

**NEK**

Nuklearna elektrarna Krško d.o.o.  
Vrbina 12, 8270 Krško  
Slovenija



## TECHNICAL SPECIFICATION

**SP-F3024**

**Revision 0**

**February 2024**

## Alarm Annunciator Panels

### EQUIPMENT ORDERING SPECIFICATION

### Augmented Quality

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## RECORD OF REVISION

No.	Date	Reason for revision and revision summary	Affected pages
0	26.2.2024	Initial issue	

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## **1 SCOPE OF WORK AND SUPPLY**

This specification establishes the design, testing and delivery requirements for the thirty (30) new Alarm Annunciator Panels plus one (1) new Alarm Panel and associated services for the Krško Nuclear Power Plant (NEK). The SUPPLIER shall be responsible for compliance with all detailed requirements presented in this specification as well as with the NEK specific requirements during procurement, testing and shipping process.

### **1.1 The scope of supply**

#### **1.1.1 Alarm Annunciator Panels and software**

- a) Thirty (30) new individual Alarm Annunciator Panels with fully engraved window labels
- b) One (1) new individual Alarm Panel with fully engraved window labels
- c) Configuration software, if available - optional request

#### **1.1.2 Associated services and deliverables**

- a) Technical documentation (Part 1 and Part 2)
- b) Factory Acceptance Test (FAT) at supplier facility
- c) Operations, configuration and maintenance training course
- d) Alarm Annunciator Panels factory configuration
- e) Window label engravings
- f) Certificate of Compliance (COC)
- g) Equipment handling, storage and transport requirements
- h) Equipment shipment / delivery

#### **1.1.3 Spare parts**

- a) Spares per SUPPLIER recommendation (for panel maintenance for at least 10 years)

### **1.2 The Scope of Work**

- i) Window label engravings
- a) Alarm Annunciator Panels factory configuration
- b) FAT
- c) Operations, configuration and maintenance training course during FAT



## 2 DEFINITIONS AND ACRONYMS

<b>BOM</b>	Bill of Material
<b>EMC</b>	Electromagnetic Compatibility
<b>COC</b>	Certificate of Compliance
<b>FAT</b>	Factory Acceptance Test
<b>FCV</b>	Field Contact Voltage
<b>FRS</b>	Floor Response Spectra
<b>NC</b>	Normally Closed contact at no alarm condition
<b>NO</b>	Normally Open contact at no alarm condition
<b>NEK</b>	Nuclear Power Plant Krško
<b>PDR</b>	Problem Deficiency Report
<b>SAT</b>	Site Acceptance Test
<b>QA</b>	Quality Assurance
<b>RE</b>	Responsible Engineer

**AUGMENTED QUALITY (AQ):** The term used in procurement process of Non Safety Related equipment, parts or services, when special quality requirements exist that demand higher quality requirements than usual for similar kind of equipment, parts and services. Augmented Quality as a term can be applied to any equipment, part or service item classified as Non Safety Related that has special requirements imposed by NEK (seismic, tests, analysis reports, cyber security, electromagnetic compatibility commercial QA program, manufacturing and inspection plan, etc.). Augmented Quality determination is applicable for all equipment, parts and services items that are specific for NEK, complex, or are important for availability and reliability of the plant operation.

### **3 CODES, STANDARDS AND REGULATORY REQUIREMENTS**

#### **3.1 Operational requirements**

ISA 18.1-1979 (R2004); Annunciator Sequences and Specifications

#### **3.2 Seismic qualification**

USNRC RG 1.61, Rev. 1; Damping Values for Seismic Design of Nuclear Power Plants

IEEE 344-2004; IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations

#### **3.3 EMC requirements**

RG-1.180, Rev. 1; GUIDELINES FOR EVALUATING ELECTROMAGNETIC AND RADIO-FREQUENCY INTERFERENCE IN SAFETY-RELATED INSTRUMENTATION AND CONTROL SYSTEMS

EPRI-TR102323, Rev. 1; Guidelines for Electromagnetic Interference Testing of Power Plant Equipment

#### **3.4 Quality management**

ISO 9001; International Standards Organization - Quality management and QA system (or comparable)

## **4 DOCUMENT SUBMITTAL**

### **4.1 General**

All submitted documents shall be in electronic or hard copy format. Acceptable document format sizes shall be A2 or smaller, A3 and A4 should be used whenever possible. Preferred format for electronic correspondence is Adobe Acrobat Reader (pdf). Other acceptable formats shall be:

- a) Word Processing: Microsoft WORD (docx)
- b) Spreadsheet: Microsoft EXCEL (xlsx)
- c) Computer Aided Drafting: AutoCAD (dwg, dwf)

All SUPPLIER's documents shall bear at least the following information:

- a) SUPPLIER's Name
- b) Date of issue
- c) Document status
- d) Document number
- e) Revision Number
- f) Sub supplier Name if participated
- g) NEK Purchase Order number
- h) NEK Specification number

### **4.2 Technical and qualification information required with the proposal**

The BIDDER shall submit complete operating data and description of the equipment offered with the proposal. This data shall include the following:

- a) General description of proposed equipment with operating characteristics
- b) Preliminary outline drawings of the panel assembly showing all major dimensions, unit weights and typical cross-section views.

The BIDDER may provide standard submittal drawings for this purpose.

- c) Engraving examples for small, medium and large windows
- d) Timeline of the project with general activities
- e) Description of factory acceptance tests FAT
- f) Description of proposed procedure for the seismic qualification
- g) Panel and components life time definition and spare parts availability period

The BIDDER shall indicate additional documentation he proposes to supply.

SUPPLIER qualification documentation is required with the proposal as follows:

- a) A list of the SUPPLIER's design, fabrication, testing and inspection facilities
- b) A copy of SUPPLIER's QA Program
- c) List of applicable standards implemented
- d) Positive references for the last two years

#### **4.3 Technical documentation - Part 1**

- a) Technical specifications and details, power consumption calculation per panel
- b) Interconnection wiring diagrams and connection terminals – drawings for:
  - Power connection and distribution
  - FCV and alarm input circuits
  - Remote pushbutton circuits
  - Remote logic module connection
  - Output relays connection
  - Communication port
- c) Layout and dimensional drawings (use metric units)
- d) Installation instructions
- e) Seismic qualification procedure

#### **4.4 Technical documentation - Part 2**

- a) Detailed drawings of components, sub-components or accessories, jumper and switch settings. If these items are shown on separate drawings appropriate cross references shall be used.
- b) Detail Software Functional Specification
- c) Seismic qualification report
- a) Testing documentation such as FAT procedures and acceptance criteria
- b) Panel configuration and maintenance instructions/ procedures
  - Associated panel configuration and setup instructions
  - Associated panel operation instructions
  - Associated panel maintenance and diagnostics instructions
  - Shelf life and equipment conditioning instructions
- d) Recommended spare parts list
- e) BOM with exact Part No. codes

#### **4.5 Periodic documentation**

The SUPPLIER shall submit Monthly Reports.

#### **4.6 Final documentation**

The SUPPLIER shall submit the Final Report.

## **5 SUPPLEMENTAL DATA**

The supplemental documentation is not an integral part of this specification, it is available on request.

- a) ED-18; Seismic Qualification Program
- b) SP-S702; Seismic Analysis, Testing and Documentation

## 6 DESIGN INPUTS AND REQUIREMENTS

### 6.1 Basic Alarm Annunciator Panel Requirements

No.	Equipment Tag No.	Window size	Window colour	Column No.	Row No.	Active Window No.	Power supply	FCV	Cutout W X H [mm]
1	BREVERE01B-ANN	LARGE	White	8	2	15	24VDC	125VDC	494 X 134
2	GHRECA02B-ANN	LARGE	White	7	3	20	24VDC	125VDC	434 X 194
3	PC100CME010	LARGE	White	7	4	27	24VDC	125VDC	434 X 254
4	PC100CME012	LARGE	White	9	4	35	24VDC	125VDC	554 X 254
5	WPEVWD01B-ANN	LARGE	White	8	2	15	24VDC	125VDC	494 X 134
6	XA1180	LARGE	White	5	3	14	24VDC	125VDC	314 X 194
7	XA1181	SMALL	White	2	8	12	24VDC	24VDC	74 X 254
8	XX1098	LARGE	White	9	3	26	24VDC	125VDC	554 X 194
9	XX1099	LARGE	White	11	3	32	24VDC	125VDC	674 X 194
10	XX1299	LARGE	White	5	3	14	24VDC	125VDC	314 X 194
11	GHRECA01B-ANN	LARGE	White	7	3	20	24VDC	125VDC	434 X 194
12	CKALB01	MEDIUM	White	9	6	52	24VDC	24VDC	554 X 194
13	CT900RCKT001-CTALB01	SMALL	Red	6	2	8	24VDC	125VDC	194 X 74
14	CT900RCKT002-CTALB02	SMALL	Red	6	2	8	24VDC	125VDC	194 X 74
15	E805-ANN (**)	LARGE	White	5	2	9	24VDC	24VDC	314 X 134
16	G904-ANN	LARGE	White	4	2	7	24VDC	24VDC	254 X 134
17	GN099SYEG702-ANN	LARGE	White	8	5	39	24VDC	125VDC	494 X 314
18	PC100CME013	MEDIUM	White	6	10	58	24VDC	125VDC	374 X 314
19	PC100CME014	MEDIUM	White	9	6	52	24VDC	24VDC	554 X 194
20	PC100CME015	MEDIUM	White	9	6	52	24VDC	24VDC	554 X 194
21	PC100CME016	MEDIUM	White	9	6	52	24VDC	24VDC	554 X 194
22	R926-ANN	LARGE	White	4	3	11	24VDC	24VDC	254 X 194
23	RD106PNLX921-ANN	SMALL	White	6	4	20	24VDC	24VDC	194 X 134
24	AFALB01 (***)	MEDIUM	White	3	4	10	24VDC	24VDC	194 X 134
25	PC100CME026 (*)	LARGE	White	8	5	40	24VDC	24VDC	494 X 314
26	CTCSALB001	SMALL	Red	8	4	28	24VDC	24VDC	254 X 134
27	CTCSALB002	SMALL	Red	8	4	28	24VDC	24VDC	254 X 134
28	CTCSALB003	SMALL	Red	8	4	28	24VDC	24VDC	254 X 134
29	CTCSALB004	SMALL	Red	8	4	28	24VDC	24VDC	254 X 134
30	RMELRM01A04-ANN/1 (*)	MEDIUM	White	5	6	30	24VDC	24VDC	314 X 194

Marks:

(\*) – Remote logic module shall be constructed.

(\*\*) – Individual alarm's repeat relays shall be fitted.

(\*\*\*) – IP54 viewing window shall be added.

## 6.2 Basic Alarm Panel Requirements

No.	Equipment Tag No.	Window size	Window colour	Column No.	Row No.	Active Window No.	Power supply	FCV	Cutout W X H [mm]
1	RMELRM01A04-ANN/2	MEDIUM	White	5	6	30	24VDC	N/A	314 X 194

## 6.3 General Alarm Annunciator Panel Requirements

- a) Illumination: LED
- b) Power supply: 24VDC external power supply by NEK
- c) FCV supply: 24VDC or 125VDC external power supply by NEK
- d) Alarm input contacts:
  - Optocoupled volt-free contact for 24VDC or 125VDC FCV (see basic requirements in sect. 6.1)
  - NO or NC user selectable contact configuration
- e) Output relays: Volt-free contact 24VDC @ 2A up to 125VDC @ 0.5A
  - Individual repeat relay - special request for the particular Alarm Annunciator Panel, see sec. 6.6: NO or NC contacts, user configurable
  - Group alarm relays: NO or NC contacts, de-energized or energized, user configurable with reflash facility option
  - Group audible relays: NO or NC contacts, user configurable
  - Diagnostic relays: NO or NC contacts, de-energized or energized, user configurable
- f) Logic module – interface module with buttons and buzzer
  - Integrated into alarm annunciator panel (bottom - right)
  - Remote: only for the Alarm Annunciator Panels No. 25 and 30
- g) Pushbuttons:
  - Integrated into logic module
  - Available terminals for remote installation such are: Lamp Test, System Test, Acknowledge, Mute, Reset, First Reset
- h) Audible devices: Buzzer integrated into logic module, optionally disableable
- i) Input response time: Up to 10ms, user configurable

- j) Field wiring terminations: screw clamp terminals up to 2.5mm<sup>2</sup>
- k) Alarm management sequence: Standard ISA 18.1 sequences, user selectable
- l) Environment:
  - Operating temperature: -20°C to +60°C
  - Humidity: 0-95% RH, non-condensing
- m) Mounting:
  - Existing cutout dimensions should be meet as per detailed individual basic specification.
  - Panel mounted
  - Existing panel steel thickness is between 2 and 5 mm.
- n) Protection: IP41 front of the panel
- o) Window label engraving, fully factory engraved per detailed individual specification.
  - Lettering font: for instance, Calibri
  - Lettering size shall be optimized and unified to correspond window size.

The SUPPLIER should acquire NEK's confirmation for window engraving samples before implementation!

- p) Communication:
  - Standard RS232 or RS485 port. Port RS485 port shall support full- and half-duplex transmission modes.
    - Protocol: Modbus RTU and Modbus ASCII, acting as slave or master, all user selectable.
    - Available data to be transmitted: window status as illuminated or off
  - USB programming port (optional): downloading/ uploading configuration

## **6.4 General Alarm Panel Requirements**

- a) Illumination: LED
- b) Power supply: From external 24VDC power supply by NEK
- c) Power supply logic: With common positive 24V and with 0V potential for window activation
- d) Field wiring terminations: screw clamp terminals up to 2.5mm<sup>2</sup>



e) Environment:

- Operating temperature: -20°C to +60°C
- Humidity: 0-95% RH, non-condensing

f) Mounting:

- Existing cutout dimensions should be meet as per detailed individual basic specification.
- Panel mounted
- Existing panel steel thickness is between 2 and 5 mm

g) Protection: IP41 front of the panel

h) Window label engraving, fully factory engraved per detailed individual specification.

- Lettering font: for instance, Calibri
- Lettering size shall be optimized and unified to correspond window size.

The SUPPLIER should acquire NEK's confirmation for window engraving samples before implementation!

## **6.5 General Alarm Annunciator Panel Configuration Requirements**

The SUPPLIER shall perform the following configuration to each Alarm Annunciator Panel:

- ISA 18.1 Sequence: Code M – manual reset, on each alarm channel
- Critical group alarm relay output: Common group alarm, reflash facility option selected, NC contact state at energized relay and at no alarm condition.
- Critical group audible relay output: NO contact state at no audible condition
- Diagnostic relay outputs:
  - Watchdog for system diagnostic, NC contact state at energized relay and no alarm condition
  - PWR failure monitoring, NC contact state at energized relay and no alarm condition
  - Communication failure monitoring, NC contact state at no alarm condition

## **6.6 Individual Alarm Annunciator Panel Configuration Requirements**

The SUPPLIER shall perform alarm contact configuration and all window engravings as specified per individual Alarm Annunciator Panel.

**6.6.1 1 - Alarm Annunciator Panel, Tag No.: BREVRE01B-ANN**

- a) Alarm contact configuration: NC - normally closed (open to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8
A	CONDENSER LEVEL HIGH  LA306	CONCENTRATE FLOW LOW  FS314	PREHEATER OUTLET TEMPERATURE HIGH  TA304	DISTILLATE COOLER OUTLET TEMPERATURE HIGH  TA321	EVAPORATOR LEVEL HIGH  LA315	EVAPORATOR PRESSURE HIGH  PA316	CONCENTRATE PUMP COOLING UNIT PRESSURE LOW  PS317	
B	CONDENSER LEVEL LOW  LA306	EVAPORATOR TEMPERATURE LOW  TA314	PREHEATER OUTLET TEMPERATURE LOW  TA304	DISTILLATE COOLER OUTLET TEMP. LOW  TA321	EVAPORATOR LEVEL LOW  LA315	EVAPORATOR PRESSURE LOW  PA316	CONCENTRATE PRESSURE LOW  PS318	INTEGRATED LOGIC MODULE

WINDOW A-1

**CONDENSER  
LEVEL  
HIGH  
LA306**

WINDOW A-2

**CONCENTRATE  
FLOW  
LOW  
FS314**

WINDOW A-3

**PREHEATER OUTLET  
TEMPERATURE  
HIGH  
TA304**

WINDOW A-4

**DISTILLATE COOLER  
OUTLET TEMPERATURE  
HIGH  
TA321**

WINDOW A-5

**EVAPORATOR  
LEVEL  
HIGH  
LA315**

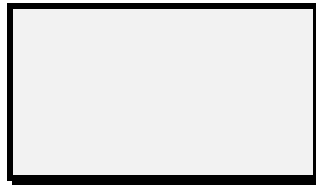
WINDOW A-6

**EVAPORATOR  
PRESSURE  
HIGH  
PA316**

WINDOW A-7

**CONCENTRATE PUMP  
COOLING UNIT  
PRESSURE  
LOW  
PS317**

WINDOW A-8



WINDOW B-1

**CONDENSER  
LEVEL  
LOW  
LA306**

WINDOW B-2

**EVAPORATOR  
TEMPERATURE  
LOW  
TA314**

WINDOW B-3

**PREHEATER OUTLET  
TEMPERATURE  
LOW  
TA344**

WINDOW B-4

**DISTILLATE COOLER  
OUTLET TEMPERATURE  
LOW  
TA321**

WINDOW B-5

**EVAPORATOR  
LEVEL  
LOW  
LA315**

WINDOW B-6

**EVAPORATOR  
PRESSURE  
LOW  
PA316**

WINDOW B-7

**CONCENTRATE  
PRESSURE  
LOW  
PS318**

**6.6.2 2 - Alarm Annunciator Panel, Tag No.: GHRECA02B-ANN**

- a) Alarm contact configuration: NC - normally closed (open to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7
A	HARC-1104 FEED GAS HIGH HYDROGEN	OARC-1119 PRODUCT GAS HIGH OXYGEN ALARM	HAIC-1118 PRODUCT GAS HIGH HYDROGEN ALARM	FS-1105 M-1 HEATER LO FLOW HEATER SHUTDOWN	TCA-1106 M-1 HEATER INPUT GAS HI TEMP. HEATER SHUTDOWN	LS-1117 PS-1 SEPARATOR HIGH LEVEL ALARM	TR-1100 CR-1 REACTOR HIGH TEMP ALARM
B	HARC-1104 OARC-1112 HI-HI H <sub>2</sub> /O <sub>2</sub> O <sub>2</sub> SHUTDOWN	OARC-1119 PRODUCT GAS HI-HI OXYGEN O <sub>2</sub> SHUTDOWN	OARC-1112 CR-1 REACTOR HIGH OXYGEN O <sub>2</sub> LIMIT	FS-1105 LO-LO FLOW O <sub>2</sub> SHUTDOWN		LS-1117 PS-1 SEPARATOR LOW LEVEL ALARM	TCA-1114 CR-1 REACTOR HI-HI TEMP O <sub>2</sub> SHUTDOWN
C	ANALYZER BYPASS SWITCH ON	TCA-1116 HX-1 COOLER HIGH TEMP ALARM			TCA-1111 HI-HI TEMP FLAME PRESENT O <sub>2</sub> SHUTDOWN		<b>INTEGRATED LOGIC MODULE</b>

WINDOW A-1

**HARC-1104  
FEED GAS  
HIGH HYDROGEN**

WINDOW A-2

**OARC-1119  
PRODUCT GAS  
HIGH OXYGEN  
ALARM**

WINDOW A-3

**OARC-1119  
PRODUCT GAS  
HIGH OXYGEN  
ALARM**

WINDOW A-4

**FS-1105  
M-1 HEATER  
LO FLOW  
HEATER SHUTDOWN**

WINDOW A-5

**TCA-1106  
M-1 HEATER INPUT GAS  
HI TEMP.  
HEATER SHUTDOWN**

WINDOW A-6

**LS-1117  
PS-1 SEPARATOR  
HIGH LEVEL  
ALARM**

WINDOW A-7

**TR-1100  
CR-1 REACTOR  
HIGH TEMP  
ALARM**

WINDOW B-1

**HARC-1104  
OAIC-1112  
HI-HI H<sub>2</sub>/O<sub>2</sub>  
O<sub>2</sub> SHUTDOWN**

WINDOW B-2

**OARC-1119  
PRODUCT GAS  
HI-HI OXYGEN  
O<sub>2</sub> SHUTDOWN**

WINDOW B-3

**OAIC-1112  
CR-1 REACTOR  
HIGH OXYGEN  
O<sub>2</sub> LIMIT**

WINDOW B-4

**FS-1105  
LO-LO FLOW  
O<sub>2</sub> SHUTDOWN**

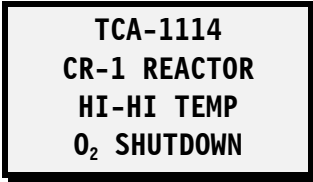
WINDOW B-5



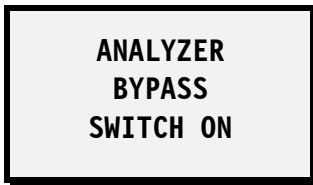
WINDOW B-6



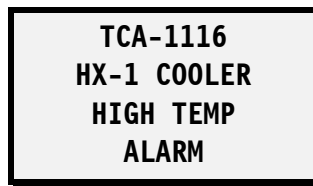
WINDOW B-7



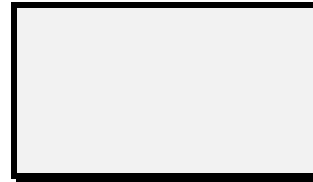
WINDOW C-1



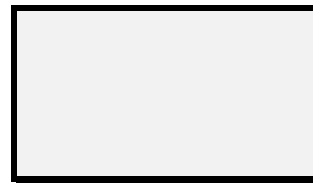
WINDOW C-2



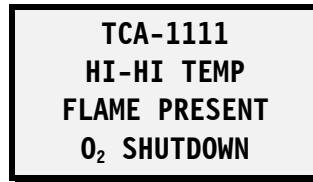
WINDOW C-3



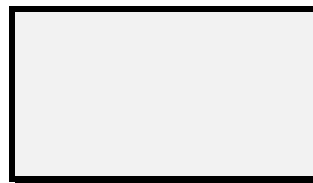
WINDOW C-4



WINDOW C-5



WINDOW C-6



**6.6.3 3 - Alarm Annunciator Panel, Tag No.: PC100CME010**

a) Alarm contact configuration: Mixed

- NO – normally open (close to alarm) for WINDOWS B-6, C-1, C-2, C-3, C-4, C-5
- NC - normally closed (open to alarm) for all other WINDOWS

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7
A	#1 TB ROOF VENTILATOR TEMP HI	#2 TB ROOF VENTILATOR TEMP HI	#3 TB ROOF VENTILATOR TEMP HI	#4 TB ROOF VENTILATOR TEMP HI	#5 TB ROOF VENTILATOR TEMP HI	#6 TB ROOF VENTILATOR TEMP HI	
B	#7 TB ROOF VENTILATOR TEMP HI	#8 TB ROOF VENTILATOR TEMP HI	#9 TB ROOF VENTILATOR TEMP HI	#10 TB ROOF VENTILATOR TEMP HI	#11 TB ROOF VENTILATOR TEMP HI		
C						VP72626 SYSTEM TROUBLE	
D	#1 TB DUCTED VENTILATOR TEMP HI	#2 TB DUCTED VENTILATOR TEMP HI	#3 TB DUCTED VENTILATOR TEMP HI	ANNUNCIATOR SYSTEM DC GROUND	LUBE OIL ROOM EXHAUST FLOW LOW	LUBE OIL ROOM EXHAUST TEMP HI	INTEGRATED LOGIC MODULE

WINDOW A-1

#1 TB ROOF  
VENTILATOR  
TEMP HI

WINDOW A-2

#2 TB ROOF  
VENTILATOR  
TEMP HI

WINDOW A-3

#3 TB ROOF  
VENTILATOR  
TEMP HI

WINDOW A-4

**#4 TB ROOF  
VENTILATOR  
TEMP HI**

WINDOW A-5

**#5 TB ROOF  
VENTILATOR  
TEMP HI**

WINDOW A-6

**#6 TB ROOF  
VENTILATOR  
TEMP HI**

WINDOW B-1

**#7 TB ROOF  
VENTILATOR  
TEMP HI**

WINDOW B-2

**#8 TB ROOF  
VENTILATOR  
TEMP HI**

WINDOW B-3

**#9 TB ROOF  
VENTILATOR  
TEMP HI**

WINDOW B-4

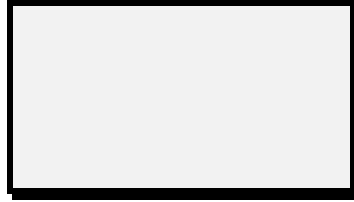
**#10 TB ROOF  
VENTILATOR  
TEMP HI**

WINDOW B-5

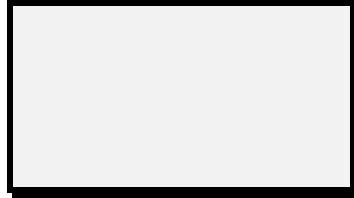
**#11 TB ROOF  
VENTILATOR  
TEMP HI**



WINDOW B-6



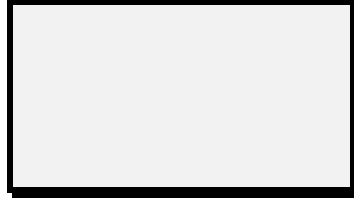
WINDOW C-1



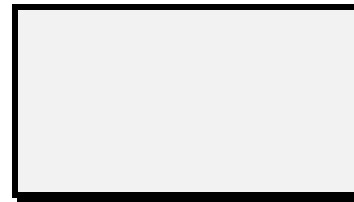
WINDOW C-2



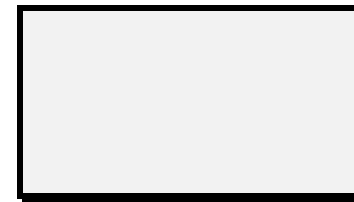
WINDOW C-3



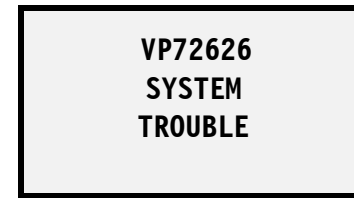
WINDOW C-4



WINDOW C-5



WINDOW C-6



WINDOW D-1



WINDOW D-2

**#2 TB DUCTED  
VENTILATOR  
TEMP HI**

WINDOW D-3

**#3 TB DUCTED  
VENTILATOR  
TEMP HI**

WINDOW D-4

**ANNUNCIATOR  
SYSTEM  
DC GROUND**

WINDOW D-5

**LUBE OIL ROOM  
EXHAUST  
FLOW LOW**

WINDOW D-6

**LUBE OIL ROOM  
EXHAUST  
TEMP HI**

**6.6.4 4 - Alarm Annunciator Panel, Tag No.: PC100CME012**

a) Alarm contact configuration: Mixed

- NO – normally open (close to alarm) for WINDOWS A-2, A-3, B-2, B-3, B-8, C-2, C-3, C-7, D-3, D-4
- NC - normally closed (open to alarm) for all other WINDOWS

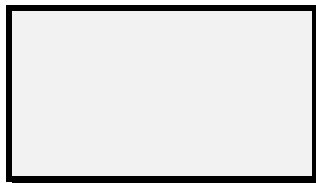
b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8	9
A	FW105PMP-001 LO SUCTION FLOW			FW105PMP-001 LO LUBE OIL PRESS	FW105PMP-001 NORMAL LUBE OIL PMP TRIPPED	FW105PMP-001 LO-LO-LO LUBE OIL PRESSURE	FW105PMP-001 TRIP	FW105PMP-003 TRIP	
B	FW105PMP-002 LO SUCTION FLOW			FW105PMP-002 LO LUBE OIL PRESS	FW105PMP-002 NORMAL LUBE OIL PMP TRIPPED	FW105PMP-002 LO-LO-LO LUBE OIL PRESSURE	FW105PMP-002 TRIP		
C	FW105PMP-003 LO SUCTION FLOW			FW105PMP-003 LO LUBE OIL PRESS	FW105PMP-003 NORMAL LUBE OIL PMP TRIPPED ("A" SOURCE)	FW105PMP-003 LO-LO-LO LUBE OIL PRESSURE		FW VIBRATION SYSTEM TROUBLE	
D	21136 FW ISOL VALVE HYDR PRESS HI	21136 FW ISOL VALVE OIL LEVEL LO			FW105PMP-003 NORMAL LUBE OIL PMP TRIPPED ("B" SOURCE)	21137 FW ISOL VALVE HYDR PRESS HI	21137 FW ISOL VALVE OIL LEVEL LO	PC100CME012 GROUND DETECT	INTEGRATED LOGIC MODULE

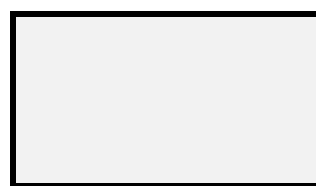
WINDOW A-1



WINDOW A-2



WINDOW A-3



WINDOW A-4

**FW105PMP-001  
LO LUBE OIL PRESS**

WINDOW A-5

**FW105PMP-001  
NORMAL LUBE OIL  
PMP TRIPPED**

WINDOW A-6

**FW105PMP-001  
LO-LO-LO LUBE  
OIL PRESSURE**

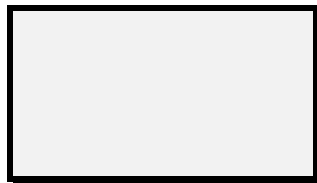
WINDOW A-7

**FW105PMP-001  
TRIP**

WINDOW A-8

**FW105PMP-003  
TRIP**

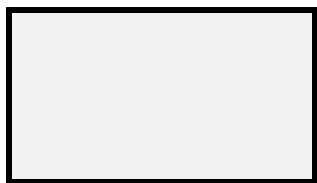
WINDOW A-9



WINDOW B-1

**FW105PMP-002  
LO SUCTION FLOW**

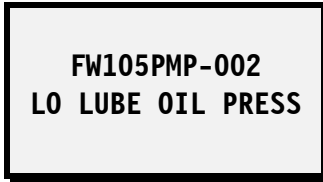
WINDOW B-2



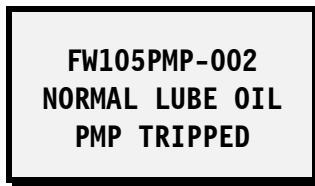
WINDOW B-3



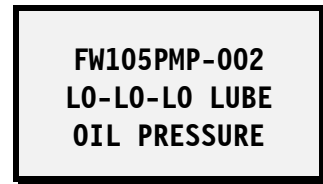
WINDOW B-4



WINDOW B-5



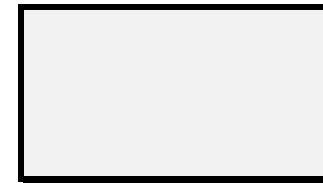
WINDOW B-6



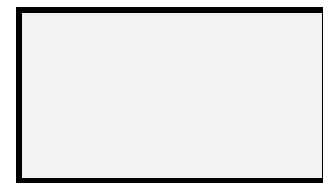
WINDOW B-7



WINDOW B-8



WINDOW B-9



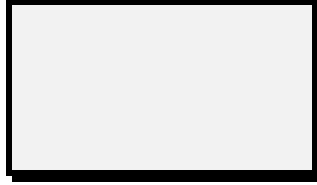
WINDOW C-1



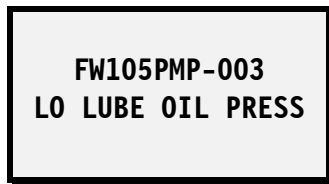
WINDOW C-2



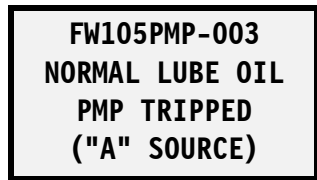
WINDOW C-3



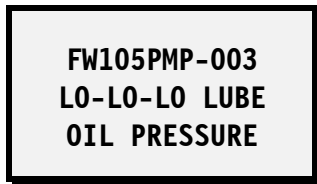
WINDOW C-4



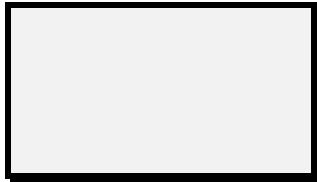
WINDOW C-5



WINDOW C-6



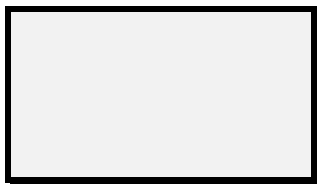
WINDOW C-7



WINDOW C-8



WINDOW C-9



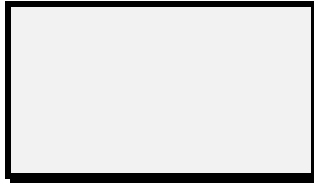
WINDOW D-1

**21136  
FW ISOL VALVE  
HYDR PRESS HI**

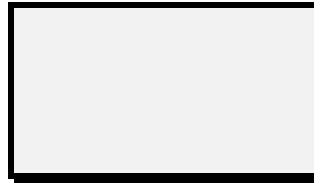
WINDOW D-2

**21136  
FW ISOL VALVE  
OIL LEVEL LO**

WINDOW D-3



WINDOW D-4



WINDOW D-5

**FW105PMP-003  
NORMAL LUBE OIL  
PMP TRIPPED  
("B" SOURCE)**

WINDOW D-6

**21137  
FW ISOL VALVE  
HYDR PRESS HI**

WINDOW D-7

**21137  
FW ISOL VALVE  
OIL LEVEL LO**

WINDOW D-8

**PC100CME012  
GROUND  
DETECT**

**6.6.5 5 - Alarm Annunciator Panel, Tag No.: WPEVWD01B-ANN**

- a) Alarm contact configuration: NC - normally closed (open to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8
A	CONDENSER LEVEL HIGH  LA326	CONCENTRATE FLOW LOW  FS339	PREHEATER OUTLET TEMPERATURE HIGH  TA325	DISTILLATE COOLER OUTLET TEMPERATURE HIGH  TA341	EVAPORATOR LEVEL HIGH  LA335	EVAPORATOR PRESSURE HIGH  PA337	DISTILLATE COOLER OUTLET TEMP. LOW  TA341	
B	CONDENSER LEVEL LOW  LA326	EVAPORATOR TEMPERATURE LOW  TA336	PREHEATER OUTLET TEMPERATURE LOW  TA325	CONCENTRATE PUMP COOLING UNIT PRESSURE LOW  PS327	EVAPORATOR LEVEL LOW  LA335	EVAPORATOR PRESSURE LOW  PA337	CONCENTRATE PRESSURE LOW  PS328	INTEGRATED LOGIC MODULE

WINDOW A-1

**CONDENSER  
LEVEL  
HIGH**

**LA326**

WINDOW A-2

**CONCENTRATE  
FLOW  
LOW**

**FS339**

WINDOW A-3

**PREHEATER OUTLET  
TEMPERATURE  
HIGH**

**TA325**

WINDOW A-4

**DISTILLATE COOLER  
OUTLET TEMPERATURE  
HIGH**

**TA321**



WINDOW A-5

**EVAPORATOR  
LEVEL  
HIGH**

**LA335**

WINDOW A-6

**EVAPORATOR  
PRESSURE  
HIGH**

**PA337**

WINDOW A-7

**DISTILLATE COOLER  
OUTLET TEMPERATURE  
LOW**

**TA341**

WINDOW A-8

WINDOW B-1

**CONDENSER  
LEVEL  
LOW**

**LA326**

WINDOW B-2

**EVAPORATOR  
TEMPERATURE  
LOW**

**TA336**

WINDOW B-3

**PREHEATER OUTLET  
TEMPERATURE  
LOW**

**TA325**

WINDOW B-4

**CONCENTRATE PUMP  
COOLING UNIT  
PRESSURE  
LOW  
PS327**

WINDOW B-5

**EVAPORATOR  
LEVEL  
LOW  
  
LA335**

WINDOW B-6

**EVAPORATOR  
PRESSURE  
LOW  
  
PA337**

WINDOW B-7

**CONCENTRATE  
PRESSURE  
LOW  
  
PS328**

**6.6.6 6 - Alarm Annunciator Panel, Tag No.: XA1180**

- a) Alarm contact configuration: NC - normally closed (open to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5
A	TOTAL BLOWDOWN HI-LO PRESS  (PUC1151)	SG NO.1 BLOWDOWN HI FLOW  (FUC1171)	SG BLOWDOWN INLET FILTER HI FLOW  (FUI1152)	SG BLOWDOWN HX NO.1 HI-LO TEMP DEV  (TUC1191)	
B		SG NO.2 BLOWDOWN HI FLOW  (FUC1172)	SG BLOWDOWN INLET FILTER HI PRESS  (PUI1153)	SG BLOWDOWN HX NO.2 HI-LO TEMP DEV  (TUC1192)	
C			SG BLOWDOWN INLET FILTER HI TEMP  (TUI1150)	BD SAMPLE INLET LO PRESS (PS1187)	<b>INTEGRATED LOGIC MODULE</b>

WINDOW A-1

**TOTAL  
BLOWDOWN  
HI-LO PRESS  
(PUC1151)**

WINDOW A-2

**SG NO.1  
BLOWDOWN  
HI FLOW  
(FUC1171)**

WINDOW A-3

**SG BLOWDOWN  
INLET FILTER  
HI FLOW  
(FUI1152)**

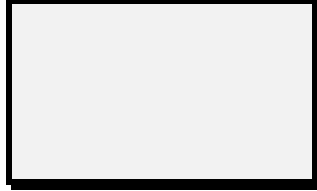
WINDOW A-4

**SG BLOWDOWN  
HX NO.1  
HI-LO TEMP DEV  
(TUC1191)**

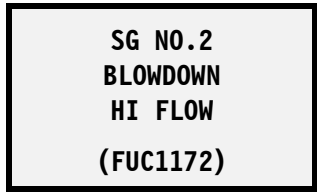
WINDOW A-5



WINDOW B-1



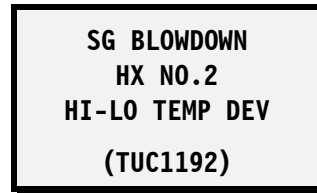
WINDOW B-2



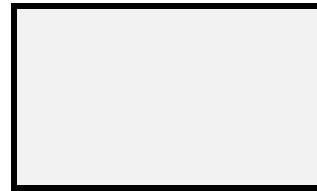
WINDOW B-3



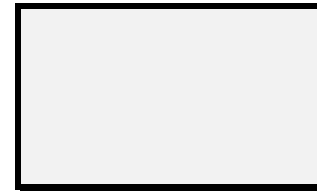
WINDOW B-4



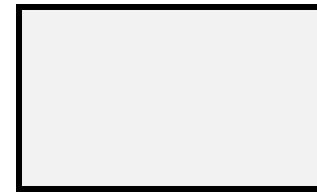
WINDOW B-5



WINDOW C-1



WINDOW C-2



WINDOW C-3

**SG BLOWDOWN  
INLET FILTER  
HI TEMP  
(TUI1150)**

WINDOW C-4

**BD SAMPLE  
INLET  
LO PRESS  
(PS1187)**

**6.6.7 7 - Alarm Annunciator Panel, Tag No.: XA1181**

a) Alarm contact configuration:

- NO - normally open (close to alarm) for all WINDOWS

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2
A	SRST LEVEL HI  (LUI1165)	SRST LEVEL LO  (LUI1165)
B	SRST PRESS HI  (PUI1166)	
C	SR SLUICE LINE LO FLOW  (FUI1169)	
D		
E		
F		
INTEGRATED LOGIC MODULE		

WINDOW A-1

**SRST LEVEL  
HI  
  
(LUI1165)**

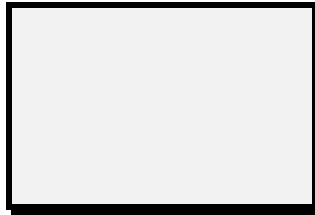
WINDOW A-2

**SRST LEVEL  
LO  
  
(LUI1165)**

WINDOW B-1

**SRST PRESS  
HI  
  
(PUI1166)**

WINDOW B-2



WINDOW C-1

**SR SLUICE LINE  
LO FLOW  
  
(FUI1169)**

**6.6.8 8 - Alarm Annunciator Panel, Tag No.: XX1098**

- a) Alarm contact configuration: NC - normally closed (open to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8	9
A	REACTOR COOLANT DRAIN TANK HI-LO LEVEL	REACTOR COOLANT DRAIN TANK HI TEMP	REACTOR COOLANT DRAIN TANK HI PRESS	WATER DISCHARGE LINE HI RAD	LAUNDRY, HOT SHOWER TANK HI-LO LEVEL		SPENT RESIN STORAGE TANK HI-LO LEVEL	WASTE MONITOR TANK NO. 1 HI-LO LEVEL	
B	REACTOR COOLANT DRAIN TK RECIRC LO FLOW	REACTOR COOLANT DRAIN TK VENT HI PRESS		WASTE HOLDUP TANK HI-HI LEVEL	WASTE HOLDUP TANK HI-LO LEVEL	WASTE EVAPORATOR CONDENSATE TANK HI-LO LEVEL	CHEMICAL DRAIN TANK HI-LO LEVEL	WASTE MONITOR TANK NO. 2 HI-LO LEVEL	
C	WMB SUMP HI-LO LEVEL	FLOOR DRAIN TANK HI-HI LEVEL	FLOOR DRAIN TANK HI-LO LEVEL	WASTE EVAPORATOR PACKAGE	SPENT RESIN SLUICE DISCHARGE LO FLOW	SPENT RESIN STORAGE TANK HI PRESS	ANNUNCIATOR GROUND DETECTOR	DC POWER FAILURE	INTEGRATED LOGIC MODULE

WINDOW A-1

REACTOR COOLANT  
DRAIN TANK  
HI-LO LEVEL

WINDOW A-2

REACTOR COOLANT  
DRAIN TANK  
HI TEMP

WINDOW A-3

REACTOR COOLANT  
DRAIN TANK  
HI PRESS

WINDOW A-4

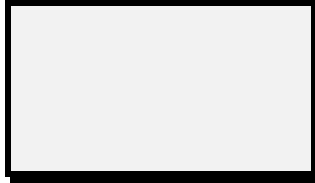
WATER DISCHARGE  
LINE  
HI RAD



WINDOW A-5

**LAUNDRY, HOT  
SHOWER TANK  
HI-LO LEVEL**

WINDOW A-6



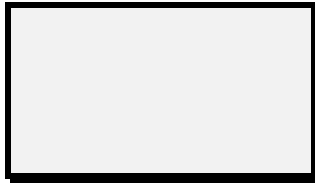
WINDOW A-7

**SPENT RESIN  
STORAGE TANK  
HI-LO LEVEL**

WINDOW A-8

**WASTE MONITOR  
TANK NO. 1  
HI-LO LEVEL**

WINDOW A-9



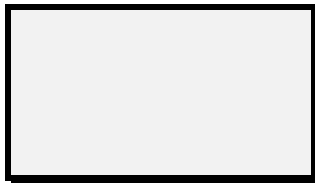
WINDOW B-1

**REACTOR COOLANT  
DRAIN TK RECIRC  
LO FLOW**

WINDOW B-2

**REACTOR COOLANT  
DRAIN TK VENT  
HI PRESS**

WINDOW B-3



WINDOW B-4

WASTE HOLDUP  
TANK  
HI-HI LEVEL

WINDOW B-5

WASTE HOLDUP  
TANK  
HI-LO LEVEL

WINDOW B-6

WASTE EVAPORATOR  
CONDENSATE TANK  
HI-LO LEVEL

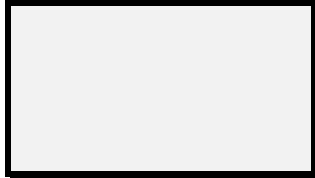
WINDOW B-7

CHEMICAL DRAIN  
TANK  
HI-LO LEVEL

WINDOW B-8

WASTE MONITOR  
TANK NO. 2  
HI-LO LEVEL

WINDOW B-9



WINDOW C-1

WMB SUMP  
HI-LO LEVEL

WINDOW C-2

FLOOR DRAIN  
TANK  
HI-HI LEVEL

WINDOW C-3

**FLOOR DRAIN TANK  
HI-LO LEVEL**

WINDOW C-4

**WASTE  
EVAPORATOR  
PACKAGE**

WINDOW C-5

**SPENT RESIN  
SLUICE DISCHARGE  
LO FLOW**

WINDOW C-6

**SPENT RESIN  
STORAGE TANK  
HI PRESS**

WINDOW C-7

**ANNUNCIATOR  
GROUND  
DETECTOR**

WINDOW C-8

**DC  
POWER  
FAILURE**

**6.6.9 9 - Alarm Annunciator Panel, Tag No.: XX1099**

- a) Alarm contact configuration: NC - normally closed (open to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8	9	10	11
<b>A</b>	GAS DECAY TANK NO.1 HI PRESS	GAS DECAY TANK NO.2 HI PRESS	GAS DECAY TANK NO.3 HI PRESS	O <sub>2</sub> SUPPLY HEADER LO PRESSURE RECOMB. 2		WASTE GAS COMP. NO 1 MOIST. SEPARATOR HI-LO LEVEL		PLANT VENT MONITOR HI RAD	WASTE GAS COMP. NO 1 MOIST. SEPARATOR HI-PRESS	WASTE GAS COMP. NO 2 MOIST. SEPARATOR HI-PRESS	
<b>B</b>	GAS DECAY TANK NO.4 HI PRESS	GAS DECAY TANK NO.5 HI PRESS	GAS DECAY TANK NO.6 HI PRESS	O <sub>2</sub> SUPPLY HEADER LO PRESSURE RECOMB. 1		WASTE GAS COMP. NO 2 MOIST. SEPARATOR HI-LO LEVEL	LOW PRESS H <sub>2</sub> SUPPLY HEADER LO PRESS	VOLUME CONT. TK PURGE FLOW UNIT 2 HI FLOW	WASTE GAS COMP. NO 1 MOIST. SEPARATOR LO-PRESS	WASTE GAS COMP. NO 2 MOIST. SEPARATOR LO-PRESS	
<b>C</b>	N <sub>2</sub> SUPPLY ACCUMULATOR TANK NO. 1 LO PRESS	N <sub>2</sub> SUPPLY ACCUMULATOR TANK NO. 2 LO PRESS	WASTE GAS COMP. SUCTION LO PRESS	PRIMARY MAKEUP WATER TO GAS DECAY TANKS HI VOLUME	RECOMBINER NO. 1 ALARM	RECOMBINER NO. 2 ALARM	H <sub>2</sub> SUPPLY HEADER LO PRESS	N <sub>2</sub> SUPPLY HEADER LO PRESS	ANNUNCIATOR GROUND DETECTOR	DC POWER FAILURE	INTEGRATED LOGIC MODULE

WINDOW A-1

GAS DECAY  
TANK NO.1  
HI PRESS

WINDOW A-2

GAS DECAY  
TANK NO.2  
HI PRESS

WINDOW A-3

**GAS DECAY  
TANK NO.3  
HI PRESS**

WINDOW A-4

**O<sub>2</sub> SUPPLY  
HEADER  
LO PRESSURE  
RECOMB. 2**

WINDOW A-5

WINDOW A-6

**WASTE GAS  
COMP. NO 1  
MOIST. SEPARATOR  
HI-LO LEVEL**

WINDOW A-7

WINDOW A-8

**PLANT VENT  
MONITOR  
HI RAD**

WINDOW A-9

**WASTE GAS  
COMP. NO. 1  
MOIST. SEPARATOR  
HI-PRESS**

WINDOW A-10

**WASTE GAS  
COMP. NO. 2  
MOIST. SEPARATOR  
HI-PRESS**

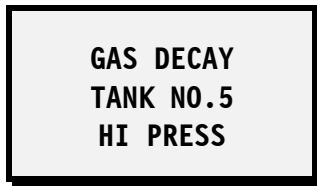
WINDOW A-11



WINDOW B-1



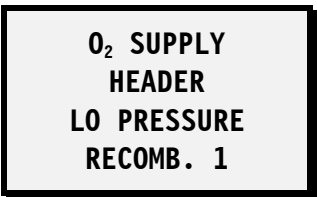
WINDOW B-2



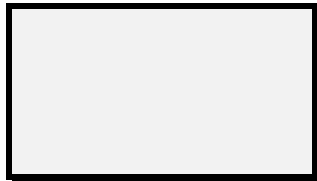
WINDOW B-3



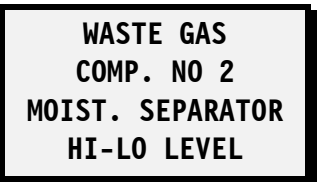
WINDOW B-4



WINDOW B-5



WINDOW B-6



WINDOW B-7



WINDOW B-8

**VOLUME CONT. TK  
PURGE FLOW  
UNIT 2  
HI FLOW**

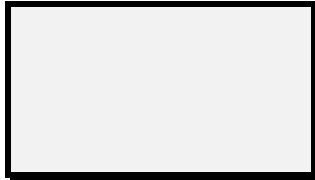
WINDOW B-9

**WASTE GAS  
COMP. NO. 1  
MOIST. SEPARATOR  
LO-PRESS**

WINDOW B-10

**WASTE GAS  
COMP. NO. 2  
MOIST. SEPARATOR  
LO-PRESS**

WINDOW B-11



WINDOW C-1

**N<sub>2</sub> SUPPLY  
ACCUMULATOR  
TANK NO. 1  
LO PRESS**

WINDOW C-2

**N<sub>2</sub> SUPPLY  
ACCUMULATOR  
TANK NO. 2  
LO PRESS**

WINDOW C-3

**WASTE GAS  
COMP. SUCTION  
LO PRESS**

WINDOW C-4

**PRIMARY MAKEUP  
WATER TO GAS  
DECAY TANKS  
HI VOLUME**



WINDOW C-5

**RECOMBINER  
NO. 1  
ALARM**

WINDOW C-6

**RECOMBINER  
NO. 2  
ALARM**

WINDOW C-7

**H<sub>2</sub> SUPPLY HEADER  
LO PRESS**

WINDOW C-8

**N<sub>2</sub> SUPPLY HEADER  
LO PRESS**

WINDOW C-9

**ANNUNCIATOR  
GROUND  
DETECTOR**

WINDOW C-10

**DC  
POWER  
FAILURE**

**6.6.10 10 - Alarm Annunciator Panel, Tag No.: XX1299**

- a) Alarm contact configuration: NC - normally closed (open to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5
A	RECYCLE HOLDUP TANK NO.1 HI-LO LEVEL	RECYCLE EVAPORATOR PACKAGE	RECYCLE HOLDUP TANK NO.2 HI-LO LEVEL	VOLUME TO REC HOLDUP TANK HI VOLUME	
B	RECYCLE EVAP FEED DEMIN HI TEMP	RECYCLE EVAP FEED DEMIN HI DIFF PRESS	RECYCLE HOLDUP TANK EDUCTOR LO PRESS	RECYCLE EVAP CONDENSATE HI RAD	
C	RECYCLE HOLDUP TANK NO.3 HI-LO LEVEL		ANNUNCIATOR GROUND DETECTOR	DC POWER FAILURE	INTEGRATED LOGIC MODULE

WINDOW A-1

RECYCLE HOLDUP  
TANK NO.1  
HI-LO LEVEL

WINDOW A-2

RECYCLE  
EVAPORATOR  
PACKAGE

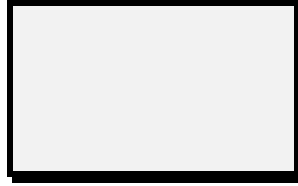
WINDOW A-3

RECYCLE HOLDUP  
TANK NO.2  
HI-LO LEVEL

WINDOW A-4

VOLUME TO REC  
HOLDUP TANK  
HI VOLUME

WINDOW A-5



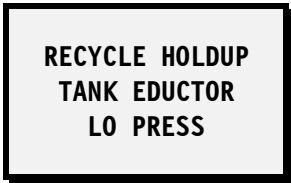
WINDOW B-1



WINDOW B-2



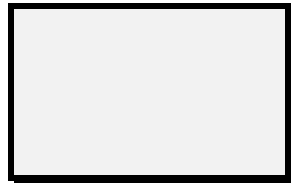
WINDOW B-3



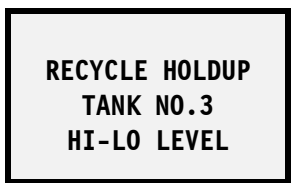
WINDOW B-4



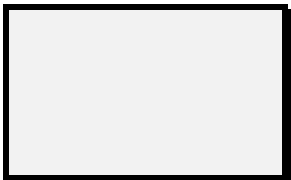
WINDOW B-5



WINDOW C-1



WINDOW C-2



WINDOW C-3



WINDOW C-4

**DC  
POWER  
FAILURE**

**6.6.11 11 - Alarm Annunciator Panel, Tag No.: GHRECA01B-ANN**

- a) Alarm contact configuration: NC - normally closed (open to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7
A	HARC-1104 FEED GAS HIGH HYDROGEN	OARC-1119 PRODUCT GAS HIGH OXYGEN ALARM	HAIC-1118 PRODUCT GAS HIGH HYDROGEN ALARM	FS-1105 M-1 HEATER LO FLOW HEATER SHUTDOWN	TCA-1106 M-1 HEATER INPUT GAS HI TEMP. HEATER SHUTDOWN	LS-1117 PS-1 SEPARATOR HIGH LEVEL ALARM	TR-1100 CR-1 REACTOR HIGH TEMP ALARM
B	HARC-1104 OARC-1112 HI-HI H <sub>2</sub> /O <sub>2</sub> O <sub>2</sub> SHUTDOWN	OARC-1119 PRODUCT GAS HI-HI OXYGEN O <sub>2</sub> SHUTDOWN	OARC-1112 CR-1 REACTOR HIGH OXYGEN O <sub>2</sub> LIMIT	FS-1105 LO-LO FLOW O <sub>2</sub> SHUTDOWN		LS-1117 PS-1 SEPARATOR LOW LEVEL ALARM	TCA-1114 CR-1 REACTOR HI-HI TEMP O <sub>2</sub> SHUTDOWN
C	ANALYZER BYPASS SWITCH ON	TCA-1116 HX-1 COOLER HIGH TEMP ALARM			TCA-1111 HI-HI TEMP FLAME PRESENT O <sub>2</sub> SHUTDOWN		INTEGRATED LOGIC MODULE

WINDOW A-1

**HARC-1104  
FEED GAS  
HIGH HYDROGEN**

WINDOW A-2

**OARC-1119  
PRODUCT GAS  
HIGH OXYGEN  
ALARM**

WINDOW A-3

**OARC-1119  
PRODUCT GAS  
HIGH OXYGEN  
ALARM**

WINDOW A-4

**FS-1105  
M-1 HEATER  
LO FLOW  
HEATER SHUTDOWN**

WINDOW A-5

**TCA-1106  
M-1 HEATER INPUT GAS  
HI TEMP.  
HEATER SHUTDOWN**

WINDOW A-6

**LS-1117  
PS-1 SEPARATOR  
HIGH LEVEL  
ALARM**

WINDOW A-7

**TR-1100  
CR-1 REACTOR  
HIGH TEMP  
ALARM**

WINDOW B-1

**HARC-1104  
OAIC-1112  
HI-HI H<sub>2</sub>/O<sub>2</sub>  
O<sub>2</sub> SHUTDOWN**

WINDOW B-2

**OARC-1119  
PRODUCT GAS  
HI-HI OXYGEN  
O<sub>2</sub> SHUTDOWN**

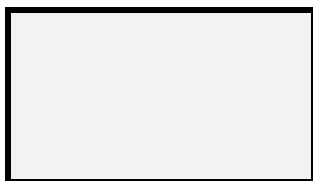
WINDOW B-3

**OAIC-1112  
CR-1 REACTOR  
HIGH OXYGEN  
O<sub>2</sub> LIMIT**

WINDOW B-4

**FS-1105  
LO-LO FLOW  
O<sub>2</sub> SHUTDOWN**

WINDOW B-5



WINDOW B-6

**LS-1117  
PS-1 SEPARATOR  
LOW LEVEL  
ALARM**

WINDOW B-7

**TCA-1114  
CR-1 REACTOR  
HI-HI TEMP  
O<sub>2</sub> SHUTDOWN**

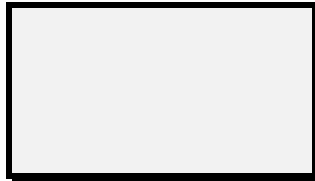
WINDOW C-1

**ANALYZER  
BYPASS  
SWITCH ON**

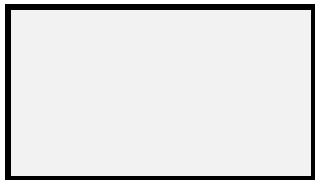
WINDOW C-2

**TCA-1116  
HX-1 COOLER  
HIGH TEMP  
ALARM**

WINDOW C-3



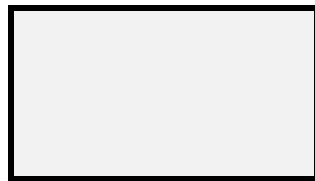
WINDOW C-4



WINDOW C-5

**TCA-1111  
HI-HI TEMP  
FLAME PRESENT  
O<sub>2</sub> SHUTDOWN**

WINDOW C-6



**6.6.12 12 - Alarm Annunciator Panel, Tag No.: CKALB01**

- a) Alarm contact configuration:
  - NO - normally open (close to alarm) for all WINDOWS
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8	9
<b>A</b>	CY113PMP-001/002 SHUTDOWN	$\Delta$ P F/D1 HIGH	$\Delta$ P MIXED BED 1 HIGH	$\Delta$ P MIXED BED 2 HIGH	LEVEL WT104TNK-001 LOW	FLOW ACID LOW	F/D 1 HOLDING FAILURE	CK103MCC001/002 FAILURE	WT NEUT. SUMP LEVEL HIGH
<b>B</b>	INSTRUMENT AIR PRESSURE LOW	$\Delta$ P POST FILTER F/D1 HIGH	$\Delta$ P POST FILTER MB 1 HIGH	$\Delta$ P POST FILTER MB 2 HIGH	CY113PMP001 WINDING TEMPERATURE HIGH	FLOW WATER DILUTION ACID LOW	CONDUCTIVITY F/D 1 HIGH	PRESSURE AIR RECEIVER LOW	LEVEL BRB HIGH
<b>C</b>	115 Vac INSTRUMENTS SUPPLY FAILURE	$\Delta$ P F/D2 HIGH	CONDUCTIVITY MB 1 HIGH	CONDUCTIVITY MB 2 HIGH	CY113PMP001 BEARING TEMPERATURE HIGH	FLOW CAUSTIC SODA LOW	F/D 2 HOLDING FAILURE	FLOW WATER BACKWASH LOW	LEVEL BRB LOW
<b>D</b>	INLET - OUTLET $\Delta$ FLOW HIGH INLET FLOW LOW OR LOW-LOW	$\Delta$ P POST FILTER F/D2 HIGH	$\Delta$ P MIXED BED 3 HIGH	CONDUCTIVITY MB 3 HIGH	CY113PMP002 WINDING TEMPERATURE HIGH	FLOW WATER DILUTION SODA LOW	CONDUCTIVITY F/D 2 HIGH		LEVEL BRB LOW <u>LOW</u>
<b>E</b>	LEVEL CONDENSER LOW		$\Delta$ P POST FILTER MB 3 HIGH	CONDUCTIVITY OUTLET MIXED BEDS HIGH	CY113PMP002 BEARING TEMPERATURE HIGH	TEMPERATURE DILUTED SODA HIGH	FD REGENERATION SHUTDOWN	REGENERATION MB SHUTDOWN	INTEGRATED  LOGIC MODULE
<b>F</b>						TEMPERATURE WATER WH-1 TANK HIGH	FD VALVE IRREGULAR POSITION	MB VALVE IRREGULAR POSITION	



WINDOW A-1	<div>CY113PMP-001/002 SHUTDOWN</div>
WINDOW A-2	<div><math>\Delta</math>P F/D1 HIGH</div>
WINDOW A-3	<div><math>\Delta</math>P MIXED BED 1 HIGH</div>
WINDOW A-4	<div><math>\Delta</math>P MIXED BED 2 HIGH</div>
WINDOW A-5	<div>LEVEL WT104TNK-001 LOW</div>
WINDOW A-6	<div>FLOW ACID LOW</div>
WINDOW A-7	<div>F/D 1 HOLDING FAILURE</div>
WINDOW A-8	<div>CK103MCC001/002 FAILURE</div>

WINDOW A-9

**WT NEUT. SUMP  
LEVEL HIGH**

WINDOW B-1

**INSTRUMENT AIR  
PRESSURE LOW**

WINDOW B-2

**$\Delta$ P POST FILTER  
F/D1 HIGH**

WINDOW B-3

**$\Delta$ P POST FILTER  
MB 1 HIGH**

WINDOW B-4

**$\Delta$ P POST FILTER  
MB 2 HIGH**

WINDOW B-5

**CY113PMP-001  
WINDING  
TEMPERATURE HIGH**

WINDOW B-6

**FLOW WATER DILUTION  
ACID LOW**

WINDOW B-7

**CONDUCTIVITY  
F/D 1 HIGH**

WINDOW B-8

**PRESSURE AIR  
RECEIVER LOW**

WINDOW B-9

**LEVEL BRB  
HIGH**

WINDOW C-1

**115 Vac INSTRUMENTS  
SUPPLY FAILURE**

WINDOW C-2

**$\Delta$ P F/D2  
HIGH**

WINDOW C-3

**CONDUCTIVITY  
MB 1 HIGH**

WINDOW C-4

**CONDUCTIVITY  
MB 2 HIGH**

WINDOW C-5

**CY113PMP-001  
BEARING  
TEMPERATURE HIGH**

WINDOW C-6

**FLOW CAUSTIC  
SODA LOW**

WINDOW C-7

**F/D 2 HOLDING  
FAILURE**

WINDOW C-8

**FLOW WATER  
BACKWASH LOW**

WINDOW C-9

**LEVEL BRB  
LOW**

WINDOW D-1

**INLET - OUTLET  
 $\Delta$ FLOW HIGH  
INLET FLOW LOW OR  
LOW-LOW**

WINDOW D-2

**$\Delta$ P POST FILTER  
F/D2 HIGH**

WINDOW D-3

**$\Delta$ P MIXED BED 3  
HIGH**

WINDOW D-4

**CONDUCTIVITY  
MB 3 HIGH**

WINDOW D-5

**CY113PMP-002  
WINDING  
TEMPERATURE HIGH**

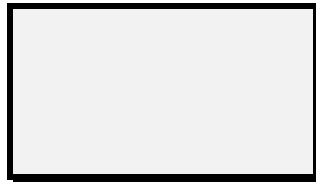
WINDOW D-6

**FLOW WATER DILUTION  
SODA LOW**

WINDOW D-7

**CONDUCTIVITY  
F/D 2 HIGH**

WINDOW D-8



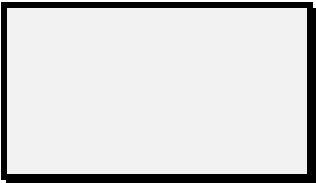
WINDOW D-9

**LEVEL BRB  
LOW LOW**

WINDOW E-1

**LEVEL CONDENSER  
LOW**

WINDOW E-2



WINDOW E-3

**$\Delta$ P POST FILTER  
MB 3 HIGH**

WINDOW E-4

**CONDUCTIVITY OUTLET  
MIXED BEDS HIGH**

WINDOW E-5

**CY113PMP-002  
BEARING  
TEMPERATURE HIGH**

WINDOW E-6

**TEMPERATURE DILUTED  
SODA HIGH**

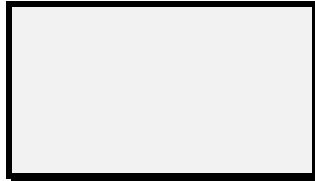
WINDOW E-7

**FD REGENERATION  
SHUTDOWN**

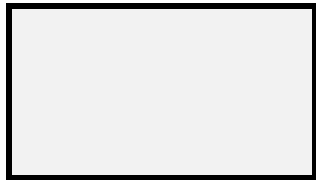
WINDOW E-8

**REGENERATION MB  
SHUTDOWN**

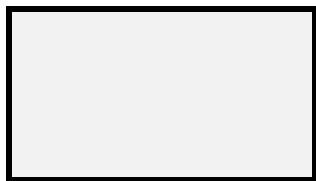
WINDOW F-1



WINDOW F-2



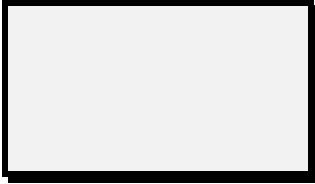
WINDOW F-3



WINDOW F-4



WINDOW F-5



WINDOW F-6



WINDOW F-7



WINDOW F-8



**6.6.13 13 - Alarm Annunciator Panel, Tag No.: CT900RCKT001-CTALB01**

a) Alarm contact configuration:

- NO - normally open (close to alarm) for all WINDOWS

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	
A	IZPAD ALI NAPAKA PLC	TEMP. OLJA NOSILNEGA LEŽAJA CT103PMP-001 > 80°C	TLAK TESNILNE IN MAZALNE VODE ZA CT103PMP-001 < 2.2 bar	DELOVANJE ZAŠČITE TRANSFORMATORJA T-31	INTEGRATED LOGIC MODULE
B	TERMIČNA ZAŠČITA MOTORJA CT103PMP-001	IZPAD NAPETOSTI 24 VDC	DELOVANJE ELEKTRIČNE ZAŠČITE ČRPALKE CT103PMP-001		

WINDOW A-1

IZPAD ALI  
NAPAKA PLC

WINDOW A-2

TEMP. OLJA  
NOSILNEGA LEŽAJA  
CT103PMP-001  
> 80°C

WINDOW A-3

TLAK TESNILNE  
IN MAZALNE  
VODE ZA  
CT103PMP-001  
< 2.2 bar

WINDOW A-4

DELOVANJE  
ZAŠČITE  
TRANSFORMATORJA  
T-31



WINDOW B-1

**TERMIČNA  
ZAŠČITA  
MOTORJA  
CT103PMP-001**

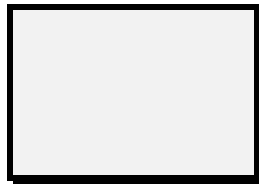
WINDOW B-2

**IZPAD  
NAPETOSTI  
24 VDC**

WINDOW B-3

**DELOVANJE  
ELEKTRIČNE  
ZAŠČITE  
ČRPALKE  
CT103PMP-001**

WINDOW B-4



**6.6.14 14 - Alarm Annunciator Panel, Tag No.: CT900RCKT002-CTALB02**

a) Alarm contact configuration:

- NO - normally open (close to alarm) for all WINDOWS

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	
A	IZPAD ALI NAPAKA PLC	TEMP. OLJA NOSILNEGA LEŽAJA CT103PMP-002 > 80°C	TLAK TESNILNE IN MAZALNE VODE ZA CT103PMP-002 < 2.2 bar	DELOVANJE ZAŠČITE TRANSFORMATORJA T-41	INTEGRATED LOGIC MODULE
B	TERMIČNA ZAŠČITA MOTORJA CT103PMP-002	IZPAD NAPETOSTI 24 VDC	DELOVANJE ELEKTRIČNE ZAŠČITE ČRPALKE CT103PMP-002		

WINDOW A-1

IZPAD ALI  
NAPAKA PLC

WINDOW A-2

TEMP. OLJA  
NOSILNEGA LEŽAJA  
CT103PMP-002  
> 80°C

WINDOW A-3

TLAK TESNILNE  
IN MAZALNE  
VODE ZA  
CT103PMP-002  
< 2.2 bar

WINDOW A-4

DELOVANJE  
ZAŠČITE  
TRANSFORMATORJA  
T-41

WINDOW B-1

**TERMIČNA  
ZAŠČITA  
MOTORJA  
CT103PMP-002**

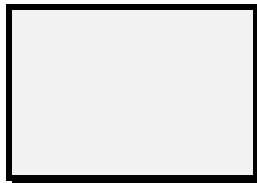
WINDOW B-2

**IZPAD  
NAPETOSTI  
24 VDC**

WINDOW B-3

**DELOVANJE  
ELEKTRIČNE  
ZAŠČITE  
ČRPALKE  
CT103PMP-002**

WINDOW B-4



**6.6.15 15 - Alarm Annunciator Panel, Tag No.: E805-ANN**

**Individual alarm's repeat relays shall be fitted!**

a) Alarm contact configuration:

- NO - normally open (close to alarm) for all WINDOWS

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5
A	SW STRAINER 1A DIFF PRESS HI	SW STRAINER 2B DIFF PRESS HI	SW STRAINER 3C DIFF PRESS HI	SW DESILT STR DIFF PRESS HI	SW DESILT PMP PW WTR PRESS LO
B	SW DESILT PMP TRIP			ANNUNCIATOR GROUND DETECTOR ALARM	INTEGRATED LOGIC MODULE

WINDOW A-1

SW STRAINER 1A  
DIFF PRESS HI

WINDOW A-2

SW STRAINER 2B  
DIFF PRESS HI

WINDOW A-3

SW STRAINER 3C  
DIFF PRESS HI

WINDOW A-4

SW DESILT STR  
DIFF PRESS HI

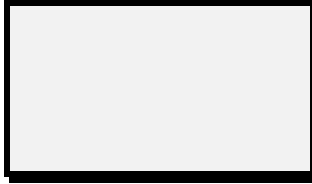
WINDOW A-5

**SW DESILT PMP  
PW WTR  
PRESS LO**

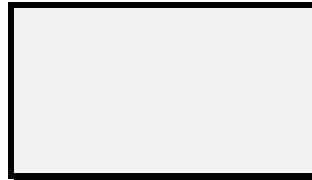
WINDOW B-1

**SW DESILT PMP  
TRIP**

WINDOW B-2



WINDOW B-3



WINDOW B-4

**ANNUNCIATOR  
GROUND DETECTOR  
ALARM**

**6.6.16 16 - Alarm Annunciator Panel, Tag No.: G904-ANN**

b) Alarm contact configuration: Mixed

- NC - normally closed (open to alarm) for WINDOWS A-1, A-2, A-4
- NO – normally open (close to alarm) for all other WINDOWS

a) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4
A	1 DEGAS TNK LEVEL LO	2 DEGAS TNK LEVEL HI	3 DEGAS TNK VACUUM LO	4 CY109HTR-001 OUT TEMP HI
B	5	6	7	INTEGRATED LOGIC MODULE

WINDOW A-1



WINDOW A-2



WINDOW A-3



WINDOW A-4



**6.6.17 17 - Alarm Annunciator Panel, Tag No.: GN099SYEG702-ANN**

a) Alarm contact configuration: Mixed

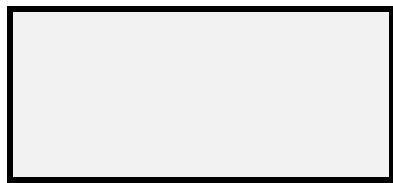
- NO – normally open (close to alarm) according to the following table
- NC - normally closed (open to alarm) according to the following table

	1	2	3	4	5	6	7	8
A	NO	NO	NO	NC	NO	NC	NC	NC
B	NO	NO	NO	NO	NO	NO	NC	NO
C	NO	NO	NO	NC	NO	NO	NO	NO
D	NO	NO	NO	NO	NO	NO	NO	NO
E	NO	NO	NO	NO	NC	NO	NC	

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8
A		DEFOAMING TANK VISOK NIVO	TLAK TESNILNEGA OLJA NIZEK	ČRPALKI STAT. HLAD. VODE 1 IN 2 ZAUSTAVLJENI	TEMPERATURA STAT. HLAD. VODE NA VSTOPU VISOKA	PRETOK VODE V STAT. NAVITJU MAJHEN	ΔP PREKO FILTROV STAT. HLAD. VODE VISOK	TLAK V REZ. ALI ODMEGLJEVALCU MAZ. OLJA VISOK
B		ČRPALKA TESN. OLJA ZRAČNA STRAN ZAUSTAVLJENA	NIVO TESN. OLJA NA H2 STRANI NIZEK		TEMPERATURA STAT. HLAD. VODE NA IZSTOPU VISOKA	PRETOK VODE V STAT. NAVITJU ZELO MAJHEN	ΔP STAT. HLAD. VODE V NAVITJU VELIK	
C	TEMPERATURA VODIKA V GEN. VISOKA	ČRPALKA TESN. OLJA H2 STRAN ZAUSTAVLJENA	TLAK REZERVNEGA TESN. OLJA NIZEK	DODAJANJE VODE V STAT. HLAD. VODO VKLOPLJENO	NIVO V REZERVOARJU STAT. HLAD. VODE VISOK	PREVODNOST STAT. HLAD. VODE NA VSTOPU VISOKA	ΔP MED H2 V GEN. IN STAT. HLAD. VODO NIZEK	
D	TLAK VODIKA NA DOVODU NIZEK	REZERVNA ČRPALKA TESN. OLJA ZRAČNA STRAN OBRATUJE	MOTOR REZERVNE ČRPALKE TESN. OLJA ZRAČNA STRAN PREOBREMEN		NIVO V REZERVOARJU STAT. HLAD. VODE NIZEK	PREVODNOST STAT. HLAD. VODE NA VSTOPU ZELO VISOKA	KONCENTRACIJA KISIKA V STAT. HLAD. VODI VISOKA	
E	DETEKCIJA VODE V GENERATORJU VISOK NIVO				TLAK V REZERVOARJU STAT. HLAD. VODE VISOK	PREVODNOST STAT. HLAD. VODE IZ DEMIN. VISOKA	PANEL ALKALIZERJA IN ALNALIZE STAT. HLAD. VODE NAPAKA	INTEGRATED LOGIC MODULE

WINDOW A-1



WINDOW A-2

**DEFOAMING  
TANK  
VISOK NIVO**

WINDOW A-3

**TLAK  
TESNILNEGA  
OLJA  
NIZEK**

WINDOW A-4

**ČRPALKI  
STAT. HLAD.  
VODE  
1 IN 2  
ZAUSTAVLJENI**

WINDOW A-5

**TEMPERATURA  
STAT. HLAD.  
VODE NA VSTOPU  
VISOKA**

WINDOW A-6

**PRETOK  
VODE V  
STAT. NAVITJU  
MAJHEN**

WINDOW A-7

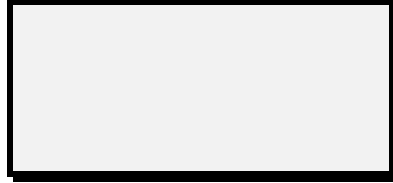
**$\Delta P$   
PREKO FILTROV  
STAT. HLAD.  
VODE  
VISOK**

WINDOW A-8

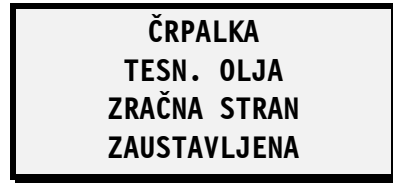
**TLAK  
V REZ. ALI ODMEGLJEVALCU  
MAZ. OLJA  
VISOK**



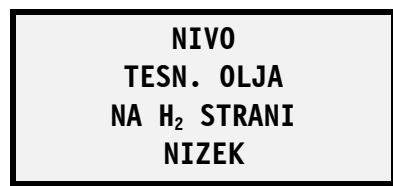
WINDOW B-1



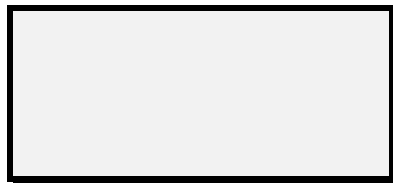
WINDOW B-2



WINDOW B-3



WINDOW B-4



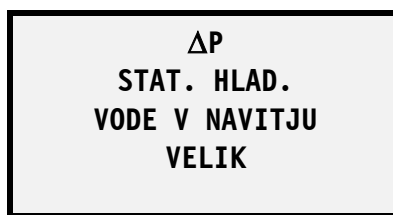
WINDOW B-5



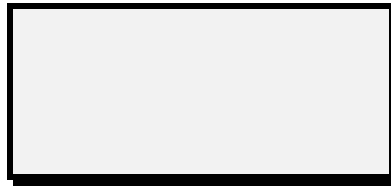
WINDOW B-6



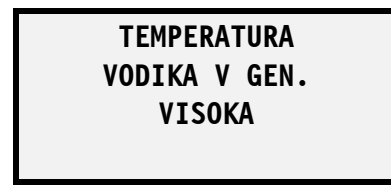
WINDOW B-7



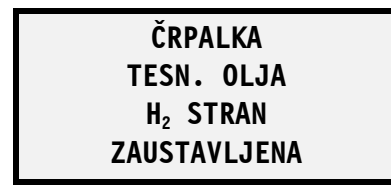
WINDOW B-8



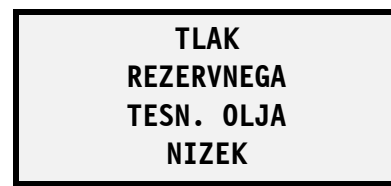
WINDOW C-1



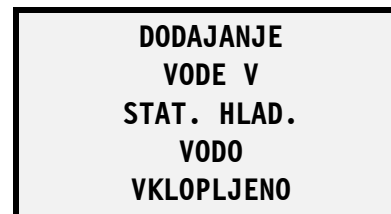
WINDOW C-2



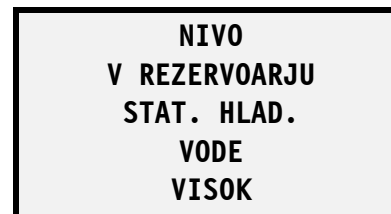
WINDOW C-3



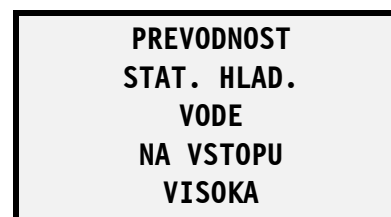
WINDOW C-4



WINDOW C-5



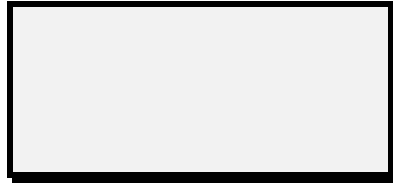
WINDOW C-6



WINDOW C-7

$\Delta P$   
MED  $H_2$  V GEN. IN  
STAT. HLAD.  
VODO  
NIZEK

WINDOW C-8



WINDOW D-1

TLAK  
VODIKA  
NA DOVODU  
NIZEK

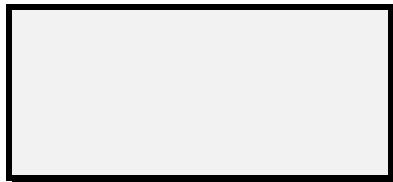
WINDOW D-2

REZERVNA  
ČRPALKA  
TESN. OLJA  
ZRAČNA STRAN  
OBRATUJE

WINDOW D-3

MOTOR  
REZERVNE  
ČRPALKE  
TESN. OLJA  
ZRAČNA STRAN  
PREOBREMENJEN

WINDOW D-4



WINDOW D-5

NIVO  
V REZERVOARJU  
STAT. HLAD.  
VODE  
NIZEK

WINDOW D-6

**PREVODNOST  
STAT. HLAD.  
VODE  
NA VSTOPU  
ZELO VISOKA**

WINDOW D-7

**KONCENTRACIJA  
KISIKA V  
STAT. HLAD. VODI  
VISOKA**

WINDOW D-8

WINDOW E-1

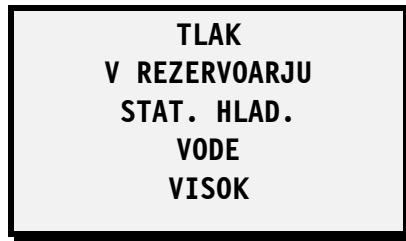
**DETEKCIJA  
VODE V  
GENERATORJU  
VISOK NIVO**

WINDOW E-2

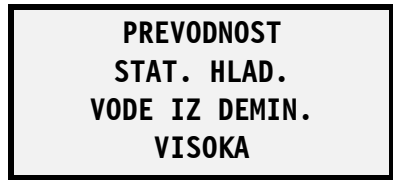
WINDOW E-3

WINDOW E-4

WINDOW E-5



WINDOW E-6



WINDOW E-7



#### **6.6.18 18 - Alarm Annunciator Panel, Tag No.: PC100CME013**

a) Alarm contact configuration: Mixed

- NC - normally closed (open to alarm) for WINDOWS F-3, F-4, H-2, H-4 and
- NO – normally open (close to alarm) for all other WINDOWS

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6
A	01 WINDING HI TEMP OR MECH OVERLOAD CW105TSC001	02 WINDING HI TEMP OR MECH OVERLOAD CW105TSC002	03 WINDING HI TEMP OR MECH OVERLOAD CW105TSC003	04 WINDING HI TEMP OR MECH OVERLOAD CW105TSC004	05 WINDING HI TEMP OR MECH OVERLOAD CW105TSC005	06 WINDING HI TEMP OR MECH OVERLOAD CW105TSC006
B	07 LEFT CHAIN DEFLECTED CW105TSC001	08 LEFT CHAIN DEFLECTED CW105TSC002	09 LEFT CHAIN DEFLECTED CW105TSC003	10 LEFT CHAIN DEFLECTED CW105TSC004	11 LEFT CHAIN DEFLECTED CW105TSC005	12 LEFT CHAIN DEFLECTED CW105TSC006
C	13 RIGHT CHAIN DEFLECTED CW105TSC001	14 RIGHT CHAIN DEFLECTED CW105TSC002	15 RIGHT CHAIN DEFLECTED CW105TSC003	16 RIGHT CHAIN DEFLECTED CW105TSC004	17 RIGHT CHAIN DEFLECTED CW105TSC005	18 RIGHT CHAIN DEFLECTED CW105TSC006
D	19 SAFETY FLAP OPEN CW105TSC001	20 SAFETY FLAP OPEN CW105TSC002	21 SAFETY FLAP OPEN CW105TSC003	22 SAFETY FLAP OPEN CW105TSC004	23 SAFETY FLAP OPEN CW105TSC005	24 SAFETY FLAP OPEN CW105TSC006
E	25 CW TRASH RAKE HI ΔLEVEL	26 CW TRAVELING SCREENS HI-HI ΔLEVEL	27 CLEANING CONVEYOR TROUBLE	28	29 WATER LEVEL MEASUREMENT TROUBLE	30 CW105 OR CW106 CONTROL IN LOCAL
F	31 CW106 PUMPS TRIP	32 CW106 PUMPS PULL TO LOCK	33 CW106 PMP 1 LO SEAL WATER	34 CW106 PMP 2 LO SEAL WATER	35 CW106 PMP 3 LO SUPPLY WATER OR VLV 22805 CLSD	36 PLC AUTOMATIC ACTION NOT SUCCESSFUL
G	37 CW106 PMP 1&2 SCREEN WASH PRESSURE LOW	38 CW106 PMP 3 SCREEN WASH PRESSURE LOW	39 CW901 FSN 1 STRAINER HI ΔP	40 CW901 FSN 2 STRAINER HI ΔP	41 CW901 FSN 3 STRAINER HI ΔP	42 PLC FAULT
H	43 FILTERED WATER FILTER DIFF PRESS HIGH	44 LUBR WATER TANK SUPPLY LO PRSSURE	45 CW PUMP SEAL SUPPLY TROUBLE	46 ACCUMULATOR TANK IN SERVICE	47	48 ANNUNCIATOR GROUND DETECTOR ALARM
I	49	50	51	52	53	<b>INTEGRATED LOGIC MODULE</b>
J	54 DEICING PUMP TRIP	55 DEICING PUMP PULL TO LOCK	56 DEICING PUMP TROUBLE	57	58 CT103 PUMPS PNL TROUBLE	

WINDOW A-1	<div><div>WINDING HI TEMP OR MECH OVERLOAD CW105TSC001</div></div>
WINDOW A-2	<div><div>WINDING HI TEMP OR MECH OVERLOAD CW105TSC002</div></div>
WINDOW A-3	<div><div>WINDING HI TEMP OR MECH OVERLOAD CW105TSC003</div></div>
WINDOW A-4	<div><div>WINDING HI TEMP OR MECH OVERLOAD CW105TSC004</div></div>
WINDOW A-5	<div><div>WINDING HI TEMP OR MECH OVERLOAD CW105TSC005</div></div>
WINDOW A-6	<div><div>WINDING HI TEMP OR MECH OVERLOAD CW105TSC006</div></div>
WINDOW B-1	<div><div>LEFT CHAIN DEFLECTED CW105TSC001</div></div>
WINDOW B-2	<div><div>LEFT CHAIN DEFLECTED CW105TSC002</div></div>

WINDOW B-3

**LEFT CHAIN  
DEFLECTED  
CW105TSC003**

WINDOW B-4

**LEFT CHAIN  
DEFLECTED  
CW105TSC004**

WINDOW B-5

**LEFT CHAIN  
DEFLECTED  
CW105TSC005**

WINDOW B-6

**LEFT CHAIN  
DEFLECTED  
CW105TSC006**

WINDOW C-1

**RIGHT CHAIN  
DEFLECTED  
CW105TSC001**

WINDOW C-2

**RIGHT CHAIN  
DEFLECTED  
CW105TSC002**

WINDOW C-3

**RIGHT CHAIN  
DEFLECTED  
CW105TSC003**



WINDOW C-4

**RIGHT CHAIN  
DEFLECTED  
CW105TSC004**

WINDOW C-5

**RIGHT CHAIN  
DEFLECTED  
CW105TSC004**

WINDOW C-6

**RIGHT CHAIN  
DEFLECTED  
CW105TSC006**

WINDOW D-1

**SAFETY FLAP  
OPEN  
CW105TSC001**

WINDOW D-2

**SAFETY FLAP  
OPEN  
CW105TSC002**

WINDOW D-3

**SAFETY FLAP  
OPEN  
CW105TSC003**

WINDOW D-4

**SAFETY FLAP  
OPEN  
CW105TSC004**

WINDOW D-5

**SAFETY FLAP  
OPEN  
CW105TSC005**

WINDOW D-6

**SAFETY FLAP  
OPEN  
CW105TSC006**

WINDOW E-1

**CW TRASH  
RAKE  
HI ΔLEVEL**

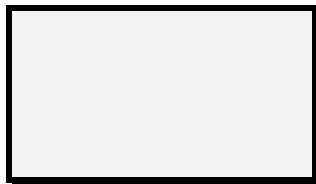
WINDOW E-2

**CW TRAVELLING  
SCREENS  
HI-HI ΔLEVEL**

WINDOW E-3

**CLEANING  
CONVEYOR  
TROUBLE**

WINDOW E-4



WINDOW E-5

**WATER LEVEL  
MEASUREMENT  
TROUBLE**

WINDOW E-6

**CW105 OR CW106  
CONTROL IN LOCAL**

WINDOW F-1

**CW106 PUMPS  
TRIP**

WINDOW F-2

**CW106 PUMPS  
PULL TO LOCK**

WINDOW F-3

**CW106 PMP 1  
LO SEAL WATER**

WINDOW F-4

**CW106 PMP 2  
LO SEAL WATER**

WINDOW F-5

**CW106 PMP 3  
LO SUPPLY WATER OR  
VLV 22805 CLSD**

WINDOW F-6

**PLC  
AUTOMATIC ACTION  
NOT SUCCESSFUL**

WINDOW G-7

**CW106 PMP 1 & 2  
SCREEN WASH  
PRESSURE LOW**

WINDOW G-2

**CW106 PMP 3  
SCREEN WASH  
PRESSURE LOW**

WINDOW G-3

**CW901 FSN 1  
STRAINER HI ΔP**

WINDOW G-4

**CW901 FSN 2  
STRAINER HI ΔP**

WINDOW G-5

**CW901 FSN 3  
STRAINER HI ΔP**

WINDOW G-6

**PLC  
FAULT**

WINDOW H-1

**FILTERED WATER  
FILTER  
DIFF PRESS HIGH**

WINDOW H-2

**LUBR WATER  
TANK SUPPLY  
LO PRESSURE**

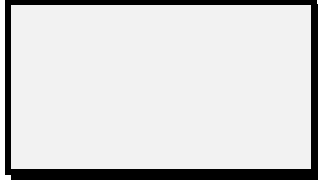
WINDOW H-3

**CW PUMP SEAL  
SUPPLY TROUBLE**

WINDOW H-4

**ACCUMULATOR TANK  
IN SERVICE**

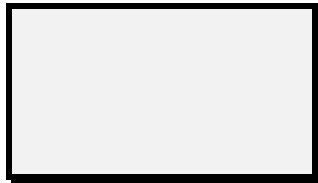
WINDOW H-5



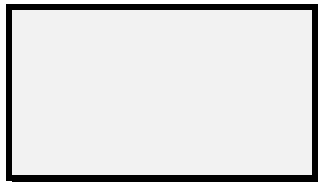
WINDOW H-6

**ANNUNCIATOR GROUND  
DETECTOR ALARM**

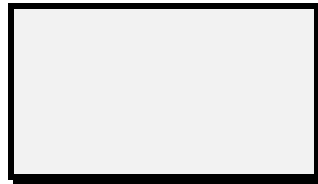
WINDOW I-1



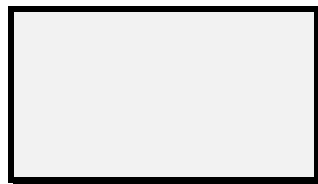
WINDOW I-2



WINDOW I-3



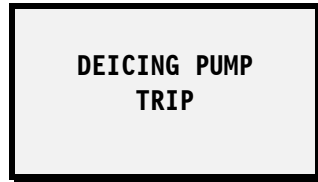
WINDOW I-4



WINDOW I-5



WINDOW J-1



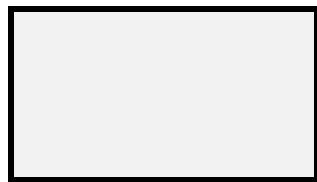
WINDOW J-2



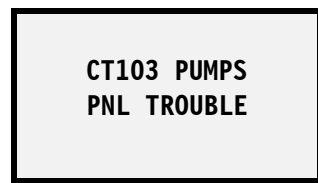
WINDOW J-3



WINDOW J-4



WINDOW J-5



**6.6.19 19 - Alarm Annunciator Panel, Tag No.: PC100CME014**

- a) Alarm contact configuration: Mixed
  - NC - normally closed (open to alarm) for WINDOWS A-9, F-4, D-9 and
  - NO – normally open (close to alarm) for all other WINDOWS
- b) First - up Group shall be configured for windows B-2, C-2, D-2, E-2, F-2, B-3, C-3, D-3, A-4, B-4, A-6, A-7, B-7, B-7, A-9
- c) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8	9
A	LOW FUEL PRESSURE TO INJECTORS	86 LOCKOUT TRIP	GENERATOR TRIP	OVERSPEED TRIP	LOW STARTING AIR PRESSURE	HIGH WATER TEMPERATURE SHUTDOWN	HIGH LUBE OIL TEMPERATURE SHUTDOWN	HIGH LUBE OIL TEMPERATURE ALARM	HIGH CRANKCASE PRESSURE 1 OUT OF 3
B	LOW ENGINE FUEL PUMP PRESSURE	GENERATOR DIFFERENTIAL TRIP	GENERATOR ROTOR GROUND	START FAIL	HIGH STARTING AIR PRESSURE	HIGH WATER TEMPERATURE ALARM	ENGINE A LOW OIL PRESSURE 1 OUT OF 3	ENGINE B LOW OIL PRESSURE 1 OUT OF 3	LOW BATTERY VOLTAGE
C	LOW DC FUEL PUMP PRESSURE	GENERATOR REVERSE POWER	GENERATOR GROUND	GOVERNOR DIFFERENTIAL	AIR RECEIVER LOW PRESSURE	LOW WATER TEMPERATURE	LOW LUBE OIL LEVEL	LOW LUBE OIL TEMPERATURE	LOW DC BUS VOLTAGE
D	DAY TANK HIGH LEVEL	GENERATOR OVERCURRENT	GENERATOR PHASE BALANCE	AIR FILTER RESTRICTION	AIR RECEIVER HIGH WATER LEVEL	LOW WATER LEVEL	LOW CIRCULATING OIL PRESSURE	LOW SOAKBACK OIL PRESSURE	VOLTAGE REGULATOR TRIP
E	DAY TANK LOW LEVEL	GENERATOR INSTANTANEOUS OVERCURRENT	GENERATOR STATOR TEMPERATURE HIGH	SWITCH NOT IN AUTO	VALVE OUT OF POSITION	STORAGE TANK LO LEVEL		LOW LUBE OIL PRESSURE ALARM	INTEGRATED LOGIC MODULE
F	BACKUP FUEL TRANSFER PUMP RUNNING	GENERATOR LOSS OF EXCITATION	MULTIFUNCTION PROTECTIVE RELAY TROUBLE	BLOWN FUSE		STORAGE TANK LO-LO LEVEL			



WINDOW A-1

**LOW FUEL  
PRESSURE TO  
INJECTORS**

WINDOW A-2

**86 LOCKOUT  
TRIP**

WINDOW A-3

**GENERATOR  
TRIP**

WINDOW A-4

**OVERSPEED  
TRIP**

WINDOW A-5

**LOW STARTING  
AIR PRESSURE**

WINDOW A-6

**HIGH WATER  
TEMPERATURE  
SHUTDOWN**

WINDOW A-7

**HIGH LUBE OIL  
TEMPERATURE  
SHUTDOWN**

WINDOW A-8

**HIGH LUBE OIL  
TEMPERATURE  
ALARM**

WINDOW A-9

**HIGH CRANKCASE  
PRESSURE  
1 OUT OF 3**

WINDOW B-1

**LOW ENGINE FUEL  
PUMP PRESSURE**

WINDOW B-2

**GENERATOR  
DIFFERENTIAL TRIP**

WINDOW B-3

**GENERATOR  
ROTOR GROUND**

WINDOW B-4

**START FAIL**

WINDOW B-5

**HIGH STARTING  
AIR PRESSURE**

WINDOW B-6

**HIGH WATER  
TEMPERATURE  
ALARM**

WINDOW B-7

**ENGINE A LOW  
OIL PRESSURE  
1 OUT OF 3**

WINDOW B-8

**ENGINE B LOW  
OIL PRESSURE  
1 OUT OF 3**

WINDOW B-9

**LOW BATTERY  
VOLTAGE**

WINDOW C-1

**LOW DC FUEL  
PUMP PRESSURE**

WINDOW C-2

**GENERATOR  
REVERSE POWER**

WINDOW C-3

**GENERATOR  
GROUND**

WINDOW C-4

**GENERATOR  
DIFERENTIAL**

WINDOW C-5

**AIR RECEIVER  
LOW PRESSURE**

WINDOW C-6

**LOW WATER  
TEMPERATURE**

WINDOW C-7

**LOW LUBE  
OIL LEVEL**

WINDOW C-8

**LOW LUBE OIL  
TEMPERATURE**

WINDOW C-9

**LOW DC BUS  
VOLTAGE**

WINDOW D-1

**DAY TANK  
HIGH LEVEL**

WINDOW D-2

**GENERATOR  
OVERCURRENT**

WINDOW D-3

**GENERATOR  
PHASE  
BALANCE**

WINDOW D-4

**AIR FILTER  
RESTRICTION**

WINDOW D-5

**AIR RECEIVER  
HIGH WATER LEVEL**

WINDOW D-6

**LOW WATER  
LEVEL**

WINDOW D-7

**LOW CIRCULATING  
OIL PRESSURE**

WINDOW D-8

**LOW SOAKBACK  
OIL PRESSURE**

WINDOW D-9

**VOLTAGE  
REGULATOR  
TRIP**

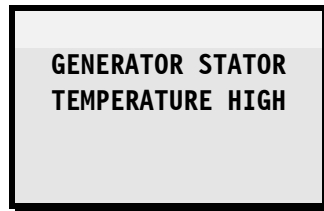
WINDOW E-1



WINDOW E-2



WINDOW E-3



WINDOW E-4



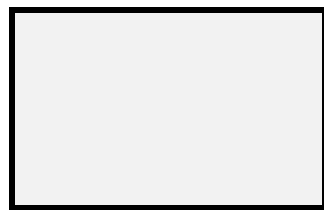
WINDOW E-5



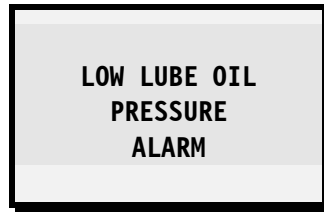
WINDOW E-6



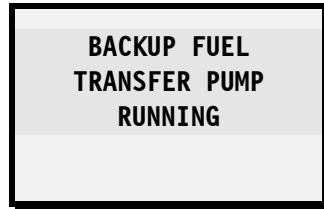
WINDOW E-7



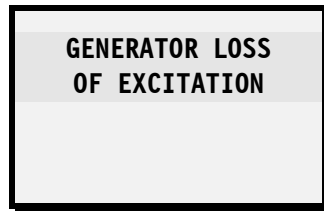
WINDOW E-8



WINDOW F-1



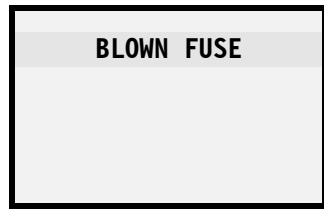
WINDOW F-2



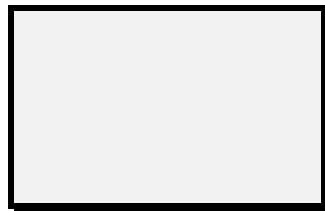
WINDOW F-3



WINDOW F-4



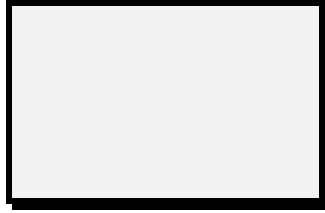
WINDOW F-5



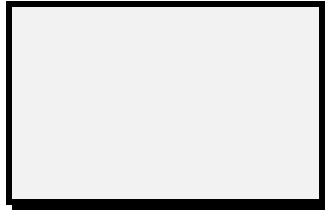
WINDOW F-6



WINDOW F-7



WINDOW F-8



**6.6.20 20 - Alarm Annunciator Panel, Tag No.: PC100CME015**

- a) Alarm contact configuration:
  - NO - normally open (close to alarm) for all WINDOWS
- b) First - up Group shall be configured for WINDOWS A-1, B-1, A-2, B-2, A-4, B-4, A-5, A-6, A-7, B-7, C-7, D-7, A-9
- c) Window engraving: All windows shall be engraved according to the following scheme.



	1	2	3	4	5	6	7	8	9
A	LOW OIL PRESSURE SHUTDOWN	HIGH CRANKCASE PRESSURE SHUTDOWN	LOW OIL PRESSURE SHUTDOWN	HIGH CRANKCASE PRESSURE SHUTDOWN	ENGINE A OVERSPEED TRIP	ENGINE B OVERSPEED TRIP	GENERATOR DIFFERENTIAL TRIP	86 LOCKOUT TRIP	FAIL TO START
B	HIGH LUBE OIL TEMPERATURE SHUTDOWN	HIGH WATER TEMPERATURE SHUTDOWN	HIGH LUBE OIL TEMPERATURE SHUTDOWN	HIGH WATER TEMPERATURE SHUTDOWN	SWITCH NOT IN AUTO	BLOWN FUSE	GENERATOR TRIP	BACKUP FUEL TRANSFER PUMP RUNNING	LOW STARTING AIR PRESSURE
C	HIGH LUBE OIL TEMPERATURE ALARM	HIGH WATER TEMPERATURE ALARM	HIGH LUBE OIL TEMPERATURE ALARM	HIGH WATER TEMPERATURE ALARM	LOW WATER TEMPERATURE	LOW LUBE OIL TEMPERATURE	GENERATOR ROTOR GROUND	ENGINE A OR B DAY TANK LOW LEVEL	AIR RECEIVER HIGH WATER LEVEL
D	LOW LUBE OIL PRESSURE ALARM	LOW WATER LEVEL	LOW LUBE OIL PRESSURE ALARM	LOW WATER LEVEL	GOVERNOR DIFFERENTIAL	LOW CIRCULATION OIL PRESSURE OR SOAKBACK PUMP TRIP	GENERATOR FIELD FAILURE	ENGINE A & B DAY TANK HIGH LEVEL	GENERATOR OVERVOLTAGE
E	LOW LUBE OIL LEVEL	LOW ENGINE FUEL PRESSURE	LOW LUBE OIL LEVEL	LOW ENGINE FUEL PRESSURE		LOW SOAKBACK OIL PRESSURE	GENERATOR STATOR TEMPERATURE HIGH	FUEL OIL STORAGE TANK LOW-LOW LEVEL	INTEGRATED LOGIC MODULE
F		AIR FILTER RESTRICTION		AIR FILTER RESTRICTION			MULTIFUNCTION PROTECTIVE RELAY TROUBLE	FUEL OIL STORAGE TANK LOW LEVEL	

WINDOW A-1

**LOW OIL  
PRESSURE  
SHUTDOWN**

WINDOW A-2

**HIGH CRANKCASE  
PRESSURE  
SHUTDOWN**

WINDOW A-3

**LOW OIL  
PRESSURE  
SHUTDOWN**

WINDOW A-4

**HIGH CRANKCASE  
PRESSURE  
SHUTDOWN**

WINDOW A-5

**ENGINE A  
OVERSPEED TRIP**

WINDOW A-6

**ENGINE B  
OVERSPEED TRIP**

WINDOW A-7

**GENERATOR  
DIFFERENTIAL  
TRIP**

WINDOW A-8

**86 LOCKOUT  
TRIP**

WINDOW A-9

**FAIL  
TO START**

WINDOW B-1

**HIGH LUBE OIL  
TEMPERATURE  
SHUTDOWN**

WINDOW B-2

**HIGH WATER  
TEMPERATURE  
SHUTDOWN**

WINDOW B-3

**HIGH LUBE OIL  
TEMPERATURE  
SHUTDOWN**

WINDOW B-4

**HIGH WATER  
TEMPERATURE  
SHUTDOWN**

WINDOW B-5

**SWITCH NOT  
IN AUTO**

WINDOW B-6

**BLOWN FUSE**

WINDOW B-7

**GENERATOR  
TRIP**

WINDOW B-8

**BACKUP FUEL  
TRANSFER PUMP  
RUNNING**

WINDOW B-9

**LOW STARTING  
AIR PRESSURE**

WINDOW C-1

**HIGH LUBE OIL  
TEMPERATURE  
ALARM**

WINDOW C-2

**HIGH WATER  
TEMPERATURE  
ALARM**

WINDOW C-3

**HIGH LUBE OIL  
TEMPERATURE  
ALARM**

WINDOW C-4

**HIGH WATER  
TEMPERATURE  
ALARM**

WINDOW C-5

**LOW WATER  
TEMPERATURE**

WINDOW C-6

**LOW LUBE OIL  
TEMPERATURE**

WINDOW C-7

**GENERATOR  
ROTOR  
GROUND**

WINDOW C-8

**ENGINE A OR B  
DAY TANK  
LOW LEVEL**

WINDOW C-9

**AIR REVEIVER  
HIGH WATER  
LEVEL**

WINDOW D-1

**LOW LUBE OIL  
PRESSURE  
ALARM**

WINDOW D-2

**LOW  
WATER  
LEVEL**

WINDOW D-3

**LOW LUBE OIL  
PRESSURE  
ALARM**

WINDOW D-4

**LOW  
WATER  
LEVEL**

WINDOW D-5

**GOVERNOR  
DIFFERENTIAL**

WINDOW D-6

**LOW CIRCULATING OIL  
PRESSURE OR  
SOAKBACK PUMP TRIP**

WINDOW D-7

**GENERATOR  
FIELD  
FAILURE**

WINDOW D-8

**ENGINE A & B  
DAY TANK  
HIGH LEVEL**

WINDOW D-9

**GENERATOR  
OVERVOLTAGE**

WINDOW E-1

**LOW  
LUBE OIL  
LEVEL**

WINDOW E-2

**LOW  
ENGINE FUEL  
PRESSURE**

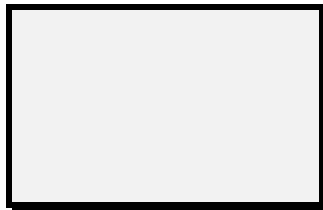
WINDOW E-3

**LOW  
LUBE OIL  
LEVEL**

WINDOW E-4

**LOW ENGINE  
FUEL PRESSURE**

WINDOW E-5



WINDOW E-6

**LOW SOAKBACK  
OIL PRESSURE**

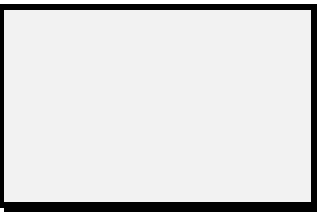
WINDOW E-7

**GENERATOR  
STATOR  
TEMPERATURE HIGH**

WINDOW E-8

**FUEL OIL  
STORAGE TANK  
LOW-LOW LEVEL**

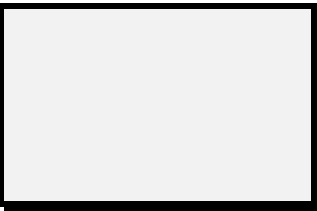
WINDOW F-1



WINDOW F-2

**AIR FILTER  
RESTRICTION**

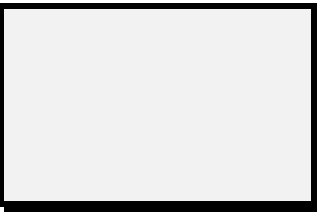
WINDOW F-3



WINDOW F-4

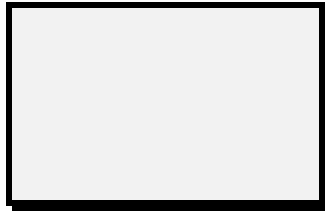
**AIR FILTER  
RESTRICTION**

WINDOW F-5





WINDOW F-6



WINDOW F-7



WINDOW F-8



#### **6.6.21 21 - Alarm Annunciator Panel, Tag No.: PC100CME016**

a) Alarm contact configuration:

- NO - normally open (close to alarm) for all WINDOWS

b) First - up Group shall be configured for WINDOWS A-1, B-1, A-2, B-2, A-4, B-4, A-5, A-6, A-7, B-7, C-7, D-7, A-9

c) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8	9
A	LOW OIL PRESSURE SHUTDOWN	HIGH CRANKCASE PRESSURE SHUTDOWN	LOW OIL PRESSURE SHUTDOWN	HIGH CRANKCASE PRESSURE SHUTDOWN	ENGINE A OVERSPEED TRIP	ENGINE B OVERSPEED TRIP	GENERATOR DIFFERENTIAL TRIP	86 LOCKOUT TRIP	FAIL TO START
B	HIGH LUBE OIL TEMPERATURE SHUTDOWN	HIGH WATER TEMPERATURE SHUTDOWN	HIGH LUBE OIL TEMPERATURE SHUTDOWN	HIGH WATER TEMPERATURE SHUTDOWN	SWITCH NOT IN AUTO	BLOWN FUSE	GENERATOR TRIP	BACKUP FUEL TRANSFER PUMP RUNNING	LOW STARTING AIR PRESSURE
C	HIGH LUBE OIL TEMPERATURE ALARM	HIGH WATER TEMPERATURE ALARM	HIGH LUBE OIL TEMPERATURE ALARM	HIGH WATER TEMPERATURE ALARM	LOW WATER TEMPERATURE	LOW LUBE OIL TEMPERATURE	GENERATOR ROTOR GROUND	ENGINE A OR B DAY TANK LOW LEVEL	AIR RECEIVER HIGH WATER LEVEL
D	LOW LUBE OIL PRESSURE ALARM	LOW WATER LEVEL	LOW LUBE OIL PRESSURE ALARM	LOW WATER LEVEL	GOVERNOR DIFFERENTIAL	LOW CIRCULATION OIL PRESSURE OR SOAKBACK PUMP TRIP	GENERATOR FIELD FAILURE	ENGINE A & B DAY TANK HIGH LEVEL	GENERATOR OVERVOLTAGE
E	LOW LUBE OIL LEVEL	LOW ENGINE FUEL PRESSURE	LOW LUBE OIL LEVEL	LOW ENGINE FUEL PRESSURE		LOW SOAKBACK OIL PRESSURE	GENERATOR STATOR TEMPERATURE HIGH	FUEL OIL STORAGE TANK LOW-LOW LEVEL	INTEGRATED LOGIC MODULE
F		AIR FILTER RESTRICTION		AIR FILTER RESTRICTION			MULTIFUNCTION PROTECTIVE RELAY TROUBLE	FUEL OIL STORAGE TANK LOW LEVEL	

WINDOW A-1	<b>LOW OIL PRESSURE SHUTDOWN</b>
WINDOW A-2	<b>HIGH CRANKCASE PRESSURE SHUTDOWN</b>
WINDOW A-3	<b>LOW OIL PRESSURE SHUTDOWN</b>
WINDOW A-4	<b>HIGH CRANKCASE PRESSURE SHUTDOWN</b>
WINDOW A-5	<b>ENGINE A OVERSPEED TRIP</b>
WINDOW A-6	<b>ENGINE B OVERSPEED TRIP</b>
WINDOW A-7	<b>GENERATOR DIFFERENTIAL TRIP</b>

WINDOW A-8

**86 LOCKOUT  
TRIP**

WINDOW A-9

**FAIL  
TO START**

WINDOW B-1

**HIGH LUBE OIL  
TEMPERATURE  
SHUTDOWN**

WINDOW B-2

**HIGH WATER  
TEMPERATURE  
SHUTDOWN**

WINDOW B-3

**HIGH LUBE OIL  
TEMPERATURE  
SHUTDOWN**

WINDOW B-4

**HIGH WATER  
TEMPERATURE  
SHUTDOWN**

WINDOW B-5

**SWITCH NOT  
IN AUTO**

WINDOW B-6

**BLOWN FUSE**

WINDOW B-7

**GENERATOR  
TRIP**

WINDOW B-8

**BACKUP FUEL  
TRANSFER PUMP  
RUNNING**

WINDOW B-9

**LOW STARTING  
AIR PRESSURE**

WINDOW C-1

**HIGH LUBE OIL  
TEMPERATURE  
ALARM**

WINDOW C-2

**HIGH WATER  
TEMPERATURE  
ALARM**

WINDOW C-3

**HIGH LUBE OIL  
TEMPERATURE  
ALARM**

WINDOW C-4

**HIGH WATER  
TEMPERATURE  
ALARM**

WINDOW C-5

**LOW WATER  
TEMPERATURE**

WINDOW C-6

**LOW LUBE OIL  
TEMPERATURE**

WINDOW C-7

**GENERATOR  
ROTOR  
GROUND**

WINDOW C-8

**ENGINE A OR B  
DAY TANK  
LOW LEVEL**

WINDOW C-9

**AIR REVEIVER  
HIGH WATER  
LEVEL**

WINDOW D-1

**LOW LUBE OIL  
PRESSURE  
ALARM**

WINDOW D-2

**LOW  
WATER  
LEVEL**

WINDOW D-3

**LOW LUBE OIL  
PRESSURE  
ALARM**

WINDOW D-4

**LOW  
WATER  
LEVEL**

WINDOW D-5

**GOVERNOR  
DIFFERENTIAL**

WINDOW D-6

**LOW CIRCULATING OIL  
PRESSURE OR  
SOAKBACK PUMP TRIP**

WINDOW D-7

**GENERATOR  
FIELD  
FAILURE**

WINDOW D-8

**ENGINE A & B  
DAY TANK  
HIGH LEVEL**

WINDOW D-9

**GENERATOR  
OVERVOLTAGE**

WINDOW E-1

**LOW  
LUBE OIL  
LEVEL**

WINDOW E-2

**LOW  
ENGINE FUEL  
PRESSURE**

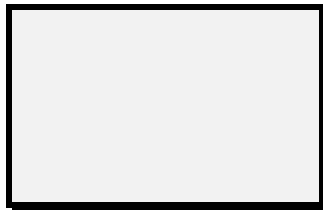
WINDOW E-3

**LOW  
LUBE OIL  
LEVEL**

WINDOW E-4

**LOW ENGINE  
FUEL PRESSURE**

WINDOW E-5



WINDOW E-6

**LOW SOAKBACK  
OIL PRESSURE**



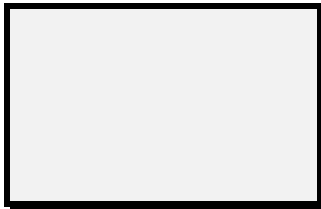
WINDOW E-7

**GENERATOR  
STATOR  
TEMPERATURE HIGH**

WINDOW E-8

**FUEL OIL  
STORAGE TANK  
LOW-LOW LEVEL**

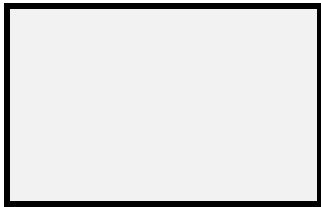
WINDOW F-1



WINDOW F-2

**AIR FILTER  
RESTRICTION**

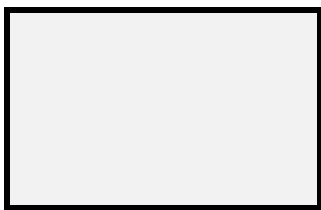
WINDOW F-3



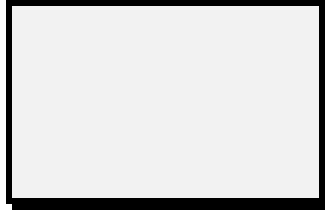
WINDOW F-4

**AIR FILTER  
RESTRICTION**

WINDOW F-5



WINDOW F-6



WINDOW F-7



WINDOW F-8



**6.6.22 22 - Alarm Annunciator Panel, Tag No.: R926-ANN**

a) Alarm contact configuration: Mixed

- NO – normally open (close to alarm) for WINDOWS A-3, B-1, B-2, C-3
- NC - normally closed (open to alarm) for all other WINDOWS

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4
A	MW TNK TEMP LO	MW TNK TEMP HI	MW100PMP-03C START FAILED	PW900PMP-006 TRIP
B	SERVICE LINE FLOW A HI OR FUI3223 FAILURE	SERVICE LINE FLOW B HI OR FUI3224 FAILURE	SERVICE LINE FLOW A LO	SERVICE LINE FLOW B LO
C	DEGAS TNK VACUUM LO	DEGAS TNK LEVEL HI / LO	MW DEMAND PRESS HI / LO-LO	INTEGRATED LOGIC MODULE

WINDOW A-1



WINDOW A-2

**MW TNK  
TEMP  
HI**

WINDOW A-3

**MW100PMP-03C  
START  
FAILED**

WINDOW A-4

**PW900PMP-006  
TRIP**

WINDOW B-1

**SERVICE LINE  
FLOW A  
HI OR  
FUI3223 FAILURE**

WINDOW B-2

**SERVICE LINE  
FLOW B  
HI OR  
FUI3224 FAILURE**

WINDOW B-3

**SERVICE LINE  
FLOW A  
LO**

WINDOW B-4

**SERVICE LINE  
FLOW B  
LO**

WINDOW C-1

**DEGAS TNK  
VACUUM  
LO**

WINDOW C-2



WINDOW C-3

**6.6.23 23 - Alarm Annunciator Panel, Tag No.: RD106PNLX921-ANN**

a) Alarm contact configuration:

- NO - normally open (close to alarm) for all WINDOWS

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6
A	NAPAKA ZAPORNICA 1	NAPAKA ZAPORNICA 2	NAPAKA ZAPORNICA 3	NAPAKA ZAPORNICA 4	NAPAKA ZAPORNICA 5	NAPAKA ZAPORNICA 6
B	DELTA T  >3°C	TEMP. MEŠANJA  >28°C	TEMP. CW IZTOK  >43°C		NAPAKA V UKAZU PP	NIVO JEZU  <150m n.m.
C	NAPAKA RD SISTEMA	IZPAD MER. MESTA  M1 - M6			INTEGRATED LOGIC MODULE	
D						

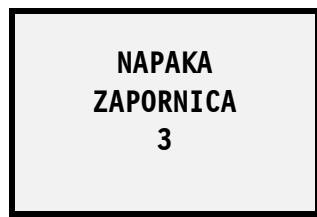
WINDOW A-1



WINDOW A-2



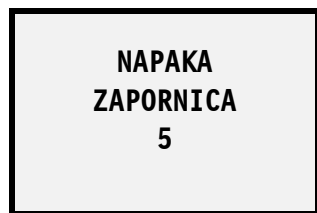
WINDOW A-3



WINDOW A-4



WINDOW A-5



WINDOW A-6



WINDOW B-1

**DELTA T**  
**>3°C**

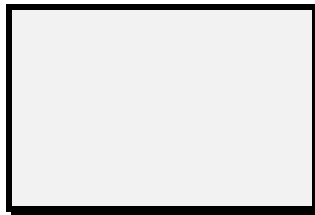
WINDOW B-2

**TEMP.**  
**MEŠANJA**  
**>28°C**

WINDOW B-3

**TEMP.**  
**CW IZTOK**  
**>43°C**

WINDOW B-4



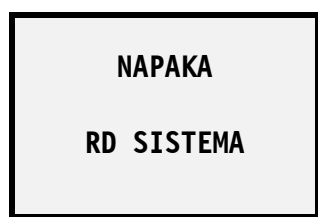
WINDOW B-5

**NAPAKA**  
**V UKAZU**  
**PP**

WINDOW B-6

**NIVO JEZU**  
**<150m n.m.**

WINDOW C-1



WINDOW C-2



#### 6.6.24 24 - Alarm Annunciator Panel, Tag No.: AFALB01

**IP54 viewing window shall be added.**

a) Alarm contact configuration: Mixed

- NC – normally closed (open to alarm) for WINDOW A-2
- NO - normally open (close to alarm) for all other WINDOWS

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3
A	VIBRATION HIGH	LOSS OF CONTROL POWER	MECHANICAL TRIP OPERATED
B	ELECTRONIC OVER- SPEED SET POINT NOT NORMAL	ELECTRICAL TRIP OPERATED	LOW BEARING LUBE WATER DIFFERENTIAL PRESSURE
C			INTEGRATED LOGIC MODULE
D			



WINDOW A-1

**VIBRATION  
HIGH**

WINDOW A-2

**LOSS OF  
CONTROL  
POWER**

WINDOW A-3

**MECHANICAL  
TRIP  
OPERATED**

WINDOW B-1

**ELECTRONIC OVER-  
SPEED SET POINT  
NOT NORMAL**

WINDOW B-2

**ELECTRICAL  
TRIP  
OPERATED**

WINDOW B-3

**LOW BEARING LUBE  
WATER DIFFERENTIAL  
PRESSURE**

**6.6.25 25 - Alarm Annunciator Panel, Tag No.: PC100CME026****Remote logic module shall be constructed!**

a) Alarm contact configuration: Mixed

- NO – normally open (close to alarm) according to the following table
- NC - normally closed (open to alarm) according to the following table

	1	2	3	4	5	6	7	8
A	NC	NC	NC	NC	NC	NC	NC	NC
B	NO	NO	NO	NO	NO	NO	NO	NO
C	NC	NC	NC	NC	NC	NC	NC	NC
D	NC	NC	NC	NC	NC	NO	NO	NC
E	NC	NC	NC	NC	NC	NC	NO	NO

b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8
A	OSC CHARCOAL CLEANUP FAN 1 FLOW LO	OSC CHARCOAL CLEANUP FAN 2 FLOW LO	OSC CHARCOAL PLENUM EHC TROUBLE	OSC AHU 1 FLOW LO	OSC AHU 2 FLOW LO	OSC PURGE FAN 003 FLOW LO	OSC CHILLER UNIT 1 TROUBLE	OSC CHILLER UNIT 2 TROUBLE
B	OSC CHARCOAL CLEANUP FAN 1 PULL TO LOCK	OSC CHARCOAL CLEANUP FAN 2 PULL TO LOCK	OSC CHAR PLENUM HEATING COIL PULL TO LOCK	OSC AHU 1 PULL TO LOCK	OSC AHU 2 PULL TO LOCK	OSC PURGC FAN 003 PULL TO LOCK	OSC CHILLER UNIT 1 PULL TO LOCK	OSC CHILLER UNIT 2 PULL TO LOCK
C	OSC DIFERENTIAL PRESSURE LO	OSC CHAR PLENUM INTAKE AIR HUMIDITY HI	OSC CHAR PLM HEATING COIL CONTROL IN LOCAL	OSC AHU 1 CONTROL IN LOCAL	OSC AHU 2 CONTROL IN LOCAL	OSC EXHAUST FAN 004 FLOW LO	OSC CHILLER UNIT 1 CONTROL IN LOCAL	CHILLER UNIT 2 CONTROL IN LOCAL
D	OSC CO2 AIR CONC HI	OSC CHAR CLEANUP INTAKE DAMPERS OVERRIDE	OSC CHAR PLENUM CHARCOAL TEMP HI-HI	OSC AHU 1 TROUBLE	OSC AHU 2 TROUBLE	OSC EXHAUST FAN 004 PULL TO LOCK	OSC EXHAUST FAN 007 FLOW LO	GROUND FAULT ALARM
E	OSC VENTILATION SMOKE	OSC DG ROOM FAN 006 FLOW LO	OSC CHAR PLENUM CHARCOAL TEMP HI	OSC ROOMS VENT ISOLATION	OSC ROOMS PURGE SWITCH IN PURGE	OSC ROOMS SMOKE SWITCH IN SMOKE	OSC EXHAUST FAN 007 PULL TO LOCK	

WINDOW A-1

**OSC CHARCOAL  
CLEANUP FAN 1  
LO FLOW**

WINDOW A-2

**OSC CHARCOAL  
CLEANUP FAN 2  
LO FLOW**

WINDOW A-3

**OSC CHARCOAL  
PLENUM EHC  
TROUBLE**

WINDOW A-4

**OSC AHU 1  
LO FLOW**

WINDOW A-5

**OSC AHU 2  
LO FLOW**

WINDOW A-6

**OSC  
PURGE FAN 003  
FLOW LO**

WINDOW A-7

**OSC CHILLER  
UNIT 1  
TROUBLE**

WINDOW A-8

**OSC CHILLER  
UNIT 2  
TROUBLE**

WINDOW B-1

**OSC CHARCOAL  
CLEANUP FAN 1  
PULL TO LOCK**

WINDOW B-2

**OSC CHARCOAL  
CLEANUP FAN 2  
PULL TO LOCK**

WINDOW B-3

**OSC CHAR PLENUM  
HEATING COIL  
PULL TO LOCK**

WINDOW B-4

**OSC AHU 1  
PULL TO LOCK**

WINDOW B-5

**OSC AHU 2  
PULL TO LOCK**

WINDOW B-6

**OSC  
PURGE FAN 3  
PULL TO LOCK**

WINDOW B-7

**OSC CHILLER 1  
UNIT  
PULL TO LOCK**

WINDOW B-8

**OSC CHILLER 2  
UNIT  
PULL TO LOCK**

WINDOW C-1

**OSC  
DIFERENTIAL  
LO PRESSURE**

WINDOW C-2

**OSC CHAR PLENUM  
INTAKE AIR  
HI HUMIDITY**

WINDOW C-3

**OSC CHAR PLENUM  
HEATING COIL  
CONTROL IN LOCAL**

WINDOW C-4

**OSC AHU 1  
CONTROL IN LOCAL**

WINDOW C-5

**OSC AHU 2  
CONTROL IN LOCAL**

WINDOW C-6

**OSC EXHAUST  
FAN 004  
FLOW LO**

WINDOW C-7

**OSC CHILLER  
UNIT 1  
CONTROL IN LOCAL**

WINDOW C-8

**OSC CHILLER  
UNIT 2  
CONTROL IN LOCAL**

WINDOW D-1

**OSC C02  
AIR CONC HI**

WINDOW D-2

**OSC CHAR CLEANUP  
INTAKE DAMPERS  
OVERRIDE**

WINDOW D-3

**OSC CHAR PLENUM  
CHARCOAL  
HI-HI TEMP**

WINDOW D-4

**OSC AHU 1  
TROUBLE**

WINDOW D-5

**OSC AHU 2  
TROUBLE**

WINDOW D-6

**OSC EXHAUST  
FAN 004  
PULL TO LOCK**

WINDOW D-7

**OSC EXHAUST  
FAN 007  
FLOW LO**

WINDOW D-8

**GROUND FAULT  
ALARM**

WINDOW E-1

**OSC  
VENTILATION  
SMOKE**

WINDOW E-2

**OSC  
DG FAN 006  
LO FLOW**

WINDOW E-3

**OSC CHAR PLENUM  
CHARCOAL  
HI TEMP**

WINDOW E-4

**OSC ROOMS  
VENT ISOLATION**

WINDOW E-5

**OSC ROOMS  
PURGE SWITCH  
IN PURGE**

WINDOW E-6

**OSC ROOMS  
SMOKE SWITCH  
IN SMOKE**

WINDOW E-7

**OSC  
EXHAUST FAN 007  
PULL TO LOCK**



**6.6.26 26 - Alarm Annunciator Panel, Tag No.: CTCSALB001**

- a) Alarm contact configuration: NO - normally open (close to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8
A	BALL RECIRCULATION PUMP TROUBLE	BALL COLLECTOR TROUBLE	SCREENS TROUBLE	BALL RECIRCULATIN MONITOR TROUBLE				
B	$\Delta$ P EXCESSIVE HIGH	$\Delta$ P SYSTEM TROUBLE	SYSTEM ALARMS	PLC TROUBLE				
C							INTEGRATED LOGIC MODULE	
D								

WINDOW A-1

**BALL  
RECIRCULATION  
PUMP TROUBLE**

WINDOW A-2

**BALL  
COLLECTOR  
TROUBLE**

WINDOW A-3

**SCREENS  
TROUBLE**

WINDOW A-4

**BALL  
RECIRCULATING  
MONITOR  
TROUBLE**

WINDOW B-1

**$\Delta$ P  
EXCESSIVE  
HIGH**

WINDOW B-2

**$\Delta$ P  
SYSTEM  
TROUBLE**

WINDOW B-3

**SYSTEM  
ALARMS**

WINDOW B-4

**PLC  
TROUBLE**

**6.6.27 27 - Alarm Annunciator Panel, Tag No.: CTCSALB002**

- a) Alarm contact configuration: NO - normally open (close to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8
A	BALL RECIRCULATION PUMP TROUBLE	BALL COLLECTOR TROUBLE	SCREENS TROUBLE	BALL RECIRCULATIN MONITOR TROUBLE				
B	$\Delta$ P EXCESSIVE HIGH	$\Delta$ P SYSTEM TROUBLE	SYSTEM ALARMS	PLC TROUBLE				
C							INTEGRATED LOGIC MODULE	
D								

WINDOW A-1

**BALL  
RECIRCULATION  
PUMP TROUBLE**

WINDOW A-2

**BALL  
COLLECTOR  
TROUBLE**

WINDOW A-3

**SCREENS  
TROUBLE**

WINDOW A-4

**BALL  
RECIRCULATING  
MONITOR  
TROUBLE**

WINDOW B-1

**$\Delta$ P  
EXCESSIVE  
HIGH**

WINDOW B-2

**$\Delta$ P  
SYSTEM  
TROUBLE**

WINDOW B-3

**SYSTEM  
ALARMS**

WINDOW B-4

**PLC  
TROUBLE**

**6.6.28 28 - Alarm Annunciator Panel, Tag No.: CTCSALB003**

- a) Alarm contact configuration: NO - normally open (close to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8
A	BALL RECIRCULATION PUMP TROUBLE	BALL COLLECTOR TROUBLE	SCREENS TROUBLE	BALL RECIRCULATIN MONITOR TROUBLE				
B	$\Delta$ P EXCESSIVE HIGH	$\Delta$ P SYSTEM TROUBLE	SYSTEM ALARMS	PLC TROUBLE				
C							INTEGRATED LOGIC MODULE	
D								

WINDOW A-1

**BALL  
RECIRCULATION  
PUMP TROUBLE**

WINDOW A-2

**BALL  
COLLECTOR  
TROUBLE**

WINDOW A-3

**SCREENS  
TROUBLE**

WINDOW A-4

**BALL  
RECIRCULATING  
MONITOR  
TROUBLE**

WINDOW B-1

**$\Delta$ P  
EXCESSIVE  
HIGH**

WINDOW B-2

**$\Delta$ P  
SYSTEM  
TROUBLE**

WINDOW B-3

**SYSTEM  
ALARMS**

WINDOW B-4

**PLC  
TROUBLE**

**6.6.29 29 - Alarm Annunciator Panel, Tag No.: CTCSALB004**

- a) Alarm contact configuration: NO - normally open (close to alarm) on each alarm channel
- b) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5	6	7	8
A	BALL RECIRCULATION PUMP TROUBLE	BALL COLLECTOR TROUBLE	SCREENS TROUBLE	BALL RECIRCULATIN MONITOR TROUBLE				
B	$\Delta$ P EXCESSIVE HIGH	$\Delta$ P SYSTEM TROUBLE	SYSTEM ALARMS	PLC TROUBLE				
C							INTEGRATED LOGIC MODULE	
D								

WINDOW A-1

**BALL  
RECIRCULATION  
PUMP TROUBLE**

WINDOW A-2

**BALL  
COLLECTOR  
TROUBLE**

WINDOW A-3

**SCREENS  
TROUBLE**

WINDOW A-4

**BALL  
RECIRCULATING  
MONITOR  
TROUBLE**

WINDOW B-1

**$\Delta$ P  
EXCESSIVE  
HIGH**

WINDOW B-2

**$\Delta$ P  
SYSTEM  
TROUBLE**

WINDOW B-3

**SYSTEM  
ALARMS**

WINDOW B-4

**PLC  
TROUBLE**



**6.6.30 30 - Alarm Annunciator Panel, Tag No.: RMELRM01A04-ANN/1****Remote logic module shall be constructed!**

- a) Alarm contact configuration: NO - normally open (close to alarm) on each alarm channel
- c) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5
A	MALFUNCTION CONTAINMENT AREA R09	MALFUNCTION R-24.1	MALFUNCTION R-24.2	MALFUNCTION R-25.1	MALFUNCTION R-25.2
B	THRESHOLD 1 CONTAINMENT AREA R09	THRESHOLD 1 R-24.1	THRESHOLD 1 R-24.2	THRESHOLD 1 R-25.1	THRESHOLD 1 R-25.2
C	THRESHOLD 2 CONTAINMENT AREA R09	THRESHOLD 2 R-24.1	THRESHOLD 2 R-24.2	THRESHOLD 2 R-25.1	THRESHOLD 2 R-25.2
D	MALFUNCTION CONTAINMENT AREA R10	PUMP OFF R-24.1	TEST R24	PUMP OFF R-25.1	DB RM COMMON ALARM
E	THRESHOLD 1 CONTAINMENT AREA R10	R-05.2 FHB AREA	R-26 CS/FAILED FUEL	R-27 AB VENT	R-28 FHB VENT
F	THRESHOLD 2 CONTAINMENT AREA R10	R-33 MS RELIEF L.1	R-34 MS RELIEF L.2	R-27 PUMP	R-28 PUMP

WINDOW A-1

**MALFUNCTION  
CONTAINMENT AREA  
R09**

WINDOW A-2

**MALFUNCTION  
R-24.1**

WINDOW A-3

**MALFUNCTION  
R-24.2**

WINDOW A-4	<b>MALFUNCTION R-25.1</b>
WINDOW A-5	<b>MALFUNCTION R-25.2</b>
WINDOW B-1	<b>TRESHOLD 1 CONTAINMENT AREA R09</b>
WINDOW B-2	<b>TRESHOLD 1 R-24.1</b>
WINDOW B-3	<b>TRESHOLD 1 R-24.2</b>
WINDOW B-4	<b>TRESHOLD 1 R-25.1</b>
WINDOW B-5	<b>TRESHOLD 1 R-25.2</b>
WINDOW C-1	<b>TRESHOLD 2 CONTAINMENT AREA R09</b>
WINDOW C-2	<b>TRESHOLD 2 R-24.1</b>
WINDOW C-3	<b>TRESHOLD 2 R-24.2</b>

WINDOW C-4	<b>TRESHOLD 2 R-25.1</b>
WINDOW C-5	<b>TRESHOLD 2 R-25.2</b>
WINDOW D-1	<b>MALFUNCTION CONTAINMENT AREA R10</b>
WINDOW D-2	<b>PUMP OFF R-24.1</b>
WINDOW D-3	<b>TEST R24</b>
WINDOW D-4	<b>PUMP OFF R-25.1</b>
WINDOW D-5	<b>DB RM COMMON ALARM</b>
WINDOW E-1	<b>TRESHOLD 1 CONTAINMENT AREA R10</b>
WINDOW E-2	<b>R-05.2 FHB AREA</b>
WINDOW E-3	<b>R-26 CS/FAILED FUEL</b>

WINDOW E-4	<div><b>R-27 AB VENT</b></div>
WINDOW E-5	<div><b>R-28 FHB VENT</b></div>
WINDOW F-1	<div><b>TRESHOLD 2 CONTAINMENT AREA R10</b></div>
WINDOW F-2	<div><b>R-33 MS RELIEF L .1</b></div>
WINDOW F-3	<div><b>R-34 MS RELIEF L . 2</b></div>
WINDOW F-4	<div><b>R-27 PUMP</b></div>
WINDOW F-5	<div><b>R-28 PUMP</b></div>

## 6.7 Individual Alarm Panel Configuration Requirements

The SUPPLIER shall perform all window engravings as specified.

### 6.7.1 1 - Alarm Panel, Tag No.: RMELRM01A04-ANN/2

- a) Internal power wiring: Common positive 24V
- b) Alarm activation configuration: 0V separately for each channel
- c) Window engraving: All windows shall be engraved according to the following scheme.

	1	2	3	4	5
A	MALFUNCTION CONTAINMENT AREA R09	MALFUNCTION R-24.1	MALFUNCTION R-24.2	MALFUNCTION R-25.1	MALFUNCTION R-25.2
B	THRESHOLD 1 CONTAINMENT AREA R09	THRESHOLD 1 R-24.1	THRESHOLD 1 R-24.2	THRESHOLD 1 R-25.1	THRESHOLD 1 R-25.2
C	THRESHOLD 2 CONTAINMENT AREA R09	THRESHOLD 2 R-24.1	THRESHOLD 2 R-24.2	THRESHOLD 2 R-25.1	THRESHOLD 2 R-25.2
D	MALFUNCTION CONTAINMENT AREA R10	PUMP OFF R-24.1	TEST R24	PUMP OFF R-25.1	DB RM COMMON ALARM
E	THRESHOLD 1 CONTAINMENT AREA R10	R-05.2 FHB AREA	R-26 CS/FAILED FUEL	R-27 AB VENT	R-28 FHB VENT
F	THRESHOLD 2 CONTAINMENT AREA R10	R-33 MS RELIEF L.1	R-34 MS RELIEF L.2	R-27 PUMP	R-28 PUMP

WINDOW A-1

**MALFUNCTION  
CONTAINMENT AREA  
R09**

WINDOW A-2

**MALFUNCTION  
R-24.1**

WINDOW A-3

**MALFUNCTION  
R-24.2**

WINDOW A-4	<b>MALFUNCTION R-25.1</b>
WINDOW A-5	<b>MALFUNCTION R-25.2</b>
WINDOW B-1	<b>TRESHOLD 1 CONTAINMENT AREA R09</b>
WINDOW B-2	<b>TRESHOLD 1 R-24.1</b>
WINDOW B-3	<b>TRESHOLD 1 R-24.2</b>
WINDOW B-4	<b>TRESHOLD 1 R-25.1</b>
WINDOW B-5	<b>TRESHOLD 1 R-25.2</b>
WINDOW C-1	<b>TRESHOLD 2 CONTAINMENT AREA R09</b>
WINDOW C-2	<b>TRESHOLD 2 R-24.1</b>
WINDOW C-3	<b>TRESHOLD 2 R-24.2</b>

WINDOW C-4	<b>TRESHOLD 2 R-25.1</b>
WINDOW C-5	<b>TRESHOLD 2 R-25.2</b>
WINDOW D-1	<b>MALFUNCTION CONTAINMENT AREA R10</b>
WINDOW D-2	<b>PUMP OFF R-24.1</b>
WINDOW D-3	<b>TEST R24</b>
WINDOW D-4	<b>PUMP OFF R-25.1</b>
WINDOW D-5	<b>DB RM COMMON ALARM</b>
WINDOW E-1	<b>TRESHOLD 1 CONTAINMENT AREA R10</b>
WINDOW E-2	<b>R-05.2 FHB AREA</b>
WINDOW E-3	<b>R-26 CS/FAILED FUEL</b>

WINDOW E-4	<b>R-27 AB VENT</b>
WINDOW E-5	<b>R-28 FHB VENT</b>
WINDOW F-1	<b>TRESHOLD 2 CONTAINMENT AREA R10</b>
WINDOW F-2	<b>R-33 MS RELIEF L .1</b>
WINDOW F-3	<b>R-34 MS RELIEF L . 2</b>
WINDOW F-4	<b>R-27 PUMP</b>
WINDOW F-5	<b>R-28 PUMP</b>



## **7 INSPECTION AND TEST**

The SUPPLIER shall ensure that equipment furnished under this specification conforms to the requirements of applicable standards and procurement requirements by appropriate evaluations, functional tests, inspections and other activities which the SUPPLIER considers necessary to ensure that the design, material and workmanship are satisfactory for the service intended, or as may be required by common usage or practice.

- a) The final reports shall be reviewed by competent technical personnel who shall certify that the equipment tested meets all requirements of this specification.
- b) Certifications of design tests shall contain statements on when, where, and by whom the tests were performed and shall state the results of the tests. These certifications shall be signed by a responsible individual in the employment of the SUPPLIER.

### **7.1 Pre-FAT requirements**

The SUPPLIER shall perform pre-FAT and remain system continuously operating until FAT. The SUPPLIER shall perform pre-FAT two weeks before FAT. All the panels shall be configured at pre-FAT.

- a) The system shall continuously operate between pre-FAT and FAT period

### **7.2 FAT and Training requirements**

- a) The SUPPLIER shall perform all necessary FAT.
- b) The SUPPLIER shall prepare test procedures for FAT with acceptance criteria and submit procedures to NEK for review and approval.
- c) The SUPPLIER shall perform FAT on fully assembled and operating equipment according to approved FAT procedure.
- b) The SUPPLIER shall prepare training procedures for maintenance and configuration.
- c) NEK representatives (foreseen 3) will witness the FAT and will participate at training.
- d) Any deficiencies or malfunctions, which occur during the tests, shall be noted and corrected and the failed test repeated. The SUPPLIER shall replace defective, damaged or faulty components at his expense.
- e) If NEK representative finds a deficiency during FAT, it is reported to SUPPLIER using the PDR form.
- f) Test reports shall be prepared for each test and submitted to NEK for review and approval.
- g) Prior to shipment, each item shall meet the performance requirements specified.

## **8 TRAINING**

The SUPPLIER shall prepare training documentation and plan for the annunciators configuration, operation and maintenance purpose. Training courses shall be organized at FAT phase.

## **9 PROBLEM DEFICIENCY REPORTS**

The PDRs are those problems/ deficiencies found during FAT project until SAT completion. In the PDR format shall be described the problem detected, the root cause explanation and a corrective action proposal for solving the deficiency. Besides, the corrective action shall be monitored until the problem solving completion or approval. In case that NEK detects a technical issue or problem/ deficiency, it is reported to SUPPLIER using the PDR form. Respectively NEK is author of included comments. For tracking purposes, the PDR form will have its unique PDR number and priority assignment. See attachment 1: PDR form.

### **9.1 PDR workflow**

- a) Detection of problem/deficiency or technical issue or other deviation
- b) Rating PDR priority as A, B, C or D
- c) Communicating to SUPPLIER responsible
- d) Confirmation of reception to be sent to NEK
- e) Assigning capable personnel for resolving at SUPPLIER
- f) Contacting NEK personnel if necessary for resolution
- g) Starting related SUPPLIER internal quality workflows
- h) Follow up until resolution with quality – controlled documentation
- i) After NEK accepted resolution, PDR will be closed

### **9.2 PDR priority classification**

#### **9.2.1 PDR Priority A**

The issue needs urgent (within two days as maximum) response from SUPPLIER/ NEK technical personnel. System performance is degraded and ongoing test or activity cannot be completed or the tasks that were planned to follow cannot be executed.

#### **9.2.2 PDR Priority B**

The issue needs prompt response (within five working days as maximum). Considering some plan adjustments and rescheduling, part of the planned and scheduled work can be continued but not with the full system performance and not with the full system functionality as designed. If the issue is not resolved within the available time, the FAT or SAT activities will have to be rescheduled for some another time.

### **9.2.3 PDR Priority C**

The identified issue has no influence on ongoing activities and no influence on scope of work that is in progress. However, the system demonstrates obvious technical issue or deficiency that has to be resolved. The major part of problems, deviations and/or deficiencies that would belong to this priority group are the issues related to the manufacture or assembly related components. The appropriate time window for resolution of problems/ deficiencies from the Priority C group is up to two weeks.

### **9.2.4 PDR Priority D**

Minor issues that do not affect system functionality and system performance (equipment, cable, materials, inconsistencies in non-essential documentation). Those problems, deviations and/or deficiencies cannot be seen by the NEK operators. The problem resolution should be achieved within 4 weeks.

## **9.3 Warranty period**

All PDR's of priority A and B shall be closed while small number (less than 5) of the lower priority C or D PDR's may still be open before taking over the system by NEK and starting the warranty period.

## **10 PERFORMANCE REQUIREMENTS**

All the new Alarm Annunciator Panels shall ensure performance in accordance with standard ISA 18.1-1979 (R2004) - Annunciator Sequences and Specifications.

## **11 EMC REQUIREMENTS**

EMC tests have to be performed:

- a) The new alarm annunciator panels shall be able to perform its intended function without degradation or mis-operation and without adversely affecting other equipment in the electromagnetic environment in which it is installed.
- b) The susceptibility and emissions testing shall be performed in accordance with the RG-1.180 rev. 1, or EPRI-TR102323 rev. 1.
- c) The SUPPLIER shall develop a test specification and propose a preliminary set of tests. A technical rationale should be provided for each omitted test. The exact scope of EMC tests shall be mutually agreed and approved by NEK.
- d) The SUPPLIER shall prepare wiring, earthing, grounding or other concept documents to present the plan for EMC compliance.

## **12 SEISMIC QUALIFICATION REQUIREMENTS**

All alarm panels should be attached by the same mechanism. Alarm panels shall be anchored to the cabinets by considering the seismic loads, so that the anti-fall down criteria is fulfilled. The seismic load for all alarm panels is represented by Envelope of Floor Response Spectra for all selected locations based on SP-S702. Enveloped FRS are attached to this specification in Appendix 2. For the factor of in-cabinet amplification use value of 2 at the peak spectral response and 6 at the natural frequency of 20 Hz. Use linear interpolation in between. Above natural frequency of 20 Hz, the spectral accelerations can be considered constant. Alarm panel shall be qualified for anti-fall down criteria in accordance with seismic qualification program ED-18.

The SUPPLIER shall provide seismic qualification documentation to the NEK for review and approval.

## **13 OTHER REQUIREMENTS**

### **13.1 SUPPLIERS responsibility**

- a) The SUPPLIER shall furnish adequate information for the NEK to evaluate the SUPPLIER's proposed design.
- b) SUPPLIER shall identify purchase of any equipment, material, or service from other SUPPLIERS
- c) SUPPLIER or his representative shall perform inspections and/or witness tests at the sub-SUPPLIER facilities.
- d) SUPPLIER has obligation to meet the requirements of this specification and to maintain adequate test, inspection and documentation program or of any obligation required by this specification.

### **13.2 NEK responsibilities**

- a) Provide the SUPPLIER with all available documentation upon request.
- b) Provide any special requirements applicable to the installation of equipment.
- c) Designate a contract Responsible Engineer who will serve as the principal interface with the SUPPLIER.
- d) Whenever the NEK's approval is required in this specification for submittals, procedures, methodologies, approaches or options, such approval shall be provided in writing or if provided orally shall be confirmed in writing.
- e) NEK will provide all required approvals in a timely fashion consistent with the project schedule

## **14 SHELF LIFE**

SUPPLIER shall provide identity of the materials and components so that shelf life can be determined. Also shelf life data like manufacturing or cure data and expiration date shall be provided in BOM as a part of Technical documentation.

## **15 RIGHT TO ACCES**

The SUPPLIER shall provide an office in his facility for the period of NEK presence during inspection with no additional expenses.

## **16 QA REQUIREMENTS**

### **16.1 SUPPLIER's Quality Assurance System**

All equipment and services within a scope of this specification shall be performed in accordance with SUPPLIER's quality management system, which complies with ISO 9001 or a comparable standard, and with relevant requirements from QA specification NEK QS 610, Rev. 2, Generic Quality Assurance Program Requirements. SUPPLIER's QA Manual shall be previously reviewed and accepted by NEK. All changes to the QA Manual shall be submitted and approved by NEK prior to the implementation.

### **16.2 SUPPLIER's QA documentation**

Quality documents are a deliverable item.

- a) COC shall be submitted by the SUPPLIER stating that the equipment is in conformance with the requirements of this specification.
- b) The SUPPLIER and the possible SUPPLIER's sub-SUPPLIERS of the equipment shall maintain adequate documentation to support the facts certified in the COC for turnover to the NEK.
- c) Original documentation (to be transmitted with a shipment) shall be adequately packaged, protected and secured to ensure it will arrive undamaged with the shipment.
- d) Each document submitted shall be clearly identified by the NEK address, purchase order numbers, equipment description, specification identification and the SUPPLIER's name and address.
- e) The SUPPLIER shall be responsible for inspecting the item(s) and checking the applicable records, prior to shipment, to verify compliance with all specification requirements. SUPPLIER has responsibility for compliance with specification requirements.

## **17 NEK PROPRIETARY DATA**

NEK has a proprietary interest in a technical documentation and data which may be furnished pursuant contract execution. The right to use technical information shall be transmitted to NEK

for its personnel use only and shall be entirely restricted to the performance of the contract as a subject of the confidentiality provision.

## **18 PACKAGING, HANDLING AND STORAGE**

- a) The packing shall be in accordance with common practice and SUPPLIER's standards, to assure adequate protection from the effects of temperature extremes, humidity and transitive shocks & jarring of the equipment until delivered and accepted at destination.
- b) The packaging procedure like cushioning, blocking & bracing within the shipping container and materials required to protect equipment from damage, shall be adequate for the method of transportation to be used, possible storage duration and storage environment.
- c) SUPPLIER shall provide instructions and requirements for site storage and handling.
- d) Packing list shall contain adequate identification (markings, Tag, No/PN, etc.) of shipped equipment, which must match with markings placed on equipment to enable easy identification at receiving.

## **19 SHIPPING REQUIREMENTS**

SUPPLIER shall provide adequate shipping methods to assure equipment protection from the effects of temperature extremes, humidity and transitive shocks and jarring. Equipment and certifications or accompanying documentation, supplied under this order, shall be directly shipped from SUPPLIER to NEK. The distributor shall not take possession of equipment or documentation. The NEKs authorized source inspector have the right to hold shipment if purchase order requirements are not met.

## **20 DELIVERY SCHEDULE**

The SUPPLIER shall submit essential technical documentation within delivery schedule as follows:

Note: T0 – initial time after signing the contract

### **20.1 Documentation**

- a) Technical documentation - Part 1, per sec. 4.3 T0 + 2 months
- b) Technical documentation - Part 2, per sec. 4.4 T0 + 4 months

### **20.2 Equipment and services**

- c) FAT T0 + 5 months
- d) Equipment delivered to NEK site T0 + 6 months

## **21 ATTACHMENTS**

**Attachment 1: PDR form**

**Attachment 2: Enveloped FRS for equipment qualification**

**Attachment 3: QS610 GENERIC QUALITY ASSURANCE PROGRAM REQUIREMENTS**

## ATTACHMENT 1

## PDR – Problem/Deficiency Report



PDR Number (mm):	Priority (A-D):	Date of PDR Issue (dd/mm/yy):		
000X				

supplier logo

Initiated by NEK ☒ / supplier ☐

<b>NEK/ supplier: PDR Issue</b>	
<b>PROBLEM TITLE:</b>	
Affected Components:	
Reference documents:	

<b>NEK/ supplier: Scenario Identification</b>
Environment description and order of events that were predecessors to the problem appearance:
Identified by:

<b>NEK/ supplier: Description of the Problem or Deficiency</b>				
Problem/deficiency existence verified and approved by:	Date (dd/mm/yy):	Problem is repeatable:	YES <input type="checkbox"/>	NO <input type="checkbox"/>
			N/A <input type="checkbox"/>	

<b>supplier: Troubleshooting and Problem/Deficiency Root Cause Explanation</b>	
Troubleshooting and Explanation Provided by:	Date (dd/mm/yy):

<b>supplier: Corrective Action Proposal and Corrective Action Tracking Log and Tracking References</b>			
Corrective Action Description:			
Corrective Action Performed by:			Date (dd/mm/yy):
<b>supplier</b> Track Changes References:			
Other Applicable Documentation References and Attachments:			

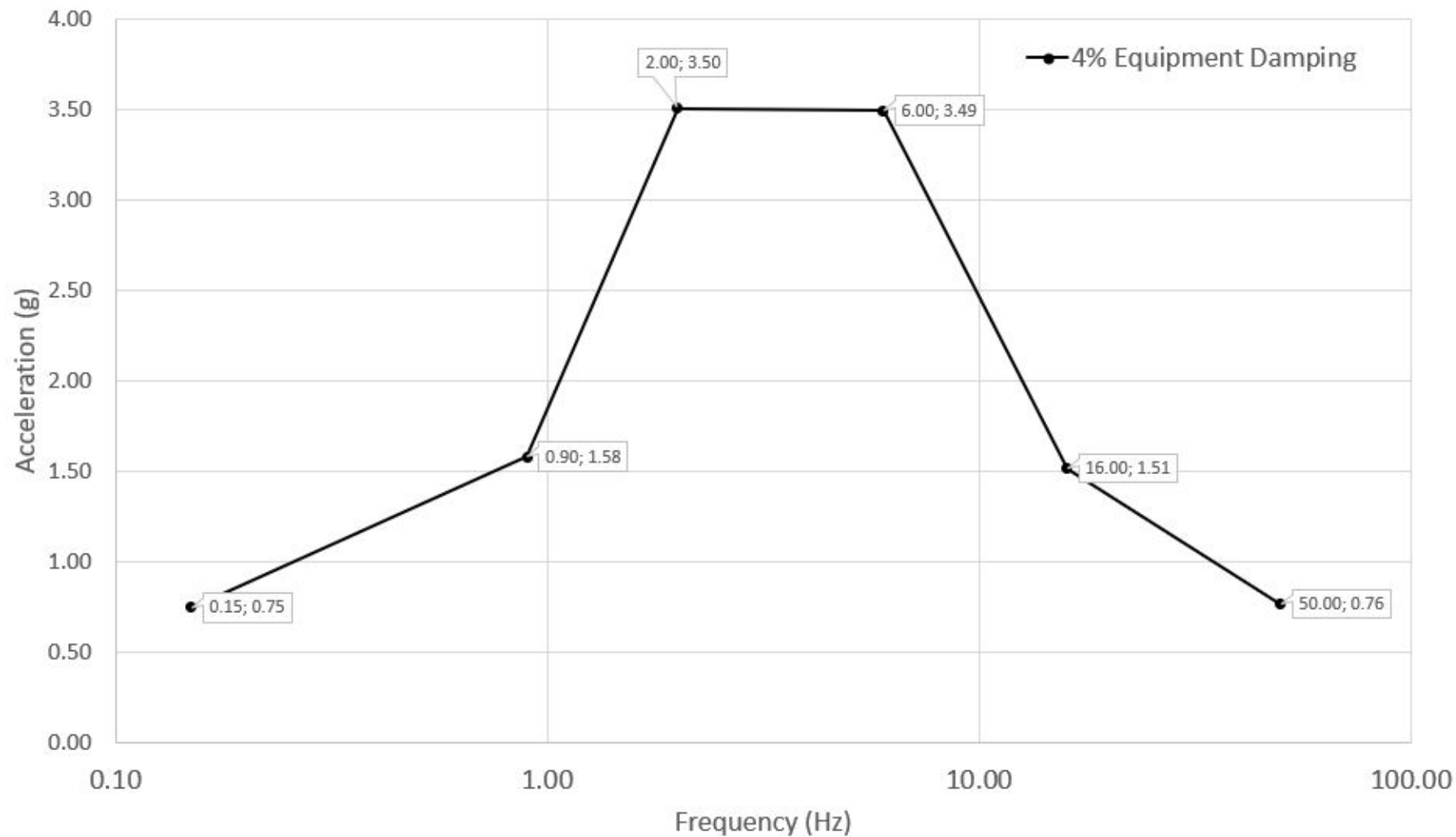
<b>NEK: Resolution and/or Answer Acceptance</b>	
NEK Comments:	
Accepted by:	Date (dd/mm/yy):



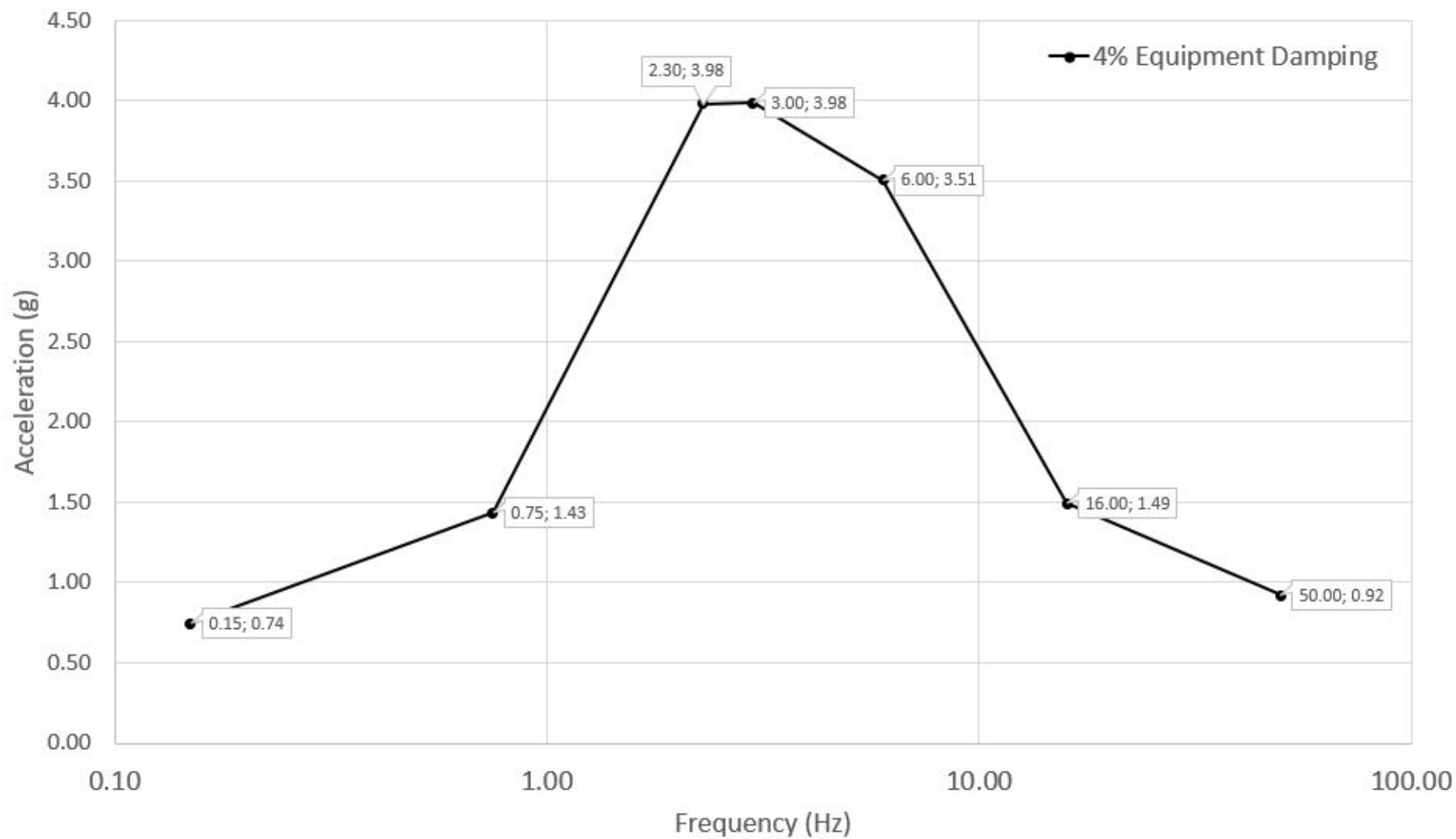
## **ATTACHMENT 2**

### **Enveloped FRS for equipment qualification**

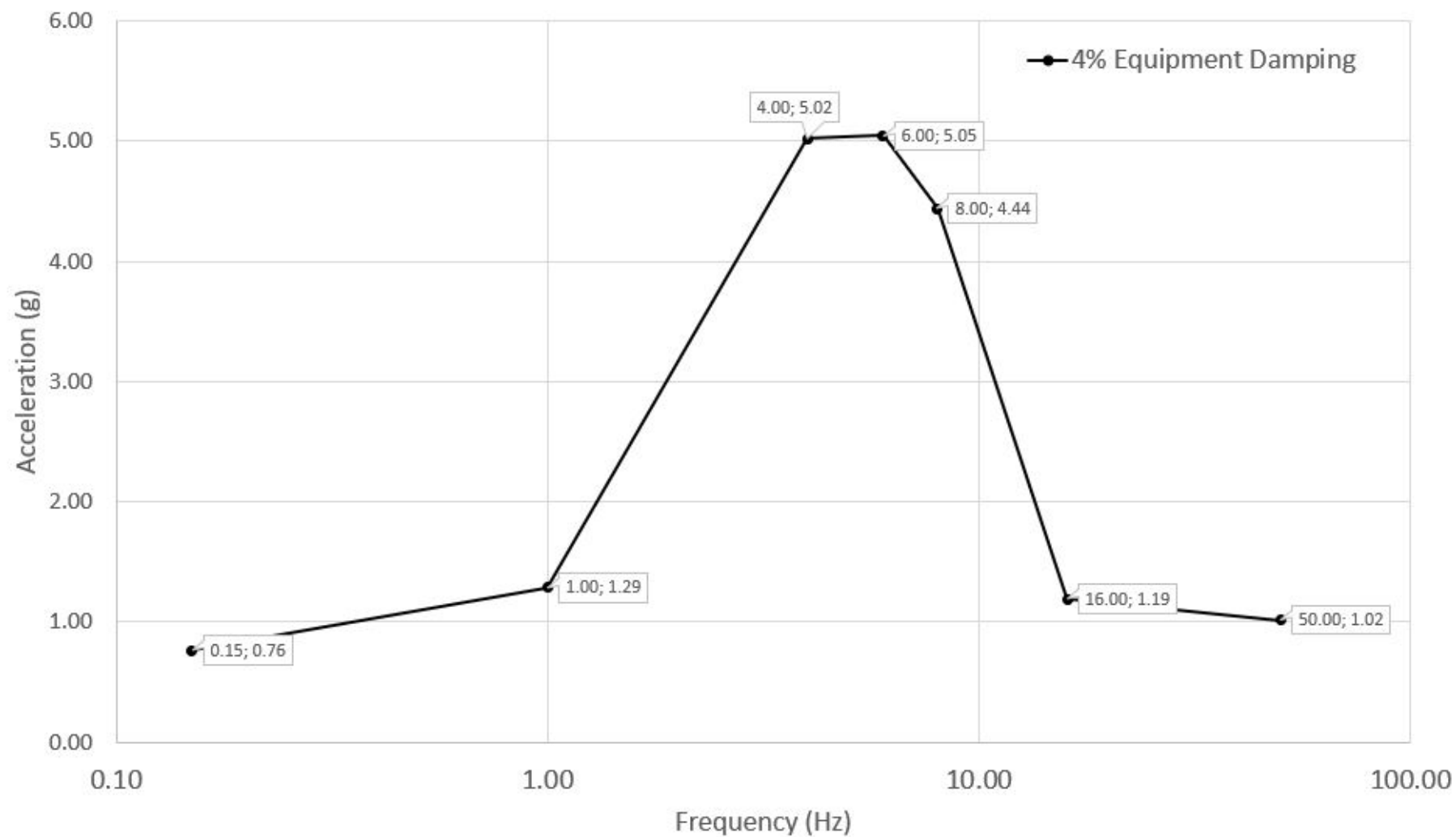
NPP KRSKO FRS  
ENVELOPE OF BB1 100, CB 115, IB 115, AB 115, ESW 100, DG 100 CCB 94  
EAST-WEST RESPONSE  
SSE For Modifications on Existing SSCs



NPP KRSKO FRS  
ENVELOPE OF BB1 100, CB 115, IB 115, AB 115, ESW 100, DG 100 CCB 94  
NORTH-SOUTH RESPONSE  
SSE For Modifications on Existing SSCs



NPP KRSKO FRS  
ENVELOPE OF BB1 100, CB 115, IB 115, AB 115, ESW 100, DG 100 CCB 94  
VERTICAL RESPONSE  
SSE For Modifications on Existing SSCs



**ATTACHMENT 3**

**QS 610, Rev.2**

**GENERIC QUALITY ASSURANCE PROGRAM REQUIREMENTS**



Nuklearna Elektrarna Krško	
MASTER DOCUMENT	
Date Received:	04-11-2020
Log Number:	236045

# NUCLEAR POWER PLANT KRŠKO


## QA SPECIFICATION

### GENERIC QUALITY ASSURANCE PROGRAM REQUIREMENTS

**QS-610, Rev. 2**

***Safety Related***

Prepared by:

  
Romeo Bišćan, QA Engineer


Datum: 22/10/2020

Reviewed by:

  
Janez Novak, QA Superintendent

Datum: 27/10/2020

Approved by:

  
Darko Kayšek,  
Quality and Nuclear Oversight Director

Datum: 4/11/2020



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## **1.0 GENERAL**

- 1.1 This specification establishes the requirements for Supplier's QA program that shall apply to all activities affecting the quality of the supplied equipment, materials, or services.
- 1.2 Supplier shall ensure that its Subsuppliers conform to the applicable requirements of this specification.
- 1.3 For Safety Related products and services (SR), Supplier shall ensure compliance with the requirements of Title 10, Code of Federal Regulations, Part 50, Appendix B (10CFR50, Appendix B), "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants", and ANSI/ASME N45.2-1977, "Quality Assurance Program Requirements for Nuclear Facilities" or ASME NQA-1-2008, Addenda 2009/2011, "Quality Assurance Requirements for Nuclear Facility Applications". Additionally, IAEA GSR part 2, 2016 "Leadership and Management for Safety" and all other codes or standards referenced herein and in the purchase order could be applied.
- 1.4 For SR ASME Code Section III components, Supplier shall ensure compliance with the requirements of ASME Code Section III, NCA-4000 "Quality Assurance" and NCA-3800 "Metallic Material Organization's Quality System Program". In addition to ASME Code Section III requirements, Supplier shall ensure compliance with the requirements of 10CFR50 Appendix B and 10CFR Part 21.
- 1.5 The reporting and posting requirements of Title 10, Code of Federal Regulations, Part 21 (10CFR21), "Reporting of Defects and Noncompliance", shall apply for SR products and services.
- 1.6 For Non-Safety Related products and services with Augmented Quality requirements (AQ), Supplier shall ensure compliance with the requirements of international standards as ISO 9001, "Quality management systems – Requirements" or ISO/IEC 17025, "General requirements for the competence of testing and calibration laboratories" or other relevant recognized standards. Compliance with the requirements of international standards shall be certified by accredited organization. Additional QA requirements to the Supplier commercial QA Program shall be specified and selected in accordance with this Quality Specification and scope of supply referenced in the purchase order.
- 1.7 The Purchaser shall have the right of access to enter the premises of the Supplier to witness inspection/test activities or to conduct surveillances or quality assurance audits. This right shall extend to the Subsuppliers and will be coordinated through the Supplier.

## **2.0 DEFINITIONS**

- 2.0 Definitions shall be as stated in ANSI N45.2.10-1973, "Quality Assurance Terms and Definitions" and in other standards referenced herein.



- 2.1 PURCHASER - Utility issuing the purchase order.
- 2.2 SUPPLIER - The person or organization to whom a purchase order from the Purchaser has been issued.
- 2.3 SUBSUPPLIER - The person or organization that furnishes items and services to the Supplier that will be used to complete the Purchaser's purchase order requirements.
- 2.4 ABBREVIATIONS:
- |          |   |
|----------|---|
| ANSI     | American National Standards Institute   |
| ASME     | American Society of Mechanical Engineers  |
| ASNT     | American Society for Nondestructive Testing                                       |
| CFR      | Code of Federal Regulation, USA   |
| ILAC MRA | International Laboratory Accreditation Cooperation Mutual Recognition Arrangement |
| ISO      | International Organization for Standardization                                    |
| NEK      | Nuclear Power Plant Krško   |
| NRC      | Nuclear Regulatory Commission, USA  |
| QA       | Quality Assurance   |
| SR       | Safety Related  |
| USA      | United States of America  |

### 3.0 DOCUMENTS FOR SUBMISSION

- 3.1 The Supplier shall submit a full description of its QA program, proposed for the scope of work to be performed, as controlled copy document, for the Purchaser's review and acceptance/approval.
- 3.2 If the Purchaser has already approved the Supplier's QA program, it does not have to be submitted for acceptance/approval. However, if the Purchaser's copy of the QA program is not current, all portions of the program that have been revised since the Purchaser's previous approval shall be submitted for review and acceptance/approval.

### 4.0 QUALITY ASSURANCE PROGRAM REQUIREMENTS

Supplier shall develop and implement a QA program consistent with the requirements defined herein and in the purchase order. As a minimum, the program shall encompass the following quality assurance criteria.



## 4.1 Organization

The organizational structure, functional responsibilities, levels of authority and lines of communication for personnel performing activities affecting quality shall be documented in organizational charts and written procedures.

- 4.1.1 Quality Assurance and Quality Control inspection and audit personnel shall have sufficient and well-defined responsibility, authority, and organizational freedom to identify and evaluate quality problems, to require implementation of approved corrective action, and to verify implementation of corrective actions. Such persons or organizations shall report to a management level so that required authority and organizational freedom are provided, including sufficient independence from cost and schedule considerations.
- 4.1.2 Personnel responsible for verifying if Supplier's work conforms to established requirements shall not have direct responsibility for the work being performed.
- 4.1.3 Where more than one organization is involved in the execution of activities, the responsibilities, interfaces, and authority of each organization shall be clearly defined and documented. The external interfaces between organizations and the internal interfaces between organizational units, and changes thereto, shall be documented.

## 4.2 QA Program

The documented QA program shall be planned, implemented, and maintained to identify the items and services to which it applies and to comply with requirements of the relevant Code and/or Standard (See Attachment A).

- 4.2.1 The program shall provide for planning and accomplishing activities which affect quality under suitably controlled conditions. Controlled conditions include the use of appropriate equipment, suitable environmental conditions for accomplishing the activity, and assurance that prerequisites for the given activity have been satisfied.
- 4.2.2 The program shall provide for any special controls, processes, test equipment, tools, and skills necessary to attain the required quality and provide for verification of quality by inspection and test, as necessary.
- 4.2.3 The program shall provide for indoctrination and training of personnel, who is performing activities affecting quality, to ensure that suitable proficiency is achieved and maintained.
- 4.2.4 The Supplier's management shall regularly review the status and adequacy of the documented QA program.
- 4.2.5 For items which are supplied to the Purchaser as "Commercial Grade," the Supplier's program, as a minimum, shall contain procedures, processes, etc., necessary to ensure the Purchaser that the items being supplied meet



industry standards, purchase order requirements, and performance or technical requirements specified in the Suppliers catalog.

### **4.3 Design Control**

The Supplier's program for controlling design activities shall satisfy the requirements of ANSI N45.2.11-1974, "Quality Assurance Requirements for the Design of Nuclear Power Plants," or requirements of relevant Code and Standard (See Attachment A), and shall include as a minimum, the following:

- 4.3.1 Design activities shall be prescribed and accomplished in accordance with procedures of a type sufficient to ensure that applicable design inputs are correctly translated into specifications, drawings, procedures, or instructions.
- 4.3.2 Interface between organizations performing work, affecting quality of design, shall be identified in writing and shall include those organizations that provide criteria, design, specifications, and technical direction.
- 4.3.3 Applicable design inputs, such as design bases, regulatory requirements, codes and standards, shall be identified, documented, and their selection reviewed and approved. Changes from specified design inputs, including the reasons for the changes, shall be identified, approved, documented, and controlled.
- 4.3.4 Documentation of design/analysis shall be verifiable and include the following:
  - 1. The objective of the analysis,
  - 2. Design inputs and their sources,
  - 3. Results of reference document searches or other applicable background data,
  - 4. Assumptions with indication of those that must be verified as the design proceeds,
  - 5. Computer calculations, including computer type, computer program identification, revision, inputs, evidence of, or reference to computer program verification, and the bases, or reference thereto, supporting the application of the computer program to the specific problem,
  - 6. Independent review and approval.
- 4.3.5 Design verification methods shall be established to provide assurance that the design meets the specified design inputs. Acceptable verification methods include design reviews, alternate calculations, and qualification testing.





- 4.3.6 Design verification shall be performed by individuals or groups other than those who performed the original design. This verification may be performed by the originator's supervisor, if the supervisor is the only individual in the organization competent to perform the verification, and the need is documented and approved in advance by the supervisor's management.
- 4.3.7 Changes to design documents shall be reviewed and approved by the same organizations that performed the original review and approval, unless other organizations are specifically designated. This shall ensure that the impact of the change is carefully considered, required actions documented, and information concerning the change transmitted to the affected persons and organizations.
- 4.3.8 When material substitutions or modifications in the design are made, Supplier shall:
1. Review prior design qualification tests to determine any adverse effect,
  2. Evaluate whether or not new qualification tests are required,
  3. Provide documented justification for not having to perform new qualification tests.
- 4.3.9 The software design process is documented, approved by the responsible design organization, and controlled in accordance with criteria defined in ASME NQA-1, "Quality Assurance Requirements for Nuclear Facility Applications", Part I: Requirement 3, Section 800 – Software Design Control, Part II: Subpart 2.7, or equal standard.
- 4.3.10 To procure and utilize a Commercial Grade items and services for nuclear power plants pursuant to 10CFR21, dedication activities and controls shall be implemented in accordance with ASME NQA-1, "Quality Assurance Requirements for Nuclear Facility Applications", Subpart 2.14 to ensure the item or service is adequate for its intended safety function.

#### **4.4 Procurement Document Control**

The Supplier's program for controlling procurement documents of items and services, which are not considered to be Commercial Grade, shall satisfy the requirements of ANSI N45.2.13-1976, "Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants" or requirements of relevant Code and Standard (See Attachment A), and shall include as a minimum, the following:

- 4.4.1 Applicable design bases, quality assurance requirements, and other requirements necessary to ensure adequate quality shall be included or referenced in documents for procurement of items and services.
- 4.4.2 Procurement documents shall require Subsuppliers to have a QA program consistent with the applicable requirements of this specification.



- 4.4.3. The procurement documents shall provide for access to the Subsupplier's facilities and records for inspection or audit by Supplier's and Purchaser's representatives.
- 4.4.4. Procurement documents shall identify the documentation required to be submitted.
- 4.4.5. Procurement documents shall include the Purchaser's requirements for reporting and approving dispositions of nonconformances.
- 4.4.6. A review of the procurement documents shall be performed to ensure that the documents include appropriate technical and quality requirements.
- 4.4.7. Procurement document changes that affect technical or quality requirements shall be subject to the same degree of control as used in preparing the original document.
- 4.4.8. Procurement documents for Safety-Related equipment or services shall include statement informing Subsuppliers of their responsibility to report any defect of basic component in accordance with 10CFR21 Requirements.
- 4.4.9. Procurement documents shall include the Purchaser's requirements for ordering materials, parts or components from original Subsuppliers/Manufacturers and/or authorized distributors, to prevent supply of counterfeit/fraudulent material, items or components.

#### **4.5 Instructions, Procedures, and Drawings**

- 4.5.1 The Supplier shall ensure that all activities affecting quality and services are prescribed by and performed in accordance with documented instructions, procedures, or drawings that include or reference appropriate quantitative or qualitative criteria for determining that prescribed activities have been satisfactorily accomplished.
- 4.5.2 The need for and level of detail in written procedures or instructions shall be determined based upon complexity of the task, the significance of the item or activity, work environment, and worker proficiency and capability (education, training, experience).

#### **4.6 Document Control**

The Supplier shall ensure that quality-related documents, including changes, are reviewed for adequacy, approved for release by authorized personnel, and properly distributed to and used at locations where the prescribed activity is performed.

- 4.6.1 Document changes shall be reviewed and approved by the same organization that performed the original review and approval, unless other organizations are specifically designated.



4.6.2 Procedures governing document control shall be established and provide for:

1. The identification of controlled documents,
2. The specified distribution of controlled documents for use at the appropriate location,
3. The identification of individuals responsible for the preparation, review, approval, and distribution of controlled documents,
4. Changes to documents shall be reviewed and approved by the same organizations that performed the original review and approval unless other organizations are specifically designated,
5. The review of controlled documents for adequacy, completeness, and approval prior to distribution,
6. A method to ensure the correct documents are being used.

#### **4.7 Control of Purchased Items and Services**

The Supplier's program for controlling purchased items and services shall satisfy the requirements of ANSI N45.2.13-1976, "Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants" or requirements of relevant Code and Standard (See Attachment A), and shall include as a minimum, the following:

- 4.7.1 The selection of Subsuppliers shall be based on evaluation of their capability to provide items or services in accordance with the requirements of the procurement documents.
- 4.7.2. Methods to be utilized in evaluation of Subsuppliers, and the results therefrom shall be documented and shall include the following:
  1. Evaluating the Subsupplier's history of providing a product which performs satisfactorily in actual use.
  2. Determining the Subsupplier's technical and quality capability by a review of its QA program and a direct evaluation of its facilities and the QA program implementation.
  3. Verifying if Subsupplier possesses an ASME Certificate of Authorization for the items/services, or other relevant Certificate/Accreditation related to the scope of supply.
- 4.7.3. Procedures shall be established and implemented for verification activities (surveillance, receipt inspection, and audit) as appropriate, to ensure conformance of procured items and services to identified requirements.





- 4.7.4. Where acceptance is based on certifications from Subsuppliers, the Supplier shall validate the certifications via surveillance, audit and/or independent testing.
- 4.7.5. When Commercial Grade items or services are utilized in SR applications, the dedicating entity shall apply requirements in accordance with ASME NQA-1, "Quality Assurance Requirements for Nuclear Facility Applications", Subpart 2.14, "Quality Assurance Requirements for Commercial Grade Items and Services" to ensure the item or service is adequate for its intended safety function. The Supplier shall:
1. Identify the critical characteristics (form, fit, function, material and process) of the commercial grade items and the methods for verifying that these critical characteristics have been met.
  2. Establish and document measures to ensure that any changes (by Subsuppliers) in materials, product, design or manufacturing are identified and evaluated.

#### **4.8 Identification and Control of Items**

Supplier shall establish and document measures to identify and control materials, parts and components. These measures shall prevent the use of an incorrect or defective item, and suspicious (including counterfeit/fraudulent) material, parts or components that may not be as ordered. Items for production shall be identified (batch, lot, component, part) from the initial receipt and fabrication of items up to and including installation and use. This identification shall relate an item to an applicable design or other pertinent specifying document.

- 4.8.1 Traceability for these items shall be maintained with records and/or markings. Physical identification shall be used to the maximum extent possible, but if physical identification on the item is impractical or insufficient, physical segregation, procedural control or other appropriate means shall be used. Identification markings shall be applied using materials and methods that provide a clear and legible identification and do not degrade the function or service life of the item. Markings shall be transferred to each part of an item when subdivided and shall not be obliterated or hidden by surface treatment or coating unless other means of identification are substituted.

#### **4.9 Control of Special Processes**

Supplier shall establish and document measures to ensure that special processes, including welding, heat treating, cleaning, coating and nondestructive examination, are accomplished under controlled conditions in accordance with applicable codes, standards, specifications, criteria, and other special requirements.

- 4.9.1 Special process personnel, procedures, and equipment shall be qualified and comply with the requirements of applicable codes and standards. For special processes not covered by existing codes or standards, or where item quality requirements exceed the requirements of established codes or standards, the



necessary qualifications of personnel, procedures, or equipment shall be defined.

- 4.9.2 All personnel performing nondestructive examination shall be qualified and certified in accordance with Recommended Practice ASNT SNT-TC-1A "Personnel Qualification and Certification in Nondestructive Testing" or shall be qualified in accordance with requirements of relevant Code and Standard (See Attachment A).
- 4.9.3 Documentation shall be maintained for currently qualified personnel, processes, or equipment in accordance with the requirements of pertinent codes and standards.

#### **4.10 Inspection**

The Supplier shall ensure that activities affecting quality are inspected for conformance to the documented instructions, procedures, and drawings used in the accomplishment of the activity.

- 4.10.1 Inspection activities shall be performed by persons other than those who performed the activity being inspected. Such persons shall not report directly to the immediate supervisors who are responsible for the work being inspected.
- 4.10.2 Inspection and test personnel shall be appropriately qualified. The program for qualifying inspection and test personnel shall be in accordance with the requirements of ANSI/ASME N45.2.6-1978, "Qualifications of Inspection, Examination, and Test Personnel for Nuclear Power Plants" or requirements of relevant Code and Standard (See Attachment A), and shall satisfy, as a minimum, the following:
  - 1. Provisions shall be made for the indoctrination of inspection and test personnel as to the technical objectives of the work, the codes and standards that are to be used, and the quality assurance elements that are to be employed.
  - 2. The need for formal training programs shall be determined, and such training activities shall be conducted, as required, to qualify inspection and test personnel.
  - 3. Any special physical characteristics needed in order to perform inspection and test activities shall be identified. Inspection and test personnel requiring these characteristics shall have them verified by examination at intervals which shall not exceed one year.
  - 4. The capabilities of inspection and test personnel shall be initially determined by an evaluation of the individual's education, experience training, test results, or proficiency demonstration.
  - 5. The job performance of inspection and test personnel shall be reevaluated at periodic intervals not to exceed three years. Reevaluation





shall be performed by evidence of continued satisfactory performance or redetermination of capability in accordance with item 4, above.

6. Inspection and test personnel who have not performed inspection/test activities for a period of one year shall be reevaluated in accordance with item 4, above.
  7. Inspection and test personnel shall be certified based on their qualifications. The certification shall be documented in an appropriate form including, as a minimum, the following information:
    - a. Employer's name,
    - b. Identification of the person being certified,
    - c. Activities certified to perform,
    - d. Basis used for certification (one or more of the following):
      - i) Records of education, experience, and training,
      - ii) Test results, where applicable,
      - iii) Results of capability demonstration,
    - e. Results of periodic evaluations,
    - f. Results of physical examinations, when required,
    - g. Signature of employer's designated representative who is responsible for such certification,
    - h. Date of certification and date of certification expiration.
- 4.10.3 Written procedures shall require that inspections are performed according to instructions or checklists that are based on the instructions, procedures, and drawings used in accomplishing the inspected activity. Inspection procedures shall also require documentation of the qualitative or quantitative results of the specific parameters being inspected.
- 4.10.4 Examinations, measurements, or tests of items processed shall be performed for each work operation, where necessary to ensure quality. Where a sample is used to verify acceptability of a batch of items, the sampling procedure shall be based on recognized standard practices and adequately justify the sample size and selection process.
- 4.10.5 If inspection of processed items is impossible or disadvantageous, indirect control by monitoring processing methods, equipment, and personnel shall be provided. Process monitoring shall be performed by qualified personnel or qualified automated means. Both inspection and process monitoring shall be provided when control is inadequate without both.



- 4.10.6 Witness/hold points imposed by the Purchaser shall be indicated in appropriate documents.
- 4.10.7 Final inspection shall include a records review of the process results and resolution of nonconformances identified by prior inspection. Completed items shall be inspected for completeness, marking, calibration, adjustments, protection from damage, or other characteristics as required, to verify the quality and conformance of the item according to specified requirements. The acceptance of the item shall be approved by authorized personnel. Any modifications, repairs, or replacements of items performed subsequent to final inspection shall require reinspection or retest, as appropriate, to verify acceptability.

#### **4.11 Test Control**

The Supplier shall establish a test program to identify and document all testing required, demonstrating that the equipment will perform satisfactorily in service. All testing shall be performed in accordance with written test procedures that incorporate all requirements and test limits specified in the design documents.

- 4.11.1 Test procedures shall ensure that prerequisite such as calibrated instrumentation, appropriate equipment, qualified personnel, condition of test equipment and the item to be tested, suitable environmental conditions, and provisions for data acquisition, are met.
- 4.11.2 Test requirements, results, and acceptance criteria shall be documented and evaluated by authorized personnel to ensure that all requirements have been satisfied.
- 4.11.3 Equipment that fails testing shall be dispositioned to ensure appropriate corrective action and retest. If dispositioned as "use as is," adequate justification shall be documented.
- 4.11.4 Test personnel shall be qualified in accordance with the requirements of paragraph 4.10.2 of this specification.
- 4.11.5 Computer program test procedures shall provide for demonstrating the adherence of the computer program to documented requirements.
  - 1. For computer programs used in design activities, computer program test procedures shall provide for assuring that the computer program produces correct results.
  - 2. For computer programs used for operational control, computer program test procedures shall provide for demonstrating required performance over the range of operation of the controlled function or process.
  - 3. The procedures shall also provide for evaluating technical adequacy through comparison of test results from alternative methods such as

hand calculation, calculations using comparable proven programs, or empirical data and information from technical literature.

4. In-use test procedures shall be developed and documented to permit confirmation of acceptable performance of the computer program in the operating system. In-use test procedures shall be performed after the computer program is installed on a different computer, or when there are significant changes in the operating system.
5. Periodic in-use manual or automatic self-check-in-use tests shall be prescribed and performed for those computer programs in which computer program errors, data errors, computer hardware failures, or instrument drift can affect required performance.
6. Test procedures or plans shall specify the following, as applicable:
  - a. Required tests and test sequence,
  - b. Required ranges of input parameters,
  - c. Identification of the stages at which testing is required,
  - d. Criteria for establishing test cases,
  - e. Requirements for testing logic branches,
  - f. Requirements for hardware integration,
  - g. Anticipated output values,
  - h. Acceptance criteria,
  - i. Reports, records, standard formatting, and conventions.
7. Test results shall be documented and maintained. Test results shall be evaluated by the responsible authority to ensure that test requirements have been satisfied.

#### **4.12 Control of Measuring and Test Equipment**

The Supplier shall ensure that all tools, gauges, instruments, calibration standards, and other measuring and test equipment used in activities affecting quality are of the proper range, type, and accuracy to verify conformance to established requirements. Measuring and test equipment shall be controlled, calibrated, adjusted, and maintained at prescribed intervals against certified equipment having known valid relationships to nationally recognized standards. If no national standard exists, the basis for calibration shall be documented.

- 4.12.1 Documentation shall be maintained that provides the following information for measuring and test equipment used in activities affecting quality:





1. The identification of the items.
  2. As-found calibration data or conditions.
  3. As-left calibration data or conditions.
  4. A list of the standards used to perform the calibration.
  5. A statement or information that standards or equipment are traceable to the National Bureau of Standards or accepted values of natural physical constraints.
  6. Calibration requirements that were not met.
  7. Signature of the person within the calibrator's organization who is responsible for the quality of the service provided.
- 4.12.2 Suppliers of external calibration services must be accredited to ISO/IEC 17025 standard by a National Accreditation Body that is a signatory to the ILAC MRA. The service must be provided in accordance with their accredited ISO/IEC 17025 program and scope of accreditation. Subcontracting is prohibited. The customer must be notified of any conditions that adversely impact the laboratory's ability to maintain the scope of accreditation.
- 4.12.3 When measuring and test equipment is out-of-calibration, the validity of previous inspection or test results and of the acceptability of items previously inspected or tested shall be evaluated and documented.
- 4.12.4 Inspection, measuring, or test equipment consistently found to be out-of-calibration shall be repaired or replaced.
- 4.12.5 Records shall be maintained and equipment suitably marked to indicate calibration status.
- 4.12.6 Measuring and test equipment shall be properly handled and stored to maintain accuracy.
- 4.12.7 Measuring and test equipment shall be used and calibrated in environments that are controlled to the extent necessary to ensure that the required accuracy and precision are maintained.

#### **4.13 Handling, Storage, and Shipping**

The Supplier's program for handling, storage, cleaning, packaging, shipping, and preservation of items shall be controlled to prevent damage or loss and to minimize deterioration. These activities shall satisfy the requirements of ANSI/ASME N45.2.2-1978, "Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants" or requirements of relevant Code and Standard (See Attachment A), and shall include, as a minimum, the following:



- 4.13.1. When required for critical, sensitive, perishable, or high-value items, specific procedures for handling, storage, packaging, shipping, and preservation shall be used.
- 4.13.2. Item shall be stored within a fire resistant, weathertight, and well ventilated building or equivalent enclosure and shall be placed on skids or shoring to permit air circulation.
- 4.13.3 A preventive maintenance program for item in storage shall be maintained.
- 4.13.4 Item shall be suitably packaged to protect against detrimental contamination and physical damage during shipping. Caps and plugs shall be used to seal openings with sensitive internal surfaces and to protect threads and weld end preparations.
- 4.13.4 When required, special equipment (such as containers, shock absorbers, and accelerometers) and special protective environment (such as inert gas atmosphere, specific moisture content levels, and temperature levels) shall be specified and provided and their existence verified.
- 4.13.5 Special handling tools and equipment shall be utilized and controlled where necessary to ensure safe and adequate handling. Special handling tools and equipment shall be inspected and tested in accordance with procedures at specified time intervals or prior to use.
- 4.13.6 Marking or labeling shall be utilized as necessary to adequately maintain and preserve the item, including indication of the presence of special environments or the need for special controls.

#### **4.14 Inspection, Test, and Operating Status**

The Supplier shall establish measures to identify the status of inspection and test activities either on the items or in documents traceable to the items. These measures are necessary to ensure that required inspections and tests are performed and to ensure that items that have not passed the required inspections and tests are not inadvertently used.

- 4.14.1 Status shall be maintained through indicators such as physical location and tags, markings, shop travelers, stamps, inspection records, or other suitable means.
- 4.14.2 The authority for application and removal of tags, markings, labels, and stamps shall be specified.

#### **4.15 Control of Nonconforming Items**

The Supplier shall ensure that items, services, or activities that do not conform to requirements are identified, documented, evaluated and dispositioned (use-as-is, rework, repair, or reject) in accordance with documented procedures.



- 4.15.1 Written procedures shall define the responsibility and authority of those personnel involved in issuing and dispositioning nonconforming items or conditions.
- 4.15.2 Procedures shall provide for evaluation of nonconforming items or conditions for reportability in accordance with 10CFR21. For Safety Related items and/or services ordered from the USA, Supplier and Subsupplier reporting pursuant to 10CFR21 shall be made to the NRC and NEK. For Safety Related items and/or services supplied from outside the USA, Supplier and Subsupplier shall be subject to the reporting pursuant to 10CFR21 to the NEK, only.
- 4.15.3 Written descriptions of nonconformances dispositioned “use-as-is” or “repair” shall include appropriate technical justification to substantiate the disposition and shall be submitted to the Purchaser for review and acceptance of those changes affecting customer design requirements.
- 4.15.4 Repaired and reworked items shall be reexamined in accordance with applicable procedures and with the original acceptance criteria. Repaired items can be reexamined in accordance with alternate acceptance criteria, if disposition has been approved by the Purchaser.
- 4.15.5 When a nonconforming item has been dispositioned as “reject”, controls shall be implemented and adequate records shall be maintained to verify the item has not been used.
- 4.15.6 Nonconforming items shall be segregated, when practical, by placing items in clearly identified and designated hold areas until properly dispositioned. When size, weight, or access limitations preclude segregation, other precautions shall be employed to prevent inadvertent use of the item.
- 4.15.7 Nonconforming items shall not be shipped or installed without the prior written approval of the Purchaser's responsible personnel.

#### **4.16 Corrective Action**

The Supplier shall ensure that conditions adverse to quality are promptly identified and corrected.

- 4.16.1 In the case of significant conditions adverse to quality, the cause of the condition shall be determined and corrective action taken to preclude recurrence.
- 4.16.2 The identification of significant conditions adverse to quality, the cause of the conditions, and the corrective action taken shall be documented and reported to appropriate levels of management. Follow-up action shall be taken to verify completion of corrective action.
- 4.16.3 Review of corrective actions shall be performed to determine if they were timely and effectively implemented.





#### **4.17 Quality Assurance Records**

The Supplier shall establish procedures to identify the specific records that will be generated and maintained and to prescribe their retention periods and storage requirements.

- 4.17.1 Records shall include drawings, specifications, purchase documents, work orders, material certifications, calculations, inspection and test reports, work procedures, nonconformance and corrective action reports, audit reports, software design verification and computer program testing records, personnel, process, and equipment qualification records.
- 4.17.2 Inspection, test, and work performance monitoring records shall indicate the nature of observations, the acceptable limits of parameters checked, the qualitative or quantitative results, the actions taken in connection with any identified deficiencies, the date of the observation, and the identity of personnel involved.
- 4.17.3 Required records shall be legible, identifiable, and retrievable.
- 4.17.4 A system for controlling and monitoring legibility and accuracy for radiograph reproductions shall be included in the quality assurance program. This system shall include procedures for exposure, scanning, focusing, contrast, resolution, and distinguishing film artifacts.
- 4.17.5 All maintained records shall have clear identification markings that can be traced to a specific job or item and shall be entered into a system that provides for timely retrieval.
- 4.17.6 Records retention periods and storage requirements shall satisfy the requirements of ANSI/ASME N45.2.9-1979, "Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants" or requirements of relevant Code and Standard (See Attachment A), or the Supplier shall, as a minimum, transmit identifiable and reproducible copies of all records as delineated by Purchaser at the time of shipment.

#### **4.18 Audits**

The Supplier shall establish a system of audits to ensure compliance with all aspects of the quality assurance program and to determine its effectiveness. Written procedures and controls shall comply with the requirements of ANSI/ASME N45.2.12-1977, "Requirements for Auditing of Quality Assurance Programs for Nuclear Power Plants" or requirements of relevant Code and Standard (See Attachment A), and shall include, as a minimum, the following:

- 4.18.1 Audits shall be scheduled at a frequency commensurate with the status and importance of the activity.
- 4.18.2 An audit plan which identifies the audit scope, requirements, audit personnel, activities to be audited, organizations to be notified, applicable



documents scheduled and audit procedures or checklists shall be developed and documented for each audit.

- 4.18.3 Auditors shall not have any direct responsibility for performance of the activities they audit.
- 4.18.4 Audit team shall be identified prior to the beginning of the audit, consisting of one or more auditors, and shall include an individual, who is a qualified Lead Auditor, appointed to lead the team.
- 4.18.5 Audits shall be performed in accordance with written procedures or checklist.
- 4.18.6 Audit results shall be documented by the auditing personnel and shall be reviewed by management responsible for the area audited. Conditions requiring prompt corrective action shall be reported immediately to management of the audited organization.
- 4.18.7 Audit reports shall be signed by the audit team leader and shall include the following information:
  1. Description of the audit scope.
  2. Identification of the auditors.
  3. Identification of persons contacted during audit activities.
  4. Summary of audit results.
  5. A statement on the effectiveness of the program elements which were audited.
  6. Description of each reported adverse audit finding in sufficient detail to enable corrective action to be taken by the audited organization.
- 4.18.8 Follow-up action shall be taken to verify that corrective action is implemented as scheduled.
- 4.18.9 Audit records shall be maintained and shall include audit plans, audit reports, written replies, and the record of completion of corrective action.
- 4.18.10 Lead Auditors shall be qualified in accordance with the requirements of ANSI/ASME N45.2.23-1978, "Qualification of Quality Assurance Program Audit Personnel for the Nuclear Power Plants", or requirements of relevant Code and Standard (See Attachment A), and shall satisfy, as a minimum, the following requirements:
  1. Lead Auditors shall be trained to the extent necessary to ensure their competence in auditing skills. Training in the following areas shall be given based upon management evaluation of the needs of each Lead Auditor: nuclear-related codes, standards and regulations; general structure of quality assurance programs; auditing techniques of examining, evaluating, and reporting; and audit planning.





2. Initial qualification of Lead Auditors shall be determined according to the individual's education, experience, training, auditing skills, and capabilities.
3. Lead Auditors shall pass an examination which shall evaluate their competence in auditing skills.
4. The proficiency of each Lead Auditor shall be assessed by management on an annual basis. Based on this assessment, management may extend the qualification, require retraining or require requalification.
5. The qualification of Lead Auditors shall be certified in writing in an appropriate form, including the following information:
  - a. Employer's name,
  - b. Lead Auditor's name,
  - c. Date of certification or recertification,
  - d. Basis for qualification (i.e., education, experience, training, examination, etc.),
  - e. Signature of employee's designated representative who is responsible for this certification.
6. Records for each Lead Auditor shall be maintained and updated annually.

**Attachment A**  
**QA Program Requirements - Cross Reference Table**

QA PROGRAM ELEMENTS	SAFETY RELATED ITEMS NON ASME CODE	SAFETY RELATED ITEMS ASME CODE		AUGMENTED QUALITY ITEMS	
	10CFR50 App. B ASME NQA-1/ANSI N45.2	ASME III NCA-4000	ASME III NCA-3800	ISO 9001*	ISO 17025*
<b>1.0 GENERAL</b>					
1.1; 1.2; 1.7	X	X	X	X	X
1.3	X				
1.4	X	X	X		
1.5	X	X	X		
1.6				X	X
<b>2.0 DEFINITIONS</b>	X	X	X	X	X
<b>3.0 DOCUMENTS FOR SUBMISSION</b>	X	X	X	X	X
<b>4.0 QA PROGRAM REQUIREMENTS</b>					
4.1 Organization	X	X	X	X	X
4.2 QA Program	X	X	X	X	X
4.3 Design Control					
4.3.1 – 4.3.9	X	X	X	X	
4.3.10	X	X	X		
4.4 Procurement					
4.4.1 – 4.4.7; 4.4.9	X	X	X	X	X
4.4.8	X	X	X		
4.5 Instructions, Procedures, and Drawings	X	X	X	X	X
4.6 Document Control	X	X	X	X	X
4.7 Control of Purchased Items and Services					
4.7.1 – 4.7.4	X	X	X	X	X
4.7.5	X	X	X		

**Attachment A**  
**QA Program Requirements - Cross Reference Table**

QA PROGRAM ELEMENTS	SAFETY RELATED ITEMS NON ASME CODE	SAFETY RELATED ITEMS ASME CODE		AUGMENTED QUALITY ITEMS	
	10CFR50 App. B ASME NQA-1/ANSI N45.2	ASME III NCA-4000	ASME III NCA-3800	ISO 9001*	ISO 17025*
<b>4.8 Identification and Control of Items</b>	X	X	X	X	X
<b>4.9 Control of Special Processes</b>	X	X	X	X	X
<b>4.10 Inspection</b>	X	X	X	X	X
<b>4.11 Test Control</b>	X	X	X	X	X
<b>4.12 Control of Measuring and Test Equipment</b>	X	X	X	X	X
<b>4.13 Handling, Storage, and Shipping</b>	X	X	X	X	X
<b>4.14 Inspection, Test, and Operating Status</b>	X	X	X	X	X
<b>4.15 Control of Nonconforming Items</b>					
<b>4.15.1; 4.15.3 – 4.15.7</b>	X	X	X	X	X
<b>4.15.2</b>	X	X	X		
<b>4.16 Corrective Action</b>	X	X	X	X	X
<b>4.17 Quality Assurance Records</b>	X	X	X	X	X
<b>4.18 Audits</b>	X	X	X	X	X

Note: \* Compliance with the requirements of international standards shall be certified by accredited organization.