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ENVIRONMENTAL TEST LABORATORY

LV 27064

**Earthquake resistance tests
on a BLOKSET BT switchboard
type 132**

Company : **SCHNEIDER Electric**

Copy N° *2*

Commercial engineer : D. TAUZIN

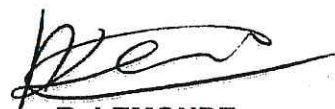
Test engineer : B. HUET

Number of pages, appendices not included : 43

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Number of pages in appendices : 112

Certified exact for SOPEMEA
Villacoublay, july 21st july 1997



R. LEMONDE
Quality Department Manager

This test report concerns only tested material



B. COLOMIES
Tests Department Manager

07.97/CL

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1 – GENERAL INFORMATION**1.1. ADMINISTRATIVE INFORMATION****1.1.1. ORDER ISSUER**

SCHNEIDER Electric Company
38050 GRENOBLE CEDEX 9

1.1.2. ORDER NUMBER

SCHNEIDER Electric ref. : Order n° 141H1031 693621 FPA dated april 19th 1997

1.1.3. PURPOSE OF THE ORDER

Earthquake resistance tests on a BLOKSET BT switchboard type 132

1.1.4. SOPEMEA REFERENCE

In-house reference n° : LV 27064

1.1.5. TEST PERFORMANCE DATE

The tests were performed from april 28th and 29th 1997

1.2. SOPEMEA PERSONNEL

Mrs BUFFET DELMAS
Messrs HUET - CALMELS

2 – TEST FACILITIES

2.1. TEST EQUIPMENT USED

2.1.1. TESTS FACILITIES

Type	Manufacturer	Model n°	Verification procedure n°	Periodicity	Date of last verification	Starting procedure n°
Electrohydraulic vibration generator	JACOTTET	Biaxial 30 000 daN	3011 C/VMK	1 year	04.29.97	3002 U/VLE

3 – TECHNICAL PART

3.1. EQUIPMENT SUBMITTED FOR TESTING

The SCHNEIDER Electric Company submits for testing a BLOKSET BT switchboard consisting of three coupled cells :

- 1 BLOKSET D cell, type 132
- 1 BLOKSET Mw cell, type 132
- 1 BLOKSET D/Mg cell, type 132

Dimensions : 2350 mm x 600 mm x 2200 mm

Weight : $\approx$ 1400 kg

3.2. TEST PROGRAM

The test program, is defined in accordance with the norm CEI 68.3.3.

The tests carried out were of polycyclic, biaxial type

The test program is executed as indicated hereafter :

3.2.1. SEARCH FOR RESONANCE FREQUENCIES TESTS

Excitation mode

Monoaxial excitation

Sinusoidal vibrations maintained with exponential frequency excursion

Frequency excursion

Sweep speed : 1 oct/min

Sweep to rising, then decreasing frequency

Frequency range

1 to 100 Hz

Excitation level

Excitation at constant acceleration of 0,1 g.

3.2.2. EARTHQUAKE RESISTANCE TESTS**Excitation mode**

Biaxial excitation

Synthesized time histories based on spectra given by the SCHNEIDER Electric Company, for the earthquakes of UBC, intermediate and BLOKSET level, on the one hand, and by EDF, (ref. HN-20-E-53) for the earthquakes of OBE and SSE level, on the other hand.

Damping value pertaining to spectra : 5 %

Time history duration : 20 s

See RRS reference spectra, pages 8 to 10 and reference time histories pages 11 to 16 for the SCHNEIDER Electric earthquakes, pages 17 to 20 for the SRS spectra and pages 21 to 24 for the time histories of EDF earthquakes.

Frequency range

0,5 to 100 Hz for SCHNEIDER Electric spectra

0,5 to 50 Hz for EDF spectra

Test level

The time history applied to the test table must produce a TRS test response spectrum comparable to the RRS reference spectrum

Sequence of the tests

An earthquake is simulated by a 20 s time history.

The specimen is subjected to 1 earthquake at UBC level, then 1 earthquake at intermediate level, and 1 earthquake at BLOKSET level, according to the two axes configurations OX/OZ and OY/OZ.

The specimen is subjected to 1 earthquake at OBE level, then 1 earthquake at SSE level, according to the two axes configurations OX/OZ and OY/OZ.

Abbreviations	English	French
Required Response Spectrum	RRS	SRS
Test Response Spectrum	TRS	SRE
Operate Basis Earthquake	OBE	DSD
Safe Shutdown Earthquake	SSE	SDD

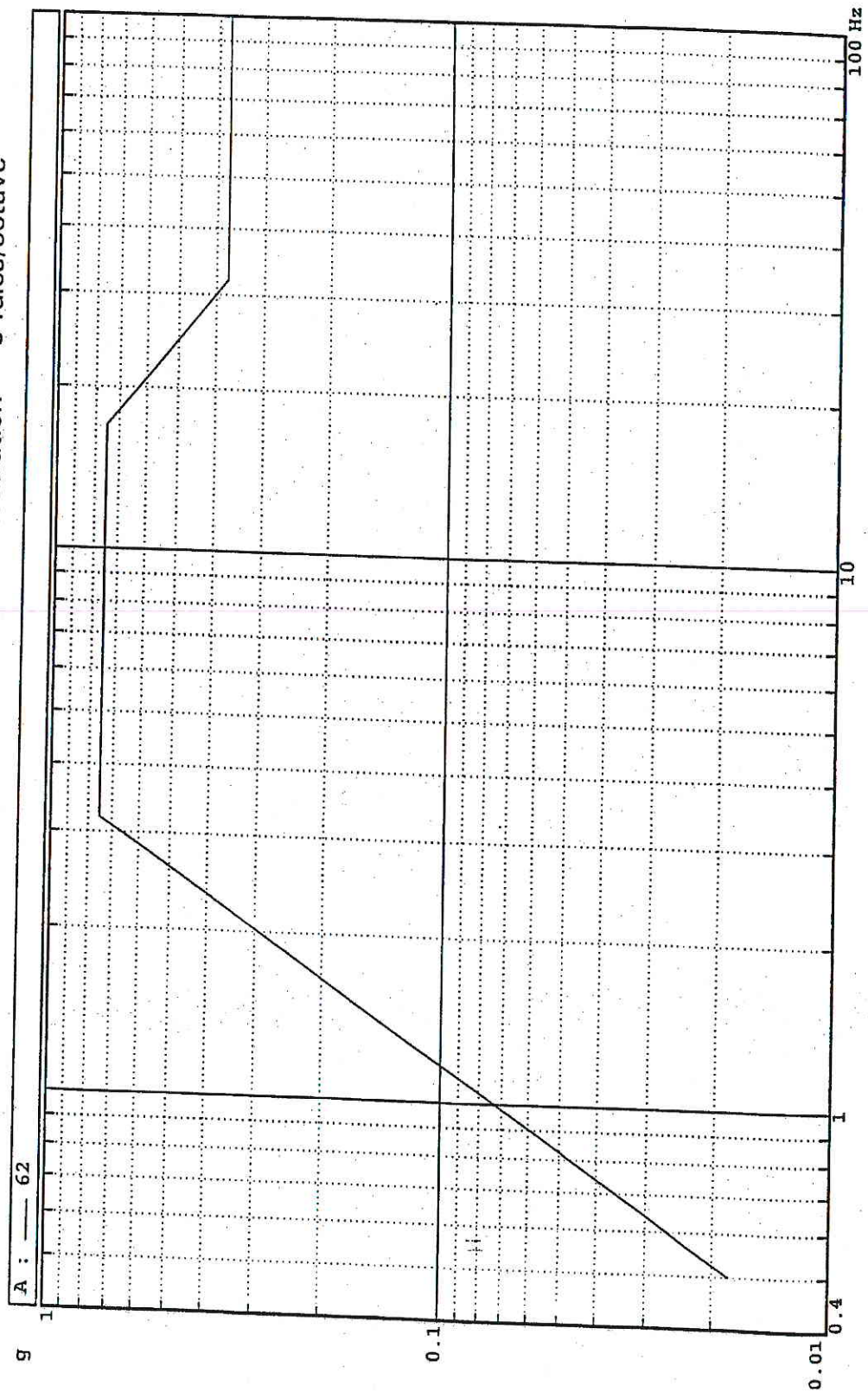
REFERENCE SPECTRA, HORIZONTAL AND VERTICAL AXES

Societe : SCHNEIDER ELECTRIC

Niveau : SMS UBC

Amortissement = 5%

Resolution = 6 raies/octave



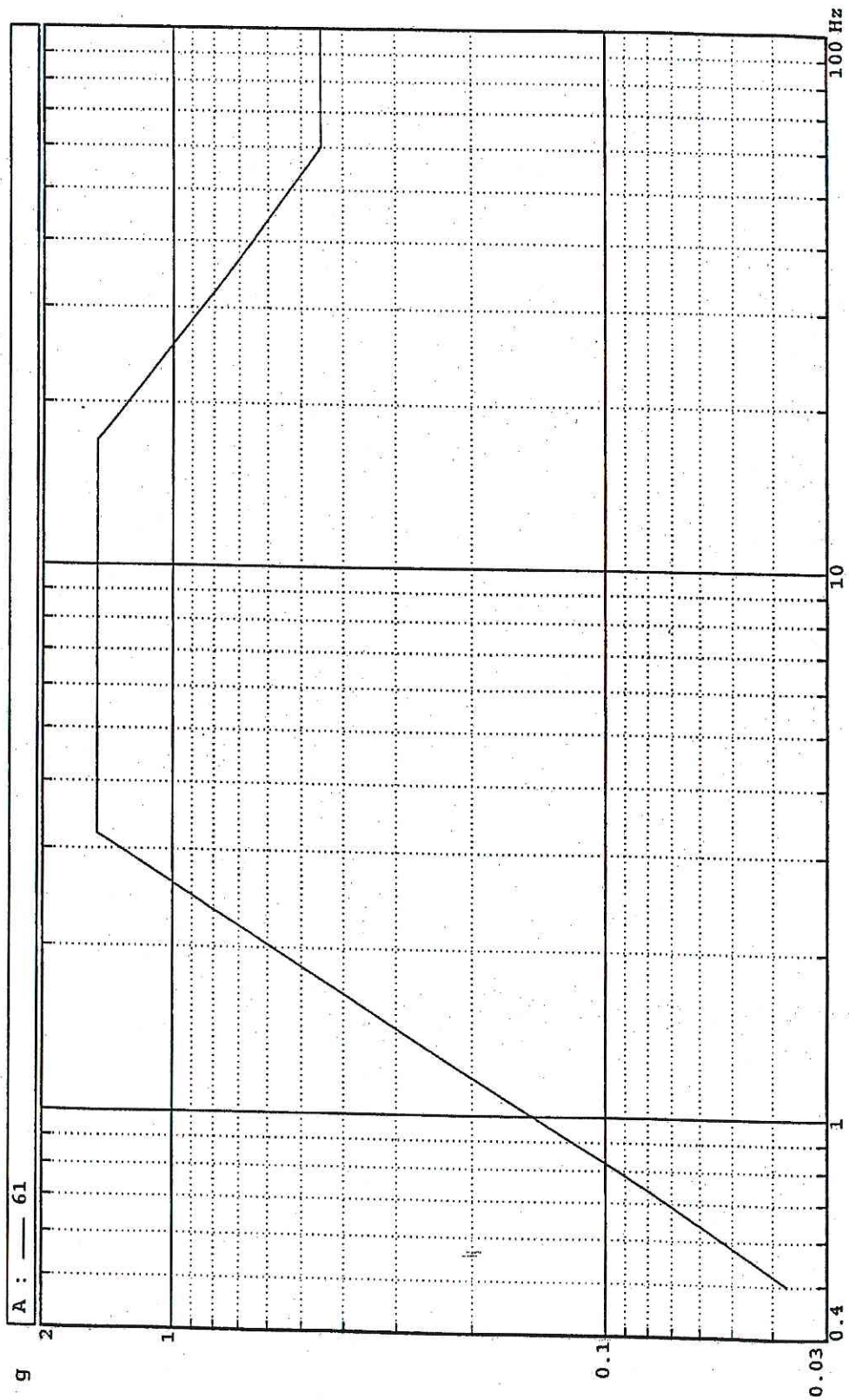
REFERENCE SPECTRA, HORIZONTAL AND VERTICAL AXES

Niveau : SMS Intermediaire

Societe : SCHNEIDER ELECTRIC

Resolution = 6 raies/octave

Amortissement = 5%



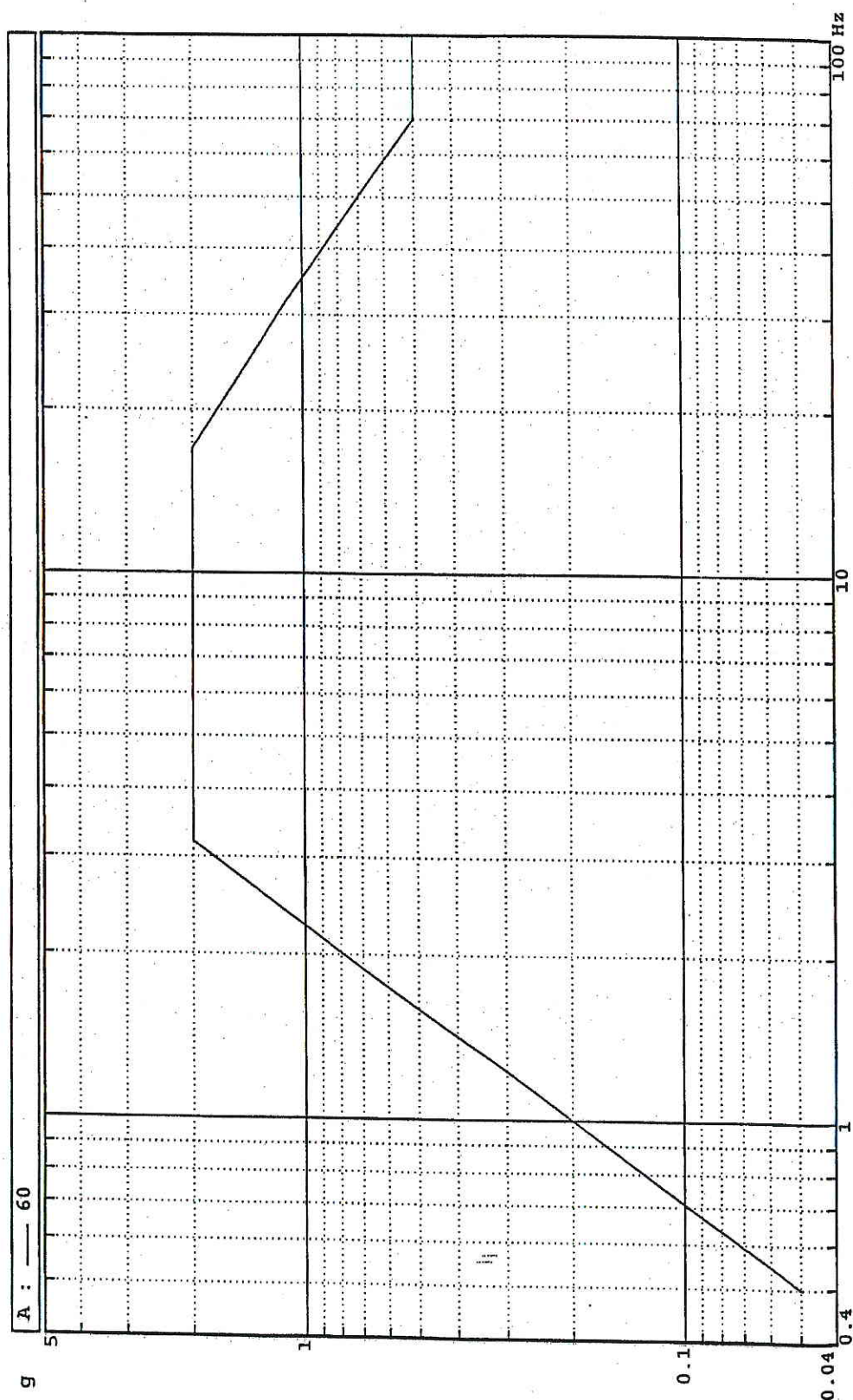
REFERENCE SPECTRA, HORIZONTAL AND VERTICAL AXES

Niveau : SMS Blockset

Societe : SCHNEIDER ELECTRIC

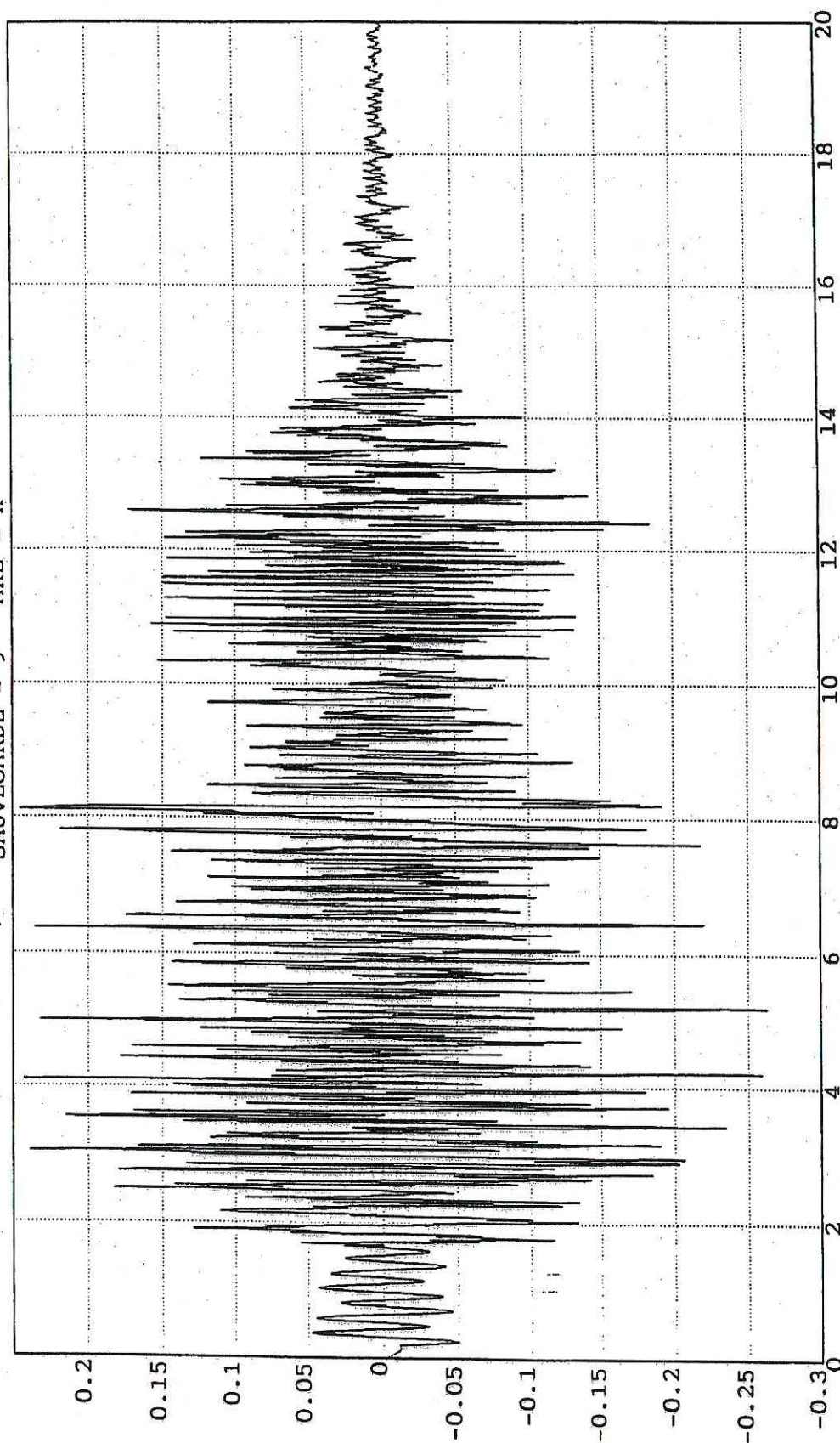
Resolution = 6 raies/octave

Amortissement = 5%



REFERENCE TIME HISTORIES, HORIZONTAL AXES

le 28/ 5/97 a 9h 55m 19s : ESSAI = SCHNEIDER5 GABARIT = UBC
ACCELEROGRAMME de REFERENCE (g) #
SAUVEGARDE = 9 AXE = X



Temps en Sec.
LV 27064 SCHNEIDER ELECTRIC Tableau BLOKSET (UBC)

3.3. OPERATING PROCEDURE

3.3.1. ORIENTATION REFERENCE

The position of the specimen is defined in relation to the axes of the trirectangular reference system shown on photographs n° 1 and 2 page 30.

3.3.2. TEST CONDITIONS

3.3.2.1. Mounting

The three coupling cabinets are fastened on the test table with 14 screws of M10 diameter.

3.3.2.2. Vibration method

□ Search for resonance frequencies

Sinusoidal vibrations

The tests are carried out by a digital control console.

The rectilinear and sinusoidal vibrations transmitted are defined by their amplitude of displacement a and their frequency f .

The amplitude of acceleration obtained is :

$$\Gamma = \frac{1}{g} 4 \pi^2 f^2 a$$

with Γ in number of g
 f in Hz
 a in m

(g : acceleration of normalized unlight)

Control is made on the unfiltered signal at 2 points

□ Earthquake resistance tests

The tests were controlled with a digital control console using a calculation program in transient mode.

The program enabled :

- The synthesis of a time history based on the RRS reference spectrum. This time history is used to excite the specimen during the test.
- The analysis of the TRS spectrum of this time history after the test to validate program realization. The TRS spectrum must be equal or more than the RRS spectrum at all points.

The functions of synthesis and analysis were programmed according to the data hereafter.

Synthesis

- Generation of a synthesized time history
- Characteristics of a time history.

	EDF spectra	SCHNEIDER spectra
RRS spectra pages	17 to 20	8 to 10
Damping (%)	5	5
Frequency range (Hz)	0,5 – 50	0,5 – 100
Resolution (1/n octave)	1/6	1/6
Time history duration (s)	20	20

Analysis

The excitation movement of the cabinet during the test is measured using an accelerometric chain and recorded (see paragraph 3.3.3.1.).

Analysis of TRS spectrum

Characteristic of the spectrum

Response	Absolute
Spectrum	Composed
Frequency range (Hz)	0,5 – 50 or 0,5 – 100
Resolution (1/n octave)	1/6
Damping (%)	5

Graphic plotting :
acceleration in relation to frequency

Analysis of test time history

Characteristics of the analysis

Response	Absolute
Definition	6144 points
Duration of basic time history (s)	20

Graphic plotting :
acceleration in relation to time.

Absolute response : signal processing is carried from the absolute value of the time history.

Composed spectrum : spectrum calculation is carried on the total duration of the time history and on the entirety of frequential content.

3.3.3. ACCELERATION MEASUREMENTS

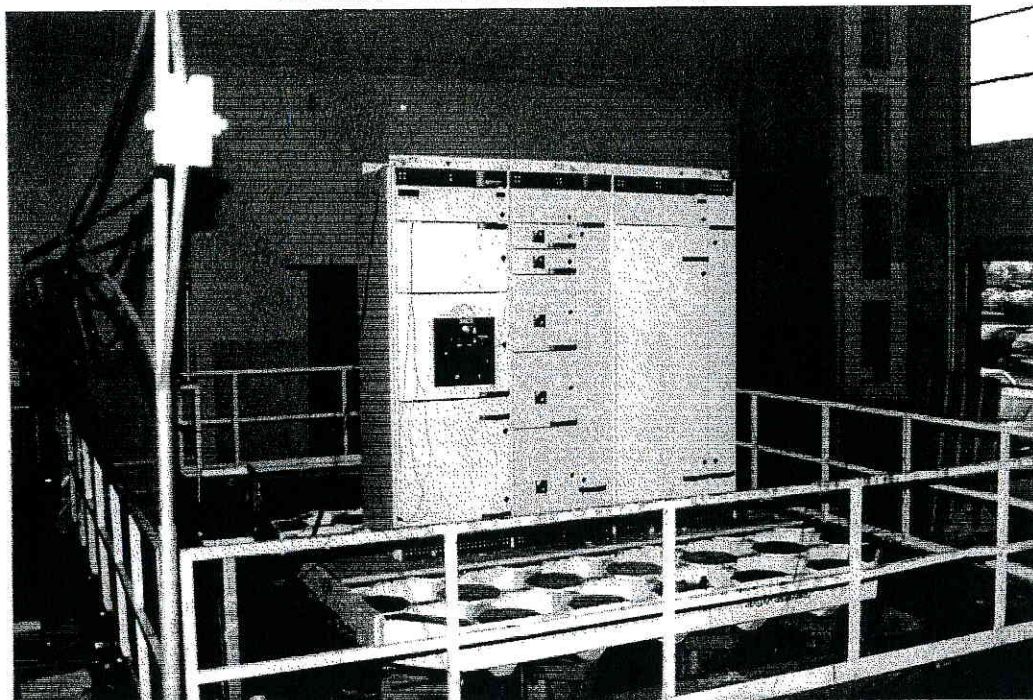
3.3.3.1. Measurement point

Accelerometers were installed on the equipment.
Their location and photographs number are given in the table below.

Point n°	Location description	Photograph	
		n°	Page
Pilots	On the test apparatus table	-	-
1	From upper frame, on the cabinet left-hand side	3	31
2	From upper frame, in the cabinet middle	4	31
3	From upper frame, on the cabinet right-hand side	5	32
4	On Masterpact	6	32

PHOTOGRAPH N° 1

OVERALL VIEW ALONG OX/OZ AXES



PHOTOGRAPH N° 2

OVERALL VIEW ALONG OY/OZ AXES

