出國報告審核表

出國報告名稱： 赴法商 Alstom 稽催及了解緊急柴油發電機安全級儀電盤耐震驗證事宜		
出國人姓名(2人以上,以1人為代表)	職稱	服務單位
王茂田	電氣組長	台灣電力公司核能技術處
出國類別	☐考察 ☐進修 ☐研究 ☐實習 ☑其他 洽公 （例如國際會議、國際比賽、業務接洽等）	
出國期間： 102 年 09 月 04 日至 102 年 09 月 13 日	報告繳交日期：102 年 09 月 24 日	

出國計畫主辦機關審核意見	☑1.依限繳交出國報告 ☑2.格式完整（本文必須具備「目地」、「過程」、「心得」、「建議事項」） ☑3.無抄襲相關出國報告 ☑4.內容充實完備. ☐5.建議具參考價值 ☐6.送本機關參考或研辦 ☐7.送上級機關參考 ☐8.退回補正，原因：☐不符原核定出國計畫 ☐以外文撰寫或僅以所蒐集外文資料為內容 ☐內容空洞簡略未涵蓋規定要項 ☐抄襲相關出國報告之全部或部分內容 ☐電子檔案未依格式辦理 ☐未於資訊網登錄提要資料及傳送出國報告電子檔 ☐9..本報告除上傳至出國報告資訊網外，將採行之公開發表： ☐辦理本機關出國報告座談會（說明會），與同仁進行知識分享。 ☐於本機關業務會報提出報告 ☐其他_____ ☐10.其他處理意見及方式：

說明：

一、各機關可依需要自行增列審核項目內容，出國報告審核完畢本表請自行保存。

二、審核作業應儘速完成，以不影響出國人員上傳出國報告至「政府出版資料回應網公務出國報告專區」為原則。

報告人	核電處副處長 102.9.24 王茂田	審核人	單位主管 核電技術會 副處長 102.9.25 吳永福	主管處主管 核能技術處 處長 102.9.26 姚俊全	總經理 副總經理 副總經理 102.9.26 徐永華

行政院及所屬各機關出國報告提要

出國報告名稱：

赴法商 Alstom 公司稽催及了解緊急柴油發電機安全級儀電盤耐震驗證事宜

頁數 1 含附件：□是☑否

出國計畫主辦機關/聯絡人/電話

台灣電力公司 /陳德隆/(02)2366-7685

出國人員姓名/服務機關/單位/職稱/電話

王茂田/核能技術處/電氣組/組長/(02)2490-2401 Ext.5267

出國類別：□1 考察□2 進修□3 研究□4 實習☑5 其他

出國期間：102 年 09 月 04 日至 102 年 09 月 13 日 出國地區：法 國

報告日期：102.09.24

分類號/目

關鍵詞：稽查/催

內容摘要：(二百至三百字)

一.Alstom 公司將於 102 年 9 月底前提送其安全級儀電盤耐震測試 Program 供台電審查, Alstom 將於 102 年 11 月中旬前提送修正後耐震測試計畫給本公司核准。

二.Alstom 將以 103 年 3 月底前提送本公司本案之耐震驗證測試報告為目標

本文電子檔已傳至出國報告資訊網(http://open.nat.gov.tw/reportwork)

出國報告（出國類別：洽公）

赴法商 Alstom 公司稽催及了解緊急柴油發電機安全級儀電盤耐震驗證事宜

服務機關：台灣電力公司-核能技術處

姓名職稱：王茂田　電氣組長

派赴國家：法國

出國期間：102 年 09 月 04 日至 102 年 09 月 13 日

報告日期：102 年 09 月 24 日

目　　次

章節/標題　　頁次

壹、 目的

赴 Alstom 公司稽催及了解緊急柴油發電機安全級儀電盤耐震驗證事宜。

貳、 過程

一. 出國行程

(1) 去程:
台北→ 巴黎
102 年 09 月 04 日至 102 年 09 月 05 日
(2) 洽公:
巴黎 Alstom 公司
102 年 09 月 06 日至 102 年 09 月 11 日
(3) 回程:
巴黎→ 台北
102 年 09 月 12 日至 102 年 09 月 13 日

二. 稽催及了解緊急柴油發電機安全級儀電盤耐震驗證事宜

(1) Alstom 公司在 MS041A 合約提供六台緊急柴油發電機給龍門一、二號機，每部緊急柴油發電機約有 13 個安全級儀電盤安裝於 RB18100 高程，但因為 Alstom 所提供此等儀電盤之耐震驗證報告所用樓層之反應頻譜卻為 EL12300 者; Alstom 公司在會談中，表示此 13 個安全級儀電盤之尺寸大約可分三種，其中二種盤面及內部主要組件，Alstom 將再重新測試，其餘之儀電元件將個別測試。

(2) 在會談中，本公司提醒 Alstom 個別測試之儀電組件之 TRS 要確定大於個別儀電組件在儀、電盤內實際位置之 RRS，Alstom 公司 SQ 專家表示 Alstom 會先量測個別儀電組件在盤內所有可能位置之 Spectrum，再選取一個 Worst Case 之 Spectrum，作為未來實驗室測試之被比較值。

(3) Alstom 公司表示其修改後之 SQ 測試計劃將於今年 9 月底前提送本公司及 GEH/B&V 審查，本公司將於 10 月底前告知 Alstom 我們及 GEH 之審查意見，Alstom 將於 11 月中旬提送修正版之 SQ Test Plan

給台電核准。

(4) 本公司要求 Alstom 於 103 年 3 月底前提送其耐震驗證測試報告，Alstom 於會中表示測試之準備所需時間較長，實驗室實際測試時間較短，Alstom 還要與西班牙之實驗室協調以達成此目標。

三. 有關 SDG 之 Plate Heat Exchanger 現場將油/水 Plate Heat Exchanger 裝反是否要現場更換或由 Alstom 分包商修改相關文件事宜

Alstom 公司表示已確定不會要求台電現場更換 Plate Heat Exchanger，因為 Alstom 分包商已找到 NP Stamp Holder 將會修改相關文件，Alstom 將另行通知本公司。

四. 有關 EDG/SDG 耐震驗震報告要求註冊技師簽署替代方式

本公司提供 Alstom 53 份 EDG/SDG SQ 報告 List 及修正後之 EQ Program 給 Alstom 參考，Alstom 將正式來函告知本公司其所有 SQ 報告簽署人員皆為專門學校畢業並具 5 年工作經驗，Alstom 說明其工程師在法國由一專門培育工程師之學院畢業並不一定為大學畢業。

五. 附件 1: 9/6 與 Alstom 會談紀錄
附件 2: Alstom 於 9/6 會談中所附之 Draft Test Specification

參、 心得

一. Alstom 公司處理龍門 EDG/SDG 之人員僅剩一位計畫經理，因此本公司 EDG/SDG 之諸多問題常讓其計畫經理疲於奔命，無法及時回應台電，工程拖太久對廠家亦是一種懲罰，此與核三 5th D/G 之時程相比，已拖延 3~4 倍時間。

二.據了解自福島 311 事件後，歐洲各核能機組，每部機皆被要求增加一台安全級 EDG，因此 Alstom 公司近期生意興隆無暇他顧，亦會影響對本公司 EDG/SDG 問題之處置時間。

肆、 建議事項

近期公司招聘正式工程師，建請補充本組土木結構專長同仁以便及早學習 A/E 同仁在 Seismic Qualification 方面之工作。

附件 1

POWER
THERMAL PRODUCTS
Nuclear Activity – Emergency Diesel Generators
4, avenue André Malraux
92309 Levallois-Perret Cedex (France)
Phone: 33 (0)1 41 49 29 21
Fax: 33 (0)1 41 49 24 35
www.alstom.com

ALSTOM

Date: 2013/09/06

MEETING REPORT

Subject: Shin-Kori 3&4 Project – Meeting with TPC & BV on Sept 06, 2013	
Date of the meeting: 2013/09/06	Place of the meeting: Alstomoffice in Levallois France
Participants: ALSTOM Power NUEG Eusebio LOPEZ - Daniel CHOUZENOUX –	TPC: Mr Thomas Wang B&V: Mr Pat Gove
Minutes prepared by: D. CHOUZENOUX (ALSTOM)	

Reviewed and approved by (ALSTOM): Name: Signature:	Reviewed and approved: Name Signature:

Description	Action by	Deadline
Agenda		
Main items are: 1. Review of Qualification Program 2. Plate heat exchanger for SDG 3. SQ reports signing		

06 Sept 2013

9/6/2013

Review of Qualification Program		
ABB protection relays: Alstom to request to manufacturer if they have recorded the number of cycles (time history data)which were performed during their seismic qualif tests. Seismic spectra of contract for individual components testing cannot be applied. These spectra apply only for componants installed inside rigid structure. ABB protection relays qualification will be checked by analysis between seismic test spectra from manufacturer and seismic spectra recorded at corresponding location of each relay in the specimen cubicle tested. For the components that need to be tested, the list shown in the Seismic qualification program will indicate all location of each component of each panel, and the location selected for the test (which represents the worst location – highest spectra) The qualification program will also show the location of accelero-meters from top to bottom, and for each protection relay The revised Qualification program is scheduled to be issued to TPC by the end of September TPC scheduled to review the document within 3 weeks. Estimated time to incorporate TPC comments is about 2 weeks. - B&V pointed out the response spectra provided in the MS041A & -B specifications for individual components could only be used for components located in rigid panels. Alstom agreed this is a specification requirement. - Alstom agreed to update the draft seismic qualification plan to provide a complete list of component locations for each device and indicate which is considered to be the worst case location. Alstom will provide additional accelerometers during testing to provide data supporting the assumed worst case locations. - The target date for updating and submitting the updated draft seismic qualification plan for TPC informal review is September 30. TPC agreed to return comments in three weeks. Alstom will then incorporate any comments and formally issue the seismic qualification plan to TPC by Nov		

15 for formal approval. - Alstom will provide a seismic qualification certificate as an interim measure after seismic testing is complete and prior to issuing the seismic test report for TPC review. The Qualification report which will be issued after the seismic tests is requested to be issued to TPC by the end of March 2014 (target date)		
Plate heat exchanger for SDG		
Alstom will inform TPC regarding the progress of this matter which is to update the documentation to reflect installation at site. In order to achieve this, heat exchanger manufacturer has already contacted a company which is NR stamp holder (ENERTEC in the US) Heat exchanger manufacturer is currently providing inputs to them.		
SQ report signing		
53 SQ reports need to be signed by Alstom. It is not required that these reports are signed by RPE. Alstom will have these documents signed by his experienced engineer with Bachelor degree (more than 5 years experience in the business) ,and will send a clarification letter to TPC regarding this matter.		

P/T/14 2

Rev.	Date	Drafted by	Reviewed by	Approved by	Modification-Observation	Status
0	30.08.13	BOSCHER	LOPEZ	CHOUZENOUX	FIRST ISSUE	GFE

TAIWAN POWER COMPANY

LUNGMEN NUCLEAR UNITS 1 AND 2
EMERGENCY DIESEL GENERATORS
CONTRACT N° 874 9011M041A0

Title :

ELECTRICAL COMPONENTS

SEISMIC PARTICULAR TEST SPECIFICATION

GE DRAWING NUMBER :

TAIPOWER DRAWING NUMBER: 12801.MS041.6-XXXXX

THIS DOCUMENT CONTAINS SAFETY RELATED ITEMS	THIS DOCUMENT CONTAINS SEISMIC CATEGORY (Q) ITEMS	REVIEW LEVEL
[X] YES [ ] NO	[X] YES [ ] NO	II

MAIN CONTRACTOR :

S.E.M.T. PIELSTICK
Saint – Nazaire - France

SIZE
A4

TECHNICAL COORDINATOR

ALSTOM
Levallois-Perret - France
Power
Electrical and Control Systems

SUB-SUPPLIER :

SCALE
1 / 1

CONTRACTOR INTERNAL DOCUMENT NUMBER

P - 2 4 0 2 - A4 XXXX	1	FOLIO 1	END 42	Nb F° 42

MICROFILM TEST

Draft

9/6/2013 per France Alstom

ALSTOM

SUIVI DES MODIFICATIONS / *REVISION RECORDS*		
REV	DATE	DESCRIPTION
0	30.08.13	FIRST ISSUE

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Excitation and regulation panel - Components to be tested

1 - Energising of components

Verify first there is a connection between 125 V DC supply and inputs TB1/25 and TB1/26.
If not, TB1/25 and TB1/26 inputs shall be supplied directly with 125 V DC.

Put a bridge between the following terminals:
TB1/31 and TB1/32
TB1/41 and TB1/42
TB1/43 and TB1/44

Verify the position of the following switches:
Excitation switch → ON
PF/Volt selector → VOLT
Channel A → ON
Channel B → ON

Value of supplies:

Item 1E	Inputs	Energising
Control power supply (from excitation cubicle)	TB1/7 & TB1/8 TB3/7 & TB3/8 TB13/1 TB13/2	125 V DC
AVR U V W	TB1/5 TB1/6 & TB1/7	120/√3 V AC
AVR PMG	TB1/1 & TB1/2	209 V AC
Circuit excitation off: validation speed > 80%	TB1/27 & TB1/28	External switch

2 - Monitoring

Connections are inspected visually.
Measurements are performed before, during and after tests.

Item 1E	Outputs	Monitoring
AVR	TB1/3+ & TB1/4	Visually inspected, monitored for continuity of output voltage DC following initial measurement value and verification there is no change of state of contacts lasting more than 2 ms (*)
Circuit excitation on	TB1/88 & TB1/89 ON TB1/86 & TB1/87 OFF	Visually inspected, acceptance criterion is "excitation off signal not present", when switch related to TB1/27&28 is actuated and verification there is no change of state of contacts lasting more than 2 ms (*)
Auto control on from PLC	Channel A: TB1/84 & TB1/85 ON Channel B: TB1/108 & TB1/109 ON Excitation fault trip to manual: TB1/114 & TB1/115	Visually inspected, monitored for continuity of output signal and verification there is no change of state of contacts lasting more than 2 ms (*)

(*) In accordance with ANSI/IEEE C37.98

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CC CUBICLE / MV CUBICLE - COMPONENTS TO BE TESTED.

Cabinet	Technical Form	Designation	Auxiliary supply	Monitoring	Energising	VIRLAB Identification
CC	K31111	DC MOTOR STARTING RESISTOR (1,3 Ω)	21 V cc	Continuity	Apply an input current (16 A)	S1 (125 Vdc); S2 (continuity)
CC	K51211	AUXILIARY CONTACTOR CAD32GD	125V cc	Continuity auxiliary contacts (3 NC + 1 NO)	0 - 125 Vcc	D1 -D4 // S3-S6
CC	K51471	ONE PHASE MAIN CONTACTOR CV1	125V cc	Continuity main contact	Apply an input current (16 A)	S2 (continuity); S7 (current)
CC	L75321	SIGNALLING BOX (1 LIGHT)	125V cc	Luminosity	125 Vcc	Recorded by video
CC	N63121	MEASURE SHUNT	125V cc	Continuity	Apply an input current (16 A)	S8 (continuity)
MV	K41401	TETRAPOLAR ISOLATOR		Continuity three poles+neutral	-	D5 - D8
MV	N61203	POTENTIAL TRANSFORMER	120V / 50Hz	Continuity	Apply a voltage of 416 V	S9 (416 V); S10 (12 V)
						S: signal monitored in computer
						D: contact monitored in Fault Detector

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LV CUBICLE - COMPONENTS TO BE TESTED

Cabinet	Technical Form	Designation	Auxiliary supply	Monitoring	Energising	VIRLAB Identification
LV	K52121	INSTANTANEOUS RELAY (WITH DIODE)	125V cc	Continuity auxiliary contacts (4 change-over)	0 - 125 Vcc	S1 (125 Vdc);D1 -D4 // S2-S5
LV	K52122	INSTANTANEOUS RELAY	125V cc	Continuity auxiliary contacts (4 change-over)	0 - 125 Vcc	D5-D8 // S6-S9
LV	K52321	BISTABLE RELAY	125V cc	Continuity auxiliary contacts (2 change-over)	0 - 125 Vcc	D9-D10 // S10-S11
LV	K52821	INTERFACE MODULE	125V cc	Continuity auxiliary contact (1 change-over)	0 - 125 Vcc	D11-D12 // S12-S13
LV	K53351	MULTIFUNCTIONS RELAY	125V cc	Continuity auxiliary contacts (2 change-over)	0 - 125 Vcc	D13-D14 // S14-S15
LV	K53352	ELECTRONIC TIMER	125V cc	Continuity auxiliary contact (1 change-over)	0 - 125 Vcc	D15 // S16
LV	N88331	AMMETRIC THRESHOLD RELAY	125V cc	Continuity auxiliary contact (1 change-over)	0 - 125 Vcc; 4-20 mA	D16 // S17
LV	N88431	VOLTMETRIC THRESHOLD RELAY	125V cc	Continuity auxiliary contact (1 change-over)	0 - 125 Vcc; 100 mV	D17 // S18
LV	N82232	O/C WITH U/V PROTECTION RELAY	125V cc	Continuity auxiliary contacts	0 - 125 Vcc; 120 V; 5 A	D18 // S19; S20 (120 V); S21 (5A)
LV	K43231	2 POLES CIRCUIT BREAKER	125V cc	Continuity	Apply an input current (16 A)	S22 (continuity)
LV	K41201	BIPOLAR FUSES ISOLATOR	125V cc	Continuity	-	D19
LV	K42411	ISOLATOR SWITCH WITH LOCK	125V cc	Continuity	-	D20
LV	K45321	SWITCH COMMUTATOR	125V cc	Continuity	-	D21
LV	K51212	TRIPOLAR CONTACTOR	125V cc	Continuity three poles	0 - 125 Vcc	D22-D24 // S23-S25
						S: signal monitored in computer
						D: contact monitored in Fault Detector

LV CUBICLE - COMPONENTS TO BE TESTED

Cabinet	Technical Form	Designation	Auxiliary supply	Monitoring	Energising	VIRLAB Identification
LV	K13002	CURRENT TEST BLOCK	-	Continuity	-	D1
LV	K17101	TERMINAL 9,5 WITH SCREW	-	Continuity		
LV	K17102	TERMINAL 10	-	Continuity		
LV	K17202	M4 TERMINAL STUD 6mm2	-	Continuity	-	D2
LV	K17204	POWER TERMINAL 6-70mm2	-	Continuity		
LV	K17210	TERMINAL 6 GREEN/YELLOW	-	Continuity		
LV	K45726	CONTROL SWITCH CRH16B	-	Continuity	-	D3
LV	K46211	PUSH BUTTON C16BLP	-	Continuity	-	D4
LV	K46311	PUSH BUTTON C16BPH	-	Continuity	-	D5
LV	L76226	SIGNALLING BOX 2 LIGHTS	125 Vcc	Luminosity		Recorded by video
LV	N21521	AMMETER WITH CENTRAL ZERO 96x96	mA	Visual	-	-
LV	N21532	BLADES DOUBLE FREQUENCYMETER 96x96	100V/50Hz	Visual	-	-
LV	N21533	DIFFERENTIAL VOLTMETER 96x96	100V/50Hz	Visual	-	-
LV	N48121	HOUR COUNTER	100V/50Hz	Visual	-	-
LV	N51131	SINGLE PHASE VOLTAGE CONVERTER	125 Vcc	Continuity	0-120 V	S1 (60V); S2 (12mA / 60V)
LV	N51132	THREE PHASES VOLTAGE-FREQUENCY CONVERTER	125 Vcc	Continuity	0-120 V / 60 Hz	S3 (60V); S4 (12mA / 60 V); S5 (12 mA / 60 Hz)
LV	N51133	SINGLE PHASE VOLTAGE CONVERTER (EXCITATION CURRENT)	125 Vcc	Continuity	0-100 mV	S6 (50 mV); S7 (12mA / 50 mV)
LV	N52131	SINGLE PHASE CURRENT CONVERTER	100V/50Hz	Continuity	0-5 A	S8 (2,5 A); S9 (12mA / 2.5 A)
LV	N52132	THREE PHASES CURRENT CONVERTER	125 Vcc	Continuity	0-5A Three phases	S10 (2,5 A); S11-S13 (12mA / 2,5 A / 3 Phases)
LV	N52133	CURRENT CONVERTER 4-20mA/4-20mA	125 Vcc	Continuity	4-20 mA	S14 (12 mA / 12mA)
LV	N53121	THREE PHASES CONVERTER (P, Q, Cos Phi)	125 Vcc	Continuity	0-5A/0120V/3 Ph	S15(2,5A);S16-S18(60V/3Ph); S19-S21(mA/W;mA/Var);mA/cos f)
LV	N58131	TEMPERATURE ANALOGIC CONVERTER	125 Vcc	Continuity	-	S22 (mA / °C); S23 (°C)
LV	N61121	INTERPOSING TRANSFORMER(120V/V3 / 120V	120V/√3	Continuity	120V/√3	S24 (120V /√3); S25 (120V)
						S: signal monitored in computer
						D: contact monitored in Fault Detector

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APPENDIX 5

MONITORING DURING TESTS

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TAIPOWER DRAWING NUMBER: 12801.MS041-6.XXXXX P-2402-A4XXXX.37 /0

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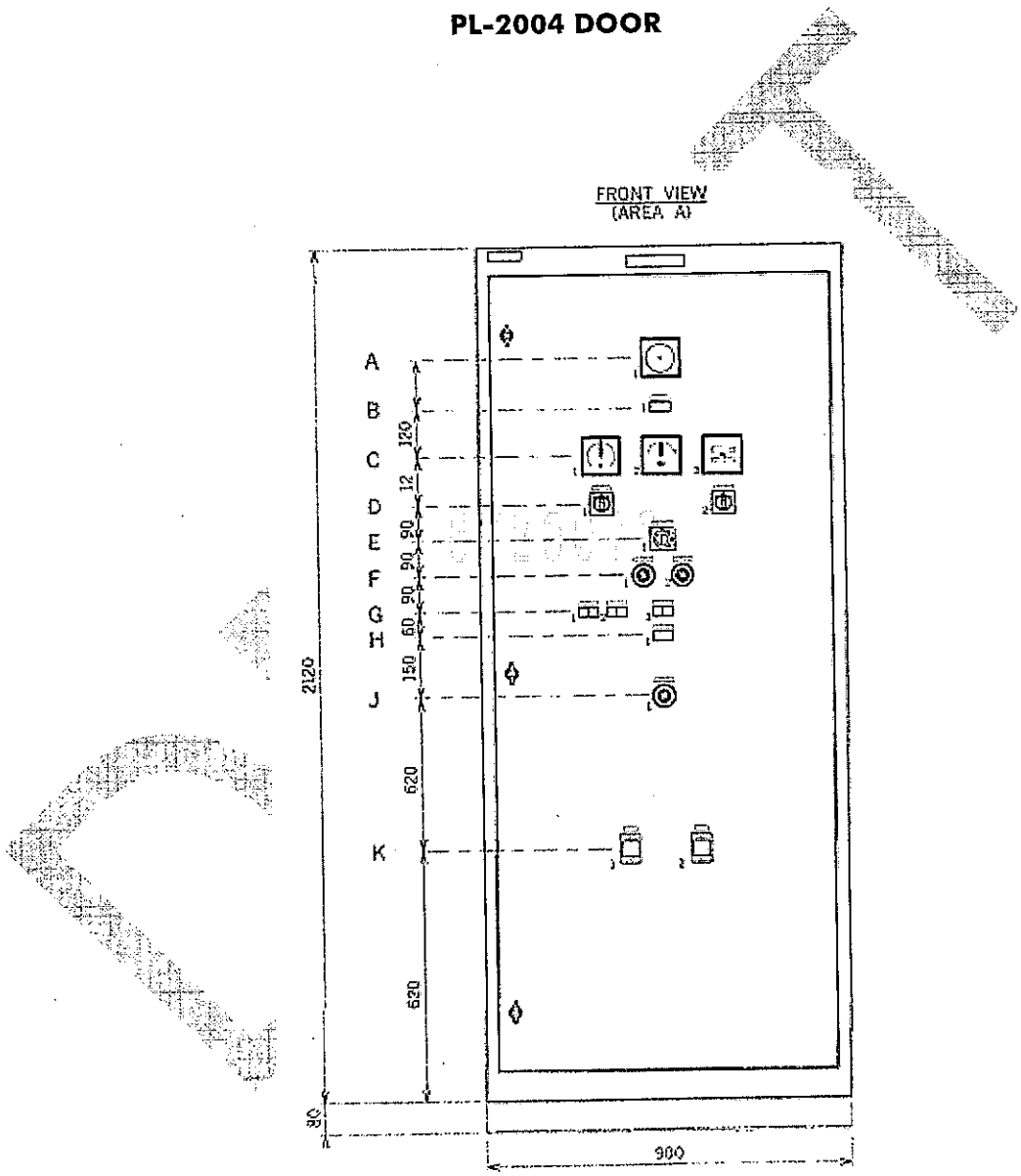
APPENDIX 4

ACCELEROMETER LOCATION

ALSTOM

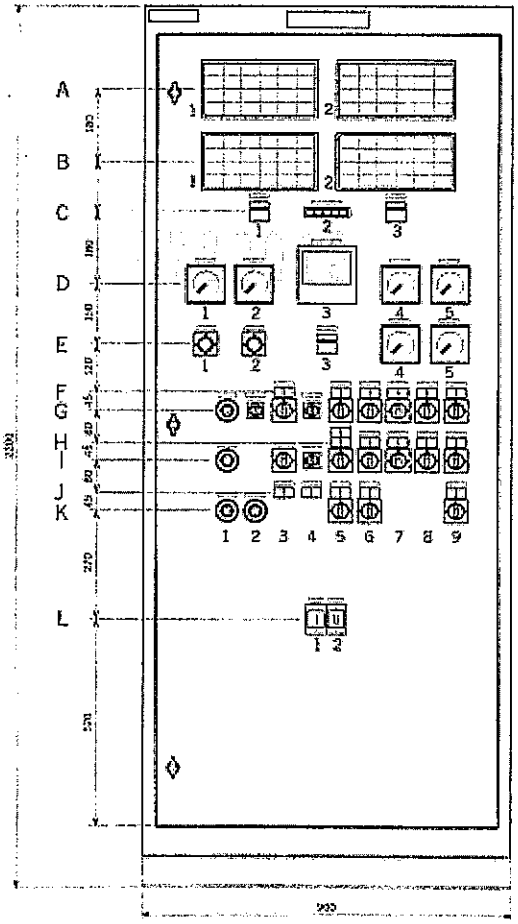
PL-2004 DOOR



ALSTOM

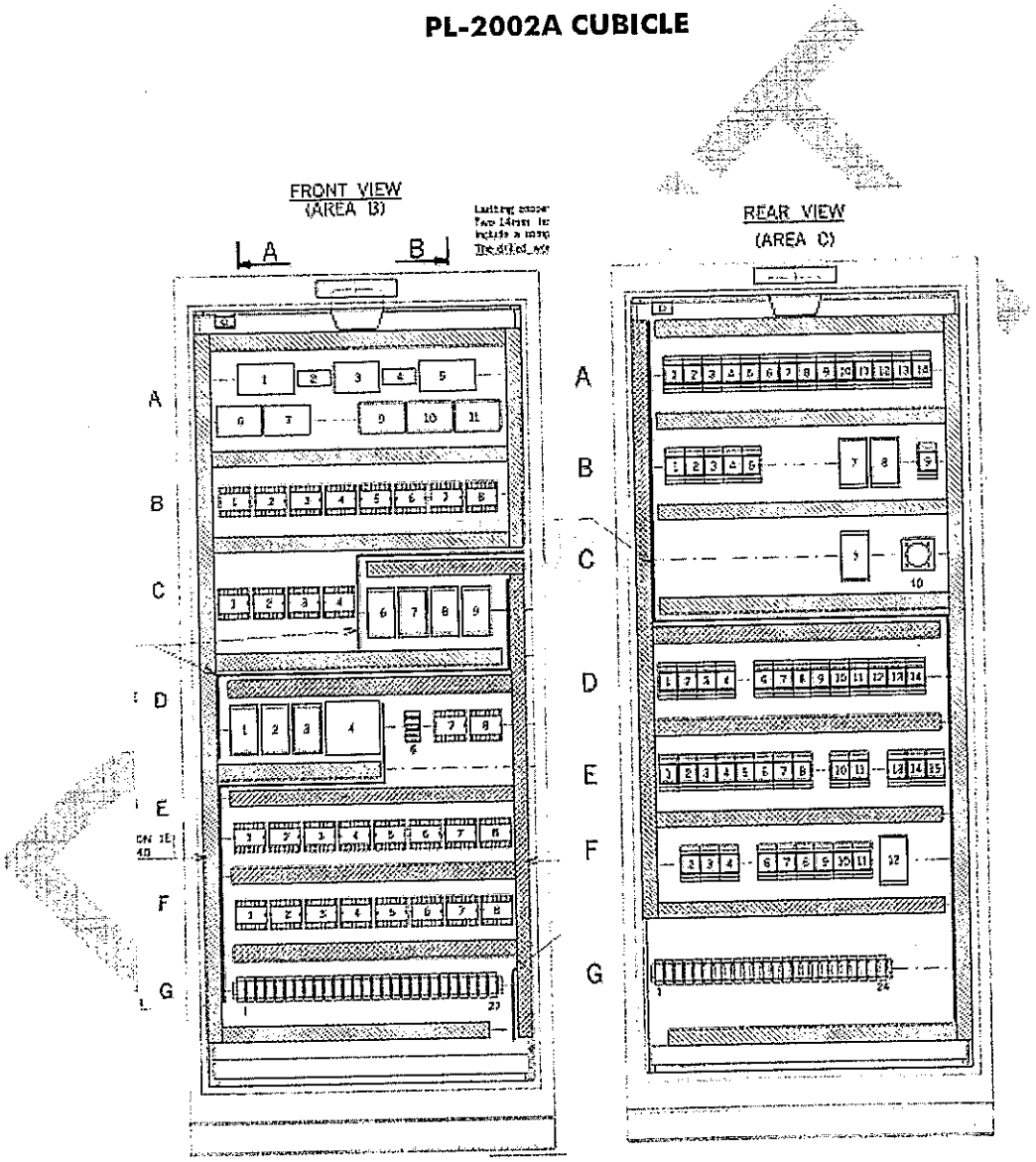
PL-2002B DOOR

FRONT VIEW
(AREA A)



ALSTOM

PL-2002A CUBICLE



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REF	Description	Most unfavorable location among all cubicles	Position in representative cubicle 2002 A	Position in representative door of cubicle 2002 B	Position in representative door of cubicle 2004	Position in representative cubicle 2012
	(120V / 100V)					
N61121	Interposing transformer (120V/V3/120V)	2003-2004 B/J02	2002 B/G14			
N63121	Measure shunt (P0003)	2012 C/B05				2012 C/B05
N74111	Check synchronizing relay	2003-2004 C/B02	2002 B/B07			
N74221	Synchronizing device	2003-2004 B/B01	2002 B/B02			
N83291	Lock-out relay 125V DC (LOR)	2003-2004 A/A03 Door			2004 A/D02 moved	
N88331	Ammetric threshold relay	2002 B/B04	2002 B/B04			
N88431	Voltmetric threshold relay (P0003)	2012 C/B01				2012 C/B01

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REF	Description	Most unfavorable location among all cubicles	Position in representative cubicle 2002 A	Position in representative door of cubicle 2002 B	Position in representative door of cubicle 2004	Position in representative cubicle 2012
N51131	Single-phase voltage converter	2002 B/D02	2002 C/E02			
N51132	Three-phase voltage-frequency converter	2002 B/D06	2002 C/E06			
N51133	Single-phase voltage converter (excitation current)	2001 C/A08	2002 B/A02			
N51134	Single-phase voltage converter (excitation)	2001 C/A09	2002 B/A01			
N51135	Three-phase voltage converter	2002 B/D05	2002 C/E05			
N52131	Single-phase current converter	2002 B/D01	2002 C/E01			
N52132	Three-phase voltage converter (IA IB IC)	2002 B/D04	2002 C/E04			
N52133	Current converter 4-20mA/4-20mA	2002 B/C06	2002 B/C06			
N53121	Three-phase current converter (P,Q,cos Phi)	2002 B/D03	2002 C/E03			
N58131	RTD temperature transmitter (pt100/4-20mA)	2002 C/B07	2002 C/B07			
N58132	RTD temperature transmitter (pt100/4-20mA)	2002 C/F12	2002 C/F12			
N61120	Synchro insulating transformer	2003-2004 B/H02	2002 B/F06			

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REF	Description	Most unfavorable location among all cubicles	Position in representative cubicle 2002 A	Position in representative door of cubicle 2002 B	Position in representative door of cubicle 2004	Position in representative cubicle 2012
	front connections					
K58122	Base for relay front connections (for 1841)					
N21510	Indicator 4-20mA (Speed) 96x96	2004 A/A01 Door			2004 A/A01	
N21517	Excitation ammeter 96x96	2001 A/A02 Door		2002 A/B01		
N21518	Excitation voltmeter 96x96	2001 A/A03 Door		2002 A/B01		
N21519	Ammeter (P0003) 96x96	2012 A/A01 Door				2012 A/A01 Door
N21520	Ammeter (P0013) 96x96					
N21521	Ammeter switch central zero 96x96	2001 A/A04	2002 B/A10			
N21531	Synchroscope 96x96 (with 2 lamps)	2003-2004 A/C02 Door			2004 A/C02	
N21532	Double frequencymeter at blades 96x96	2003-2004 A/C03 Door			2004 A/C03	
N21533	Differential voltmeter 96x96	2003-2004 A/C01 Door			2004 A/C01	
N21534	External box (for differential voltmeter)	2003-2004 A/C01 Door			2004 A/C01	
N48121	Hour counter 48x48	2002 A/E03 Door		2002 A/E03		

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REF	Description	Most unfavorable location among all cubicles	Position in representative cubicle 2002 A	Position in representative door of cubicle 2002 B	Position in representative door of cubicle 2004	Position in representative cubicle 2012
	DC					
K51471	Main contactor 125V DC (P0003)	2012 C/C05				2012 C/C05
K51472	Step contactor 125V DC (P0003)	2012 C/C05				2012 C/C05
K51911	Time delay block for auxiliary contactor					
K51912	Diode for auxiliary contactor					
K51971	Coil for contactor 125V DC (opening 1 pole) P0003					
K51972	Coil for contactor 125V DC (opening 1 pole) P0003					
K51975	Electro-magnet for contactor CV1 (P0003)					
K51978	Auxiliary switch "F"					
K51979	Auxiliary switch "O"					
K52111	Instantaneous relay 24V DC (with diode)	2002 C/B09	2002 C/B09			
K52121	Instantaneous relay 125V DC (with diode)	2002 C/A07	2002 C/A07			
K52321	Bistable relay 125V DC					
K52811	Interface module 24V DC					
K52821	Interface module 125V DC	2001 C/A05	2002 B/A09			
K53351	Multifunctions relay (F or O) 125V DC 1841	2012 B/C05				2012 B/C05
K58121	Base for relay					

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REF	Description	Most unfavorable location among all cubicles	Position in representative cubicle 2002 A	Position in representative door of cubicle 2002 B	Position in representative door of cubicle 2004	Position in representative cubicle 2012
	commutator (2 positions) TPL					
K45721	Switch commutator (2 positions) with return to zero	2001 A/AE01 Door		2002 A/D02		
K45726	Key switch commutator (2 positions) with return to zero	2002 Door		2002 A/I04		
K45731	Switch commutator (3 positions) with return to zero	2002 Door		2002 A/G05		
K45733	Switch commutator (3 positions) with return to zero	2002 Door		2002 A/G03		
K45735	Switch commutator (3 positions) with return to zero	2003-2004 Door			2004 A/D01	
K45741	Key switch commutator (4 positions)	2003-2004 Door			2004 A/E01	
K46111	White push-button	2003-2004 Door			2004 A/F02	
K46112	White push-button	2003-2004 Door			2004 A/F01	
K46113	Black push-button	2012 A/F01 Door				2012 A/F01 Door
K46211	White push-button (with cover)	2002 Door		2002 A/K02		
K46311	Red push-button (with cover)	2002 Door		2002 A/G01		
K51211	Auxiliary contactor 125V DC					
K51212	Tripolar contactor 125V	2004 B/F16	2002 B/E08			

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DC Cubicle

REF	Description	Most unfavorable location among all cubicles	Position in representative cubicle 2002 A	Position in representative door of cubicle 2002 B	Position in representative door of cubicle 2004	Position in representative cubicle 2012
K31111	125V DC motor starting resistors (P0003)	2012 B/A01				2012 B/A01
K38101	Cylindrical fuse 14x51 4A (with trip indicator)					
K38102	Cylindrical fuse 14x51 10A (with trip indicator)					
K41201	Bipolar fuses-isolator (with contact)					
K41921	Locked accessorie					
K42611	3P Hand switch interruptor (125V DC) P0003	2012 C/A07				2012 C/A07
K43201	2 Poles circuit breaker 2A (DC)	2012 B/B06				2012 B/B06
K43205	2 Poles circuit breaker 3A (DC)	2012 B/B02				2012 B/B02
K43211	2 Poles circuit breaker 6A (DC)	2012 B/B03				2012 B/B03
K43231	2 Poles circuit breaker 16A (DC)	2001 C/B11	2002 B/B05			
K43901	Position auxiliary switch (DC)					
K45122	Switch commutator (2 positions)	2002 Door		2002 A/I05		
K45123	Switch commutator (2 positions)	2001 A/D01 Door		2002 A/D01		
K45125	Key switch commutator (2 positions)	2002 Door		2002 A/G02		
K45137	Key switch commutator (3 positions)	2002 Door		2002 A/G04		
K45141	Ammeter switch	2002 Door		2002 A/E01		
K45142	Voltmeter switch	2002 Door		2002 A/E02		
K45321	Switch	2002 Door		2002 A/I03		

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APPENDIX 3

TESTED SPECIMEN CUBICLE DEFINITION

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REF	Description	Comments	Tested in cubicle / Equipment on table	Most unfavourable location among all cubicles
	converter (IA IB IC)			
N52133	Current converter 4-20mA/4-20mA		Tested in cubicle	2002 B/C06
N53121	Three-phase current converter (P,Q,cos Phi)		Tested in cubicle	2002 B/D03
N58131	RTD temperature transmitter (pt100/4-20mA)		Tested in cubicle	2002 B/B07
N58132	RTD temperature transmitter (pt100/4-20mA)		Tested in cubicle	2002 C/F12
N61120	Synchro insulating transformer (120V / 100V)		Tested in cubicle	2003-2004 B/H02
N61121	Interposing transformer (120V/V3/120V)		Tested in cubicle	2003-2004 B/J02
N61202	Neutral Grounding transformer (1 secondary)		Tested on table	
N61203	Potential transformer (2 secondaries)		Tested on table	
N63121	Measure shunt (P0003)		Tested in cubicle	2012 C/B05
N73111	Automatic voltage regulator (AVR)		Tested on table	
N74111	Check synchronizing relay		Tested in cubicle	2003-2004 C/B02
N74221	Synchronizing device		Tested in cubicle	2003-2004 B/B01
N83291	Lock-out relay 125V DC (LOR)		Tested in cubicle	2003-2004 A/A03 Door
N88331	Ammetric threshold relay		Tested in cubicle	2002 B/B04
N88431	Voltmetric threshold relay (P0003)		Tested in cubicle	2012 C/B01

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REF	Description	Comments	Tested in cubicle / Equipment on table	Most unfavourable location among all cubicles
N25252	Bargraph indicator (Level)			
N25253	Bargraph indicator (Pressure)			
N25254	Bargraph indicator (Temperature)			
N21510	Indicator 4-20mA (Speed) 96x96	Difference is only text engraving Model provided for re-test is N21510	Tested on cubicle door	2004 A/A01 Door
N21511	Indicator 4-20mA (Ammeter) 96x96		Tested on cubicle door	
N21512	Indicator 4-20mA (Voltmeter) 96x96		Tested on cubicle door	
N21513	Indicator 4-20mA (Frequencymeter) 96x96		Tested on cubicle door	
N21514	Indicator 4-20mA (Active power) 96x96		Tested on cubicle door	
N21515	Indicator 4-20mA (Reactive power) 96x96		Tested on cubicle door	
N21516	Indicator 4-20mA (Cos phi) 96x96		Tested on cubicle door	
N21517	Excitation ammeter 96x96		Tested on cubicle door	2001 A/A02 Door
N21518	Excitation voltmeter 96x96		Tested on cubicle door	2001 A/A03 Door
N21519	Ammeter (P0003) 96x96		Tested on cubicle door	2012 A/A01 Door
N21520	Ammeter (P0013) 96x96		Tested on cubicle door	
N21521	Ammeter switch central zero 96x96		Tested on cubicle door	2001 A/A04
N21531	Synchroscope 96x96 (with 2 lamps)		Tested on cubicle door	2003-2004 A/C02 Door
N21532	Double frequency meter at blades 96x96		Tested on cubicle door	2003-2004 A/C02 Door
N21533	Differential voltmeter 96x96		Tested on cubicle door	2003-2004 A/C02 Door
N21534	External box (for differential voltmeter)		Tested on cubicle door	2003-2004 A/C02 Door
N48121	Hour counter 48x48		Tested in cubicle	2002 A/E03 Door
N51131	Single-phase voltage converter		Tested in cubicle	2002 B/D02
N51132	Three-phase voltage-frequency converter		Tested in cubicle	2002 B/D06
N51133	Single-phase voltage converter (excitation current)		Tested in cubicle	2001 C/A08
N51134	Single-phase voltage converter (excitation)		Tested in cubicle	2001 C/A09
N51135	Three-phase voltage converter		Tested in cubicle	2002 B/D05
N52131	Single-phase current converter		Tested in cubicle	2002 B/D01
N52132	Three-phase voltage		Tested in cubicle	2002 B/D04

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REF	Description	Comments	Tested in cubicle / Equipment on table	Most unfavourable location among all cubicles
K51978	Auxiliary switch "F"		Tested in cubicle	
K51979	Auxiliary switch "O"		Tested in cubicle	
K52111	Instantaneous relay 24V DC (with diode)		Tested in cubicle	2002 C/B09
K52121	Instantaneous relay 125V DC (with diode)		Tested in cubicle	2002 C/A07
K52321	Bistable relay 125V DC		Tested in cubicle	
K52811	Interface module 24V DC		Tested in cubicle	
K52821	Interface module 125V DC		Tested in cubicle	2001 C/A05
K53351	Multifunctions relay (F or O) 125V DC 1841		Tested in cubicle	2012 B/C05
K58121	Base for relay front connections		Tested in cubicle	
K58122	Base for relay front connections (for 1841)		Tested in cubicle	
L21311	Power supply 125V DC / 24V DC (200W)		Tested on table	
L75320	Blue signalling unit 125V		Tested on table	
L75321	Red signalling unit 125V		Tested on table	
L75324	White signalling unit 125V		Tested on table	
L76211	Signalling box 1 light DIN 48x24 (1 lamp/light)	Difference is only text engraving. Model manufacturing discontinued. No sample available for re-test	Tested on table	
L76212	Signalling box 1 light DIN 48x24 (1 lamp/light)		Tested on table	
L76221	Signalling box 2 lights DIN 48x24 (1 lamp/light)	Difference is only text engraving. Model manufacturing discontinued. No sample available for re-test	Tested on table	
L76222	Signalling box 2 lights DIN 48x24 (1 lamp/light)		Tested on table	
L76223	Signalling box 2 lights DIN 48x24 (1 lamp/light)		Tested on table	
L76225	Signalling box 2 lights DIN 48x24 (1 lamp/light)		Tested on table	
L76226	Signalling box 2 lights DIN 48x24 (1 lamp/light)		Tested on table	
L76241	Signalling box 4 lights DIN 48x24 (1 lamp/light)	Difference is only text engraving. Model manufacturing discontinued. No sample available for re-test	Tested on table	
L76242	Signalling box 4 lights DIN 48x24 (1 lamp/light)		Tested on table	
L76243	Signalling box 4 lights DIN 48x24 (1 lamp/light)		Tested on table	
M21201	Diodes holder (14)		Tested on table	
N25251	Bargraph indicator (Flow)	Difference is the scale engraving Model manufacturing discontinued. No sample available for re-test		

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REF	Description	Comments	Tested in cubicle / Equipment on table	Most unfavourable location among all cubicles
K45142	Voltmeter switch		Tested on cubicle door	2002 Door
K45321	Switch commutator (2 positions) TPL		Tested on cubicle door	2002 Door
K45721	Switch commutator (2 positions) with return to zero		Tested on cubicle door	2001 A/AE01 Door
K45726	Key switch commutator (2 positions) with return to zero		Tested on cubicle door	2002 Door
K45731	Switch commutator (3 positions) with return to zero		Tested on cubicle door	2002 Door
K45733	Switch commutator (3 positions) with return to zero		Tested on cubicle door	2002 Door
K45735	Switch commutator (3 positions) with return to zero	Difference is only text engraving Model provided for re-test is K45735 only	Tested on cubicle door	2003-2004 Door
K45736	Switch commutator (3 positions) with return to zero		Tested on cubicle door	
K45741	Key switch commutator (4 positions)		Tested on cubicle door	2003-2004 Door
K46111	White push-button		Tested on cubicle door	2003-2004 Door
K46112	White push-button		Tested on cubicle door	2003-2004 Door
K46113	Black push-button		Tested on cubicle door	2012 A/F01 Door
K46211	White push-button (with cover)		Tested on cubicle door	2002 Door
K46311	Red push-button (with cover)		Tested on cubicle door	2002 Door
K51211	Auxiliary contactor 125V DC		Tested in cubicle DC???	
K51212	Tripolar contactor 125V DC		Tested in cubicle DC???	2004 B/F16
K51471	Main contactor 125V DC (P0003)		Tested in cubicle DC???	2012 C/C05
K51472	Step contactor 125V DC (P0003)		Tested in cubicle DC???	2012 C/C05
K51911	Time delay block for auxiliary contactor		Tested in cubicle DC???	
K51912	Diode for auxiliary contactor		Tested in cubicle DC???	
K51971	Coil for contactor 125V DC (opening 1 pole) P0003		Tested in cubicle	
K51972	Coil for contactor 125V DC (opening 1 pole) P0003		Tested in cubicle	
K51975	Electro-magnet for contactor CV1 (P0003)		Tested in cubicle	

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REF	Description	Comments	Tested in cubicle / Equipment on table	Most unfavourable location among all cubicles
K13002	Current test block - Flush mounting		Tested on table	
K13102	Voltage test block - Flush mounting		Tested on table	
K13202	Control test block - Flush mounting		Tested on table	
K17101	Terminal 9,5 with screws (For Lug)		Tested on table	
K17102	Terminal 10 SCR./SCR.		Tested on table	
K17105	Terminal 6 SCR./SCR. with shield continuity		Tested on table	
K17151	Terminal 8 SCR./SCR.		Tested on table	
K17202	M4 Terminal stud 6mm²		Tested on table	
K17203	Power terminal 6-35mm²		Tested on table	
K31111	125V DC motor starting resistors (P0003)		Tested in cubicle DC???	
K31131	Neutral M.V. Grounding resistor		Calculation	
K31211	Diode for contactor 125V DC		Tested on table???	
K38101	Cylindrical fuse 14x51 4A (with trip indicator)		Tested in cubicle	
K38102	Cylindrical fuse 14x51 10A (with trip indicator)		Tested in cubicle	
K41201	Bipolar fuses-isolator (with contact)		Tested in cubicle	
K41401	Tetrapolar isolator		Tested in cubicle	
K41921	Locked accessory		Tested in cubicle	
K42411	Isolator switch (with lock)		Tested on table	
K42611	3P Hand switch interrupter (125V DC) P0003		Tested in cubicle	2012 C/A07
K43201	2 Poles circuit breaker 2A (DC)		Tested in cubicle	2012 B/B06
K43205	2 Poles circuit breaker 3A (DC)		Tested in cubicle	2012 B/B02
K43211	2 Poles circuit breaker 6A (DC)		Tested in cubicle	2012 B/B03
K43231	2 Poles circuit breaker 16A (DC)		Tested in cubicle	2001 C/B11
K43901	Position auxiliary switch (DC)		Tested in cubicle	
K45122	Switch commutator (2 positions)		Tested on cubicle door	2002 Door
K45123	Switch commutator (2 positions)		Tested on cubicle door	2001 A/D01 Door
K45125	Key switch commutator (2 positions)		Tested on cubicle door	2002 Door
K45136	???			
K45137	Key switch commutator (3 positions)		Tested on cubicle door	2002 Door
K45141	Ammeter switch		Tested on cubicle door	2002 Door

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APPENDIX 2

IDENTIFICATION OF

CLASS 1E DEVICES TO BE TESTED

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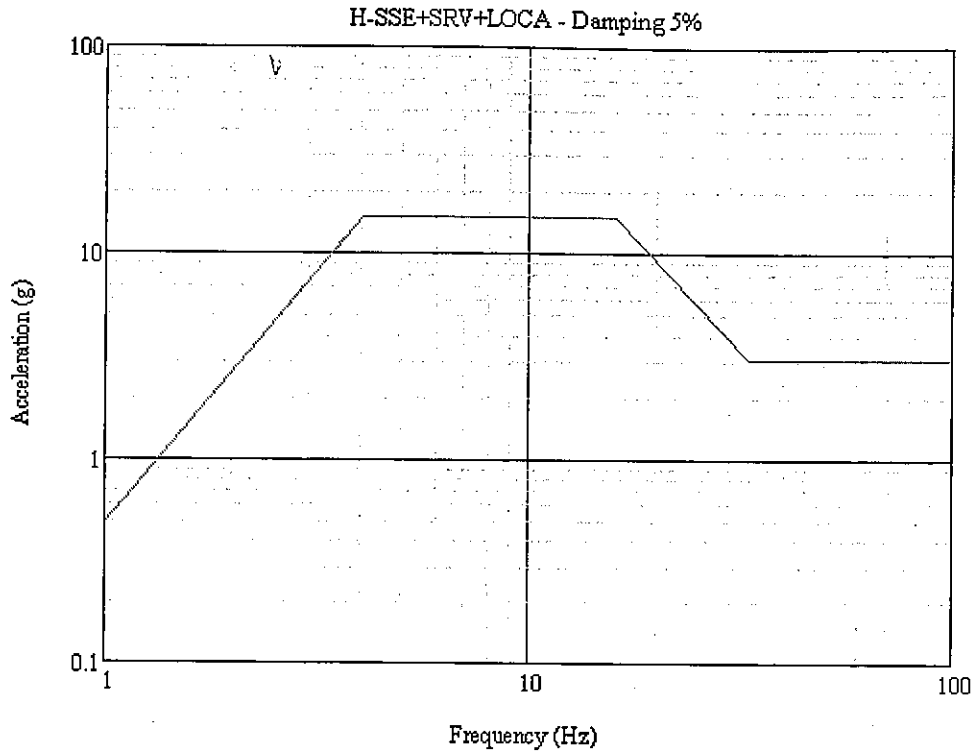
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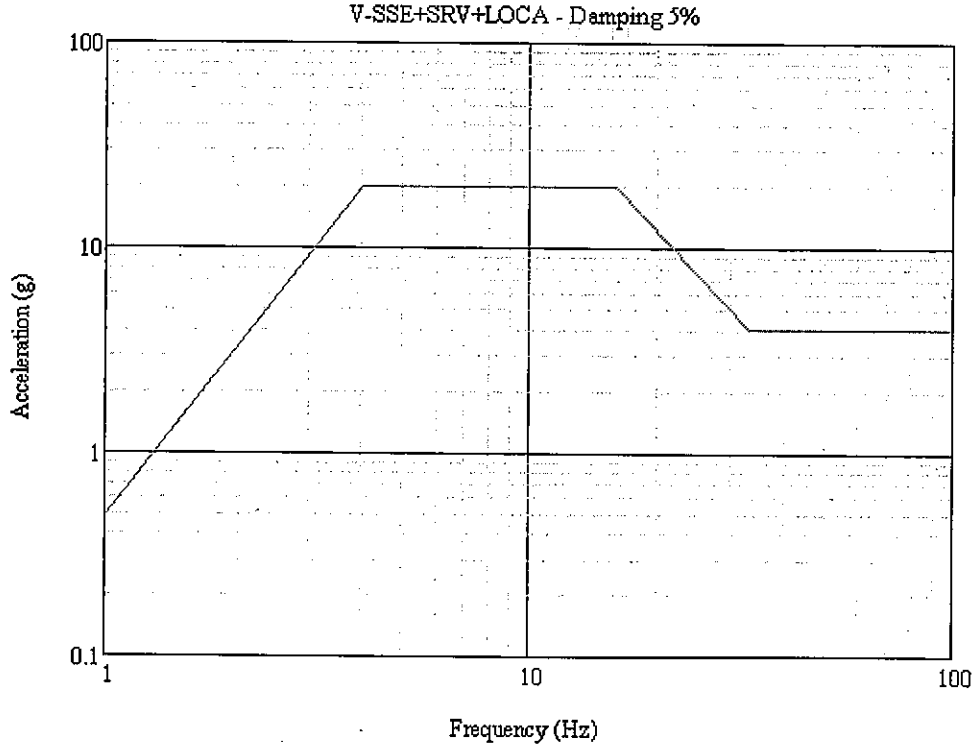
10
1
0.1
Acceleration (g)
1
10
100
Frequency (Hz)


V-SSE+SRV+LOCA - Damping 5%
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10
1
0.1
Acceleration (g)
1
10
100
Frequency (Hz)

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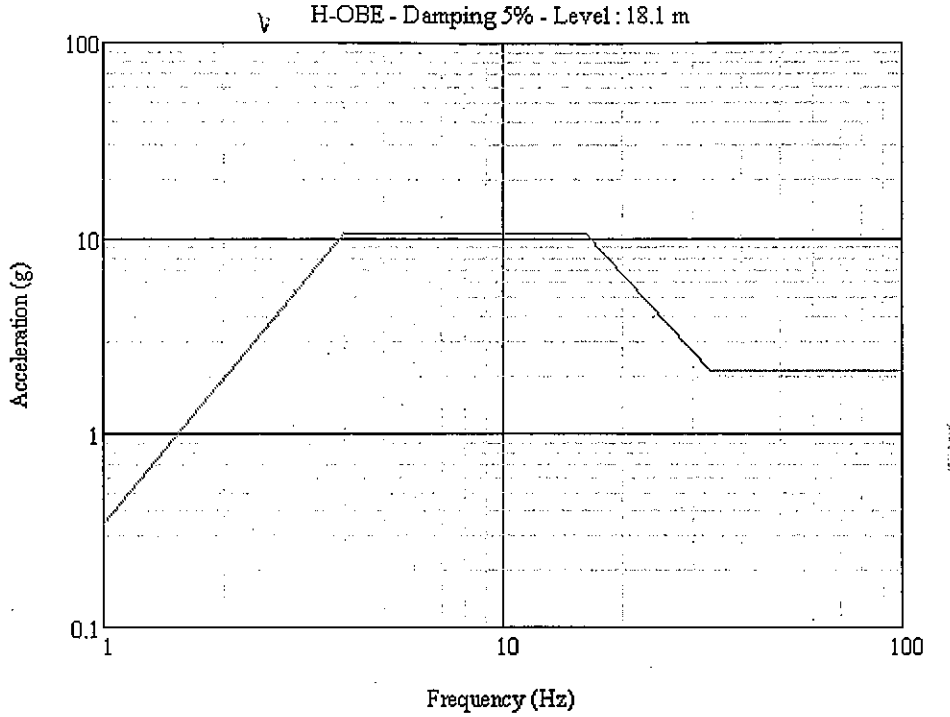
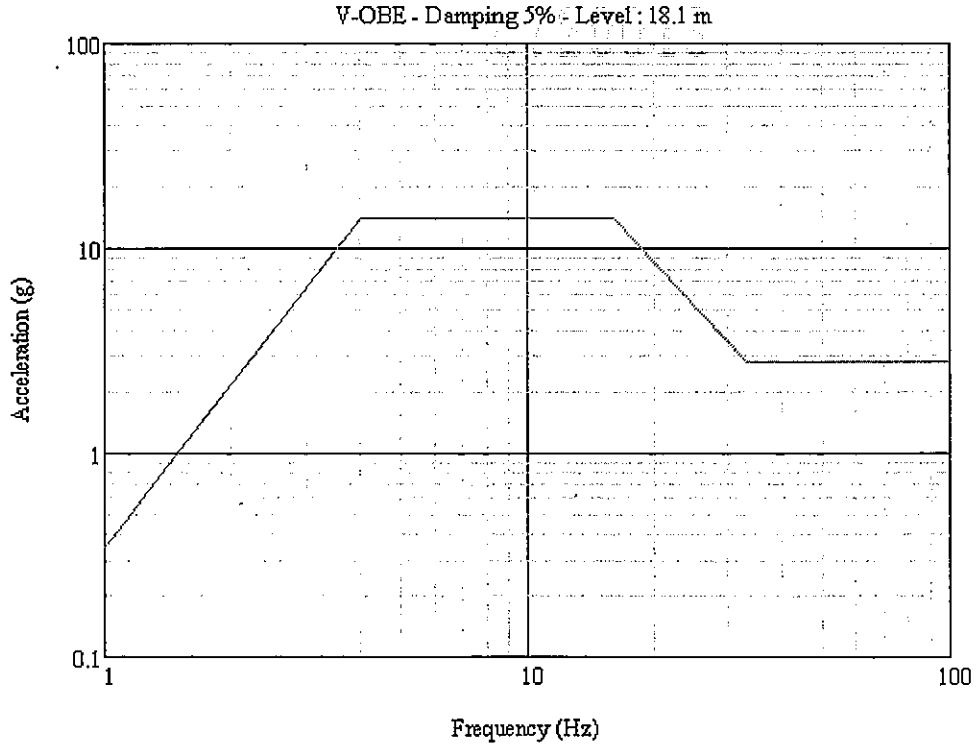
REQUIRED RESPONSE SPECTRA FOR DEVICES





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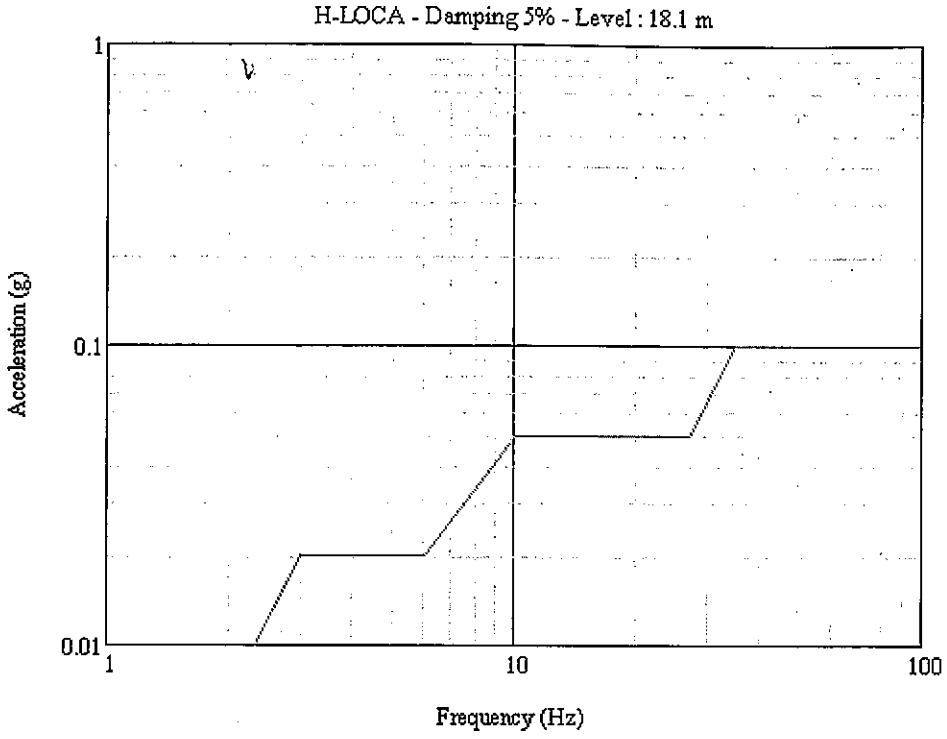
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Acceleration (g)
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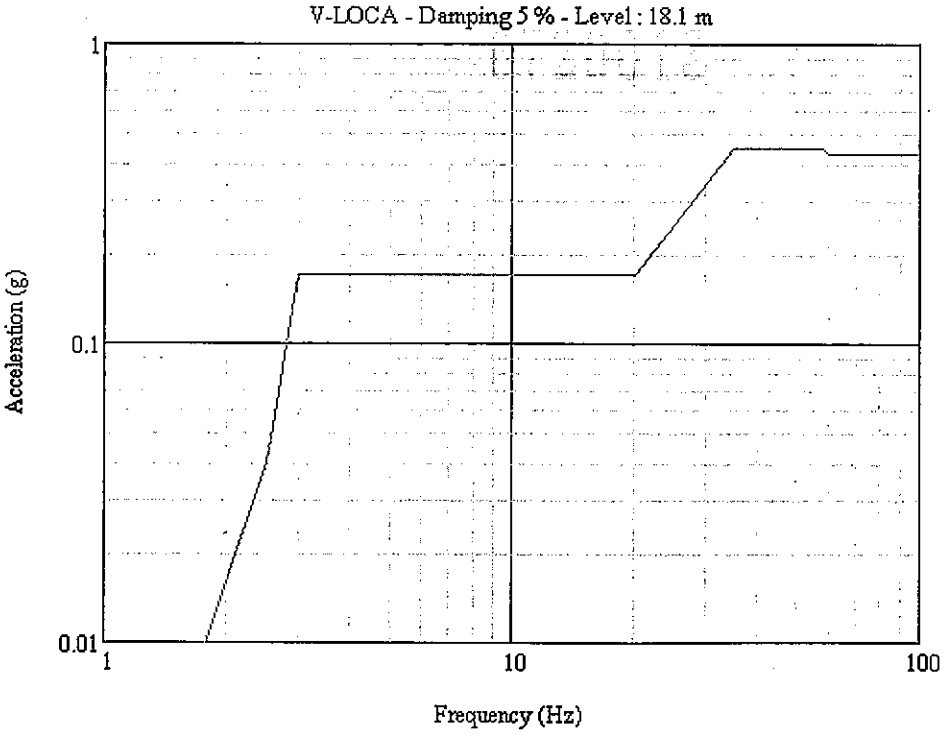
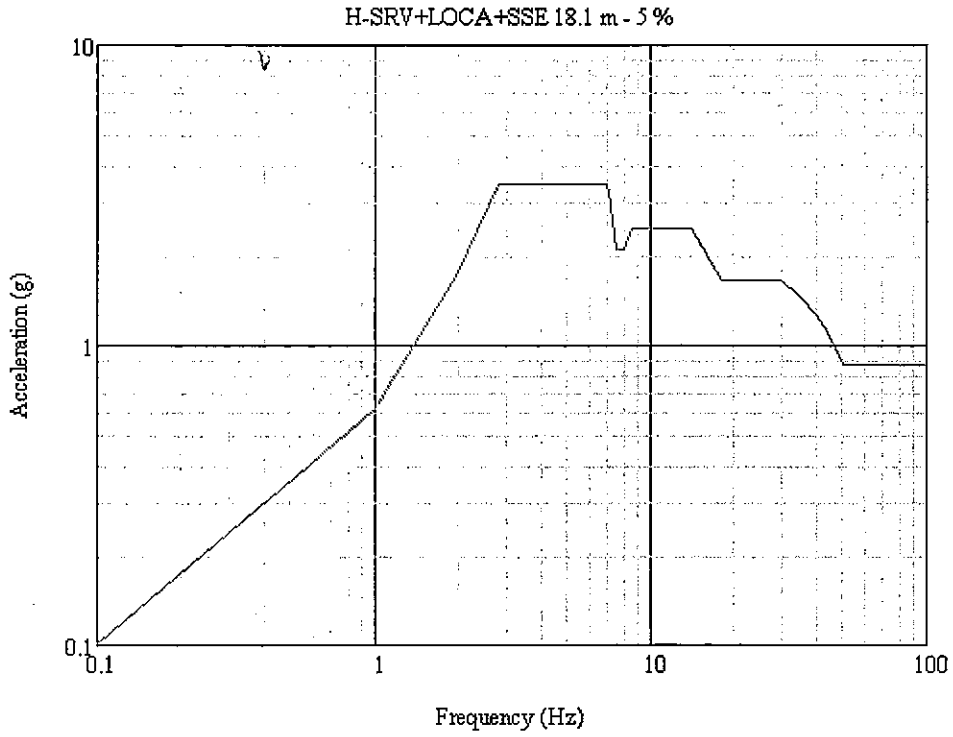
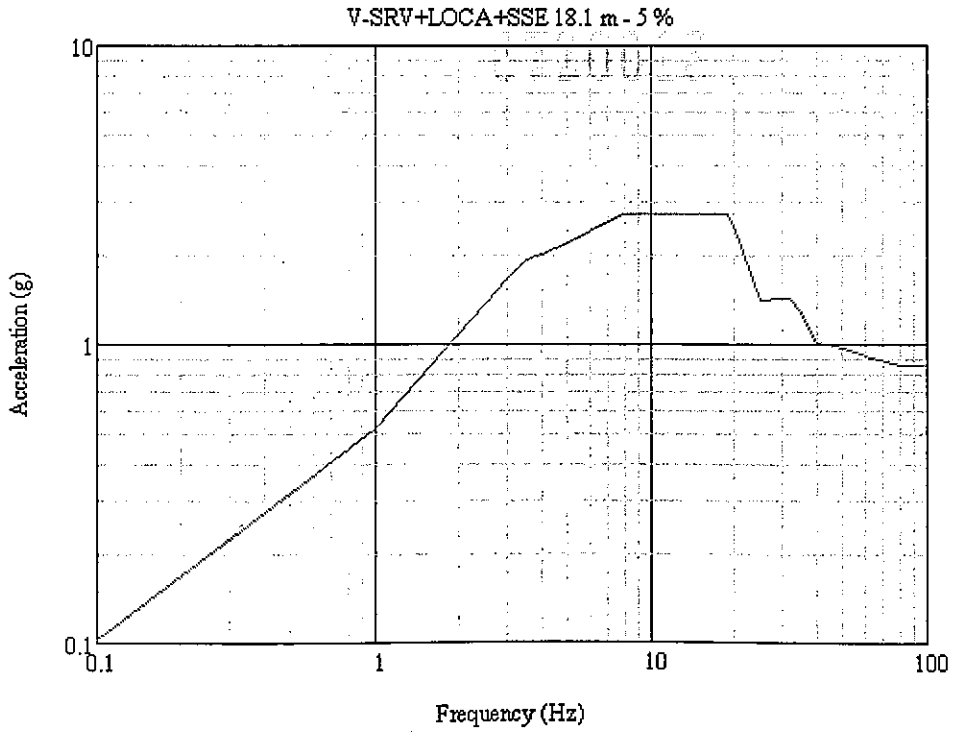
0.1
0.01
1
10
100
Frequency (Hz)


V-LOCA - Damping 5 % - Level : 18.1 m
Acceleration (g)
1
0.1
0.01
1
10
100
Frequency (Hz)

ALSTOM


H-SRV+LOCA+SSE 18.1 m - 5 %
10
1
0.1
Acceleration (g)
0.1
1
10
100
Frequency (Hz)


V-SRV+LOCA+SSE 18.1 m - 5 %
10
1
0.1
Acceleration (g)
0.1
1
10
100
Frequency (Hz)

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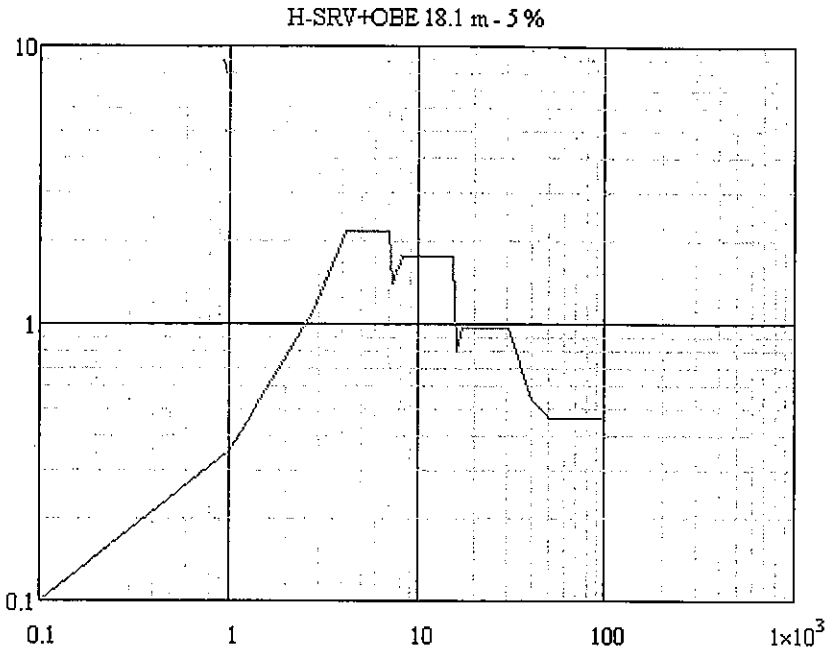
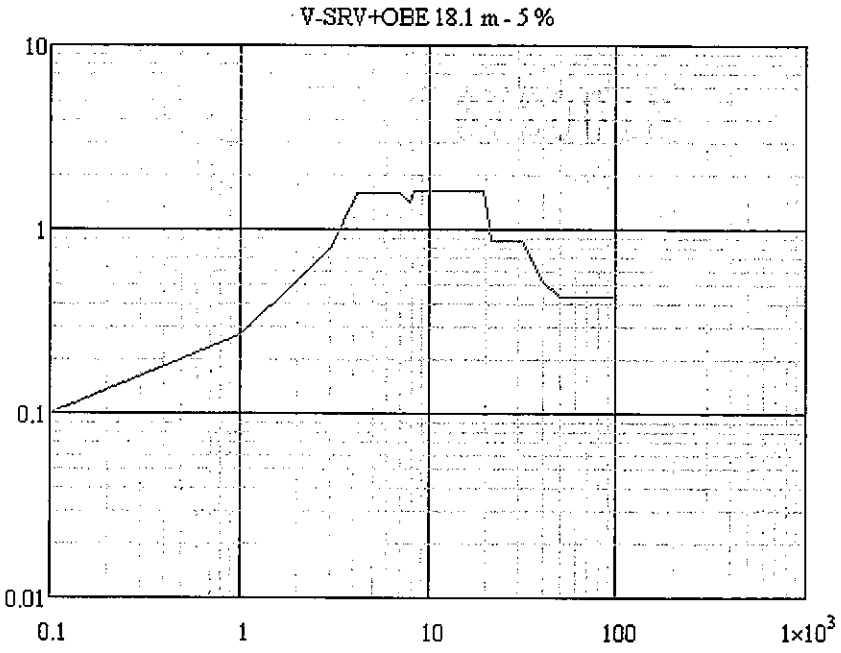

H-SRV+OBE 18.1 m - 5 %
10
1
0.1
0.1
1
10
100
1×10^3


V-SRV+OBE 18.1 m - 5 %
10
1
0.1
0.01
0.1
1
10
100
1×10^3

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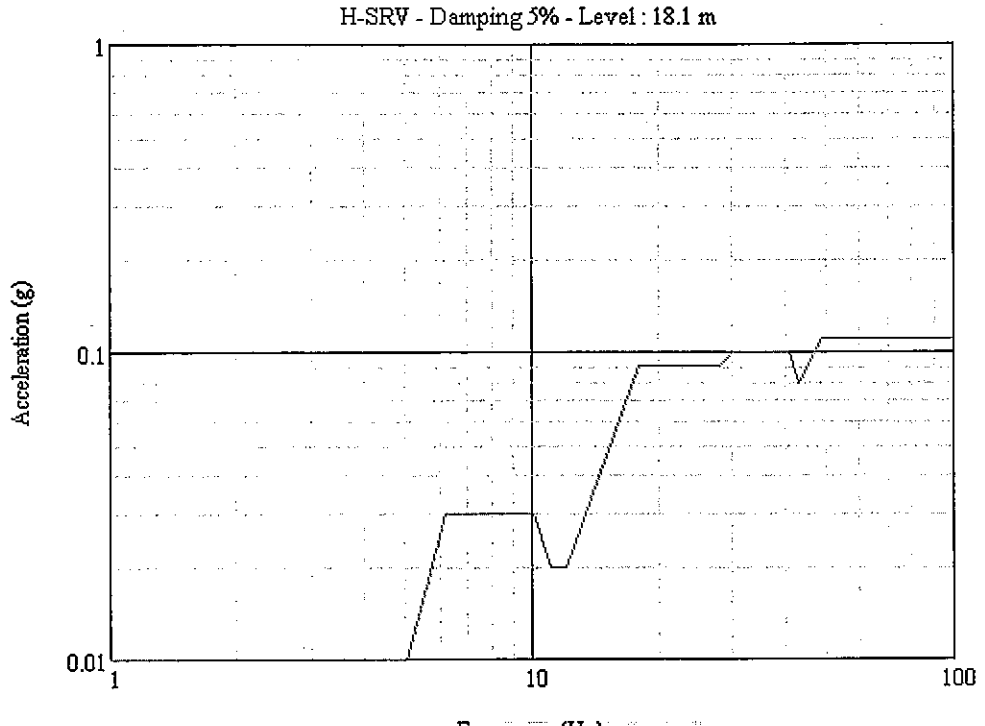
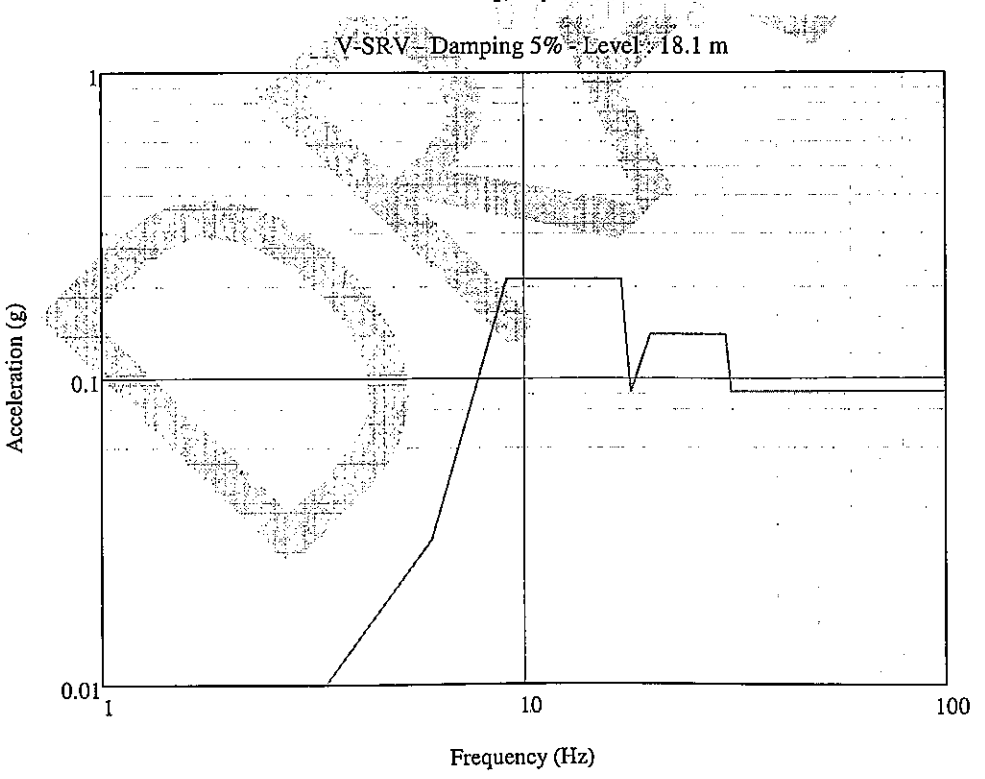
REQUIRED RESPONSE SPECTRA FOR CUBICLES





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APPENDIX 1

REQUIRED RESPONSE SPECTRA

4) - Test procedure:

. Test mounting and vibration sensor locations, eventually photographs.

. Operating procedure.

. Test level.

. Test method.

5) - Results and conclusions including:

. Equipment modifications during tests.

. Response signal filtered and non-filtered of actual table motion acceleration time history and digital records.

. Resonant frequencies and maximum acceleration.

. Comparison between TRS and RRS.

. TRS at measure point locations.

. Functional parameters monitored during and after the tests.

. Acceptance criteria, observations and conclusions.

6) - Date, names and signatures of responsible engineers.

7) - Certification of compliance, Tag N° of equipment with specific building/elevation and assembly drawing.

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6. AFTER TEST

6.1 VERIFICATIONS TO PERFORM

After performing dynamic tests, cubicles are submitted to the following verifications:

- Electrical connectors and connections remain in place.
- Fixating screws of components and structure remain in place.
- No damage to welds of cabinet structure (if any).
- No important structure deformation.
- Functional tests to verify proper working of tested class 1E devices.

6.2 ACCEPTANCE CRITERION

- Structural failures which could disturb the safety related functions are not allowed.
- See appendix for device electrical function acceptance criteria.

6.3 TEST QUALIFICATION REPORT

This document includes:

1) - Equipment identifying data adding weight and centre of gravity location.

2) - Equipment seismic qualification particular test specification references.

3) - Test facility characteristics:

. Location of the facility.

. Vibration machine description.

. Verification and measure means.

Cubicles are submitted to one SRV (pre-aging test) followed by five $\sqrt{OBE^2 + SRV^2}$, one $\sqrt{SSE^2 + SRV^2 + LOCA^2}$ and one LOCA (post-aging test).

Devices directly tested on the shaking table are submitted to five OBE and one $\sqrt{SSE^2 + SRV^2 + LOCA^2}$.

This test is performed for each couple of axes: X-Z and Y-Z.

5.3 TEST SEQUENTIAL STEPS

The sequence of resonance and seismic tests are as follows:

1) - X-Z bi-axial tests

- Z resonance search test
- X resonance search test

2) - Y-Z bi-axial tests

- Y resonance search test
- 1 SRV for a total of 8400 stress cycles (cubicles only)
- 5 $\sqrt{SRV^2 + OBE^2}$ qualification tests for a total of 5×10 stress cycles
- 1 $\sqrt{SRV^2 + LOCA^2 + SSE^2}$ qualification test for a total of 10 stress cycles
- 1 LOCA for a total of 9000 stress cycles (cubicles only)

3) - X-Z bi-axial tests

- 1 SRV for a total of 8400 stress cycles (cubicles only)
- 5 $\sqrt{SRV^2 + OBE^2}$ qualification tests for a total of 5×10 stress cycles
- 1 $\sqrt{SRV^2 + LOCA^2 + SSE^2}$ qualification test for a total of 10 stress cycles
- 1 LOCA for a total of 9000 stress cycles (cubicles only)

5.4 MONITORING DURING TESTS

See appendix 5.

5 TEST PROCEDURE

5.1 RESONANCE FREQUENCY EXPLORATORY TESTS

A resonance search is performed on cubicles prior to the qualification seismic test. The test is based on a single axis sinusoidal vibration excitation with a 2 m/s² peak input and with a continuously varying frequency.

The resonance search sweeps the 1 to 100 Hz and 100 to 1 Hz frequency ranges with a sweep rate of 1 octave per minute.

During this test, mechanical resonance or visual or audible phenomena are pointed out as well as frequencies, input amplitudes and equipment behaviour when these phenomena occur.

This test is independently carried out on each of the X, Y and Z axes.

5.2 SEISMIC QUALIFICATION TEST

This test is performed for each couple of axes.

The vibration table is excited with the specified time histories following the previously described sequential steps. Each qualification test occurrence has at least 30 second duration and 10 stress cycles for both $\sqrt{OBE^2 + SRV^2}$ and $\sqrt{SSE^2 + SRV^2 + LOCA^2}$ levels. The time histories corresponding to different excitation axes are not correlated.

For SRV and chugging (LOCA), the TRS shall envelope the RRS and the minimum stress cycles shall be attained.

The vibrating table motion is controlled during the test to verify that the reference input motion is correctly executed.

A special analysis is necessary to verify the test response spectrum (TRS) envelops the required response spectrum (RRS).

The comparison between TRS end RRS is done with a damping value equal to 5 % of critical damping verifying the TRS is greater than the RRS with a 10 % margin.

ZPA will be confirmed from time history data.

The TRS is computed with a 1/6-octave bandwidth resolution for a 5 % damping spectrum.

The time histories corresponding to different excitation axes are not correlated.

4.4 VERIFICATIONS TO PERFORM

Before starting the test, specimens are submitted to the following verifications:

- Identification of the tested cubicles.
- Visual inspection in order to detect failures during transportation to the laboratory.
- Functional tests to verify proper working of 1E devices to be tested.

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4 BEFORE TEST

4.1 EXCITATION AXIS DEFINITION

Three main orthogonal axes are defined relatively to the equipment, one vertical axis and two horizontal axes, to apply the test excitations:

- X-axis : cubicle back to front horizontal axis
- Y-axis : cubicle side to side horizontal axis
- Z-axis : vertical axis

4.2 EQUIPMENT ANCHORAGE ON THE TEST PLATFORM

Cubicles are anchored on the vibrating table as they are anchored on site, i.e. each cubicle is anchored by welding the front and rear parts of its base on the floor.

LV cubicles:

The length of every welding seam is 50 mm, its effective thickness is 4 mm and the weld spacing centreline to centreline is 100 mm.

Devices:

Devices tested directly on the shaking table are fixed by their own fixing system on a rigid support structure excited by the shaking table.

4.3 ACCELEROMETER LOCATION

Accelerometer locations are the following ones:

- On the shaking table.
- On the top corner of each cubicle in the X, Y and Z directions.
- Eventually on other locations, inside cubicles on devices supports that could be of interest along cubicle height (cf. appendix 4).

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3 LOADING

3.1 DYNAMIC LOADS

Specimens are submitted to the following dynamic loads:

- SRV : Safety / relief valve actuation loads
- LOCA : Loss of coolant accident loads
- OBE : Operating basis earthquake
- SSE : Safe shutdown earthquake

A resonant frequency search preliminary test is undertaken.

Tests are performed on an independent bi-axial platform so specimens are submitted to a bi-axial excitation (horizontal and vertical).

To drive the platform, during dynamic tests, multi-frequency signals are employed, one for the horizontal direction, one for the vertical one, signals shall be statistically independent in time.

Tested equipment is connected to the laboratory power sources and measurement circuits to verify their functioning before, during and after tests.

3.2 OPERATING LOADS

Apart from weight, the expected loading is due to equipment energising only. Equipment of interest is the class 1E devices at the most unfavourable location in cubicles.

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[4] 12801.MS041.5-03012 Rev 7 Engine generator control panel general arrangement dwg

[5] 12801.MS041.5-03015 Rev 5 Protection cubicle arrangement drawing

[6] 12801.MS041.5-03016 Rev 6 Speed & synchronization cubicle General arrangement drawing

[7] 12801.MS041.5-03017 Rev 5 Relaying cubicle arrangement drawing

[8] 12801.MS041.5-03018 Rev 6 Connection cubicle & relaying cubicle General arrangement drawing

[10] 12801.MS041.5-03028 Rev 3 Medium voltage cubicle outline drawing

[11] 12801.MS041.5-03042 Rev 5 DC motor starter arrangement drawing

[12] 12801.MS041.5-03044 Rev 4 DC motor starter fuel oil booster pump arrangement drawing

[13] 12801.MS041.5-03046 Rev 1 Turning gear box arrangement drawing

[14] 12806 MS041B.5-03013 Rev 1 Protection Cabinet 0R21 PL 2003 general arrangement dwg

[15] 12806 MS041B.5-03027 Rev 2 DC Motor Starter Keep Warm LO Pp 13 Schematic

[16] 12806.MD041B.5-03012 Rev 4 SDG 0R21-PL-2002 mech and elec control panel general arrangement dwg

[17] 12806.MS041B.5-03011 Rev 6 Excitation & regulation panel general arrangement dwg

[18] 12806.MS041B.5-03014 Rev 2 Speed & Synchro Cabinet 0R21-PL-2004 general arrangement dwg.

[19] 12806.MS041B.5-03015 Rev 2 SDG Relaying & Connection Cubicle 0R21 PL 2005 2006 general arrangement dwg

[20] 12806.MS041B.5-03016 Rev 3 Relaying & Connection Cubicles

[21] 12806.MS041B.5-03028 Rev 2 DC Motor Start Keep Warm LO Pp 13 0R21 PL 2013 general arrangement dwg

[22] 12806.MS041B.5-03030 Rev 2 DC Motor Start FO Boost Pp 3 0R21 PL 2012 general arrangement dwg

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LUNGMEN

ELECTRICAL COMPONENTS

SEISMIC PARTICULAR TEST SPECIFICATION

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1 PURPOSE

The purpose of this document is to describe the seismic qualification test procedure of the components in electrical cubicles for the LUNGMEN project:

Three cubicle envelope types gathering class 1E devices are tested:

- Envelope of DC cubicle PL-2012.
- Envelope of protection, relaying, speed & synchronisation ... PL-2002 A/B cubicle type.
- Excitation and regulation panel type.

When necessary class 1E devices are fixed in tested cubicles at the most constraining location they can have in cubicles that will be installed on site.

Otherwise class 1E devices are tested directly on the shaking table subject to device seismic response spectra.

For that purpose, components of concern are listed and their mounting locations are identified in appendix 2.

Their corresponding test locations in PL-2002 A/B or PL-2012 specimen cubicle types are defined in appendix 3.

Empty locations in specimen cubicles are compensated with dummy masses to reach the total mass of the heaviest loaded cubicle.

2 REFERENCES

[1] 12801.MS041-6.02146 – Rev. 2 – Dated 10/09/03
Seismic qualification program

[2] IEEE Std 344 – 1987: IEEE recommended practice for seismic qualification of class 1E equipment for nuclear power generating stations

[3] 12801.MS041.5-03011 Rev 6 Excitation & regulation cubicle General arrangement drawing

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CONTENT