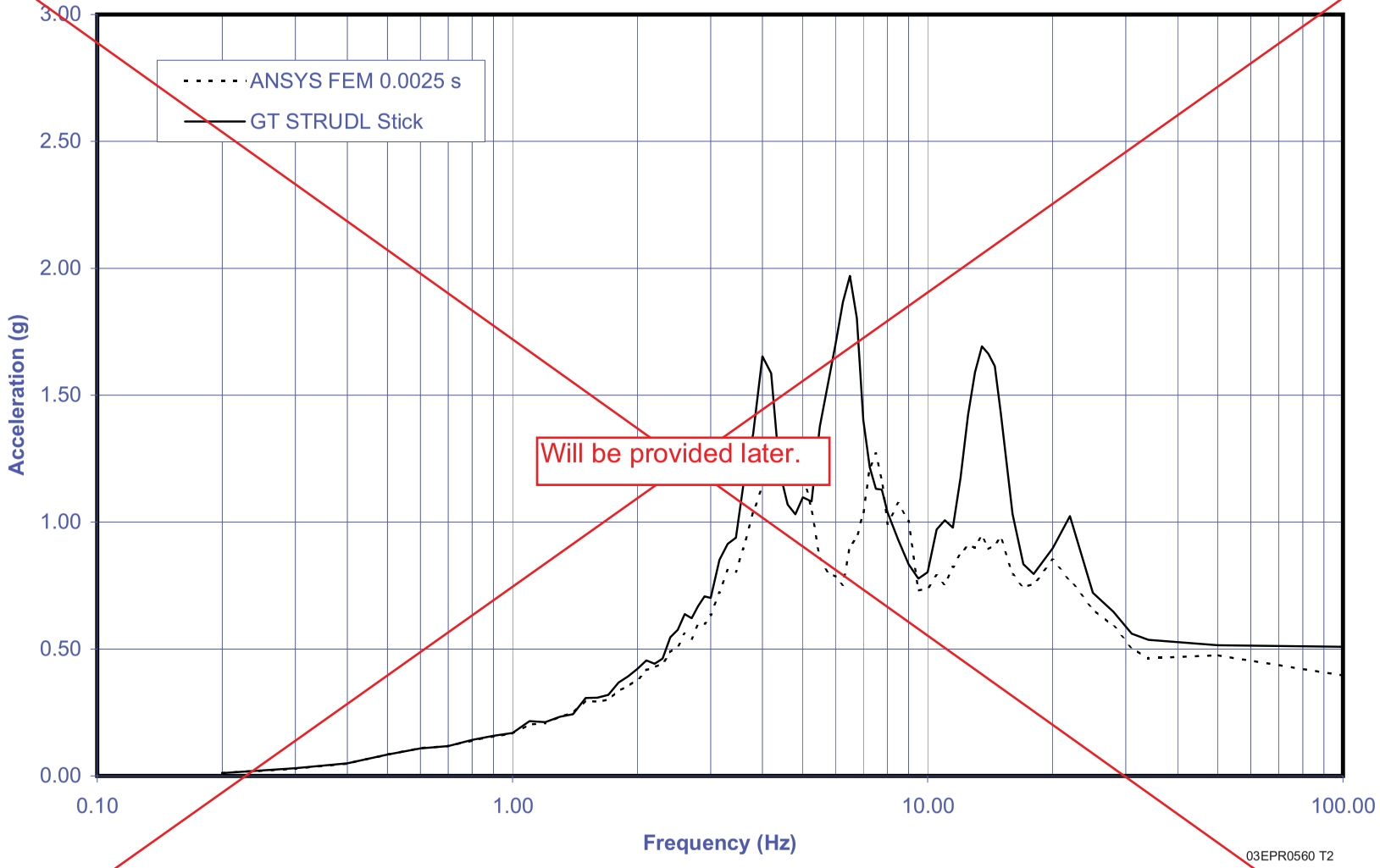


Will be provided later.

Static FEM

Figure 3.7.2-21—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 1, 5% Damping, Y-Direction

Dynamic

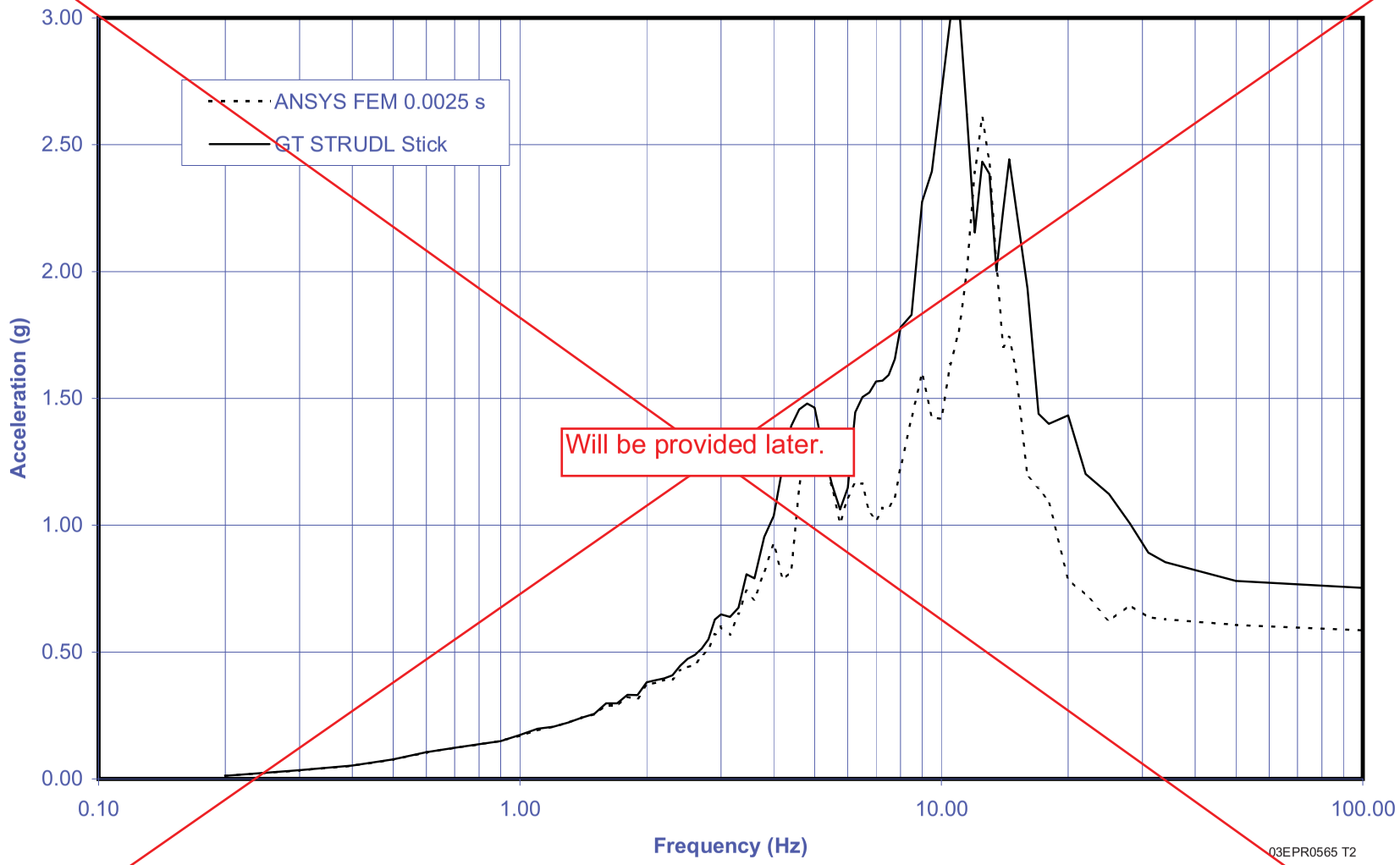


Will be provided later.

Static FEM

Figure 3.7.2-22—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 1, 5% Damping, Z-Direction

Dynamic

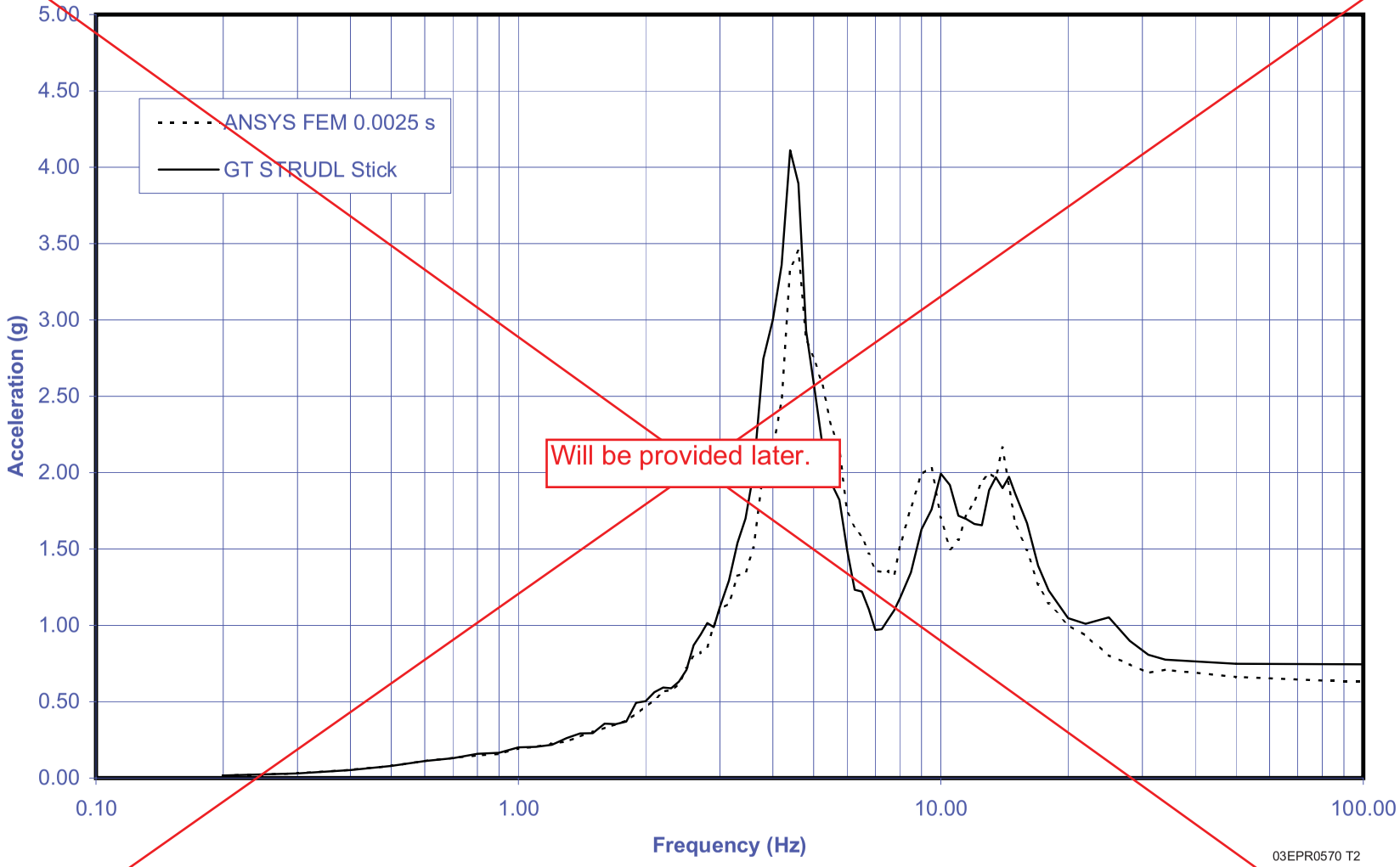


Will be provided later.

Static FEM

Figure 3.7.2-23—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 4, 5% Damping, X-Direction

Dynamic

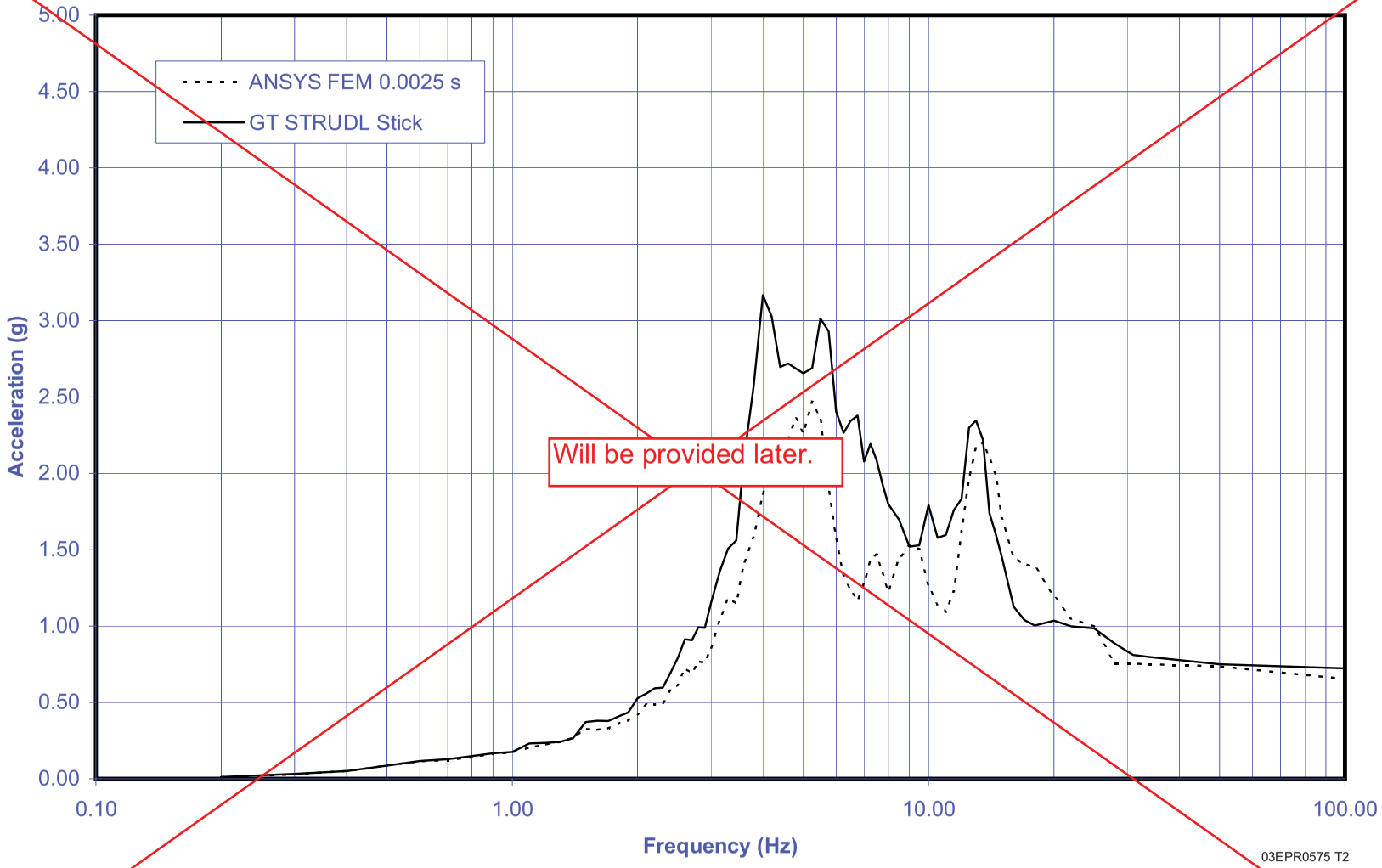


Will be provided later.

Static FEM

Figure 3.7.2-24—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 4, 5% Damping, Y-Direction

Dynamic

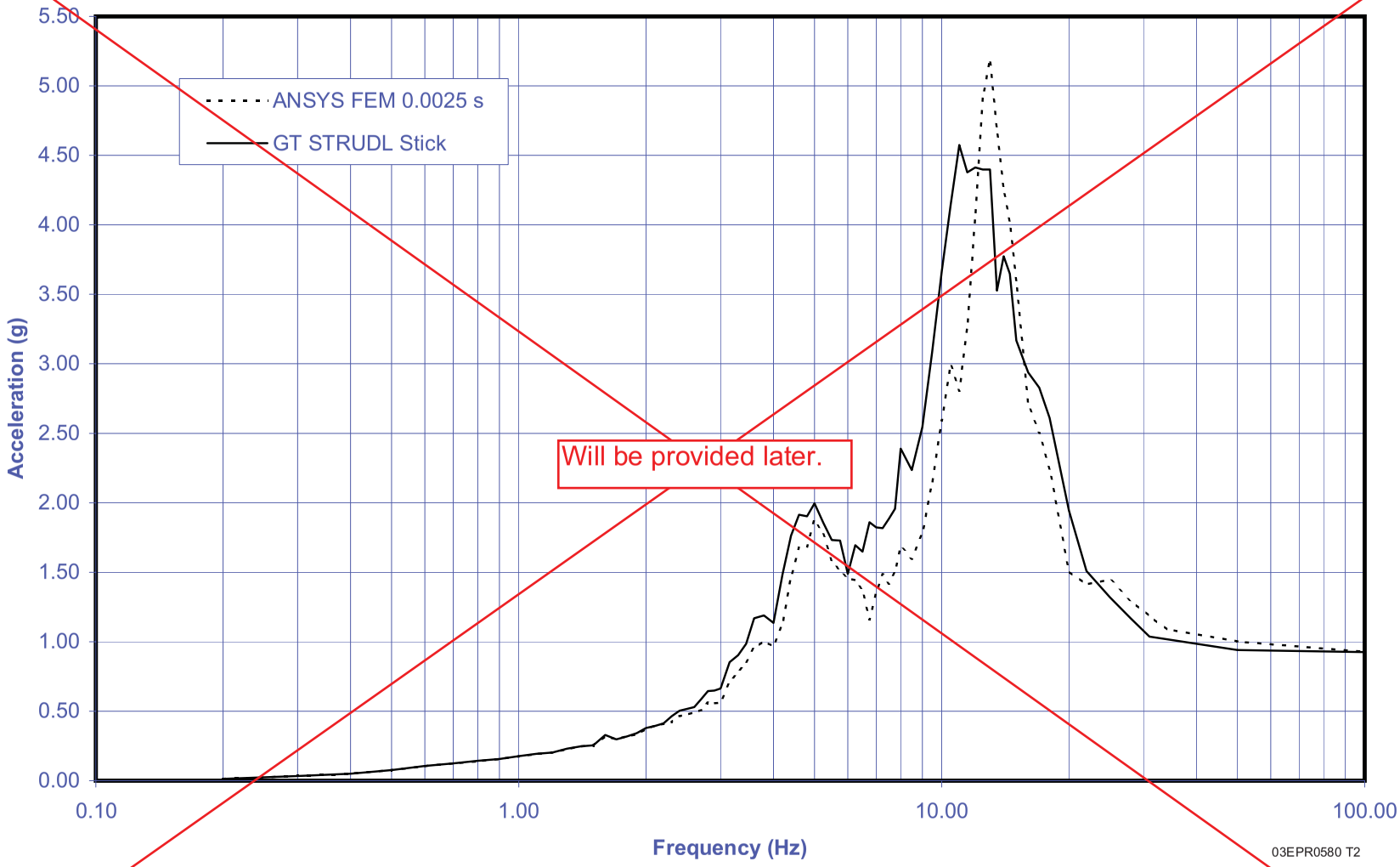


Will be provided later.

Static FEM

Figure 3.7.2-25—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +95 ft, 1-3/4 in (+29.00m) - Safeguard Building 4, 5% Damping, Z-Direction

Dynamic

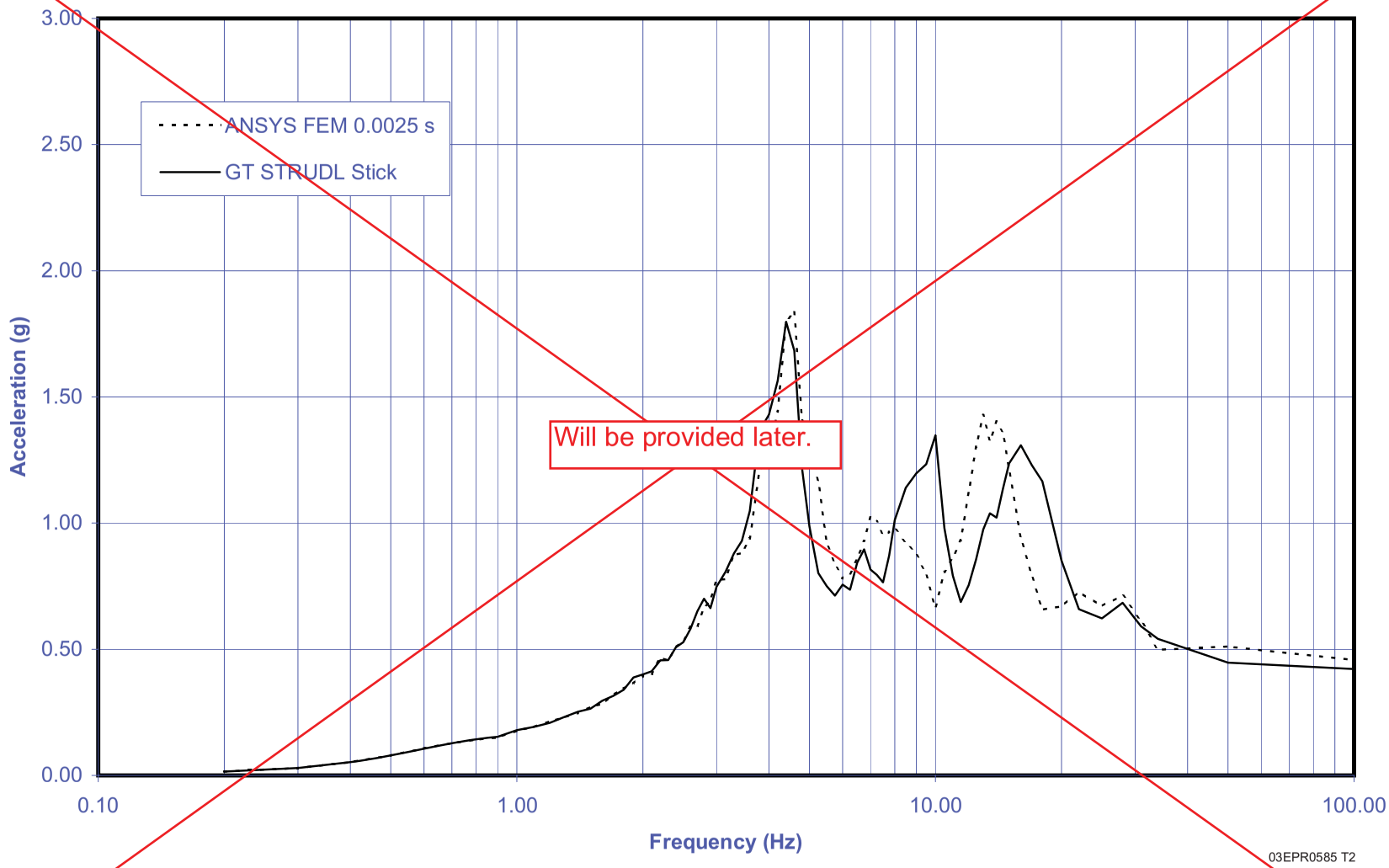


Will be provided later.

Static FEM

Figure 3.7.2-26—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 4, 5% Damping, X-Direction

Dynamic

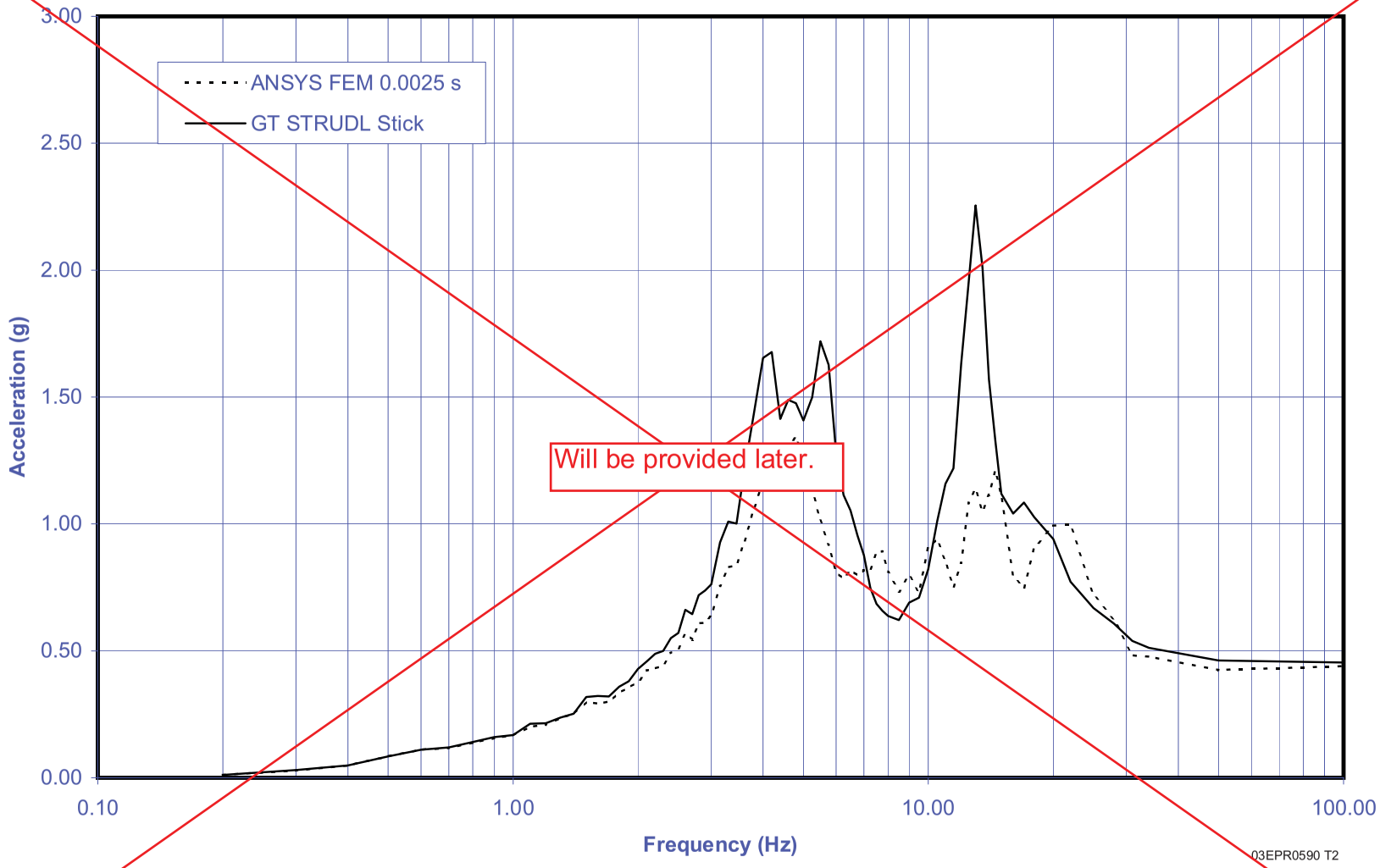


Will be provided later.

Static FEM

Figure 3.7.2-27—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 4, 5% Damping, Y-Direction

Dynamic

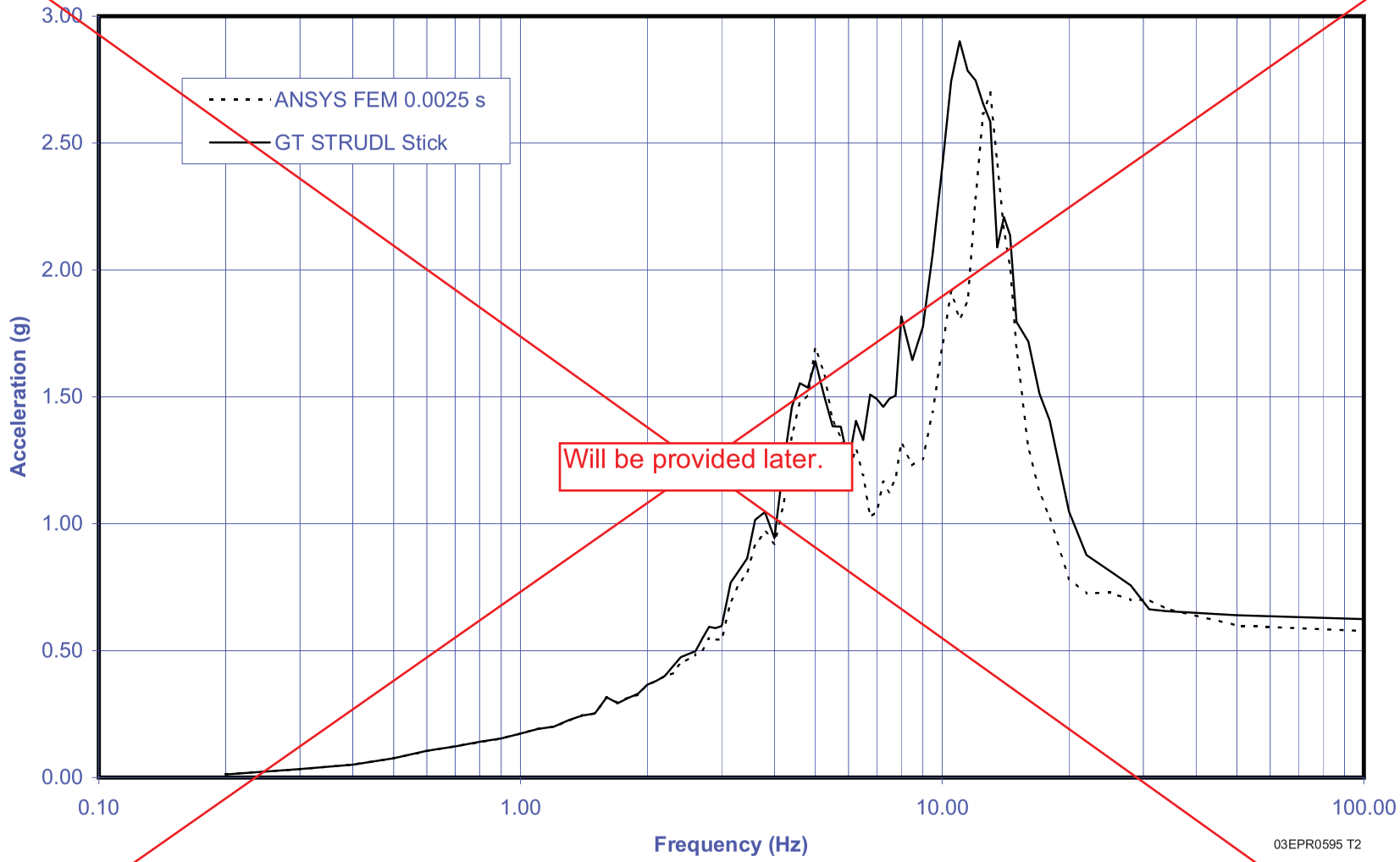


Will be provided later.

Static FEM

Figure 3.7.2-28—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 4, 5% Damping, Z-Direction

Dynamic

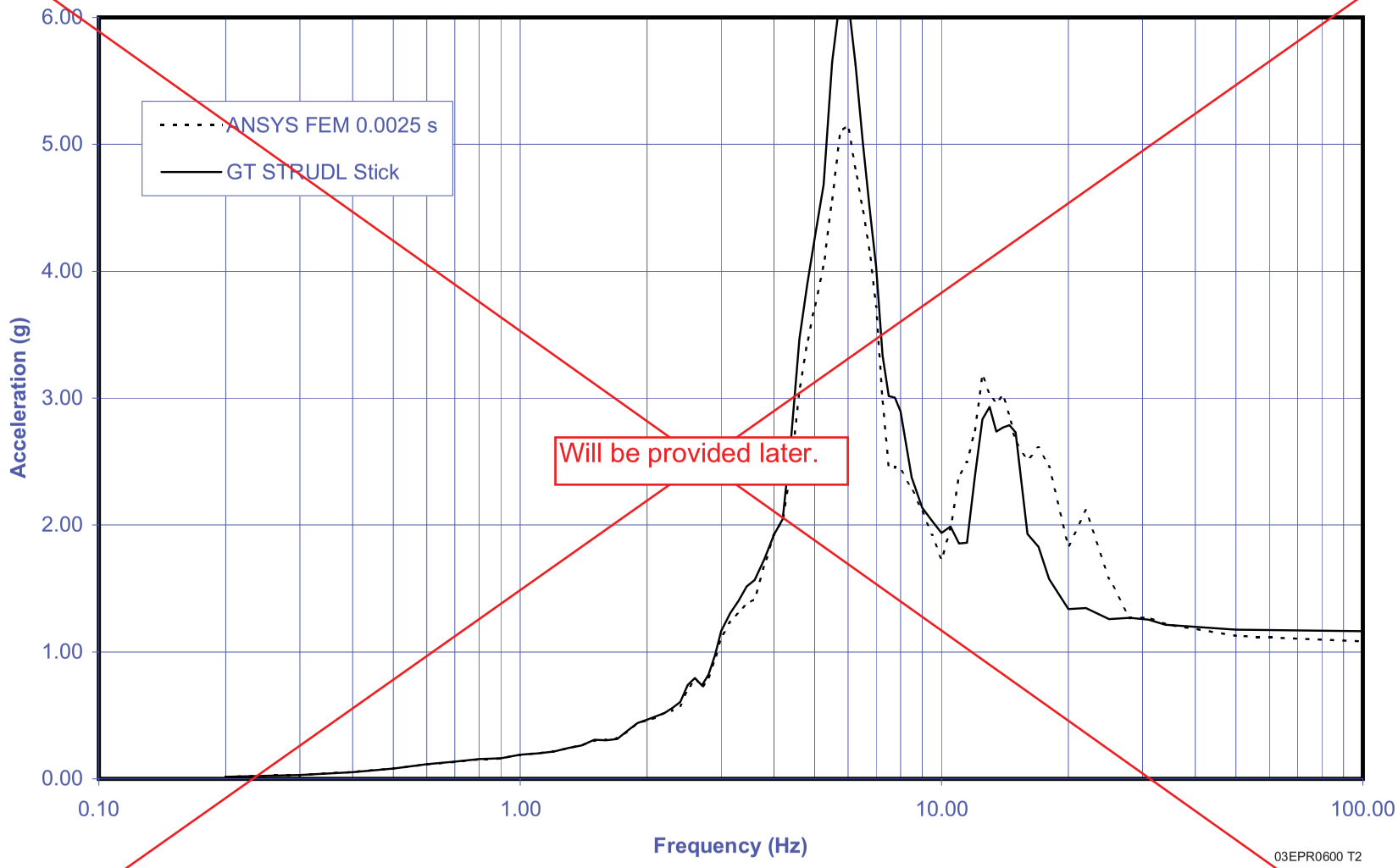


Will be provided later.

Static FEM

Figure 3.7.2-29—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +68 ft, 10-3/4 in (+21.00m) - Safeguard Building 2/3, 5% Damping, X-Direction

Dynamic

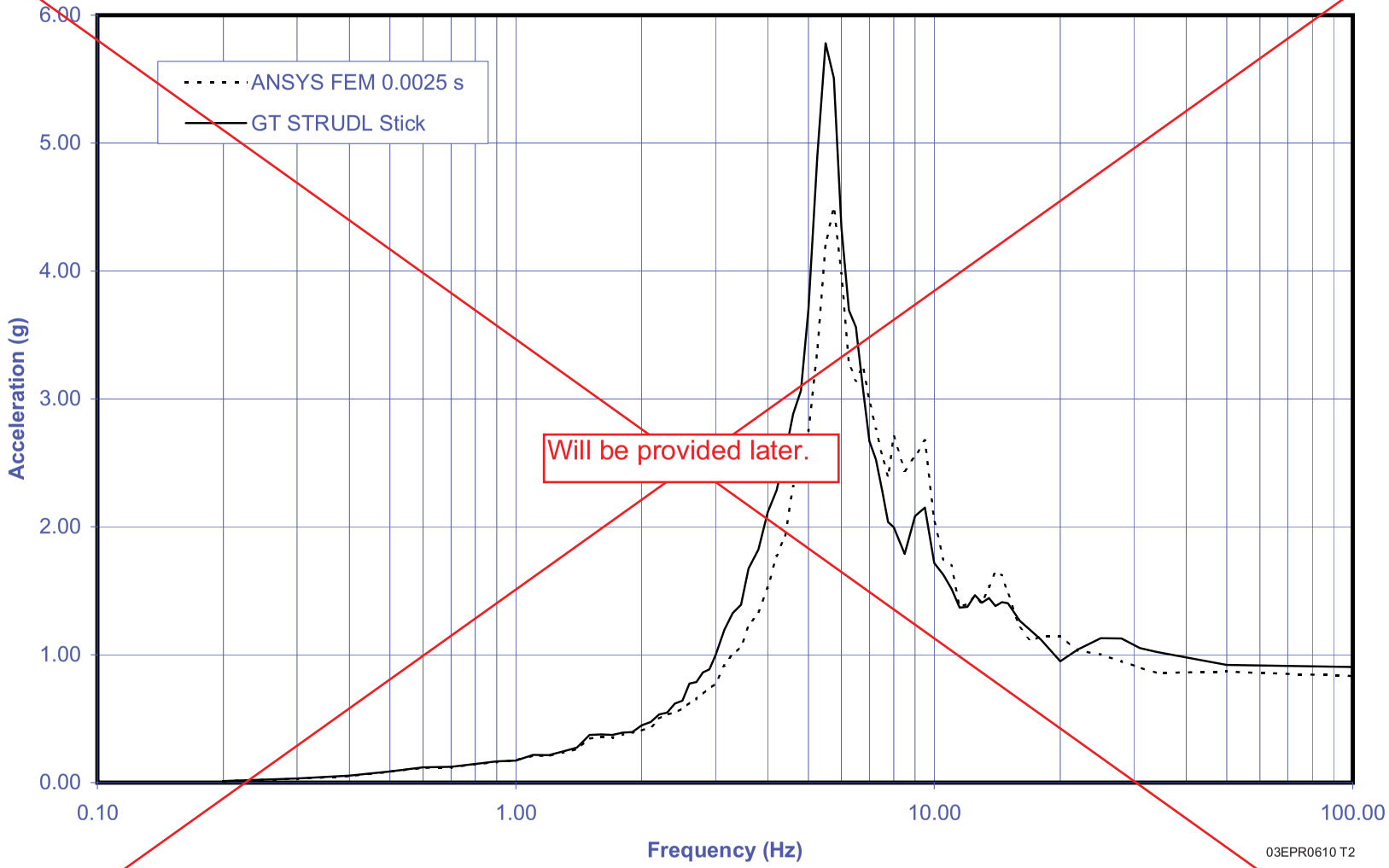


Will be provided later.

Static FEM

Figure 3.7.2-30—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +68 ft, 10-3/4 in (+21.00m) - Safeguard Building 2/3, 5% Damping, Y-Direction

Dynamic

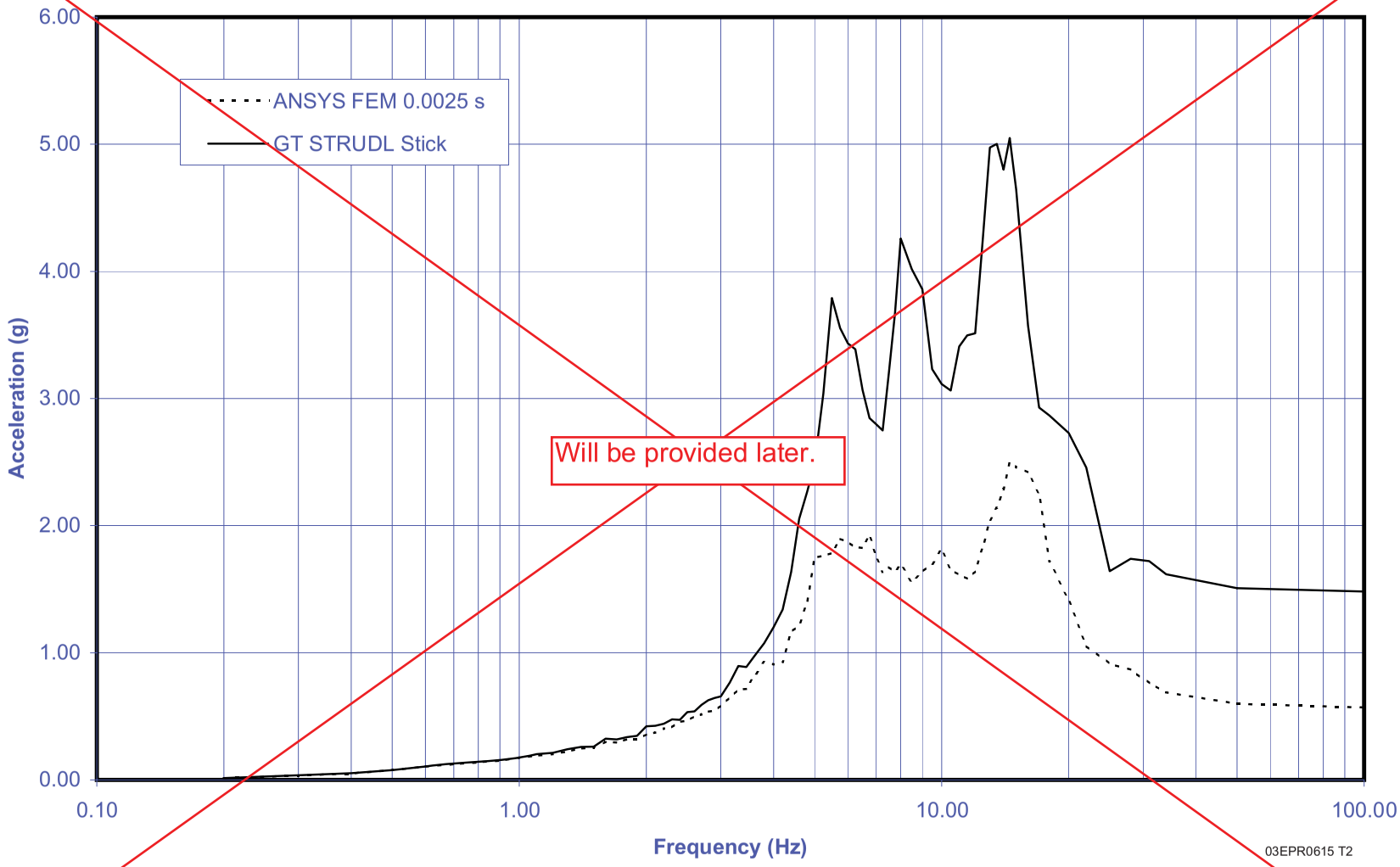


Will be provided later.

Static FEM

Figure 3.7.2-31—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +68 ft, 10-3/4 in (+21.00m) - Safeguard Building 2/3, 5% Damping, Z-Direction

Dynamic

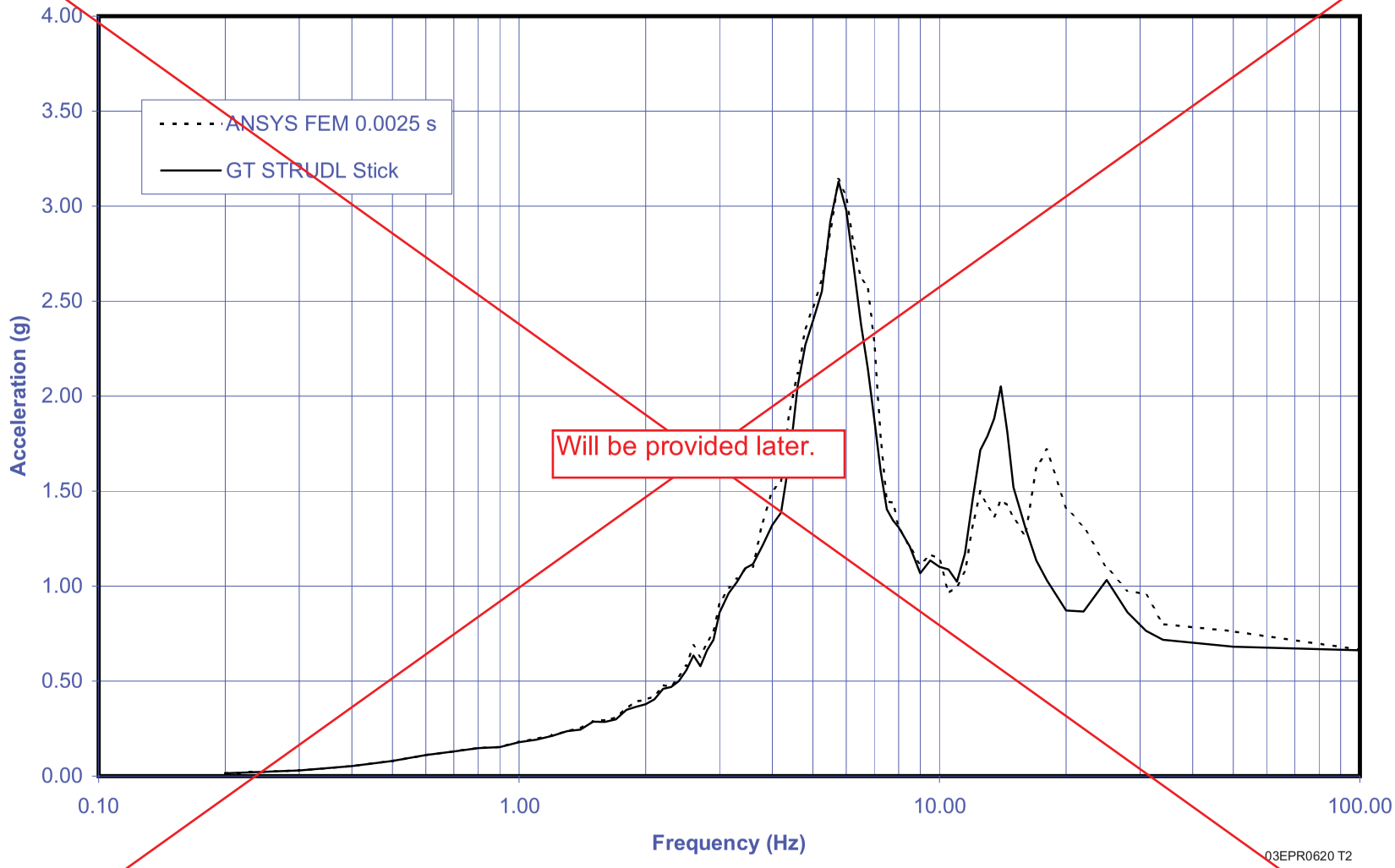


Will be provided later.

Static FEM

Figure 3.7.2-32—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 2/3, 5% Damping, X-Direction

Dynamic

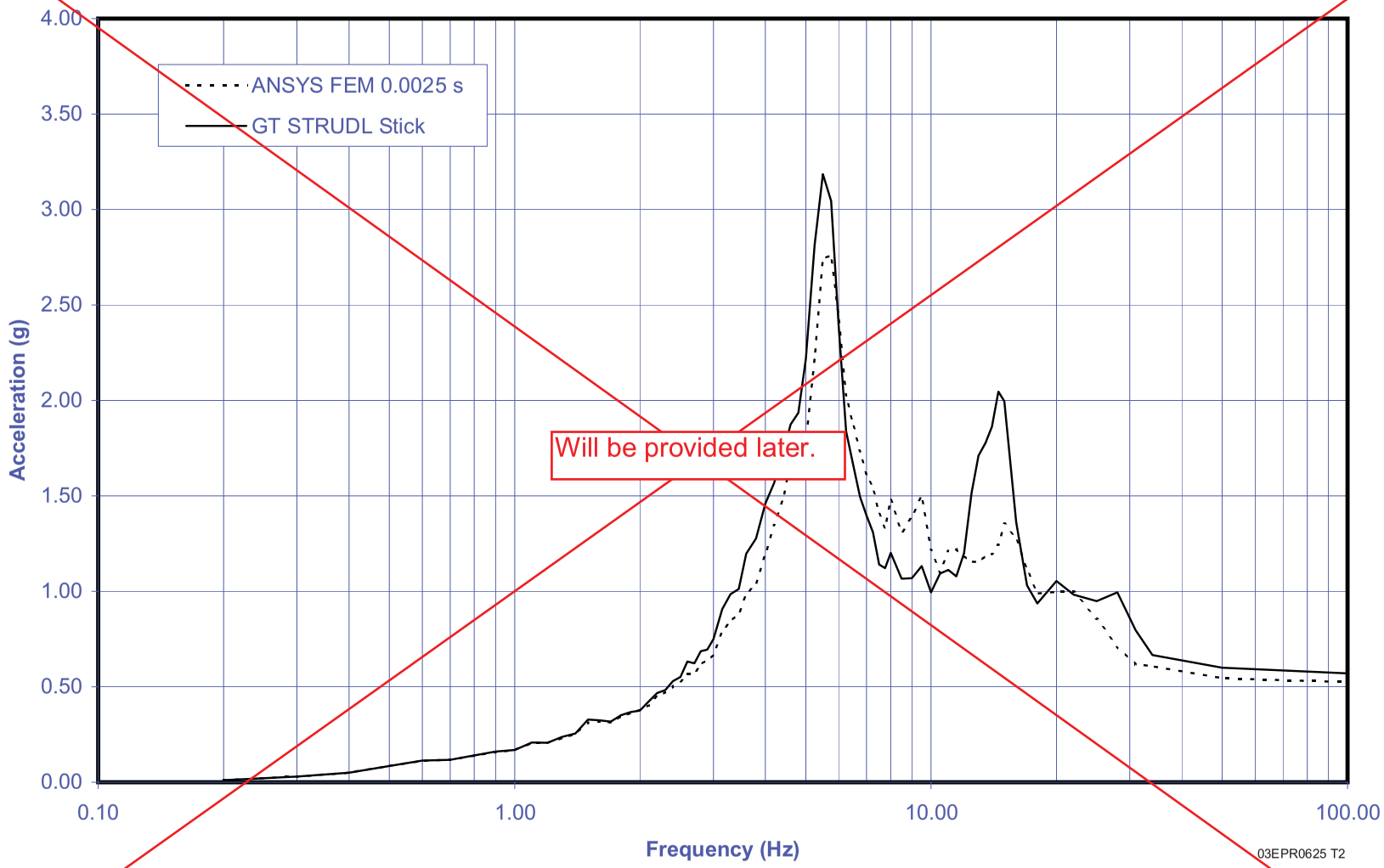


Will be provided later.

Static FEM

Figure 3.7.2-33—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 2/3, 5% Damping, Y-Direction

Dynamic

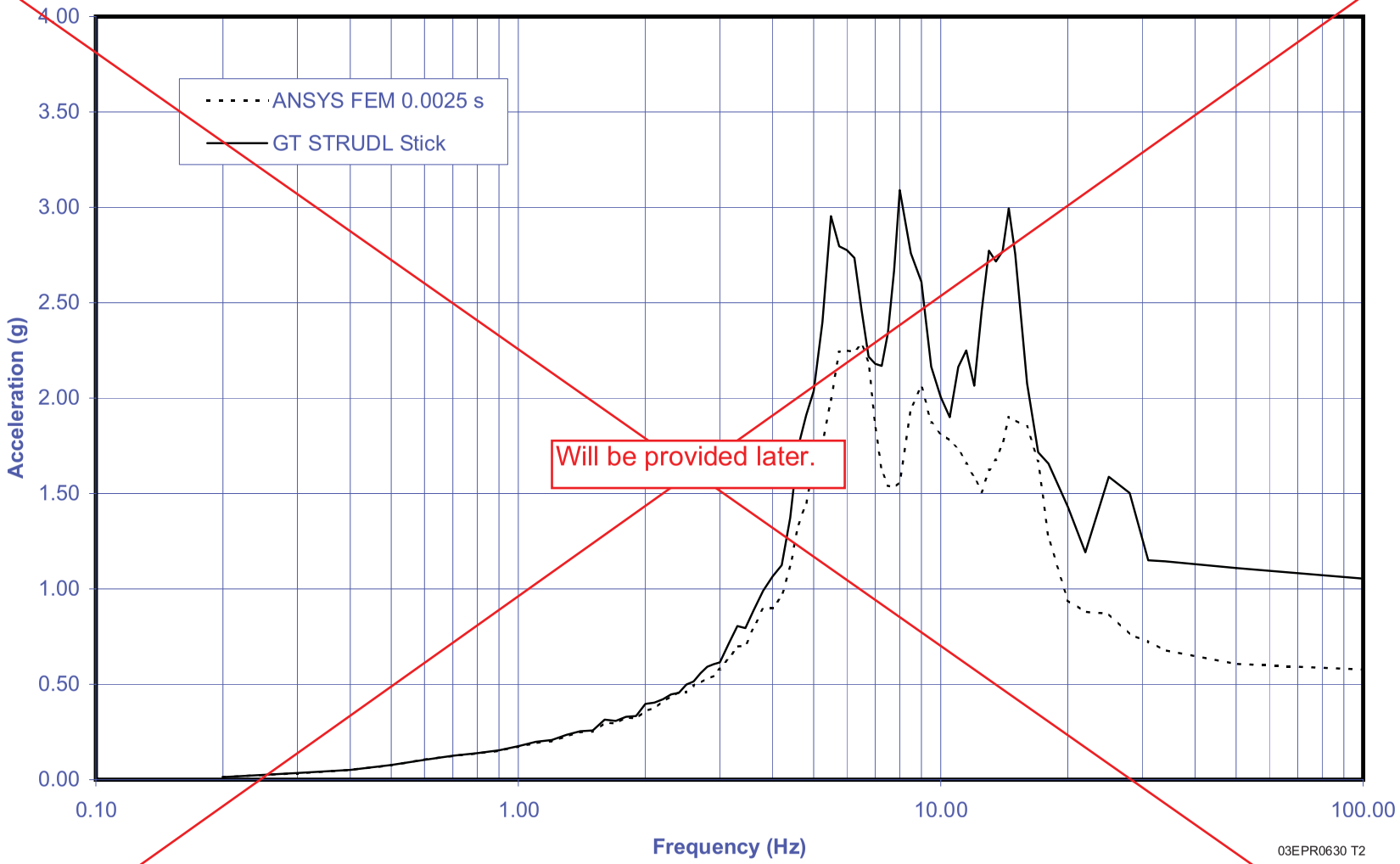


Will be provided later.

Static FEM

Figure 3.7.2-34—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +26 ft, 3 in (+8.00m) - Safeguard Building 2/3, 5% Damping, Z-Direction

Dynamic

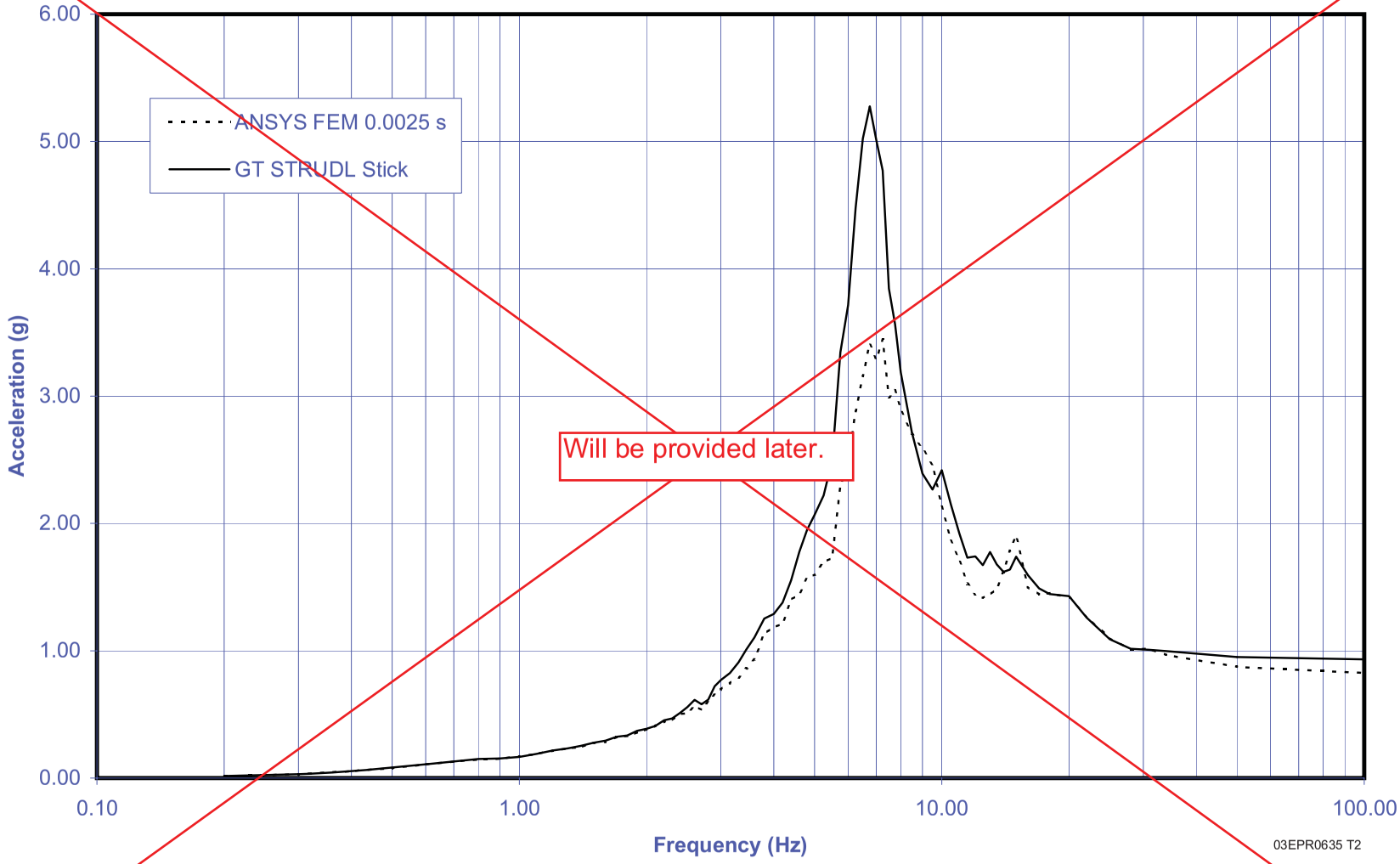


Will be provided later.

Static FEM

Figure 3.7.2-35—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +62 ft, 4-1/4 in (+19.00m) - Fuel Building, 5% Damping, X-Direction

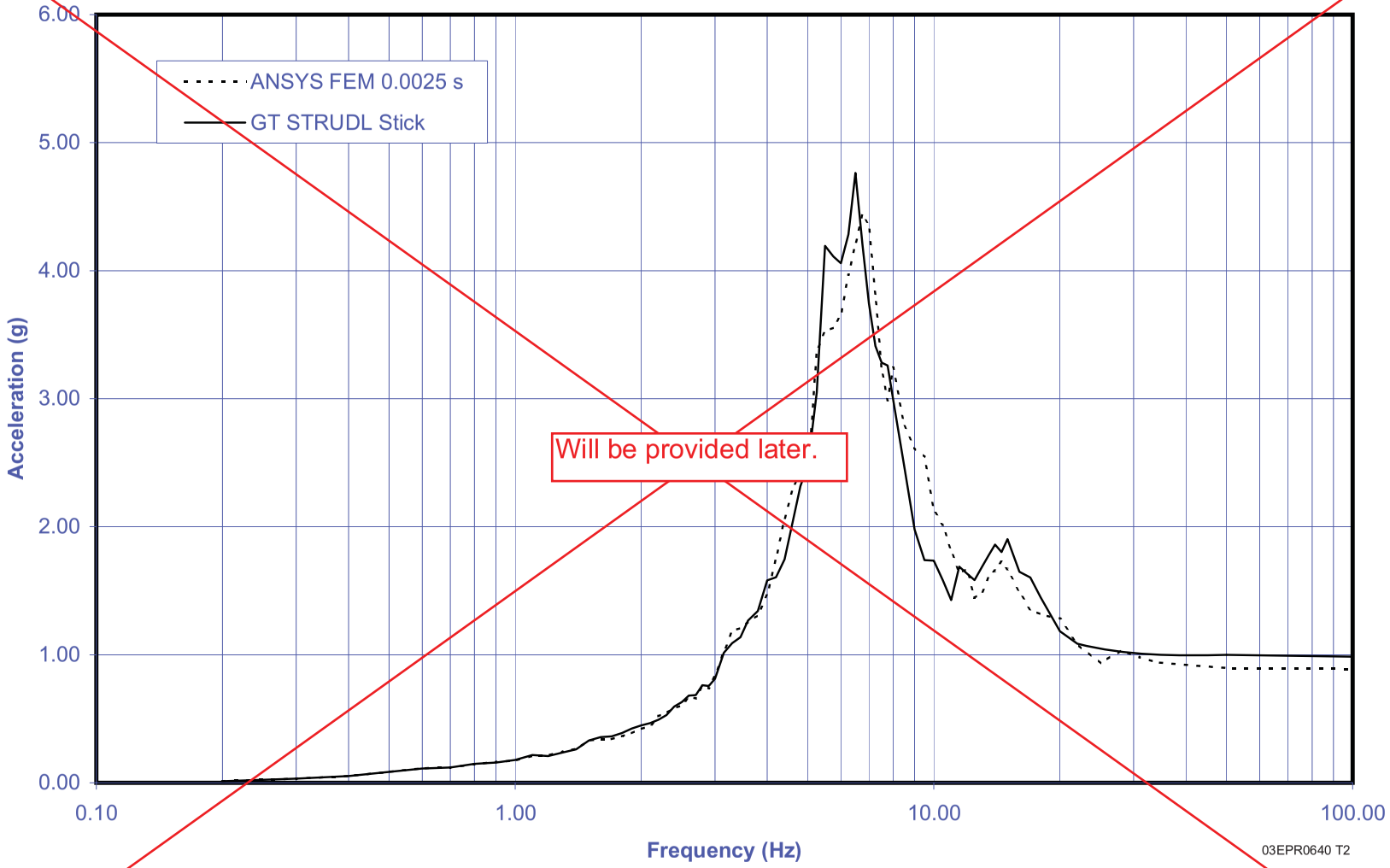
Dynamic



Static FEM

Figure 3.7.2-36—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +62 ft, 4-1/4 in (+19.00m) - Fuel Building, 5% Damping Y-Direction

Dynamic

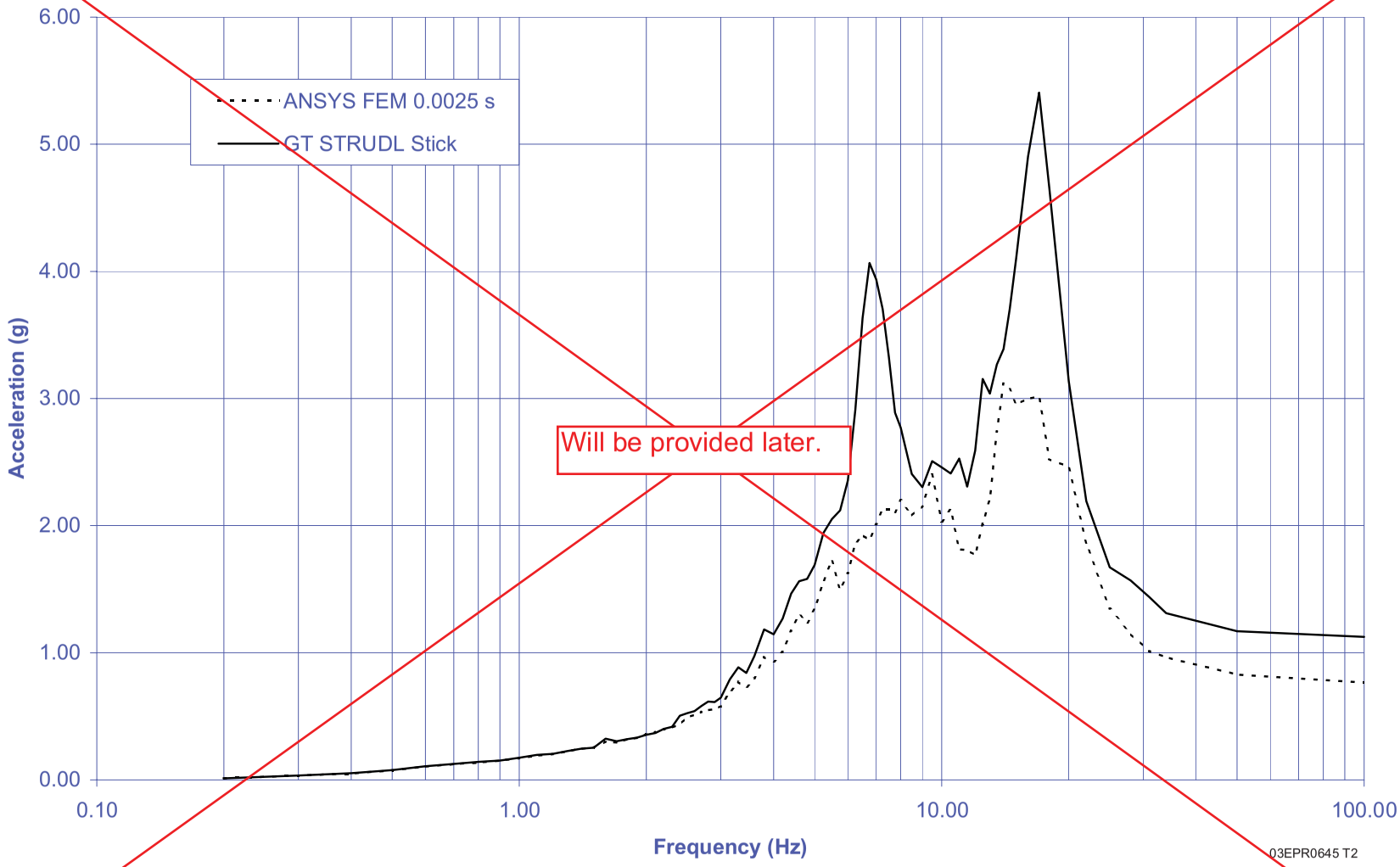


Will be provided later.

Static FEM

Figure 3.7.2-37—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +62 ft, 4-1/4 in (+19.00m) - Fuel Building, 5% Damping, Z-Direction

Dynamic

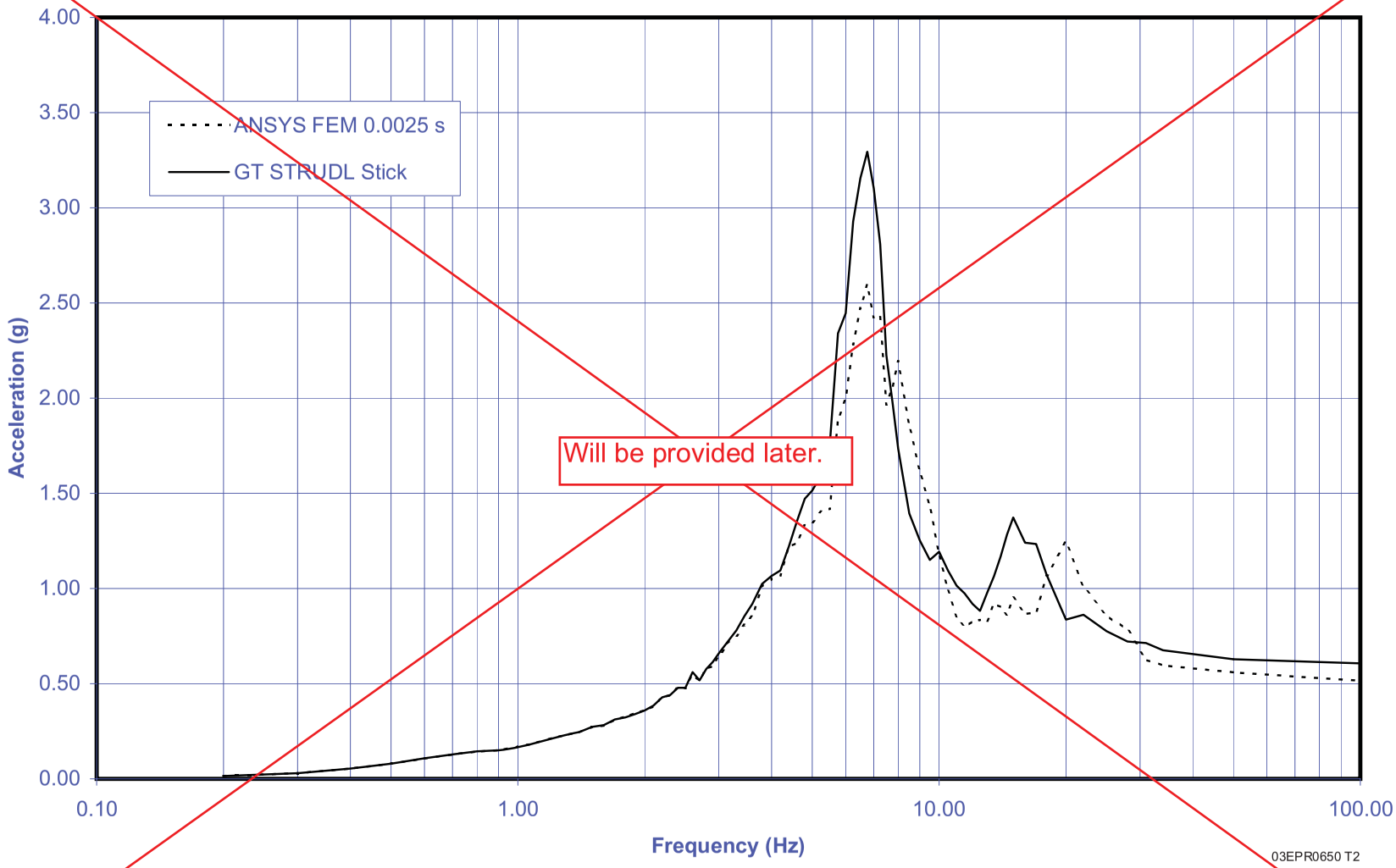


Will be provided later.

Static FEM

Figure 3.7.2-38—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +23 ft, 7-1/2 in (+7.20m) - Fuel Building, 5% Damping, X-Direction

Dynamic

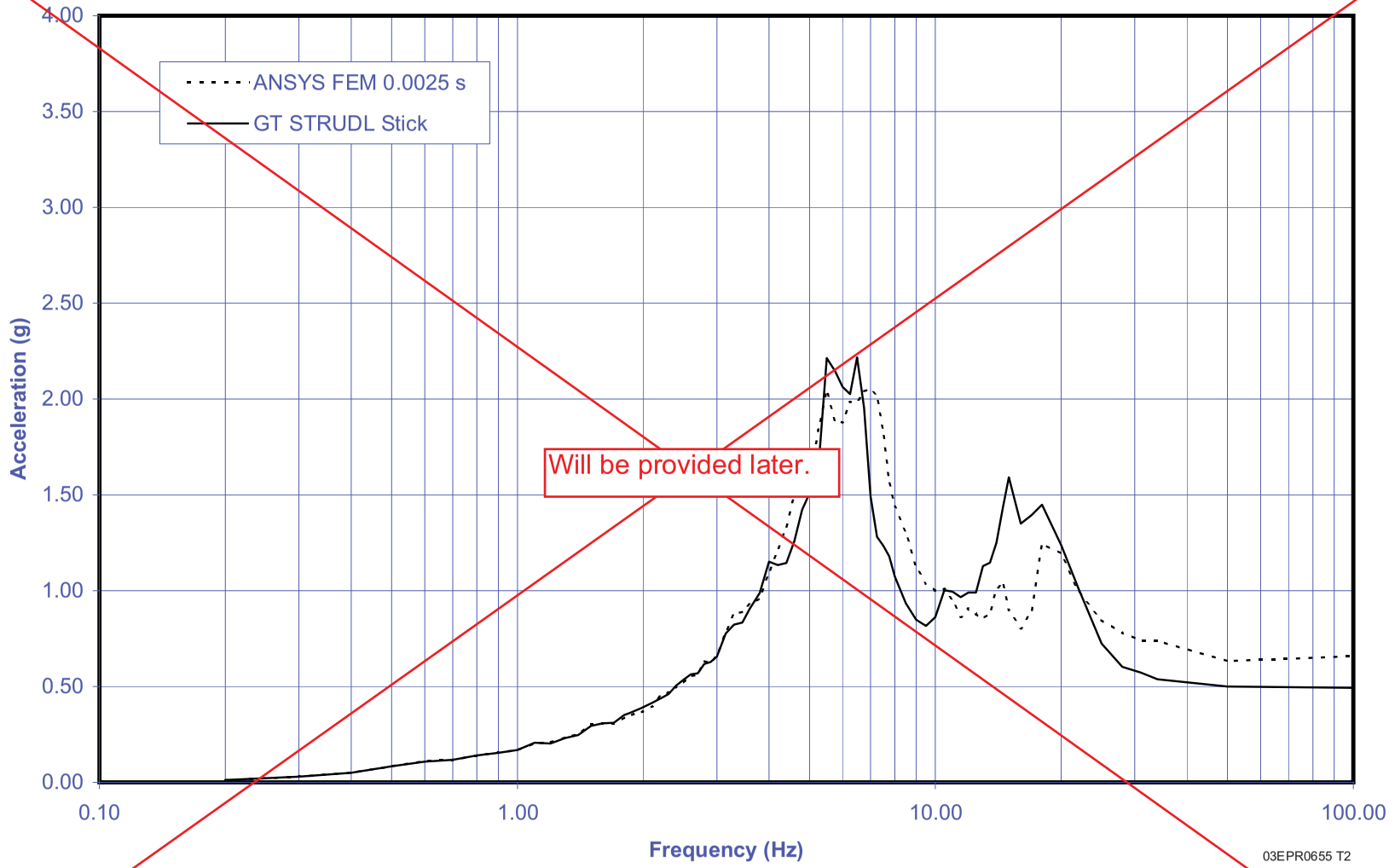


Will be provided later.

Static FEM

Figure 3.7.2-39—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +23 ft, 7-1/2 in (+7.20m) - Fuel Building, 5% Damping, Y-Direction

Dynamic

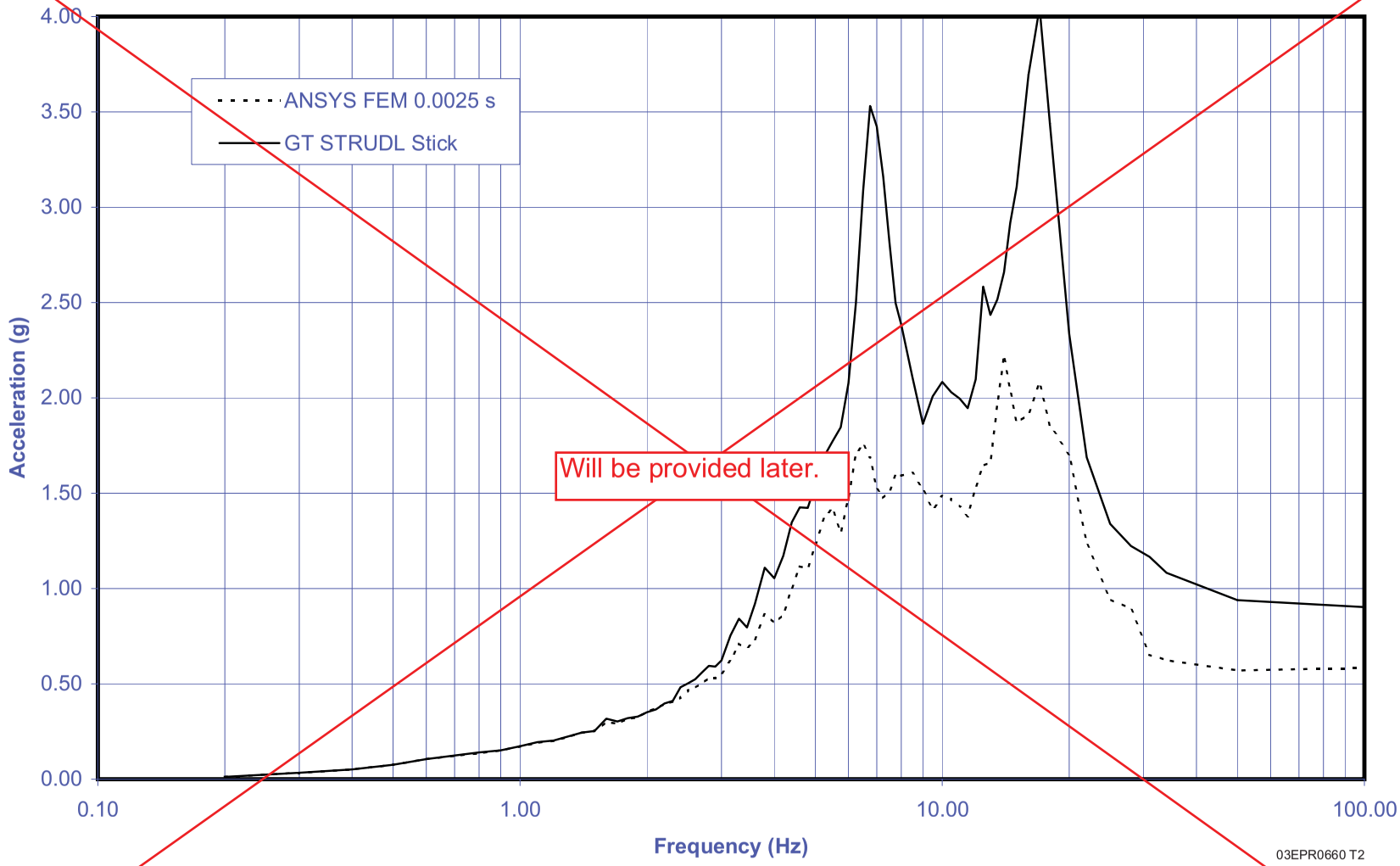


Will be provided later.

Static FEM

Figure 3.7.2-40—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +23 ft, 7-1/2 in (+7.20m) - Fuel Building, 5% Damping, Z-Direction

Dynamic

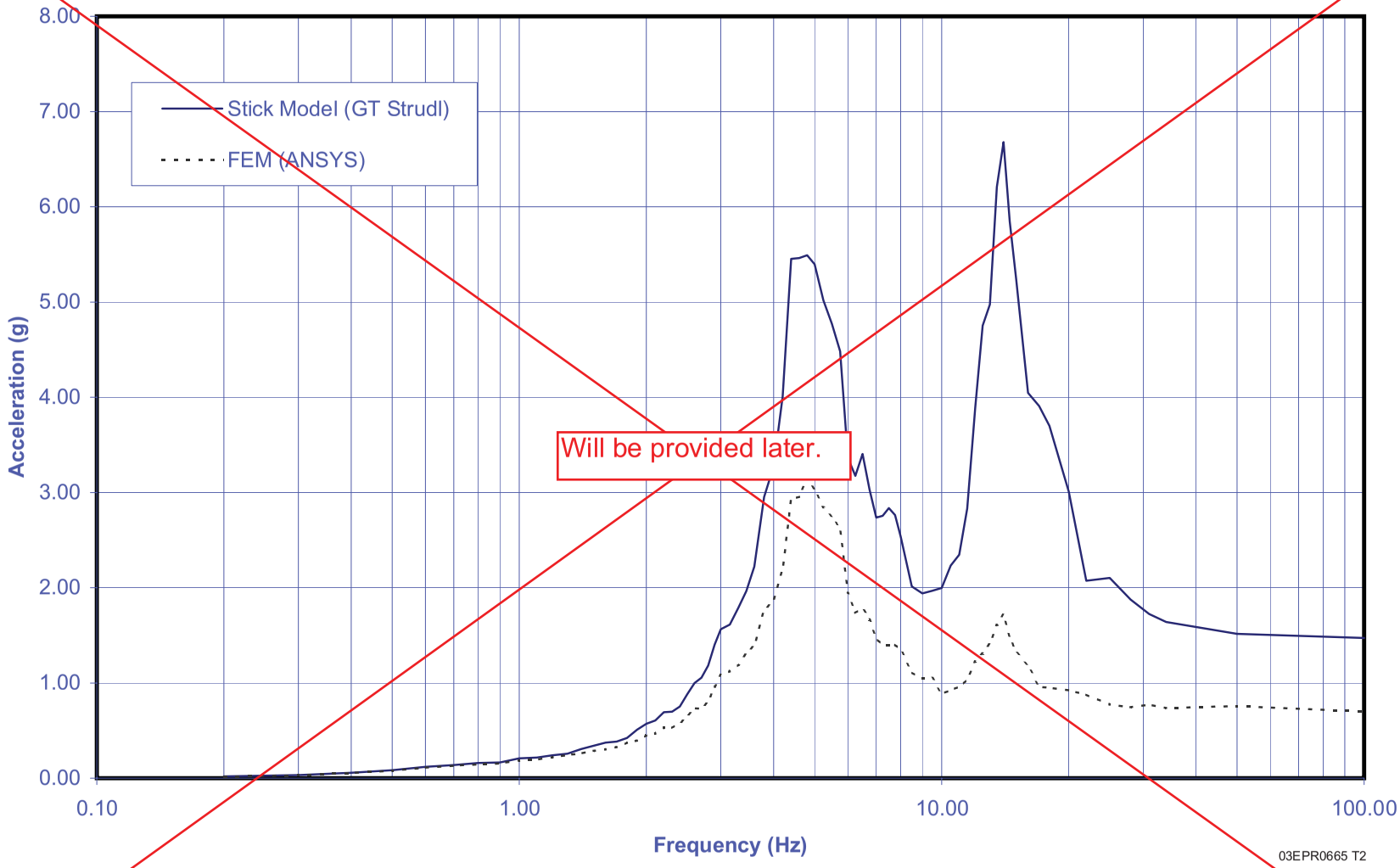


Will be provided later.

Static FEM

Figure 3.7.2-41—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +190 ft, 3-1/2 in (+58.00m) - Containment Dome Apex ~~(Without Polar Crane)~~, 5% Damping, X-Direction

Dynamic

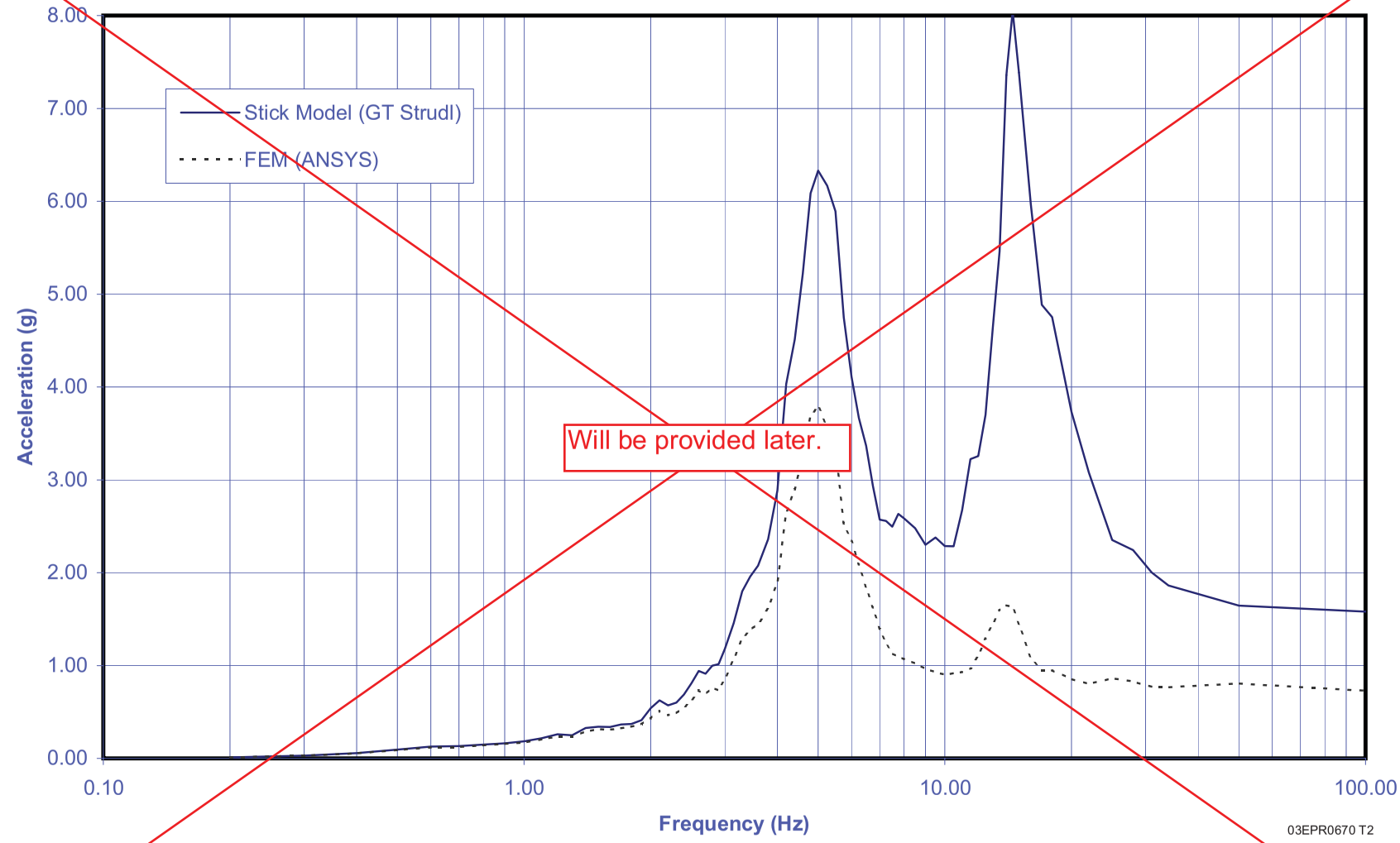


Will be provided later.

Static FEM

Figure 3.7.2-42—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +190 ft, 3-1/2 in (+58.00m) - Containment Dome Apex ~~(Without Polar Crane)~~, 5% Damping, Y-Direction

Dynamic

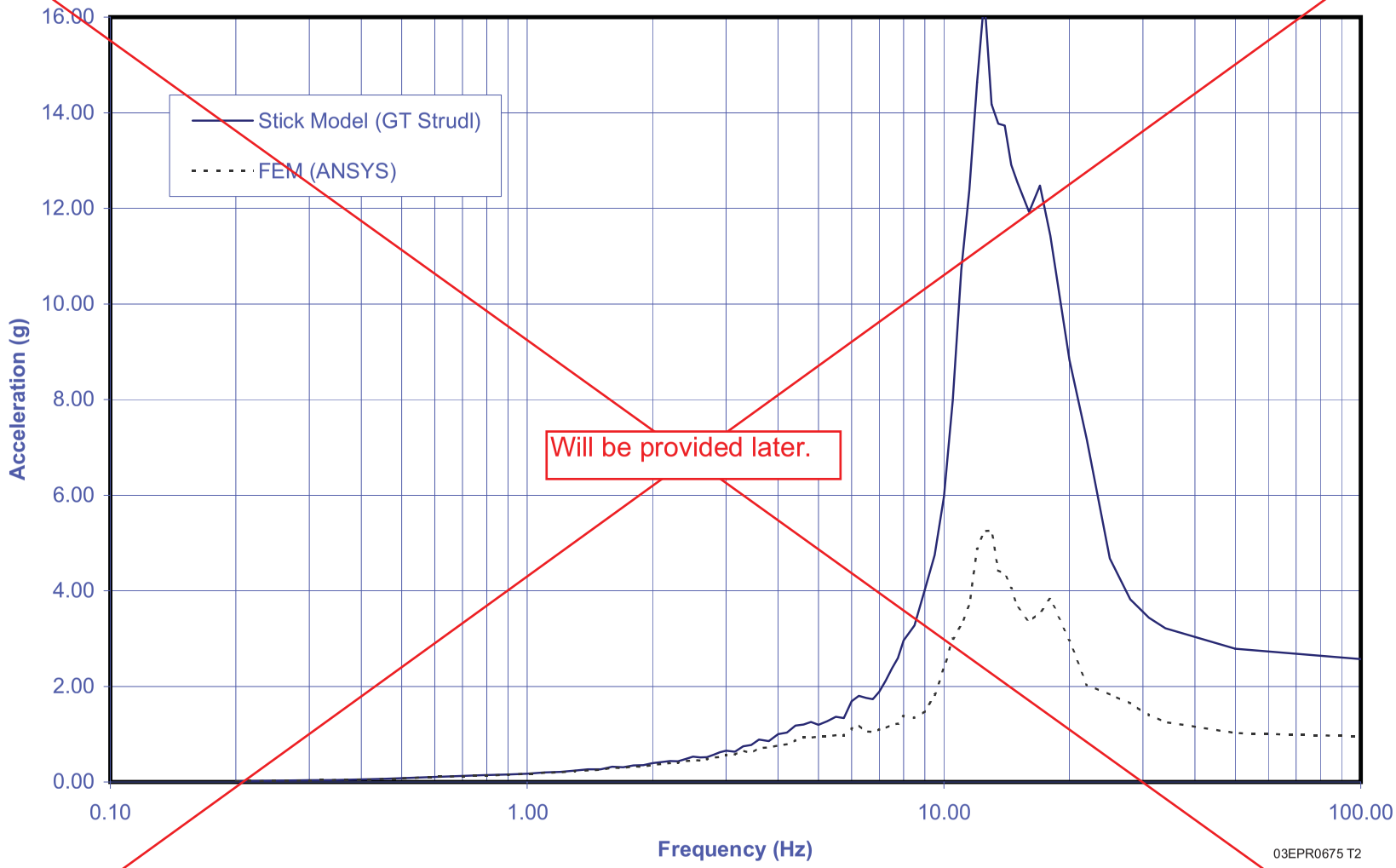


Will be provided later.

Static FEM

Figure 3.7.2-43—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +190 ft, 3-1/2 in (+58.00m) - Containment Dome Apex ~~(Without Polar Crane)~~, 5% Damping, Z-Direction

Dynamic

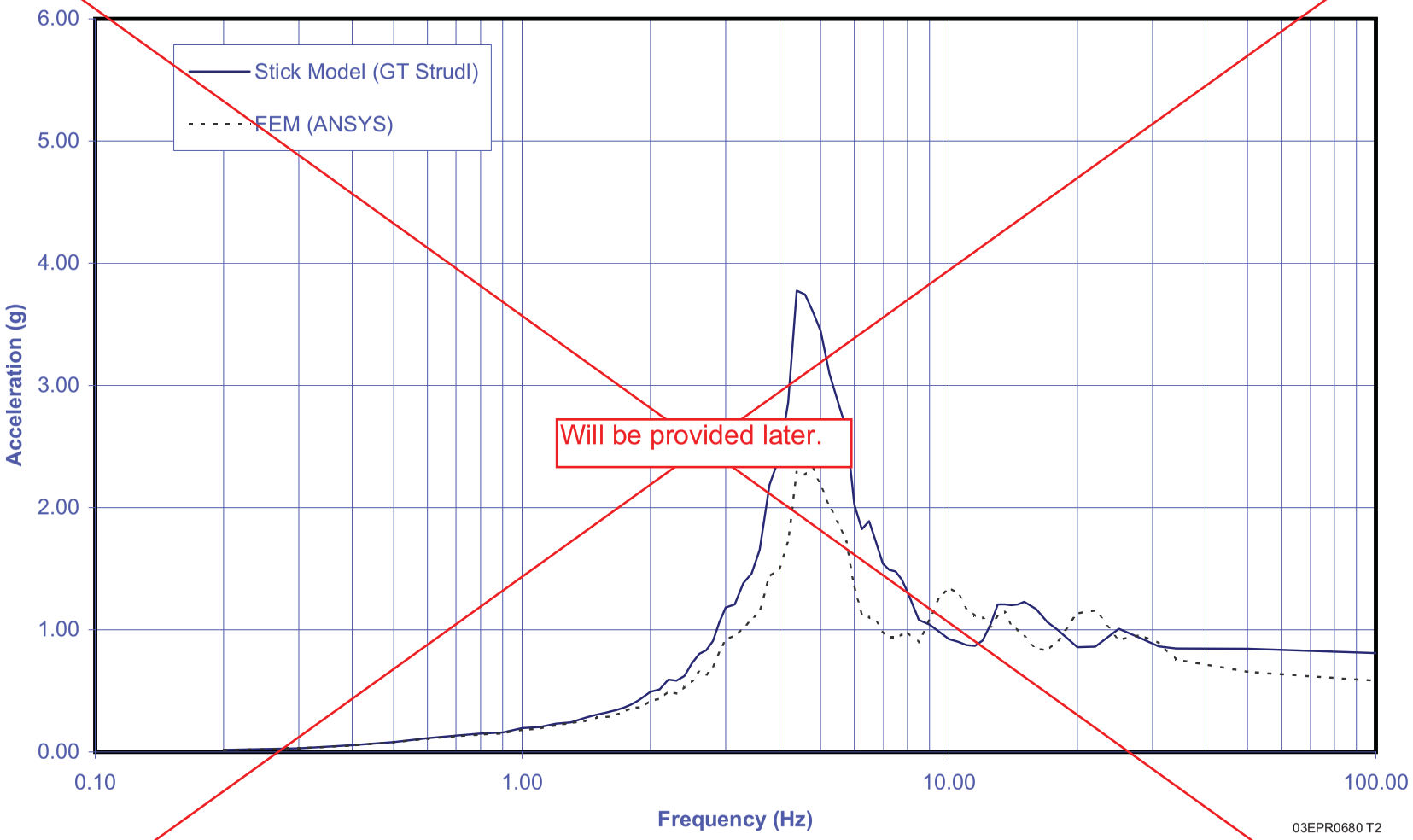


Will be provided later.

Static FEM

Figure 3.7.2-44—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +123 ft, 4-1/4 in (+37.60m) - Containment Building ~~(Without Polar Crane)~~, 5% Damping, X-Direction

Dynamic

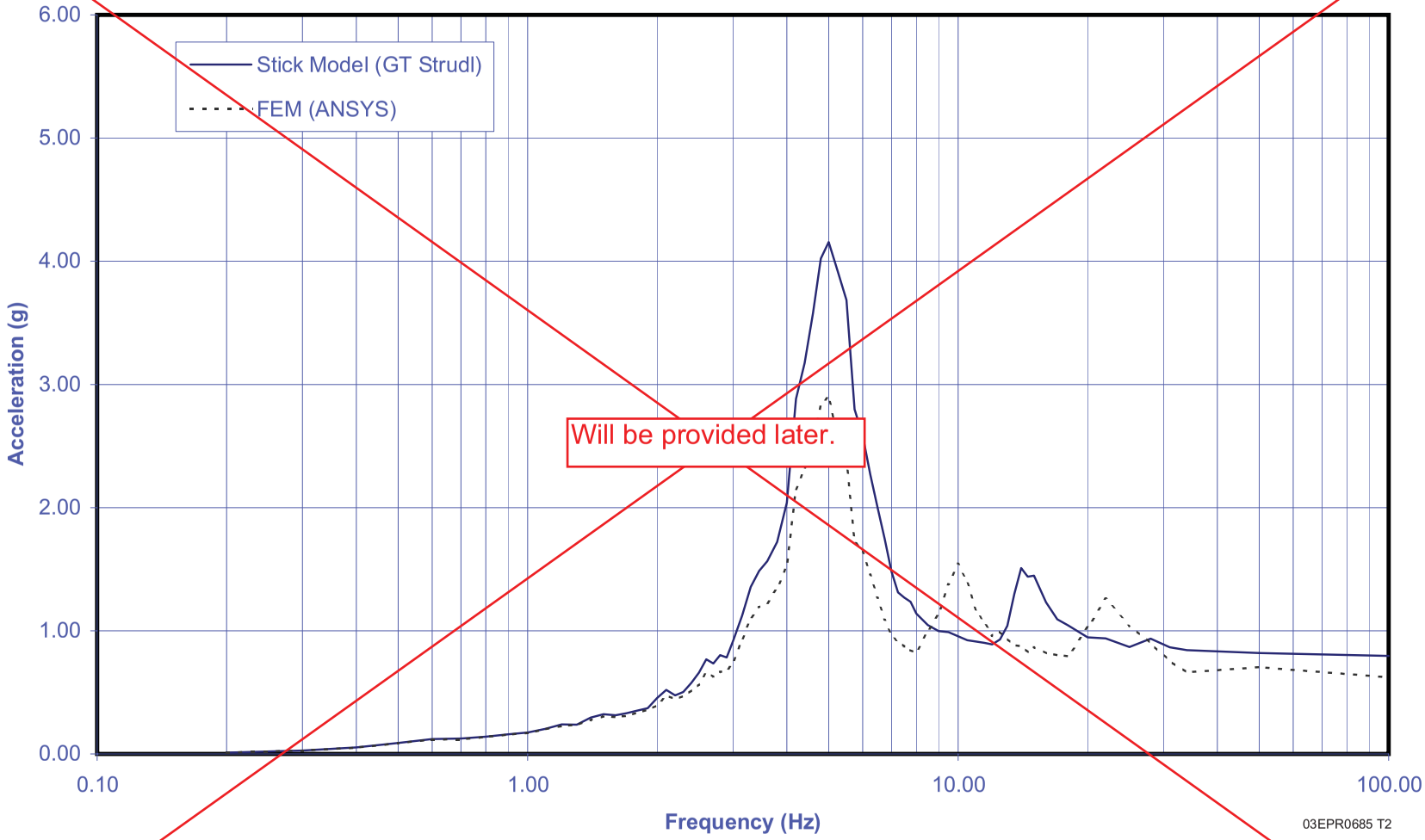


Will be provided later.

Static FEM

Figure 3.7.2-45—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +123 ft, 4-1/4 in (+37.60m) - Containment Building ~~(Without Polar Crane)~~, 5% Damping, Y-Direction

Dynamic

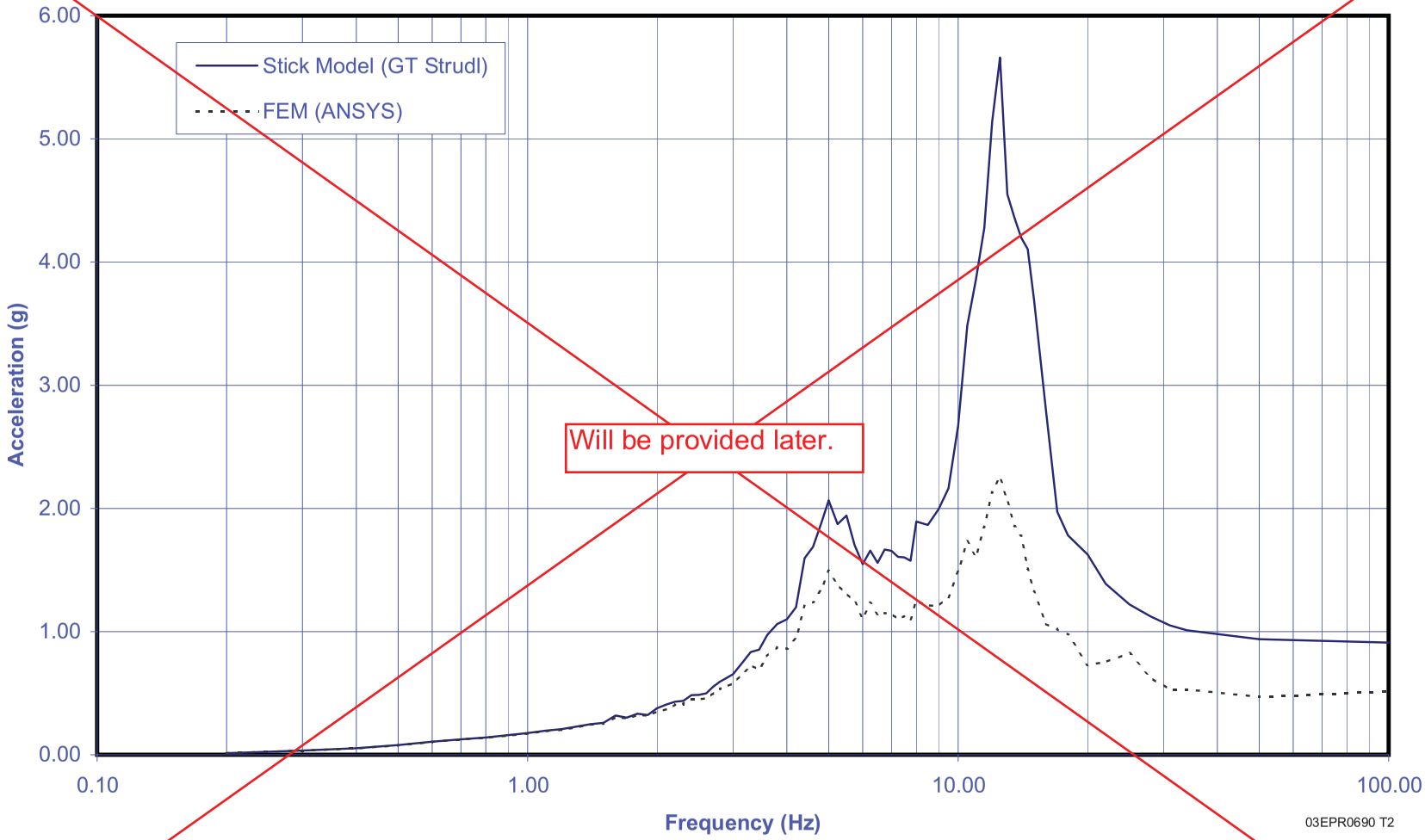


Will be provided later.

Static FEM

Figure 3.7.2-46—~~Stick~~ vs. FEM Spectrum Comparison at Elev. +123 ft, 4-1/4 in (+37.60m) - Containment Building ~~(Without Polar Crane)~~, 5% Damping, Z-Direction

Dynamic



Will be provided later.

Figure 3.7.2-~~47—Spectrum Comparison at Elev. +123 ft, 4-1/4 in (+37.60m) - Containment Building (Rigid vs. Flexible Polar Crane), 5% Damping, X-Direction~~

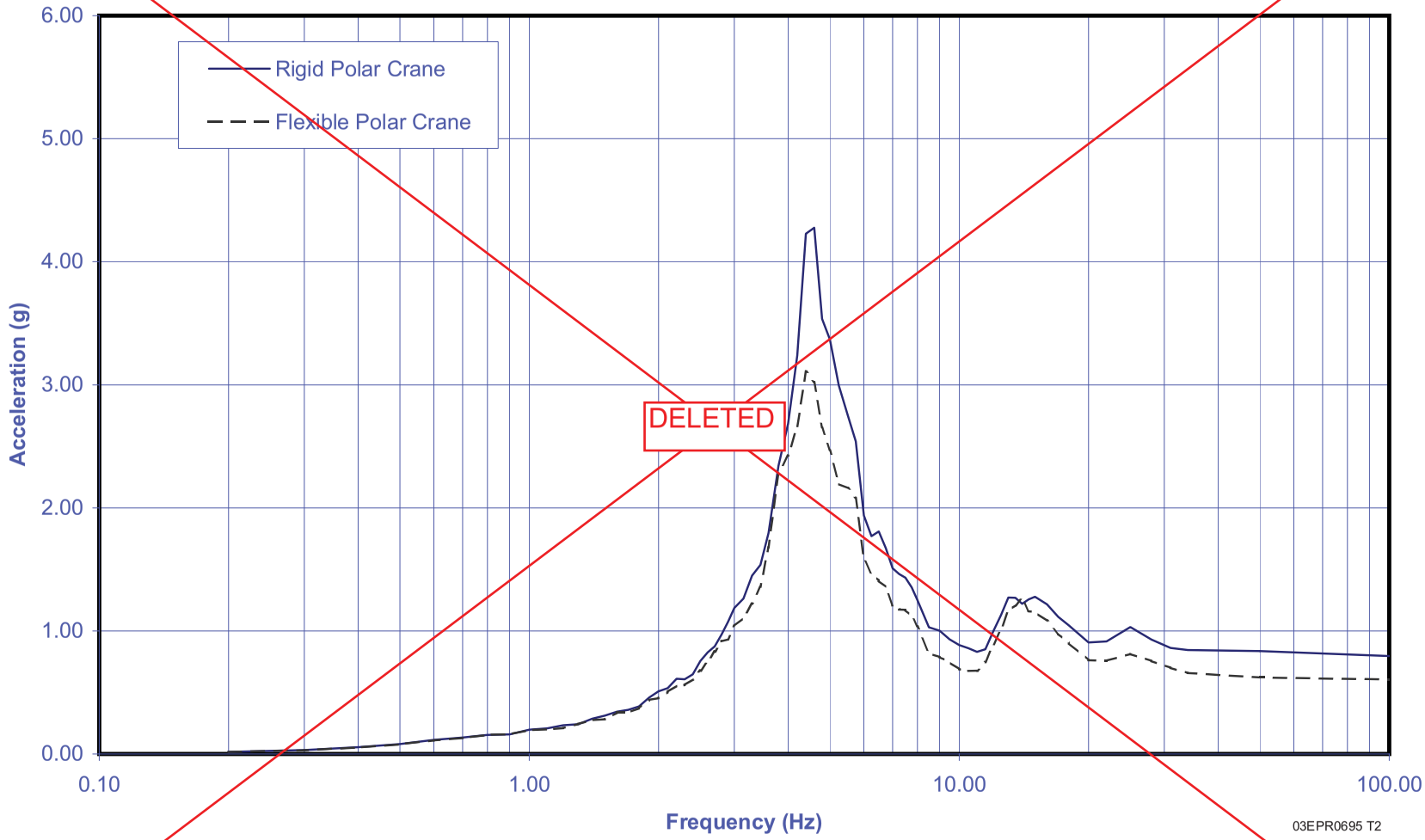


Figure 3.7.2-48—Spectrum Comparison at Elev. +123 ft, 4-1/4 in (+37.60m) - Containment Building (Rigid vs. Flexible Polar Crane), 5% Damping, Y-Direction

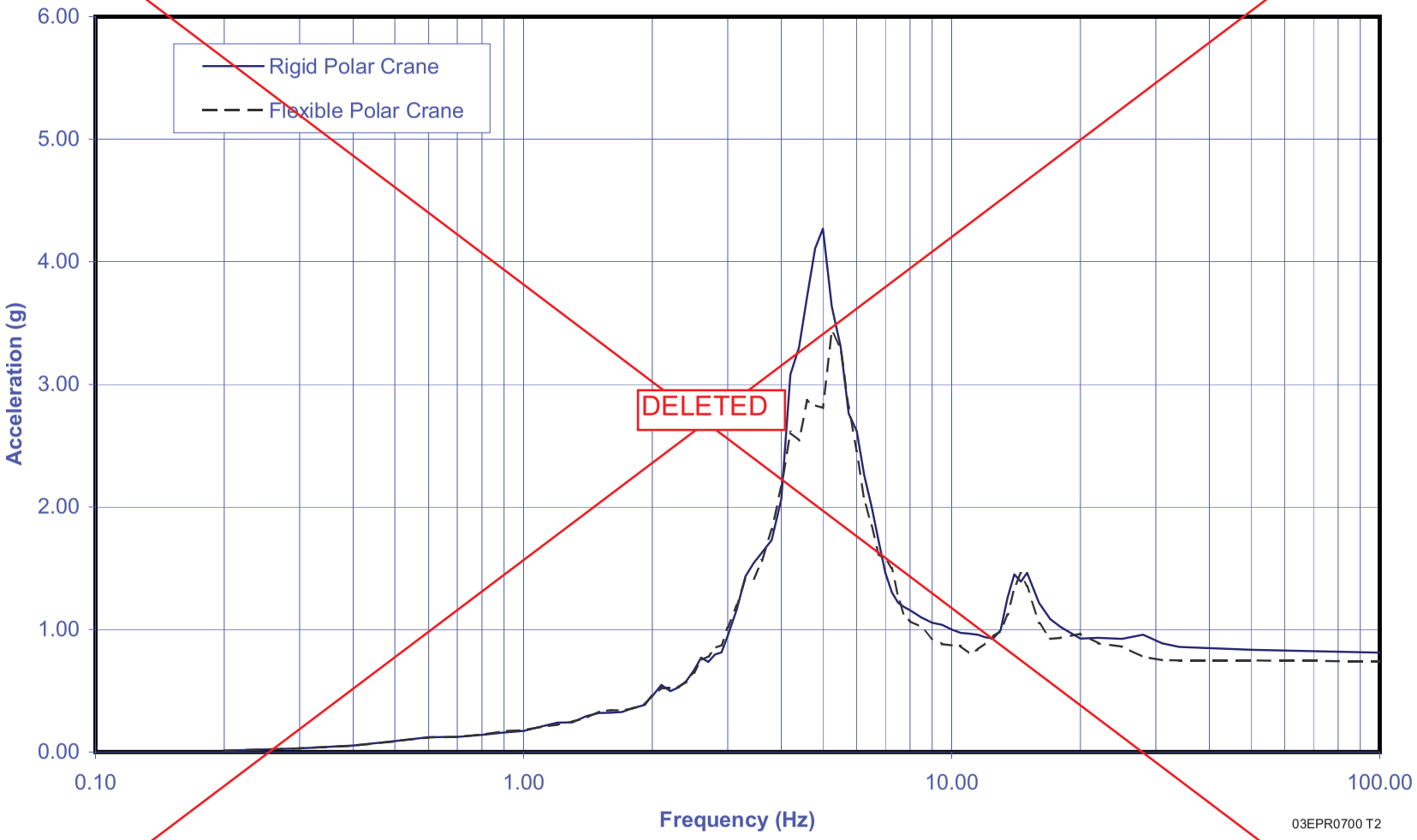


Figure 3.7.2-49—Spectrum Comparison at Elev. +123 ft, 4-1/4 in (+37.60m) - Containment Building (Rigid vs. Flexible Polar Crane), 5% Damping, Z-Direction

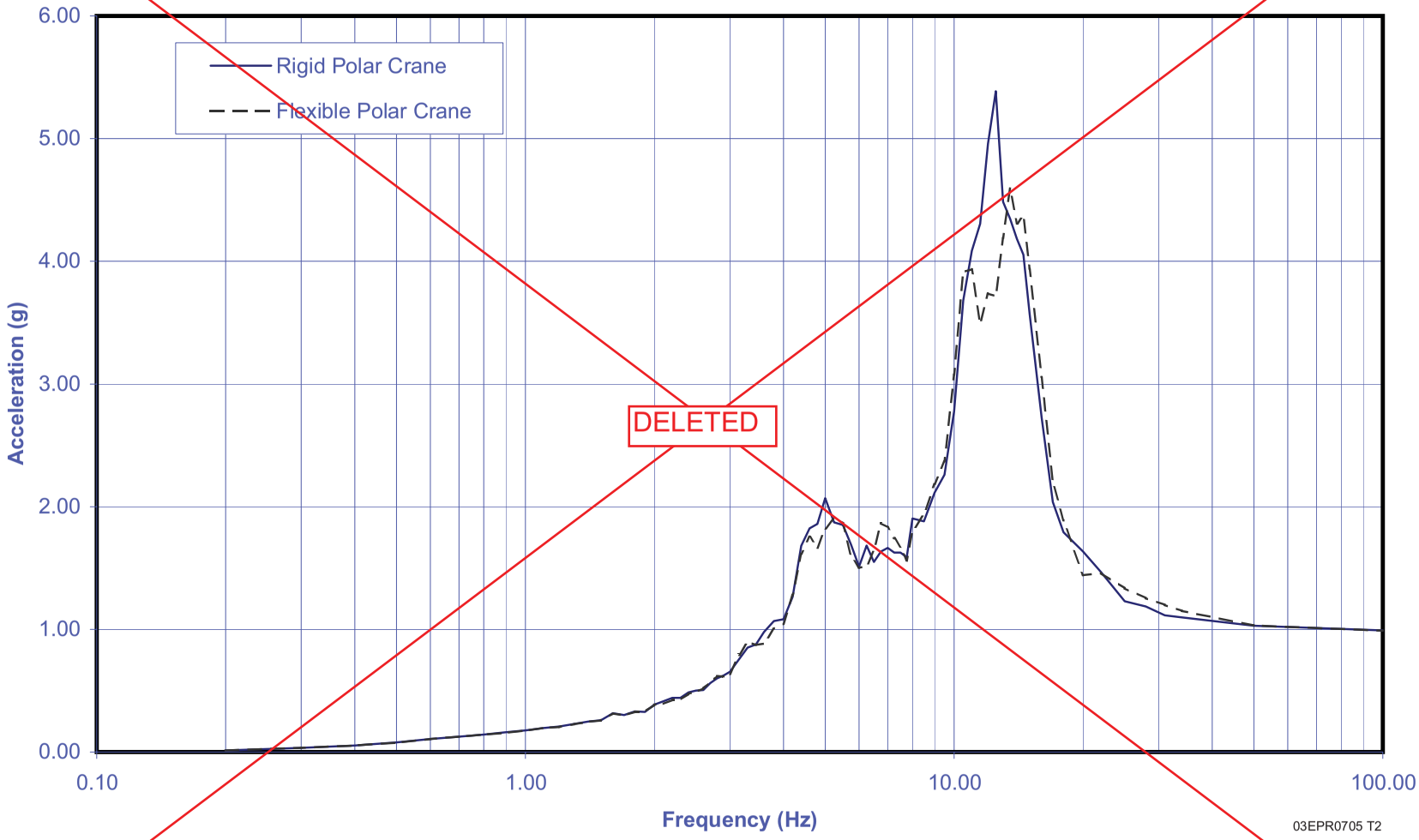
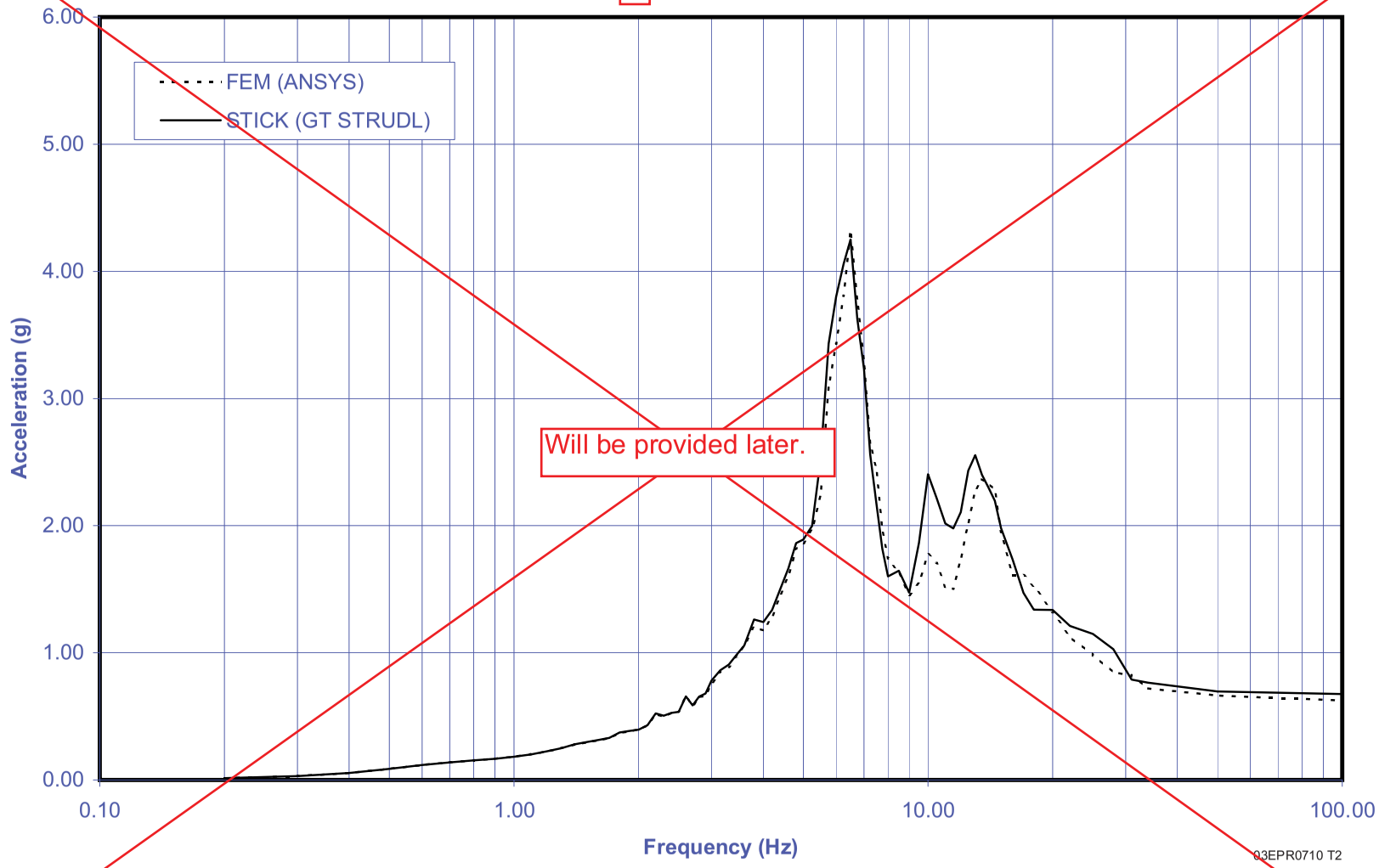


Figure 3.7.2-50—Spectrum Comparison at Elev. +63 ft, 11-3/4 in (+19.50m) - Reactor Building Internal Structure, 4% Damping, X-Direction

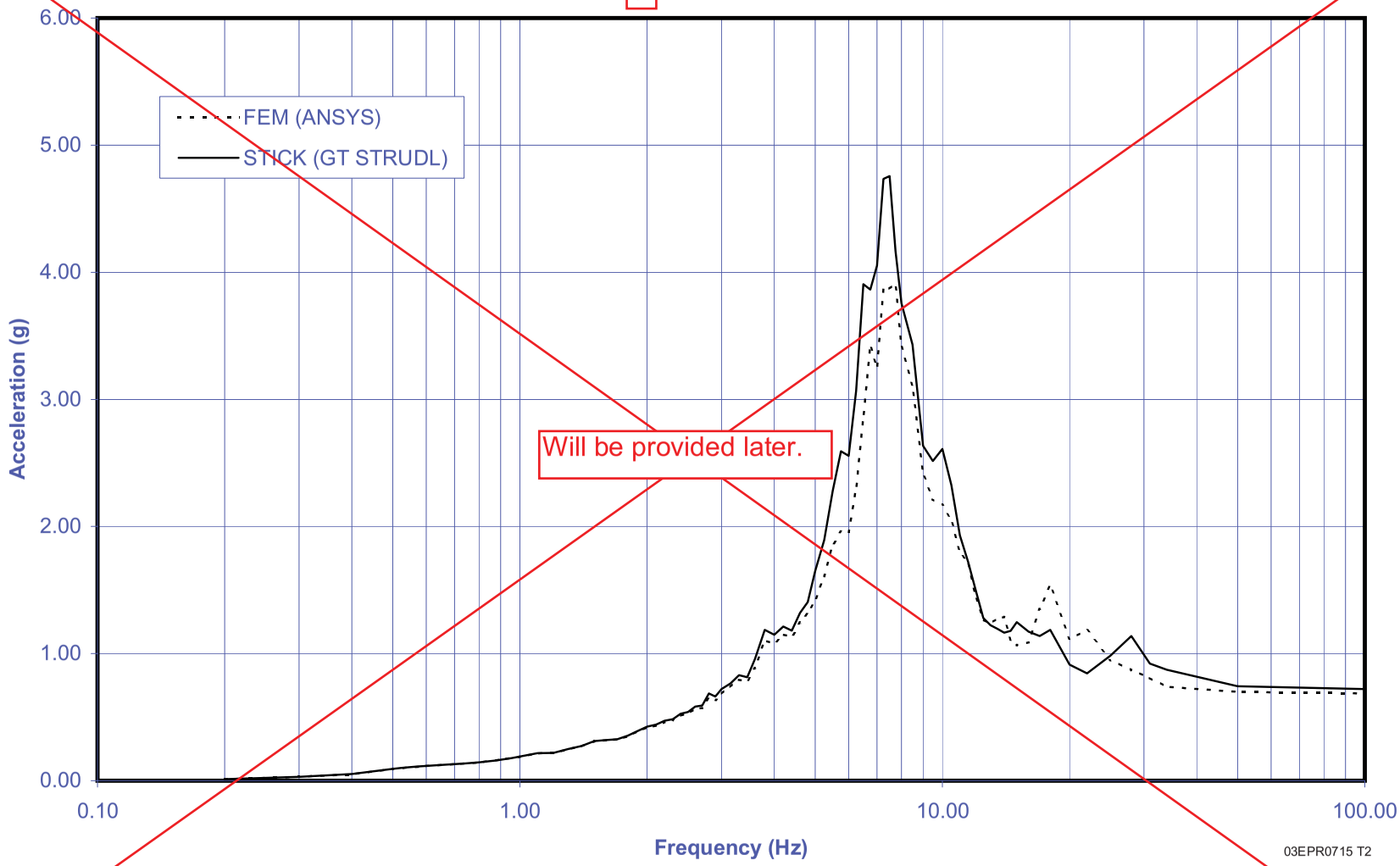
5



Will be provided later.

Figure 3.7.2-51—Spectrum Comparison at Elev. +63 ft, 11-3/4 in (+19.50m) - Reactor Building Internal Structure, 4% Damping, Y-Direction

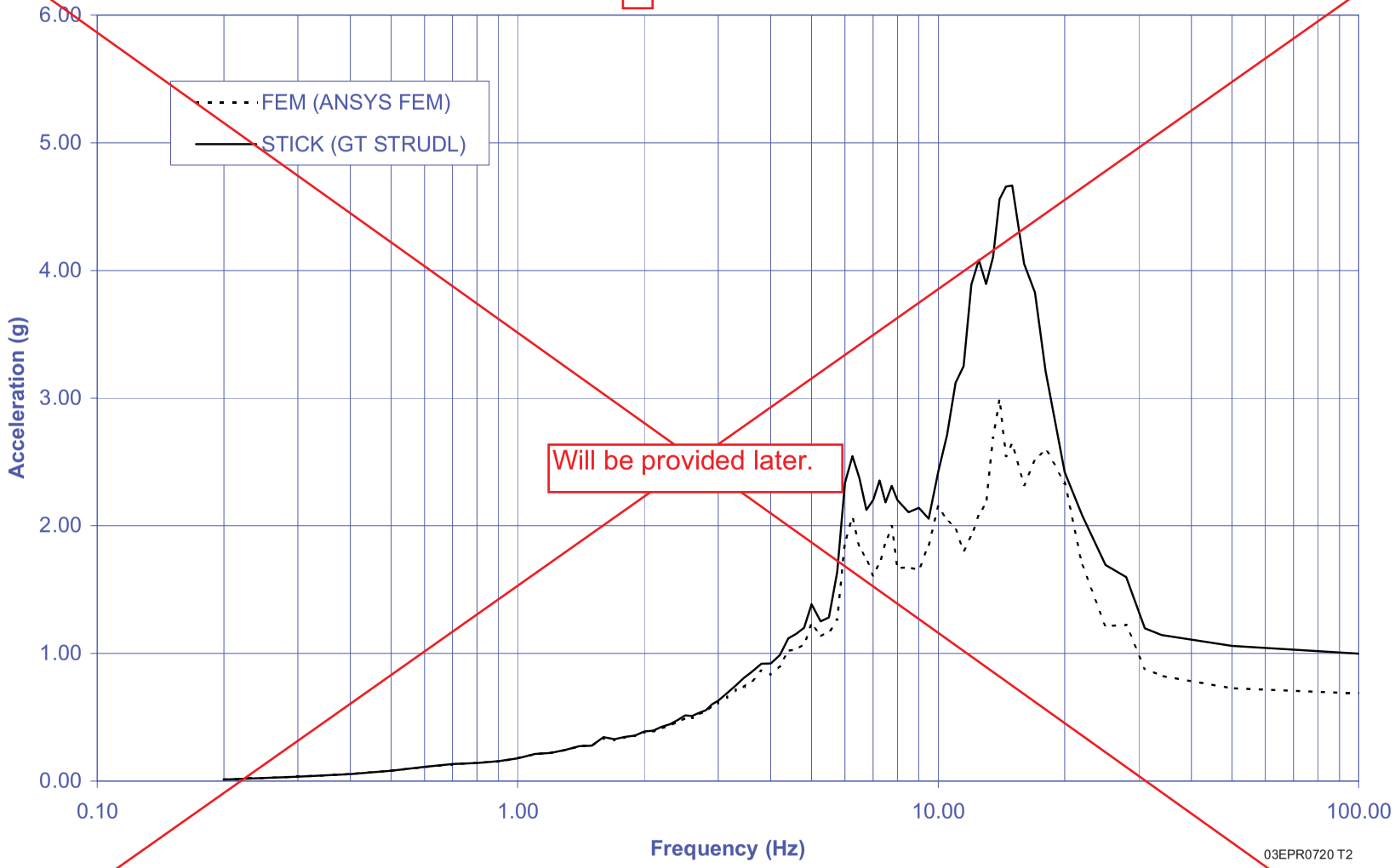
5



Will be provided later.

Figure 3.7.2-52—Spectrum Comparison at Elev. +63 ft, 11-3/4 in (+19.50m) - Reactor Building Internal Structure, 4% Damping, Z-Direction

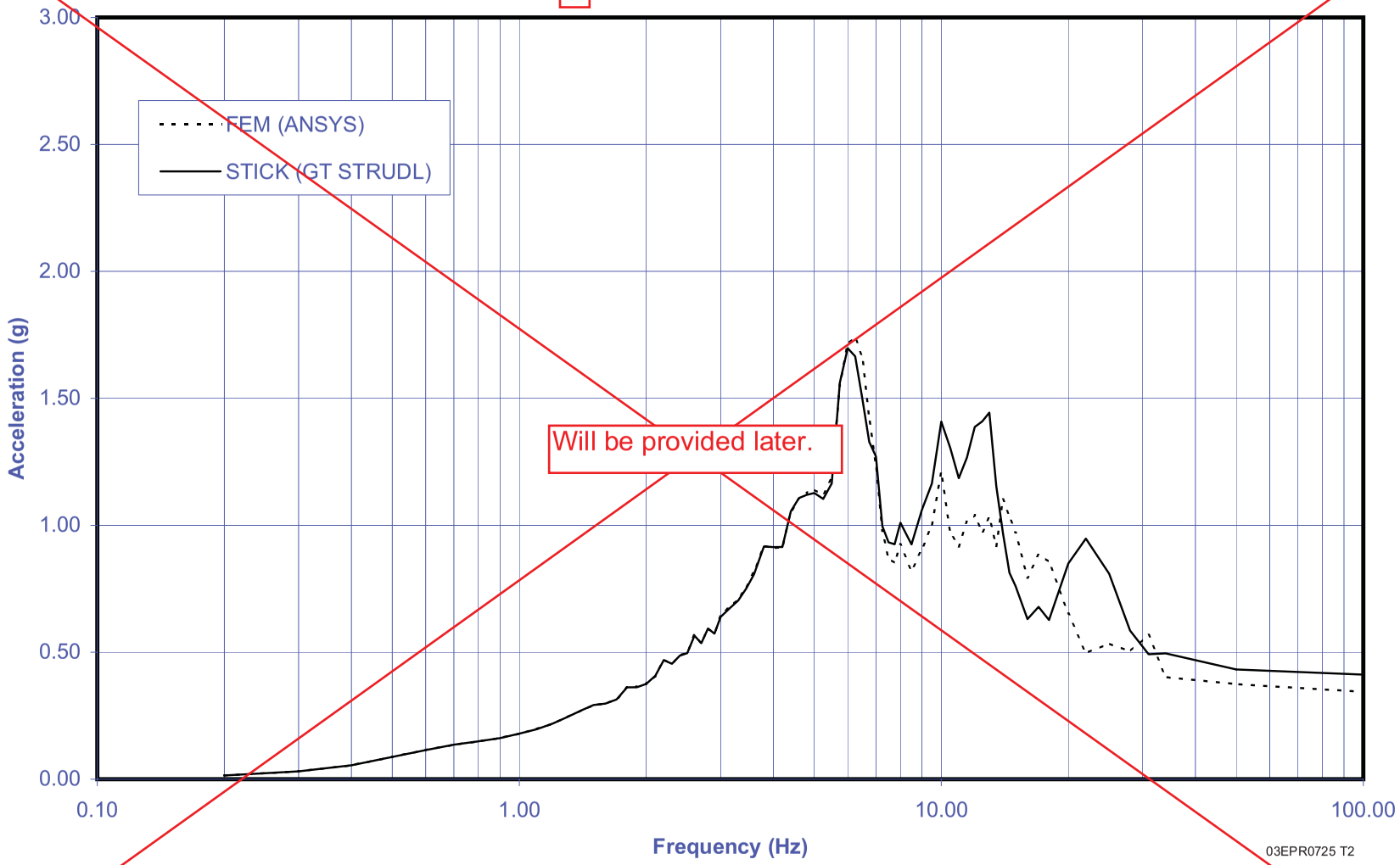
5



Will be provided later.

Figure 3.7.2-53—Spectrum Comparison at Elev. +16 ft, 10-3/4 in (+5.15m) - Reactor Building Internal Structure, 4% Damping, X-Direction

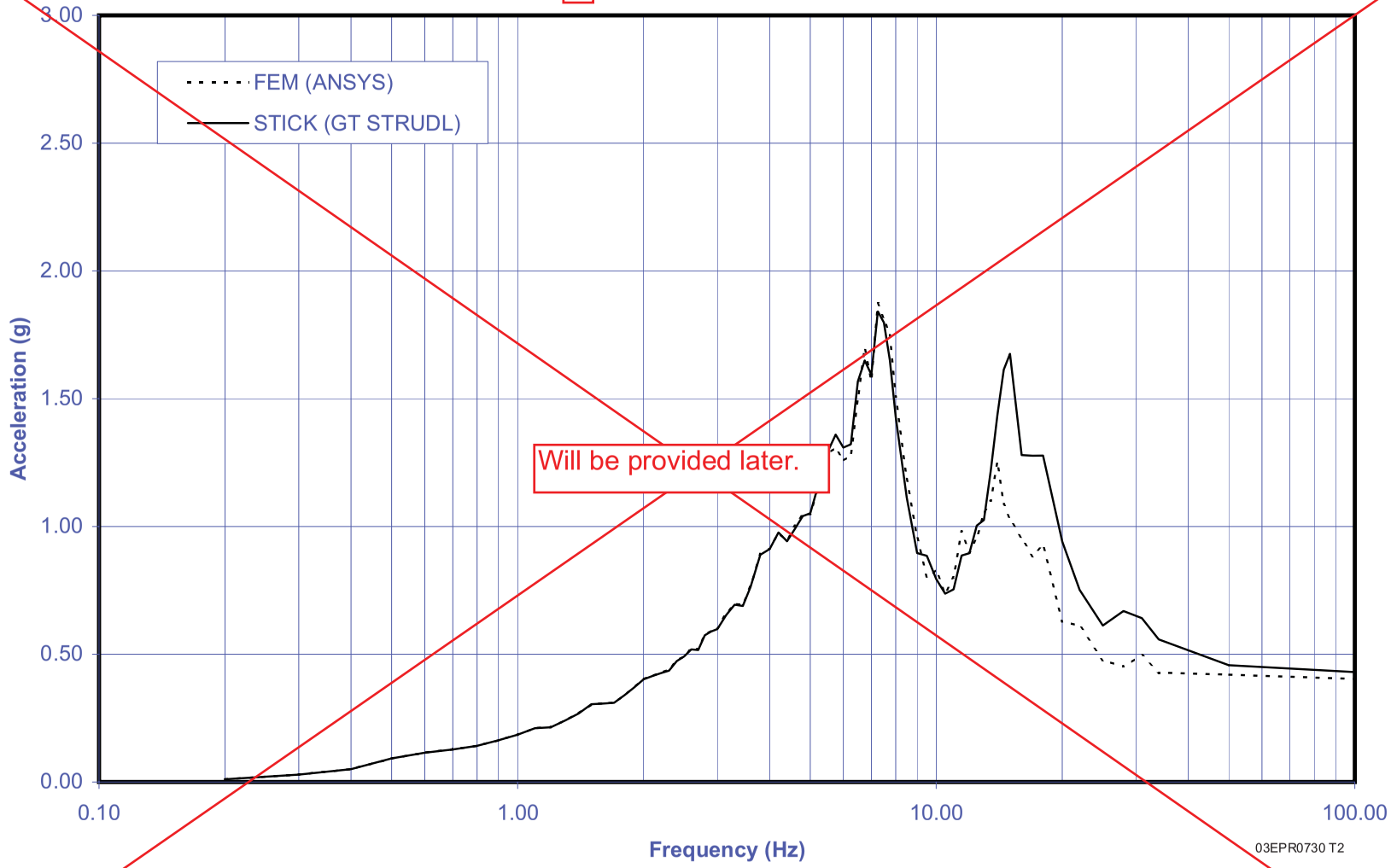
5



Will be provided later.

Figure 3.7.2-54—Spectrum Comparison at Elev. +16 ft, 10-3/4 in (+5.15m) - Reactor Building Internal Structure, 4% Damping, Y-Direction

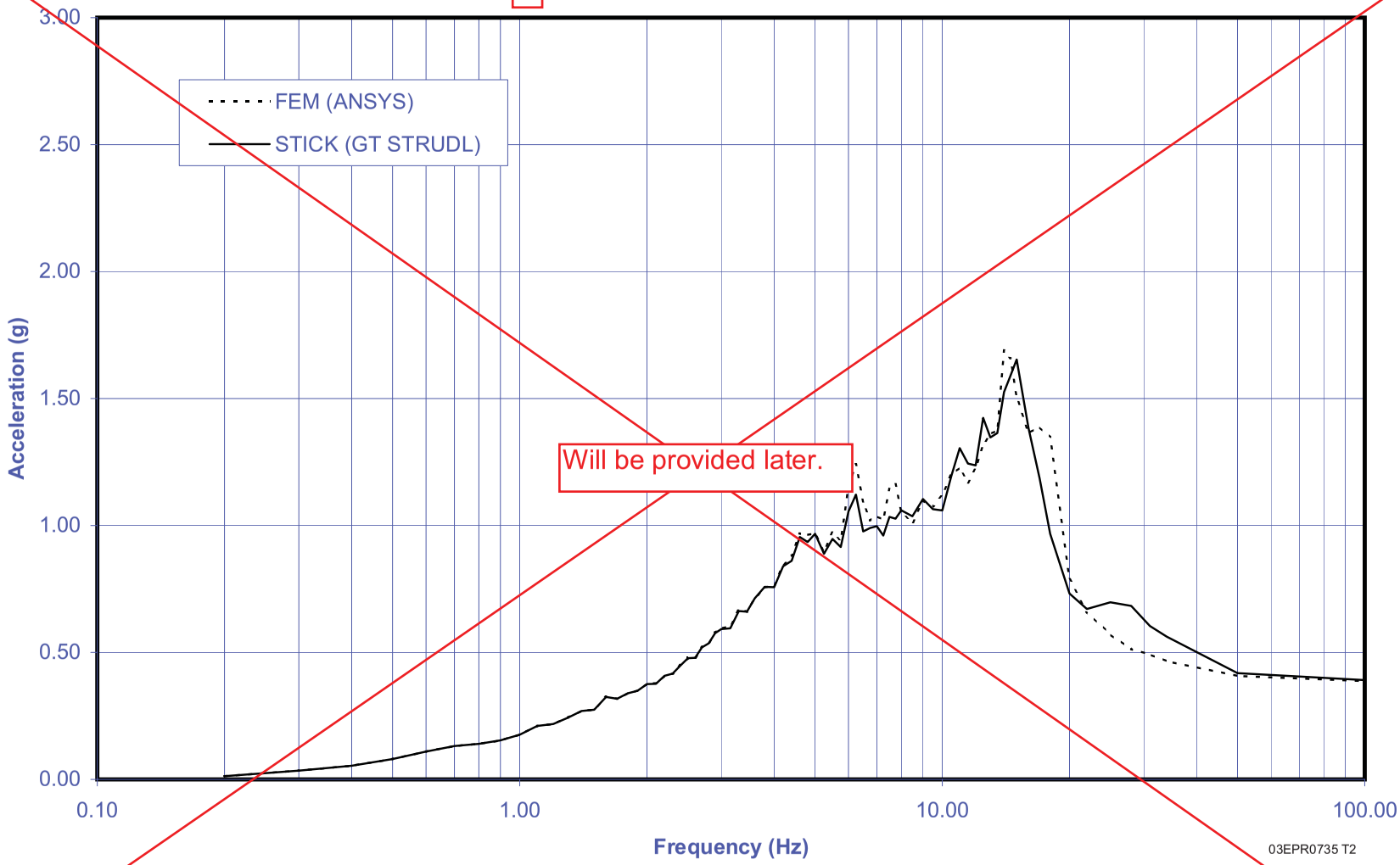
5



Will be provided later.

Figure 3.7.2-55—Spectrum Comparison at Elev. +16 ft, 10-3/4 in (+5.15m) - Reactor Building Internal Structure, 4% Damping, Z-Direction

5



Will be provided later.

Figure 3.7.2-56—Simplified Stick Model of Reactor Coolant Loop

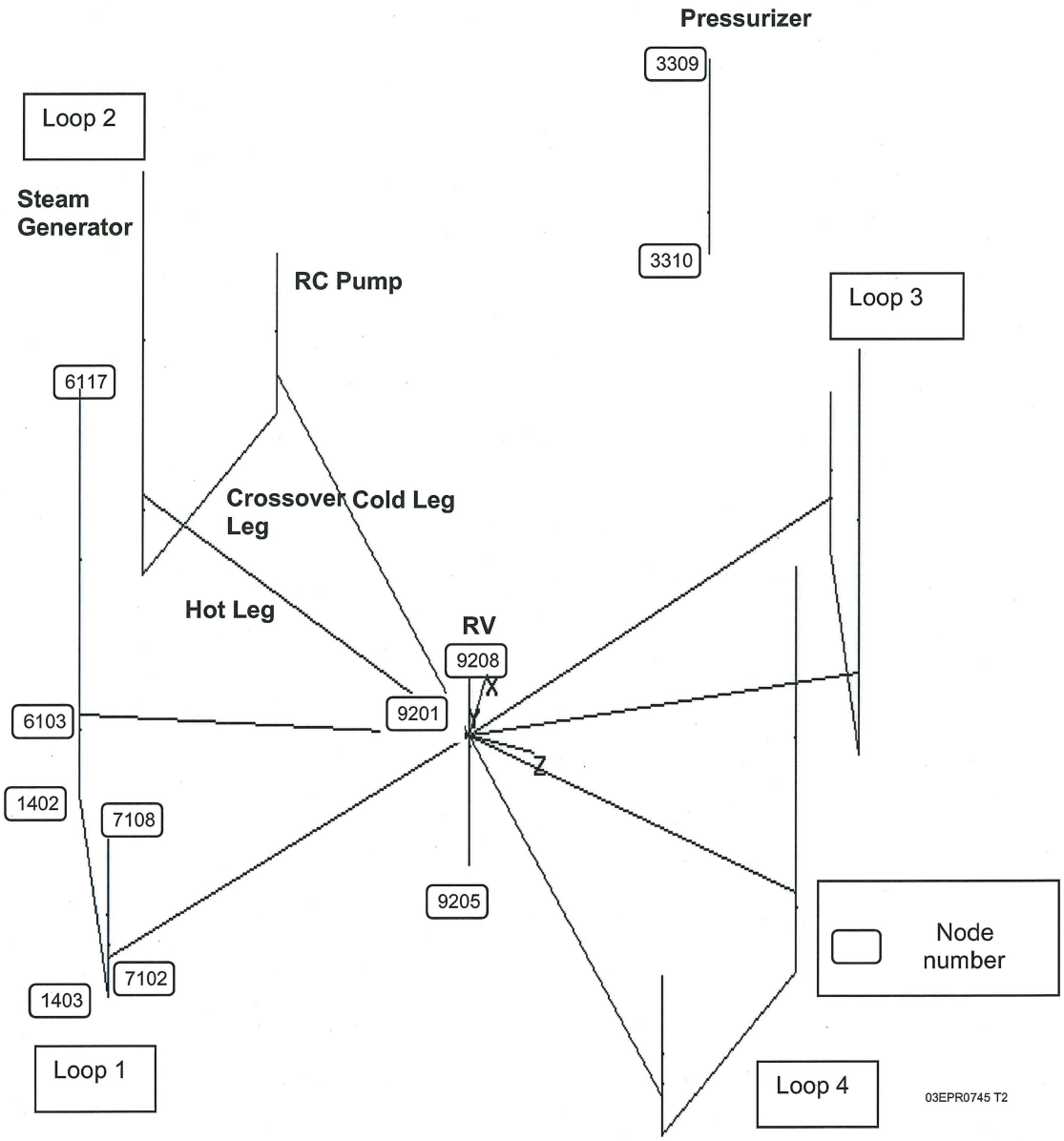


Figure 3.7.2-57—Isometric View of GTSTRUDL FEM for Emergency Power Generating Building

(EUR Motions)

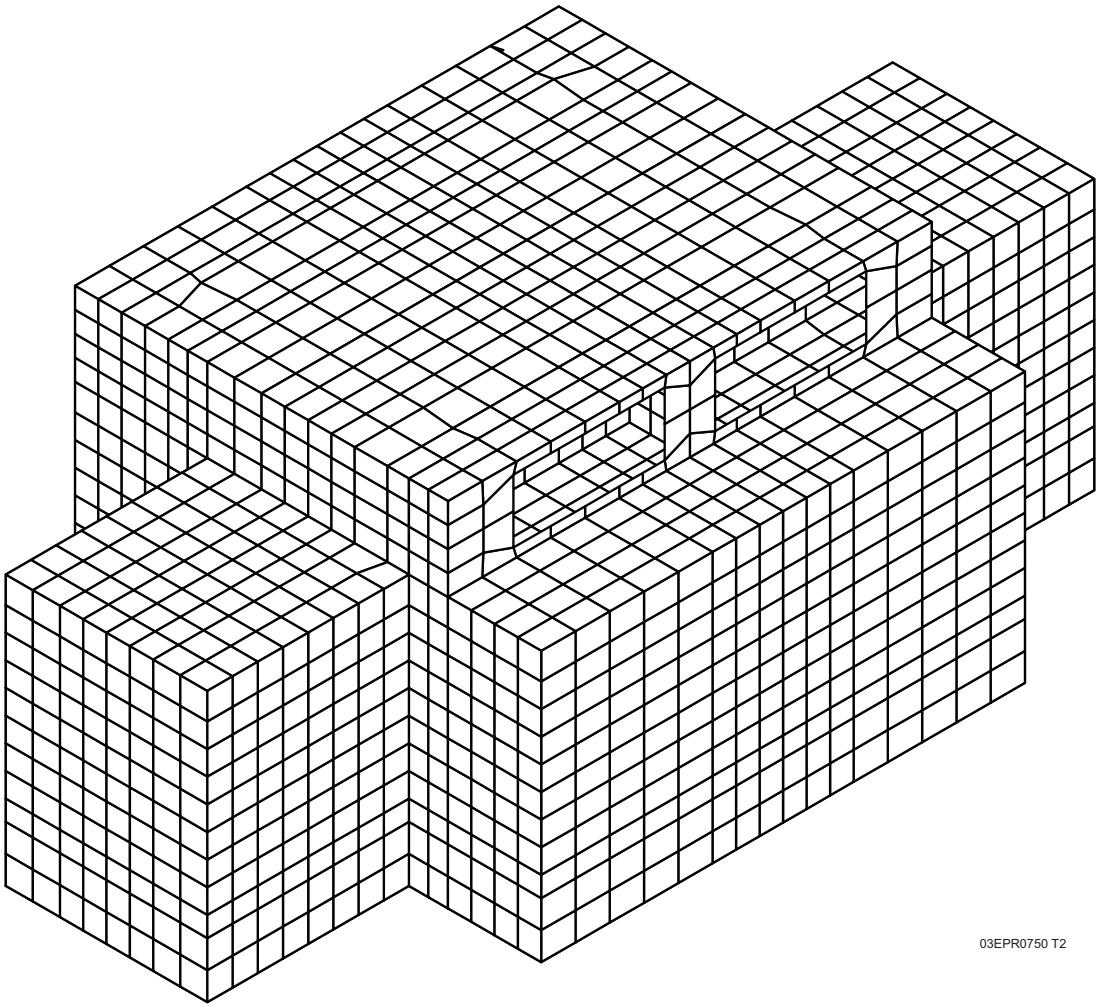


Figure 3.7.2-58—Section View of GTSTRUDL FEM for Emergency Power Generating Building

(EUR Motions)

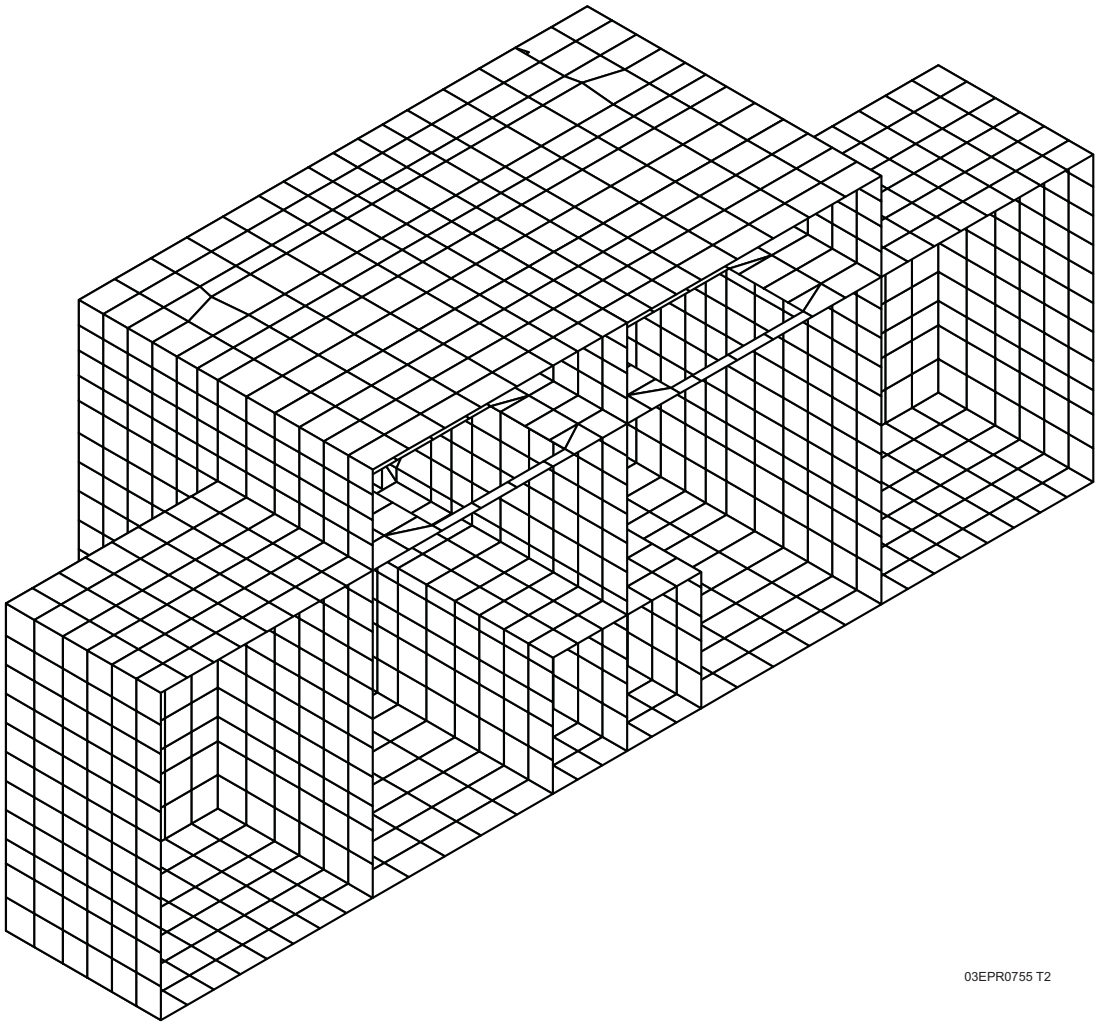


Figure 3.7.2-59—Isometric View of GTSTRUDL FEM for Essential Service Water Building

(EUR Motions)

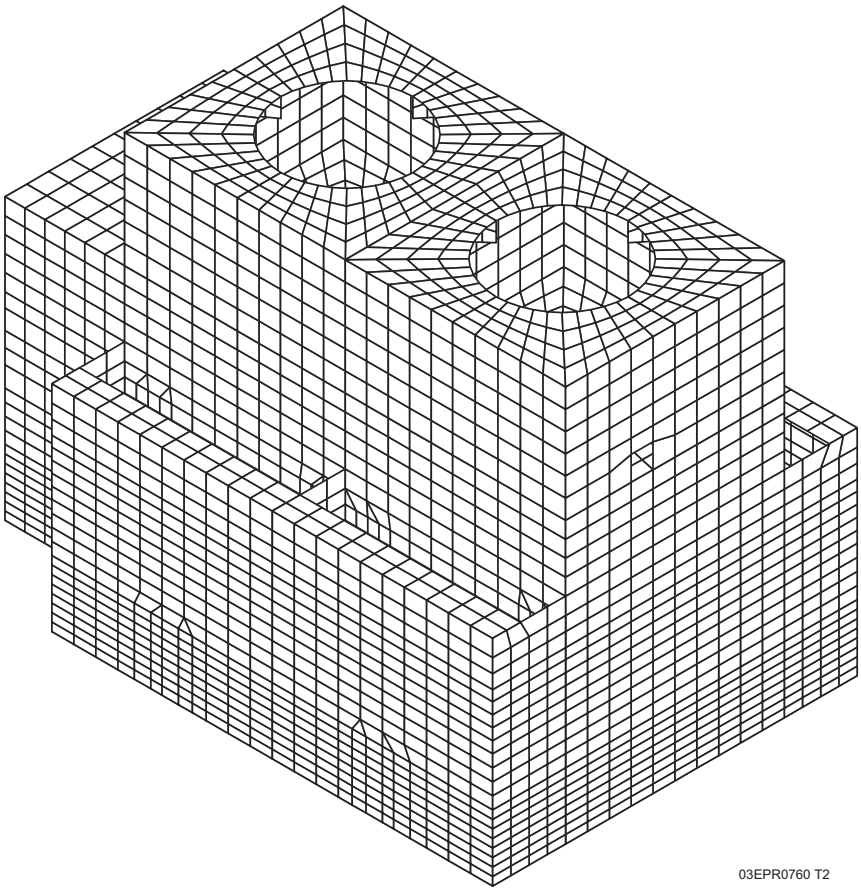


Figure 3.7.2-60—Section View of GTSTRUDL FEM for Essential Service Water Building

(EUR Motions)

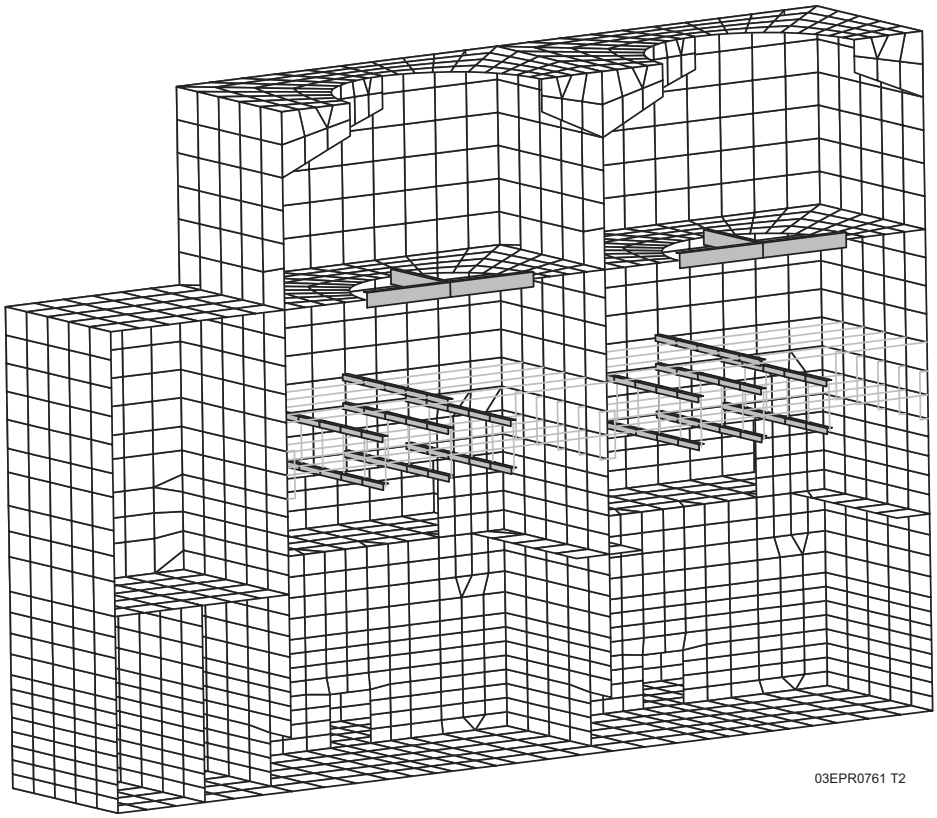
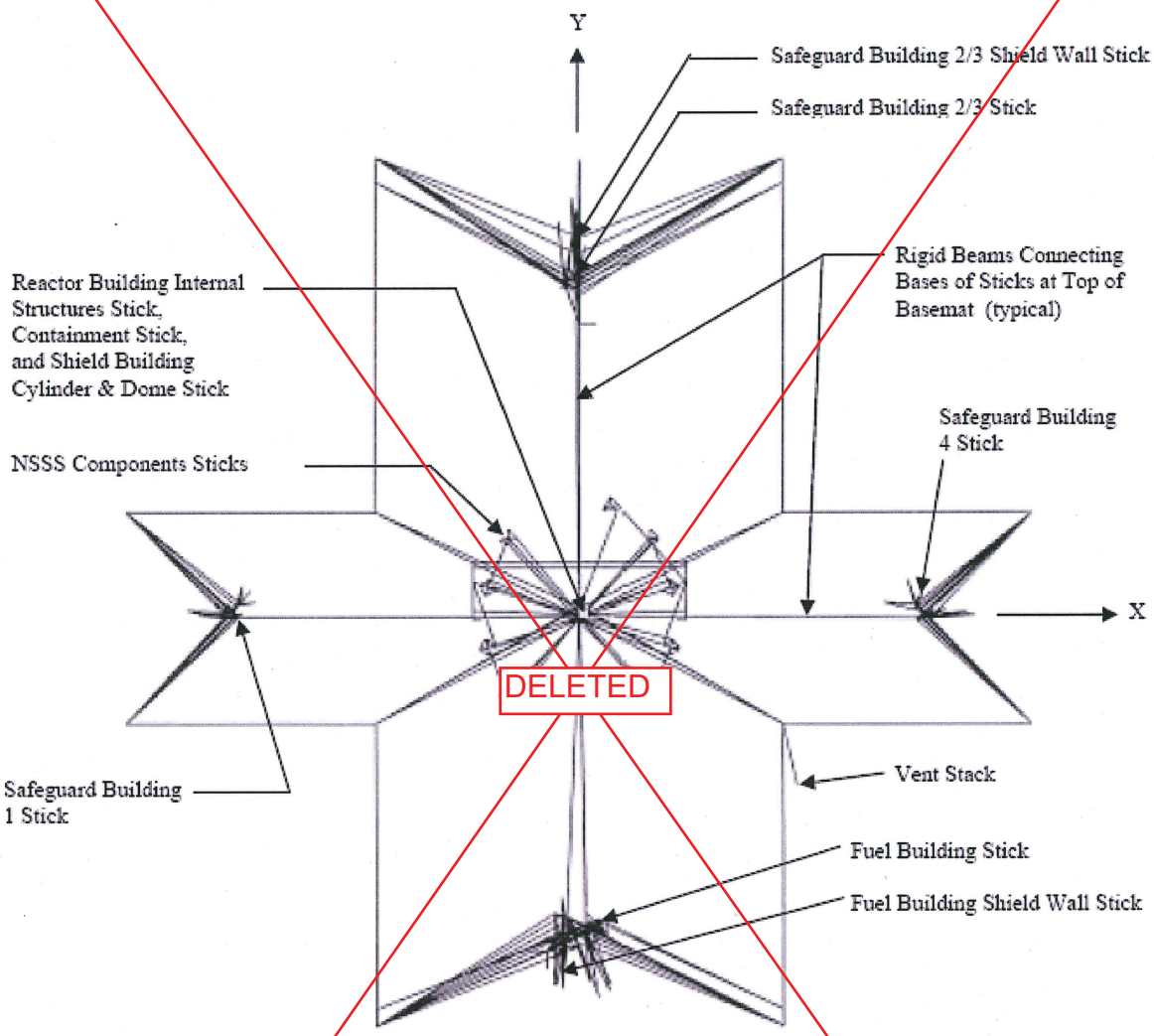


Figure 3.7.2-61—Plan View of NI Common Basemat Structures and Stick Model



Note: Rigid beams from centers of mass to wall corners for purpose of extracting seismic responses at structural corners are omitted for purpose of clarity.

03EPR0765 T2

Figure 3.7.2-62—Plan View of SSI Model for NI Common Basemat Structures and NAB

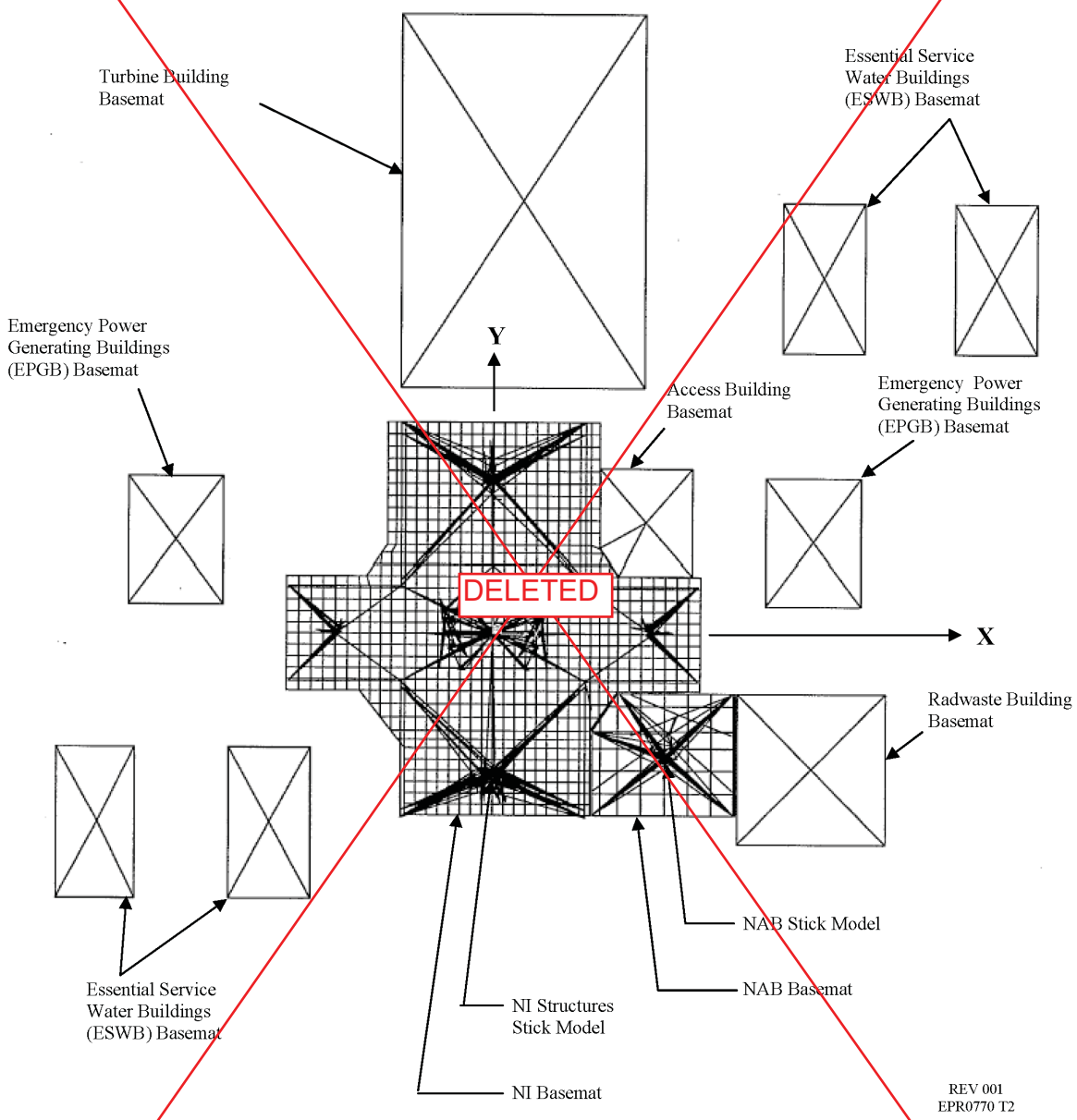
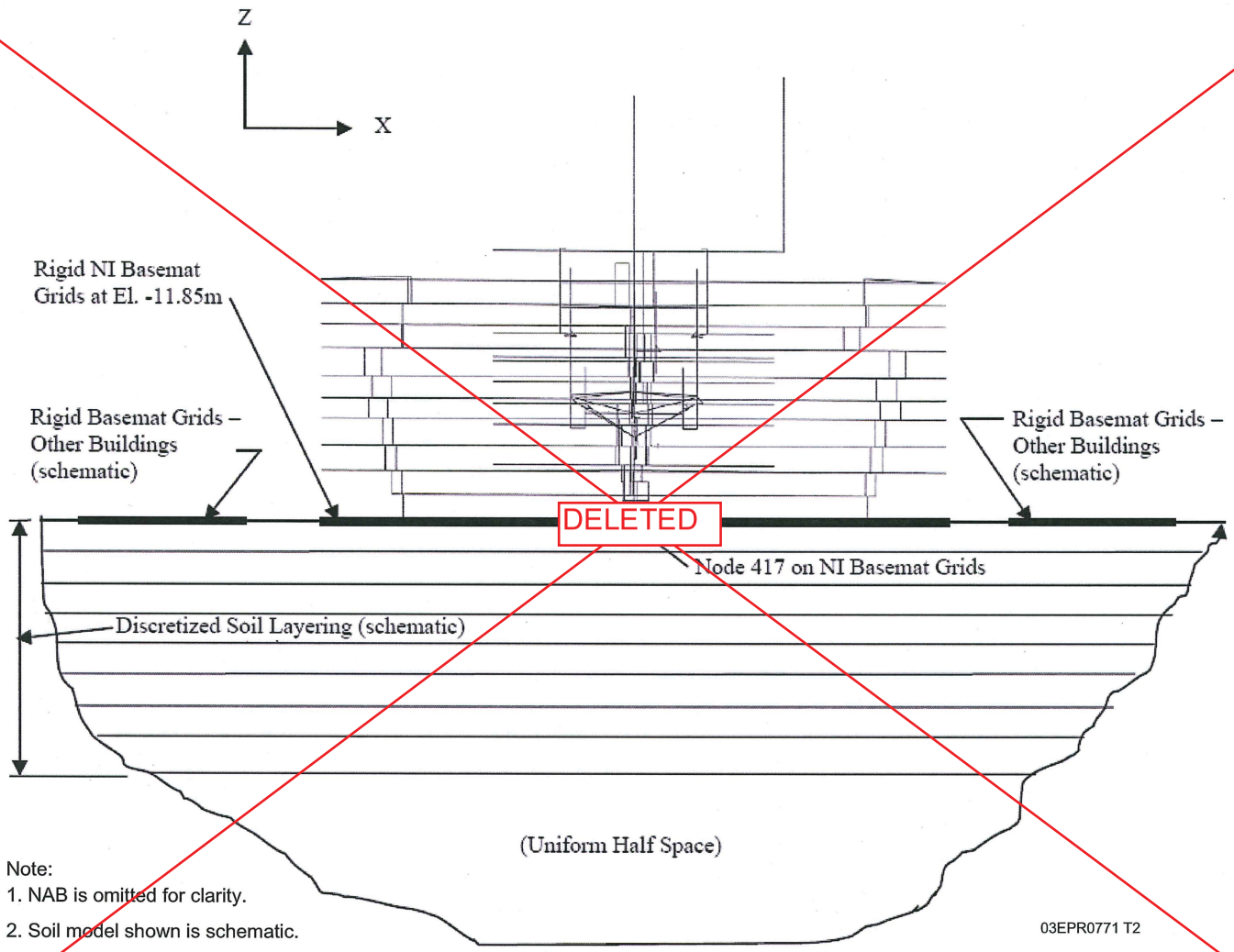


Figure 3.7.2-63—~~Elevation View of SSI Model for NI Common Basemat Structures and NAB in X-Z Plane~~



Note:
1. NAB is omitted for clarity.
2. Soil model shown is schematic.

Figure 3.7.2-64—Schematic Footprint Area of NI Common Basemat

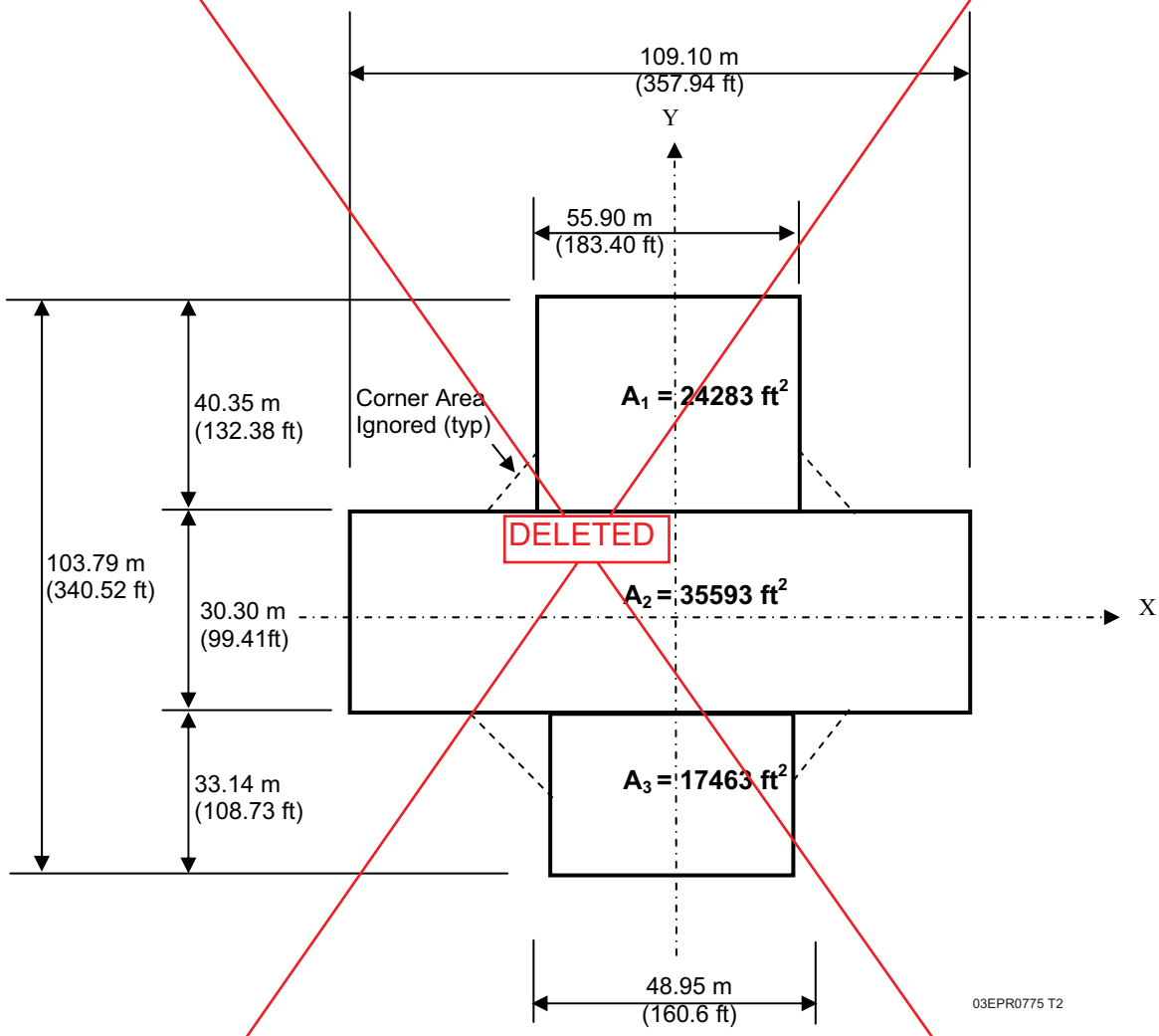


Figure 3.7.2-65—RCS Stick Coupled to Model STICK-1T for Reactor Building Internal Structure

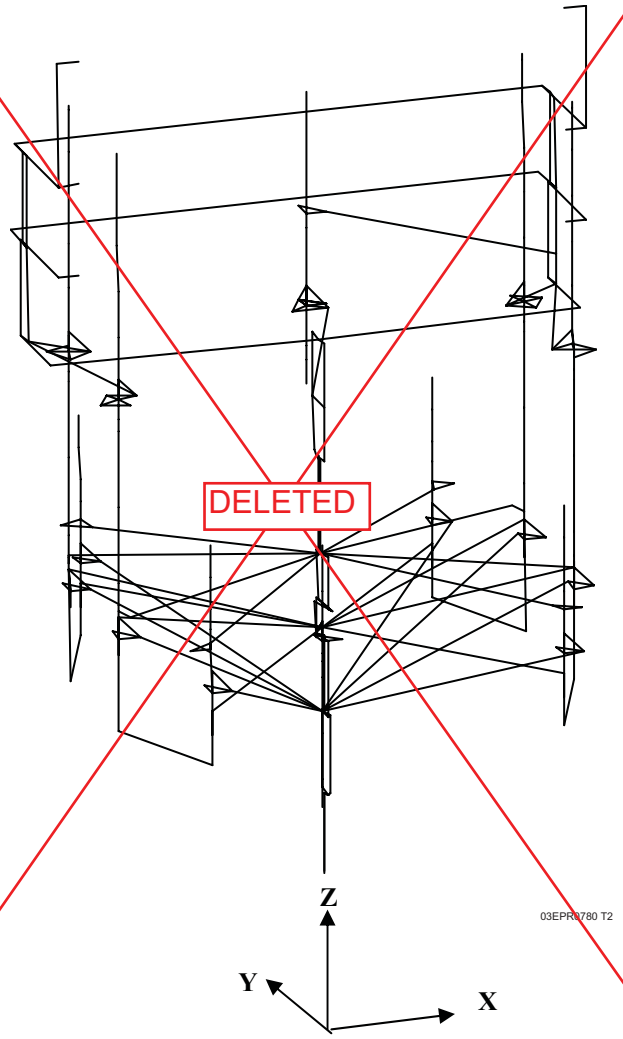


Figure 3.7.2-66—Elevation View of NAB Stick Model in X-Z Plane

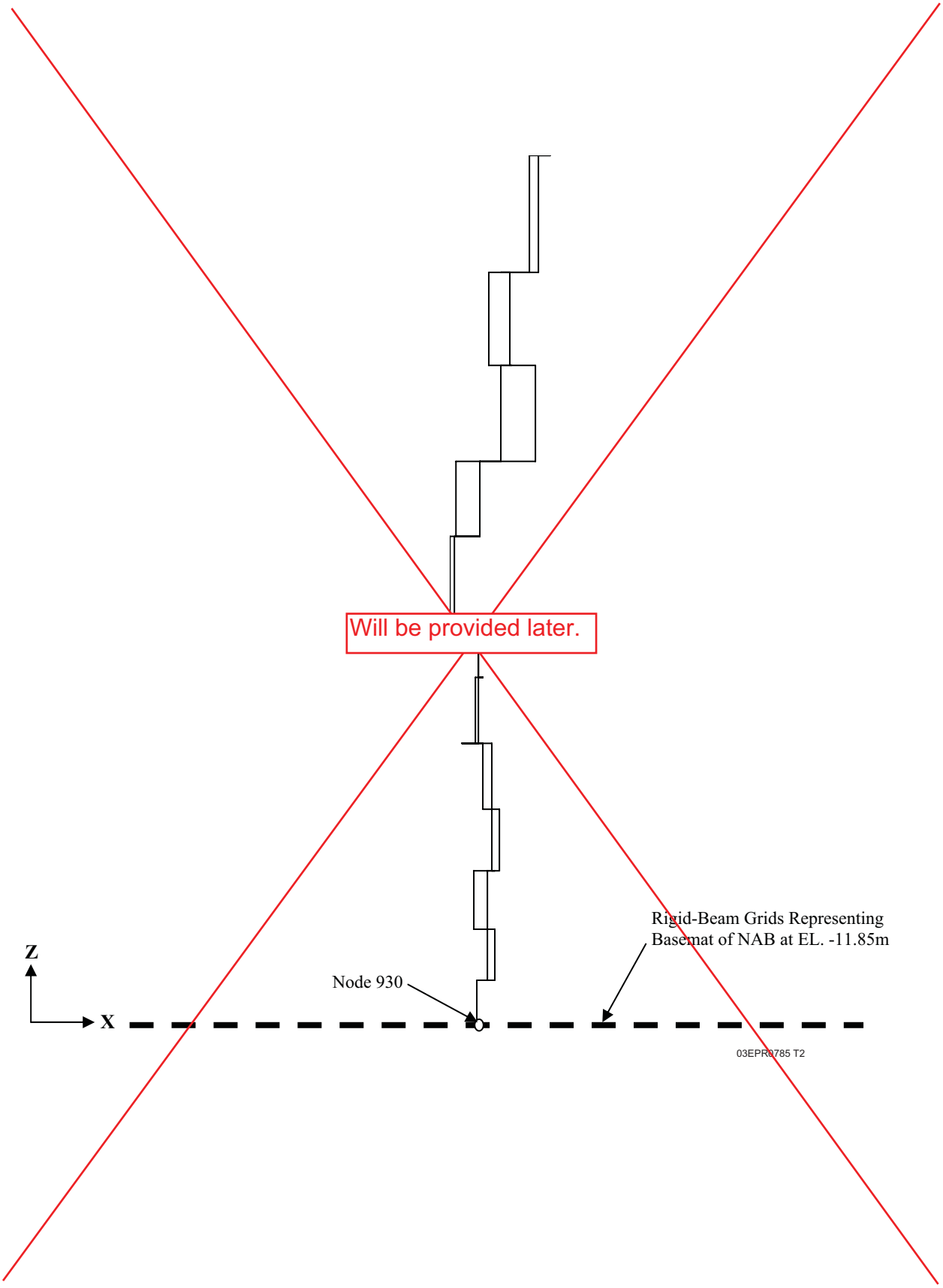


Figure 3.7.2-67—Elevation View of NAB Stick Model in Y-Z Plane

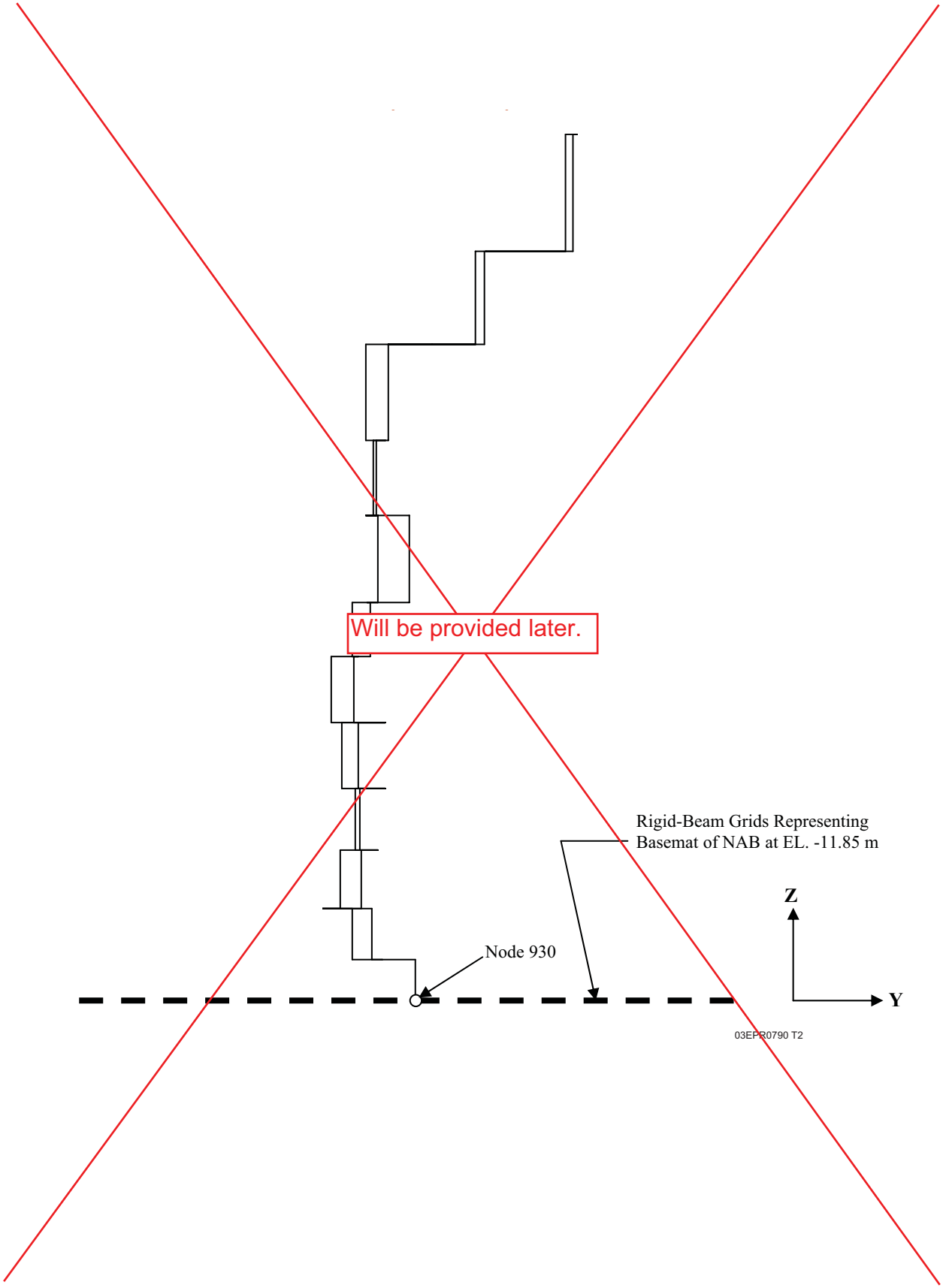
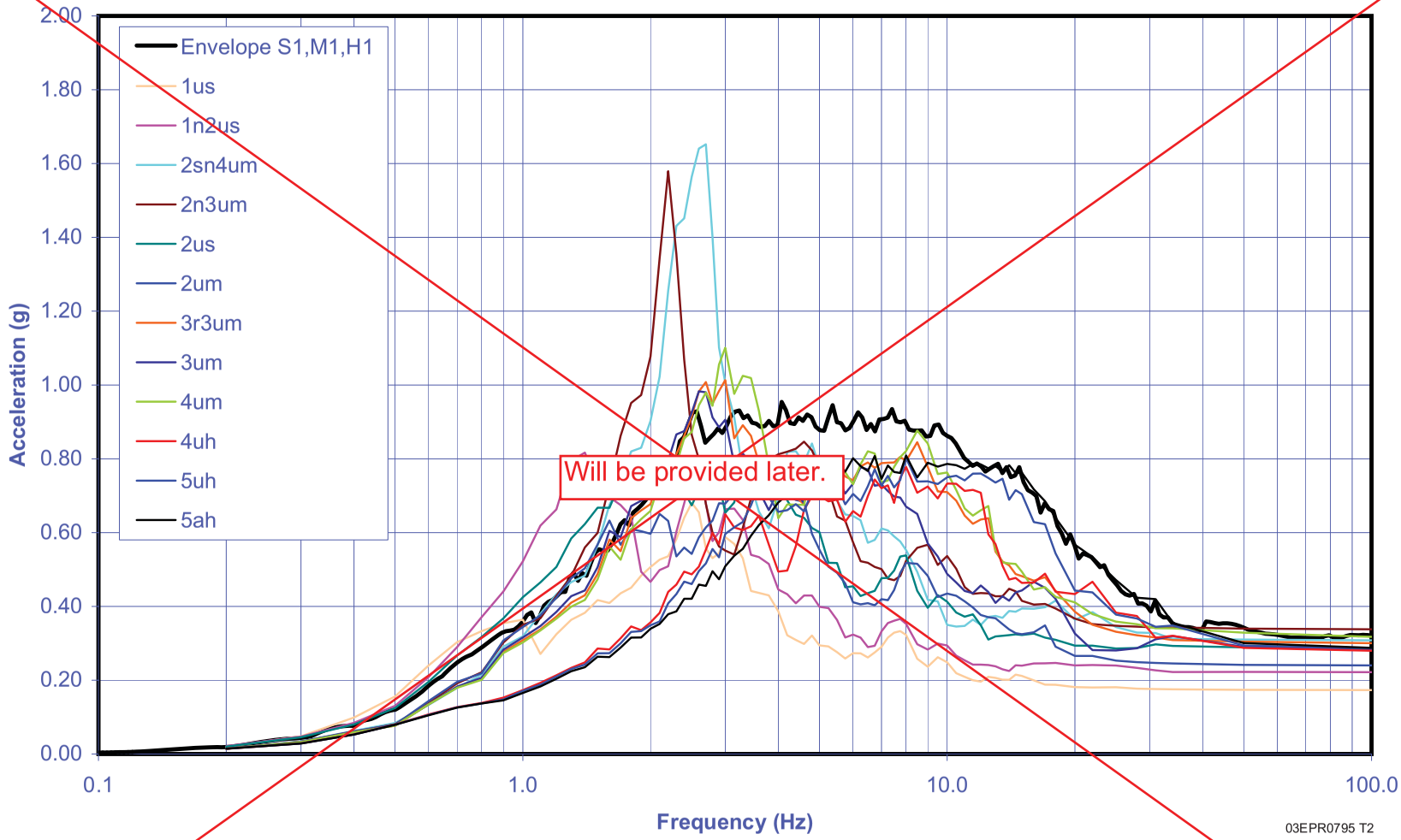


Figure 3.7.2-68—Response Spectra at NI Common Basemat Bottom Node ~~417~~ 274 - 5% Damping, X-Direction



Will be provided later.

Figure 3.7.2-69—Response Spectra at NI Common Basemat Bottom Node ~~417~~ 274 - 5% Damping, Y-Direction

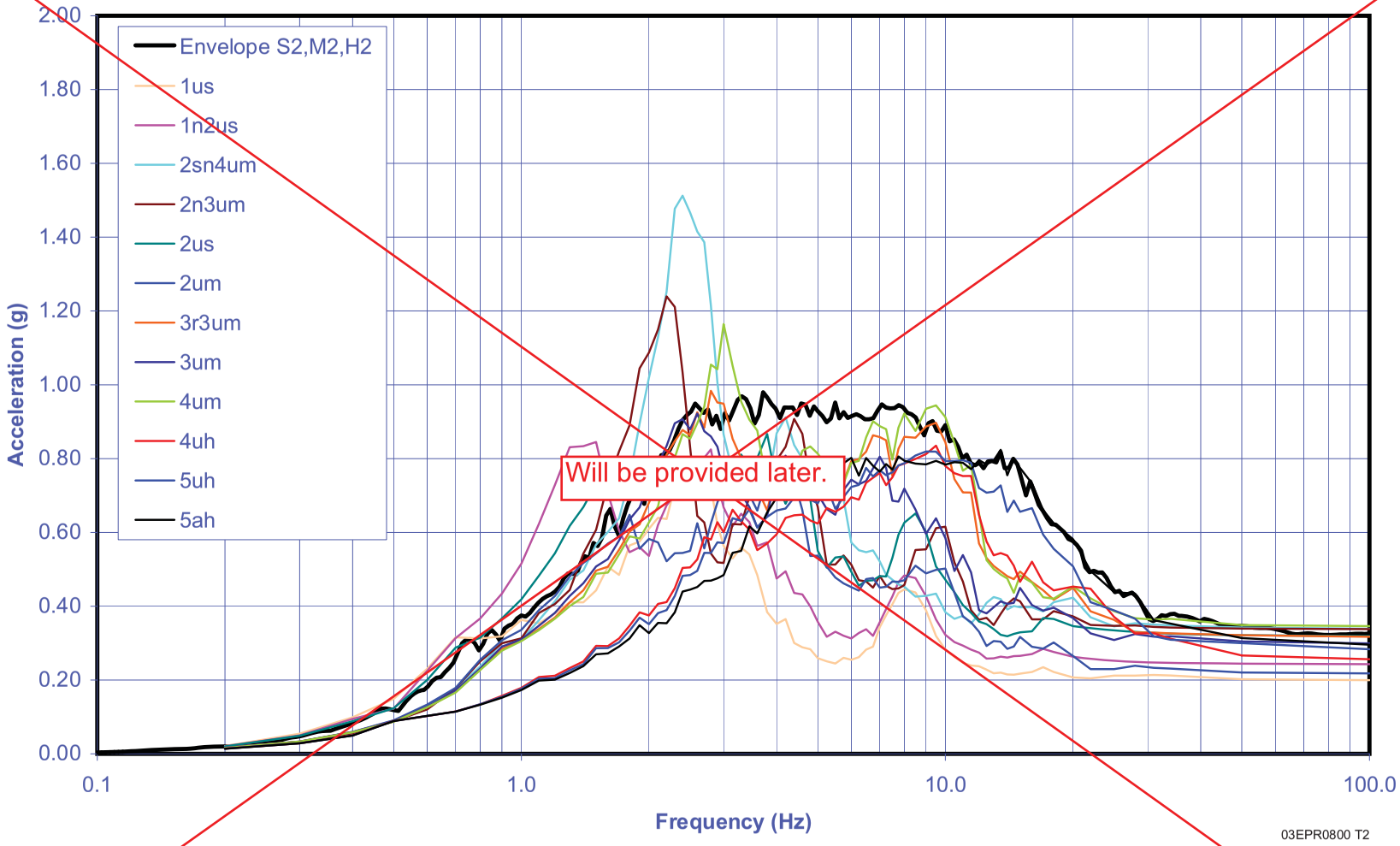


Figure 3.7.2-70—Response Spectra at NI Common Basemat Bottom Node ~~417~~ 274 - 5% Damping, Z-Direction

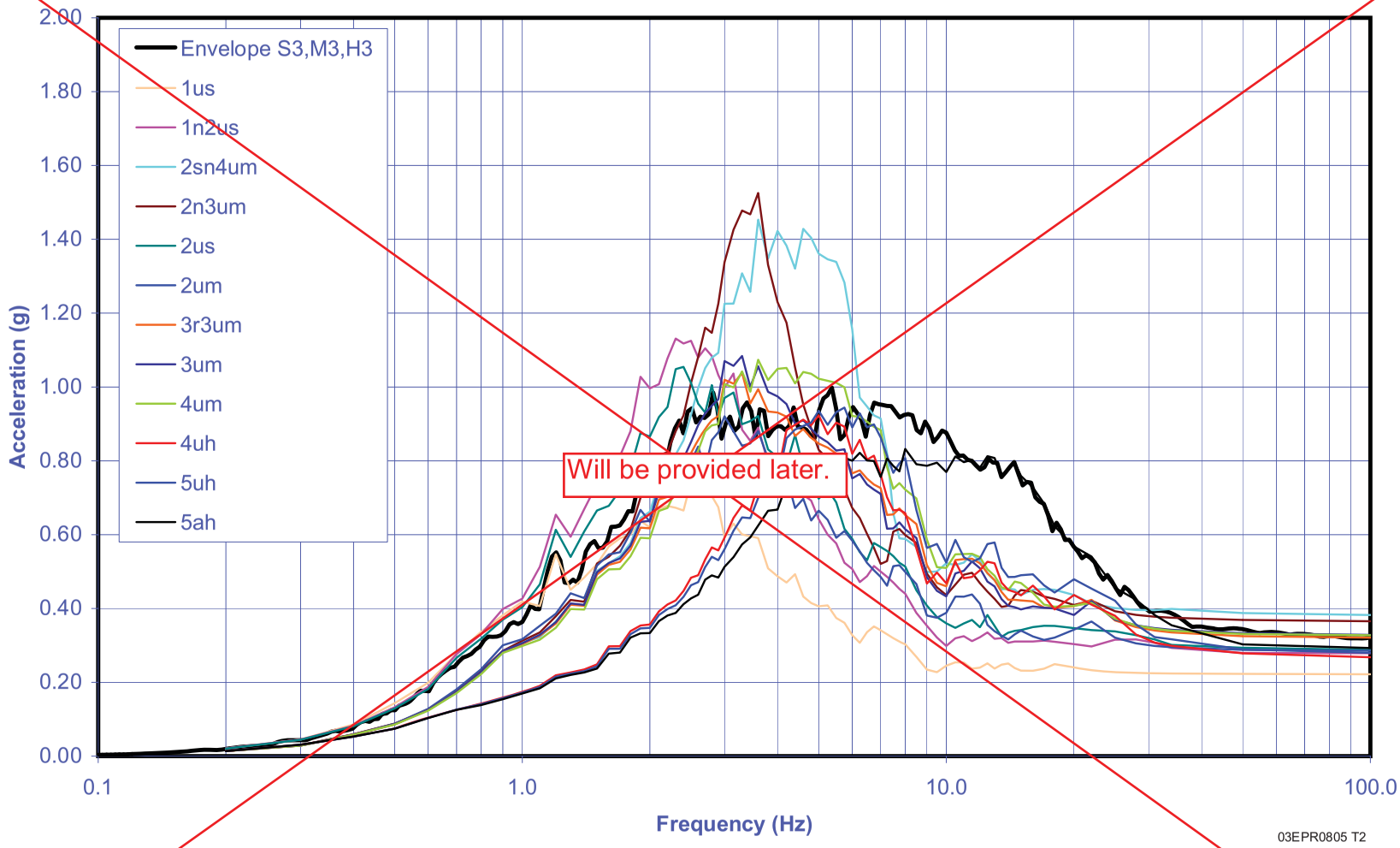


Figure 3.7.2-71—Soil Model Surface Response Spectra at Centers of Footprints of EPGB and ESWB - 5% Damping, X-Direction

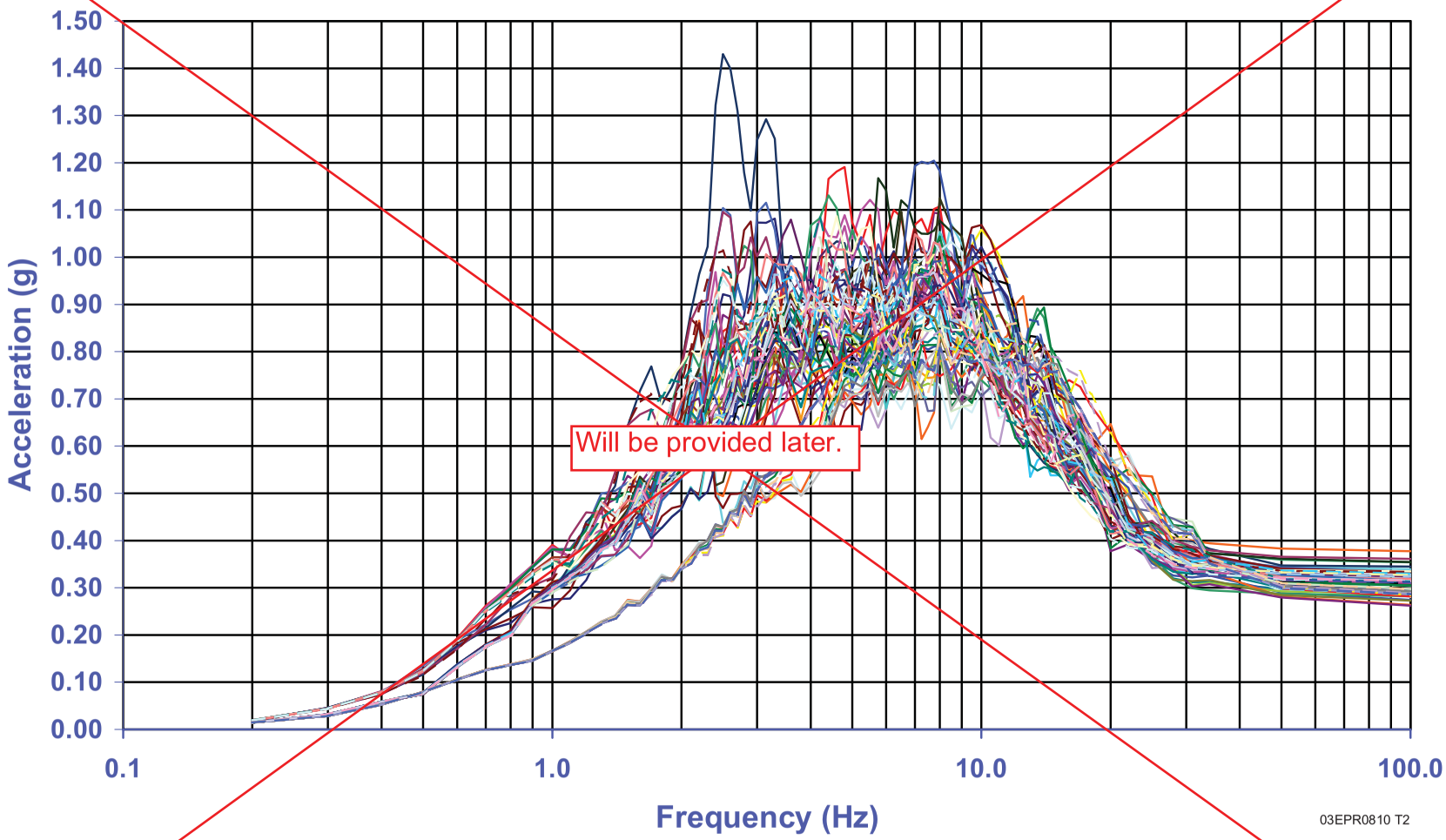


Figure 3.7.2-72—Soil Model Surface Response Spectra at Centers of Footprints of EPGB and ESWB - 5% Damping, Y-Direction

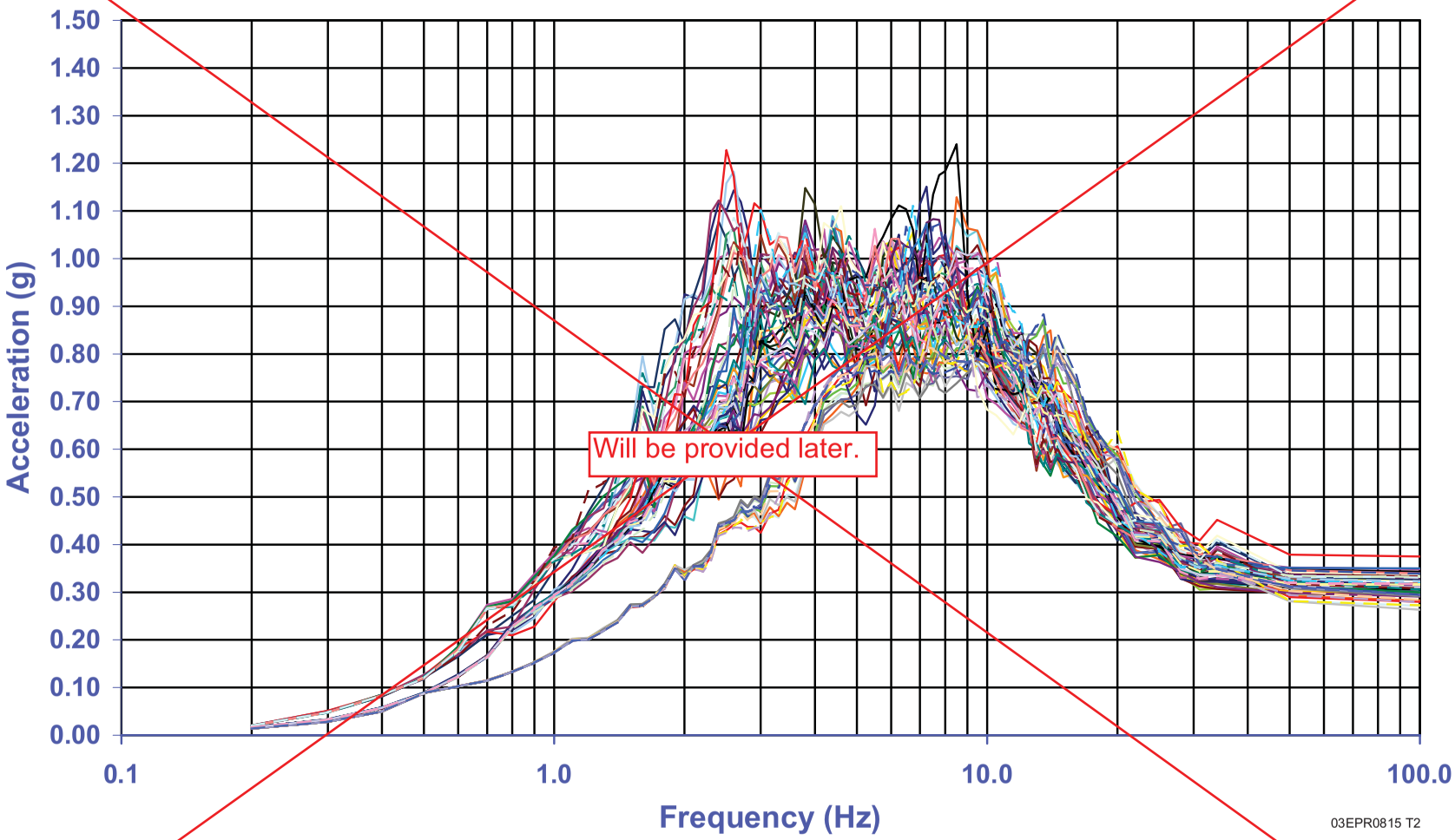


Figure 3.7.2-73—Soil Model Surface Response Spectra at Centers of Footprints of EPGB and ESWB - 5% Damping, Z-Direction

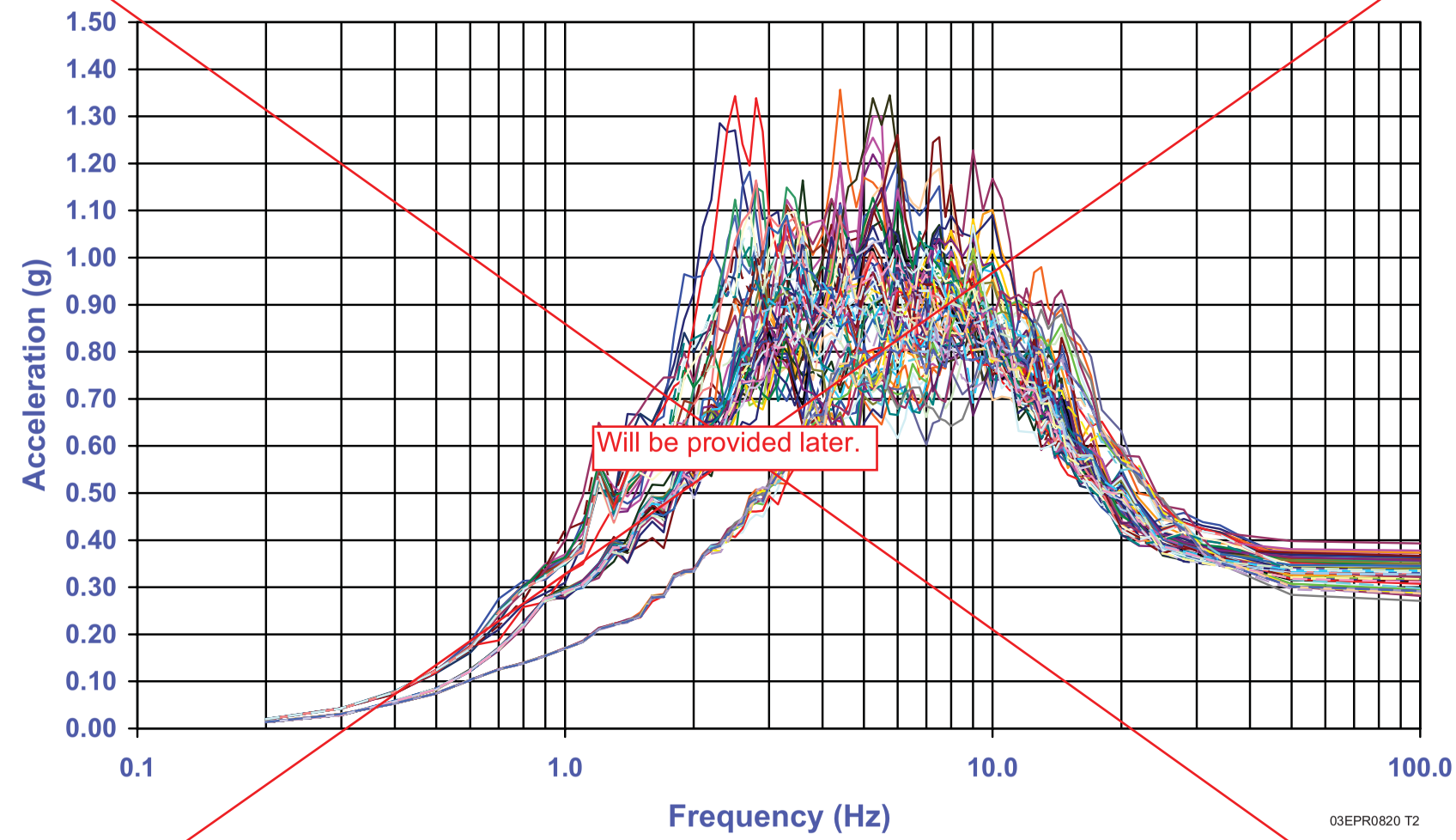


Figure 3.7.2-74—Spectrum Envelope of Reactor Building Internal Structure - Elev. +16 ft, 10-3/4 in (+5.15m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

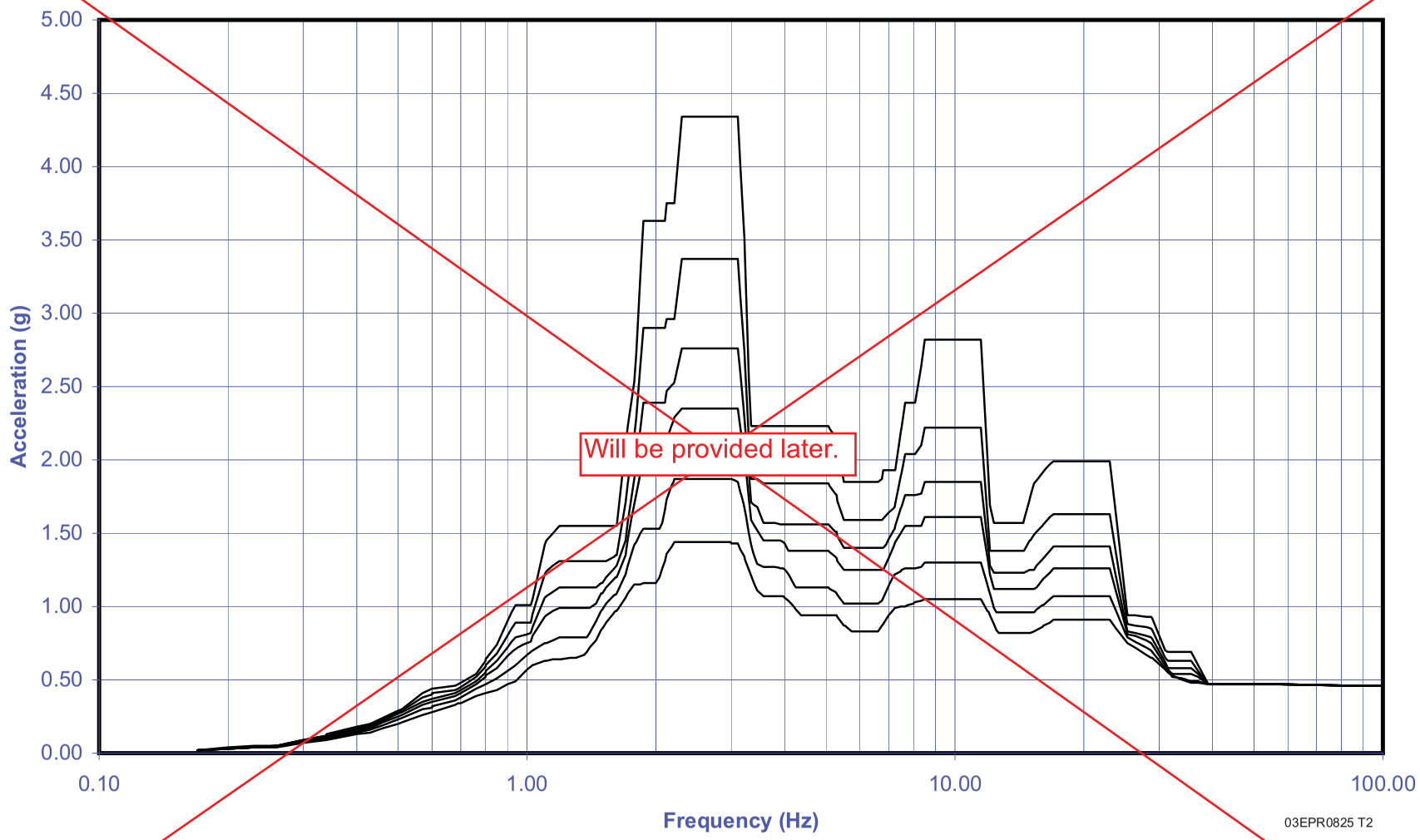


Figure 3.7.2-75—Spectrum Envelope of Reactor Building Internal Structure - Elev. +16 ft, 10-3/4 in (+5.15m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

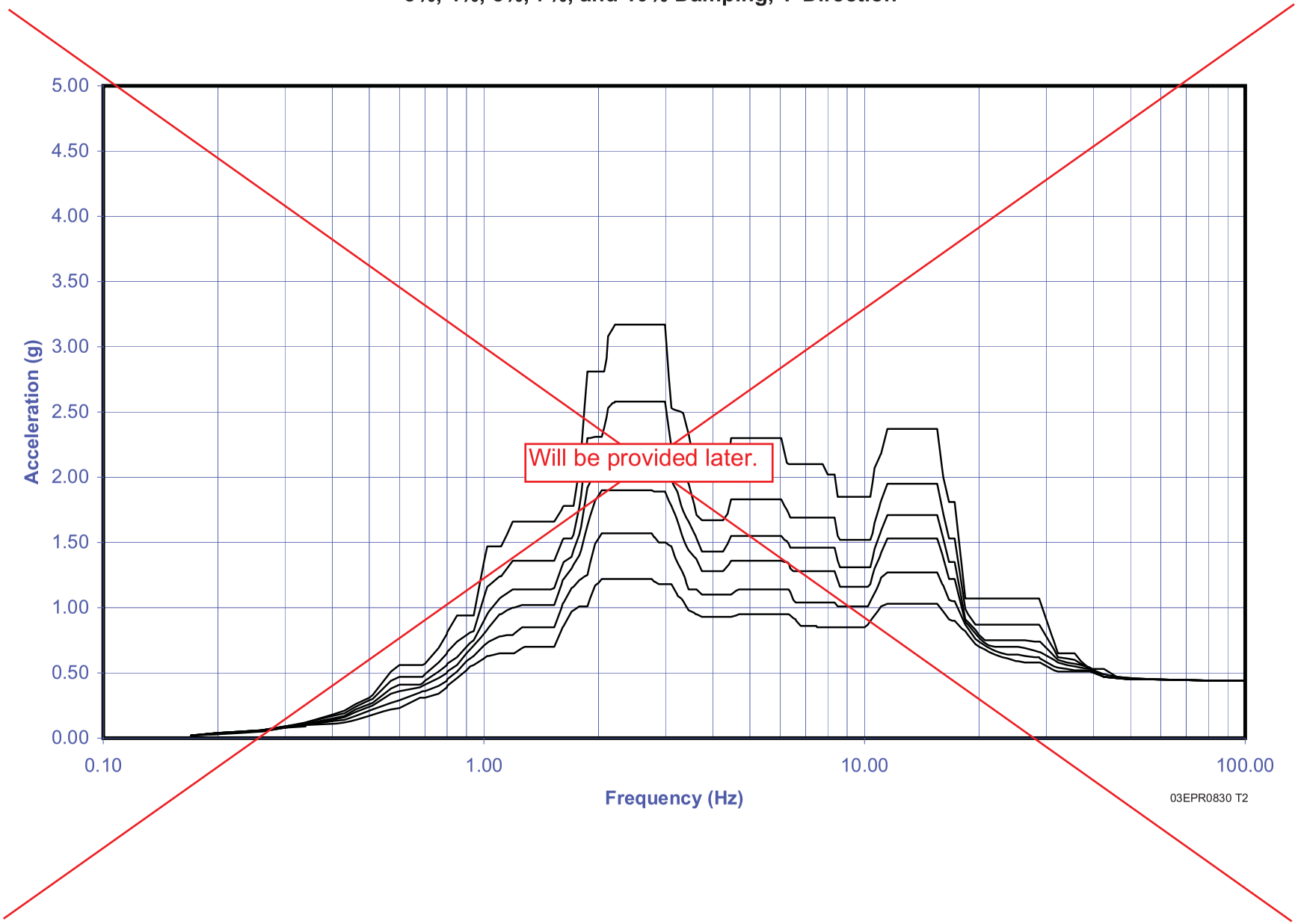


Figure 3.7.2-76—Spectrum Envelope of Reactor Building Internal Structure - Elev. +16 ft, 10-3/4 in (+5.15m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

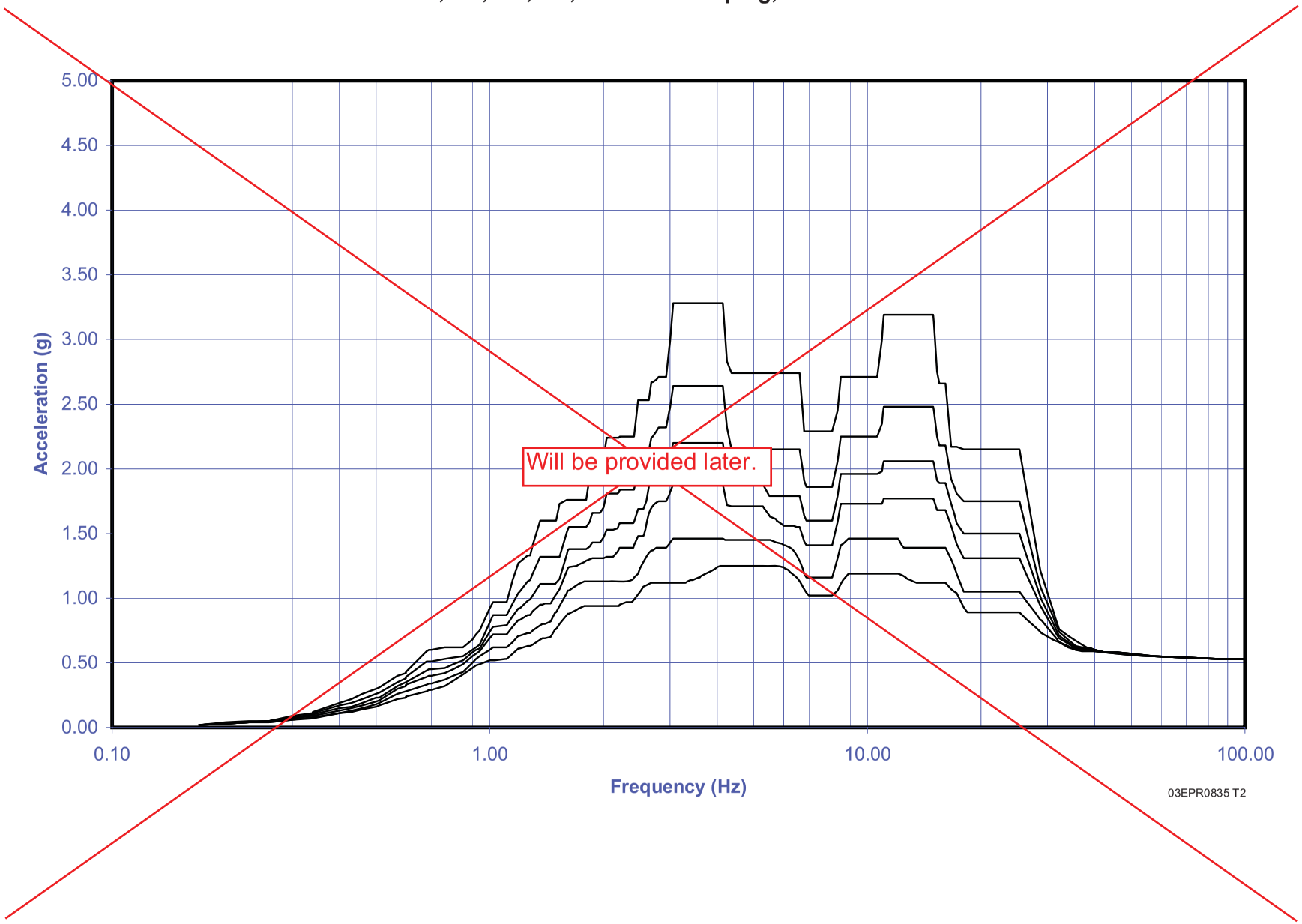


Figure 3.7.2-77—Spectrum Envelope of Reactor Building Internal Structure - Elev. +63 ft, 11-3/4 in (+19.50m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

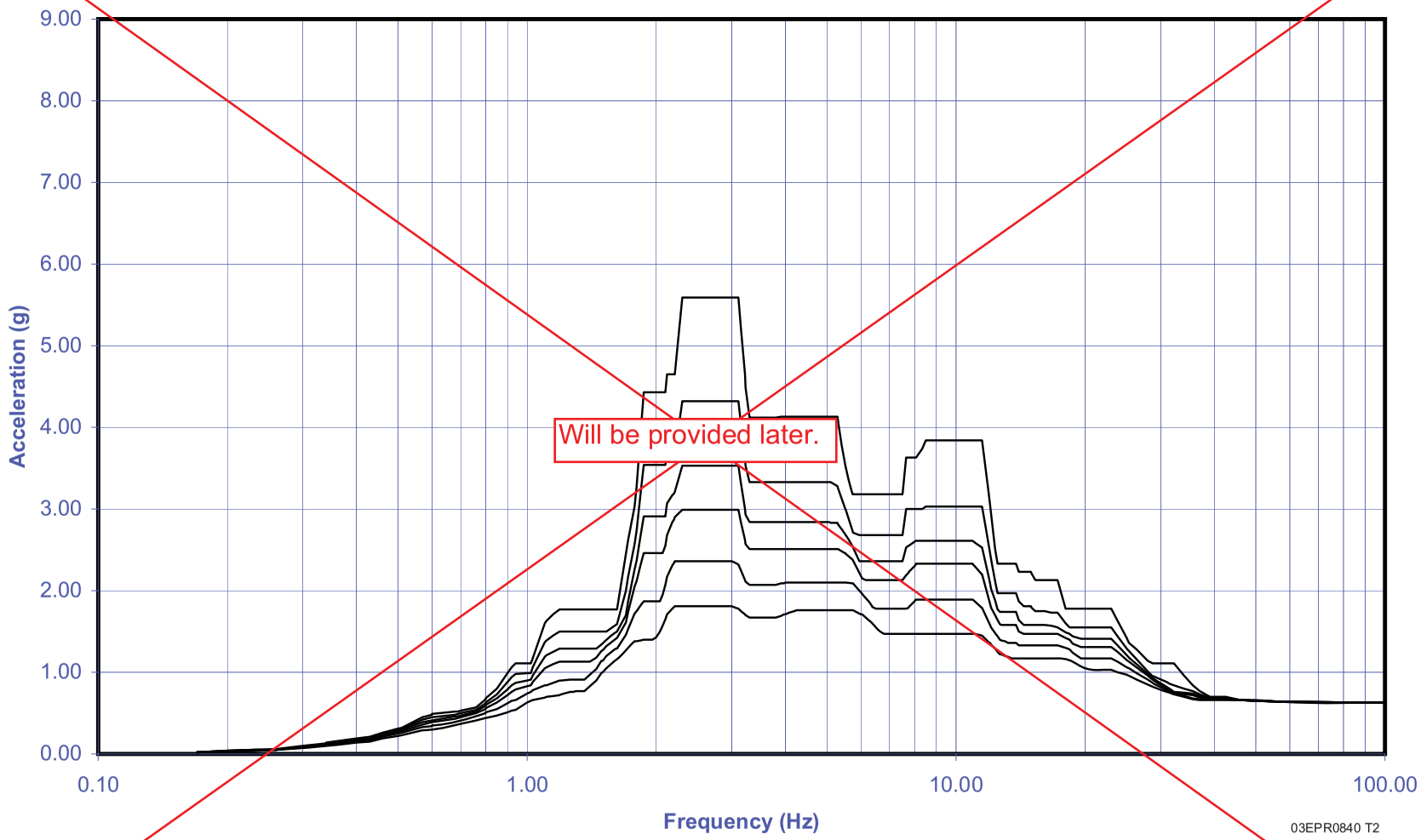
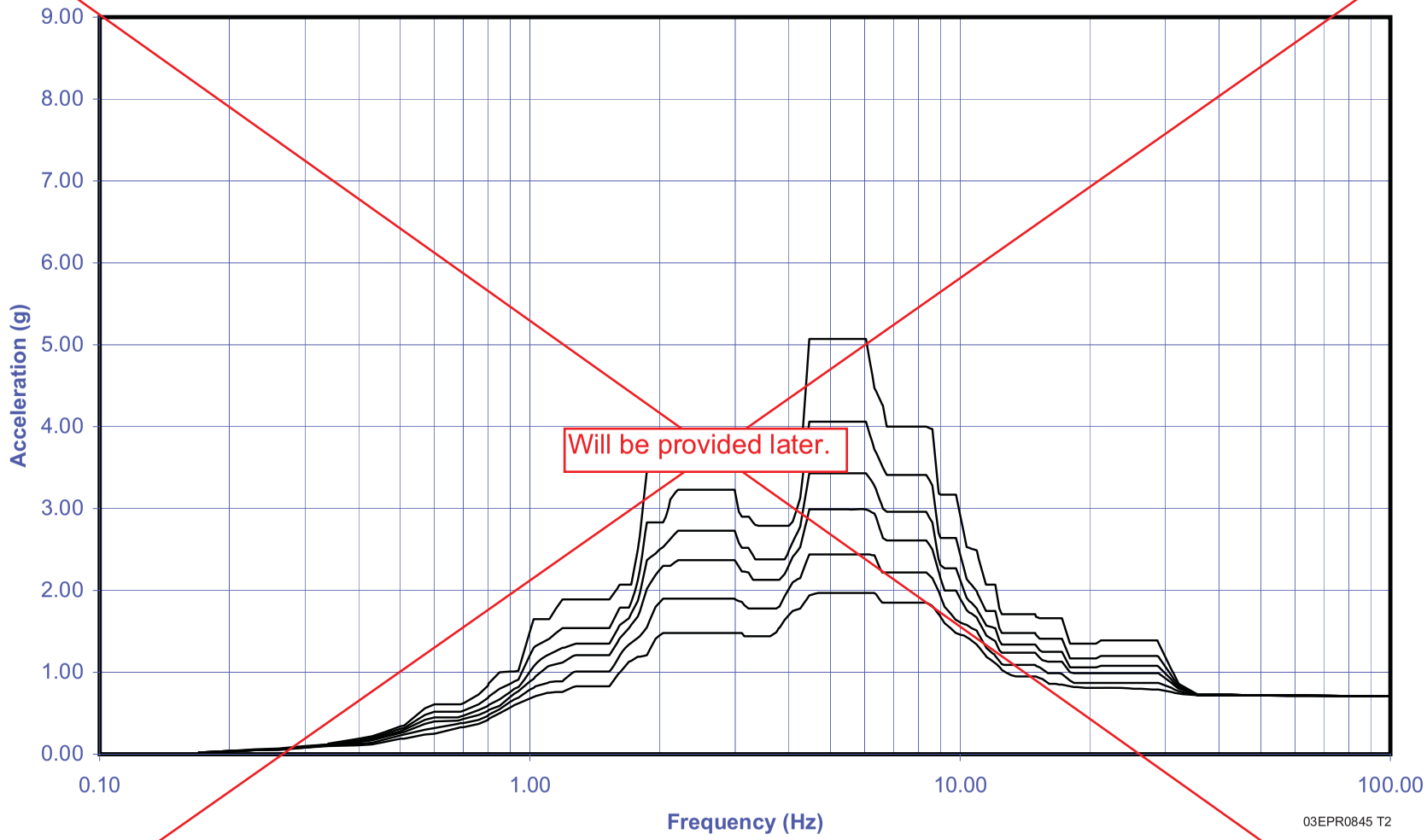
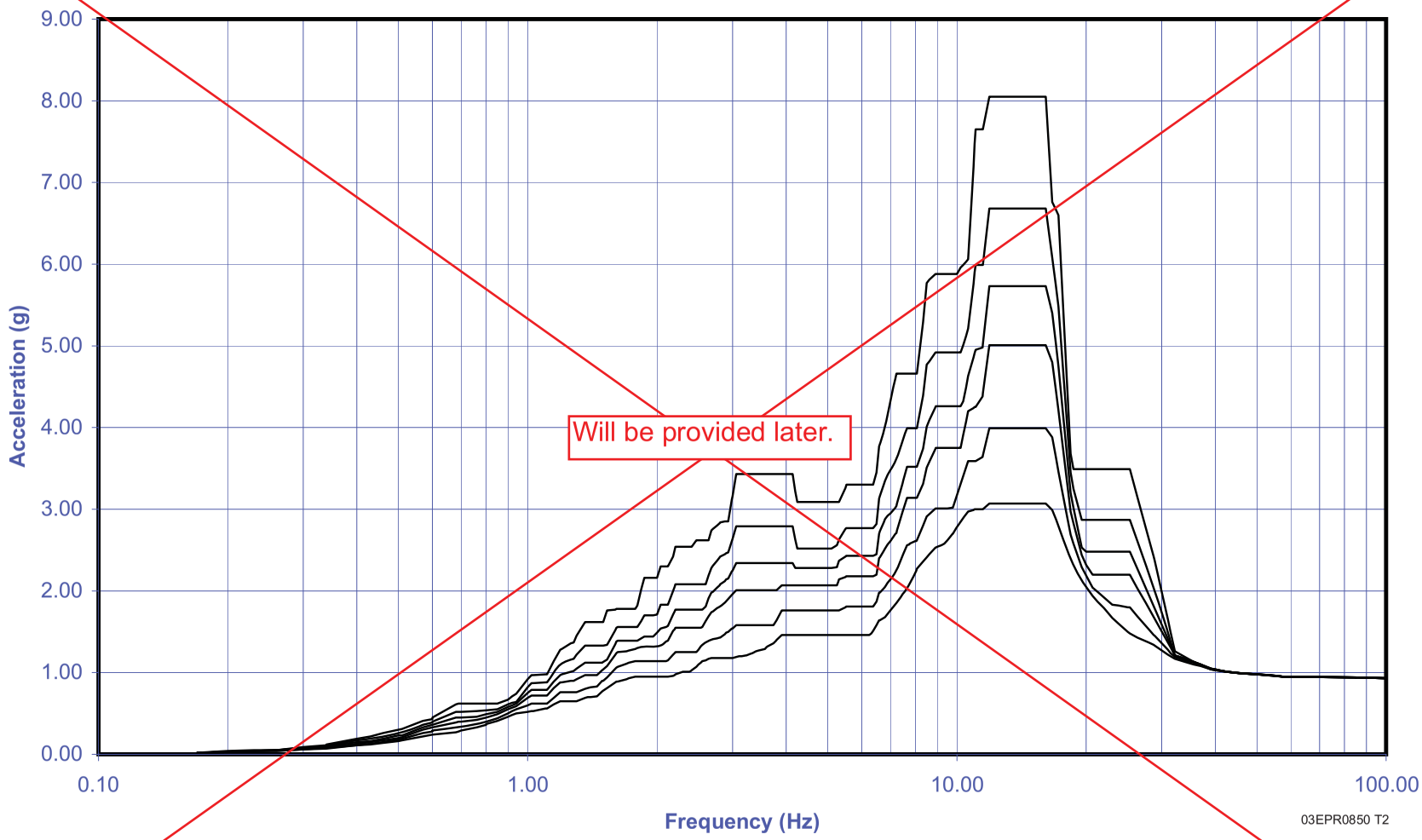


Figure 3.7.2-78—Spectrum Envelope of Reactor Building Internal Structure - Elev. +63 ft, 11-3/4 in (+19.50m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction



Will be provided later.

Figure 3.7.2-79—Spectrum Envelope of Reactor Building Internal Structure - Elev. +63 ft, 11-3/4 in (+19.50m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction



Will be provided later.

Figure 3.7.2-80—Spectrum Envelope of Safeguard Building 1 - Elev. +26 ft, 3 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

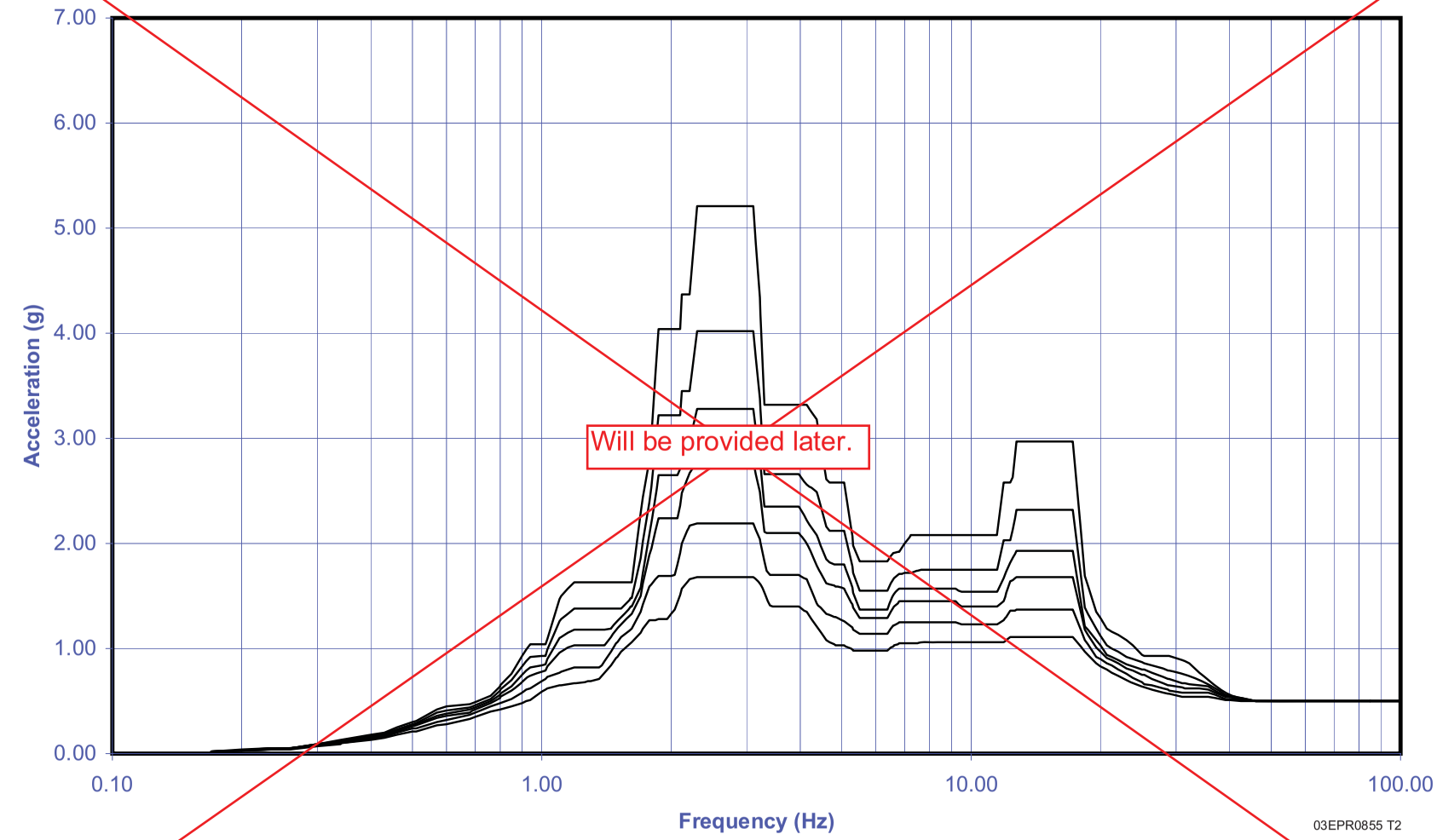


Figure 3.7.2-81—Spectrum Envelope of Safeguard Building 1 - Elev. +26 ft, 3 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

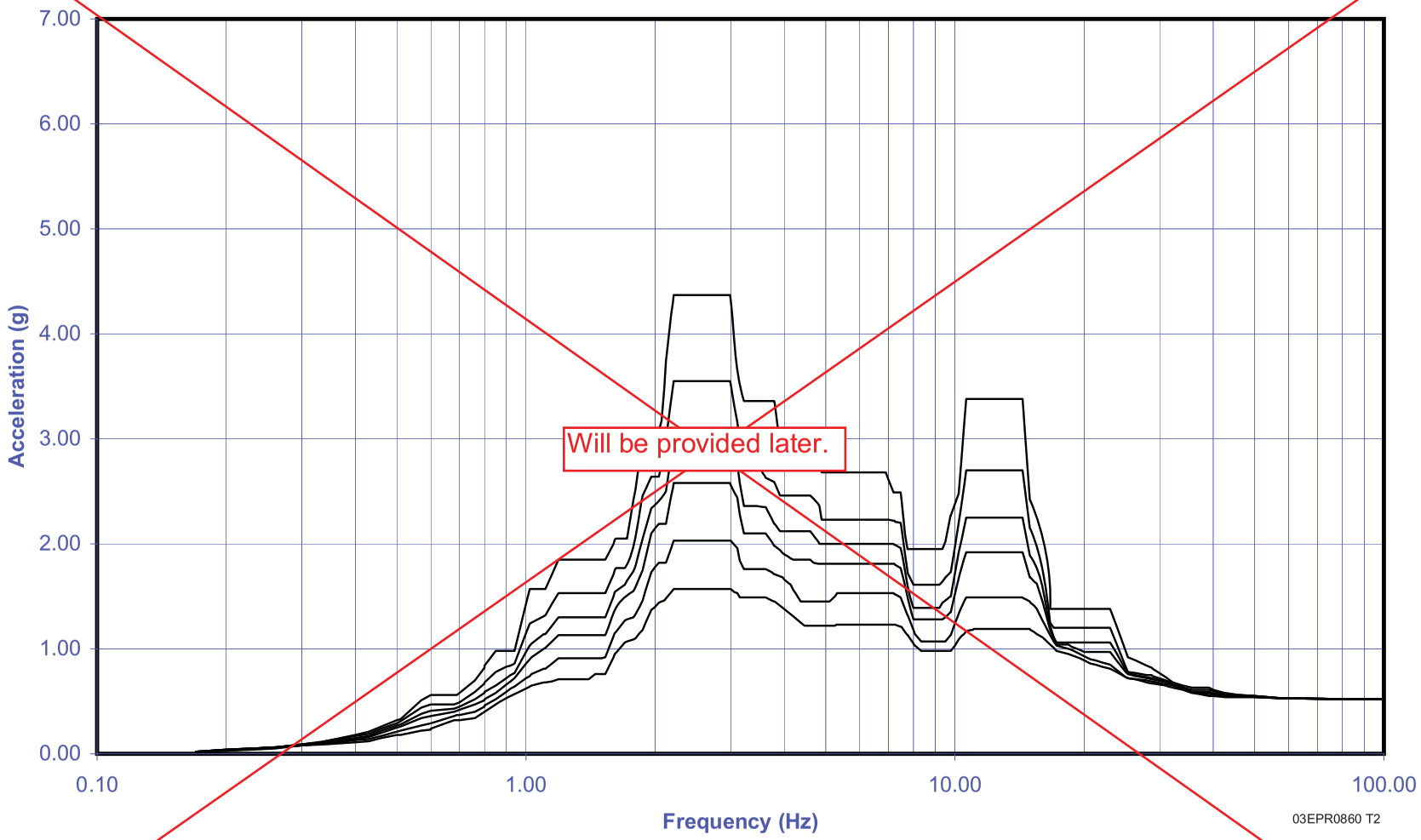


Figure 3.7.2-82—Spectrum Envelope of Safeguard Building 1 - Elev. +26 ft, 3 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

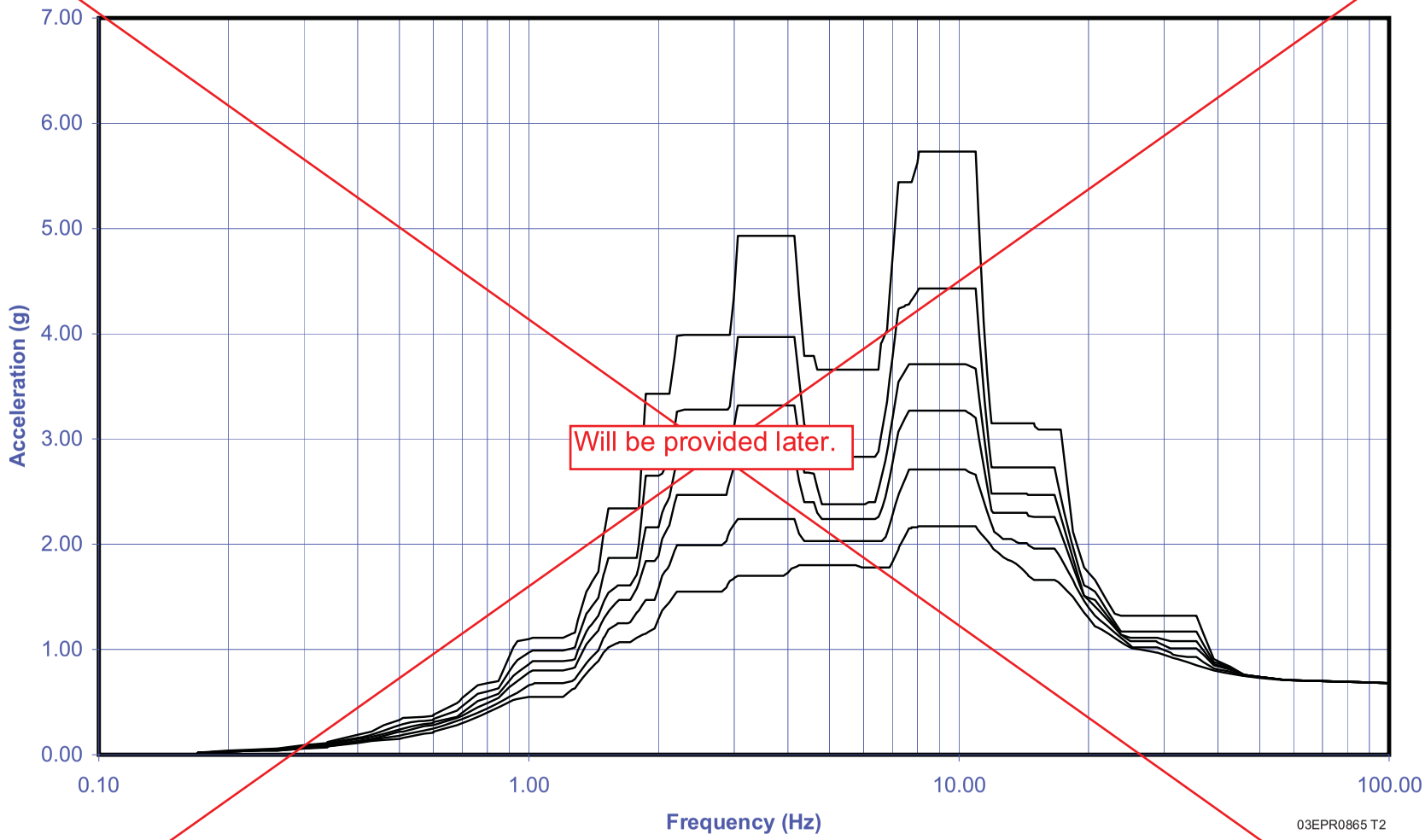
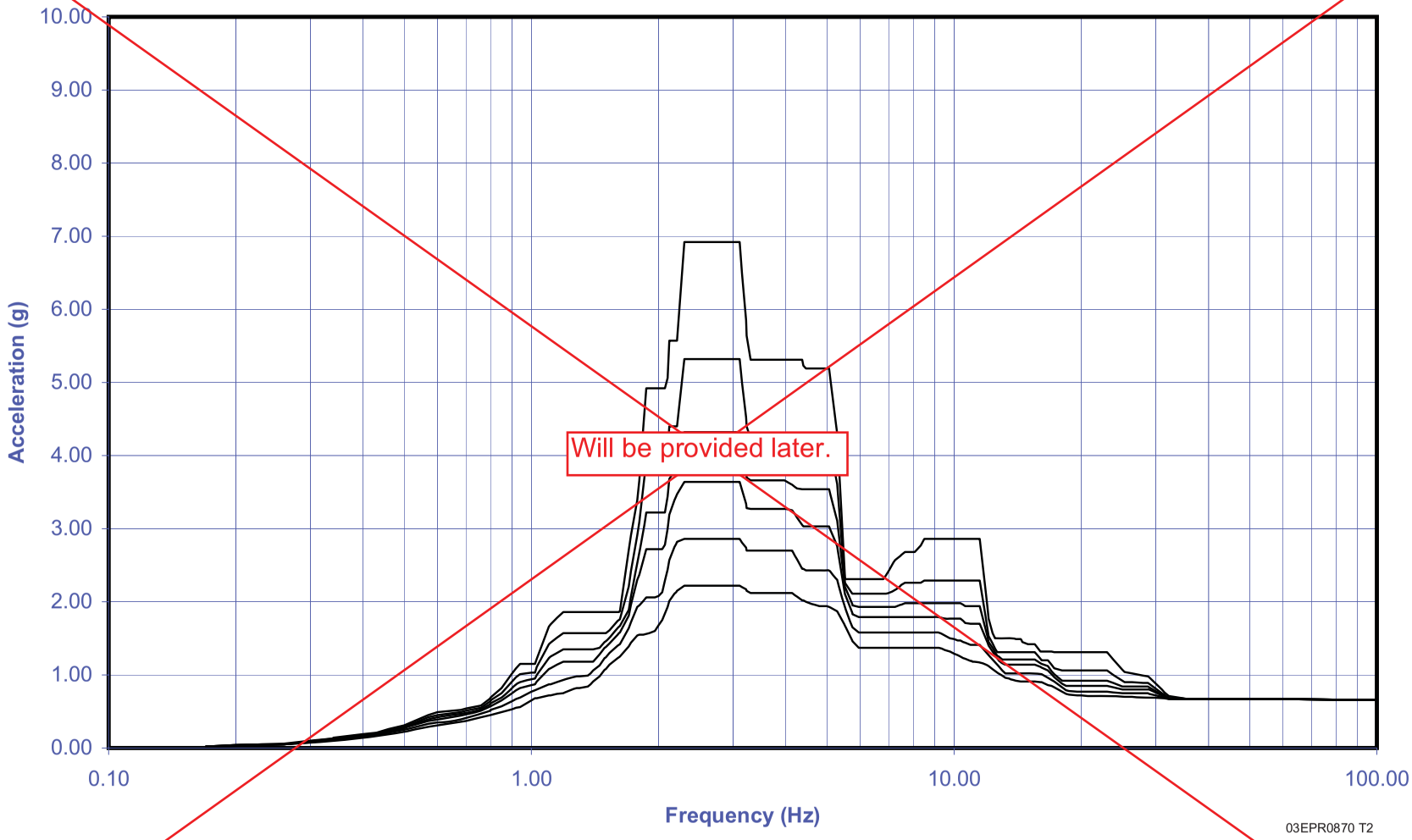


Figure 3.7.2-83—Spectrum Envelope of Safeguard Building 1 - Elev. +68 ft, 10-3/4 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction



Will be provided later.

Figure 3.7.2-84—Spectrum Envelope of Safeguard Building 1 - Elev. +68 ft, 10-3/4 in (+21.00m) 2%, 3%, 4%, 5%, 7,% and 10% Damping, Y-Direction

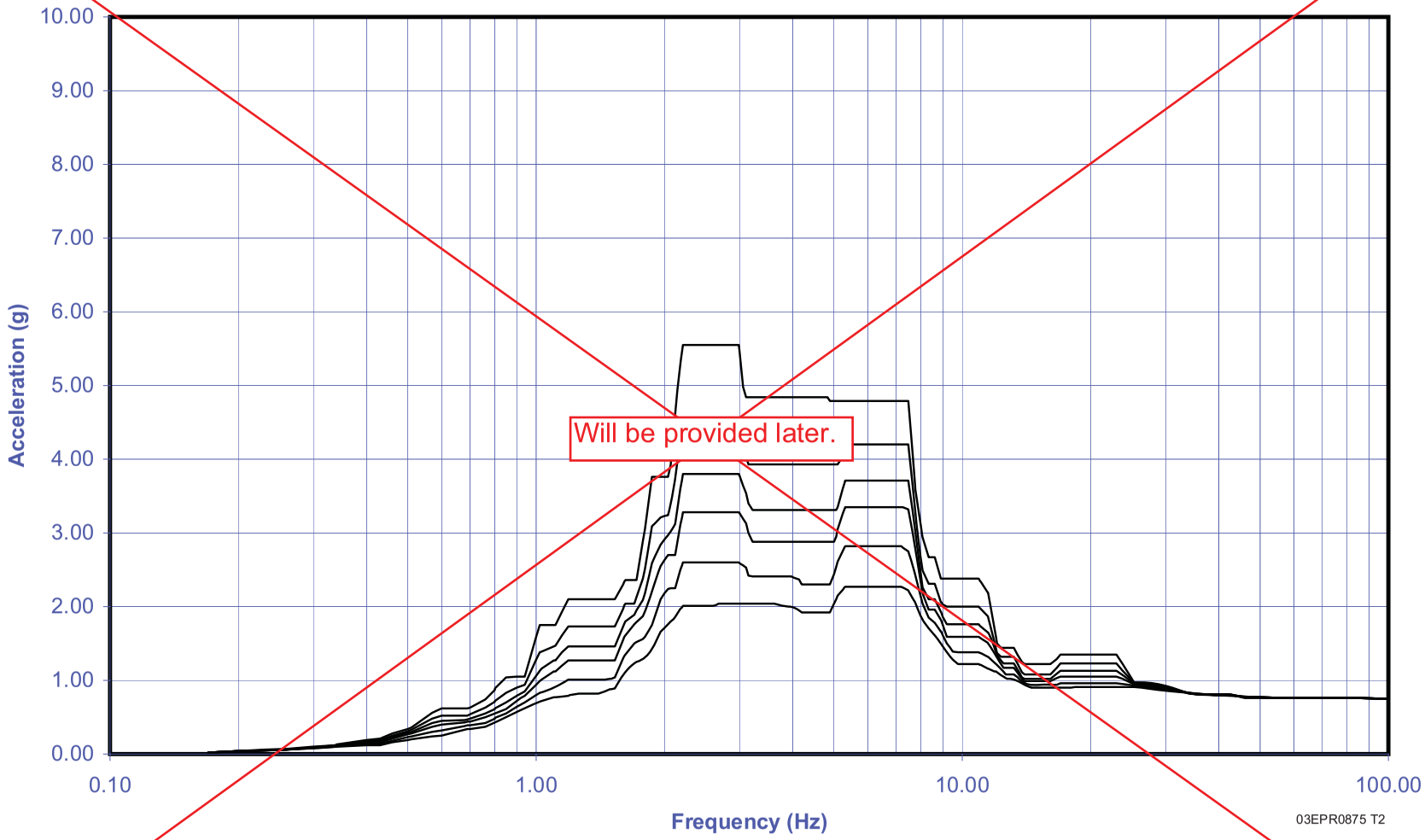


Figure 3.7.2-85—Spectrum Envelope of Safeguard Building 1 - Elev. +68 ft, 10-3/4 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

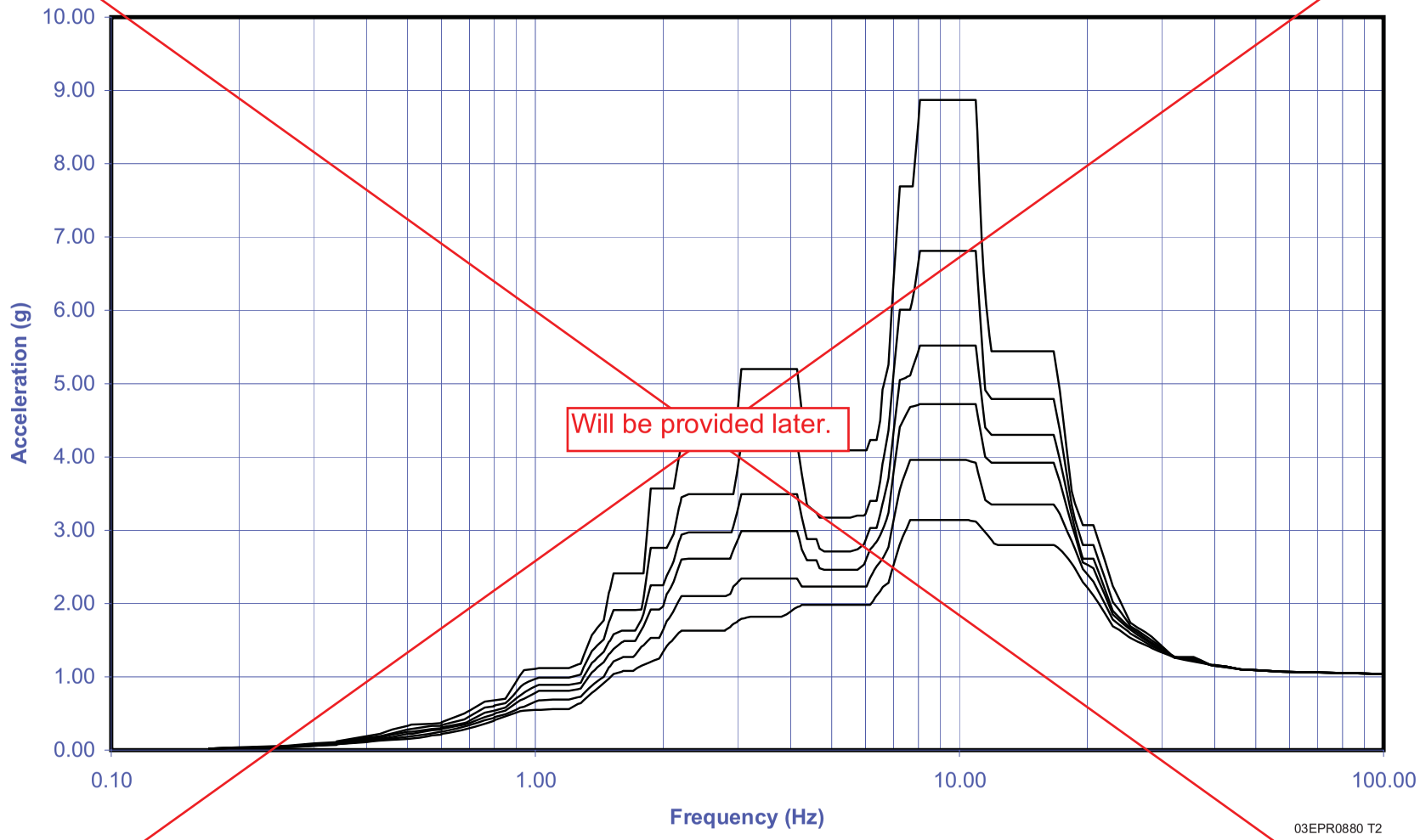


Figure 3.7.2-86—Spectrum Envelope of Safeguard Building 2&3 - Elev. +26 ft, 7 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

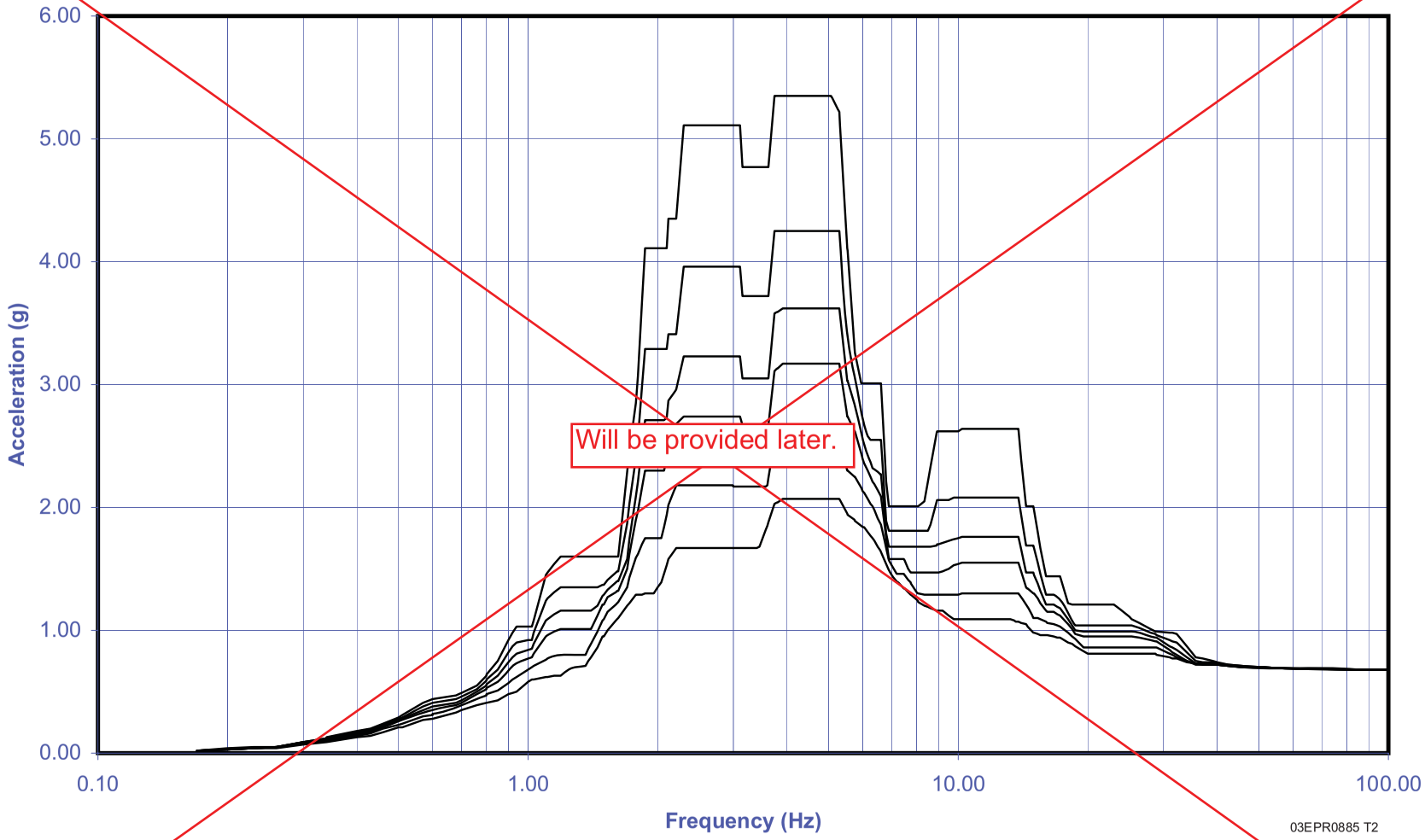


Figure 3.7.2-87—Spectrum Envelope of Safeguard Building 2&3 - Elev. +26 ft, 7 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

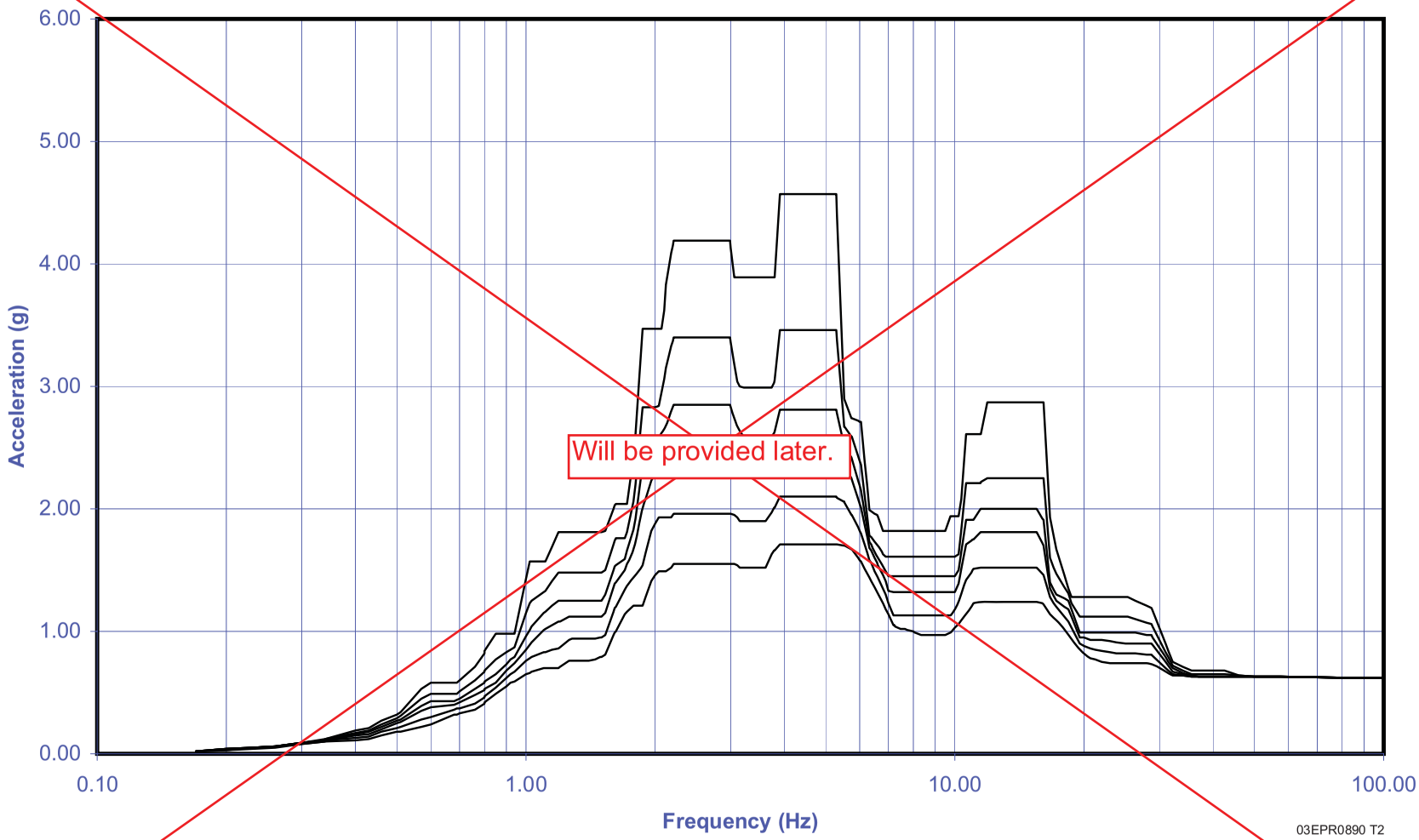


Figure 3.7.2-88—Spectrum Envelope of Safeguard Building 2&3 - Elev. +26 ft, 7 in (+8.10m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

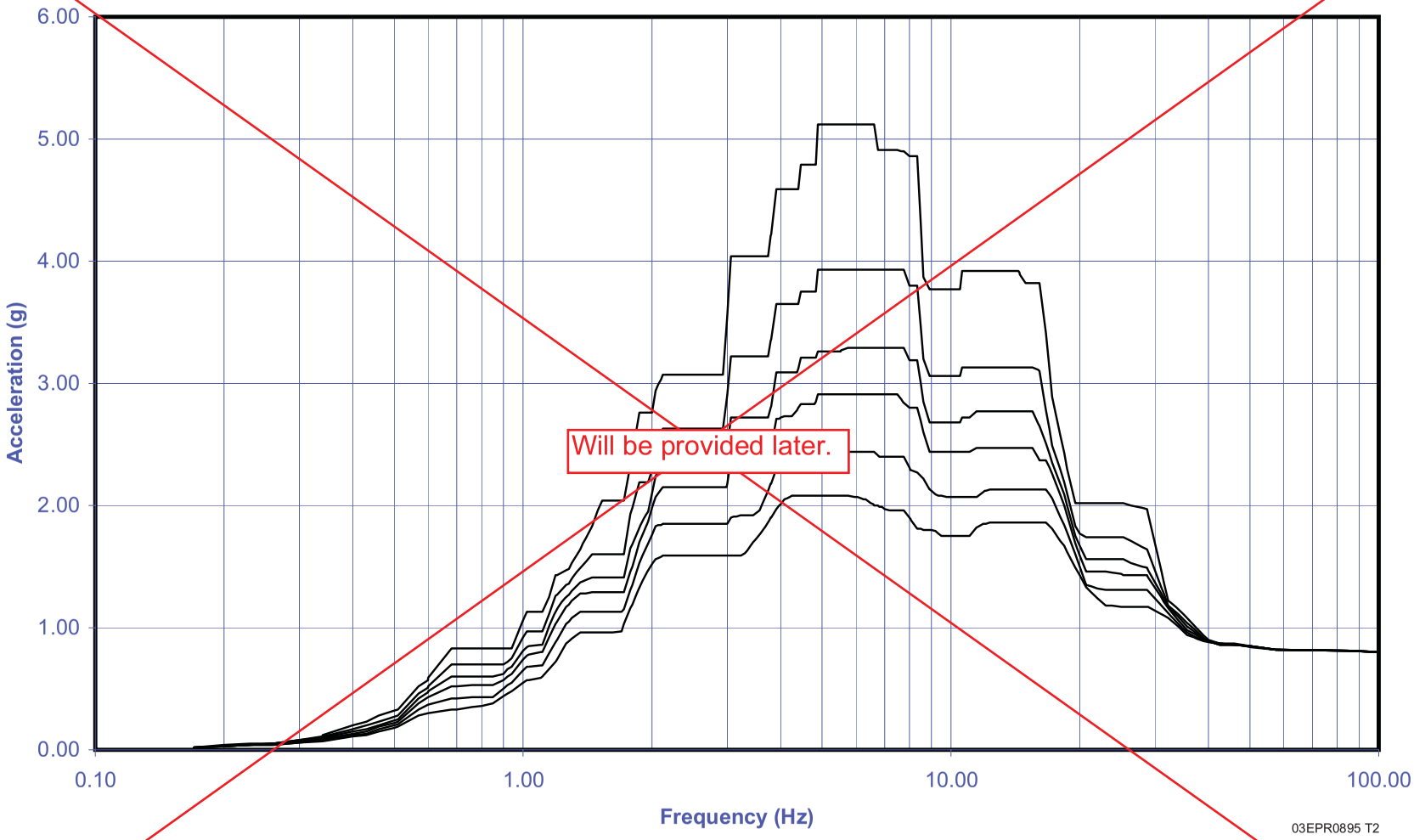


Figure 3.7.2-89—Spectrum Envelope of Safeguard Building 2&3 - Elev. +50 ft, 6-1/4 in (+15.40m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

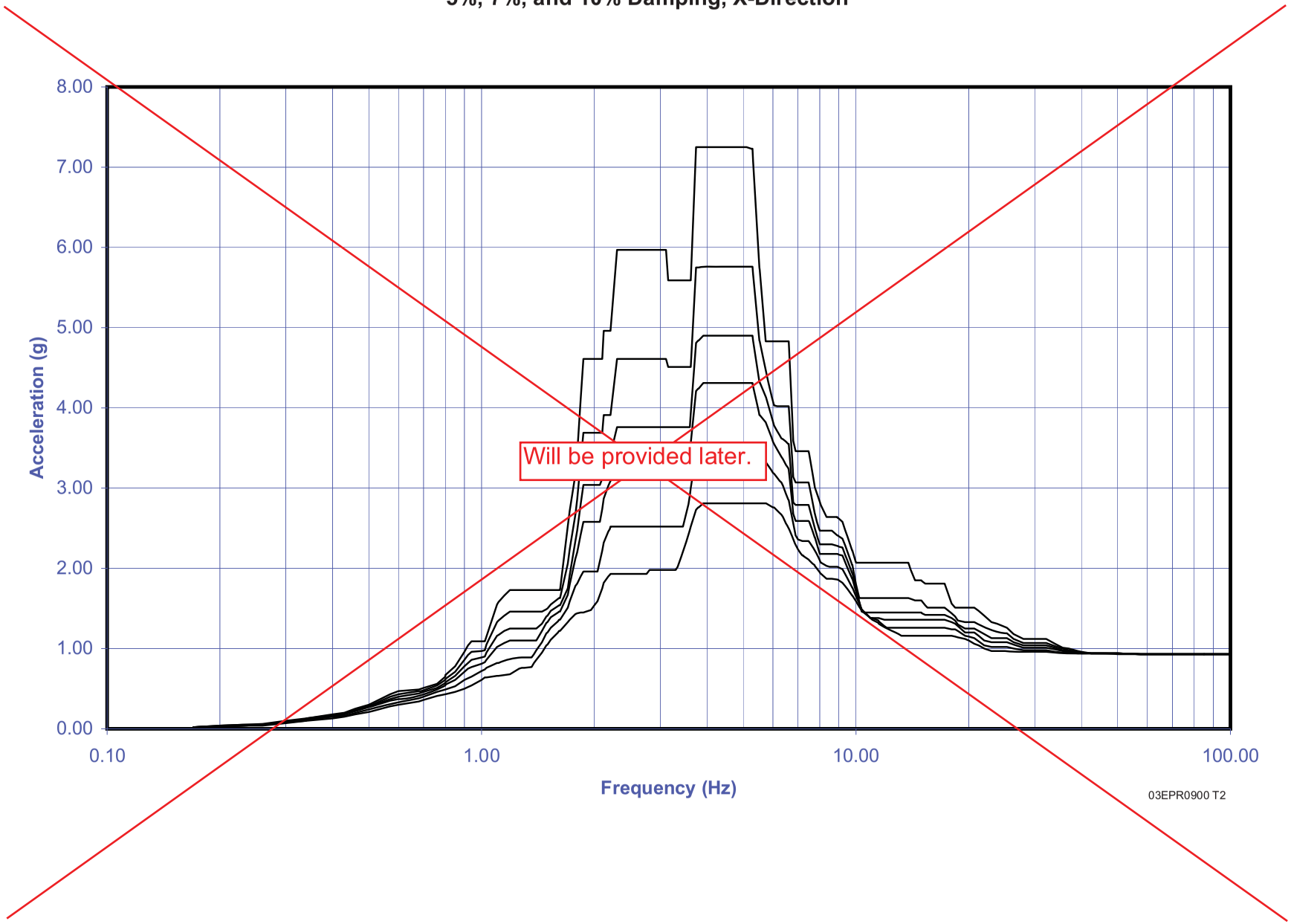


Figure 3.7.2-90—Spectrum Envelope of Safeguard Building 2&3 - Elev. +50 ft, 6-1/4 in (+15.40m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

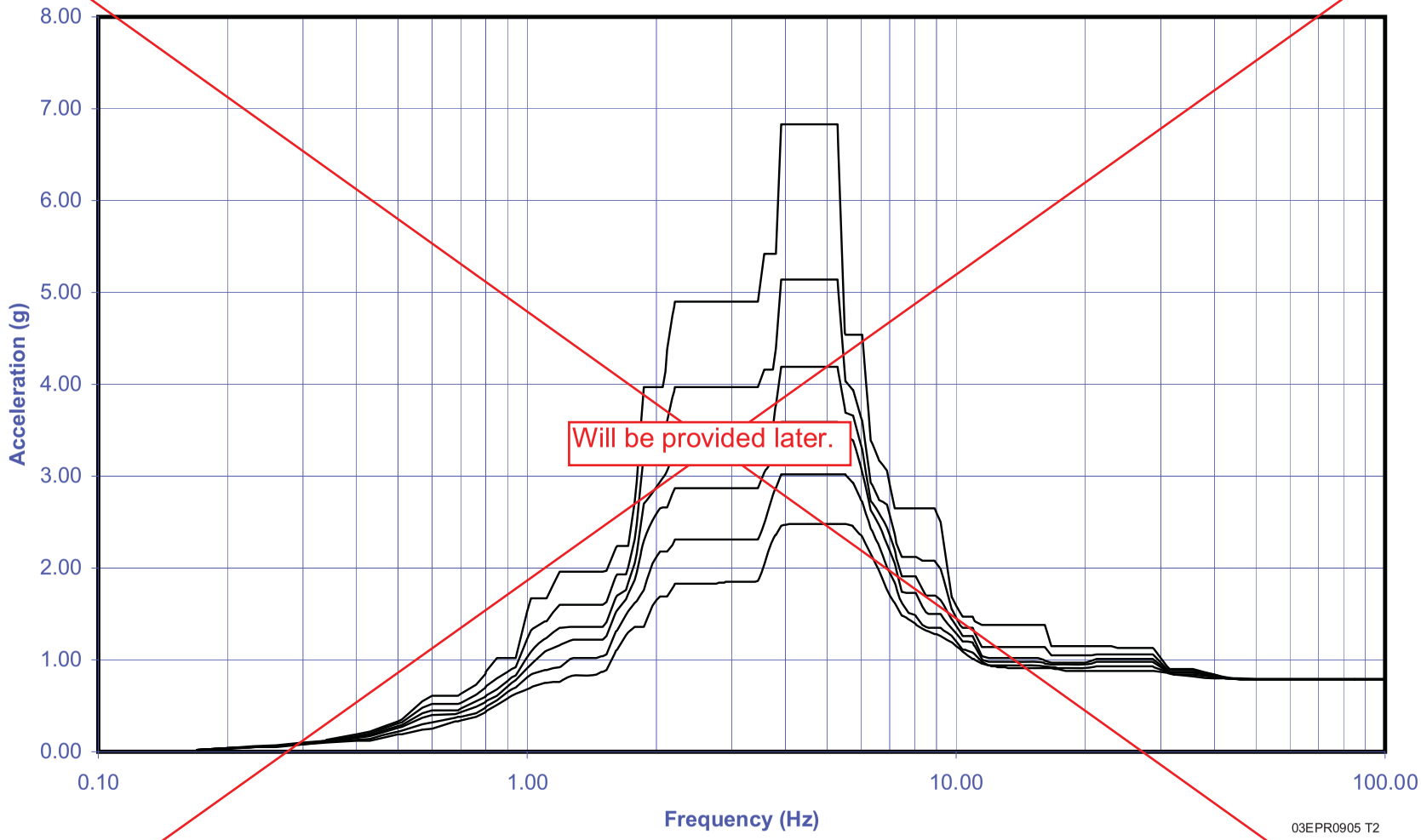


Figure 3.7.2-91—Spectrum Envelope of Safeguard Building 2&3 - Elev. +50 ft, 6-1/4 in (+15.40m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

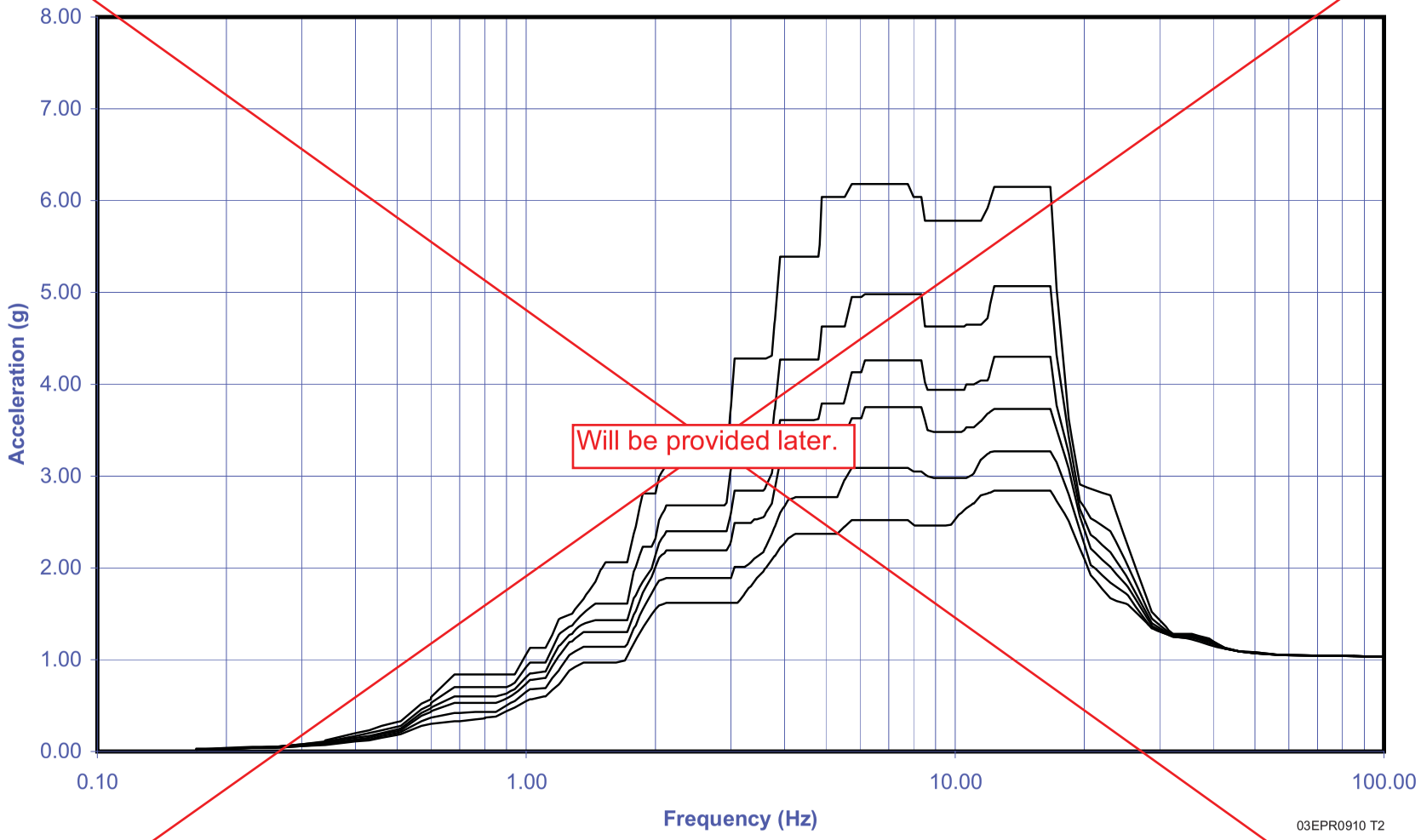


Figure 3.7.2-92—Spectrum Envelope of Safeguard Building 4 - Elev. +68 ft, 10-3/4 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

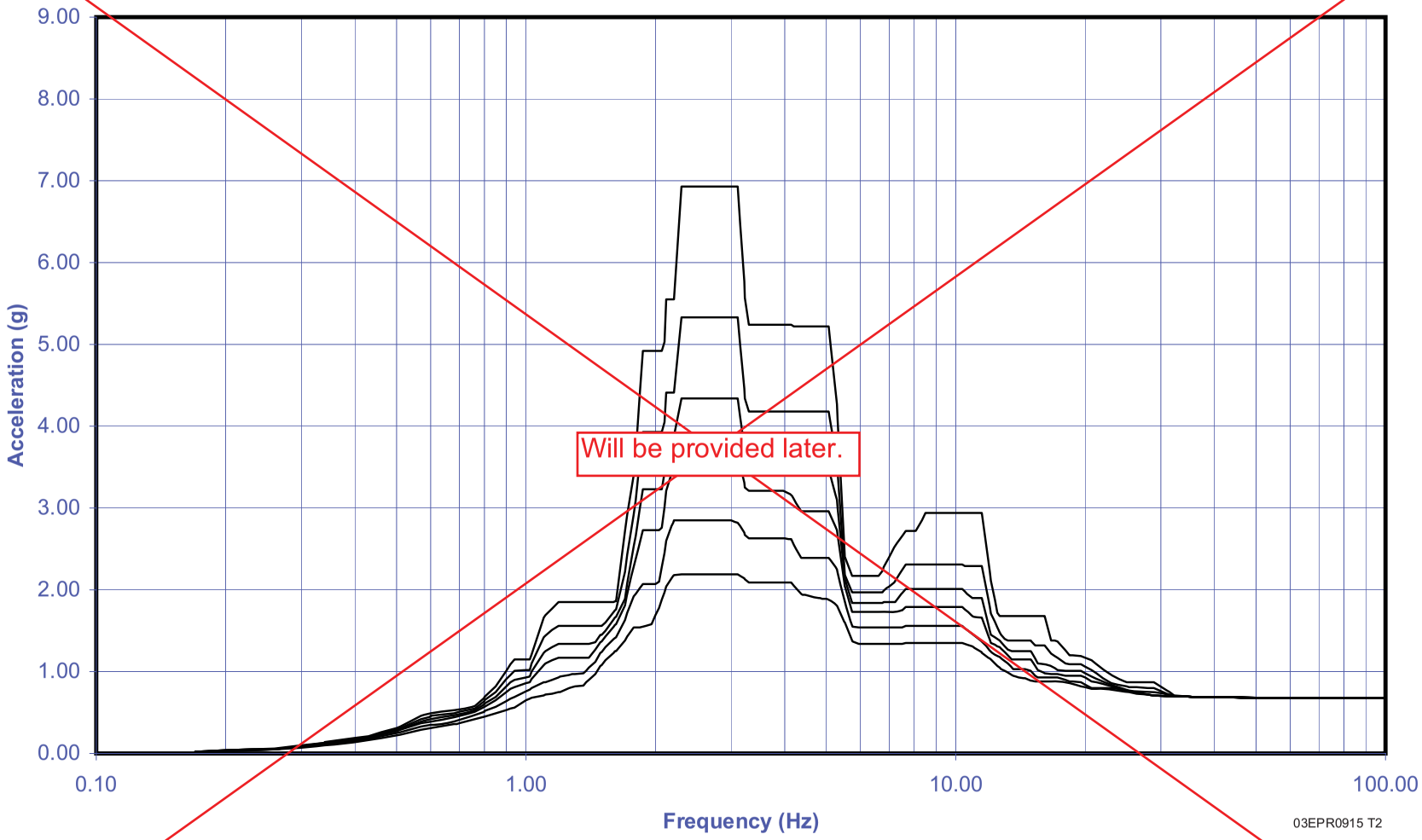


Figure 3.7.2-93—Spectrum Envelope of Safeguard Building 4 - Elev. +68 ft, 10-3/4 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

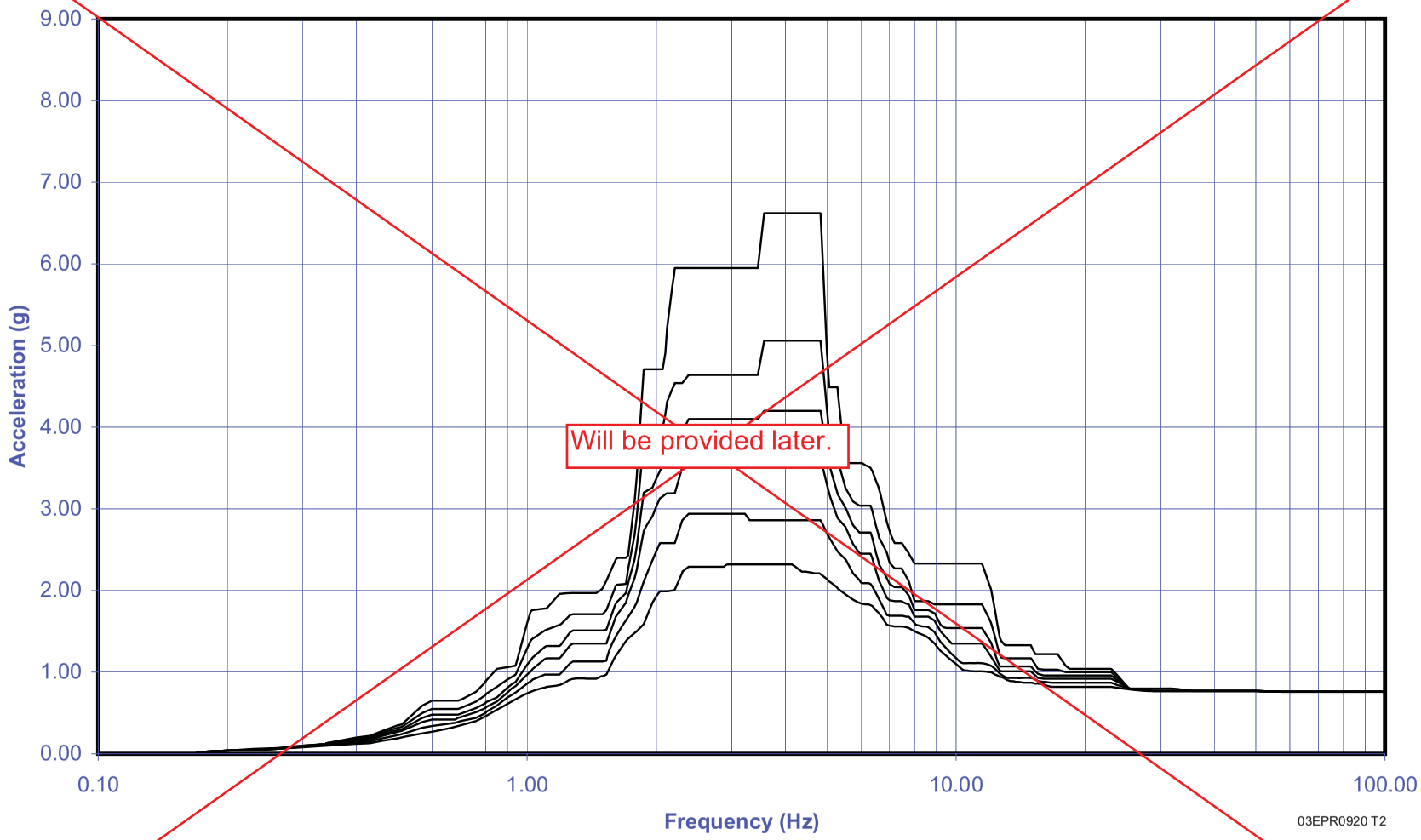


Figure 3.7.2-94—Spectrum Envelope of Safeguard Building 4 - Elev. +68 ft, 10-3/4 in (+21.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

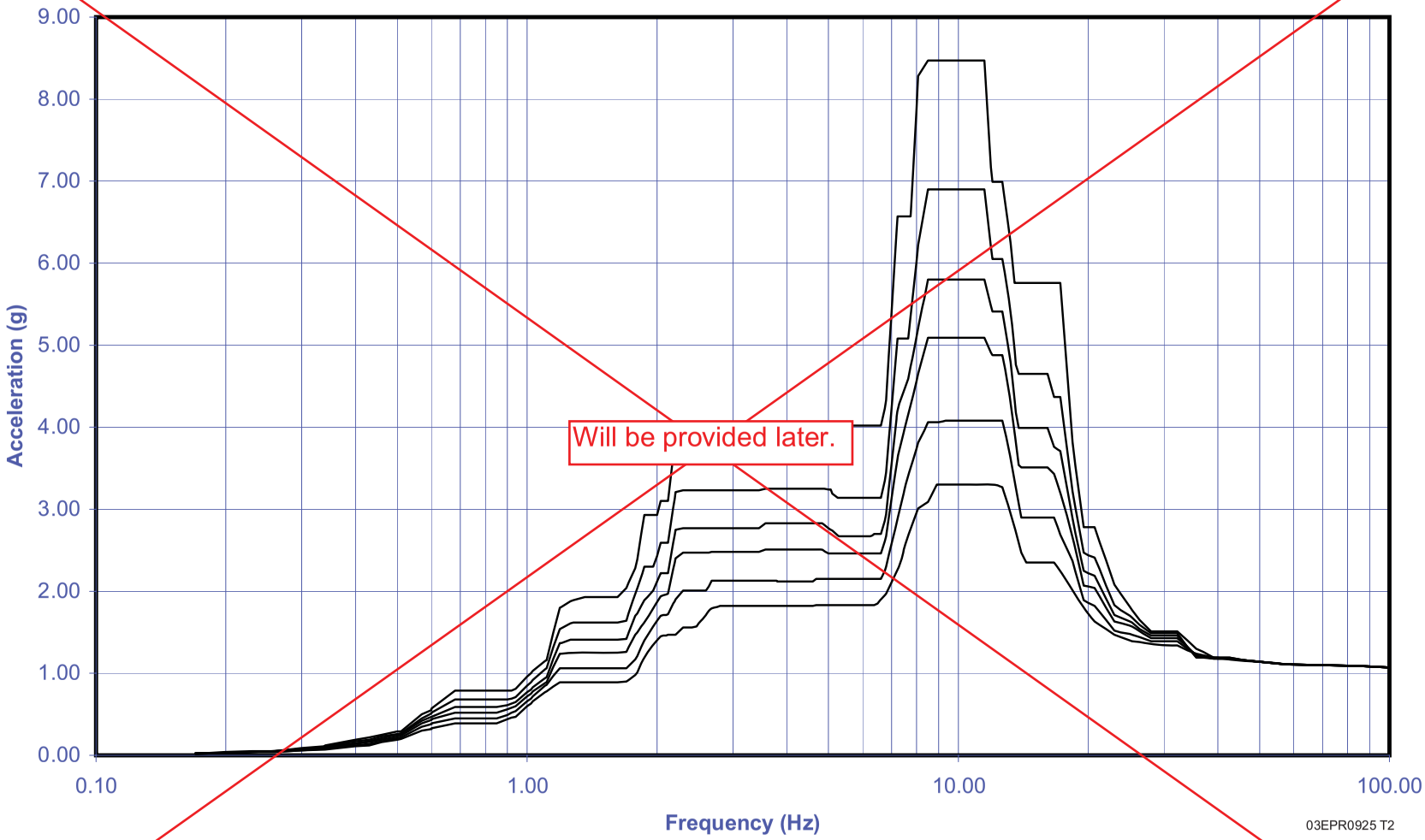


Figure 3.7.2-95—Spectrum Envelope of Containment Building - Elev. +123 ft, 4-1/4 in (+37.60m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

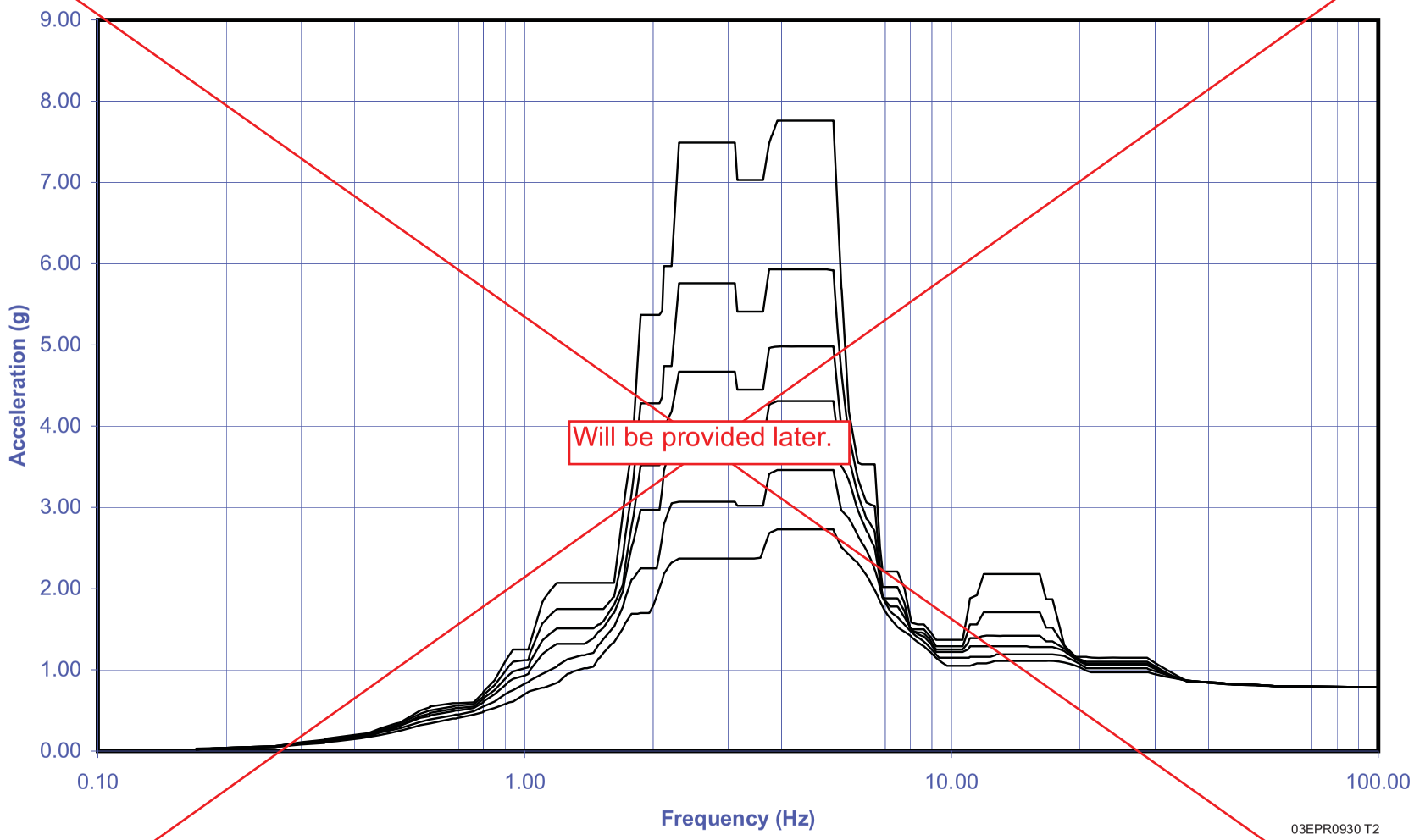


Figure 3.7.2-96—Spectrum Envelope of Containment Building - Elev. +123 ft, 4-1/4 in (+37.60m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

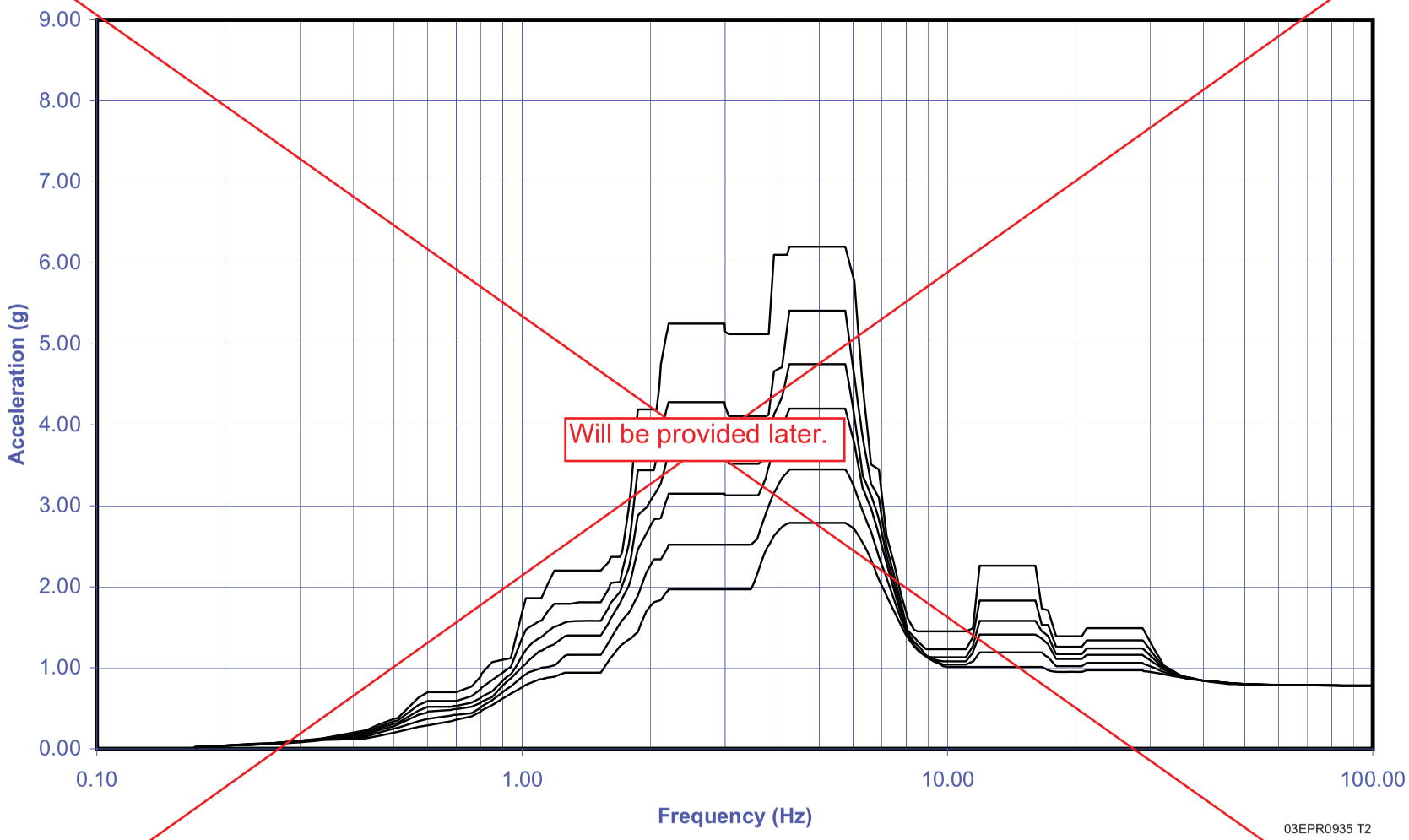


Figure 3.7.2-97—Spectrum Envelope of Containment Building - Elev. +123 ft, 4-1/4 in (+37.60m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

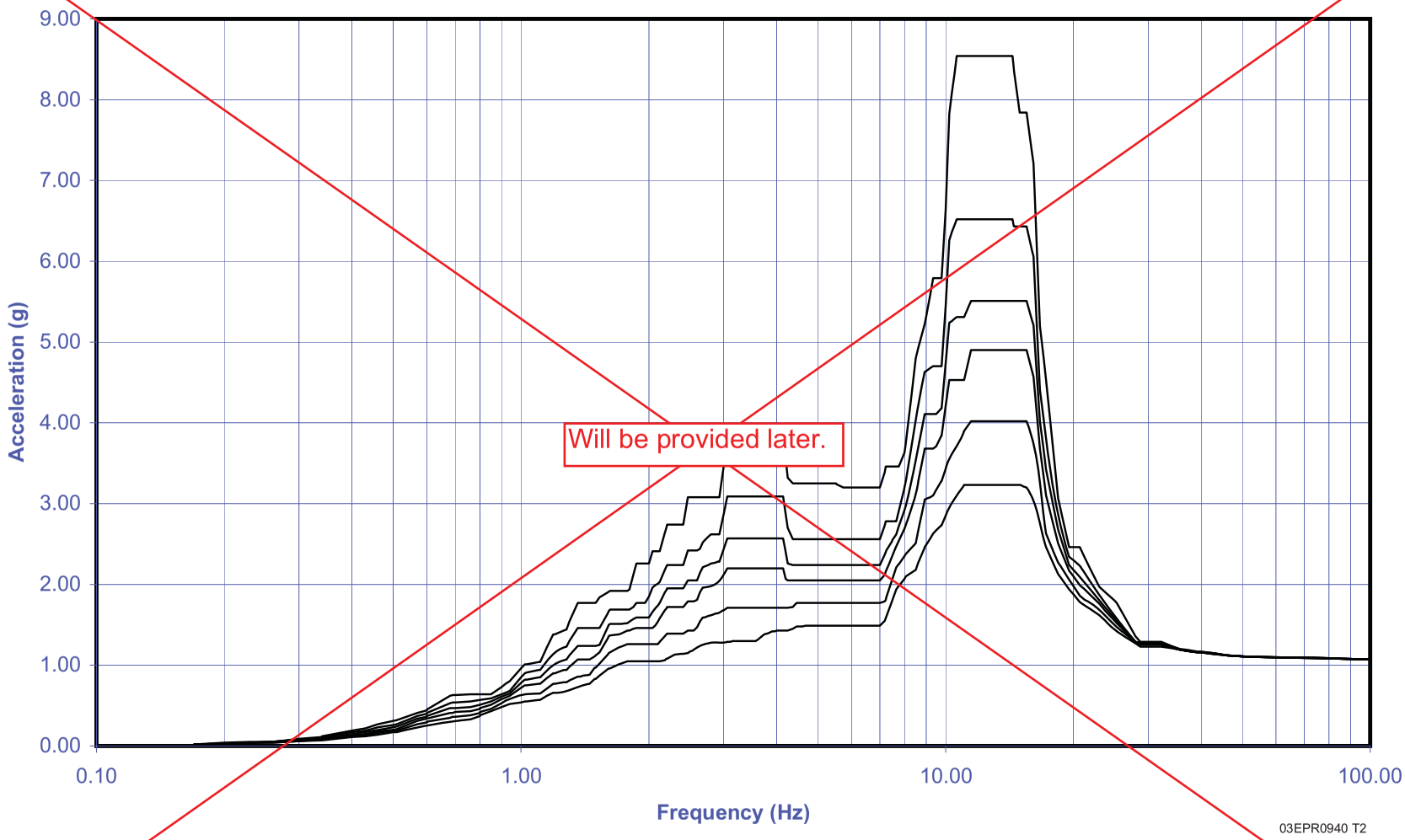


Figure 3.7.2-98—Spectrum Envelope of Containment Building - Elev. +190 ft, 3-1/2 in (+58.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

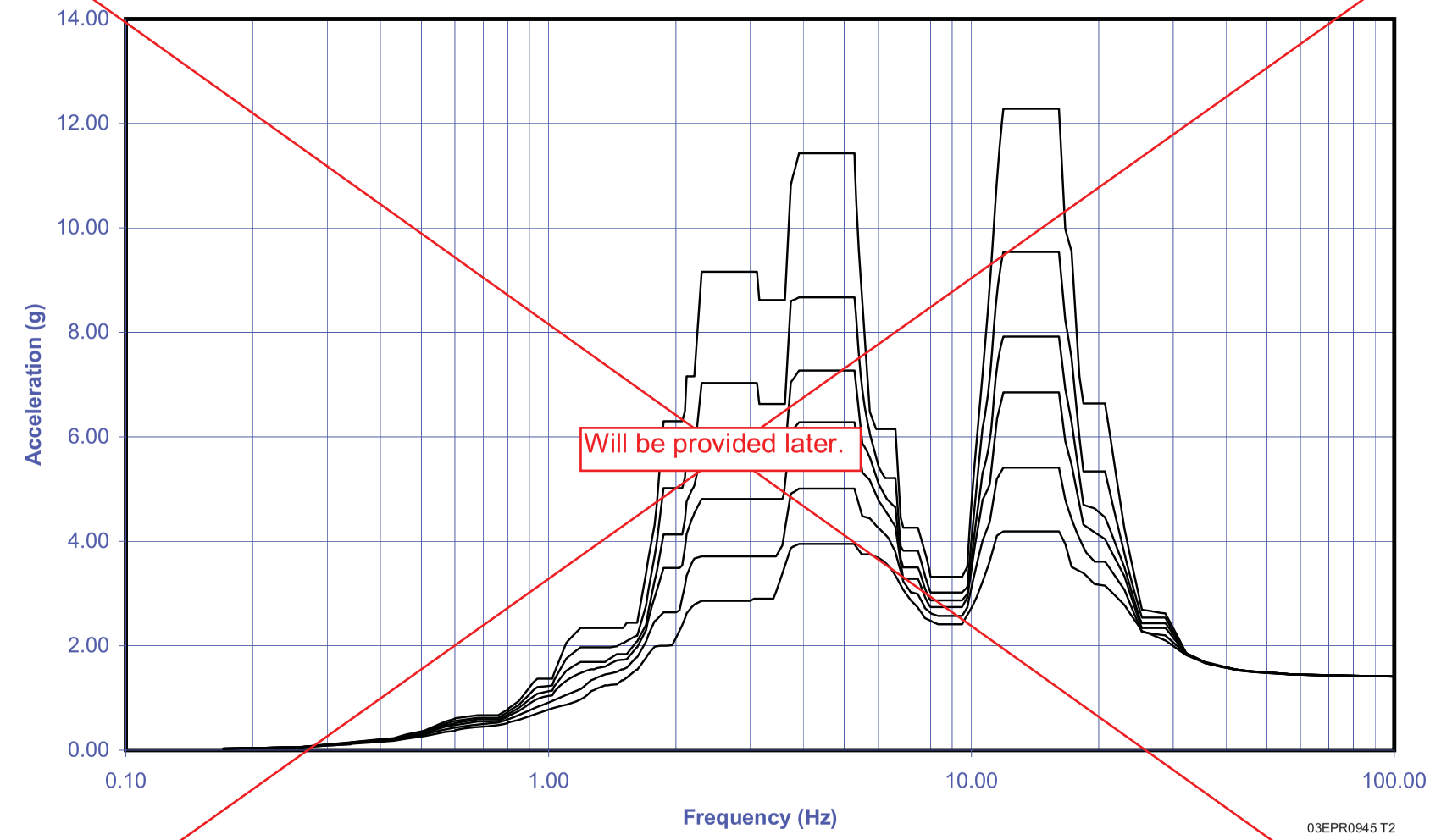
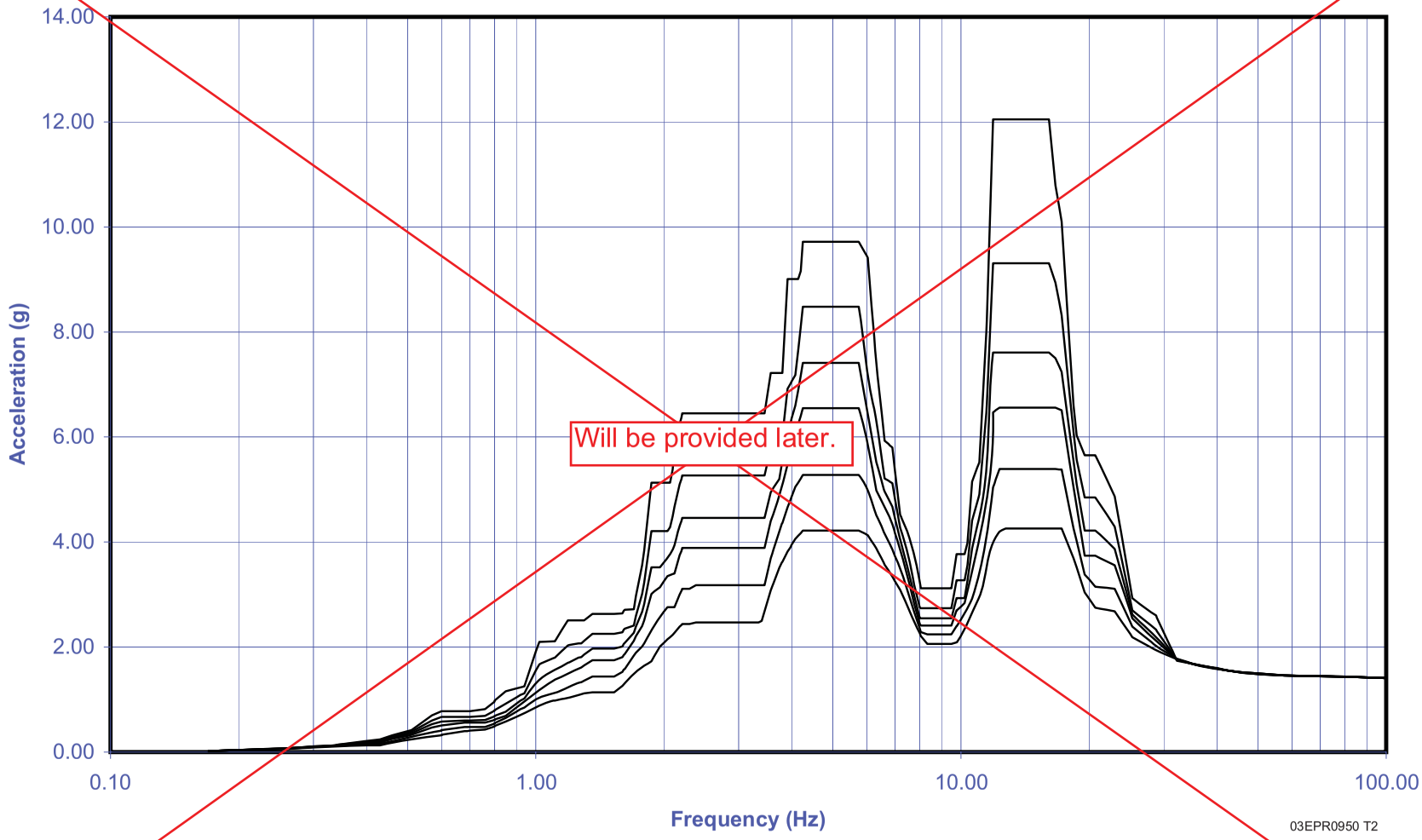


Figure 3.7.2-99—Spectrum Envelope of Containment Building - Elev. +190 ft, 3-1/2 in (+58.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction



Will be provided later.

Figure 3.7.2-100—Spectrum Envelope of Containment Building - Elev. +190 ft, 3-1/2 in (+58.00m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

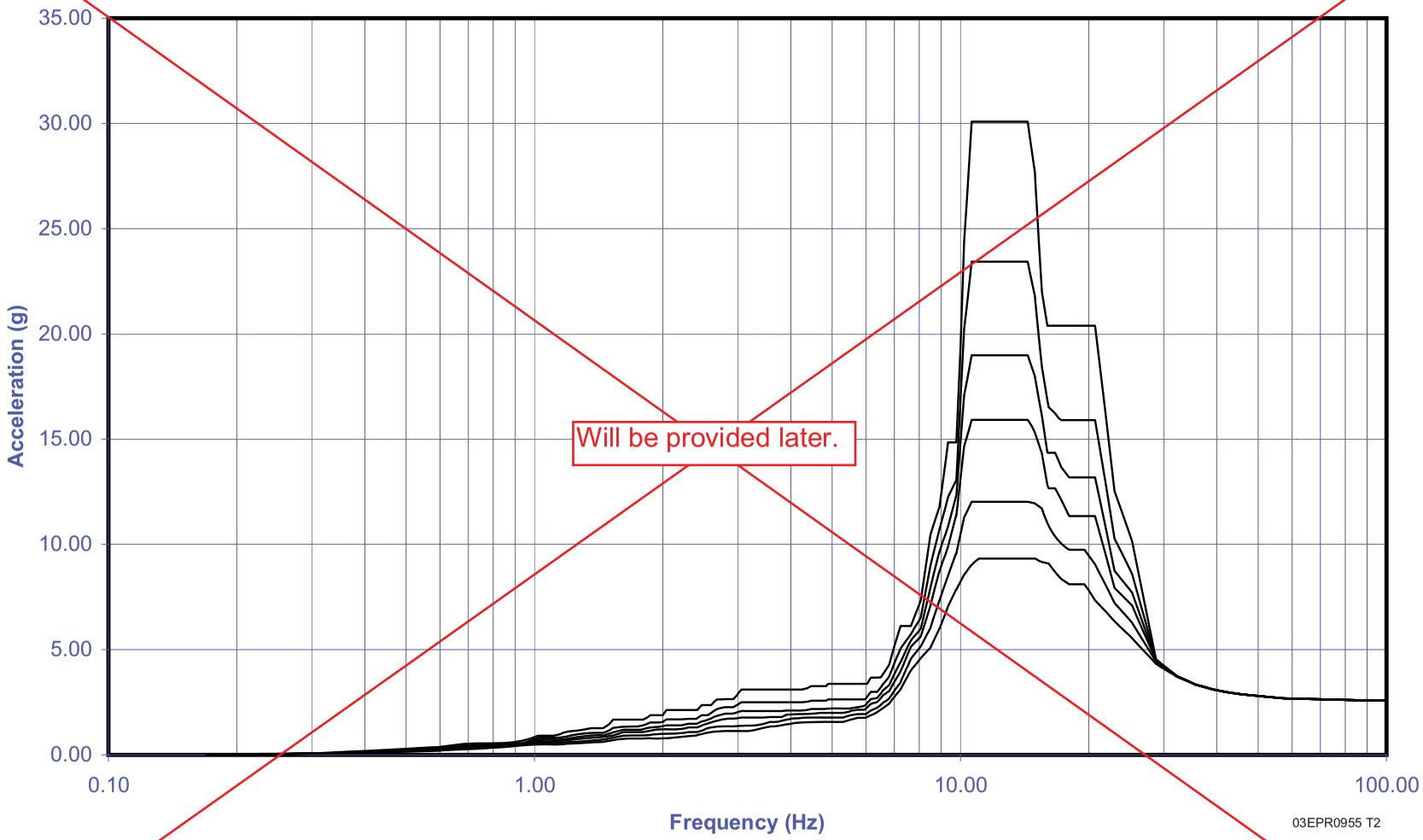


Figure 3.7.2-101—Spectrum Envelope of EPGB at Elev. +0 ft, 0 in at Node 1172 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

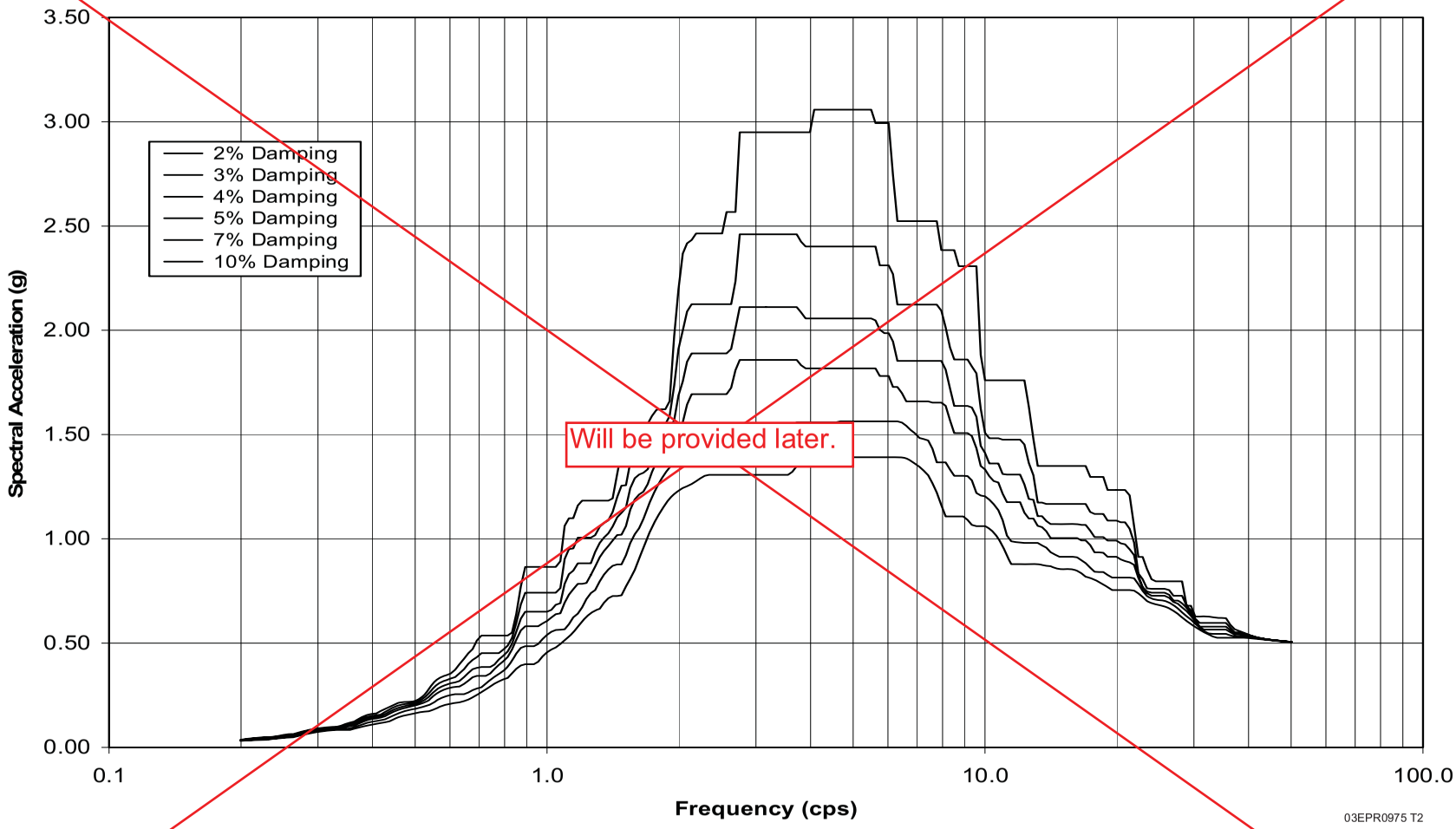


Figure 3.7.2-102—Spectrum Envelope of EPGB at Elev. +0 ft, 0 in at Node 1172 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

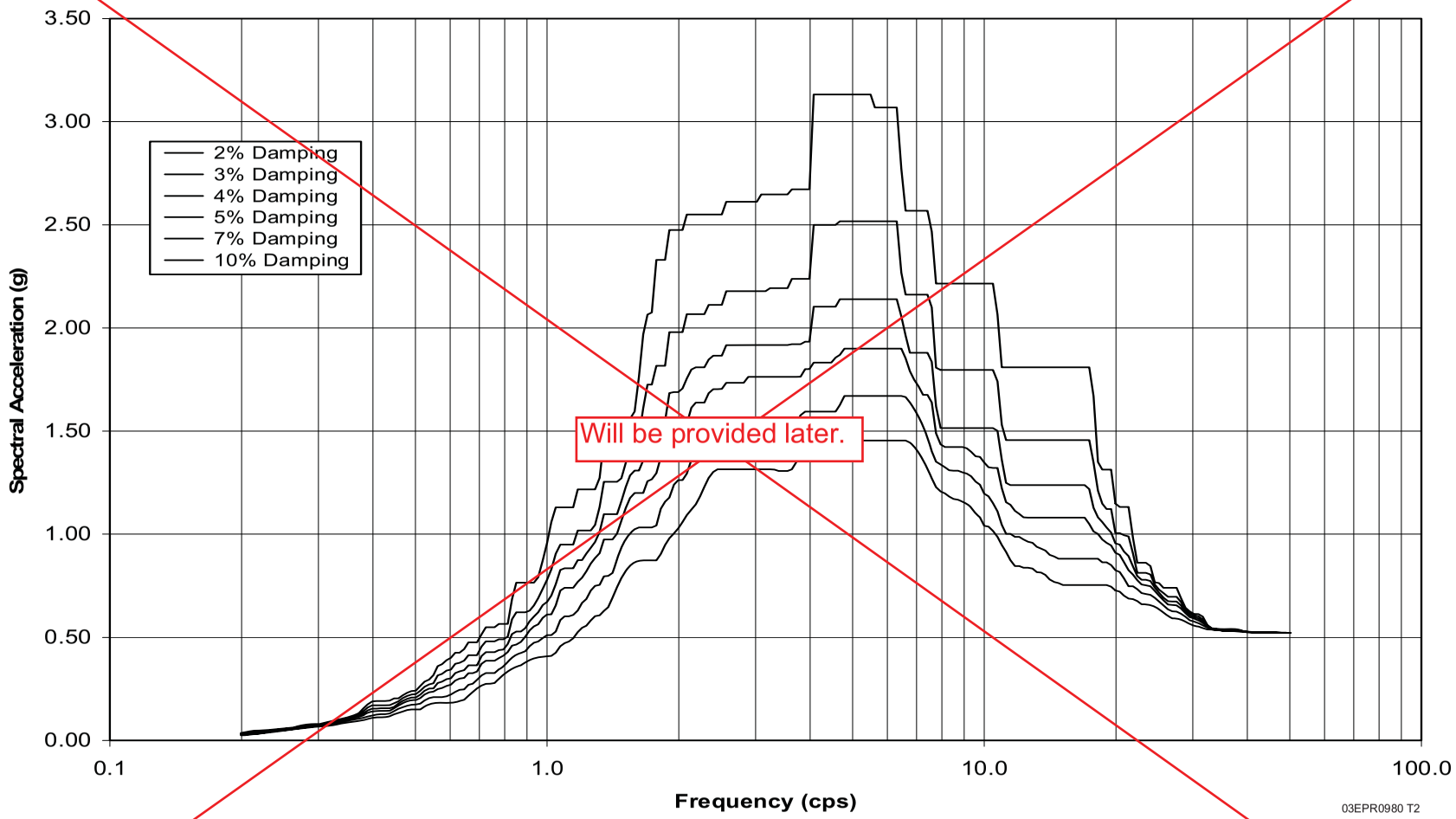


Figure 3.7.2-103—Spectrum Envelope of EPGB at Elev. +0 ft, 0 in at Node 1172 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

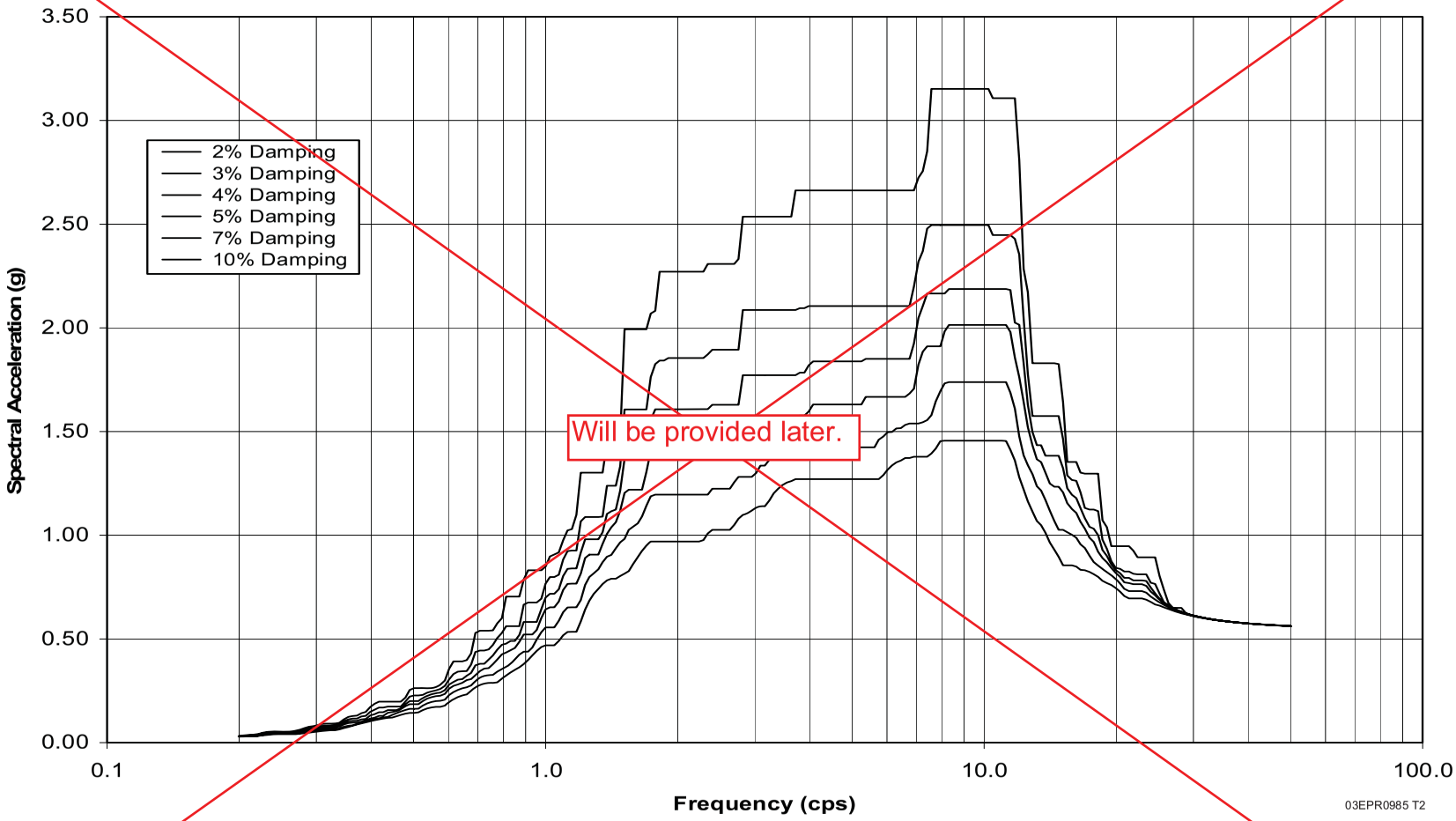
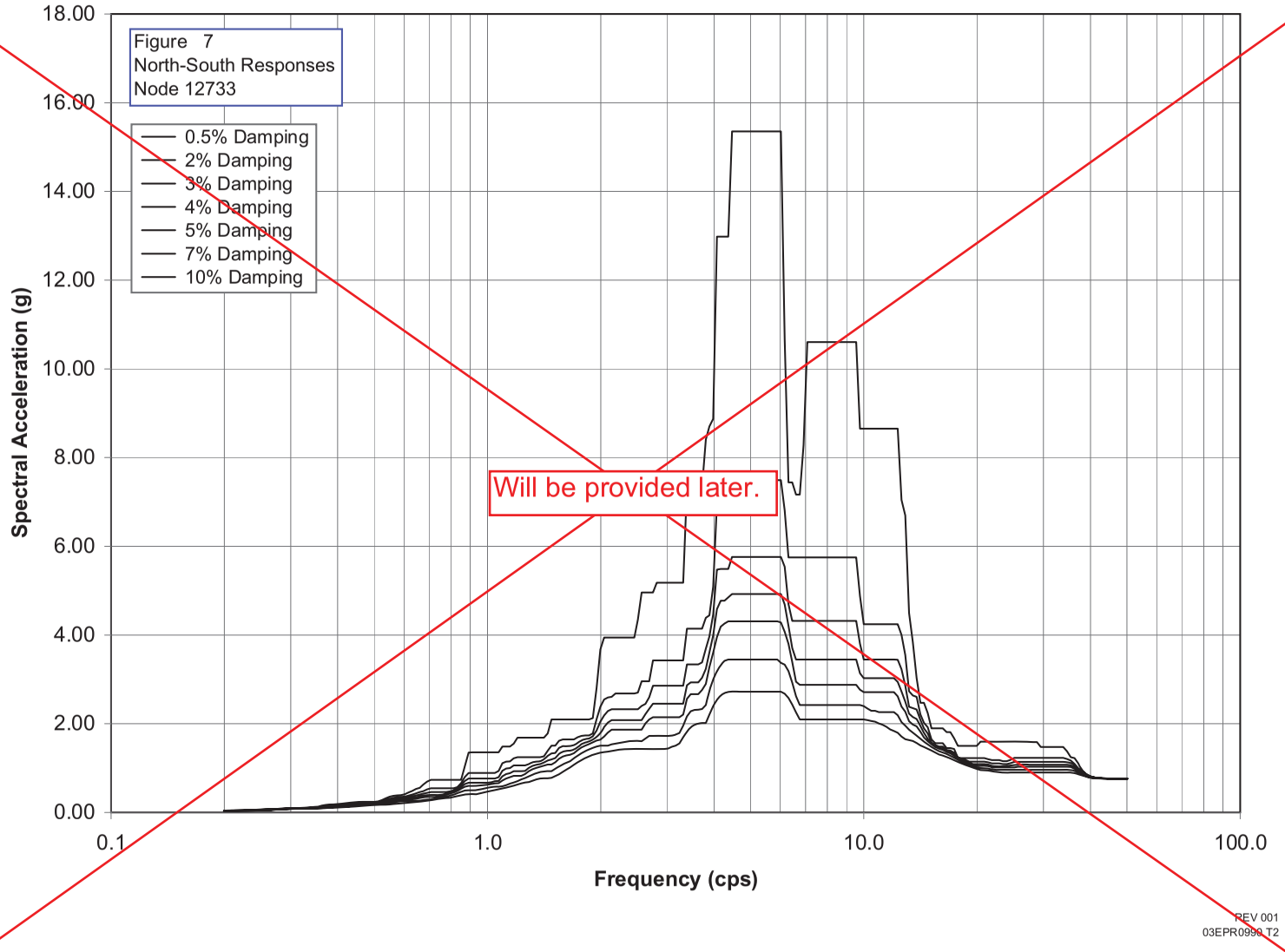


Figure 3.7.2-104—Spectrum Envelope of ESWB at Elev +63 ft, 0 in at Node 12733 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction



Will be provided later.

Figure 3.7.2-105—Spectrum Envelope of ESWB at Elev +63 ft, 0 in at Node 12733 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

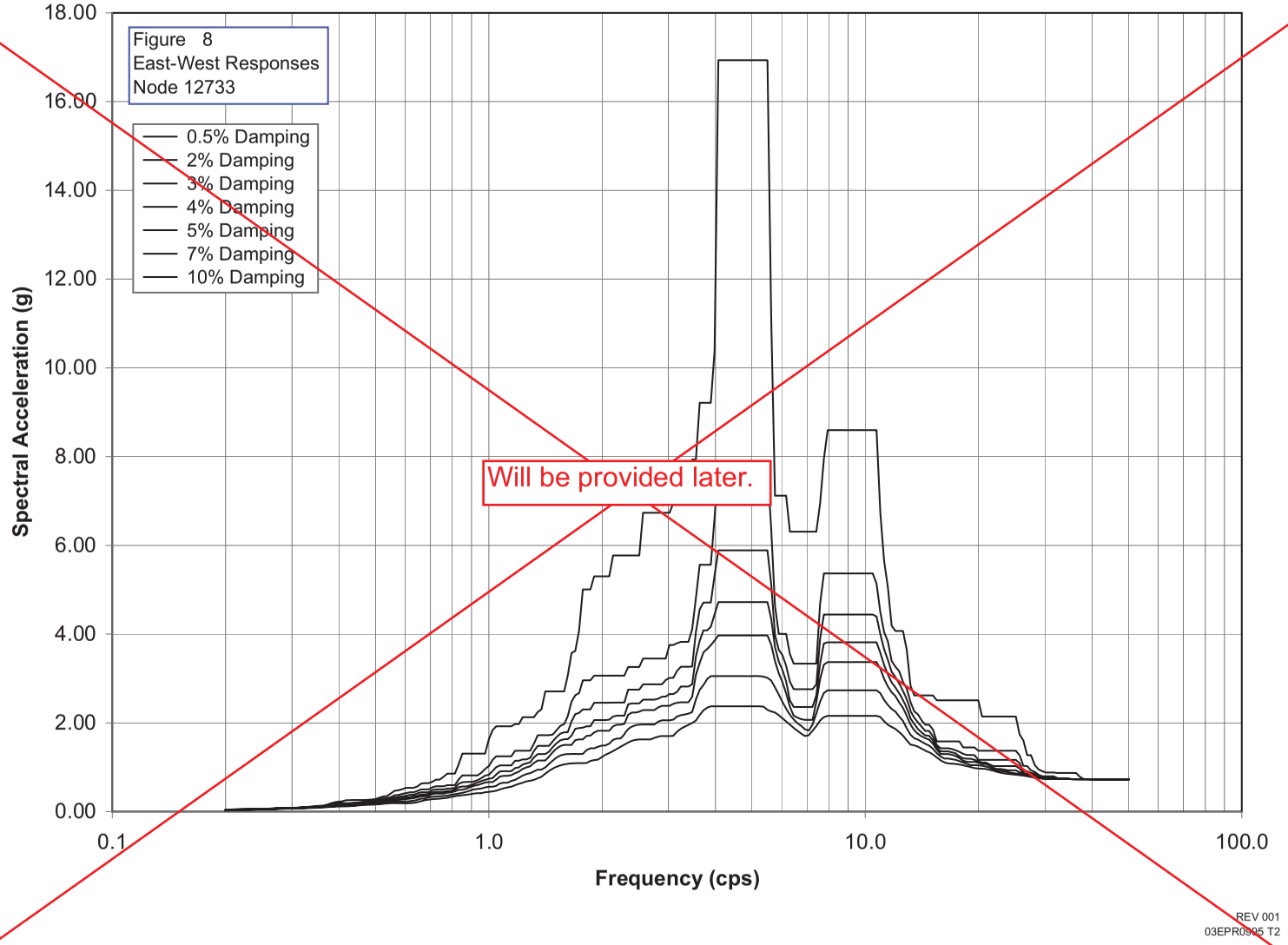


Figure 3.7.2-106—Spectrum Envelope of ESWB at Elev +63 ft, 0 in at Node 12733 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

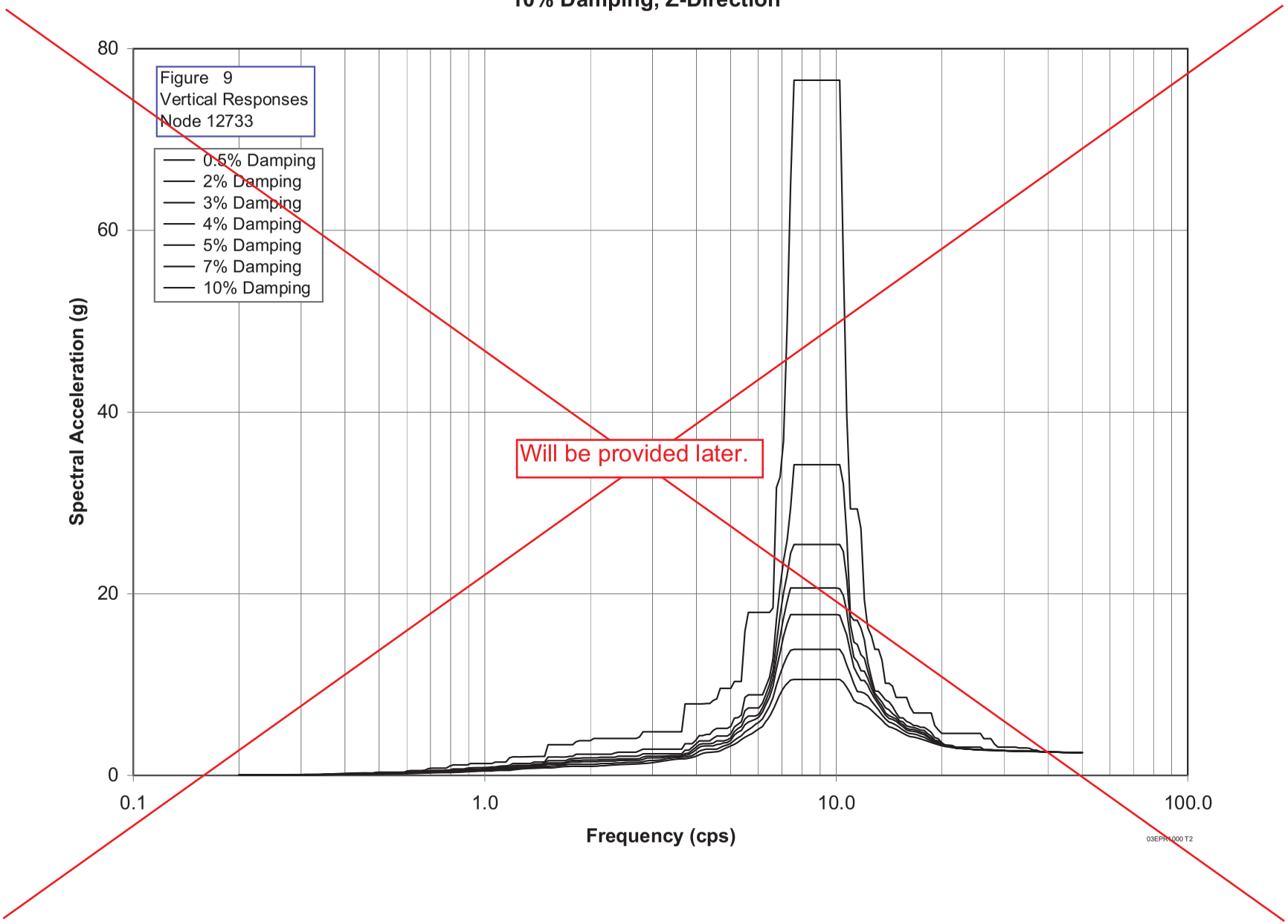


Figure 3.7.2-107—Spectrum Envelope of ESWB at Elev +14 ft, 0 in at Node 10385 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

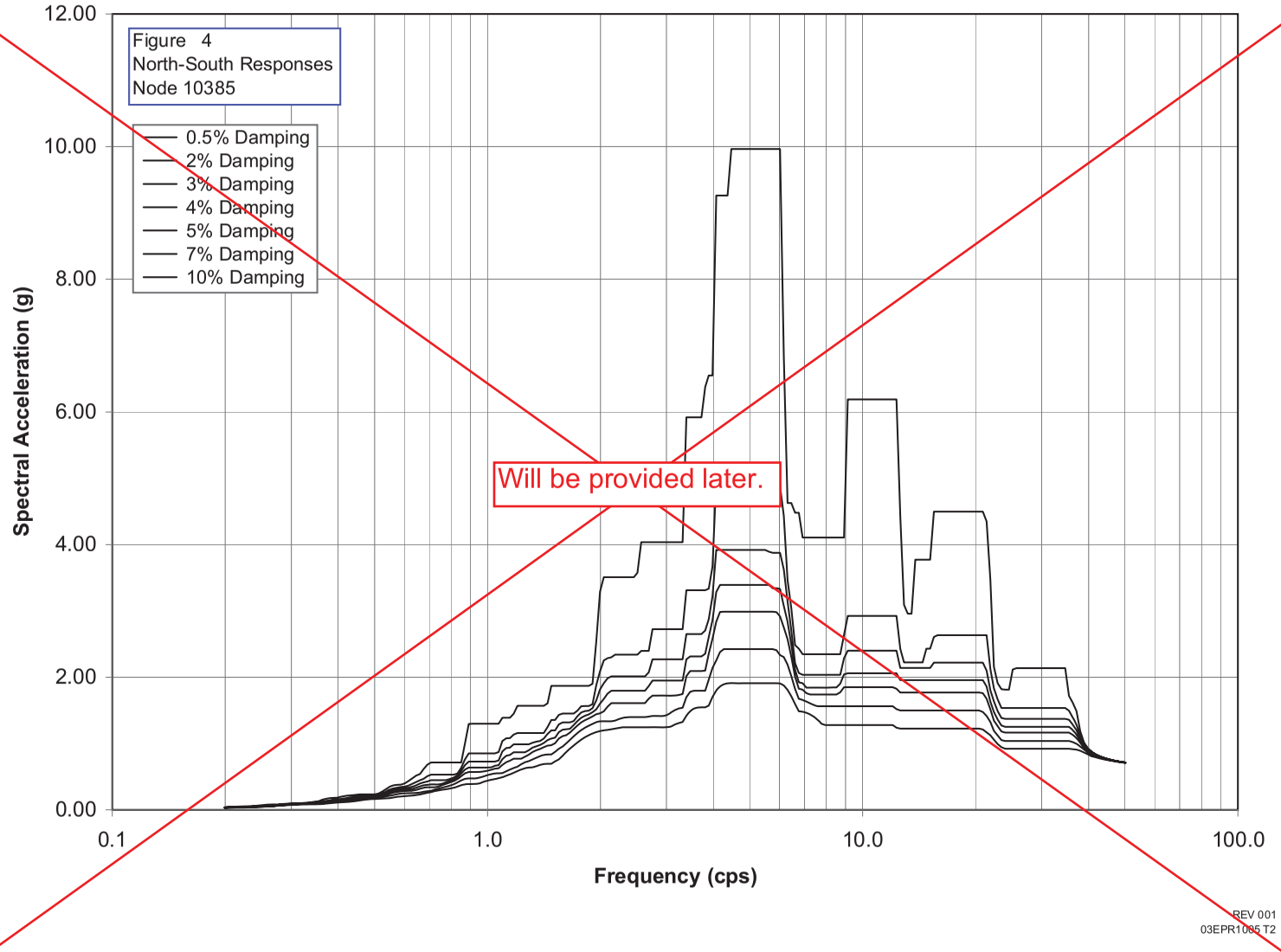


Figure 3.7.2-108—Spectrum Envelope of ESWB at Elev +14 ft, 0 in at Node 10385 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction

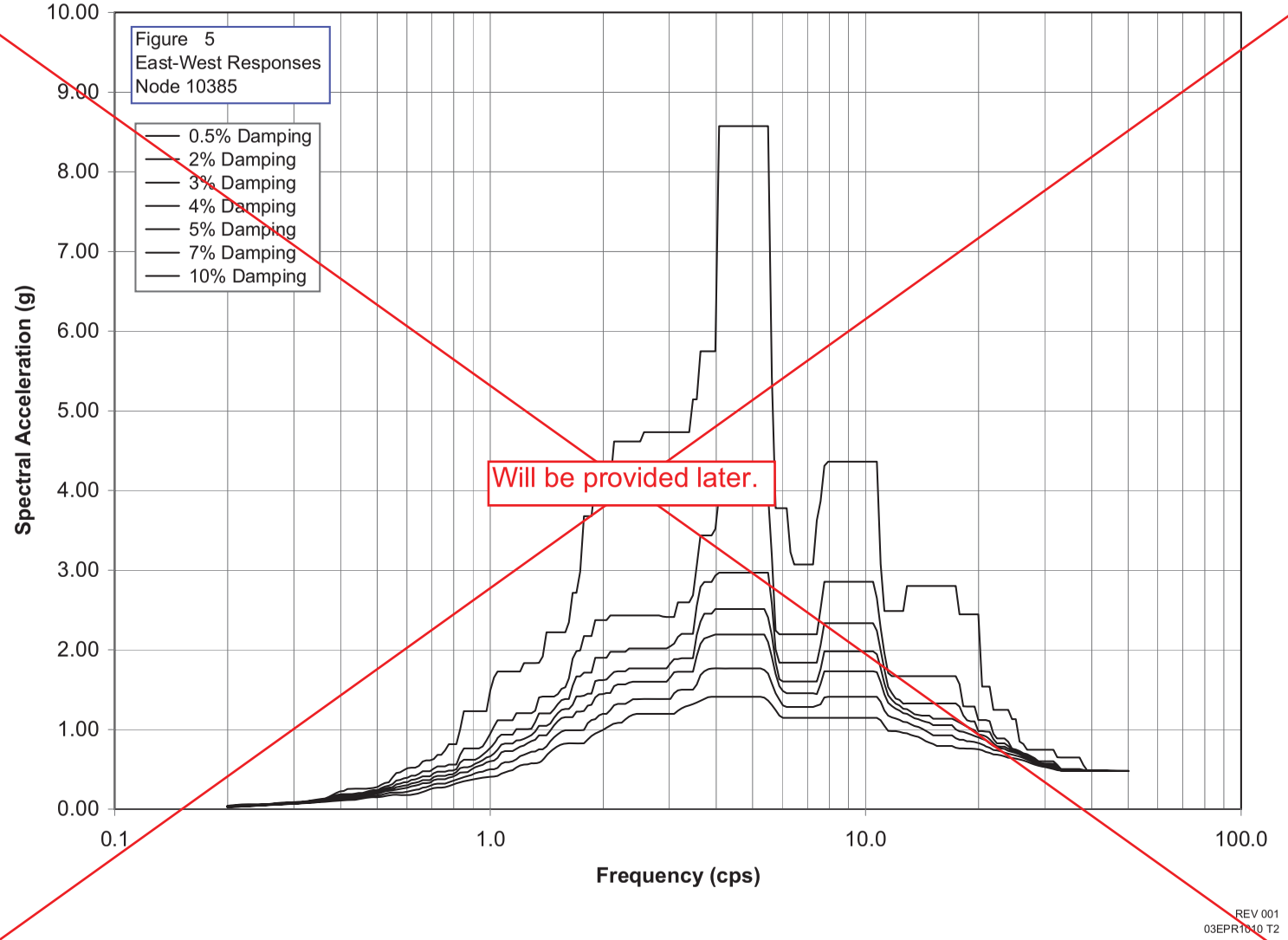


Figure 3.7.2-109—Spectrum Envelope of ESWB at Elev +14 ft, 0 in at Node 10385 - 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction

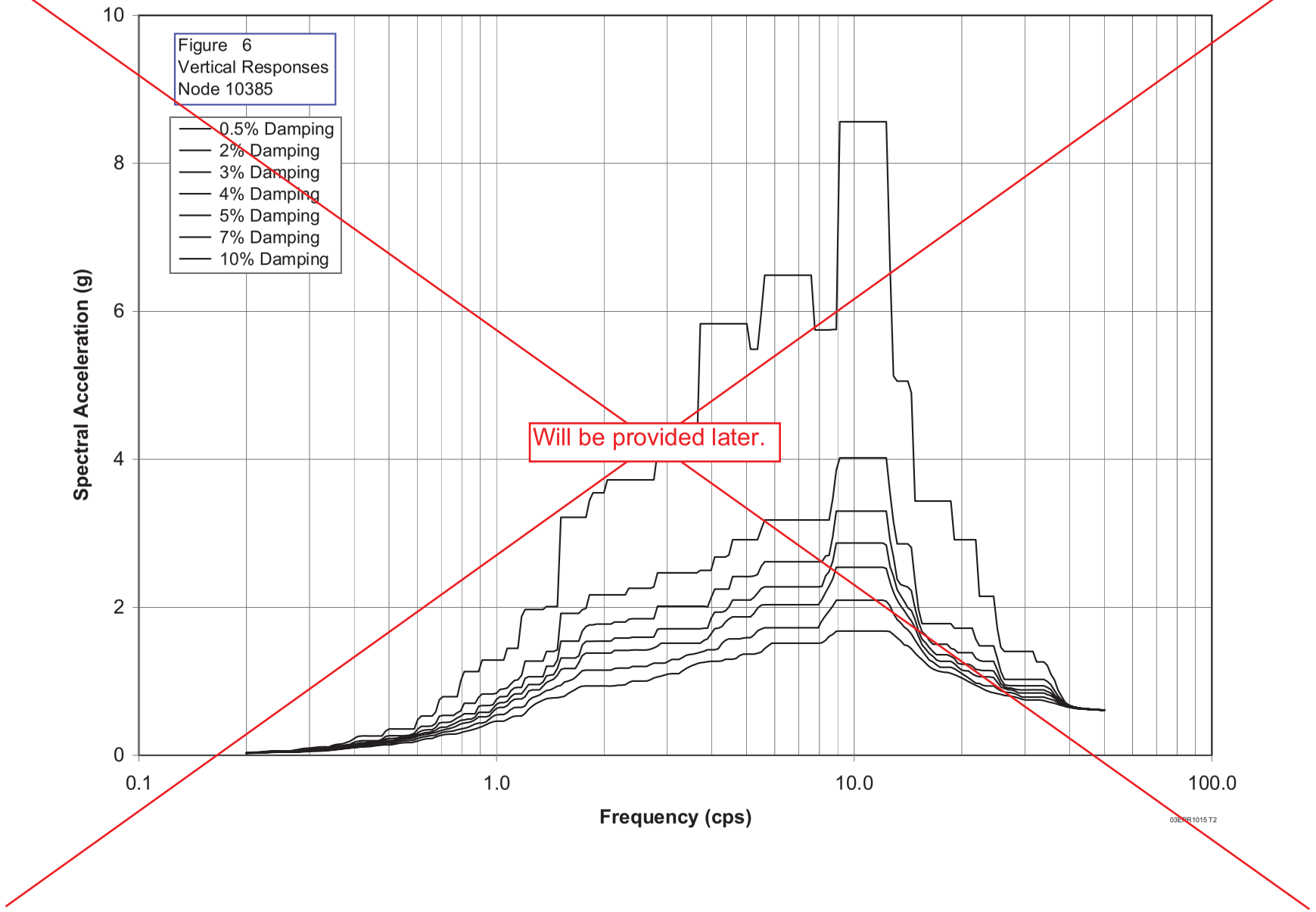


Figure 3.7.2-110—Spectrum Envelope of Fuel Building at Elev. +12 ft, 1-2/3 in (3.7 m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, X-Direction

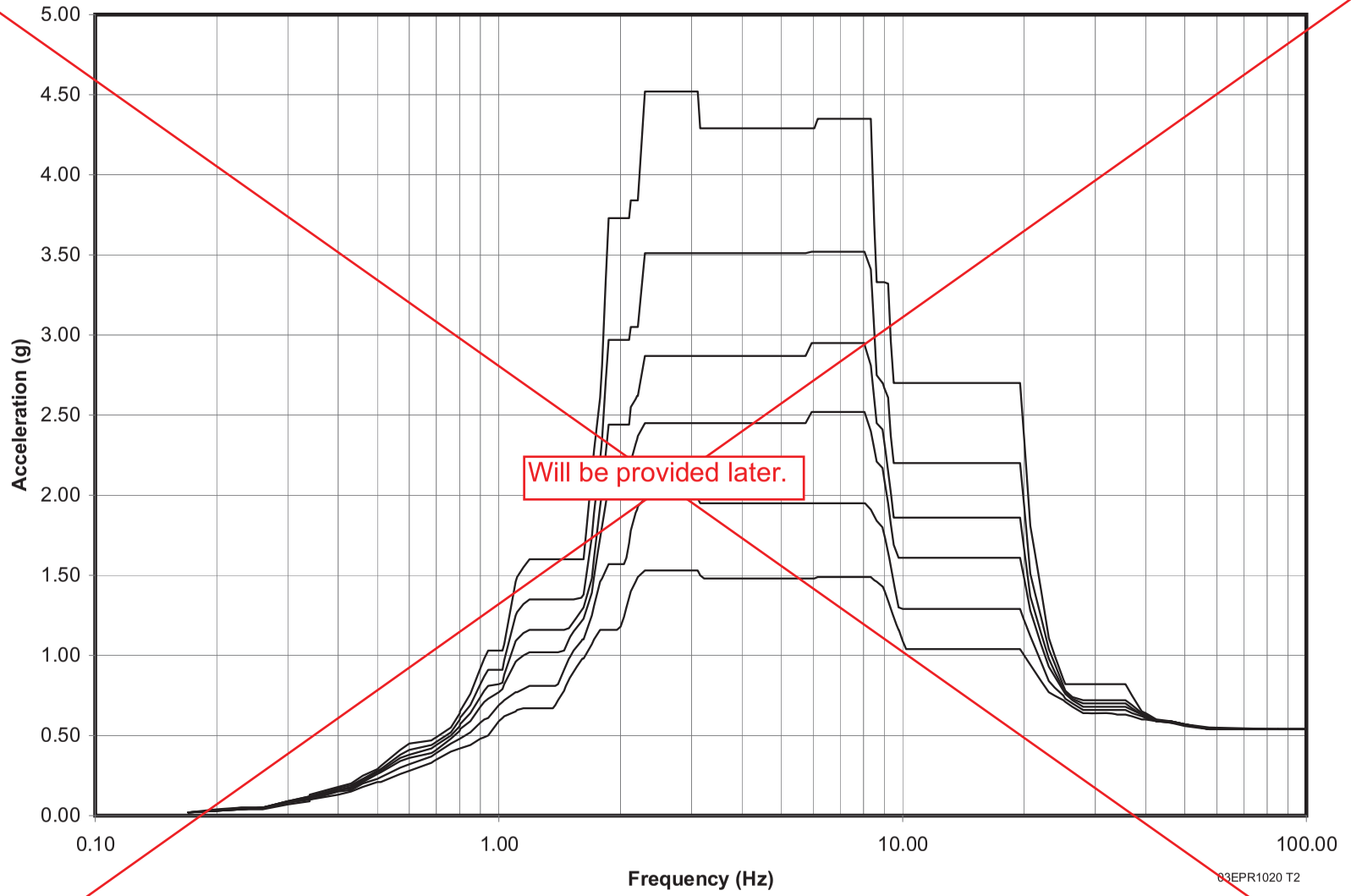
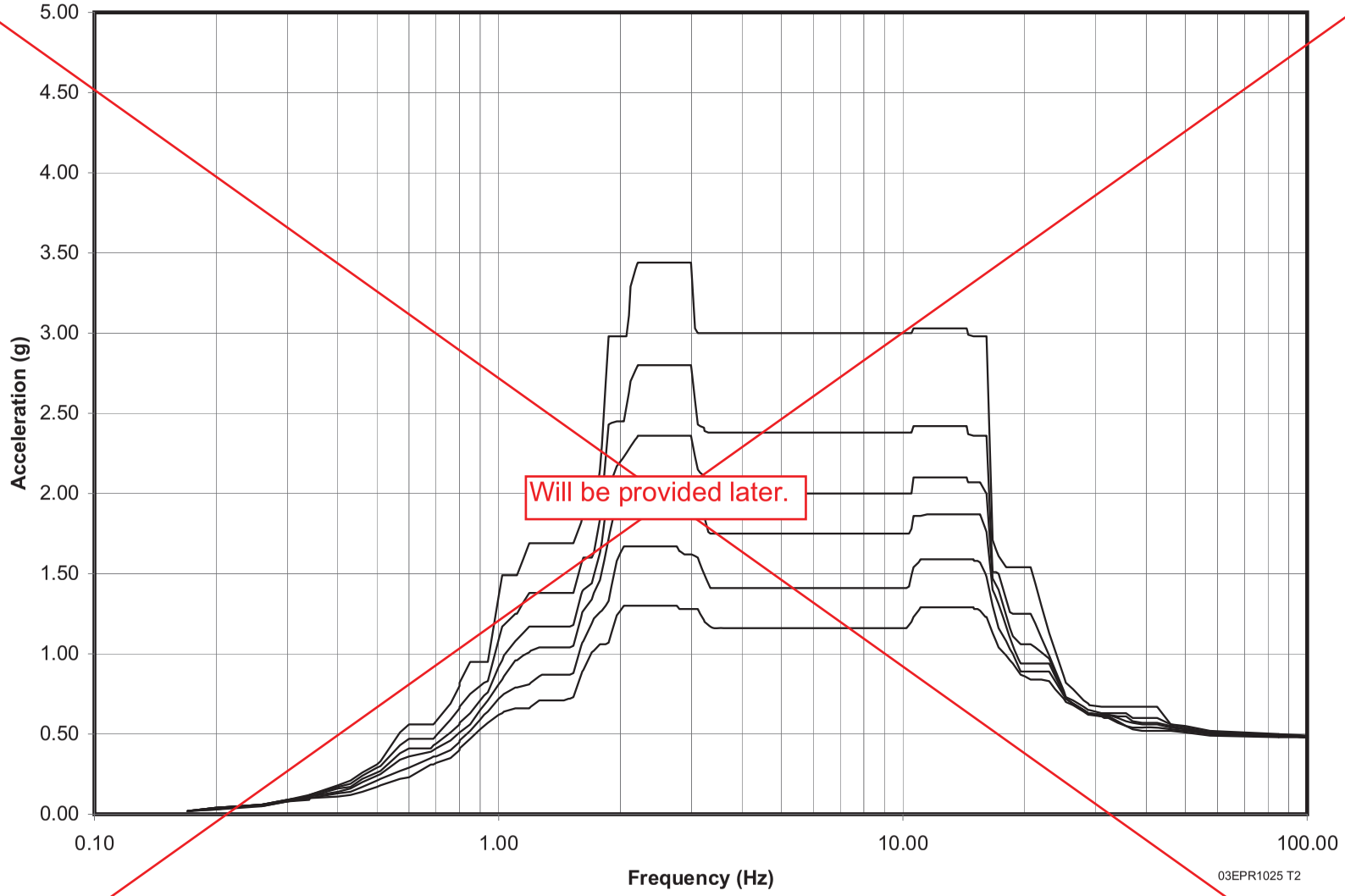
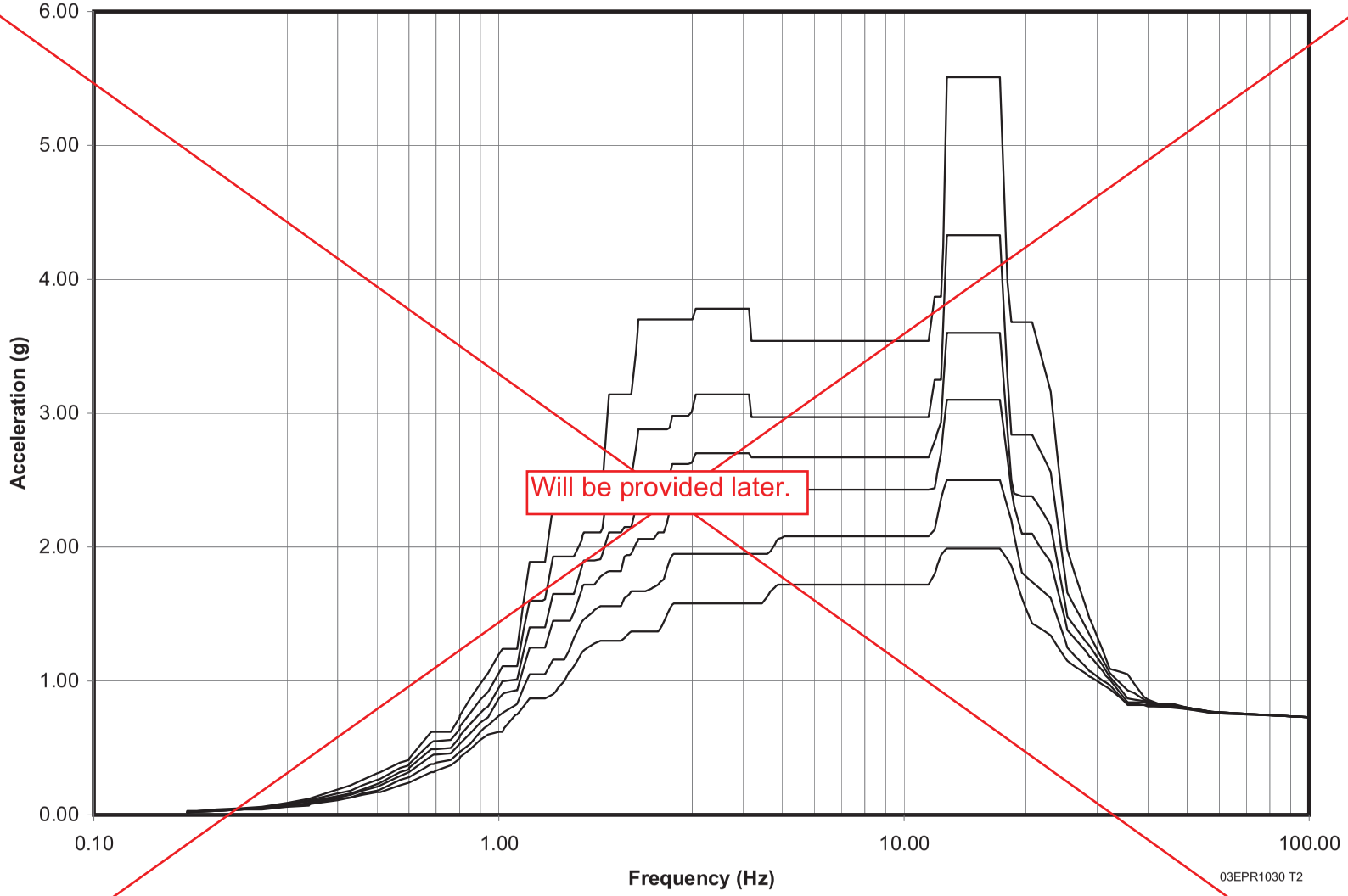


Figure 3.7.2-111—Spectrum Envelope of Fuel Building at Elev. +12 ft, 1-2/3 in (3.7 m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Y-Direction



Will be provided later.

Figure 3.7.2-112—Spectrum Envelope of Fuel Building at Elev. +12 ft, 1-2/3 in (3.7 m) 2%, 3%, 4%, 5%, 7%, and 10% Damping, Z-Direction



Will be provided later.

Next File

Figure 3.7.2-113 Dynamic 3D Finite Element Model of Nuclear Island, Isometric View

TO BE PROVIDED

Figure 3.7.2-114 Dynamic 3D Finite Element Model of Nuclear Island, Elevation View

TO BE PROVIDED

Figure 3.7.2-115 Dynamic 3D Finite Element Model of Fuel Building (FB)

TO BE PROVIDED

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Figure 3.7.2-116 Dynamic 3D Finite Element Model of Safeguard Building 1 (SB1)

TO BE PROVIDED

Figure 3.7.2-117 Dynamic 3D Finite Element Model of Safeguard Building 2/3 (SB2/3)

TO BE PROVIDED

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Figure 3.7.2-118 Dynamic 3D Finite Element Model of Safeguard Building 4 (SB4)

TO BE PROVIDED

Figure 3.7.2-119 Dynamic 3D Finite Element Model of Reactor Containment Building (RCB)

TO BE PROVIDED

Figure 3.7.2-120 Dynamic 3D Finite Element Model of Reactor Building Internal Structures (RBIS)

TO BE PROVIDED

Figure 3.7.2-121 SSI Analysis Model - Excavated Soil Solid Elements, Nuclear Island Foundation

TO BE PROVIDED

Figure 3.7.2-122 SSI Analysis Model – Nuclear Island Beam Elements

TO BE PROVIDED

Figure 3.7.2-123 SSI Analysis Model – Nuclear Island Shell Elements

TO BE PROVIDED

Figure 3.7.2-124 SSI Analysis Model - Adjacent Structures Foundation Rigid Beam Elements

TO BE PROVIDED

Figure 3.7.2-125 SSI Analysis Model – Near-Field Springs for Displacement Tracking

TO BE PROVIDED

Figure 3.7.2-126 SSI Analysis Model – Nuclear Auxiliary Building Foundation Rigid Beams

TO BE PROVIDED

Figure 3.7.2-127 SSI Analysis Model – Nuclear Auxiliary Building Side Wall Rigid Beams

TO BE PROVIDED

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Figure 3.7.2-128 SSI Analysis Model – Nuclear Auxiliary Building Stick Model

TO BE PROVIDED

Figure 3.7.2-129 SSI Analysis Model – Nuclear Auxiliary Building Foundation Excavated Soil

TO BE PROVIDED

Figure 3.7.2-130 Nuclear Island and Nuclear Auxiliary Building Interface Nodes

TO BE PROVIDED

Figure 3.7.2-131 Foundation and Embedment Layout of Adjacent Structures Relative to Nuclear Island

TO BE PROVIDED

Figure 3.7.2-132 Nuclear Island Foundation Layout showing Basemat, Sidewalls and Shear Key

TO BE PROVIDED

Figure 3.7.2-133 Near Field Soil Nodes

TO BE PROVIDED

Figure 3.7.2-134 Fire Protection Building Foundation and Surface Nodes for Tracking Response Attenuations

TO BE PROVIDED

Figure 3.7.2-135 Isometric View of GTSTRUDL FEM for Emergency Power Generating Building (HF Motion)

TO BE PROVIDED

Figure 3.7.2-136 Isometric View of GTSTRUDL FEM for Essential Service Water Building (HF Motion)

TO BE PROVIDED

Figure 3.7.2-137 Location of Response Output Nodes - Location of Response Output Nodes, NI Common Basemat

TO BE PROVIDED

Figure 3.7.2-138 Location of Response Output Nodes - Location of Response Output Nodes, Reactor Building Internal Structure - Elev. +16 ft, 10-3/4 in (+5.15m)

TO BE PROVIDED

Figure 3.7.2-139 Location of Response Output Nodes - Location of Response Output Nodes, Reactor Building Internal Structure - Elev. +63 ft, 11-3/4 in (+19.50m)

TO BE PROVIDED

Figure 3.7.2-140 Location of Response Output Nodes, Safeguard Building 1 - Elev. +26 ft, 3 in (+8.10m)

TO BE PROVIDED

Figure 3.7.2-141 Location of Response Output Nodes, Safeguard Building 1 - Elev. +68 ft, 10-3/4 in (+21.00m)

TO BE PROVIDED

Figure 3.7.2-142 Location of Response Output Nodes, Safeguard Building 2&3 - Elev. +26 ft, 7 in (+8.10m)

TO BE PROVIDED

Figure 3.7.2-143 Location of Response Output Nodes, Safeguard Building 2&3 - Elev. +50 ft, 6-1/4 in (+15.40m)

TO BE PROVIDED

Figure 3.7.2-144 Location of Response Output Nodes, Safeguard Building 4 - Elev. +68 ft, 10-3/4 in (+21.00m)

TO BE PROVIDED

Figure 3.7.2-145 Location of Response Output Nodes, Containment Building - Elev. +123 ft, 4-1/4 in (+37.60m)

TO BE PROVIDED

Figure 3.7.2-146 Location of Response Output Nodes, Containment Building - Elev. +190 ft, 3-1/2 in (+58.00m)

TO BE PROVIDED

Figure 3.7.2-147 Location of Response Output Nodes, Fuel Building at Elev. +12 ft, 1-2/3 in (3.7 m)

TO BE PROVIDED

The requirements in SRP 3.7.3-II-SAC-9 will be met as described in Topical Report ANP-10264 in Sections 3.2.2, 3.2.3, and 3.2.4.

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Where:

S_d = maximum displacement at each support.

S_a = spectral acceleration in "g's" at the ZPA cutoff frequency.

ω = fundamental frequency of the building (rad/sec).

The support displacements are imposed on the subsystems in the most unfavorable combination. The responses due to support displacements are combined with inertial responses as described in Sections 3.7.3.9.1 or 3.7.3.9.2.

3.7.3.9.1 Uniform Support Motion Method

Distribution subsystems supported at multiple elevations within one or more buildings may be analyzed using the USM method. This analysis method applies a single spectrum, called a uniform response spectrum, at each support location. This spectrum envelops the individual response spectra for other locations. The enveloping response spectrum is developed and applied for each of the three orthogonal directions of input motion. The modal and directional responses are then combined as described in Sections 3.7.3.7 and 3.7.3.6, respectively. The responses due to relative displacements at the support points are combined with the inertial responses by the absolute sum method.

3.7.3.9.2 Independent Support Motion Method

Distribution subsystems supported at multiple locations within one or more buildings with different seismic input response maybe analyzed using the ISM method. In this method of analysis, supports may be divided into support groups. A single ISRS is applied to all supports of each group, but different ISRS are applied to different groups. Typically, a support group is made up of supports attached to the same structure, floor, or portion of a floor. For distribution subsystems analyzed using the ISM method, criteria presented in NUREG-1061 (Reference 8) are followed.

In lieu of performing a response spectrum analysis with USM or ISM inputs, time histories of support motions may be utilized as input excitations. The responses due to relative displacements at the support points are combined with the inertial responses by the SRSS method.

3.7.3.10 Use of Equivalent Vertical Static Factors

Equivalent vertical static factors are not used in the design of subsystems for the U.S. EPR design. Seismic loads are calculated assuming that the vertical seismic motion occurs simultaneously with the two horizontal motions.

~~Tri-linear springs development uses the linear development as the starting point. The subsurface soil is assumed to be relatively high plasticity clay. Based on the modulus degradation for clays with plasticity index in the range 50 to 70, a relationship is developed between displacement of the foundation basemat and the corresponding average reaction imposed by the underlying soil medium on the foundation basemat. Using an incremental approach, the methodology calculates the reaction at the base of the foundation basemat for a small increment of basemat displacement, using the appropriate soil spring associated with the shear modulus at this step. In the next incremental step, the solution is advanced using a reduced shear modulus consistent with the shear strain at a representative depth associated with the soil reaction from the previous step. For the two aforementioned soil cases (4u and 2sn4u) the resultant bearing pressure versus subgrade modulus values are provided in Table 3.8-14—Tri-Linear Subgrade Modulus vs. Bearing PressuresTable Deleted.~~

The results of the soil spring analyses are used in determining forces and moments in the basemat for concrete design and for determining the acceptability of the supporting soil media under static loading conditions.

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A FEM model for SSI analysis of the embedded portions of the NI common basemat was used to evaluate the soil bearing pressures, sliding and overturning due to seismic events. This model explicitly represents the transient nature of the seismic loadings, the properties of the soils, and the dynamic characteristics of the structure. This approach produces a more realistic picture of the NI Common Basemat Structure response to seismic loadings than is possible using the static model alone.

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~~The NI Common Basemat Structure superstructure is modeled using lumped parameter systems identical to those used for the soil-structure interaction analysis. The masses, stiffnesses, and eccentricities of the buildings are mathematically computed, and spatially arranged to represent the dynamic characteristics of the NI Common Basemat structures.~~

and HF

2sn4ue, 4ue, 5ae, hfub, hfbe, and hflb

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The model is excited by simultaneous application of ~~three~~ EUR seismic transients (CSDRS) to the base of the foundation basemat for soil cases ~~2sn4u, 4u, and 5a~~ representing soft, medium and hard soils. Transients are applied, one each, in the three principal building directions. The weight of the building, including the water in the in-containment refueling water storage tank (IRWST), fuel pool, and the four emergency feedwater storage tanks (because this water is always present within the NI Common Basemat Structure), and full buoyancy are the other loadings included in this analysis.

Section 3.8.1, Section 3.8.3, and Section 3.8.4 provide descriptions of interfacing structures that induce loads on the NI Common Basemat Structure foundation basemat. The figures in those sections illustrate the concrete shear walls and columns that transfer loads to the NI Common Basemat Structure foundation basemat. The