Eskom	Template	Nuclear Engineering

Title: **Detailed Design Template**

(Title of Design inclusive of Modification Number)

Document Identifier:	**240-143890978 (The document identifier of the Design will be inserted here)**
Alternative Reference Number:	**<To be assigned as per 331-3, if required>**
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Initials and Surname	**Initials and Surname**	**Initials and Surname**
Designation	**Designation**	**Designation**
Date:	Date:	Date:

Additional classification information specific to a Division/Department can be captured on the second page of the document template where applicable. If the second page is not used, it can be deleted.

Nuclear Additional Classification Information

Business Level: **4**

Working Document: **3**

Importance Classification:

NNR Approval:

Safety Committee Approval:

ALARA Review:

Functional Control Area: **Design Engineering**

Content

Page

1. Introduction

1.1 The Existing Design

A brief description of the overall system or subsystem function, followed by a slightly more detailed description of the area of interest. The idea is to provide the reader with enough information about the existing design to facilitate an understanding of the change; do not provide more information than that. **DO NOT MENTION ANY PROBLEMS OR WEAKNESSES HERE.**

1.2 Problems with the Existing Design

Describe the system problems that will be solved by the design changes. **DO NOT MENTION SOLUTIONS HERE** e.g. a higher flow rate is needed - **JUST MENTION THE PROBLEM** e.g. there is a silt build-up in the pipe.

1.3 The New Design

Briefly describe the design changes. Do not describe all the options considered, but only the selected one. Mention any limitations of the solution such as a cost/features compromise. Remember that this is only part of the introduction, so just a short summary is in order here. Anything mentioned here should be expanded upon in §2.8.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

2.1.2 Applicability

Describe to whom the document applies. Unless identified to the contrary, the following statement is relevant:

This document shall apply throughout Eskom Holdings Limited Divisions.

Change this statement to suit the applicability of the document.

2.1.3 Effective date

Indicate the date from which the document is effective if different from the authorisation date. The effective date means that from this date all training, artefacts and supporting systems required for compliance to the document requirements shall have been established and implemented

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

List of all documents that set out the design criteria for the function of the systems impacted by the modification.

In many cases the modification will be within the existing design base of the plant i.e. the modified plant still satisfies the SAR, OTS etc. If this is not the case, design bases (e.g. ASME, ANSI, IEEE etc.) and parameters will need to be selected and justified by the design engineer. If the basis for this design is not specified in the SAR or regulatory code, then a national or international code is to be selected by the engineer with some justification.

The design engineer is to verify that the design reference used is the latest available, and where this is not the case the specific year of the reference will be added to the title and the rationale mentioned for the deviation. (Note that the latest 10 CFR 50.55a must be checked for limitations on the use of ASME III). If no such code is applicable then the design basis is formulated from basic engineering practice.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems

[2] Insert normative document references here.

These documents are indispensable for the application of this document, i.e. documents to be used together with this document, laws, standards, codes and procedures.

2.2.2 Informative

[3] Insert informative document references here.

List documents that are further sources of information referenced in your document.

2.3 Definitions

Include all definitions applicable to this document, in alphabetical order. Explain all terms used, including documents, titles and departmental references that may cause confusion if not explained.

Refer to definitions listed in recognized industry glossaries such as NRS 000 and the IEV, and use these wherever appropriate.

For NRS 000, go to www.nrs.eskom.co.za. For the IEV, contact the Eskom Information Centre.

2.4 Abbreviations

Provide explanations of terms and abbreviations including documents, titles and departmental references that may cause confusion if not explained, and that are used in this document.

Abbreviation	Explanation

2.5 Roles and Responsibilities

See KAA-501 for roles and responsibilities. (Do not remove this statement)

2.6 Process for Monitoring

Insert text here.

Include the duration the design package will stay valid for before the package must be reviewed for installation to commence. Include validity period of safety screening.

2.7 Related/Supporting Documents

Insert text here.

List related documents and documents superseded by this document.

Also list the forms and records that you have referred to and which shall be maintained, if there are any. If there are no related/supporting documents, insert 'Not applicable' to retain paragraph numbering.

PACKAGE CONTENTS

SECTION 3 – PART A DESIGN
SECTION 4 – PART B MANUFACTURING AND INSTALLATION SPECIFICATION
SECTION 5 – PART C PROCUREMENT SPECIFICATION
SECTION 6 – PART D OTHER ATTACHMENTS

3. PART A - Design Change

3.1 Requirements

This is a list of demands that the design must measure up to. If a URS or TRS was written for this modification, then those requirements should be carried forward into this document. Many of the requirements will relate directly to the problems listed in §1.2 above, and others will be imposed by operators and maintenance personnel etc.

If the modification is being done specifically to satisfy a code or standard, then that should be mentioned here as the dominant requirement.

You can use this as a checklist for your design.

At this stage the Design Input Consideration Checklist (Attachment A1) should be completed.

The requirements will usually be stated as 'shall' statements.

Example:

This modification shall obviate the need for periodic flushing of the SEC suction lines. The system shall remain ASME class 3 with no additional class breaks.

3.2 Design Limitations

State here what this design does not cover and which may need to be covered elsewhere, e.g. mechanical/electrical portions separately, or problems that will be resolved by future modifications.

3.3 Assumptions

State here all assumptions made about the problem and this modification. If no assumptions are made, state 'None.'

Ensure that assumptions are **validated** by inspection, testing or some other means prior to hand-over of the modification.

3.4 Investigation

Bearing in mind that this document is a **permanent record**, briefly describe the investigation and research undertaken. You need to leave an audit trail linking your sources of information to the final solution selected. No reader of this document should be left wondering where you got your information from.

Make use of the KIT/OE group to search for Operating Experience. Any information that is particularly relevant can be attached. Refer to any use of the KIT team or experts by name. Consider the EDF solution in the investigation.

If this modification is a recommendation from a study or from EDF, refer to the relevant documents.

If a feasibility study was done for this modification, mention it here. If there was no feasibility study, create a sub section with the heading "**Justification for Not Performing a Feasibility**" and discuss why it was not performed. Complete the following forms, if no feasibility study was performed, (where applicable) and attach to the design:

- Software design requirements - see KFU-020 (240-119532043)
- Environmental qualifications - see KFU-021
- South African Grid Code Requirements - see KFU-018 (240-119530923)
- Microprocessor & Automation Design Requirements - see KFU-019 (240-119531688)
- ALARA – see the screening review forms in KFU-028 (240-119528368)
- Single Point Vulnerabilities should be identified and assessed using the SPV analysis template on G:\Nuclear Engineering\Design Eng\Masters\Latest Templates\SPV analysis.doc.

Ensure that you understand the drainage system if any drainage is required because specific systems have their own dedicated drains, i.e. process drains vs. floor drains. Take care when identifying the appropriate drainage system.

3.5 Negative Consequences of this Modification

List and discuss all possible negative consequences of this modification, including those with a very low probability of occurrence. Discuss failure modes of systems and equipment that are introduced by this modification. The safety-related subset (if any) of this list must be addressed by the safety screening and/or the safety evaluation.

3.6 Benefits of this Modification

List and discuss the benefits of this modification, and demonstrate that the benefits outweigh the negative consequences. This list will also be used in the safety screening and/or the safety evaluation to offset the negative consequences as listed above.

3.7 Location and Environmental Conditions

Indicate the location (room numbers etc) of the existing and new equipment. List the normal and accident environmental parameters and indicate their impact on the modification. If the equipment is located in various locations, duplicate the bullets below accordingly.

- Normal Environment :
  Temperature : °C
  Pressure : kPa
  Humidity : %
  Radiation : mSv/h
- Accident Environment :
  Temperature : °C
  Pressure : kPa
  Humidity : %

Radiation : mSv/h

3.8 Functional Description

Describe the main aspects of the new design and how it works. Explain the rationale behind the solution. If parameters like power rating, speed and flowrates have been selected, defend your selection. This is where you satisfy the reader (including the reviewer) that what is being proposed is suitable, appropriate and effective. It must be clear that the benefits listed above will be realised. The reader should not be left with questions like 'why is the motor rated at 37 kW when the pump requirement is only 14 kW?'.

Remember that this is where you expand on what you mentioned in §1.3, because §1.3 is only part of the introduction.

Discuss design features such as fail-safe mechanisms and robustness of the design. What are the effects of power and instrumentation air failure on the modification? Refer to attached diagrams.

Check that everything mentioned here is installed in Part B, and everything being installed in Part B is mentioned here.

Consider ALARA over here, complete KFU-028 (240-119528368) and forward to the ALARA coordinator for review if necessary.

This section must also specify parameters such as the following, where applicable.

Fluid Flow rate: maximum, minimum, normal, accident,
Fluid Pressure: maximum, minimum, normal, accident,
Fluid Temperature: maximum, minimum, normal, accident,
Fluid Densities: maximum, minimum, normal, accident,

Voltage: maximum, minimum, normal, accident,
Amperage: maximum, minimum, normal, accident,

3.9 Operational Requirements and Changes

Describe how this design change impacts on the operation of the plant. Does this design introduce new tasks for the operators or eliminate/change tasks? Is there operator training associated with this design? If so, should the Simulator be modified first to allow for training?

If the operator interface (controls, alarms, indications, KIT inputs etc.) or duties have been altered, briefly describe those here. List all altered control room equipment by number.

Ensure that the operator interfaces are Human Factors Engineering (HFE) compliant and that time critical operator actions are considered when making changes to the control room or any other HFE related work area or process. Ensure that methods and tools are provided to address challengers associated with moving to newer technologies and that these newer technologies are used to increase plant performance.

Standard paragraph: All affected procedures are listed on the DCIF in Part D of this document.

NOTE: Any design change having an impact on safety-related operator actions that are taken to mitigate design basis events which result in an automatic reactor trip should comply with the requirements of ANSI/ANS-58.8 Time Response Design Criteria for Safety-Related Operator

Actions. Where compliance is not achieved, designers may develop data and an appropriate technical analysis to justify shorter times for the timing requirements.

3.10 Maintenance Requirements and Changes

Check the Maintenance Basis for the system, and consult Maintenance Engineering. Design for maximum maintainability or design to be maintenance free.

Consult the manufacturer and our own experience with similar equipment. Where possible, select equipment that is already used at Koeberg. List critical spares and check on stock levels.

Ensure that maintenance staff will have sufficient physical access to the equipment and make allowance for large tools etc where applicable.

Ensure that all equipment manuals etc are added to the documentation system. If a maintenance manual does not exist for the system or sub-system, create one (include on DCIF).

Address any maintenance training requirements here.

Assess the impact on the following programmes:

- ISI – in-service inspection;
- IST – in-service testing;
- FAC – flow accelerated corrosion;
- MIC – Microbiologically Induced Corrosion
- Factories Act Inspections – pressure vessels, safety valves, cranes etc.
- Ageing Management Matrix (240-101650256)

Consult Programmes Engineering and Inspection & Test for help with the above.

3.11 Nuclear Safety

The importance category of this modification is SR (safety related) according to KLA-001 because it impacts on the **** sub-system of the SEC system.

Replace the text above with the information relevant to your design. Remember that you use the Importance Category of the **most constraining system** affected by the modification. If impact on a system is minimal and risk insignificant, refer to the System Design Engineering Manager for a possible downgrade of Importance Category. Such a downgrade would need to be motivated here.

The classification of equipment to be installed can be found in the BOM in Part C.

The outcome of the safety evaluation performed in accordance with KAA-709 (331-135) and KGA-025 (331-134) needs to be referenced here, together with the safety screening and/or evaluation number. *Note that the implementation phase must be explicitly mentioned and addressed in the evaluation process.*

Remember to address common-mode effects if applicable.

Should the design change involve an Un-reviewed Safety Question (USQ) then a safety justification needs to be performed in accordance with KGA-029 (331-132).

Make reference to the safety justification here and summarise the results. (Include the actual safety justification in attachments to Part A).

3.12 Conventional Safety

Demonstrate that these design changes do not introduce additional risks to personnel or plant integrity from sources such as fire or chemical hazards, electrical shock etc.

Things like machine guarding, earth-leakage, lockout, isolation and other access control facilities can be discussed here. Determine if the location in question is classified as a hazardous location. Drawing numbers and classifications can be found in KLA-027.

Hazloc references to consult during design process are SANS 10086, 10108 and 60079. Add a statement that definitively declares that the work to be performed will or will not affect a Hazloc area and discuss the measures that will be taken to maintain a safe working environment if the area is indeed classified as a hazardous location. Provide all the necessary dilution/ventilation calculations that demonstrate compliance in an Attachment.
The designer will also consider and address potentially hazardous situations that could or will arise during construction in this section.

Note that the workplan addresses the 'usual' modification very comprehensively. The 'unusual' requirements specific to this design must be listed here.

The hazards associated with/introduced by the modification must be discussed under these three headings:

2.12.1 Implementation – discuss the hazards personnel will be exposed to during the implementation of the modification and the measures that must be taken to ensure personnel safety during construction.

2.12.2 Operating mode – discuss the hazards present (if any) during normal operation and how the design deals with them, i.e. mitigate the hazards presented by working from heights by installing access platforms.

2.12.3 Maintenance – discuss if maintenance personnel will be exposed to any hazards while executing maintenance procedures and what provision has been made in the design to ensure safety.

3.13 Selection of Equipment

Motivate/justify the selection of particular makes and models of equipment. If the equipment selected is not the standard type for the application, motivate your choice. Mention specifications and standards to which the equipment does or must comply, such as SABS, IEC, ISO, BS or other international specifications and standards.

If the equipment must be seismically qualified, specify whether this is already the case for that equipment or whether it needs to be qualified by analysis or test. If a seismic test is required, list the test on the BOM (Part C) as a separate item. A specification for the test will need to be written. Refer to DSG-310-243 as an example.

Consider obsolescence in your selection. The expectation is that all equipment installed will have a 10-year life supported by the supplier/manufacturer. Specify how long the supplier will supply/support the equipment for, or specify why this would not be necessary.

Make a declaration that the equipment selected is suited to the normal and abnormal environmental conditions as listed in §2.7.

NOTE: materials containing zinc cannot be installed in containment.

The Designer needs to consider the following in the event of valve or relevant system component procurement;

- Surface modification
- Stabilised chromium
- Pre-oxidation
- Electropolishing (replacement SG waterboxes)
- Cobalt impurity limitations
- Fuel element cobalt impurities

The abovementioed treatment processes need to be incorporated in the relevant design review processes to ensure that attention is given to the reduction or elimination of high dose radio-isotopes.

Ensure that instrument inaccuracies have been taken into account – ensure conformance with KLM-011 and KLM-012.

NOTE: For all new equipment, a new equipment qualification file (template on KFU-030) must be created in accordance with EQ process documents KSA-125 and KAA-834. The new EQ qualification file/s must be referenced in the DCIF.

Describe any custom-made equipment or part in detail. The procurement detail in Part C (Procurement Specification) must include information such as data sheets, specific ordering information, special specifications, supplier details, and applicable cost of the custom-made equipment, if this detail is available.

The project manager must be made aware of this information.

3.14 Design Calculations and Analyses

Design analyses should clearly document the objectives and conclusions in such a way that a person technically qualified in the subject can review and understand the analyses and adequacy of the results without recourse to the originator.

If there are only a few simple calculations, put them here. This paragraph is here to help to integrate the calculations into the design. In most cases, this will just refer to Attachment A2. Note: Large volumes of calculation data are to be included as an attachment to Part D and merely referenced in this section, for example the Caesar input and output data sheets.

When including numerical calculation results into procedures or plant documentation, ensure that only significant digits are used. Also, in the testing procedure, make sure that figures mentioned are not beyond the accuracy of displays.

NOTE – the acceptable format for presenting a pipe stress analysis is available at G:\Nuclear Engineering\Design Eng\Masters\Master - Pipe Stress Analysis Report.doc – all pipe stress analysis shall be presented in this format and added as an attachment to the design.

3.15 Impact on the Simulator and KIT

Describe the changes to the simulator. Remember that simulator changes do not only involve changes to the controls, indicators and the control room, but encompass any change in the functioning or "behaviour" of the plant.

Examples are: any setpoint change; any relay logic change, any processing change in the KRG cabinets.

Changes to the control room and hence the simulator should take HFE into consideration.

If you are uncertain about the impact on the simulator, contact the simulator engineer.

If there are any changes to the simulator generate an Operations-Specific Test Program using template 240-83179775 and attach it to the detailed design package as an addendum.

Mention any changes to KIT, such as changes to inputs, additional inputs or removed inputs, changes to descriptions, trigrammes or validating UPs etc. Ensure that the KIT Database Update Forms are attached to Part B.

The original KIT system architecture looped the UP validation signals to each input card that had alarms associated with that particular UP. This configuration is depicted in the relevant KIT Interblock Wiring Diagrams, KBA 1216 D04 1014/1015/1016/1017/1021/1022/1023/1024, and resulted in two (or more in some cases) KIT inputs being used for each UP validation signal.

When the Ovation system was installed the same input configuration was used, but with only the last input used for the UP validation signal (Ovation only requires a single UP validation input). The other intermediary inputs were not used and were listed as spare in KIT. However, these intermediary inputs are not spare as they are still looped from the first UP input. Hence, it cannot simply be disconnected as it provides the intermediate connections to the last UP input. The intermediary inputs may however be freed up and used as spare KIT inputs by performing the following steps:

- Transfer the relevant information from the KIT Interblock Wiring Diagrams, KBA 1216 D04 1014/1015/1016/1017/1021/1022/1023/1024, to the Cubicle Equipment and Cabling Diagrams, KBA 1215 K06 098/099/100 and KBA 01/0216 J06 578, and cancel the corresponding information from the KIT Interblocks Wiring Diagrams.
- Change the applicable KIT UP validation signal to point to the first (original) input connected to the plant.
- Once the above steps have been performed, remove the jumper to the Interblock and free up that input for future use. It is possible to do this online but a UP alarm will be generated when the link is temporarily pulled.

Update KBA 1215 K06 098/099/100, KBA 01/0216 J06 578 and all other relevant KIT documentation to reflect the new configuration once the validation signal is reassigned and the jumper removed.

When there are substantial changes to the plant logics, first implement the changes on the simulator and recheck if changes are made during commissioning. Document and discuss the test in this section and in Part B.

3.16 Environmental Impact and Energy Efficiency

Assess and describe any impact of the modification on the environment. Consider the following:

- Harmful materials used in the equipment specified;
- Harmful materials used during installation;
- Waste generated during installation;
- Waste generated during operation;
- Noise generated during operation.
- The possibility of incorporating energy efficient equipment and operating strategies.

Review the environmental qualification checklist to ensure that the modification will not affect existing environmental qualifications and that the qualifications assigned as a result of the modification are correct.

3.17 Impact on Original Design Bases

Determine if the design change improves the plant response to a transient or an accident situation.

3.18 Risk Assessment

Compile a risk assessment using the Risk Assessment Template, with guidance from the following SANS standards:

SANS12100 "Safety of Machinery – General Principles for Design – Risk Assessment and Risk Reduction".
SANS 31010 "Risk Management – Risk Assessment Techniques".

Consider the risks which occur during the fabrication, installation and commissioning phases of the project.

(For activities which carry significant risk, other risk assessment methodologies such as FMEA, HAZOP, SWIFT etc. may be used, as discussed in SANS31010.)

Discuss the mandatory risk assessment that was performed, and that the required critical actions to be taken by the designer/relevant project team member were identified to ensure successful implementation and commissioning. The actions must be listed in Part B and appear on the work plan. At a minimum, the designer should attend the installation handover at the CSC stage and formally accept the results of any testing.

3.19 Part A Design Appendix list

Note that these attachments must relate specifically to the information in Part A, and should be referenced in the text of Part A. *(remove this note)*

A.1 Design Input Consideration Checklist (331-211)

A.2 Design Calculations – provide structural, pump, pipe and/or cable sizing, gas or vapour dilution calculations to mitigate hazloc zoning .

A.3 Safety Screening/Evaluation/Justification. (as required)

A.4 Control Room Alarm Window Change

Appendix A1 – DESIGN INPUT CONSIDERATION CHECKLIST

Use the form 331-211 (KFA-066), available on Hyperwave and attach.

Appendix A2 –DESIGN CALCULATIONS

1.0 Computational Aids

e.g. CAESAR II pipe stress analysis ver 3.22.

Provide verification of all computational aids and the bases supporting the application of any computer programme used.

2.0 Calculations

Note that calculations should specify all assumptions and those that need to be verified must be clearly identified.

2.1 pipe sizing;

2.2 cable sizing;

2.3 setpoint and hysteresis calculations;

2.4 etc.

Appendix A3 – SAFETY SCREENING SXXXX/20YY

Appendix A4 – CONTROL ROOM ALARM WINDOW CHANGE

The following alarm windows have been added/removed/changed by this modification:

1	K	S	A	0	2	2	A	A

2	K	S	A	0	2	2	A	A

Shift Manager			Operations Support Alarm Co-ordinator		
Name	Signature	Date	Name	Signature	Date

Implementation :

The following documents have been updated:		Yes
KSA Alarm Lists	(KBA01/02 22E021003 ; KBA0922E021007)	☐
KSA Control Room Alarm Engraving P & T Boards	(KBA09/12 17KSC910)	☐
KSC Control Room Alarm window P & T Panels Layout	(KBA09/12 17KSC900)	☐

	Yes	No
Are the alarms installed in the correct positions?	☐	☐
Are the alarm colours correct?	☐	☐
Are the alarm descriptions correct?	☐	☐
Have the alarm cards been updated?	☐	☐

Project Engineering			Operations Support Alarm Co-ordinator		
Name	Signature	Date	Name	Signature	Date

4. PART B – Manufacturing and Installation Specification

4.1 Scope

This specification describes the manufacturing and installation of the design described in Part A of this document.

4.2 References - Installation

Only list references that are applicable to manufacturing and installation, such as procedures, standards and specifications. See below for a list of commonly referenced Koeberg documents. Delete those not applicable and add any additional ones.

4.2.1 KAA-501 : Modifications to Plant, Plant structures or Operating Parameters that Affect the Design Base.

4.2.2 OHSA No 85/93 :Occupational Health And Safety Act No 85 of 1993.

4.2.3 SANS 10086-1:2003 : The installation, inspection and maintenance of equipment used in explosive atmospheres.

4.2.4 SANS 10108 :2002 : The classification of hazardous locations and the selection of apparatus for use in such locations.

4.2.5 SANS 10142-1:2003 : The Wiring of Premises: Part 1.

4.2.6 SANS 9001: Quality Management Systems – Requirements.

4.2.7 ASME NQA-1: Quality Assurance Requirements for Nuclear Facility Applications.

4.2.8 ASME III NB Division 1 : Rules for the Construction of Nuclear Power Plant Components.

4.2.9 ASME B31.1 : Power Piping (State which edition was used.).

4.2.10 KNM-001 : Maintenance Welding Programme.

4.2.11 KWM-MM-MPS-001 :Passivation and Cleaning of Stainless Steel.

4.2.12 KBA 1222 F00 001 : Equipment Marking.

4.2.13 KBA 1215 K00 007 : Technical Specification for Cable Installation.

4.2.14 KBA 1215 K00 031 : Cable-way Equipment According to Trains and Colours.

4.2.15 KBA 1215 K00 037 : Technical Specification of the Local Cable Trays Installation.

4.2.16 KBA 0015 M00 007 : Technical Specification - Earthing Circuits.

4.2.17 DSG-318-019 : Installation and Upgrading of Cable and Pipe Penetration Fire Barriers.

4.2.18 331-170 : Corrosion Protection Maintenance Manual.

4.3 Quality Assurance

Refer to the Bill of Materials in Part C of this document for information regarding the safety class and quality level of specific items.

The designer must ensure that all safety class equipment has appropriate procurement specifications that call for quality assurance programmes that satisfy 10 CFR 50 appendix B such as NQA1. Such procurement specifications must also specify the QADP to be supplied by the manufacturer.

The project manager is responsible for ensuring that the appropriate Safety Class equipment is procured and that the correct Quality Assurance Programme is implemented by the supplier.

Address any implementation quality assurance requirements here, such as special certification or skills required of the installers.

4.4 Interfaces with Existing Plant

This is only to make the installer aware of how this design impacts on the plant. Simply list systems that are impacted by this installation and describe very briefly how they are impacted. DO NOT DESCRIBE HOW TO TEE-IN TO EXISTING PIPEWORK ETC.

4.5 Manufacturing and Preparation

This describes all work that can be done **prior to the actual installation**, e.g. prior to outage. This includes calibration of instruments, manufacturing of supports, programming of PLCs and configuration of electronic equipment such as recorders and indicators.

If codes and standards (e.g. quality assurance) are applicable, list and emphasise them here.

***Note** that electronic equipment that can be configured or programmed must be carefully assessed to ensure that all parameters have been considered. Special consideration should be given to an instrument's behaviour when it goes out of range - does it go fully high or fully low etc. If there is uncertainty about the configuration of any equipment then the designer must be involved in its configuration prior to installation.*

4.6 Installation

A step-by-step process that includes in situ welding and any preparation that can only be done after an isolation. Pulling or removing of any cables must be included here and referenced to an attachment (B2) specifying the cable route complete with Pericles printouts etc.

Specify the plant state required for installation e.g. below state 4, or if it differs for parts of the installation, specify it as required.

If codes and standards (e.g. quality assurance) are applicable, list and emphasise them here.

Remember to include any KIT installation work here.

Note: Special precautions need to be considered and included here.

4.7 Marking and Identification

Note: Allocate trigrams to all equipment that require manipulation by Operating as a minimum.

This is a convenient place to have a table showing trigramme changes. This includes new or removed trigrammes or description changes etc (see tables below). This is also a good place to

reference marking standards and to specify any special marking requirements, e.g. in accordance with Ref. 2.8. A trigramme letter from Configuration Control must be attached. The designer is responsible for the classification assigned to each piece of equipment. The trigramme letter will be provided in exchange for a list as follows:

Remove this table

System	Bigramme	Description	Parent Link	Add/Remove
RRA	MI	Transmitter for RRA 001 PO pump current	Train A	Add
RRA	MI	Transmitter for RRA 002 PO pump current	Train B	Add
RIC	MY	RTD/4-20 mA transducer for RIC 901, 902 MT	RIC	Remove

4.7.1 The cables are to be numbered as follows:

Number	Type	From	To
KIT C 929	4 core 1,5 mm^2	PTR 003 UB	KIT 105 AR
RRA C 911	1 PTB	LHA 51	KIT 109 AR
KIT M 910	2 PTB	KRG 131 AR	KRG 133 AR
KIT C 930	12 core 1,5 mm^2	KIT 102 AR	KIT 105 AR

4.7.2 The new lines are numbered as follows:

Number	Schedule / Thickness	Ø	From	To
PTR 102 TY	40/6,85 mm	50 mm	PTR 003 PO	PTR 001 VB
PTR 202 TY	40/6,85 mm	50 mm	PTR 001 PO	PTR 023 VB
PTR 103 TY	40/6,85 mm	50 mm	PTR 002 PO	PTR 006 VB
PTR 204 TY	40/6,85 mm	50 mm	PTR 003 PO	PTR 205 VB

4.7.3 New trigrammes have been allocated as follows:

Trigramme	Description	Parent Link
RRA 001 MI	Transmitter for RRA 001 PO pump current	RRA Train A
RRA 002 MI	Transmitter for RRA 002 PO pump current	RRA Train B
RIC 001 MY	RTD/4-20 mA transducer for RIC 901, 902 MT	RIC

4.7.4 The following trigrammes have been deleted:

Trigramme	Description
RRA 001 MP	Transmitter for RRA 001 PO pump pressure
RRA 002 MN	Transmitter for RRA 002 PO pump flow

RIC 001 ST	Temperature switch

4.8 Verifications and Tests

Note that this **DOES NOT** include calibration of instruments or programming of PLCs and configuration of electronic equipment such as recorders and indicators. That all belongs in § 5.0.

The testing must be adequate to ensure that the installation has been done correctly. The testing should be designed to validate assumptions made in Part A §2.3.

All of the tests that are required to demonstrate that the equipment performs its design function/s should be listed here as well as the acceptance criteria. The tests can be described in this section or be provided as an attachment. NOTE: this information must be provided with the design and any changes made after the design has been authorised need to be reviewed by the Eskom reviewer.

Consider logic set and reset times if such exist when drawing up the test requirements. Ensure that the test parameters remain within the analysed plant limits and do not cause any of the existing setpoints to be exceeded. Note that these test instructions will be used to complete KFA-006 and must be complete in the design. Simulator testing must also be discussed in this section.

Any ASME XI leak checks done in lieu of hydro tests must be justified here, for NNR approval.

4.8.1 Tests Required

List the parameters that need to be verified, the functionality that must be proven and the acceptance criteria. Where measurements or readings are to be taken, specify the precision as '± 3 mm' for example.

4.8.1.1

4.8.1.2

4.8.2 Description of Tests

Specify how to perform the tests listed in §8.1. Use numbers to match §8.1 numbers.

4.8.2.1

4.8.2.2

4.9 Documentation

Generally, specify that all documents listed on the DCIF should be updated and available as soon after commissioning as possible and that the project manager is to ensure that all documents accurately reflect the as-built status of the plant. More importantly, list the specific documentation requirements of the project.

Note: The provision of consultant/contractor supplied drawings is to be in accordance with KBA 0000 G00 1000.

4.10 Packaging, Shipping, Receiving, Storage and Handling

All equipment that does not have specific packaging, shipping, receiving, storage and handling requirements covered by a specification as listed in Part C, in the BOM shall have their requirements prescribed here. In general ASME NQA-1-2000 Subpart 2.2 should be specified as a minimum.

4.11 Part B Manufacturing and Installation Specification Appendix list

Note: Only include attachments applicable to manufacturing and installation. System Design Engineering are no longer responsible for the testing procedure, KFA-006. It is therefore no longer an attachment to the design. However, it is recommended that the designer initiate the testing procedure by listing the steps that are required to satisfy the testing as specified in section 7. (remove this note)

B.1 Cable specifications, routes and Pericles printouts.

B.2 Trigramme Allocation/Deletion Letter

B.3 Welding procedure for …

B.4 KIT input allocation letter and KIT Database Modification Forms KFU-PC-009

Concerning Attachment B4

The letter is from Process Computing Technology and will specify core numbers on KIT cables, rack numbers etc and should list the documents that require updating.

Appendix B1 – CABLE SPECIFICATIONS AND ROUTES

Example

1 Cable No. : 1 RCP C939
From : 1 KRG 142 AR (L609)
To : 1 KSA B08 AR (L607)
Length : 30 m
Train : IN
Cable Spec: 9 × 1.5 mm^2 control cable, Non-armoured
Route : 1L609
IND 1L6 6272G, F, E, D,C, B, A
1L6 6152D
1L6 6284L
1L6 6142D, C, B
1L607
1L6 6142A
1L6 6122K, J
IND

2 Cable No. : 1 RCP C939
From : 1 KRG 142 AR (L609)
To : 1 KSA B08 AR (L607)
Length : 30 m
Train : IN
Cable Spec: 9 × 1.5 mm^2 control cable, Non-armoured
Route : 1L609
IND 1L6 6272G, F, E, D,C, B, A
1L6 6152D
1L6 6284L
1L6 6142D, C, B
1L607
1L6 6142A
1L6 6122K, J
IND

Rules to be adhered to:

1 Contact SDE once the cable has been pulled and supply the as-pulled length and route (wherever possible the routes determined by Pericles must be followed).

2 The following specifications shall be consulted as applicable:

KBA 1215 K00 031 – Cable way equipment according to trains and colours.

KBA 1215 K00 007 – Technical specification for cable installation.

KBA 0015 M00 007 – Earthing circuits.

KBA 1215 K00 037 – Technical specification of the local cable trays installation.

SANS 10142-1:2003 – The wiring of premises.

SABS 0198-1988 – The selection, handling and installation of electric power cables of ratings not exceeding 33 kV.

Appendix B2 – TRIGRAMME ALLOCATION / DELETION LETTER

Appendix B3 – WELDING PROCEDURE

Appendix B4 – KIT INPUT ALLOCATION LETTER AND KIT DATABASE MOFICATION FORM, KFU-PC-009

5. PART C – Procurement Specification

No.	DESCRIPTION	TRIGRAMME	QTY	UMC	SAP No	CLASS	SPEC No.	SUPPLIER	ESTIMATED UNIT COST	TOTAL COST
1	Unelec FA280M2.B3 Motor with class H insulation	1 RRA 002 M O	2	each	0156261	024/93	DSG-316-215	Framatome	501250	1025000
2										
3										
4										
5										
6										
7										
8										
									TOTAL	

Classification and Specification numbers added by : _____ J Soap

(The designer is responsible for assignation of the correct classification and specification numbers.)

NOTES:

1. When requesting cost estimates from suppliers ask for budget prices only.
2. Let the project supervisor estimate the labour portion of the project.
3. Exact prices of small items are not significant if your total is within about 5%. Usually, getting quotes for the expensive items and estimating the consumables prices is probably sufficient.
4. If you have pages of items all with the same classification and specification numbers it is probably wrong.
5. New component types must be supplied with a BOM by the manufacturer, preferably with a General Arrangement drawing (this is for the hardware breakdown structure). This BOM must include part numbers.

5.1 Part C Procurement Specification Appendix list

Only include attachments applicable to materials and procurement, such as data sheets, specific ordering information and special specifications for custom-made equipment, cabinets etc.

C.1 Data sheet for M-System 6CT transducer.

C.2 Data sheet for Weidmuller MiniCoupler RTD transmitter.

C.3 Data sheet for ITT Cannon plugs etc.

C.4 SAP UPDATE CHECKLIST (Doc. No.: 331-516 on Hyperwave)

C.5 SAP HARDWARE BREAKDOWN STRUCTURE (Doc. No.: 331-515 on Hyperwave)

Appendix C1 – DATASHEETS…

6. PART D - Other Attachments

Include attachments here that are applicable to the whole design package rather than to a particular section. With the exception of D1 and D2 these attachments are likely to be non-essential parts of the design package. Typically these would include details from relevant catalogues, transcripts, sketches, minutes of formal and informal meetings, and any other supporting information used for the design. These attachments are added to assist the reviewing engineer in his review of the design.

The following attachments form part of this package and are included in this document.

D.1 Documentation Change Identification Form (DCIF) (331-212)

D.2 Project Team Concurrence List

Concerning Attachment D1

Ensure that the DCIF is a COMPLETE and COMPREHENSIVE list of drawings/documents to be changed in accordance with the DCIF checklist.

Remember to group DDRs by unit on the DCIF.

The following documents are to be 'issued to Ops':

- flow diagrams;
- logic diagrams;
- set-point manuals;
- feeder diagrams and board outage sheets;
- SIP/SIN drawings;
- other documents in a similar category.

See the form ‘Guidance on Configuration Control for Plant Modifications’ located on G:\Nuclear Engineering\Design Eng\Masters for a list of possible documents.
The Manufacturers / Suppliers Catalogue form (331-216) should be used for any updates related to Maintenance Manuals. System Design Engineering is responsible for providing information for 331-216. The Manufacturers / Suppliers Catalogue form (331-216) must be completed when new documents are to be added to the Maintenance Manuals.

Documentation updates for outage related modifications

If the document is unit specific eg KBA 0117 ASG 036, there is no problem.

Create **2 DDR's** for common documents - one for the unit 1 implementation and one for the unit 2 implementation. Remember that the implementation could occur in the reverse order if the mod is withdrawn from an outage. For this reason do not show markups with splitting and unsplitting – the markups are identical for both DDRs (unless the process is non-standard). **Ensure that the DDR has "Unit 1 Implementation" in the instructions and include generic instructions such as "split/unsplit". You could also write "split/unsplit" on the appropriate pages of the markups**. The drawing office will process a split or unsplit instruction using the standard method.

DESIGNER SHALL COMPLETE FORM KFT-004 AND SUBMIT TO TMG FOR A TRAINING CHANGE REQUEST NUMBER (TCR) WHICH SHALL BE LISTED IN THE DCIF. NOTE: ALL DESIGNS REQUIRE A TCR NUMBER IN THE DCIF.

Appendix D1 – DOCUMENTATION CHANGE IDENTIFICATION FORM (DCIF)

Use form 331-212 (KFA-067) – available on Hyperwave and attach.

Appendix D2 – PROJECT TEAM CONCURRENCE

Each member of the project identified in the table below. Team members are required to complete and sign KFU-027 (240-119523820), the team is only Project Team Review Report. Each completed form is then added to KFU-026 the Detailed Design Review Report.

Group	Name	Signature
System Engineer		
Operations Support		
Maintenance		
Component Engineering		
Process Computing		
Project Engineering		
OTS	T Booysen	
SAR	M Francis	
OPG	M Lyle	
Civil Engineer		
Mechanical Engineer		
Electrical Engineer		
C&I Engineer		
KSA custodian	S Dorman	
Hazloc - Committee Chairman or Representative		
Fire Risk Management	R Barnes	
ALARA		
SAMG	L Ndube	
Equipment Qualification and other Programmes (Incl. ISI, IST, FAC, Ageing Matrix and MIC)	K Moroka	
PSA	S Fagan	

(The designer may write N/A and sign in the name field where the modification clearly does not require concurrence from Fire Risk Management. The designer shall ensure that the design package shall be seen by all the engineering disciplines as indicated in the table above - **remove this note).**

NOTE: Concurrence reviewers will also concur that the documents identified in the DCIF reflect a complete set of documents requiring revision due to the modification.

7. Revisions

Note: Start with the latest Revision History in the first row and go backwards.

Date	Rev.	Compiler	Remarks
Month 20xx	X	Insert initials and surname.	Specify reasons for compiling of document.
Month 20xx	X	Insert initials and surname.	Specify reasons for revision of document. List all changes to the document, as well as authorities for these changes.

8. Development Team

The following people were involved in the development of this document:

- Insert text here

9. Acknowledgements

Insert text here.