

NEK

Nuklearna elektrarna Krško
Vrbina 12
8270 Krško



TECHNICAL SPECIFICATION


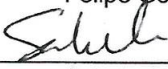

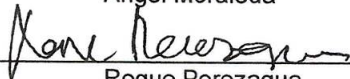




Technical Specification for Class 1E Motor Control Center

KRŠKO NUCLEAR POWER PLANT

SP-E5025

Revision 1, 14. 06. 2016

NUCLEAR SAFETY RELATED

Originator:	 Felipe González	Date: 14/06/2016
Reviewer / Verifier:	 Sabela Sarandeses	Date: 14/06/2016
Reviewer / Verifier:	 Ángel Moraleda	Date: 14/06/2016
QA Reviewer / Verifier:	 Roque Perezagua	Date: 14/06/2016
Reviewer / Verifier:	 Damjan Bizjak/Matjaž Ošlovnik	Date: 22 / 06 / 2016
Reviewer / Verifier:	 Boštjan Pevec	Date: 23 / 06 / 2016
QA Reviewer / Verifier:	 Tomaž Danijel	Date: 28 / 06 / 2016
ESD Superintendent:	 Janko Cerjak	Date: 29 / 06 / 2016



Project:

**Upgrade of BB1 Electrical Power Supply
(Modification 1137-EE-L)**

Title:

Technical Specification for Class 1E Motor Control Center

EAI Document No: **092-319-I-E-01002**

Issue: **3**

NEK Document No: **SP-E5025**

Purpose of issue: Request for Quotation

Date: 2016-06-14

Prepared:

P.a
Felipe González

Reviewed:

Sabela
Sabela Sarandeses

Approved:

Angel
Angel Moraleda

SAFETY-RELATED RECORD

This document contains proprietary information of Empresarios Agrupados Internacional, S.A. and is to be used solely for the Project and the purpose for which it is furnished. It may not be disclosed to others for a different use without the written permission of Empresarios Agrupados Internacional, S.A.



EMPRESARIOS AGRUPADOS

EMPRESARIOS AGRUPADOS INTERNACIONAL, S.A.

Magallanes, 3 28015 Madrid - España

CLASSIFICATION

Contains information for the design of structures, systems or components: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Design verification : Not applicable <input type="checkbox"/>	Head of OU/Supervisor <input type="checkbox"/> Verifier Level 1 <input checked="" type="checkbox"/> Level 2 <input type="checkbox"/>

CONTROL OF MODIFICATIONS

Issue	Modifications
3	The technical specification is updated taking into account the new HVAC consumers received within transmittal 092-319-CE-NEK-EAI-16/0079

PRELIMINARY OR PENDING INFORMATION

Issue	Paragraphs	Subject	Status
3	Section 9.1 and Attachment 3	Section of outgoing cables and information of the downstream MCCB	Pending

DISTRIBUTION

External	Internal	No. copies/Format
NEK	JUO, SSY, TLV, AML, FCU, FGW, AGD	1/electronic file

CONTENTS

	Page No.
1. SCOPE	1-1
1.1 SCOPE OF WORK.....	1-1
1.2 EQUIPMENT, MATERIAL AND SERVICES TO BE INCLUDED.....	1-1
2. DEFINITIONS AND ABBREVIATIONS	2-1
2.1 DEFINITIONS.....	2-1
2.2 ABBREVIATIONS.....	2-2
3. CODES AND STANDARDS.....	3-1
3.1 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE).....	3-1
3.2 INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC).....	3-2
3.3 MILITARY SPECIFICATIONS. USA (MIL)	3-2
3.4 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA).....	3-2
3.5 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)	3-3
3.6 CFR-UNITED STATES CODES OF FEDERAL REGULATION	3-3
3.7 U.S. NUCLEAR REGULATORY COMMISSION	3-3
3.8 UNDERWRITERS LABORATORIES (UL)	3-4
4. SUPPLEMENTAL DATA.....	4-1
5. DOCUMENT SUBMITTAL	5-1
5.1 INFORMATION REQUIRED WITH THE PROPOSAL.....	5-1
5.2 DOCUMENTATION TO BE SUPPLIED AFTER THE PURCHASE ORDER.....	5-2
6. DESIGN REQUIREMENTS.....	6-1
7. PERFORMANCE REQUIREMENTS	7-1
7.1 MOTOR CONTROL CENTERS AND BUCKETS	7-1
7.2 ELECTROMAGNETIC AND RADIOFREQUENCY INTERFERENCE EVALUATION.....	7-1
7.3 AMBIENT CONDITIONS	7-2

CONTENTS

	Page No.
7.4 SEISMIC PERFORMANCE REQUIREMENTS	7-2
8. MATERIAL REQUIREMENTS	8-1
9. FABRICATION AND ASSEMBLY REQUIREMENTS	9-1
9.1 MOTOR CONTROL CENTER AND BUCKETS	9-1
9.2 CONNECTIONS AND CABLE TERMINATIONS.....	9-9
9.3 SEPARATION REQUIREMENTS.....	9-10
9.4 GROUNDING	9-10
9.5 SPARE PARTS AND ACCESSORIES	9-11
10. INSPECTIONS AND TESTS.....	10-1
10.1 CERTIFIED DATA.....	10-1
10.2 TESTING	10-1
10.3 INSPECTION	10-2
10.4 ACCEPTANCE CRITERIA	10-3
11. QUALIFICATION.....	11-1
11.1 QUALIFICATION REQUIREMENTS OF NEW EQUIPMENT.....	11-1
11.2 RE-QUALIFICATION OF EXISTING MCC (MCCD311).....	11-3
12. CLEANING.....	12-1
13. CORROSION PROTECTION/COATING	13-1
14. MARKING AND IDENTIFICATION	14-1
15. PACKING, HANDLING AND STORAGE	15-1
16. NON-CONFORMING MATERIALS.....	16-1
17. RECORDS	17-1
17.1 RECORD SYSTEM	17-1
17.2 FABRICATION RECORDS	17-1
18. OTHER REQUIREMENTS.....	18-1

CONTENTS

	Page No.
19. RIGHT OF ACCESS	19-1
20. QA PROGRAM REQUIREMENTS.....	20-1
21. SPECIAL HANDLING	21-1
22. SHELF LIFE	22-1
23. 10CFR21 REPORTING	23-1
24. COMMERCIAL GRADE DEDICATION	24-1
25. SUPPLIER DOCUMENTATION REQUIREMENTS	25-1
26. NEK PROPRIETARY DATA.....	26-1
27. NON-CONFORMANCE REPORTS	27-1
28. REPAIR RECORDS.....	28-1
29. SOURCE INSPECTION/SURVEILLANCE NOTIFICATION	29-1
30. SHIPPING REQUIREMENTS	30-1
31. DELIVERY SCHEDULE.....	31-1
32. WITNESS/HOLD POINTS FOR SUBMITTAL OF SUPPLIER DOCUMENTATION	32-1
33. VENDOR TECHNICAL MANUAL AND REGISTERED UPDATES.....	33-1
34. TRAINING	34-1
35. APPENDICES	35-1
ATTACHMENT 1 FLOOR RESPONSE SPECTRA	
ATTACHMENT 2 BB1 400 VAC MOTOR CONTROL CENTER DATASHEETS	
ATTACHMENT 3 BB1 400 VAC MOTOR CONTROL CENTER ONE-LINE DIAGRAM	
ATTACHMENT 4 ELECTRICAL ELEMENTARY DIAGRAMS	
ATTACHMENT 5 CONTAINMENT PENETRATION DATA	

CONTENTS

Page No.

ATTACHMENT 6 EXISTING MOTOR CONTROL CENTER

ATTACHMENT 7 LAYOUT OF THE ELECTRICAL ROOM

ATTACHMENT 8 REQUIREMENTS FOR NEW COMPONENTS AND SPARES (TO BE
FILLED IN BY THE SUPPLIER)

ATTACHMENT 9 MOTOR CONTROL CENTER NAMEPLATE LEGEND AND FRONT
VIEWS

1. SCOPE

1.1 SCOPE OF WORK

This specification establishes the technical requirements for the design, manufacture, testing, packing, documentation and supply of the new BB1 Motor Control Center (Asset No.: EE103MCCD321), for the KRŠKO Nuclear Power Plant.

This specification also establishes the technical requirements for the design, manufacture, testing, packing, documentation, delivery and furnishing of fully assembled replacement buckets and accessory equipment for the existing 400 Vac Motor Control Center (Asset No.: EE103MCCD311).

The equipment to be supplied is seismic class 1 and electrical class 1E.

The Supplier shall be responsible for compliance with all of the detailed requirements presented in this specification. The Supplier shall be responsible for performing, in addition to the requirements of this specification, such analyses, 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 good practice.

All documents or information attached to this specification are considered part of it and the Bidder must comply with them.

1.2 EQUIPMENT, MATERIAL AND SERVICES TO BE INCLUDED

The equipment, material and devices to be supplied under this specification shall include but not necessarily be limited to the following:

- a) One (1) Class 1E, BB1 400 Vac Motor Control Center, 50 Hz, 3 Ph+Neutral, 800 A, 40 kA (Equipment No.: EE103MCCD321)

The MCCD shall be supplied with all circuit breakers, motor starters and spares required. See Single Line Diagram (Attachment 3 hereto).

- b) New Starters and Circuit Breaker for existing 400 Vac Motor Control Center (Equipment No.: EE103MCCD311)

- Two (2) MOV starters for Pressuriser PORV bypass shall be furnished in the vertical section 6 (empty space 6A and 6B) of the existing MCC.

The scope of supply includes the new circuit breakers, buckets and necessary components (terminals, terminal blocks, doors, unit structure and unit wrapper, barriers, guide rails, unit stabs, handle mechanism, etc) in order to modify the MCC and furnish the new required services.

See Section 6 herein and Attachment 6 for additional information.

The starter buckets shall comply with Electrical Elementary Diagrams (Attachment 4 hereto). Nameplate legends, equipment and components of the MCCs shall comply with the document "Motor Control Center Nameplate Legend and Front Views" (Attachment 9 hereto).

The Supplier shall include all the materials, internal wiring and components needed for the correct installation, operation and functionality of the equipment (completely assembled MCC and buckets) within the scope of this specification for the required service conditions.

The equipment shall be adequately rated for its most onerous duty. Temperature derating due to installation within the enclosure at the specified ambient temperature shall be taken into account.

All equipment shall be supplied for indoor installation, with the characteristics indicated later in the document.

1.2.1 Other Components in the Supply

- a) Necessary consumables and spare parts for start-up and guarantee tests.
- b) Bolts, nuts, links, cable lugs and other hardware (in excess) necessary in order to assembly the MCC on site.
- c) Spare parts deemed advisable by the Supplier in order to maintain qualification of the equipment, as specified in section 11 herein. List of the proposed spare parts shall be clearly stated in the offer as "spare". See section 9.5 herein.
- d) Channel sills (base structure) to maintain rigidity of the structure and positioned to serve as floor levelling member (optional)

- e) Master terminal block (optional)

1.2.2 Services Included

- a) Packing and transport.
- b) Performance of the tests indicated in Section 10 herein.
- c) Supply of the documentation required in Section 5 and Section 25 herein.
- d) Training for installation, maintenance and operation, as required in section 34 herein (optional)

1.2.3 Equipment, Material and Services to be Supplied by Others

- a) Foundations, foundation bolts, shims and floor channels
- b) External cables and conduits
- c) Design and labour for modification of existing MCCD311 and installation of the new buckets
- d) Labour, equipment and tools required for installation, field testing and commissioning of MCCD321
- e) 400 Vac Switchgear (Asset No.: EE104SWGLD32)

2. DEFINITIONS AND ABBREVIATIONS

2.1 DEFINITIONS

Basic Component: This item is synonymous with safety-related item.

Commercial Grade Item: A structure, system, or component, or part thereof, that affects its safety function(s) that was not designed and manufactured as a basic component:

- Not subject to design or specification requirements that are unique to nuclear facilities
- Used in applications other than nuclear facilities
- To be ordered from the manufacturer/Supplier on the basis of specifications set forth in the manufacturer's published product descriptions (for example, a catalogue)

Certificate of Conformance (C of C): A document signed or otherwise authenticated by an authorised individual certifying the degree to which items or services meet specified requirements.

Current carrying circuit: A circuit that uses electrical current through a metallic conductor as the means of transmitting signals or power.

Dedication: When applied to nuclear power plants, dedication is an acceptance process undertaken to provide reasonable assurance that a commercial grade item to be used as a basic component will perform its intended safety function and, in this respect, is deemed equivalent to an item designed and manufactured under a 10 CFR Part 50, appendix B, quality assurance programme.

Design Extension Conditions: Accident conditions that are not considered for Design Basis Accidents design.

Mild environment: A mild environment is an environment that would at no time be significantly more severe than the environment that would occur during normal plant operation, including anticipated operational occurrences.

Purchaser: Utility issuing the purchase order.

Safety-Related item: Any structure, system, component, or part used in a nuclear power plant that is relied upon during or following design basis events to assure:

- The integrity of the reactor coolant pressure boundary
- The capability to shut down the reactor and maintain it in a safe shutdown condition
- The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures

Supplier: The organisation to which a purchase order from the Purchaser has been issued.

Subsupplier: The organisation that furnishes items and services to the Supplier that will be used to complete the Purchaser's purchase order requirements.

2.2 ABBREVIATIONS

AC	Alternating Current
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AWG	American Wire Gauge
BOM	Bill of Material
CFR	Code of Federal Regulations
DC	Direct Current
DEC	Design Extension Conditions
ECR	Emergency control room
EMI	Electromagnetic Interference
FAT	Factory Acceptance Test

IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
MCC	Motor Control Centre
MCCB	Molded Case Circuit Breaker
MCCD	Motor Control Centre (with backup by Emergency Power Supply)
MOV	Motor Operated Valve
NCR	Non-Conformance Report
NEK	Krško Nuclear Power Plant
NEMA	National Electrical Manufacturers Association
NPP	Nuclear Power Plant
NRC	U.S. Nuclear Regulatory Commission
NSR	Non Safety Related
OBE	Operating Basis Earthquake
PCB	Printed Circuit Board
PIS	Plant Information System
PO	Purchase Order
QA	Quality Assurance
QC	Quality Control
RFI	Radio-Frequency Interference
RFQ	Request For Quotation
RMS	Root Mean Square
SBO	Station Black-Out
SR	Safety Related
SSE	Safe Shutdown Earthquake
SWC	Surge Withstand Capability

TRS Test Response Spectra

UL Underwriters Laboratories

3. CODES AND STANDARDS

The equipment and components to be supplied shall be designed, manufactured and tested in accordance with the following standards where applicable:

- 3.1 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
- a) IEEE 308-2001 Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations
 - b) IEEE 323-2003 Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations
 - c) IEEE 344-2004 (as endorsed by RG 1.100-2009) Standard for Seismic Qualification of Equipment for Nuclear Power Generating Stations
 - d) IEEE 383-2003 Type Test of Class 1E Electric Cables, Field Splices and Connections for Nuclear Power Generating Stations
 - e) IEEE 384-2008 Standard Criteria for Independence of Class 1E Equipment and Circuits
 - f) IEEE 627-2010 IEEE Standard for Qualification of Equipment Used in Nuclear Facilities
 - g) IEEE 649-2006 IEEE Standard for Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations
 - h) IEEE 1050-1996 Instrumentation and Control Equipment Grounding in Generating Stations
 - i) IEEE C37.98-2013 IEEE Standard for Seismic Qualification Testing of Protective Relays and Auxiliaries for Nuclear Facilities
 - j) IEEE 741-2007 IEEE Standard Criteria for the Protection of Class 1E Power Systems and Equipment in Nuclear Power Generating Stations

3.2 INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

- a) IEC 61000-3-2013 Electromagnetic compatibility (EMC) - Part 3: Limits
- b) IEC 61000-4-2006 Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques
- c) IEC 61000-6-2005 Electromagnetic compatibility (EMC) - Part 6: Generic Standards – Emission/Immunity

3.3 MILITARY SPECIFICATIONS. USA (MIL)

- a) MIL-STD-461E Requirements for the Control of Electromagnetic Interference characteristics of Subsystems and Equipment

3.4 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- a) ICS-6-1993 (or UL 508) Industrial Control and Systems: Enclosures
- b) 250-2014 (or UL 845) Enclosures for Electrical Equipment (1,000 V Maximum)
- c) ICS 1-2000 (or UL 508) Industrial Control and Systems. General Requirements
- d) ICS 2-2000 (or UL 508) Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts
- e) ICS 18-2001 (or UL 845) Motor Control Centers
- f) AB-1-2002 (or UL 489) Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures
- g) AB-3-2013 (or UL 489) Molded-Case Circuit Breakers and Their Application

- h) AB-4-2009
(or UL 489) Guidelines for Inspection and Preventive Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Applications

3.5 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- a) ANSI/ASME NQA-1 2008 Quality Assurance Requirements for Nuclear Facility Applications
- b) ANSI IEEE C37.90-2005 Relays and Relay Systems Associated with Electric Power Apparatus.
- c) ANSI IEEE C57.13-2009 IEEE Instrument Transformers
- d) ANSI IEEE C62.41-1991 IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
- e) ANSI IEEE C62.45-1992 IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits

3.6 CFR-UNITED STATES CODES OF FEDERAL REGULATION

- a) 10CFR50, Appendix B Quality Assurance Requirements for Nuclear Facility Applications
- b) 10CFR21 Reporting of Defects and Noncompliance

3.7 U.S. NUCLEAR REGULATORY COMMISSION

- a) RG 1.89 1984 Environmental Qualification of Certain Electric Equipment Important to Safety for NPP
- b) RG 1.100 2009 Seismic qualification of electrical and active mechanical equipment and functional qualification of active mechanical equipment for NPP

- | | | |
|----|---------------|---|
| c) | RG 1.172 2013 | Software requirements specifications for digital computer software and complex electronics used in safety systems of Nuclear Power Plants |
| d) | RG 1.180 2003 | Guidelines for evaluating electromagnetic and radio-frequency interference in safety-related instrumentation and control systems |
| e) | RG 1.213 2009 | Qualification of Safety-Related Motor Control Centers for Nuclear Power Plants |
| f) | RG 1.63 1987 | Electric Penetration Assemblies in Containment Structures for Nuclear Power Plants |

3.8 UNDERWRITERS LABORATORIES (UL)

- | | | |
|----|--------------|---|
| a) | UL 845-2005 | Motor Control Centers |
| b) | UL 489-2013 | Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures |
| c) | UL 1332-2005 | Standard for Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment |

In the event of any conflict between codes, or this Technical Specification and the codes, the more stringent requirements shall apply.

4. SUPPLEMENTAL DATA

The following NEK documents are part of this Technical Specification:

- | | | |
|----|----------------|--|
| a) | SP-S702 Rev.10 | Seismic Analysis, Testing, and Documentation.
KRŠKO Nuclear Power Plant |
| b) | QS-610 Rev.1 | QA Specification- Generic Quality Assurance Program
Requirements |

5. DOCUMENT SUBMITTAL

5.1 INFORMATION REQUIRED WITH THE PROPOSAL

The Supplier shall submit complete data for the equipment offered along with his proposal, including:

- a) List of deviation or exceptions to this specification.

The Vendor shall certify and sign that the Proposal is in complete and absolute agreement with this specification, except as specially outlined in the list of deviations or exceptions. All exceptions shall be included in the above-mentioned list, as well as their justification, indicating the corresponding section of the specification. Exceptions not included in the "List of Exceptions" shall not have contractual validity.

- b) All requirements listed in this specification which are not the Supplier's standard shall be clearly stated. Solutions shall be suggested.
- c) Vendor's Quality Assurance (QA) and Quality Control (QC) Programme for controlling the manufacture of the equipment.
- d) Preliminary dimension drawings, showing front views, layout of buckets.
- e) Duly completed Motor Control Center datasheets (Attachment 2 hereto)
- f) General list of the components for the MCC and bucket units, indicating manufacturer, type and characteristics of each (Bill of Materials)
- g) Reference list of nuclear plants which uses the same qualified model/type of Motor Control Center and buckets (indicate year of installation) and reference list of other qualified models.
- h) Manufacture and delivery schedule.
- i) Document delivery schedule in case of Purchase Order.
- j) List of accessories, spares and special tools.
- k) A statement of the type and manufacturer of any components to be obtained from a sub-supplier or subcontractor.
- l) Cost saving alternatives of quality comparable to the equipment specified shall be submitted with sufficient information to give the NEK a clear understanding of the equipment offered.

5.2 DOCUMENTATION TO BE SUPPLIED AFTER THE PURCHASE ORDER

5.2.1 Documents to be Submitted

Once the order has been awarded, the Supplier shall submit the following documentation:

	Fulfill (F) Approval (A) Certified (C) Record (R)	Maximum delivery period after award
• List of documents.	F/A	2 weeks
• Catalogues of the equipment	R	2 weeks
• Detailed Quality Plan with approved R (record), W (witness) and H (hold) points	F/A	3 weeks
• Dedication Plan (if needed)	F/A	3 weeks
• Certified datasheets (Attachment 2 hereto)	A/C	2 weeks
• Certified drawings of the general arrangement and dimensions, including:	A/C	6-8 weeks
- Front, plan, internal and side views of the MCC, showing position of all components. It shall also include the minimum clearance at the front, top, rear and sides.		
- Outline details of buckets and breakers		
- Details of anchoring, cable openings and weight of the equipment, showing static and dynamic support reaction forces.		
- Connection and mounting details		
- Shipping dimensions and weights		
- Structural drawing (weights, centre of gravity, dimensions of the frame, etc)		

	Fulfill (F) Approval (A) Certified (C) Record (R)	Maximum delivery period after award
<ul style="list-style-type: none"> Nameplates and rating plates of the main equipment. 	A	12 weeks
<ul style="list-style-type: none"> Bill of Materials (itemised list of the components of every equipment item), indicating the manufacturer, type and characteristics of each and the catalogue reference numbers. The items purchased as Nuclear-Qualified and as Commercial Grade shall also be indicated. <p>The design/qualified life and maintenance replacement interval shall be specified for each item</p> <p>It shall be in the form of a spreadsheet</p>	A	6-8 weeks
<ul style="list-style-type: none"> Single-line diagrams. 	A	6-8 weeks
<ul style="list-style-type: none"> Internal schematic wiring diagrams (typical diagrams) and interconnection diagrams. 	A	6-8 weeks
<ul style="list-style-type: none"> Breaker settings, time curve characteristics and coordination tables. 	A	6-8 weeks
<ul style="list-style-type: none"> Test procedures and protocols. 	F/A	8-10 weeks
<ul style="list-style-type: none"> Final test protocols and reports (after FAT). 	A	One week after FAT is finished
<ul style="list-style-type: none"> Instructions manuals (storage, installation, test & commissioning, maintenance and operation), including: <ul style="list-style-type: none"> Instructions for handling and storage prior to being put into service Installation instructions and spreadsheets with torque requirements for all electrical and mechanical bolted connections 	R	16 weeks

	Fulfill (F) Approval (A) Certified (C) Record (R)	Maximum delivery period after award
<ul style="list-style-type: none"> - Activities which will allow use of parts during the complete design/qualified life of parts. - Detailed maintenance programme, including troubleshooting - In Storage Maintenance (ISM) Instructions 		
<ul style="list-style-type: none"> • Replacement information of the buckets in the existing Motor Control Center EE103MCCD311, including: <ul style="list-style-type: none"> - Description of the modifications in the existing MCC, including labour and components - Justification of the penetration seal (see Attachment 5 hereto) 	R	16 weeks
<ul style="list-style-type: none"> • List of spare parts which must be periodically replaced in order to meet qualified life criteria, in accordance with section 11 herein. The design/qualified life and maintenance replacement interval of each item shall be specified. 	R	One week after FAT is finished
<ul style="list-style-type: none"> • Certificate of Conformance (CoC) certifying that all the requirements of this Technical Specification and purchase order have been met and that the qualification is in accordance with specified standards. 	R	One week after FAT is finished
<ul style="list-style-type: none"> • Painting procedures. 	A	4 weeks
<ul style="list-style-type: none"> • Seismic qualification, software qualification (if applicable) and EMI/RFI evaluation documentation package in accordance with reference standards. It shall comprise the qualification plan, description of the items to be tested, detail test procedures and acceptance criteria. See section 11 herein. 	A	4 weeks prior to qualification tests

	Fulfill (F) Approval (A) Certified (C) Record (R)	Maximum delivery period after award
<ul style="list-style-type: none"> Qualification reports, including results of the seismic qualification tests, software qualification (if applicable), and EMI/RFI evaluation. 	A	3 weeks prior to shipment 2 weeks (if no new qualification test is necessary)

Instructions to the Supplier:

- Fabrication prior to approval of drawings marked "A" shall be at the Supplier's own risk.
- Documents marked "R" are for record, approval is not required.

5.2.2 Format of the Documents

All documents submitted to the Purchaser shall be on hard copy and electronic media and shall include a purchase order number, equipment tag number and supplier shop order number. Documents shall be submitted in the following format:

- | | |
|---------------------------|---|
| a. Text documents: | Microsoft Word 2010 or later or Adobe Acrobat |
| b. Electronic mail: | Microsoft Outlook or compatible |
| c. Spreadsheets: | Microsoft Excel 2010 or later |
| d. Drawings: | AutoCAD & converted to pdf |
| e. Planning & Scheduling: | Primavera, Microsoft Project 2010 or later or Microsoft Excel 2010 or later |

The Purchaser shall have to approve use of any other electronic format. The preferred paper size for drawings is A2 or smaller, A3 or A4 should be used whenever possible.

All documents in electronic media shall be in original format and directly converted to pdf format and not scanned, if possible.

All data, including calculations, markings, etc, shall be in SI units (m, kg, s, A, K, cd, mol) and in Metric Units.

6. DESIGN REQUIREMENTS

- a) The MCC and buckets shall be designed and manufactured in accordance with standards listed in section 3 herein.
- b) The Class 1E, Motor Control Center (Asset No.: EE103MCCD321) shall be supplied for indoor installation.

This MCC will feed new 400 Vac safety related loads in BB1 building (Air Conditioning Units, ECR, MOV's, Fans, etc). See One Line Diagram (Attachment 3 hereto)

- c) The following equipment shall be supplied and installed in the existing Motor Control Center (Asset No.: EE103MCCD311):
 - Two (2) Motor Operated Valve starters for Pressuriser PORV bypass (MOV-1 and MOV-2, 0,8 Hp)

Section 6 of the MCC is empty and shall be modified for these two (2) MOV starters (positions 6A and 6B of the MCC), as stated in the One Line Diagrams (Attachment 3 hereto)

Each MOV starter shall be fitted with circuit breaker, two contactors and thermal protection, in accordance with the elementary drawings (Attachment 4 hereto) and RG 1.63-1987 and IEEE 741-2007.

Pzr Porv bypass MOVs are located inside the containment. These starters shall be designed to assure preservation of the corresponding electrical penetration seal and conductor. These starters shall meet requirements from RG 1.63-1987 and IEEE 741-2007 Chapter 5.4.

The existing Motor Control Center MCCD311 is manufactured by Eaton, Freedom Series 2100. It is 400 Vac, 50 Hz, 3 Ph+N, 1200 A main bus (600 A neutral bus), enclosure NEMA 12. See details of the existing MCC in Attachment 6 hereto.

The scope of supply includes the new circuit breakers, starters, necessary components (terminals, terminal blocks, doors, unit structure and unit wrapper, barriers, guide rails, unit stabs, handle mechanism, door mounted overload resets, etc).

The new withdrawable units shall be designed so that units may be readily removed or added as may be required and similar size starter or breaker units can readily be interchanged.

Each replacement bucket shall be provided with an individual front door, as needed.

The replacement buckets and circuit breakers shall comply with the requirements stated in this specification for MCC, as applicable.

- d) The incoming supply of MCCD321 and MCCD311 is 400/231 Vac, 3Ph, 50 Hz, 4 wire conductor from solidly grounded neutral source.
- e) The new MCCD321 will be installed in the “spare room 1” (room 005),. The door in room 005 is 2x2 m.
- f) The existing MCCD311 is installed in the “switchgear room” (room 002), against the wall.
- g) The equipment shall be adequately rated for their most onerous duty, taking into account installation conditions.

The Supplier shall guarantee proper operation and maintenance of the equipment from the front.

7. PERFORMANCE REQUIREMENTS

7.1 MOTOR CONTROL CENTERS AND BUCKETS

The Class 1E Motor Control Centers and buckets shall have a qualified life of 40 years with routine maintenance as identified by the Supplier. For components which do not meet the 40-year criteria, a list shall be furnished detailing the replacement parts, shelf life of the parts and frequency change-out to maintain the 40-year design life.

The equipment to be supplied shall be capable of continuous satisfactory operation under their most onerous duty and the specified ambient and installation conditions, without undue deficiencies.

The Motor Control Centers and buckets shall comply with the requirements stated in the technical datasheets (Attachment 2 hereto).

7.2 ELECTROMAGNETIC AND RADIOFREQUENCY INTERFERENCE EVALUATION

The equipment to be supplied shall be qualified in accordance with RG 1.180 (2003) "Guidelines For Evaluating Electromagnetic and Radio-Frequency in Safety-Related Instrumentation and Control Systems" regarding radio-frequency, electromagnetic interfaces and power (voltage) surges where applicable.

Compliance with the following is required, as endorsed by RG 1.180 (2003):

- a) EMI/RFI limiting practises: IEEE 1050-1996

Full standard endorsed with the exception stated in RG 1.180-2003

- b) EMI/RFI emission and susceptibility testing (radiated, conducted power line and conducted signal line): MIL-STD-461E, IEC 61000-3, IEC 61000-4 and IEC 61000-6

Selected MIL-STD-461E test methods and operating envelopes endorsed.

Selected IEC 61000 test methods and operating envelopes endorsed.

- c) SWG testing: IEEE C62.41-1991, IEEE C62.45-1992 and IEC 61000-4

Selected IEEE C62.41-1991 surge test waveforms endorsed with associated IEEE C62.45-1992 test methods.

Selected IEC 61000-4 surge test waveforms and test methods endorsed.

General withstand levels are included in RG 1.180-2003, position 5. Surge withstand levels shall comply with Category B, Medium Exposure (according to IEEE C62.41-1991) and Level 4 (according to IEC 61000-4).

7.3 AMBIENT CONDITIONS

The MCC and buckets shall be designed for continuous operation under the following ambient conditions:

- a) Minimum temperature: 5°C
- b) Maximum temperature: 40 °C
- c) Maximum relative humidity: 95 % (without condensate)

7.4 SEISMIC PERFORMANCE REQUIREMENTS

Seismic analysis, testing, and documentation shall be performed in accordance with the following:

- a) The equipment to be supplied which is designated Seismic Class 1 and electrical class 1E, as defined by IEEE 344, shall sustain no damage and perform in accordance with this specification when subjected to design extension condition (DEC) seismic accelerations, acting both horizontally and vertically, and occurring simultaneously. In addition, no component or accessory shall be dislodged or sustain damage that causes any loss of function or accuracy when the equipment is subjected to design basis seismic accelerations.
- b) Seismic qualification of the equipment shall be in accordance with and meet the requirements of specification SP-S702 and the floor response spectra (Attachment 1).
- c) Vibration dampening mounting devices, such as shock absorbers, shall not be used.

8. MATERIAL REQUIREMENTS

- a) Except where otherwise stated herein, construction materials shall meet the manufacturer's standards which have proven to be satisfactory in the past and meet applicable code requirements.
- b) Only new (not used) components/materials traceable and certified to meet the design requirements shall be used in production.
- c) Any insulation used shall be halogen-free and made of non-combustible materials. Polyvinylchloride shall not be used in any equipment, component or insulation.
- d) Bus support insulators shall be formed of high dielectric strength, low-moisture absorbing, flame retarding and high-impact-strength surface insulation.
- e) For all conductive parts, copper shall be used.

9. FABRICATION AND ASSEMBLY REQUIREMENTS

9.1 MOTOR CONTROL CENTER AND BUCKETS

9.1.1 General

- a) During manufacture and assembly, the Foreign Material Exclusions procedure shall be taken into account.
- b) The Motor Control Center (MCC) consists of enclosed vertical sections mounted on the floor. It contains incoming line facilities, a common horizontal bus and horizontal and vertical wireways.
- c) The new MCCD321 will not be mounted against a wall. Access to circuit breaker, busbars, cable connections and all necessary components shall be from the front and back side in order to allow proper maintenance. Rear covers shall be bolted.
- d) Components belonging to one functional group are assembled to form a single mechanical and electrical module. Modules shall be withdrawable. It shall be possible to replace the modules even while the MCC is live (connected to mains), without any danger and without disconnecting the neighbouring modules.
- e) When any withdrawable module is removed from the switchgear, the empty compartment shall be enclosed with protection to busbars and adjacent compartments.
- f) Units designated as "spare" in the MCC One Line Diagram (Attachment 3) shall be completely equipped, factory wired and prepared for connection of external wiring, as necessary.

9.1.2 Front Arrangement

- a) Arrangement of front-mounted devices shall be as near as possible to MCC front views shown in the One Line Diagrams (Attachment 3 hereto)
- b) The final detail layout drawings shall be approved by the Purchaser prior to actual cut-out.

9.1.3 Structural Requirements

- a) Each free-standing structure framework (vertical section) shall be fabricated from not less than MSG No. 12 steel (2.7 mm), formed and reinforced to form a rigid structure. The MCC shall be max 72" high to allow for the seismic stiffeners on top and bottom and still fit through the specified 2x2 meter (78"x78") door.
- b) Structures shall be totally enclosed, dead front, freestanding assemblies. Structures shall contain horizontal wireways, isolated from the horizontal bus and shall be readily accessible through hinged covers. Wireways shall be equipped with cable support brackets secured to the steel barrier. Adequate space for incoming and outgoing cables, conduit and wiring to enter either the top or bottom shall be provided without structural interference.
- c) The enclosures shall comply, at least, with protection NEMA 1 (IP 20)
- d) The MCC structure frame shall be designed for bolting with expansion bolts to threaded inserts embedded in the floor. Provisions shall be supplied to allow the MCC to be levelled appropriately with the ground. The Supplier shall ensure proper alignment and operation of the withdrawable cubicles.

Channel sills (base frame) to maintain rigidity of the structure during shipment and positioned to serve as floor levelling members shall be quoted as an option.

- e) The cubicles shall be constructed so as to minimize the movement of ionised gases between compartments.
- f) Compartments for mounting starter units shall be incrementally arranged such that no more than six (6) size 1 starters can be mounted (front mounting) within each vertical section.
- g) A vertical wireway with adequate cross sectional area shall be adjacent to each vertical unit and shall be covered by a hinged door. Wireways shall contain steel rod cable supports.
- h) The scope of supply shall include proper bus-bar connectors for the incoming power cable and grounding conductors to the cabinet ground point. Proper terminal blocks with bolt connection for outgoing cables with cable lugs shall also be included.
- i) All starter and feeder units are preferred to be of the draw-out type. Draw-out provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus. Draw-out units shall have a tin-plated stab assembly for connection to the vertical bus. No wiring to

these stabs shall extend into the bus compartment. Spring-loaded fastening devices shall secure all draw-out units.

- j) Each unit compartment shall be provided with an individual hinged front door.

Concealed hinge construction (no hinges visible from the outside when the door is closed) shall be used for unit and wireway doors. The doors shall be so braced that the weight of the equipment mounted thereon shall not cause any portion of the door to sag when the door is open.

The unit doors shall open opposite to the wireway doors, permitting optimum access to the unit compartment

- k) All doors, removable covers, etc shall be provided with oil resistant synthetic rubber gaskets.
- l) Each MCC vertical bus shall be completely isolated and insulated by means of a labyrinth design barrier. It shall effectively isolate the vertical buses to prevent any fault-generated gases to pass from one phase to another (prevent fault propagation).
- m) Structures shall be manufactured to allow for future expansion on either end as practicable, including provision for extension of the horizontal bus.
- n) Each shipping section shall be equipped with a lifting angle. The angle shall be attached to the top of the MCC and shall be designed for lifting the complete shipping section.
- o) A control wiring master terminal board shall be supplied on the top portion of each vertical section of the new MCCD321. It shall be completely isolated from all other parts of the MCC. All internal wiring shall be included.

9.1.4 MCC Bus-Bars

- a) Power shall be distributed to the control units by means of horizontal and vertical buses. The buses shall be rated as indicated in the MCC datasheets (Attachment 2 hereto)
- b) Vertical buses shall have current capacity in excess of the total load connected to them.
- c) All bus connections and contact surfaces shall be tin-plated and shall employ, at least, two bolts with Belleville washers (or equivalent) for each connection point.

- d) Power buses shall be constructed of high conductivity copper, with insulated supports designed to withstand the maximum available short-circuit current. Buses shall not be tapered.
- e) Bus joints may be brazed or bolted. Bolts and associated hardware shall be non-magnetic, corrosion-resistant material.
- f) The horizontal buses shall be completely separated from all other functional units in each vertical section. Visual inspection of the joints of the horizontal bus should be easy possible from the front of the MCC.
- g) Power buses shall be arranged for phase sequence A-B-C from top to bottom, front to rear and left to right as viewed from the front of the MCC.
- h) A neutral bus shall run the full length of the MCC and shall be insulated from the MCC frame and isolated from the ground bus.

Terminals shall be provided on the neutral bus for terminating the neutral cables, as necessary.

- i) A copper ground bus extending the entire length of the MCC assembly shall be provided. See Section 9.4 herein.

9.1.5 Starter Units and Feeder Units (Buckets)

- a) The Motor Control Centers are furnished with starter units and feeder units, as indicated in the one line diagrams (Attachment 3 hereto)
- b) Starters shall be sized according to the applicable standards, taking into account the motor sizing.
- c) Starters shall be of the combination type, using Molded Case Circuit Breakers (MCCB), thermal overload relay and magnetic contactors with auxiliary switches.

The MCCB for starters shall have only magnetic protection, except for Przr Porv bypass MOVs (located inside containment) which shall meet requirements from RG 1.63-1987 and IEEE 741-2007 Chapter 5.4, in order to assure preservation of the corresponding electrical penetration seal and conductor

All MOV starters shall be furnished with two contactors, in order to allow both directions of operation (reversing motor starters). The circuit breaker shall protect the thermal relay and the contactor. See Electrical Elementary Diagrams in Attachment 4 hereto.

- d) All components and wiring shall be readily accessible for ease of maintenance.

- e) The design of the withdrawable units and their associated connectors shall include provisions for accurately guiding the units from the disconnected or withdrawn position to the connected position and positively prevent mis-stabbing.
- f) Each withdrawable unit shall be separated by steel barrier plates to provide complete isolation. The rear of each unit shall be isolated from the vertical bus.
- g) All similar devices and components shall be of one manufacturer to facilitate maintenance and repair.
- h) Each starter shall be provided with a three pole, bi-metallic, ambient compensated, adjustable overload relay for motor protection. The auto/manual reset selector shall be adjusted to manual. Manual reset shall be possible from the front of the MCC (with doors closed).
- i) The design of the withdrawable units shall be such that combination starters or feeders of the same size and type shall be interchangeable without changing compartment doors.
- j) Operation of the withdrawable units should provide a user-guided interlocking system. Starter and feeder units should be able to padlock in OFF and Disconnected position.
- k) Feeder outgoings shall be sized according to non-motor loads stated in MCC One-Line diagrams (Attachment 3 hereto). Feeders are equipped only with a thermal-magnetic MCCB.

9.1.6 Control Power Transformers

- a) Each starter unit shall be equipped with a control transformer. Minimum rated output of the control transformer shall be 100 VA for starter size 1 and 2, 200 VA for starter size 3 and larger.
- b) Control power transformers shall be protected with two fuses in the primary and with a fuse on one secondary terminal side (the other secondary terminal side shall be grounded).

Control power transformer primary and secondary size voltage is 400/110 Vac, 50 Hz. Control transformers shall be free of humming noise.

9.1.7 Magnetic Contactors and Thermal Relays

- a) Contactors shall be capable of closing when a minimum of 80 percent of the nominal voltage is applied to the primary of the control transformer; hold-in and pull-in forces shall be verified and contactor shell shall be free of humming noise. Contactor's coil shall be for operation in a 110 Vac, 50 Hz circuit.
- b) The holding coil shall have a dropout voltage of less than 75% of rated voltage.
- c) All contactors shall be equipped with replaceable auxiliary contacts.
- d) Each reversing or non-reversing starter shall be equipped with three bi-metallic, ambient compensated, adjustable overload relays with interchangeable overload heaters. External manual overload reset is required.

9.1.8 Circuit Breakers

- a) All feeder units and combination starters shall be protected by circuit breakers, which conform to NEMA AB 1 (2002) and UL 489 (2013)
- b) Circuit Breakers shall be Molded Case Circuit Breakers (MCCB), single throw.
- c) MCCB for motor or MOV starter units shall have only magnetic protection (except for the Przr PORV Bypass starters – MCCD311), with adjustable instantaneous trip elements and trip-free mechanism. Circuit breakers shall have push trip button for trip shaft movement.
- d) MCCB for feeder circuits shall have ambient compensated inverse time, thermal and magnetic element overload protection and trip-free mechanism. MCCB for feeder circuits shall be provided in withdrawable units with bus connectors and guides (the same as for starter units).
- e) MCCB shall be equipped with external operating handles with "Off", "On" and "Trip" indications. Means shall be provided to lock the handle in the "Off" position with padlocks (with the door open or closed).
- f) It shall not be possible to open the compartment door with the circuit breaker in the "On" position, except by actuating a defeat mechanism (which enable authorized maintenance personnel access to the units when required).
- g) The interrupting capacity of all MCCB shall be capable of interrupting all bolted faults at their terminals with a three phase short-circuit current of 20 kA rms or 40 kA rms (as correspond) symmetrical on the line side of the MCC.

- h) Circuit breakers shall be assembled with mechanical interlock whenever is necessary.
- i) Preferred MCCB are Eaton or Cutler Hammer. MCCB that feed distributions shall be selected in order assure 100% selective coordination with the downstream MCCB. Information of the downstream MCCB is Pending (to be indicated later).

9.1.9 Terminal Blocks

- a) Buckets (withdrawable units) shall be equipped with side-mounted, positive latch pull-apart barrier type control terminal blocks rated 600 V and shall have a minimum rating of 20 A, with marker strips identifying all internal and external wiring. Number of terminal blocks and identification shall comply with Electrical Elementary Diagrams (Attachment 4 hereto).
- b) One portion of the plug-in terminal shall be mounted on the MCC cubicle (optionally hardwired to the master terminal block). The other portion of the plug-in terminal shall be prewired part of the withdrawable unit.
- c) Secondary part of the terminal blocks shall be screwed, not only held onto primary part of the terminal block.
- d) No more than two wires shall be connected to the same side of a single terminal point.
- e) Terminal blocks shall have, at least, 25% spare terminals.
- f) Buckets shall be equipped with power terminal blocks suitable for power cable connection, suited for accepting ring tongue cable lugs. Lugs shall be supplied under this specification. Incoming power cable size is Pending (to be indicated later).
- g) Those starter units requiring control for motor space heaters are indicated in the elementary wiring diagrams (Attachment 4 hereto). These units shall be supplied with an auxiliary relay with two Normally Closed (NC), electrically separated contacts rated 600 V, 10 A. The space heater circuits shall be protected with two fuses to be connected to the bus side of the control transformer.

9.1.10 Fuses

- a) Fuses for secondary and control circuits shall be located to be easily accessible to an operator standing at the front of the switchgear.

- b) The fuses may be accessible after opening a hinged door. The removal of a bolted cover plate shall not be required for access to fuses or breakers.
- c) Fuses shall be mounted so that they can be safely replaced without de-energising the MCC, any feeder circuit, or any other secondary or control circuit.

9.1.11 Internal Wiring and Connections

- a) MCC compartment buckets shall be wired in accordance with Elementary Diagrams (Attachment 4 hereto) and the requirements in this Specification. All control devices, interlocking contacts and overload relay contacts shall be wired on the ungrounded side of the operating coil of each contactor.
- b) Wire size shall be appropriate with the intended electrical duty and mechanical requirements.
- c) Power wiring shall be 12 AWG (3.31 mm²) minimum.
- d) Secondary and control wiring shall be a minimum of 14 AWG (2.08 mm²) 7 stranded copper conductors, 600 V, 90°C flame retardant insulation, self-extinguishing.
- e) Stabs shall be rated for continuous current 150 A for circuit breakers up to 150 A, and, at least 250 A for larger frames.
- f) All control wiring shall be wired out to terminal blocks. All spare contacts on instruments or devices shall be wired to accessible terminal blocks for Purchaser's connection. Connections made on terminal blocks and on internal devices shall be by means of solderless compression-type ring tongue terminals with pre-insulated sleeves. Internal wiring shall have no splices in any circumstance, nor shall more than two wires be terminated on one terminal point. Wiring connections shall be made from the front of the MCC.
- g) All devices shall be tagged with device name and wiring item number.
- h) There shall be a physical separation of at least three inches between terminal blocks used for power leads and those used for control.
- i) All internal cables shall be wire marked. Permanent markings shall identify each terminal (at device and terminal block) in accordance with the wiring and schematic diagrams. Each conductor shall be similarly identified at each terminating point using a sleeve type smear-proof, non-conductive, embossed wire marker. Marking shall be able to withstand the same environmental conditions as the cable insulation.

- j) Provisions shall be made for terminating incoming cables, including spare conductors, on adjacent points on the terminal blocks.
- k) The Supplier shall be entirely responsible for the proper functioning of the equipment being furnished and for the completeness and correctness of the MCC internal wiring as shown in the one line diagrams and elementary diagrams (appendices 3 and 4 hereto).

The Supplier shall prepare and furnish typical elementary diagrams showing each and every type of buckets of the MCC.

9.1.12 Accessories

One voltmeter (phase to phase) with one selector switch shall be mounted on a hinged door on the front of the new MCC (Asset No.: EE103MCCD321), independent of the access door to the circuit breaker. Voltage circuits shall be protected with fuses.

Instrument switches shall be heavy duty, rotary type W2 and shall have black, round knurled handles.

Voltmeter shall be semi-flush mounted, approximately 4 inches square with a 250° linearised white scale (0 - 600 V) and black markings, 1% accuracy. Antiglare glass shall be provided.

9.1.13 Space Heaters

Space Heaters are not required.

9.2 CONNECTIONS AND CABLE TERMINATIONS

- a) Provisions shall be made for power and control cable entry through the top of the new MCC (Asset No.: EE103MCCD321).

There shall be a special compartment designated for incoming line terminations. Provisions shall be made for unobstructed entry to the incoming power terminals.

Openings for cable entrance shall be supplied with bolted blank cover plates, to be drilled on-site, for power and control cable entrance (by means of rigid metal

continuous conduits). The Owner will drill these covers and provide seals during and after installation.

Terminal connections (terminal lugs) shall be provided for main incoming line cables. These terminals shall be tinned solderless Burndy Type YA long barrel, double indent, or equivalent type of terminal. These connectors shall be fastened with two bolts and Belleville washers and shall be aligned vertically to accept the incoming cables.

Section of incoming line cables is 2x(3-1-500) MCM (3 Phase) + 1-1-500 MCM (Neutral)

- b) Cable entry to the existing BB1 400 Vac Motor Control Center (Asset No.: EE103MCCD311) will be either through the bottom or top.
- c) Cables for starter and feeder outgoings are Pending and will be stated later (Pending)
- d) It shall be possible to connect the external cables without excessive bending.

9.3 SEPARATION REQUIREMENTS

Physical separation and electrical isolation (between Class 1E and Non-Class 1E circuits and components) shall be provided to maintain the independence of Class 1E circuits and equipment. Wires and equipment shall be separated and electrically isolated, as required, in accordance with IEEE 384 (2008) if applicable.

All power and control cables are safety-related and auxiliary and alarm circuits shall be classified as non-nuclear safety related.

9.4 GROUNDING

- a) A copper ground bus not less than ¼ inch (0.64 cm) by 2 inch (5.1 cm) copper cross section shall extend the entire length of the MCC assembly.

Ground bus shall be of rectangular cross section, and shall be sized according to applicable standards. In any case, the ground bus shall be sized to withstand the maximum earth fault currents of the system.

The ground bus shall have compression type terminal lugs at each end for external ground cable connections.

All metal parts of the MCC structure shall be effectively connected to the ground bus.

- b) The ground bus shall be continuous through shipping splits using bolted copper bus jumpers of the same section.
- c) Each withdrawable unit shall include a corrosion-resistant safety ground clip that makes connection before the power stabs engage the vertical bus.
- d) Provisions shall be made at each end of the ground bus for bolted connection of a 4/0 AWG copper cable (107 mm²), at least. Means of attaching a portable grounding device to the ground bus shall be provided.
- e) All bolted connections of the ground bus shall have tin-plated connection areas and shall employ, at least, two bolts with Belleville washers (or equivalent) for each connection point.
- f) Grounding of instrumentation and control equipment shall be in accordance with standard IEEE 1050 (1996)

9.5 SPARE PARTS AND ACCESSORIES

- a) The Bidder shall quote the spare parts and components which are deemed necessary, in order to maintain the qualification of the equipment (see Section 11 herein). The following spare parts shall be quoted, at least:
 - 10 fuses (of each size)
 - 2 control transformers (of each rating)
 - 4 contactors (of each size)
 - 2 circuit breakers (of each size)
 - 2 motors overload (of each rating)
 - 4 terminal blocks (of each rating)
- b) A complete list of recommended spare parts to maintain continuous operation of the equipment shall be submitted.

The appropriate delineation of the technical- and quality assurance-related data required for ordering these parts or assemblies shall also be identified. Each part of the supplied safety-related equipment must be classified for safety-related applications and must be notified on the replacement parts list or Bill of Materials.

- c) The list of spare parts shall indicate the items which must be periodically replaced in order to meet qualified life criteria, in accordance with section 11 herein. The design/qualified life and maintenance replacement interval shall be specified for each item.

10. INSPECTIONS AND TESTS

10.1 CERTIFIED DATA

Certified data shall be submitted by the Supplier to show the characteristics of the equipment being supplied and to show that the material is in compliance with the specified test values. Testing, inspection and acceptance criteria shall conform to applicable codes and standards.

The inspection and test plan shall be sent to NEK in advance for review, completion and approval.

Only calibrated measuring devices and tools shall be used. Calibration certificates of metering and test equipment (to be used during the FATs) shall be available prior to or during the tests.

10.2 TESTING

The equipment covered by this specification shall be completely assembled in the factory and thoroughly tested in accordance with the applicable standards, as stated in section 3 herein.

10.2.1 Design Tests (Type Tests)

The Supplier shall submit certificates of type tests in accordance with standard NEMA ICS 18 (2001) and UL 845 (2005). The design of the MCC supplied shall be identical to that tested. There shall not be design changes that affect the test results.

The circuit breakers and starters shall meet the design verification tests according to NEMA AB 1 (2002) (or UL 489) and NEMA ICS 2 (2000) respectively. The model and design of the equipment supplied shall be identical to that tested.

10.2.2 Production Tests (Routine Tests)

The MCC and buckets shall be tested (Factory Acceptance Test) in accordance with the applicable standards, including:

- a. Power frequency dielectric tests of the MCC, according with ICS 1-2000
- b. Mechanical operation tests
- c. Electrical operation and control-wiring test: control wiring continuity, control wiring insulation test, polarity tests, sequence tests.

The MCCB shall conform to production verifications according to NEMA AB 1 (2002) and UL 489 (2013). Additionally, for each circuit breaker, the following tests shall be performed according to NEMA AB-4 (2009):

- a. Mechanical operation
- b. Insulation resistance test
- c. Individual pole resistance test
- d. Inverse time and instantaneous over-current trip tests

The motor starters shall be tested in accordance with ICS 2 (2000), including:

- a. Contactor coil pick-up and drop-out voltage
- b. Performance tests of overload relays
- c. Torque checking for all bucket components
- d. Dielectric tests
- e. Mechanical operation

10.3 INSPECTION

- a) The Purchaser reserves the right to visit the factory at any time to witness routine factory testing.
- b) The Supplier shall notify the Purchaser of the date of availability for the test and inspection of the equipment.
- c) All devices and components shall be designed and shop tested in accordance with the relevant standards.

- d) For production tests, the test conditions, test methods, and test results shall be accurately recorded and appropriate test reports prepared. The final reports shall include photo or copies of all original data sheets as recorded (i.e., original handwritten record). The final reports shall be reviewed by competent technical personnel who shall certify that the equipment tested meets all requirements of this Specification.
- e) Test instruments shall be calibrated and shall be of suitable sensitivity and accuracy to determine the performance of the equipment being tested.

10.4 ACCEPTANCE CRITERIA

- a) The Purchaser will accept only materials and equipment which meet this specification and the supplementary specifications, codes, and standards specified herein.
- b) The equipment shall operate to the full extent of this specification. Any material or equipment which fails within the warranty period shall be replaced immediately by the Supplier at no additional cost to the Purchaser for material, equipment, services, labour or transportation.
- c) The acceptance of test results and satisfactory completion of inspection by the Purchaser shall not relieve the Supplier of the responsibility of furnishing the equipment complete and correct in all respects, including all necessary devices, for satisfactory operation.
- d) The equipment subjected to design tests or seismic qualification tests shall not be part of the supply.

11. QUALIFICATION

11.1 QUALIFICATION REQUIREMENTS OF NEW EQUIPMENT

The Motor Control Center and buckets to be provided (safety-related, seismic class 1 and electrical class 1E) shall be qualified according to IEEE 323 (2003) and IEEE 344 (2004, as endorsed by RG 1.100-2009), in order to prove that the equipment, as installed, perform their required Class 1E function throughout their qualified life, in normal, abnormal and accident conditions.

The qualification of the MCC and buckets shall also be in accordance with IEEE 649-2006 (IEEE Standard for Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations), as endorsed by Regulatory Guide RG 1.213 (2009)

If the supplied equipment incorporates programmable software, the software specifications, testing and validation shall be complied with in accordance with RG 1.172 (2013) and the regulatory guides referred therein (including the endorsed standards).

Electromagnetic and radiofrequency interference shall be evaluated in accordance with RG 1.180 "Guidelines for evaluating electromagnetic and radio-frequency interference in SR instrumentation and control systems". EMI/RFI susceptibility testing may be performed on a separate test specimen. See section 7.2 herein.

The environmental service conditions of the MCC are considered mild. The ambient conditions are those stated in section 7.3 herein.

The MCC and buckets shall have a qualification life of at least 40 years with routine maintenance as identified by the Supplier.

The seismic qualification shall be performed in accordance with specification SP-S702 "Seismic Analysis, Testing and Documentation, Rev.10". The equipment supplied must be designed to withstand Design Extension Condition (DEC) seismic accelerations (0.6 g) as defined in the referred document. See the floor response spectra in Attachment 1 hereto.

The equipment to be tested shall be qualified to operate during and after five (5) Operating Basis Earthquakes (OBE) and the Design Extension Condition (DEC) seismic accelerations.

The equipment subjected to design tests or seismic qualification tests shall not be part of the supply.

Equipment being qualified must be capable of performing its safety function(s) during and after the seismic test. The following safety functions shall be demonstrated:

- a) No spurious trip occurs during the seismic test (no circuit breaker opens spuriously)
- b) The Class 1E circuit breakers (isolation devices) that feed Non-Class 1E loads shall be able to open during the seismic test (for example, in case of short-circuit in the load).
- c) Proper condition and operation of the trip units of the circuit breakers after the seismic test. Inverse time and instantaneous over-current trips are in accordance with the setting values and defined protection curves. Test method shall be in accordance to IEEE C37.98 (2013)
- d) Absence of excessive contact chatter. Representative contacts of each device (thermal relay, contactor, etc) tested shall be monitored for contact chatter during the seismic test. The permissible time for contact chatter shall not affect the circuit in which the contact is used and shall not exceed 2 ms.

For example, for motor starter units, it shall be demonstrated that contact chatter of the thermal relay or of the contactor does not cause the contactor to open.

- e) Contactors do not change state during seismic test. Contactors shall be tested and monitored in energized and de-energized position.
- f) Proper condition of the specified physical barriers and interlocks after the seismic test.

Qualification data must provide documented evidence to support the demonstration of safety functions, as required.

Qualification based on tests already performed on similar equipment is admissible. In this case, the qualification shall comply with the requirements of section 4.4 (Qualification by Similarity) of specification SP-S702 "Seismic Analysis, Testing and Documentation, Rev.10".

In its proposal, the Supplier shall clearly state the qualified life of the MCC and buckets and its experience in the qualification of equipment in similar conditions. The

bid shall also clearly state the qualification method proposed, qualification schedule and justifications and capability for performing the necessary seismic qualification. The Supplier shall also identify if the equipment incorporates programmable software and, in this case, the proposal shall include a detailed program for software qualification identifying the applicable standards. This information will be important for the technical evaluation.

The seismic qualification shall include the documentation specified by qualification standards which certifies that the test/analysis parameters envelope the specified conditions.

11.2 RE-QUALIFICATION OF EXISTING MCC (MCCD311)

Due to changes to the existing MCCD311 (additional motor starters and breakers installed in the spare compartments) seismic requalification for DEC earthquake shall be performed. See floor response spectra (Attachment 1 hereto)

The existing MCCD311 in the BB1 has been seismically tested for SSE [Curtiss Wright Report, 2011].

A mathematical model of the cabinet shall be developed. This model shall be used to confirm that the cabinet will maintain structural integrity during and after DEC earthquake. The seismic load shall be defined based on Required Response Spectrum (RRS) for DEC earthquake and 3% critical damping for the cabinet.

New electrical equipment, which will be installed inside the existing MCCD311, may be dynamically tested separately. The RRS for the component mounting locations shall be determined with the analysis of mathematical model of the cabinet.

Once the cabinet response for the component mounting locations is determined, it must be shown that the Test Response Spectrum (TRS) for the components envelopes the RRS at the component mounting location.

Complex-motion signal shall be synthesized that comprises several individual narrowband components superimposed on lower broadband random motion in order to produce an input motion with high amplified peak without introducing excessive Zero Period Acceleration (ZPA) levels [IEEE, Standard 344].

If analysis cannot prove seismic qualification for increased seismic loads and further analysis cannot prove particular subcomponent failure as acceptable, additional seismic testing of this component might be required. This testing or component replacement is not within the scope of the Contractor.

12. CLEANING

All parts shall be free from dirt, corrosion and unwanted grease. The equipment shall be handled throughout production and packaging so that no foreign matter is introduced into or onto the components and hinders its electrical or mechanical operation.

Cleanliness during fabrication, after fabrication, and prior to shipment shall be in accordance with ANSI/ASME NQA-1 (2008) "Quality Assurance Requirements for Nuclear Facility Applications", subpart 2.1, Level C.

The Manufacturer's cleaning procedure is acceptable, subject to its compliance with the referenced standard.

13. CORROSION PROTECTION/COATING

All surfaces shall be protected against corrosion and oxidation in accordance with the Vendor's best methods.

Painting of the cabinets shall be finished with light grey conforming UL 1332 (2005). The final exterior surface shall be bonded, smooth and free of bubbles, ripples or other flaws.

Steel parts shall be thoroughly cleaned to remove dirt, scale and grease and in accordance with Supplier's procedures prior to painting. This shall be followed immediately by an application of a priming coat of rust-resistant paint and the necessary finish coats. Steel surfaces shall have a minimum of two finish coats. Paint shall be suitable for the operating temperatures of the equipment. Paint coating shall be free of sags, runs and incomplete coverage.

14. MARKING AND IDENTIFICATION

Identification labels shall be provided for all components to uniquely identify each item. All devices (terminal blocks, fuses, circuit breakers, etc) and wiring shall be adequately identified and marked to agree with the designations on the wiring diagrams.

A nameplate (rating plate) shall be provided for the new MCCD321, to be placed in a location such that the marking will be visible after installation. The nameplate shall be in accordance with applicable standards and shall show, at least, the following information:

- a. The manufacturer's name and address
- b. Type and designation of the MCC
- c. Identification reference and serial number
- d. Rated voltage, rated current, rated frequency
- e. Rated short-circuit current
- f. Insulation voltage and impulse withstand voltage

The circuit breakers shall also be fitted with rating plates, in accordance with applicable standards.

An identification plate shall also be furnished on the front of the MCC, showing the NEK system tag number (Asset No.: EE103MCCD321)

Each circuit breaker or starter units (MCCD311 and MCCD321) shall be clearly identified showing the description of the load it feeds and NEK system tab number. The position of the unit in the MCC, according to one line diagrams (Attachment 4 hereto) shall also be indicated. The identification plates shall be located inside and outside, so that the unit may be identified with the door open or closed.

A sample of the nameplates and identification plates (electronic sample: acad or pdf format) shall be sent to NEK for review and approval.

Nameplates and identification plates shall be of laminated construction with white letters on a black background. Capital letters with a minimum height of $\frac{1}{4}$ inch shall be used (for identification plates of the transformer and switchgear, letters with a minimum height of $\frac{1}{2}$ inch are required).

The nameplate key list shall be submitted to the NEK for comments and approval.

Both ends of each wire (not otherwise easily identifiable) shall be clearly identified.

All components shall be clearly identified and, where necessary, match marked in such a way as to eliminate any question or confusion at subsequent assemblies or repairs.

The Supplier shall establish and maintain a system for the identification of materials, parts and components according to NEK instructions. If the Supplier offers its own identification system, it shall be approved by NEK. These measures shall ensure that the lot number, serial number or other appropriate means, either on the item or on records, maintain identification of items traceable to the item throughout fabrication, testing, shipment and use of them.

These identification and control measures shall be designed to prevent the use of incorrect or defective materials, parts and components as well as to provide a permanent record to assist in the future evaluation of in-service degradation of parts.

15. PACKING, HANDLING AND STORAGE

Packing or crating shall be such as to ensure the satisfactory transportation, handling and arrival of the equipment at its destination. Packing, handling and storage shall be in accordance with ANSI/ASME NQA-1 (2008) "Quality Assurance Requirements for Nuclear Facility Applications", subpart 2.2, Level C.

The MCCD321 will be installed in the spare room 1 of BB1 building (room 005). The maximum package size must be 2 m x 1.9 m.

Prior to installation, the new equipment will be stored inside a fire-resistant, tear-resistant, weather-tight, and well-ventilated building or equivalent enclosure. The minimum temperature will be 5°C, and the maximum temperature will be 60°C or less if so stipulated by the manufacturer.

The Supplier shall inform NEK of any special storage, handling, controls and preventive maintenance requirements, as necessary to adequately maintain and preserve the item before installation. The Supplier shall inform sufficiently in advance of shipping for necessary preparation.

16. NON-CONFORMING MATERIALS

Any deviations or design changes which are not fully in accordance with the technical or quality assurance requirements of the procurement documents and which the Supplier desires to accept shall be approved by NEK. Any such deviation request shall be made in writing prior to disposition by means of the Deviation/Change Request Form submitted to NEK for approval prior to continuing work.

Non-conformance with specification requirements and applicable codes and standards invoked by this specification will not be accepted until approved by NEK. When such a condition exists, the Supplier shall initiate a non-conformance report (NCR) using the Supplier's standard non-conformance document, which identifies the non-conformance and the Supplier's proposed disposition.

The Supplier shall:

- a. Segregate the non-conformance item to prevent any further processing which may result in a change of the non-conformance as identified
- b. Make the NCR available to the responsible NEK inspector for review to ensure the non-conformance is completely identified and accurately stated
- c. Transmit the NCR with non-conformance disposition to NEK in an expeditious manner. The Supplier shall provide technical justification for the recommended dispositions

The requirements of the specification are binding; no departures are acceptable without the prior consent of NEK.

The NCR shall provide the method by which the Supplier shall obtain a documented response and approval from NEK when non-conformances are identified. The use of NCRs will pertain to the work at the Supplier and/or Sub-Supplier's shops.

Once the item is identified with an NCR, the NCR shall remain assigned to that item permanently and NEK shall be advised of the originating NCR.

17. RECORDS

17.1 RECORD SYSTEM

A record system shall be established and maintained by the Supplier to provide documentary evidence of the quality of items and activities affecting quality. Quality Assurance records shall include results of reviews, inspections, test, audits, monitoring of work performance and material analysis. Records shall at least identify the Purchaser's name, order number, inspection and data recorder, data inspection that was performed, type of observation, procedures used, results, acceptability and action taken with deficiencies noted. Records of inspection shall also include identity of drawings and procedures used along with the revision level.

All quality verification records, procedures and qualifications shall be identifiable to the item or activity involved. These records shall be sent to NEK as they are originated and shall be included in the final documentation package delivery or be available at the supplier's facility for review by NEK.

17.2 FABRICATION RECORDS

In addition to the requirements for manufacturing data, the Supplier shall prepare and provide all fabrication records related to NEK equipment or be available at the supplier's facility for review by NEK.

18. OTHER REQUIREMENTS

Any additional requirements and/or exceptions imposed beyond the requirements in this specification during the bidding, negotiating and contracting process shall be identified as a change to this specification and brought to the attention of the NEK ESD – Design and Modification Superintendent for resolution concurrence and/or approval.

The Supplier shall guarantee the proposal values indicated in the technical datasheets included in Attachment 2 to this specification.

19. RIGHT OF ACCESS

NEK representatives shall be allowed access to the Supplier's and Sub-Supplier's facilities, engineering offices and records for the purpose of inspecting, auditing and witnessing.

This is also applicable for activities associated with qualification (inspection of prototypes before seismic testing and witness of seismic testing).

Such audits will include examination of documentary, evidence of activities affecting quality and will be carried out on a planned periodic basis, during the course of work.

20. QA PROGRAM REQUIREMENTS

The Supplier must have a valid and implemented Quality Assurance program, which complies with 10CFR50 App.B and which must be accepted by NEK beforehand. The contractor must submit his Quality Assurance Program Manual with proposal for NEK review and approval.

The Quality Assurance Program must also comply with requirements of NEK QA specification QS-610, rev.1, Generic Quality Assurance Program Requirements.

Reporting on non-conformances and deviations must comply with requirements of 10CFR21 code.

After order placement, the contractor must send a detailed Quality Plan/Control Plan showing R (record), W (witness) and H (hold) points, which must be approved and fulfilled by NEK.

Work must be performed in accordance with contractor's Quality Assurance Program and Quality Plan/Control Plan, technical and quality control procedures, valid legislation and standards relevant for the scope of work. The contractor is also responsible for satisfying quality requirements, commercial and technical requirements, and schedule for subcontractors, if applicable.

A Certificate of Compliance (CoC) shall be provided to the NEK by the Vendor to certify that the provided equipment and services meet the requirements of this specification and related purchase order. The CoC shall also indicate part numbers, serial numbers & PO. A person identified in the Supplier's Quality Assurance program description as responsible for certification shall attest to the certificate by signature, title and date of signing. Supporting documentation to substantiate the certificate shall also be included, unless otherwise waived by NEK.

Any deviation from the Specification or repair to the equipment, which has been accepted in writing by the NEK, shall not relieve the Vendor from its responsibility for satisfactory equipment performance in accordance with this Specification.

21. SPECIAL HANDLING

The Supplier shall inform NEK of any special handling requirements and submit the appropriate procedures, as necessary, in order to maintain equipment warranties.

Marking or labelling shall be used as necessary to adequately maintain and preserve the item during transport, handling and storage.

The supplier shall suggest any necessary special handling device for transportation and installation to NEK.

22. SHELF LIFE

The Supplier shall not ship any item that has less than 90% remaining shelf life, or is older than one (1) year at time of shipment. The Supplier shall provide shelf life data for recommended or/and delivered spare parts by one of the following methods:

- a. Expiration date
- b. Cure date or manufacturing date and material composition

If the above requirements are not met, the item will be shipped back to the Supplier at the Supplier's expense.

The Supplier shall provide in-storage maintenance instructions for all parts which are subject to in storage maintenance (ISM) so that NEK can maintain spare parts to achieve the recommended shelf life. The shelf life of all components shall be at least ten years with the implementation of periodic ISMs. If the above requirements are not met the material shall be shipped back to the Supplier at its expense.

23. 10CFR21 REPORTING

Safety related items and services are subject to the provisions of Title 10 of the U.S. Code of Federal Regulations Part 21: Reporting of Defects and Noncompliance.

For Safety Related Items and/or services supplied from USA, the Supplier shall be subject to the reporting pursuant 10CFR21 to the US NRC and NEK Procurement Support (ING.POD) Superintendent. For Safety Related Items and/or services supplied outside the USA, the Supplier shall be subject to the reporting pursuant 10CFR21 to the NEK ING.POD Superintendent only.

24. COMMERCIAL GRADE DEDICATION

The use of commercial grade items is an option, but it is not preferred by NEK. The Supplier shall give notice in writing to NEK prior to use or dedication of commercial grade items.

Commercial grade dedication (CGD) shall be in accordance with the nuclear industry standard (EPRI 3002002982 – Revision 1 to EPRI NP-5652 and TR-102260) and documented as acceptable to the NRC requirements. The Vendor shall give notice in writing to the NEK if dedicated commercial grade items are to be used.

Commercial grade dedication practice shall be described in the QA programme manual.

CGD plans shall be submitted to the NEK for review, completion and approval prior to the issue of the purchase order and prior to the start of the CGD.

Dedication test record (for critical characteristics from the CGD plan approved by the NEK) shall include acceptance criteria. Dedication test records shall be supplied with items or shall be supplied as part of the final documentation package.

25. SUPPLIER DOCUMENTATION REQUIREMENTS

See the requirements for documents under section 5 and 33 herein.

The Vendor shall furnish copies of the documents to the NEK. This documentation shall include (minimum documentation requirements), but not be limited to:

- a) Documents requested under section 5.1 herein, shall be submitted with the proposal.
- b) Documents requested under section 5.2 herein, shall be submitted in case of award. All documents shall be updated no later than the FAT.
- c) Documents requested and generated under section 10 (Inspections and Tests) herein shall be submitted during the implementation of the FAT.
- d) Documentation requested under section 11 (Complete Qualification Report) shall be generated until the equipment is ready for shipment and NEK representatives are still present for FAT activities.

MCC characteristics shall be submitted no later than during the implementation of FAT.

In case of award, documents shall be submitted no later than the period stated in section 5.2 herein.

The following shall be compiled:

- a) Certificate of Compliance: each shipment must be accompanied by certificates containing the signature of a person responsible for the quality function of the Supplier and Subsupplier, stating that the material or items conform to all purchase order requirements. Applicable part numbers and other item identifications, qualification reports and the NEK purchase order numbers shall be referenced by the certificate.

- b) Spare part list: the Supplier shall supply NEK with a list of recommended spare and replacement parts or assemblies for the ordered/supplied item. The appropriate delineation of the technical- and quality assurance-related data required for ordering these parts or assemblies shall also be identified. Each part of the supplied safety-related component must be classified for safety-related applications and must be notified on the replacement part list or Bill of Material. This data shall be supplied as a portion of the final documentation package for information.

26. NEK PROPRIETARY DATA

NEK has a proprietary interest in all of the drawings, designs, specifications, documents, information or know-how which may be furnished pursuant contract execution and in any know-how, improvement, discovery or invention which may be made, developed, or conceived in the performance of work hereunder or which may arise or result there from (hereinafter collectively referred to as the "Information"). All such information shall be considered to be proprietary to the NEK. The right to use of all such Information shall be transmitted to the contractor only for its personnel use and shall be entirely restricted to the performance of the contract and subject to the confidentiality provision.

27. NON-CONFORMANCE REPORTS

The Supplier shall provide a copy for approval of all non-conformance reports disposed as repair or use-as-is disposition of material during the manufacturing process only in cases that affect interchangeability, design or operating parameters generated during manufacture or processing of this order. This report shall include technical justification for non-conformance dispositions.

All dispositions which do not return an item to the conditions stated in an approved drawing or specification shall be approved by NEK prior to the shipment of the affected item.

28. REPAIR RECORDS

With the documentation package shipment, the Supplier shall provide NEK with all generated records of repairs which shall include the following information as a minimum:

- a) Summary of repair/refurbishment work that has been performed on the item(s)
- b) Brief analysis of the reason for failure of the item(s)
- c) Details of any “special processes” used during repair that were not used during manufacture
- d) A list of replacement parts installed in the repaired item(s)

29. SOURCE INSPECTION/SURVEILLANCE NOTIFICATION

The Supplier shall provide access to the Supplier's plant facilities and records pertaining to this purchase order for the purpose of planning and performing source inspection / surveillance activities.

The Purchaser shall have the right to establish notification points for which the Supplier shall give prior notification to the Purchaser. In addition, the Purchaser may establish temporary notification points as needed to ensure resolution of temporary quality problems. Notification for Witness or Hold points require the receipt of notification at least twenty (20) working days in advance of the scheduled time of performance.

The Supplier shall contact NEK's designated representative when a witness or hold point has been reached and the Supplier will not proceed past that point until the inspection has been established or waived by NEK.

Inspection or examinations performed by NEK, or the designated representatives, do not relieve the Supplier of his responsibility to meet the requirements of this purchase order.

30. SHIPPING REQUIREMENTS

The Supplier shall provide packaging and shipping methods for protection against the effects of temperature extremes, humidity and in-transit shocks and jarring.

Material certifications and all certifications or accompanying documentation supplied under this order shall be directly shipped from the Supplier to NEK. The distributor shall not take possession of any material or documentation.

NEK's authorised source inspectors have the right to hold shipment if purchase order requirements are not met.

Each package unit shall be marked or labelled as necessary to preserve the unit.

ShockWatch and TipNTell indicators (ULINE or equivalent) shall be installed on the equipment housing and each shipping crate in all three axes prior to shipment. Clear receiving inspection acceptance criteria shall be identified by the Contractor before shipment.

All items shall be transported in containers and fastened to the floor for the final transportation from the Supplier to NEK.

31. DELIVERY SCHEDULE

The Supplier shall deliver the items required to be received at NEK by the date specified on the PO and RFQ.

32. WITNESS/HOLD POINTS FOR SUBMITTAL OF SUPPLIER DOCUMENTATION

NEK shall have the right to establish hold points and notification points for which the Supplier shall give prior notification. NEK shall identify inspection, witness or hold points which it intends to participate in based on the received Detail Manufacturing and Quality Plan, which shall be delivered to the NEK according to a mutually agreed schedule, as defined in the paragraphs below.

In addition, NEK may establish hold points and temporary notification points as needed to ensure the resolution of quality problems or temporary quality problems.

Predetermined hold or notification points require receipt of notifications at least twenty (20) working days prior to the scheduled time of performance. The following hold points for which prior notification is required are mandatory:

- a) Start of production
- b) Assembly
- c) Equipment seismic qualification tests
- d) Factory Acceptance Tests (all tests)
- e) Readiness of the final documentation package
- f) Shipping release.

The Supplier must submit documentation for the item manufacturing and quality plan. Based on this information, NEK shall have the right to specify hold points in the processing of the items and when the Supplier shall submit the required documentation to NEK for review and approval.

The documentation shall be submitted to the NEK Purchasing Department Superintendent. The Supplier shall not proceed beyond the hold point without written approval from NEK.

33. VENDOR TECHNICAL MANUAL AND REGISTERED UPDATES

All manuals shall be provided to NEK for review, comment and acceptance prior to the final issue and delivery. Preliminary versions shall be clearly marked and in proper PDF format. Drawings shall be also in acad and pdf format.

The final version shall be furnished in two (2) hard copies and one electronic version on compact disc.

The Supplier shall furnish manuals with all the necessary information for operation and maintenance and updated specific data and drawings for the items supplied. The Supplier shall be responsible for sending applicable manual updates to NEK.

See also the requirements under section 5.2.2 herein.

34. TRAINING

The Supplier shall provide complete documentation for training.

All training material shall be supplied as normal scope of supply and shall be in proper electronic media format (pdf, ppt, doc, acad). Scope of training shall cover at least what is specified below.

The Supplier shall organise training for the Purchaser maintenance personnel (2-3 participations). It shall take place at the manufacturing plant after or prior to the FAT (it is desirable to have training after FAT). The topics that shall be covered are, at least, the following:

- a) Review of the documents (one-line diagrams, wiring diagrams, etc) and describe the main features of the equipment and types of buckets
- b) Installation
- c) Operation and safety rules
- d) Testing
- e) Detail Maintenance
- f) Detail Diagnostic and Troubleshooting
- g) Replacement of all parts and components
- h) Training for in-storage maintenance for all parts that will be offered and have to be maintained to reach their qualified life.

The Supplier shall send the detail training description to the Purchaser for review and comments two months before the training shall take place.

Training shall be quoted as an option.

35. APPENDICES

Attachment 1: Floor Response Spectra

Attachment 2: BB1 400 Vac Motor Control Center Data Sheets

Attachment 3: BB1 400 Vac Motor Control Center One-Line Diagram

Attachment 4: Electrical Elementary Diagrams

Attachment 5: Containment Penetration Data

Attachment 6: Existing Motor Control Center

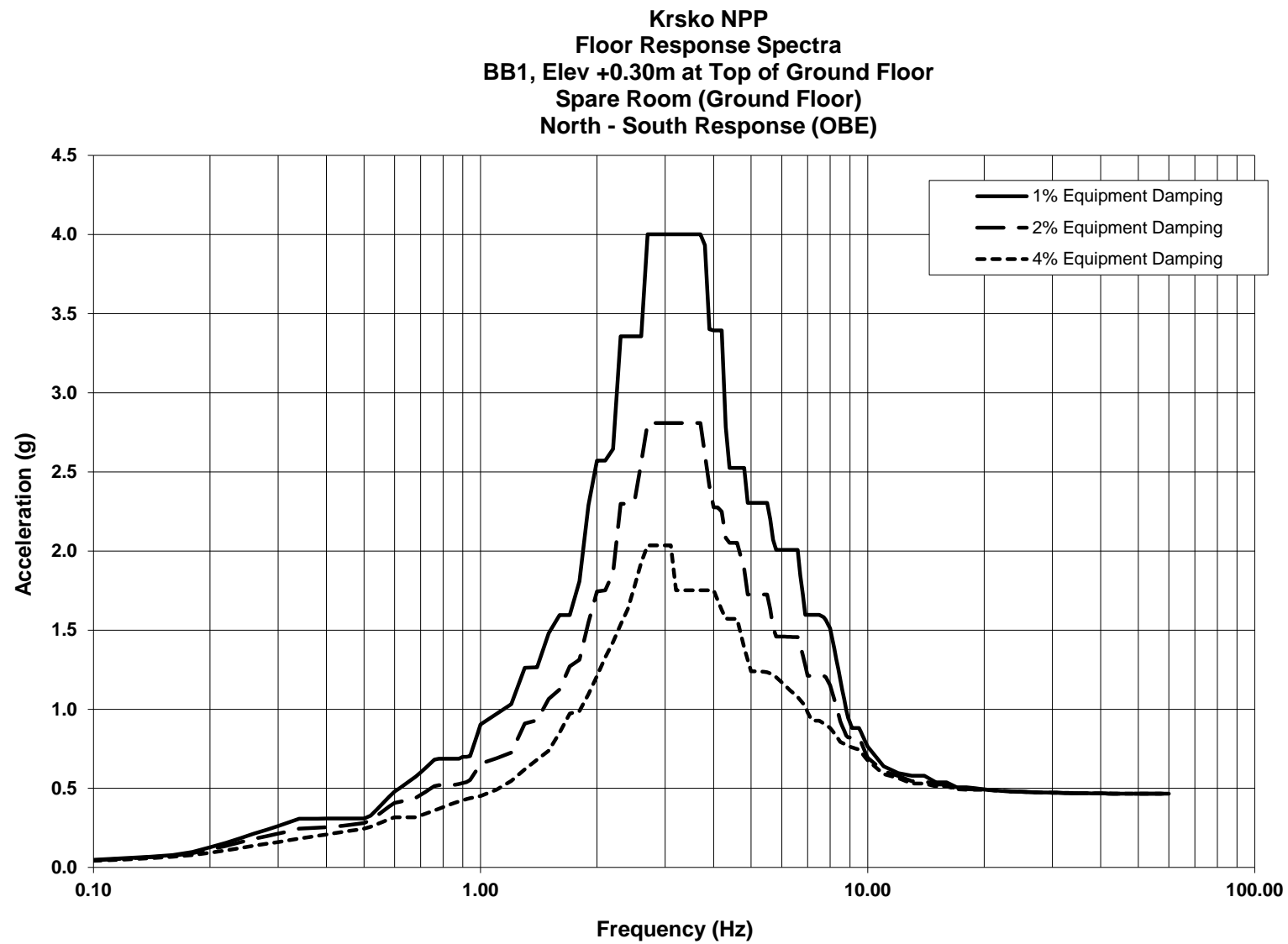
Attachment 7: Layout of the Electrical Room

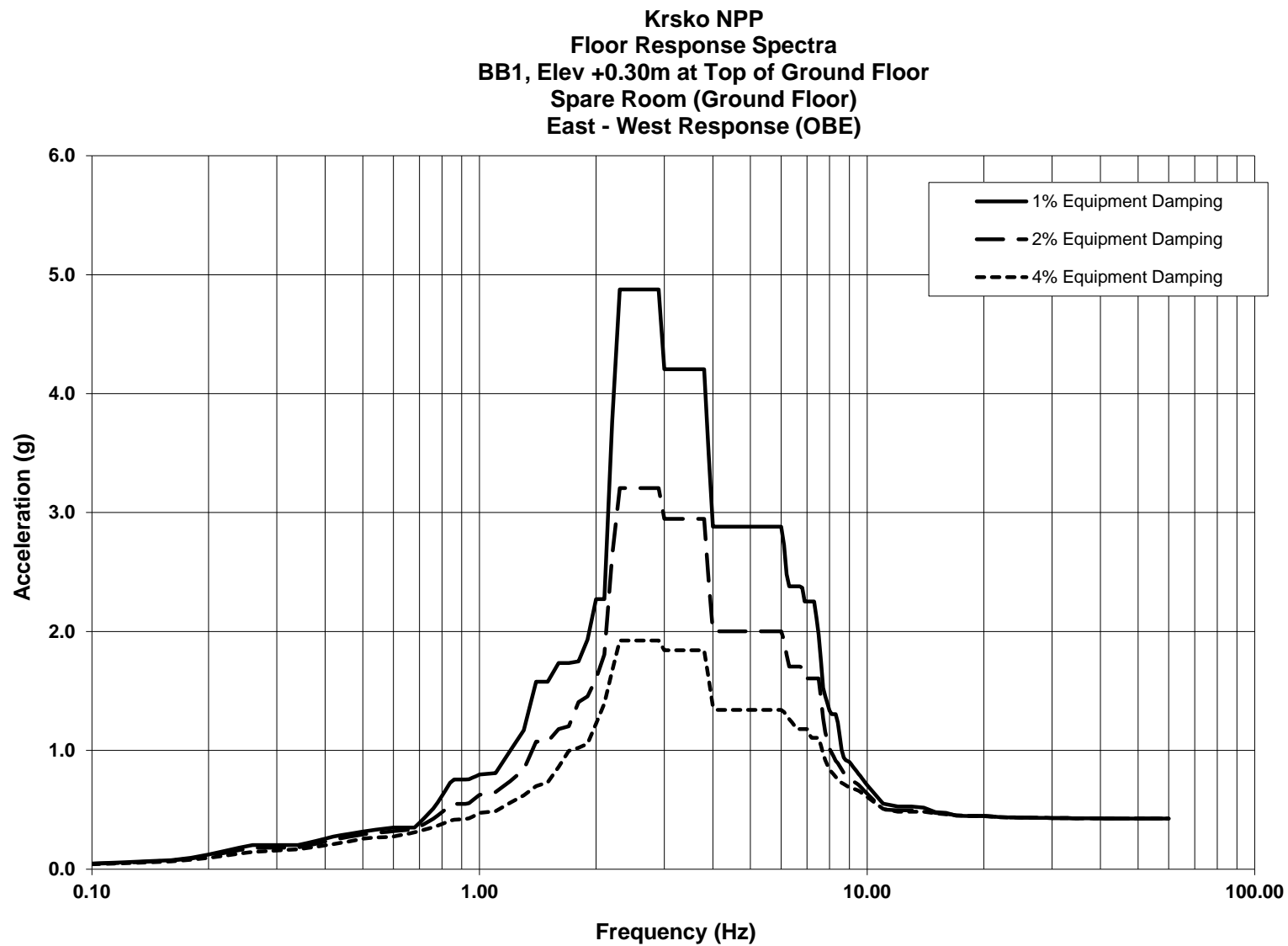
Attachment 8: Requirements for new components and spares (To be filled in by the Supplier)

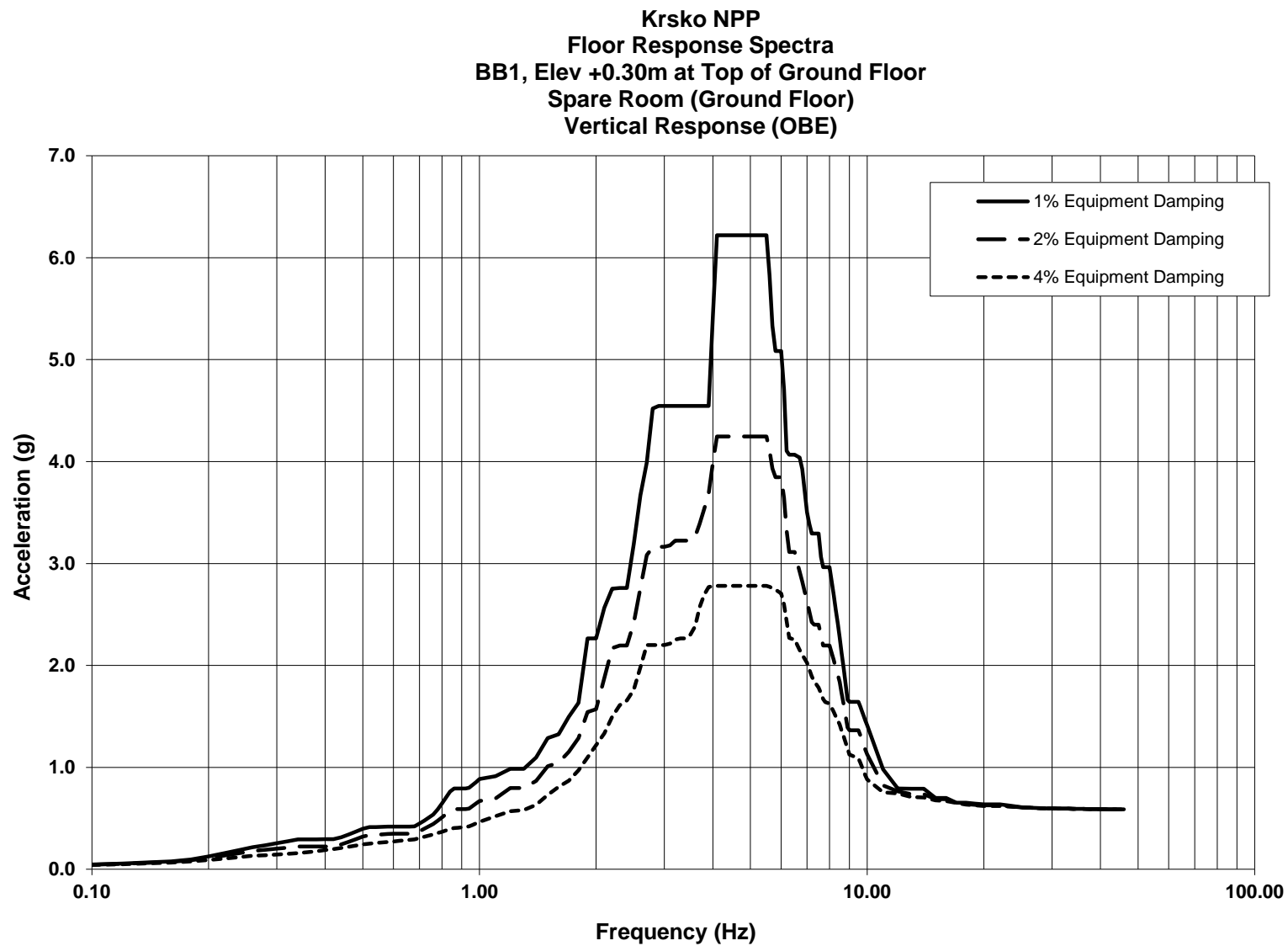
Attachment 9 Motor Control Center Nameplate Legend and front Views

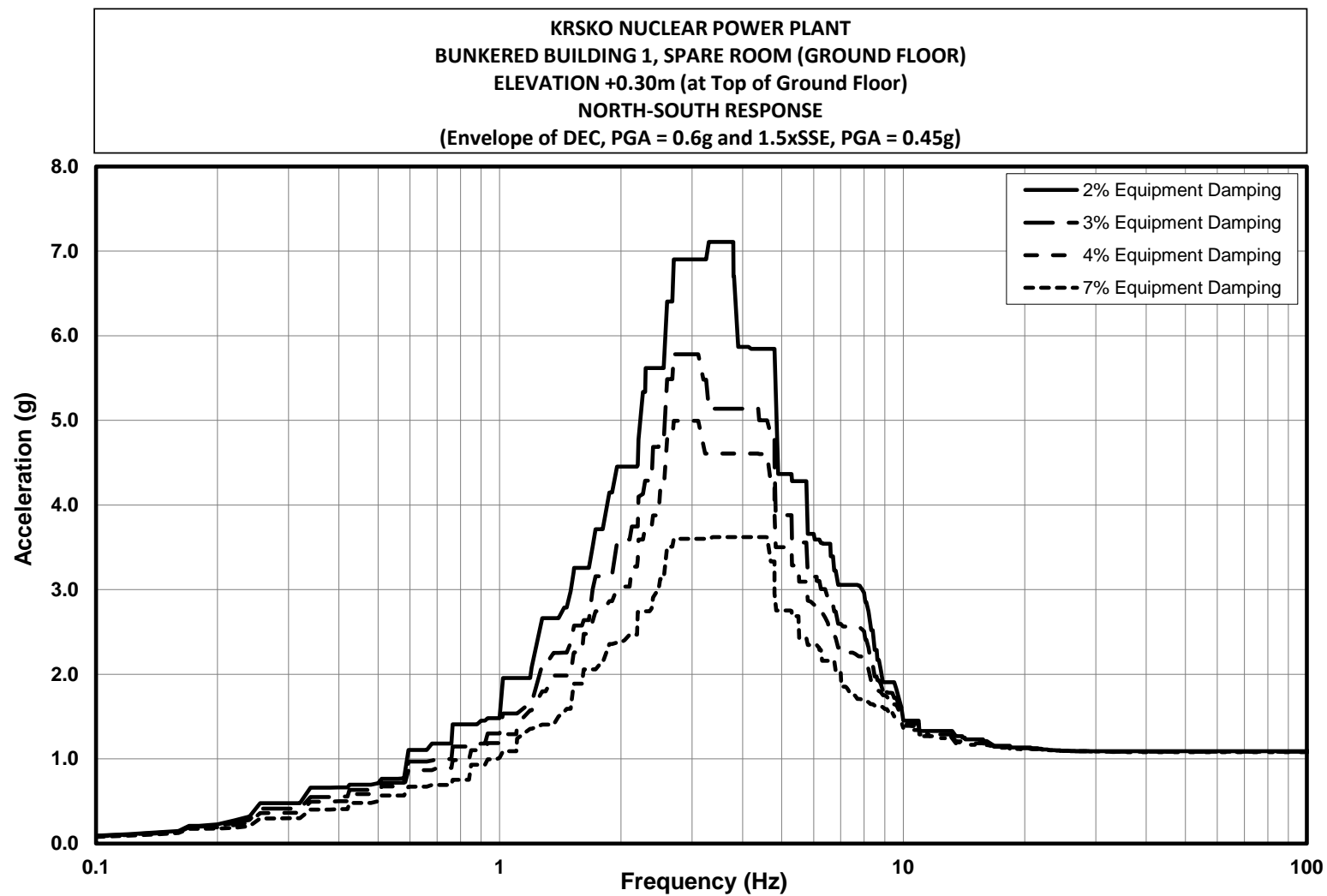
ATTACHMENT 1

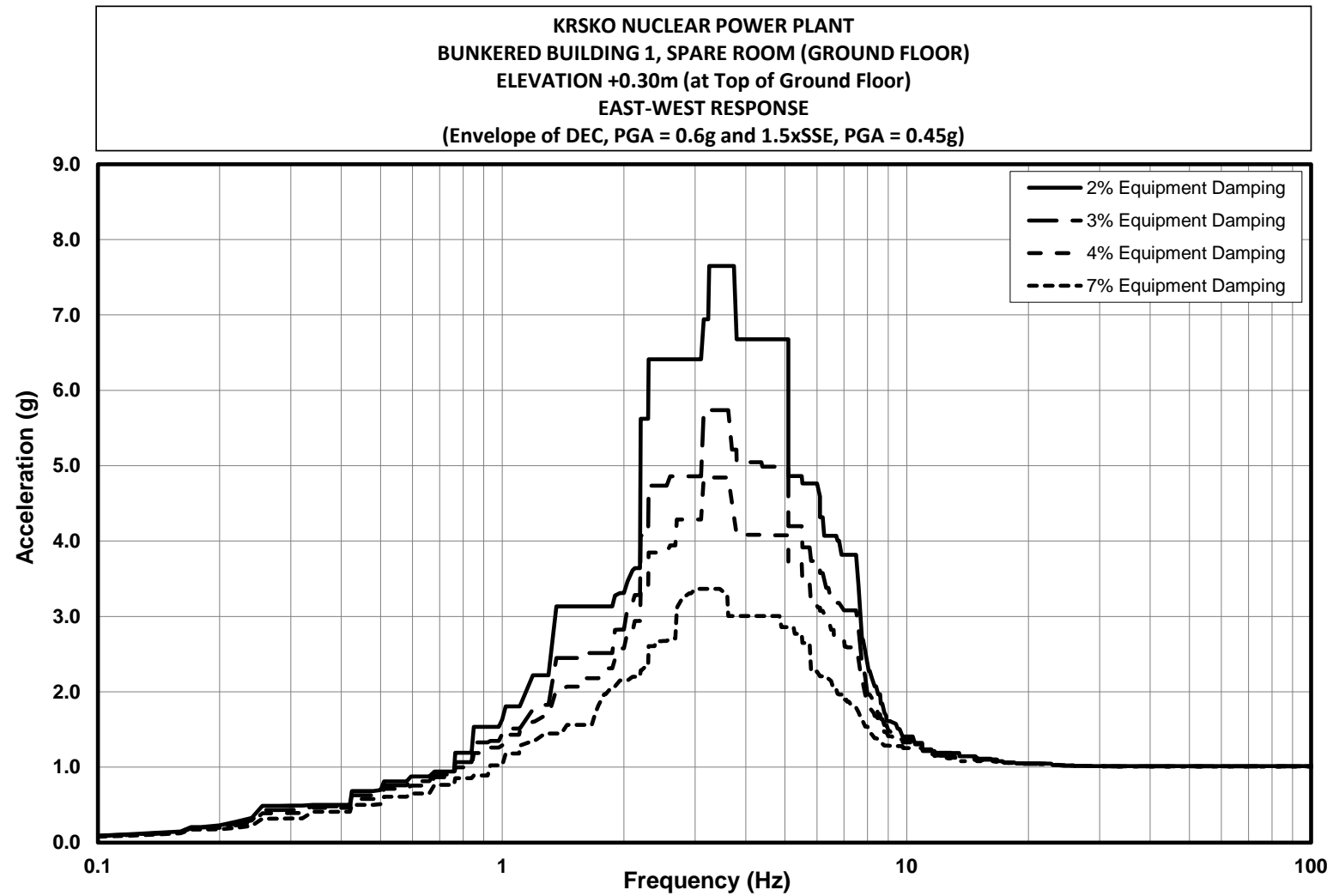
FLOOR RESPONSE SPECTRA

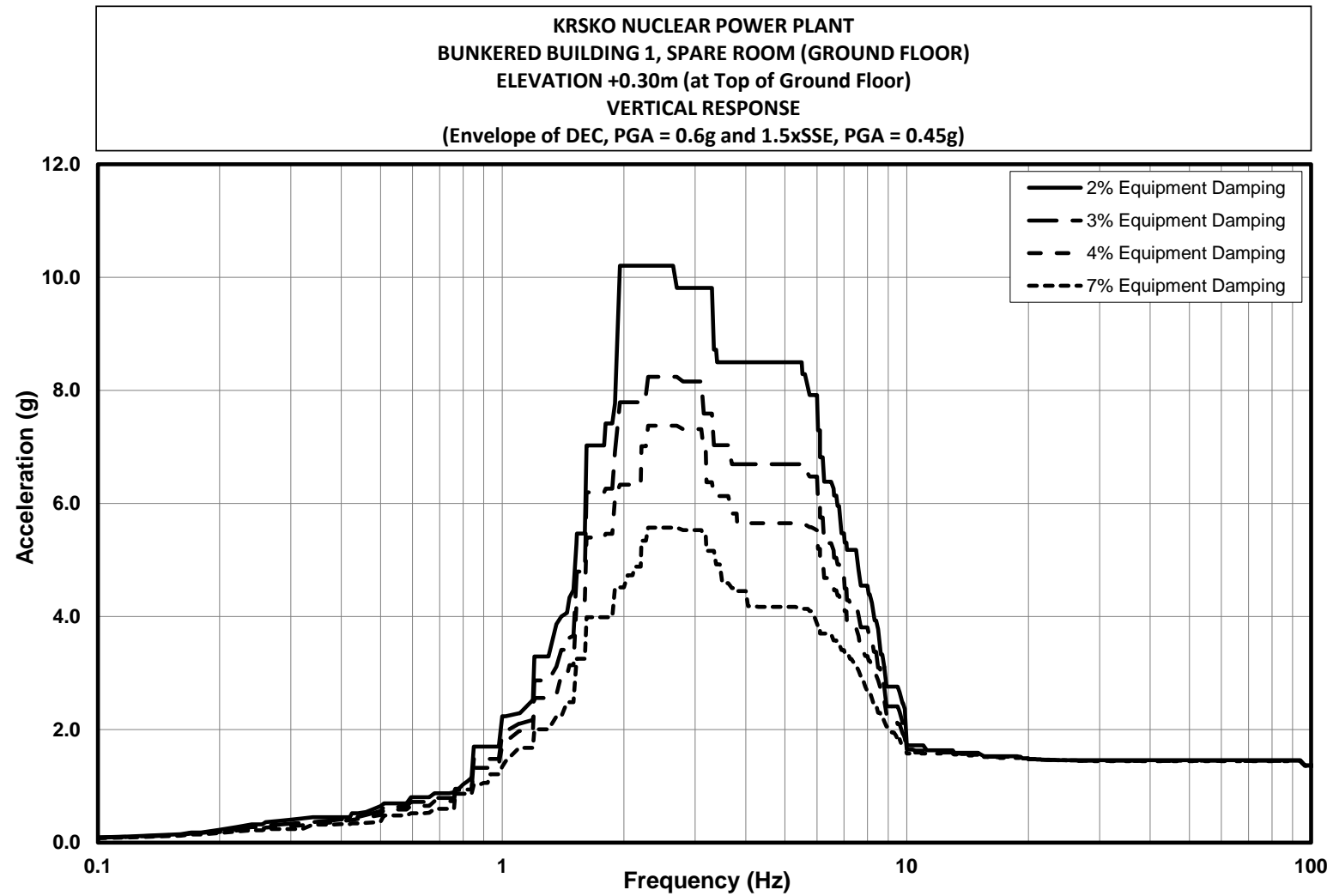












ATTACHMENT 2

BB1 400 VAC MOTOR CONTROL CENTER DATASHEETS

CHARACTERISTICS	REQUIRED	PROPOSED
1. MOTOR CONTROL CENTER AND BUCKETS		
1.1 MOTOR CONTROL CENTER MCCD321		
• Manufacturer and place of manufacturer		
• Model		
• Country of origin		
• Identification in the project of the new MCC (Asset No.)	EE103MCCD321	
• Manufacturing and testing standards	UL 845 (2005) NEMA ICS 1 (2000) NEMA ICS 18 (2001)	
• Installation (indoor, outdoor)	Indoor	
• Installation detail	MCC accessible from the front and rear part	
• Number of vertical sections of MCCD321		
• Class and type of the MCC (according to NEMA ICS 18-2001)		
• Rated frequency, Hz	50	
• Rated operational voltage, Vac	400-231 + 10%-10%	
• Number of phases and bus-bars	3 Ph + Neutral	
• Rated maximum voltage, Vac		
• Power frequency dielectric withstand voltage, 1 min, V rms	1800	
• Continuous current rating of horizontal buses at maximum temperature inside the cubicle, A	800	
• Rated symmetrical short-circuit current, kA rms	≥ 40	
• Short-circuit asymmetrical peak withstand current, KA _{peak}	≥ 80	
• Maximum temperature rises	According to NEMA ICS 18 (2001)	
• Heat loss emitted by the complete MCC assembly at rated load, kW		
• Control voltage, Vac	110 Vac, 50 Hz	
• Construction characteristics <ul style="list-style-type: none"> – Enclosure protection – Cooling method – Sheet material – Minimum thickness of the structure 	NEMA 1 (IP 20) with gaskets for doors Natural MSG No. 12 (2.7 mm)	

CHARACTERISTICS	REQUIRED	PROPOSED
<ul style="list-style-type: none"> Minimum thickness of the cover, fronts and doors Dimensions of the vertical structure (WxDxH), in Overall dimensions of the MCC (LxDxH), mm Minimum maintenance and cooling clearance (Top / Side / Front), mm MCC painting colour Each unit compartment shall be provided with an individual hinged front door with concealed hinge construction Total weight of the MCC, kg Maximum shipping dimensions (LxDxH) and shipping weight, mm / kg 	20 (508 mm) x 21 (533 mm) x 90 (2286 mm) ANSI 61 Required	
<ul style="list-style-type: none"> Bus bars and bus bar connections <ul style="list-style-type: none"> Bus material Horizontal buses continuous current, A Vertical buses continuous current, A Neutral bus continuous current, A Horizontal bus section, mm x mm Type of connections Material of the insulating supports Bus colour/markings Phase arrangement (viewed from the front) Vertical bus shall be completely isolated and insulated by means of a labyrinth design barrier. Copper ground bus extended the entire length of the MCC assembly Cross section of horizontal ground bus, mm x mm Cross section of vertical ground buses, mm x mm 	Copper 800 Tin-Plated A-B-C from top to bottom, front to rear and left to right Required Required	
1.2 STARTER AND FEEDER UNITS MCCD321		
<ul style="list-style-type: none"> Type of starter and feeder units 	Withdrawable Units	
<ul style="list-style-type: none"> Feeder Units <ul style="list-style-type: none"> Manufacturer of the MCCB MCCB frames 		

CHARACTERISTICS	REQUIRED	PROPOSED
<ul style="list-style-type: none"> - Manufacturing and testing standards - Model and ratings of the thermal-magnetic protections, A - Thermal protection settings - Magnetic protection settings - Maximum current of the MCCB, at maximum temperature inside the compartment and maximum ambient temperature (derating), % of rated current - Rated voltage, Vac - Dielectric withstand voltage, Vac - Rated frequency, Hz - Number of MCCB poles <ul style="list-style-type: none"> - Single phase feeders (2 wire, Ph+N) - Three phase feeders - Interrupting Rating, kA rms - Short-circuit making capacity, kA peak - Maximum and minimum opening time of the MCCB, ms - Electrical and mechanical endurance, number of operations - Position indicator ("Off", "On" and "Trip") - Handle mechanism - Feeder unit size (height), inches/mm - Maximum MCCB rating of dual-mounted breakers - Maximum power cable section (for each unit size), AWG 	<p>NEMA AB-1</p> <p>50</p> <p>2 pole</p> <p>3 pole</p> <p>≥ 40</p> <p>≥ 80</p> <p>Required</p>	
<ul style="list-style-type: none"> • Starter units <ul style="list-style-type: none"> - Manufacturer - Manufacturing and testing standards - NEMA size - Type - Rated voltage, Vac - Dielectric withstand voltage, Vac - Rated frequency, Hz - Symmetrical short-circuit current rating, kArms 	<p>NEMA ICS 2 (2000)</p> <p>1</p> <p>Combination Type, Full Voltage</p> <p>50</p> <p>≥ 40</p>	

CHARACTERISTICS	REQUIRED	PROPOSED
<ul style="list-style-type: none"> - Short-circuit making capacity of the starters, kA peak - Unit size of each starter (height), inches/mm <ul style="list-style-type: none"> - Reversing starters (2 contactors) - Non-Reversing starters (1 contactor) - Approximate weight of each starter (height), kg <ul style="list-style-type: none"> - Reversing starters (2 contactors) - Non-Reversing starters (1 contactor) - Maximum cable size , AWG 	<p>≥ 80</p>	
<ul style="list-style-type: none"> • Molded Case Circuit Breakers (MCCB) for starters <ul style="list-style-type: none"> - Manufacturer - MCCB frame - Manufacturing and testing standards - Model and ratings of the magnetic protection, A - Magnetic protection settings - Number of poles - Interrupting Rating, kA rms - Short-circuit making capacity, kA peak - Maximum and minimum opening time of the MCCB, ms - Position indicator ("Off", "On" and "Trip") - Handle mechanism 	<p>NEMA AB-1</p> <p>3</p> <p>≥ 40</p> <p>≥ 80</p> <p>Required</p>	
<ul style="list-style-type: none"> • Contactors for starters <ul style="list-style-type: none"> - Manufacturer and model - Quantity <ul style="list-style-type: none"> - Reversing starters - Non-Reversing starters (1 contactor) - Number of poles - Rated current of the contactors at the maximum temperature inside the cubicle, A - Operating coil voltage, Vac <ul style="list-style-type: none"> - Closing voltage margin, % - Dropout voltage, % - Endurance, number of operations 	<p>2 contactors per starter</p> <p>1 contactor per starter</p> <p>3</p> <p>110 Vac (50 Hz)</p> <p>80 % - 110 %</p> <p>≤ 75 %</p>	

CHARACTERISTICS	REQUIRED	PROPOSED
<ul style="list-style-type: none"> Number of NC and NO auxiliary contacts of each contactor 		
<ul style="list-style-type: none"> Thermal relays for starters <ul style="list-style-type: none"> Manufacturer and model Type Phase unbalance protection Rating, A Settings of the thermal relay Insulated hand reset button extended through the compartment door Number of NC and NO auxiliary contacts 	Bi-metallic, ambient compensated Required Required	
<ul style="list-style-type: none"> Control transformer for MOV starters <ul style="list-style-type: none"> Manufacturer and model Rated output, VA Primary and secondary voltage, Vac Two fuses in the primary and one fuse in the secondary terminal side (the other secondary side is grounded) 	≥ 100 400/110 Vac (50 Hz) Required	
1.3 BUCKETS REPLACEMENT FOR THE EXISTING MOTOR CONTROL CENTER EE103MCCD311		
<ul style="list-style-type: none"> Manufacturer and model of existing MCCD311 	EATOM, Freedom Series 2100.	
<ul style="list-style-type: none"> Characteristics of existing MCCD311 	400 Vac, 50 Hz, 3 Ph+N, 1200 A main bus (600 A neutral bus), 65 kA bus bracing	
<ul style="list-style-type: none"> Dimensions of the vertical structure (WxDxH), in 	20 (508 mm) x 21 (533 mm) x 90 (2286 mm)	
<ul style="list-style-type: none"> Protection of the enclosure 	NEMA 12	
<ul style="list-style-type: none"> Manufacturer of new buckets and place of manufacturer 		
<ul style="list-style-type: none"> MOV starter units (reversing motor starters) <ul style="list-style-type: none"> Installation position in the existing MCCD311 for Starters for Przr Porv Bypass MOV Quantity of replaced buckets Manufacturer Manufacturing and testing standards 	6A and 6B 2 NEMA ICS 2 (2000)	

CHARACTERISTICS	REQUIRED	PROPOSED
<ul style="list-style-type: none"> – Type of starter – NEMA size – Rated voltage, Vac – Dielectric withstand voltage, Vac – Rated frequency, Hz – Short-circuit current rating, kArms – Unit size of each starter (height), inches/mm – Maximum cable size, AWG 	Combination Type, Full Voltage 1 50 ≥ 20	
<ul style="list-style-type: none"> • MCCB for MOV starters <ul style="list-style-type: none"> – Manufacturer and type of MCCB (Starters for Przr Porv Bypass MOV) – Manufacturing and testing standards – Protection (Starters for Przr Porv Bypass MOV) – Frame and model of MCCB – Trip settings, A (Starters for Przr Porv Bypass MOV) – Maximum current of the MCCB, at maximum temperature inside the compartment and maximum ambient temperature (derating), % of rated current – Number of poles – Interrupting Rating, kA rms (Starters for Przr Porv Bypass MOV) – Short-circuit making capacity, kA peak – Maximum and minimum opening time of the MCCB, ms – Position indicator (“Off”, “On” and “Trip”) – Handle mechanism 	Eaton or Cutler-Hammer, (preferred) NEMA AB-1 Shall meet requirements from RG 1.63-1987 and IEEE 741-2007 chapter 5.4 3 ≥ 20 ≥ 40 Required Freedom 2100	
<ul style="list-style-type: none"> • Starters for Przr Porv Bypass MOV (MCCB and backup fuse) shall assure preservation of the corresponding electrical penetration seal and conductor 	Required	
<ul style="list-style-type: none"> • Contactors for MOV starters <ul style="list-style-type: none"> – Manufacturer and model – Quantity – Number of poles 	2 contactors per starter 3	

CHARACTERISTICS	REQUIRED	PROPOSED
<ul style="list-style-type: none"> – Rated current of the contactors at the maximum temperature inside the cubicle, A – Operating coil voltage, Vac <ul style="list-style-type: none"> – Closing voltage margin, % – Dropout voltage, % – Endurance, number of operations – Number of NC and NO auxiliary contacts of each contactor 	110 Vac (50 Hz) 80 % - 110 % ≤ 75 %	
<ul style="list-style-type: none"> • Thermal relays for MOV starters <ul style="list-style-type: none"> – Manufacturer and model – Type – Phase unbalance protection – Rating, A – Settings of the thermal relay – Insulated hand reset button extended through the compartment door – Number of NC and NO auxiliary contacts 	Bi-metallic, ambient compensated Required Required	
<ul style="list-style-type: none"> • Control transformer for MOV starters <ul style="list-style-type: none"> – Manufacturer and model – Rated output, VA – Primary and secondary voltage, V – Two fuses in the primary and one fuse in the secondary terminal side (the other secondary side is grounded) 	≥ 100 400/110 Vac (50 Hz) Required	
1.4 INSTRUMENTATION, CONTROL AND SECONDARY CIRCUITS		
<ul style="list-style-type: none"> • Measurement compartment in new MCC EE103MCCD321 <ul style="list-style-type: none"> – Quantity – Voltmeter <ul style="list-style-type: none"> – Manufacturer – Scale, V – Accuracy, % 	1	

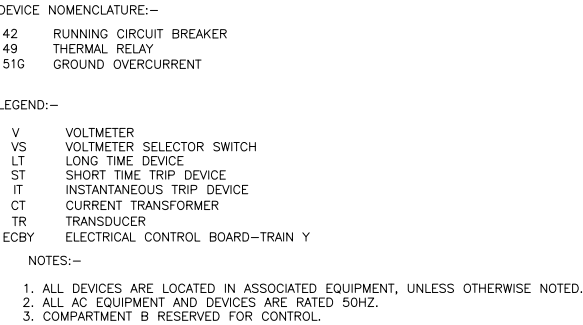
CHARACTERISTICS	REQUIRED	PROPOSED
<ul style="list-style-type: none"> – Voltmeter selector Switch <ul style="list-style-type: none"> – Manufacturer – Type – Measurement compartment size (height), inches/mm 	Heavy duty, rotary Type W2. Round knurled handles	
<ul style="list-style-type: none"> • Internal wiring and terminal blocks <ul style="list-style-type: none"> – Minimum section of secondary, control and alarm wiring, AWG (mm²) – Minimum section of power cable, AWG (mm²) – Wire insulation voltage – Type of wire insulation – Manufacturer and type of terminal blocks – Master Terminal Blocks – Type of wire terminal lugs 	14 AWG (2.08 mm ²) 12 AWG (3.31 mm ²) 600 Free of halogens and made from flame- retardant, non- combustible materials. Optional Insulated ring-tongue type	
2. TESTS		
2.1 CERTIFIED DATA		
<ul style="list-style-type: none"> • Certified data of the MCC and buckets to show that the material is in compliance with the specified test values and that testing, inspection and acceptance criteria conform to the applicable codes and standards 	Required	
<ul style="list-style-type: none"> • Calibrated measuring devices and tools shall be used. Calibration certificates of metering and test equipment (to be used during the FATs) shall be available prior to or during the tests. 	Required	
2.2 TESTING OF THE MCC		
2.2.1 Design Tests (Type Tests)		
<ul style="list-style-type: none"> • Certificates of type tests in accordance with standard NEMA ICS 18 (2001) and UL 845 (2005). The design of the equipment supplied shall be identical to that tested. There shall not be design changes that would affect the test results. 	Required	
<ul style="list-style-type: none"> • The circuit breakers shall meet the design verification tests according to NEMA AB 1 (2002). 	Required	
<ul style="list-style-type: none"> • The starters shall meet the performance and design tests according to NEMA ICS 2 (2000) 	Required	

CHARACTERISTICS	REQUIRED	PROPOSED
2.2.2 Production Tests of MCC and buckets (routine tests)		
• MCC and buckets shall be shop tested in accordance with the applicable standards.	Required	
• Power frequency dielectric tests of the MCC, according with ICS 1-2000 (1800 V, 1 min)	Required	
• Mechanical operation tests of the withdrawable units and interlocks	Required	
• Electrical operation and control-wiring test (wiring continuity, insulation test, polarity tests, etc)	Required	
2.2.3 Production Tests of the MCCB		
• MCCB shall conform to production verifications according to NEMA AB 1 (2002) and UL 489 (2013).	Required	
• The following tests shall be performed according to NEMA AB-4 (2009) on each MCCB <ul style="list-style-type: none"> – Mechanical operation – Insulation resistance test – Individual pole resistance test – Inverse time and instantaneous over-current trip tests 	Required	
2.2.4 Production tests of the Motor Starters		
• The motor starters shall be tested in accordance with ICS 2 (2000), including: <ul style="list-style-type: none"> – Contactor coil pick-up and drop-out voltage – Performance tests of overload relays – Torque checking for all bucket components – Dielectric tests – Mechanical operation 		
2.3 SITE TESTS		
• Supervision of site tests	Optional	
2.4 OTHER COMPONENTS AND DEVICES		
• All devices and components shall be designed and shop tested in accordance with the relevant standards.	Required	
3. QUALIFICATION		
• Qualification of MCC321 according to IEEE 323-2003, IEEE 344-2004 (as endorsed by RG 1.100-2009) and IEEE 649-2006 (as endorsed by RG 1.213-2009)	Required	
• Seismic requalification of existing MCCD311 and qualification of the new buckets. A mathematical model of the cabinet shall be developed to confirm that the cabinet will maintain structural integrity during and after DEC earthquake.	Required	

CHARACTERISTICS	REQUIRED	PROPOSED
<ul style="list-style-type: none"> Software specification requirements, testing and validation in accordance with RG 1.172 (2013) and regulatory guides referred therein (including the endorsed standards) 	Required if the Class 1E equipment incorporates programmable software	
<ul style="list-style-type: none"> Electromagnetic and Radiofrequency interferences shall be evaluated as stated in RG 1.180-2003 "Guidelines for evaluating electromagnetic and radio-frequency interference in SR instrumentation and control systems" 	Required	
<ul style="list-style-type: none"> Qualification life, years 	40	

ATTACHMENT 3

BB1 400 VAC MOTOR CONTROL CENTER ONE-LINE DIAGRAM




1. Interim Dwg. No.:	D-206-019-F	
Interim Sketch No.:	N/A	
2. Design Mod. No.:	1137-EE-L	
3. Drawing Rev. No.:	N/A	
4. New Drawing No.:	D-206-019	
5. Resp. Eng.:	—	Date: 19.05.2016
6. Checker:	—	Date: 19.05.2016

Original Design Firm:	EMPRESARIOS AGRUPADOS INT.
Replaced Manual Drawing:	N/A
Last Revision And Date:	N/A

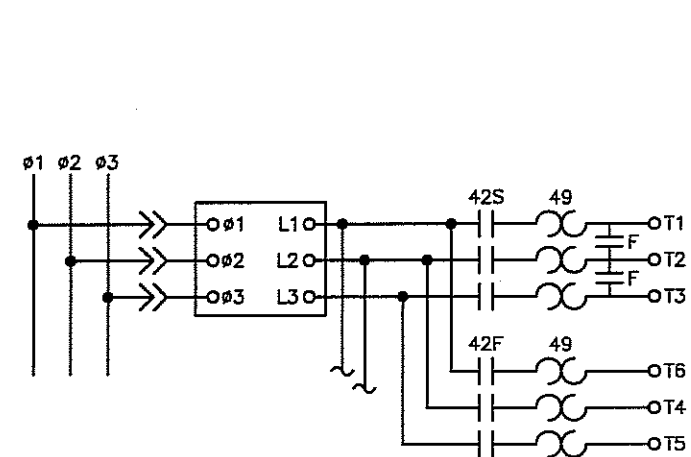
THIS IS A CAD DRAWING AND SHOULD NOT BE REVISED OR MODIFIED MANUALLY

F	16.05.19	.	ISSUED PER MOD. 1137--EE--L	.	.
NO.	DATE	BY	REVISION	OK'D. BY	LE APPR

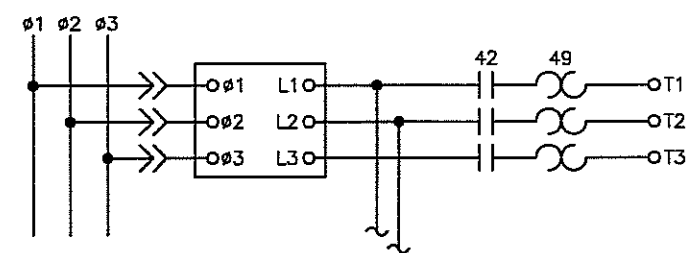
NUKLEARNA ELEKTARNA KRSKO NUCLEAR POWER PLANT KRSKO			
ELECTRICAL			
ONE LINE AND RELAY DIAGRAM			
ENGINEERING SAFEGUARD Y EE104SWGLD32			
	DESIGN ENGINEERING		
	NUCLEAR POWER PLANT KRSKO		KRSKO, SLOVENIA
	1. MADE	2. CHECKED	3. LE APPROVAL
REFERENCE DRAWINGS:			
SCALE	D-206-019		F
	DRAWING NUMBER	SYSTEM	SH.NO. REV

ATTACHMENT 4

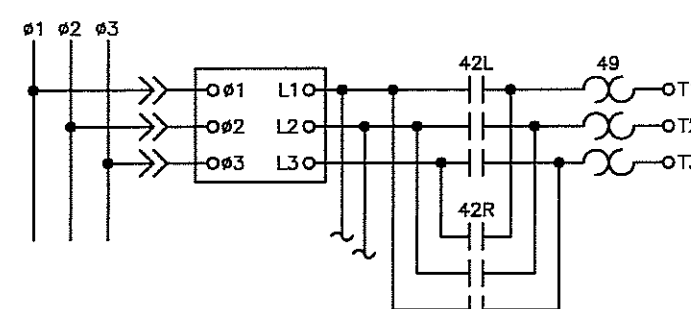
ELECTRICAL ELEMENTARY DIAGRAMS



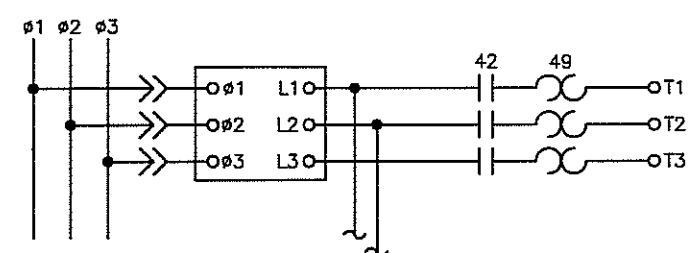
TYPICAL POWER CIRCUIT FOR ALL A956 (2S1W) STARTERS



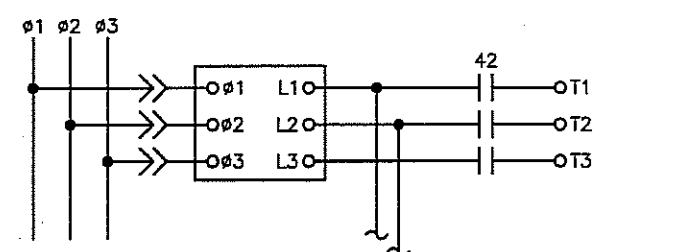
TYPICAL POWER CIRCUIT FOR ALL A206 (FVNR) STARTERS



TYPICAL POWER CIRCUIT FOR ALL A216 (FVR) STARTERS



TYPICAL POWER CIRCUIT FOR ALL A205 (CONT) STARTERS



TYPICAL POWER CIRCUIT FOR ALL A205 (CONT) STARTERS

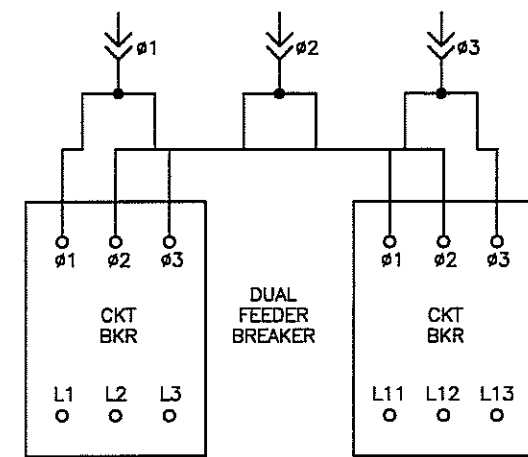


FIGURE A

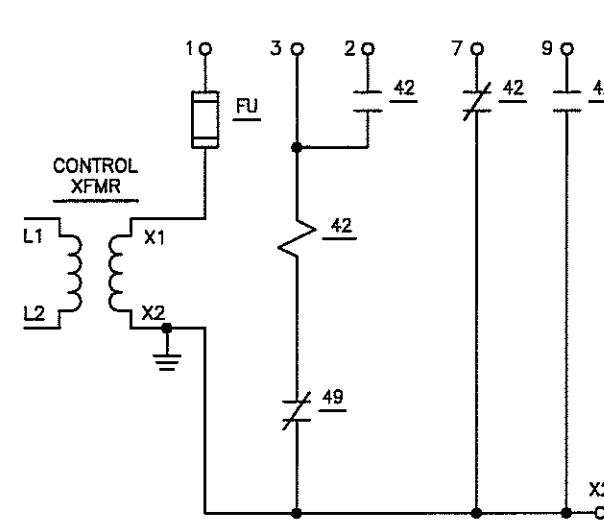


FIGURE B

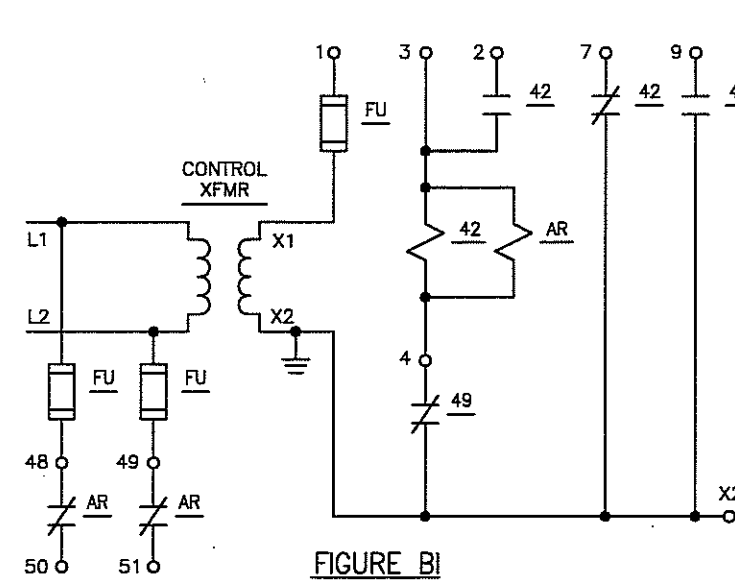


FIGURE BI

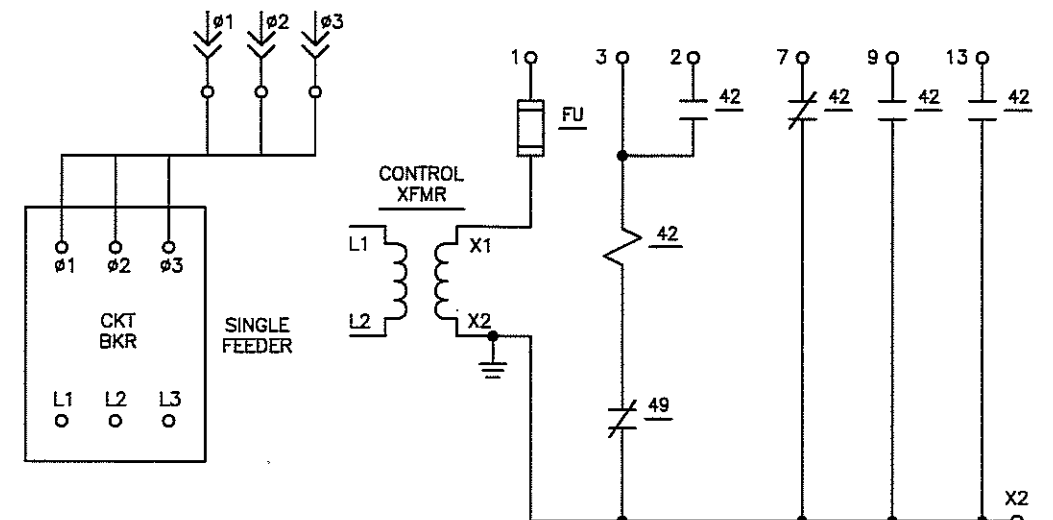


FIGURE C

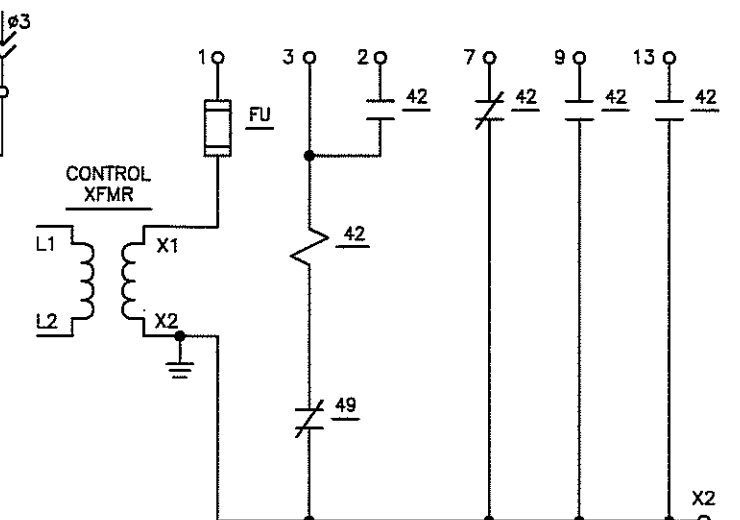


FIGURE D

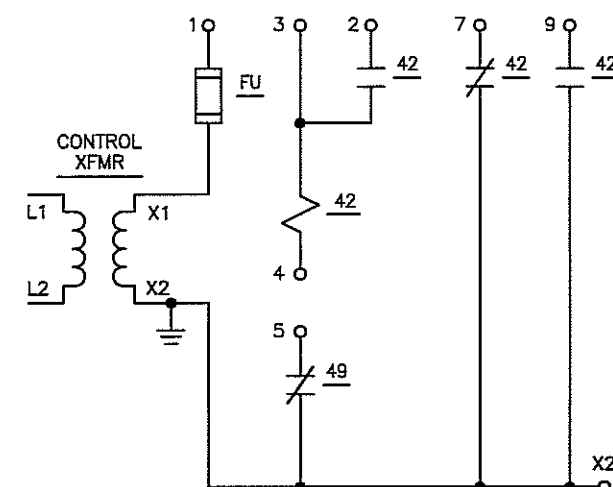


FIGURE F

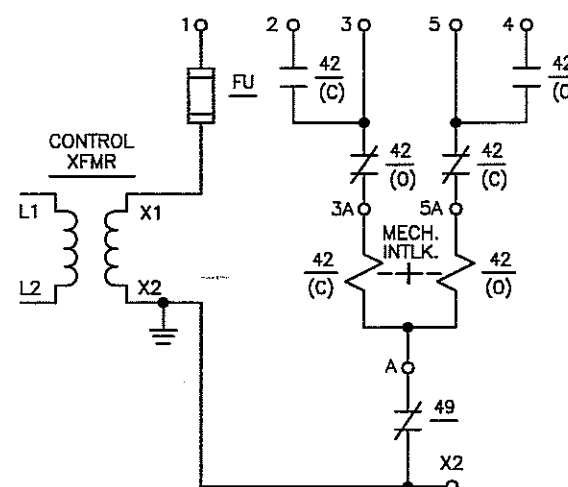


FIGURE K

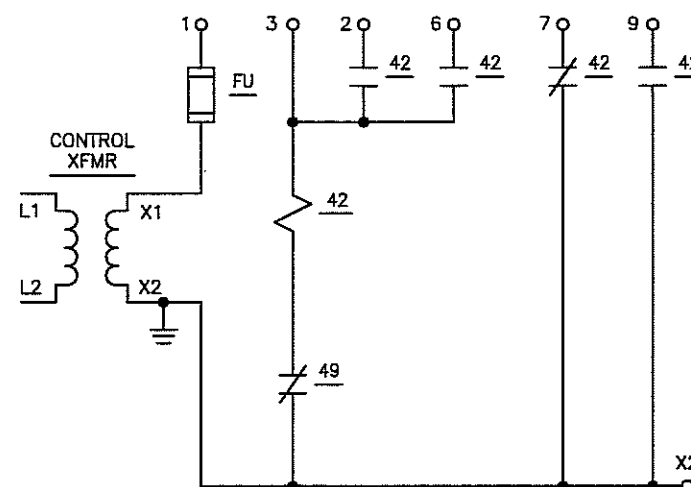


FIGURE M

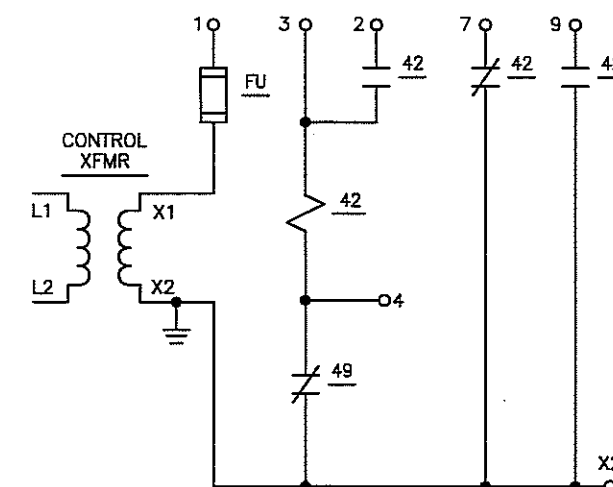


FIGURE N

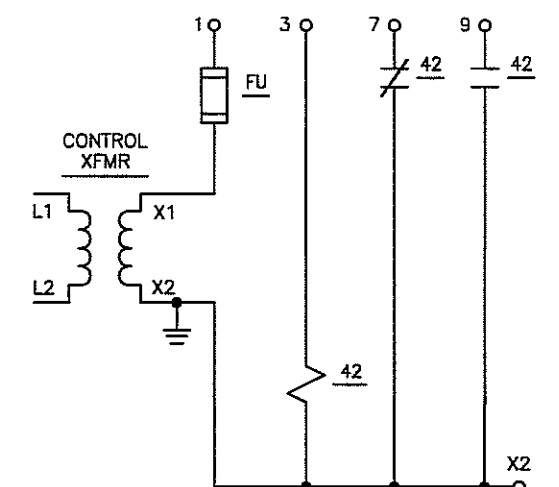


FIGURE O

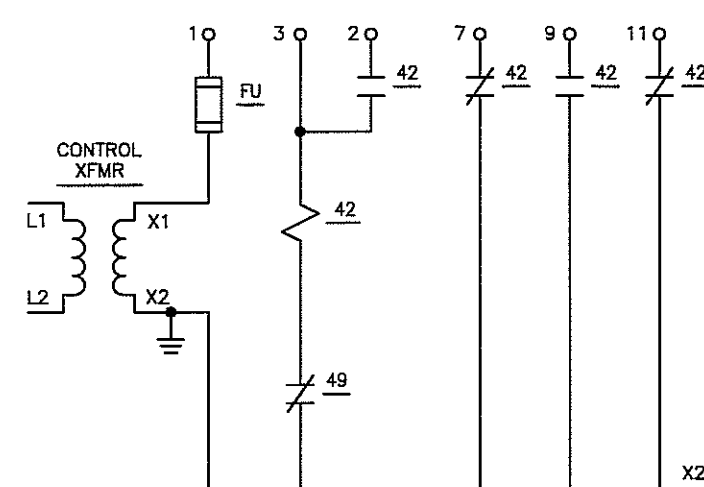


FIGURE P

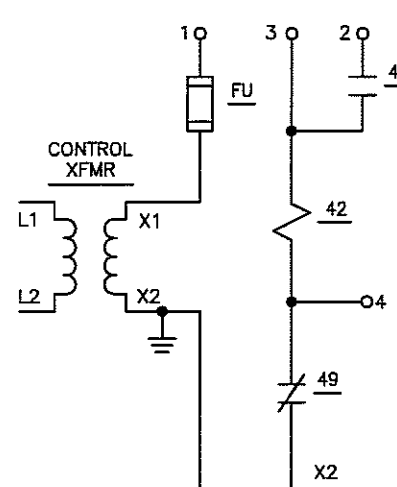


FIGURE Q

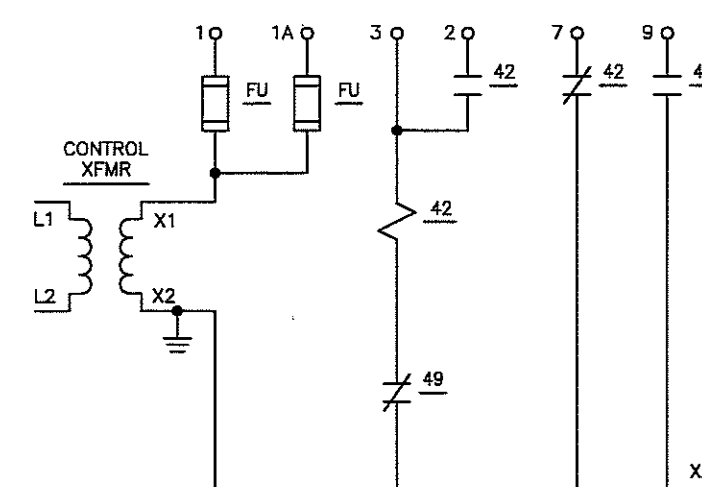


FIGURE R

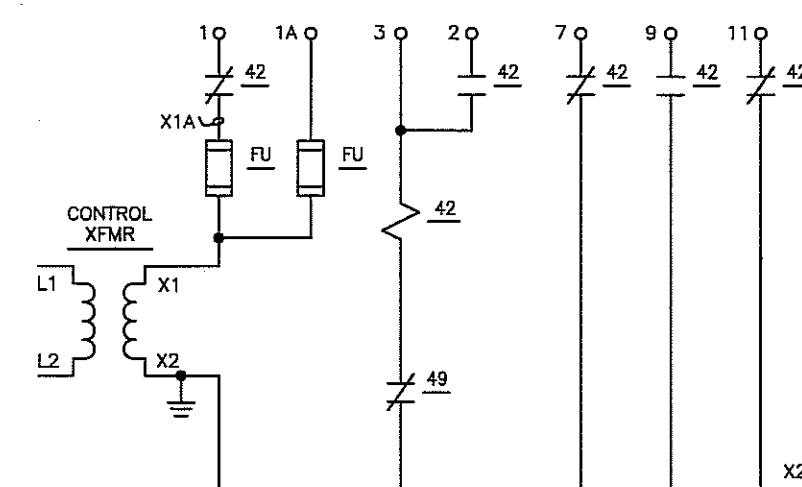


FIGURE S

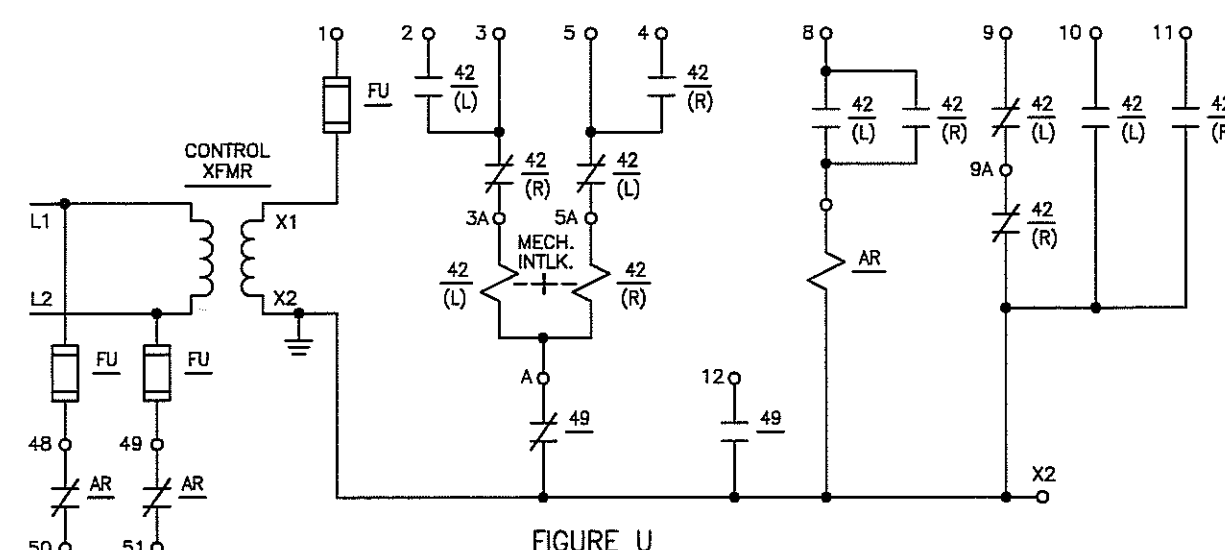


FIGURE U

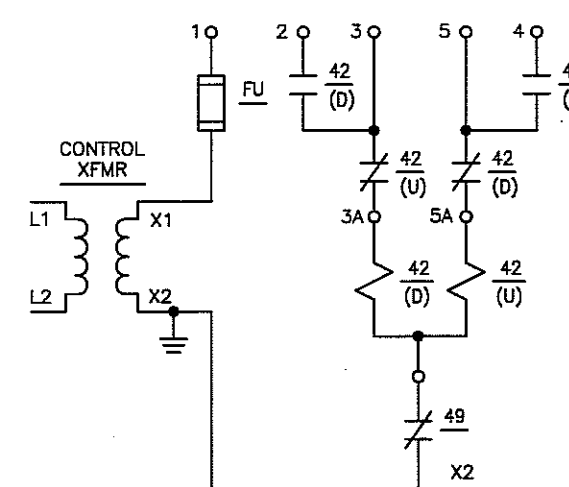


FIGURE Z

ADDITIONAL FIGURES:

FIGURE BA SAME AS FIG B PLUS 42 N/C CONTACT ON 11 & 12

FIGURE BC SAME AS FIG B PLUS 42 N/O CONTACT ON 13 & 14

FIGURE BD SAME AS FIG BC PLUS 42 N/C CONTACT ON 11 & 12

FIGURE BF SAME AS FIG BD PLUS 42 N/O CONTACT ON 15 & 16

FIGURE KB SAME AS FIG K PLUS 42(C) N/O CONTACT ON 6 & 7 AND 8 & 9

FIGURE KX SAME AS FIG K BUT POINT "A" WIRED ON TERMINAL A

FIGURE NA SAME AS FIG N PLUS 42 N/C CONTACT ON 11 & 12

Original Design Firm: GAI-Gilbert Associates, Inc.

Replaced Manual Drawing: B-201-103

Last Revision And Date: 6, 13.01.1982

THIS IS A CAD DRAWING AND SHOULD NOT BE REVISED OR MODIFIED MANUALLY

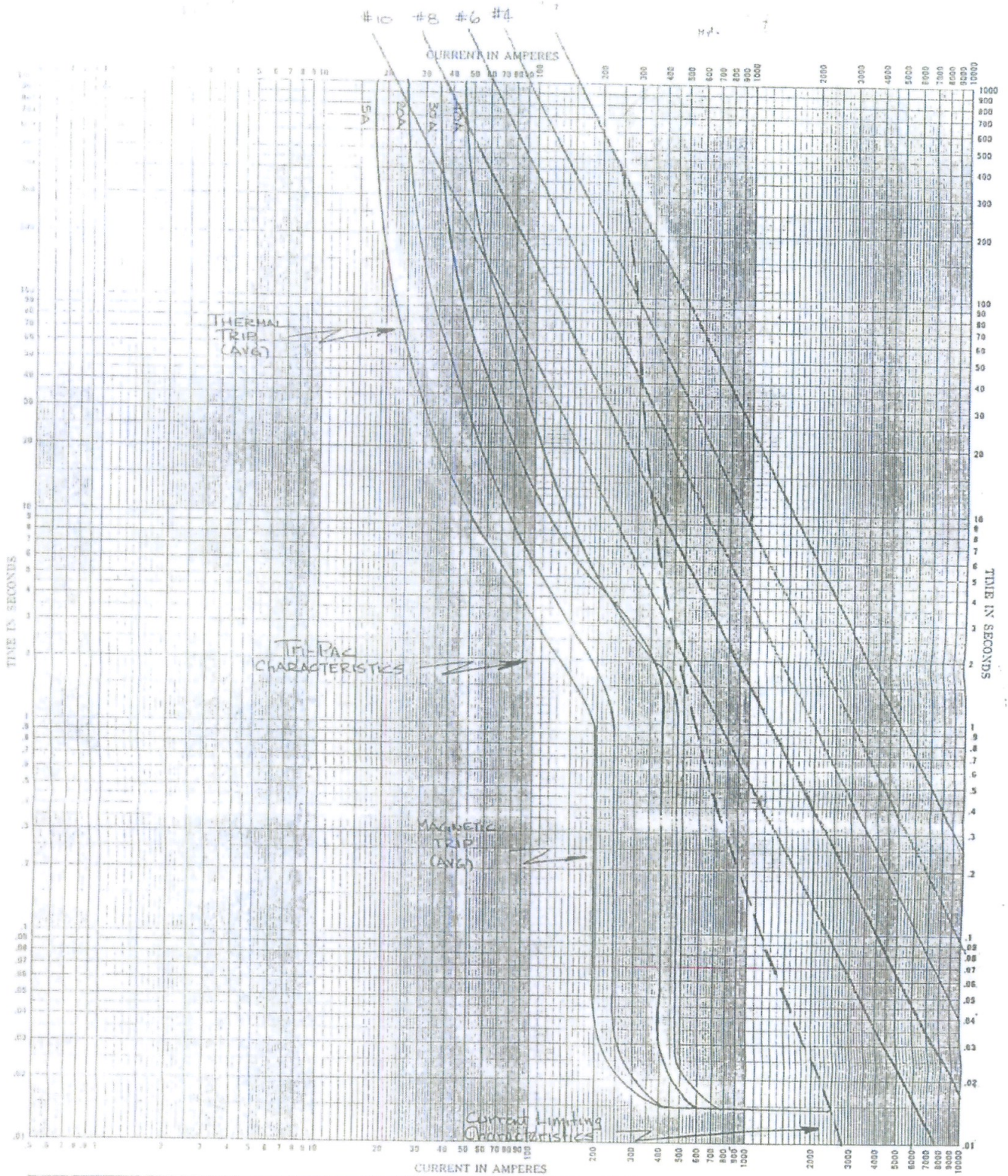
NO.	DATE	BY	REVISION	CKD. BY	LE APPR.
9	20.12.13	M.K.	CADD VECTORIZATION	S.J.	B.P.
8	14.05.12	K.K.	REV'D PER MOD 805-NA-L	S.J.	B.P.
7	05.02.01	M.K.	CADD CONVERSION	S.J.	D.V.

Nuklearna Elektrarna Krško MASTER DOCUMENT	
Date Received:	20-12-2013
Log Number:	14372

NUKLEARNA ELEKTRARNA KRŠKO NUCLEAR POWER PLANT KRŠKO		
MOTOR CONTROL CENTER		
WIRING FIGURES		
DESIGN ENGINEERING		
NUCLEAR POWER PLANT KRŠKO		KRŠKO, SLOVENIA
MADE	CHECKED	LE APPROVAL
1. M. KODRIČ	2. S. JERBIČ	3. D. VEHOVAR
REFERENCE DRAWINGS: 2018D20 REV. 3		
SCALE		9
B-201-103		DRAWING NUMBER
SYSTEM		SH.NO. REV

ATTACHMENT 5

CONTAINMENT PENETRATION DATA



For KRSKO NPP		MCC LOADS		TIME-CURRENT CHARACTERISTIC CURVES	
BASIS FOR DATA Standard		Fuse Links. In		Dated	
1. Tests made at Volts a-c at		p-f, Starting at 25C with no initial load		No.	
2. Curves are plotted to		Test points so variations should be		Date Jan 7, 1976	

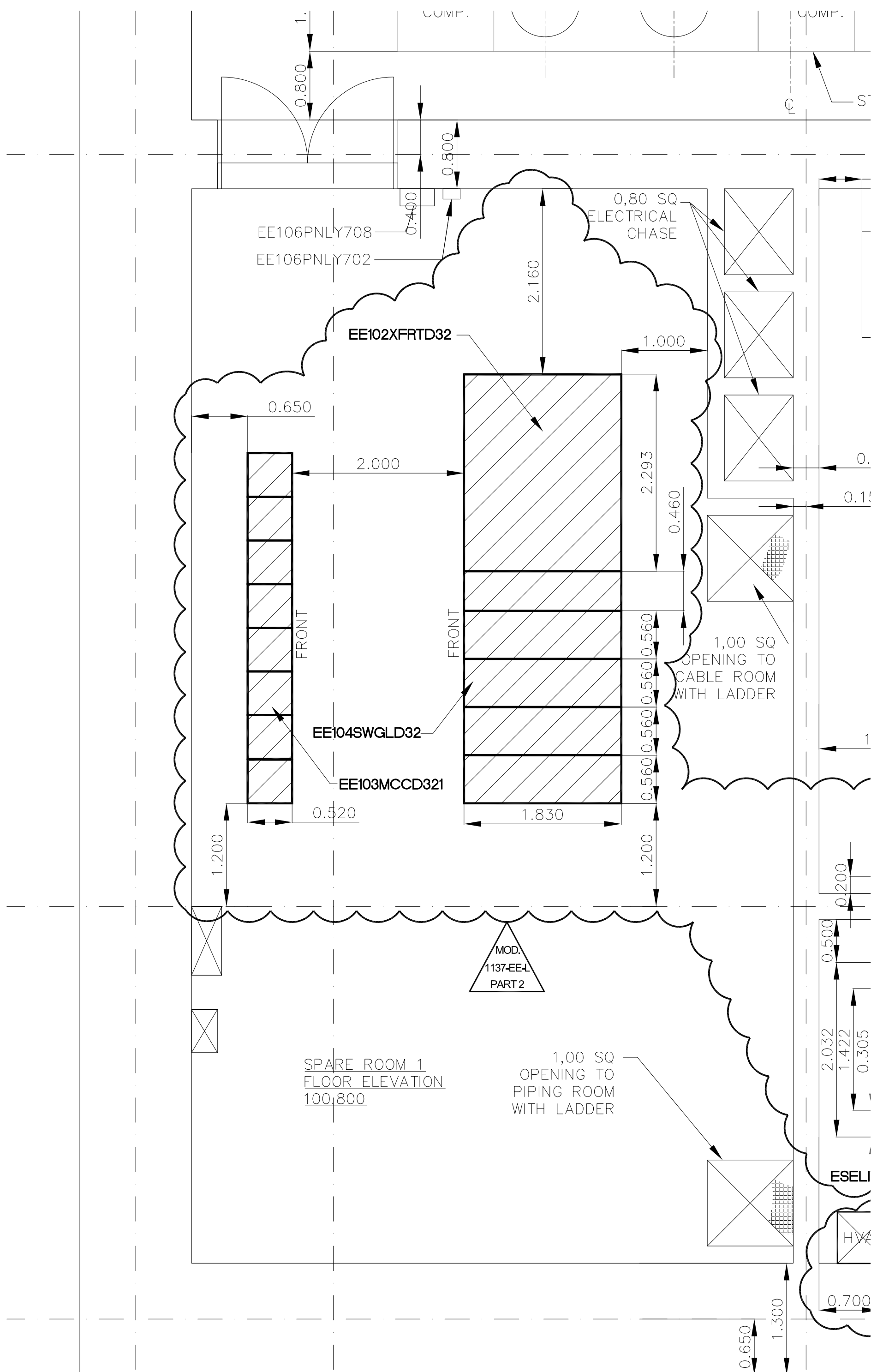
ATTACHMENT 6

EXISTING MOTOR CONTROL CENTER



ATTACHMENT 7

LAYOUT OF THE ELECTRICAL ROOM



ATTACHMENT 8

REQUIREMENTS FOR NEW COMPONENTS AND SPARES (To be filled in by the Supplier)

1) Equipment information for component:

Part number						
Item description						
Manufacturer						
Manufacturer-title-address						
Mfr part number(MPN)						
MPN Description						
Manufacturer-title-address						
Safety Classification (Y/N)						
Seismic Category (1, N/A)						
ASME CODE PN (Y/N)						
IEEE PN (Y/N)						
ENV EQ PN (Y/N)						
Quantity						
Unit of measure(UOM)						
Serial control (Y/N)						
Serial number						
Lot/Heat/Real/Batch No						
Shelf Life Control						
Shelf Life Months						
Storage Level (A,B,C,D)						
ISM REQ (Y/N)						
Qualified Life-Months						
Service/Operation Life-months						
Chemicals-MSDS (Y/N)						
Hazardous Material (Y/N)						
Nuclear Material (Y/N)						
Radioactive Material (Y/N)						
Item Price						
Purchase order no						
Ref records Ref. document (OM; DWG; BOM)						

Note:

1. Supplier shall provide all required information for main component and subcomponents.

2) Equipment information (spare part):

Part number	
Item description	
Manufacturer	
Manufacturer-title-address	
Ref. document (OM; DWG; BOM)	

3) Equipment's Spare parts:

Mfr part number(MPN)						
MPN Description						
Manufacturer-title-address						
Safety Classification (Y/N)						
Seismic Category (1, N/A)						
ASME CODE PN (Y/N)						
IEEE PN (Y/N)						
ENV EQ PN (Y/N)						
Quantity						
Unit of measure(UOM)						
Serial control (Y/N)						
Serial number						
Lot/Heat/Real/Batch No						
Shelf life control						
Shelf Life Months						
Storage Level (A,B,C,D)						
ISM REQ (Y/N)						
Qualified Life-Months						
Service/Operation Life-months						
Chemicals-MSDS (Y/N)						
Hazardous Material (Y/N)						
Nuclear Material (Y/N)						
Radioactive Material (Y/N)						
Item Price						
Purchase order no.						
Ref records						

Note:

1. Supplier shall provide all required information for Equipment's spare parts delivered within contracted scope of supply
2. Table shall be filled in by Supplier with all requested information latest at delivery of Spare Parts

ATTACHMENT 9

MOTOR CONTROL CENTER NAMEPLATE LEGEND AND FRONT VIEWS

Modification OA Firm:
Replaced Manual Drawing:
Original Design Firm:
Last Revision And Date:

EMPRESARIOS AGRUPADOS INT.
N/A
SIPRO INŽENIRING D.O.O.
N/A

FILE: 2011462 DWG, SPREJEL:

NOTES:

1. FOR MCC FRONT VIEW, SEE DRAWINGS B-201-958 SH.1 OR SH.2

MOD.
1137-EE-
PART 2

THIS IS A CAD DRAWING AND SHOULD NOT BE REVISED OR MODIFIED MANUALLY
SH. 02

MADE		CHKD		DRAWING NUMBER										REV			
				SS-201-146										0			
PDS				ENG INTF		DESIGN ENGINEERING											
				1.		2.		NUCLEAR POWER PLANT KRSKO									
								KRSKO, SLOVENIA									
SCALE																	
W.O.				ENGINEER APPROVAL										DEPT.		DATE	
REV	MADE	CH	PDS	APP	DATE	REV	MADE	CH	PDS	APP	DATE						
0	M.S.	B.P.		B.P.	01.07.12												

[illegible]

Replaced Manual Drawing:

Original Design Firm:

Last Revision And Date:

N/A

EMPRESARIOS AGRUPADOS INT.

N/A

FILE: 2011461.DWG, SPREJEL: -----

REV	MADE	CH	APPS	DATE	NOTES: 1. FOR MCC FRONT VIEW, SEE DRAWINGS B-201-NNN SH.1 OR SH.2	NUKLEARNA ELEKTRARNA KRSKO NUCLEAR POWER PLANT KRSKO MOTOR CONTROL CENTER NAMEPLATE LEGEND EE103MCCD321	MADE	CHKD	DRAWING NUMBER						REV	
C	.	.	.	14.06.16			PDS		SS-201-147		C					
ISSUED PER MOD. 1137-EE-L							ENG INTRF		DESIGN ENGINEERING NUCLEAR POWER PLANT KRSKO KRSKO, SLOVENIA							
							1.	2.								
					SCALE											
					W.O.		ENGINEER APPROVAL								DEPT	DATE
					REV	MADE	CH	PDS	APP	DATE	REV	MADE	CH	PDS	APP	DATE
										

THIS IS A CAD DRAWING AND SHOULD NOT BE REVISED OR MODIFIED MANUALLY

SH. 01

UNIT	ENGLISH			SLOVENIAN/CROATIAN
	LINE 1	LINE 2	LINE 3	
1A	MEASURING	COMPARTMENT	VOLTMETER	
1BL	SPARE			
1BR	UPS	ESELIV07EC		
1CL	SPARE			
1CR	SPARE			
1D	INCOMING FEED	(FROM EE102XFRTD32)		
2A	SPARE			
2B	SPARE			
2C	VA704AHU-001			
2D	VA704AHU-002			
3A	CONT. ISOL.	VALVE 56549		
3B	CONT. ISOL.	VALVE 56550		
3C	SU-RH/RB	MOV-1		
3D	SU-RH/RB	MOV-2		
4A	SU-RH/RB	MOV-3		
4B	SU-RH/RB	MOV-4		
4C	SU-RH/RB	MOV-5		
4D	SU-RH/RB	MOV-6		
5A	SU-RH/RB	MOV-7		
5B	SU-RH/RB	MOV-8		
5C	SU-RH/RB	MOV-9		
5D	SPARE			
6A	SPARE			
6B	VA705CHL-001			
6C	VA705CHL-002			
6D	VA704PLM-001	EHC		

ISSUED PER MOD. 1137-EE-L

1. FOR MCC FRONT VIEW, SEE DRAWINGS B-201-NNN SH.1 OR SH.2

1. Interim Dwg. No.: SS-201-147-2-C
 Interim Sketch No.: N/A
 2. Design Mod. No.: 1137-EE-L
 3. Drawing Rev. No.: N/A
 4. New Drawing No.: SS-201-147-2
 5. Resp. Eng.: — Date: 14.06.2016
 6. Checker: — Date: 14.06.2016

EE103MCCD321

MADE		CHKD		DRAWING NUMBER										REV			
				SS-201-147										C			
PDS				ENG INTRF		DESIGN ENGINEERING NUCLEAR POWER PLANT KRSKO KRSKO, SLOVENIA											
		1.		2.													
SCALE																	
W.O.				ENGINEER APPROVAL										DEPT		DATE	
REV	MADE	CH	PDS	APP	DATE	REV	MADE	CH	PDS	APP	DATE						

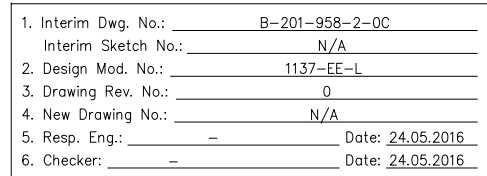
SH. 02

[illegible]

NOTES:

1. ENCLOSURE - NEMA 12
2. HORIZONTAL BUS CAPACITY 1200A
3. VERTICAL BUS 1 CAPACITY 1200A
VERTICAL BUS 2,3,4&5 CAPACITY 600A
4. BUS BRACING - 65.000A
5. GROUND BUS x YES NO
6. NEUTRAL BUS x YES NO
7. MAIN CABLE LUGS: 1-1-500 MCM/ ϕ
NEUTRAL: 1-1-500 MCM
8. CABLE ENTRY:
MAIN CABLE - BOTTOM
POWER CABLE - TOP AND BOTTOM
CONTROL CABLE - TOP AND BOTTOM
9. SERVICE 400V AC, 50HZ., 3 ϕ , 4 WIRE
CONTROL - 110V AC, 50 HZ, 1 ϕ
10. REACTORS YES x NO.
IMPEDANCE - N/A
RATING - N/A
11. CLASSIFICATION - ENGINEERING
SAFEGUARD TRAIN Y.
12. SEISMIC CURVE NO.
DG3 BUILDING
SWITCHGEAR ROOM
- NORTH-SOUTH RESPONSE (OBE)
- NORTH-SOUTH RESPONSE (SSE)
- EAST-WEST RESPONSE (OBE)
- EAST-WEST RESPONSE (SSE)
- VERTICAL RESPONSE (OBE)
- VERTICAL RESPONSE (SSE)
13. FOR GENERAL NOTES, SEE DWG.
B-201-102.
14. FOR WIRING FIGURES, SEE DWG.
B-201-103.
15. FOR NAMEPLATE LEGEND, SEE DWG.
SS-201-146.

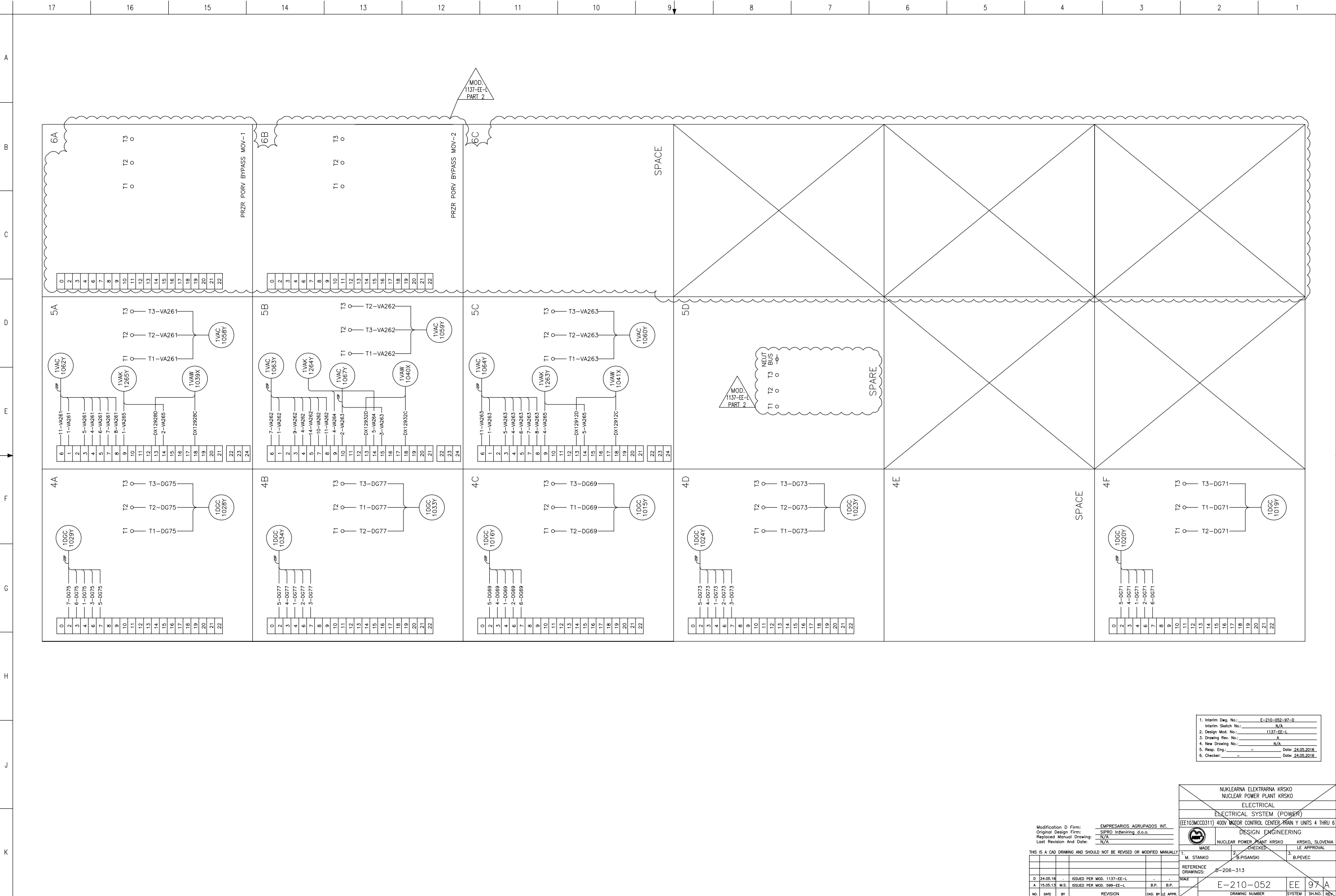
NUCLEAR SAFETY RELATED
ENGINEERING SAFEGUARD Y



Modification OC Firm:	EMPRESARIOS AGRUPADOS INT.
Original Design Firm:	SIPRO
Replaced Manual Drawing:	N/A
Last Revision And Date:	N/A

THIS IS A CAD DRAWING AND SHOULD NOT BE REVISED OR MODIFIED MANUALLY						
OC	24.05.16	.	ISSUED PER MOD. 1137-EE-L	.	.	
0	07.2012	M.S.	ISSUED PER MOD. 599-EE-L		B.S.	B.P.
NO.	DATE	BY	REVISION	CKD.	BY	LE APPR.

NUKLEARNA ELEKTRARNA KRSKO NUCLEAR POWER PLANT KRSKO				
MOTOR CONTROL CENTER FRONT VIEWS				
EE103MCCD311				
VERTICAL COMPARTMENTS 5-6				
DESIGN ENGINEERING				
NUCLEAR POWER PLANT KRSKO			KRSKO, SLOVENIA	
MADE		CHECKED		LE APPROVAL
1. M. STANKO		2. B. ŠPAN		3. B. PISANSKI
REFERENCE DRAWINGS:				
SCALE	B-201-958		EE	2 0
	DRAWING NUMBER		SYSTEM	SH.NO. REV.



1. Interim Des. No.: E-210-052-97-D
2. Interim Sketch No.: N/A
3. Design Mod. No.: 1137-EE-L
4. Drawing Rev. No.: A
5. New Drawing No.: N/A
6. Resp. Eng.: - Date: 24.05.2016
7. Checker: - Date: 24.05.2016

NUKLEARNA ELEKTRARNA KRSKO
NUCLEAR POWER PLANT KRSKO

ELECTRICAL
ELECTRICAL SYSTEM (POWER)

(EE103MCCD311) 400V MOTOR CONTROL CENTER-TRANS Y UNITS 4 THRU 6

DESIGN ENGINEERING

NUCLEAR POWER PLANT KRSKO KRSKO, SLOVENIA

MADE IN SLOVENIA

CHECKED BY: B. PISANSKI
LE APPROVAL BY: B. PEVEC

REFERENCE DRAWINGS: D-206-313

SCALE: 1:1

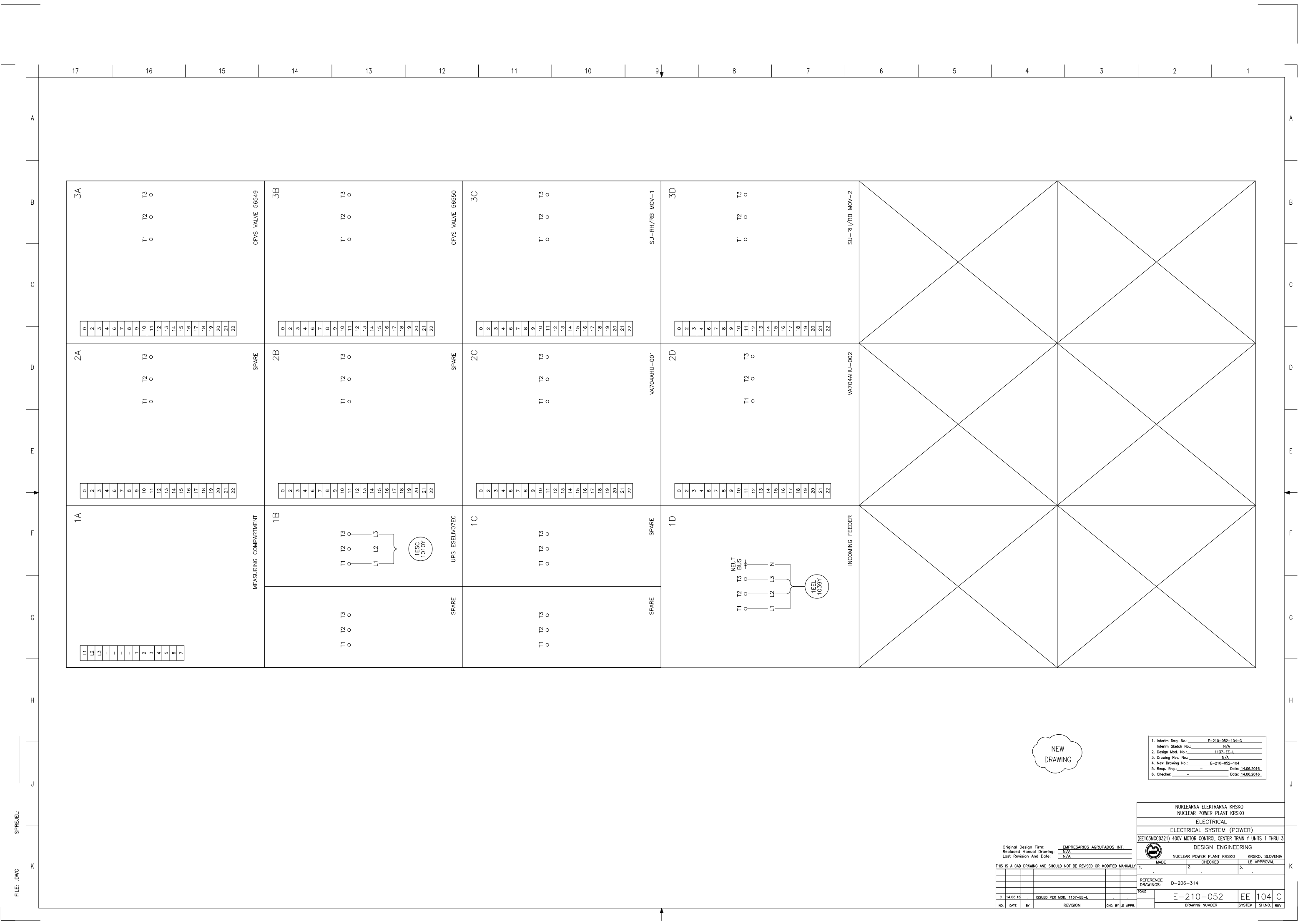
E-210-052 EE 97 A

DRAWING NUMBER SYSTEM SH.NO. REV.

Modification D Firm: EMPRESARIOS AGRUPADOS INT.
Original Design Firm: SPRO Inženiring d.o.o.
Replaced Manual Drawing: N/A
Last Revision And Date: N/A

THIS IS A CAD DRAWING AND SHOULD NOT BE REVISED OR MODIFIED MANUALLY

NO.	DATE	BY	REVISION	CHK. BY	LE APPR.
D	24.05.16		ISSUED PER MOD. 1137-EE-L		
A	15.05.13	M.S.	ISSUED PER MOD. 599-EE-L	B.P.	B.P.



1C

T1

T2

T3

0

T1

T2

T3

0

SPARE

2C

0

2

3

4

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

T1

T2

T3

0

3C

0

2

3

4

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

T1

T2

T3

0

SU-RH/RE MOV-1

1D

T1

T2

T3

0

T1

T2

T3

0

NEUT BUS

L1

L2

L3

N

1EEL
1038Y

INCOMING FEEDER

2D

0

2

3

4

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

T1

T2

T3

0

3D

0

2

3

4

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

T1

T2

T3

0

SU-RH/RE MOV-2

NEW
DRAWING

1. Interim Dwg. No.: E-210-052-104-G

2. Design Mod. No.: 1137-EE-L

3. Drawing Rev. No.: N/A

4. New Drawing No.: E-210-052-104

5. Resp. Eng.: Date: 14.06.2016

6. Checker: Date: 14.06.2016

NUKLEARNA ELEKTRARNA KRSKO
NUCLEAR POWER PLANT KRSKO

ELECTRICAL

ELECTRICAL SYSTEM (POWER)

(EE103MCCD321) 400V MOTOR CONTROL CENTER TRAIN Y UNITS 1 THRU 3

DESIGN ENGINEERING

NUCLEAR POWER PLANT KRSKO KRSKO, SLOVENIA

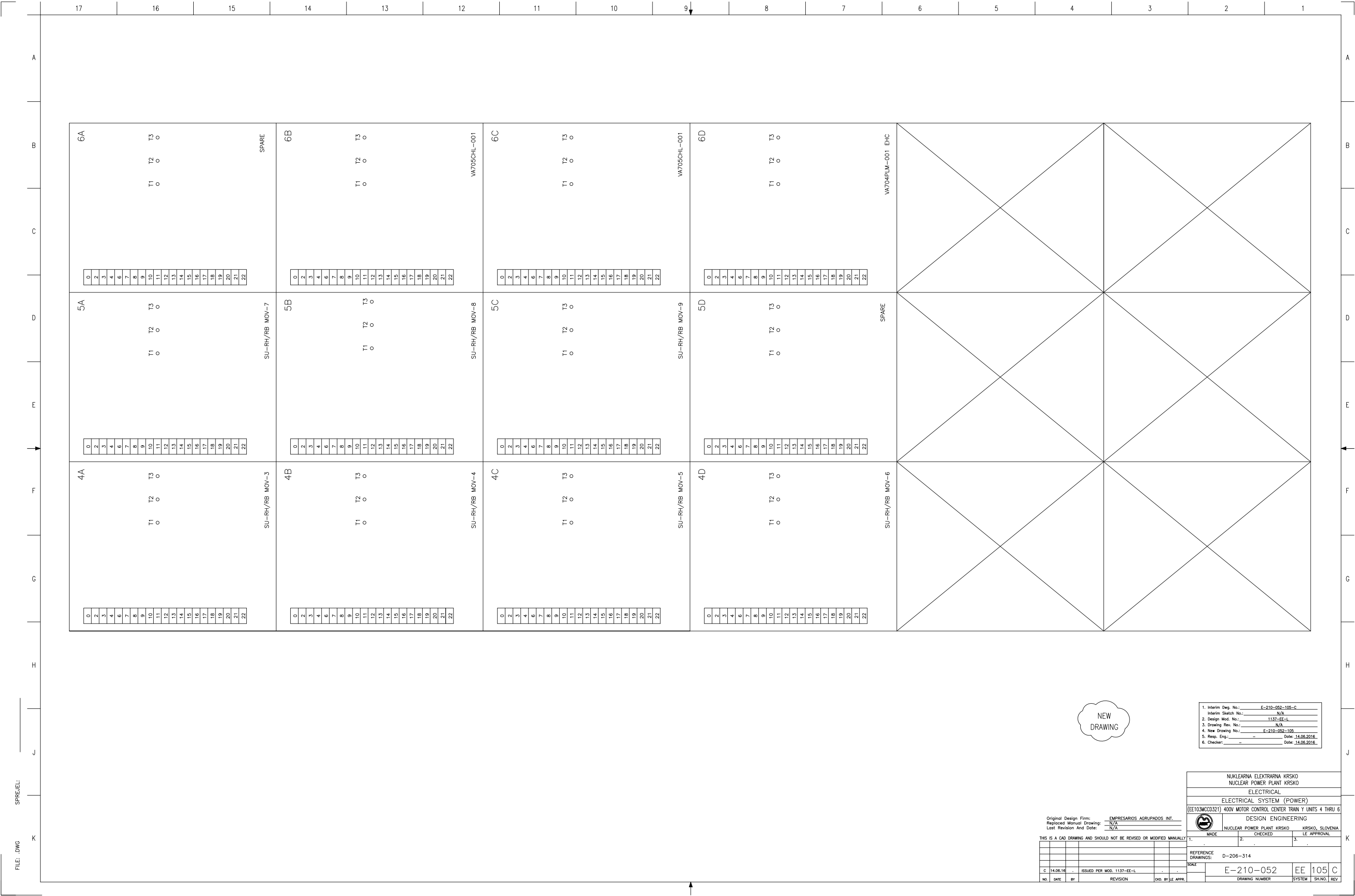
MADE CHECKED LE APPROVAL

REFERENCE DRAWINGS: D-206-314

SCALE

E-210-052 EE 104 C

NO. DATE BY REVISION CHK. BY LE APPR. DRAWING NUMBER SYSTEM SH.NO. REV



FILE: .DWG
SPREJEL:

NEW
DRAWING

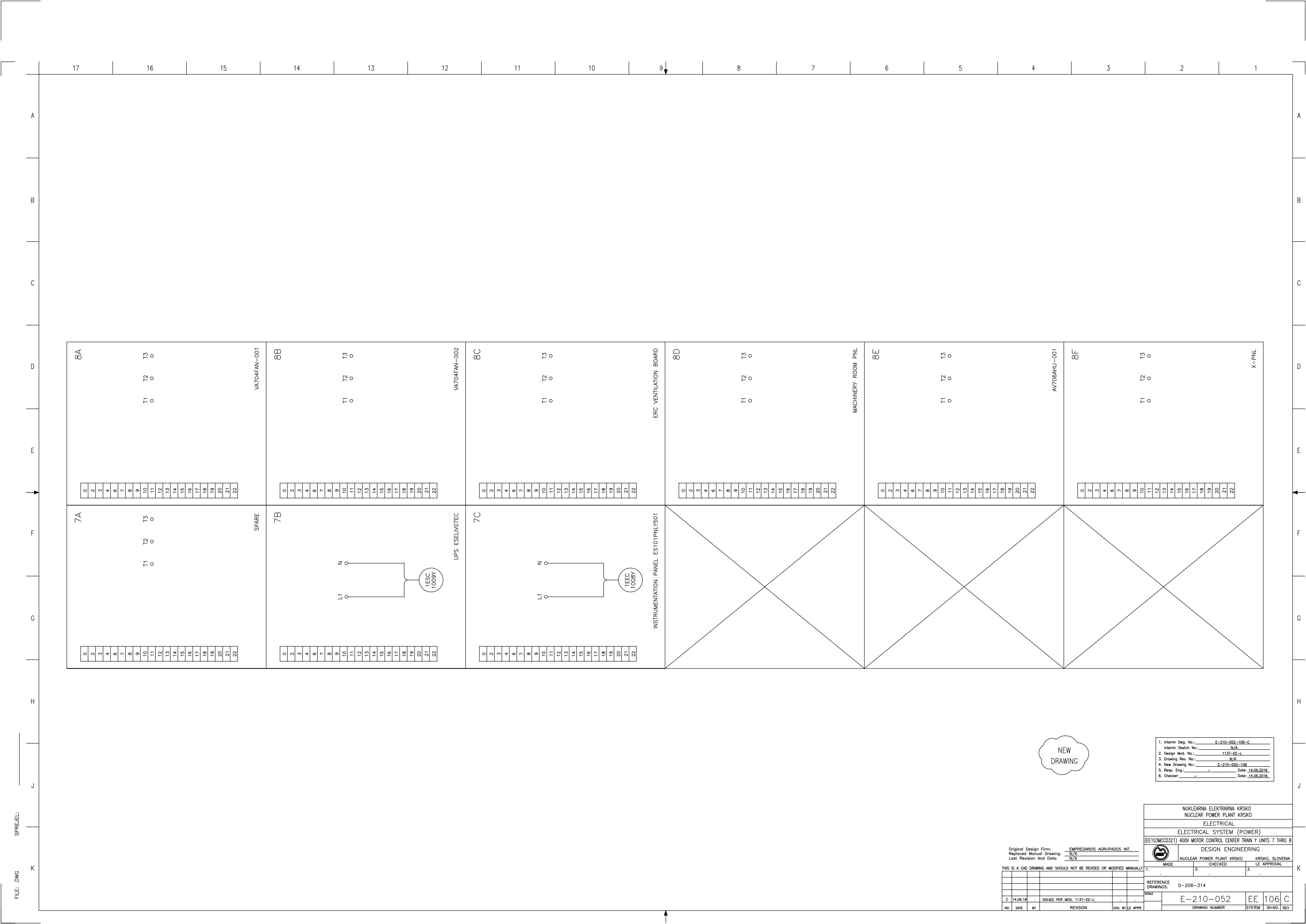
1. Interim Dwg. No.: E-210-052-105-G
Interim Sketch No.: N/A
2. Design Mod. No.: 1137-EE-L
3. Drawing Rev. No.: N/A
4. New Drawing No.: E-210-052-105
5. Resp. Eng.: Date: 14.06.2016
6. Checker: Date: 14.06.2016

NUKLEARNA ELEKTRARNA KRSKO
NUCLEAR POWER PLANT KRSKO
ELECTRICAL
ELECTRICAL SYSTEM (POWER)
(EE103MCCD321) 400V MOTOR CONTROL CENTER TRAIN Y UNITS 4 THRU 6
DESIGN ENGINEERING
NUCLEAR POWER PLANT KRSKO KRSKO, SLOVENIA
MADE CHECKED LE APPROVAL
REFERENCE DRAWINGS: D-206-314
SCALE
E-210-052 EE 105 C
DRAWING NUMBER SYSTEM SH.NO. REV

Original Design Firm: EMPRESARIOS AGRUPADOS INT.
Replaced Manual Drawing: N/A
Last Revision And Date: N/A

THIS IS A CAD DRAWING AND SHOULD NOT BE REVISED OR MODIFIED MANUALLY

NO.	DATE	BY	REVISION	CHK. BY	LE APPR.
C	14.06.16	.	ISSUED PER MOD. 1137-EE-L	.	.



FILE: .DWG
SPREJEL:

NEW
DRAWING

1. Interim Dwg. No.: E-210-052-106-C

Interim Sketch No.: N/A

2. Design Mod. No.: 1137-EE-L

3. Drawing Rev. No.: N/A

4. New Drawing No.: E-210-052-106

5. Resp. Eng.: Date: 14.06.2016

6. Checker: Date: 14.06.2016

NUKLEARNA ELEKTRARNA KRSKO
NUCLEAR POWER PLANT KRSKO

ELECTRICAL
ELECTRICAL SYSTEM (POWER)

(EE103MCCD321) 400V MOTOR CONTROL CENTER TRAIN Y UNITS 7 THRU 8

DESIGN ENGINEERING

NUCLEAR POWER PLANT KRSKO KRSKO, SLOVENIA

MADE CHECKED LE APPROVAL

REFERENCE DRAWINGS: D-206-314

SCALE

E-210-052 EE 106 C

NO. DATE BY REVISION CHK. BY LE APPR. DRAWING NUMBER SYSTEM SH.NO. REV