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1. INTRODUCTION

This engineering drawing standard establishes the protocol to be adhered to by Gx engineering and drafting personnel in the preparation, revision, and completion of engineering drawings. The requirements specified in this document are key to the standardisation of practices and to a consistent interpretation of drawings.

An **engineering drawing**, a type of technical drawing, is used to fully and clearly define requirements for items to be engineered or manufactured.

Engineering drawing (the activity of drafting) produces engineering drawings. More than merely the drawing of pictures, it is also a type of language, a graphical language that communicates ideas and information from one mind to another. Most importantly, it communicates all needed information from the engineer who designed a part to the people who will make it.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document defines general rules and code of practices to be followed by all engineering designers and drafters to produce drawings of consistent and professional quality. The accuracy and adequacy of the design and drafting work and its compliance with the applicable standards remain the responsibility of the designer or draftsman. Nothing contained in this standard shall be construed as relieving the designer or drafter of the individual responsibility for producing quality drawings.

2.1.1 Purpose

The purpose of this document is to define the requirements that must be followed by all internal Eskom Drawing offices(s) and Contractors, for production and control of all Generation Drawings.

2.1.2 Applicability

This document shall apply throughout Eskom Generation, Generation Engineering and All Eskom Contractors.

2.2 NORMATIVE/INFORMATIVE REFERENCES

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

2.2.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] SANS 10111 Engineering Drawings
- [3] 240-85194150 – EPSS CADD Office Work Request form
- [4] 240-73143217 Eskom RDS-PP Coding Standard
- [5] 240-131050729 AKZX Hybrid Coding Standard
- [6] 240-93576498 KKS Coding Standard
- [7] 240-71432150 Plant Labelling Standard
- [8] 240-58552870 SmartPlant for Owner Operators (SPO) Document Metadata Standard
- [9] 240-53113685 Design Review Procedure

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- [10] 240-141007195 Electronic Signature Usage Policy
- [11] 240-54179170 Technical Document Classification and Designation Standard
- [12] 331-85 Design Documentation Change Process
- [13] 240 – 53114002 Engineering Change Management Procedure
- [14] 240 – 53114026 Project Engineering Change Management Procedure

2.2.2 Informative

- [15] 240-83904158 – CADD Office Workflow Guideline
- [16] 32-6 Eskom Documentation Management Procedure
- [17] 36-1 Standard for Management Systems Document, Correspondence and Records
- [18] 36-2 Writing and Controlling Management Systems Documents
- [19] 240-109607662 Eskom Plant Labelling Abbreviation Standard
- [20] 240-109607942 Eskom RDS-PP Key Part Standard
- [21] 240-110409882 Functional Specification for SharePoint Portal in support of SPO Transmittal Management
- [22] 240-110409934 User Requirements Specification (URS) for a Collaboration Platform to supplement SmartPlant
- [23] Code of conduct for Registered Persons: Engineering Profession Act, 200 (Act No. 46 of 2000)

2.3 DEFINITIONS

Definition	Description
As Built Drawing	Drawing which is verified as an exact representation of a plant or a section of a plant that has been completely built.
Approve	The functional responsible person determines if the document is fit for purpose and approves the document content and therefore takes responsibility and accountability for the document content.
Authorise	The document authoriser authorises the release and application of the document and is accountable for document implementation.
Check Print	Drawing which is printed and utilized for verification of a drawing during the drawing checking procedure.
Contractor	A party appointed by Eskom to render services.
Controlled Copy	A copy of a document held by a documentation/satellite centre or by a designated individual that has the guarantee that it is the latest and current valid revision. This copy shall be clearly stamped in red 'CONTROLLED COPY'. All controlled documents that are printed will be considered valid for a maximum period of 24 hours. Users shall always reference back to the EDMS for the latest version of a document.
Deviation/Notification Process	This process is the initiator of engineering activities to permanently address plant deficiencies or incidents.
Draftsperson	A person responsible for the creation and updating of drawings, in accordance with this standard.
Functional Process Flow Diagram (FPFD)	Diagram showing all or a recognizable portion of the process, complete with a material and/or heat balance sheet. It contains details of operating parameters such as flow rate, temperature and pressure.

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Definition	Description
Piping and Instrumentation Diagram (P&ID)	Diagram which shows limited details of the mechanical and electrical components, pipework and ducting, and identifies all the measuring points and control elements that are necessary to measure and control that process.
Plant System	A collection of plant components connected in such a way that each will perform a unique process, thereby achieving specified performance parameters.
Preliminary	A drawing which is produced to convey ideas and proposals and has not been accepted/approved for any established design base.
Primary Process Flow Diagram (PPFD)	Diagram which indicates the major process as well as the process values through all or most of the main plant items of a given power station or system.
Project Configuration Files	The customized set-up files that must be utilized in conjunction standard Eskom tools Piping and Instrumentation Diagram/Process and Instrumentation Diagram (P&ID).
Secondary Process Flow Diagram (SPFD)	Secondary process flow diagram is similar to the Primary Process Flow Diagram (PPFD), except that it only deals with one particular system or subsystem of plant, and in more detail.
Text Tagging	For the purposes of this standard Text Tagging shall be the process of adding electronic text tags into a CAD drawing. .

2.3.1 Disclosure Classification

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2.4 ABBREVIATIONS

Abbreviation	Description
AKZ	Anlagen Kenn Zeichnungs System (Identification System for Power Stations)
BU	Business Unit
CAD	Computer Aided Drafting
DGN	Bentley MicroStation Drawing File Extension
DWG	AutoCAD Drawing File Extensions
DXF	Universal file for interoperability
ECSA	Engineering Council South Africa
ECN	Engineering Change Notice
EDMS	Electronic Document Management System
EPSS	Engineering Process & System Support
IEC	International Electrotechnical Commission
KKS	Kraftwerk Kennzeichen System (Identification System for Power Stations)
MDL	Master Document List
MWP	Megawatt Park
NCR	Non-conformance Report
OHSA	Occupational Health and Safety Act of 1993
PBS	Plant Breakdown Structure

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Abbreviation	Description
PDF	Adobe Portable Document Format
Pr Eng	Professional Engineer registered in terms of the Engineering Profession Act, 2000
Pr Tech Eng	Professional Engineering Technologist registered in terms of the Engineering Profession Act, 2000
RDS-PP	Reference Designation Systems for Power Plant (Wind Farm)
RFQ	Request for Quote
SoW	Scope of Work
TIFF	Tagged Image File Format

2.5 RELATED/SUPPORTING DOCUMENTS

2.5.1 Superseded Standards

The following Eskom Standards are superseded by this document.

Document No.	Title
167A/143	Drawing Office Practice
GGG 0450	Guideline to Acceptance of Contract Drawings
GGG 0182	Process Flow Diagrams and Piping Instrumentation Diagrams
GGG 0315	Standard Drawing Practice
GGG 0441	Drawing Records System
GSE/94/Y004	Standard Drawing Practice
36-943	Generation Engineering Drawing Office and Engineering Documentation Standard
45-698	Engineering Computer Aided Design Drafting Standard

2.5.2 Consolidated Reference Standards

This document combined with the following standards and standard instructions:

Document No.	Revision	Title
36-943	Latest	Generation Engineering Drawing Office and Engineering Documentation Standard

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3. GENERAL DRAWING STANDARD

The purpose of this section is to define the requirements that must be followed by Eskom drawing office(s) and Contractor's drawing office staff when producing drawings for Eskom.

3.1 DRAWING TYPES

General Drawings are seen as drawings of General Arrangement, Sectional Views and Detail Drawings of the following:

- Architectural
- Civil
- Structural
- Mechanical
- Machining
- Welding Instructions
- Piping
- Heating, Ventilation and Air-conditioning (HVAC)
- Electrical
- Lighting & Small Power
- Control and Instrumentation (C&I)
- Mapping GIS

3.2 DRAWING DETAILING

The requirements for specific drawing documents are specified in the following paragraphs.

- All drawings produced by Eskom and/or any of its contractors shall adhere to South African law and standards that are in force when the drawing is produced. This includes but is not limited to the use of internal approved standards.
- Drafting of General Drawings, including Text-Tagged Drawings shall be done in accordance with this standard.
- General Drawings shall be produced on the appropriate document size that will ensure legibility and clarity of users on the contents of the drawings.

The following best practice shall be applied in the creation of drawings:

- Drawings shall be properly planned and produced to ensure ease of interpretation and read-ability.
- Typical details are not to be duplicated. Appropriate references shall be used in the main drawing to indicate repetition of any typical details.
- The use of unnecessary views shall be eliminated.
- Application of a constant set of scales on sets of drawings.
- Avoidance of odd scales, use the SANS 10111 scales such as 1:1, 1:50, 1:20, 1:10, 1:2, 2:1
- Provision of cross-reference information shall be provided on drawings, i.e. reference to other drawings
- Manufacturer's information and datasheets shall be provided in a software format and version specified by Eskom.

3.3 CODIFICATION

Coding shall be done according to [4], [5] and [6] for the various plant in Generation.

3.4 CLASSIFICATION OF DRAWINGS

a) Drawings shall be classified according to the following information classification levels:

i. Class 1

Secret: Only for use within specified segments in the organization

3. Class 2

Confidential: May not be disclosed outside of Eskom – represents a competitive advantage for the business.

3. Class 3

Controlled Disclosure: Internal Information – controlled disclosure to any external parties – either enforced by law or discretionary

iv. Class 4

Public Domain/Non-classified: Published in any public forum without constraints, either enforced by law or discretionary

b) This classification shall form part of the document record Meta data and user access to the drawing(s) will be restricted accordingly.

3.5 DRAWING CHANGE REQUEST

All Eskom drawing offices as well as Contractor's drawings offices shall comply with the respective Divisional Work Instructions. This shall be documented clearly and must comply with Eskom's minimum change control rules.

For drawing changes, a request and scope of work is supplied by the customer to the CADD Office. Generation CADD Office Work Request form [3] will be completed in full and returned to customer for approval of time and costs. The customer will sign acceptance and return to the CADD office for commencement of work. On completion of work the draftsperson will send a copy to the customer for checking and approval. Once all work is complete the customer will receive a signed copy and the native file of the drawings and on receipt of these, the customer will sign off the original request form, that he received all work as per original request. The draftsperson shall send the drawings for archiving and storage.

Drawing changes for all generation plants are managed through Engineering Change Management (ECM) procedure[12]. Design changes for Koeberg power station are managed through design documentation change process[13]. For project related changes that result in changes to the design base which includes drawings, changes shall be done according to Project Engineering Change Procedure [14].

3.6 DRAWING APPROVAL

The overarching procedure governing drawings reviews is the Design Review Procedure [9]. The approval of the drawings shall be done only by the professional engineer/technologist appointed by the Design Authority for the project. By approving, the registered person appointed by the Design Authority takes accountability of the drawings and the technical content. The Design Authority could be internal to Eskom performed by Generation Engineering or by the external contractor.

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Generation Engineering through interim design reviews shall either Accept or Not accept drawings generated or updated for a particular project. The acceptance or non-acceptance shall be done as per the workflow process implemented in the Engineering Design and Document Management System (EDDMS).

3.7 DRAWING WORKFLOW

The issuing, updating and creating of drawings shall be done in accordance with the generic workflow as per the CAD office Workflow Guideline [15].

3.8 REQUEST FOR DRAWINGS BY EXTERNAL PARTIES

Should any drawing be required by a contractor or third party, the Eskom non-disclosure confidentiality agreement form must be signed off by the contractor or third party and sent to the designated Eskom drawing office document controller prior to the drawing being issued issuing of drawings/transmittals.

During plant design and development, as well as operations and maintenance of a plant, it is expected that numerous projects would be initiated for various purposes. These projects typically involve third-party contractors (EPCs, vendors, etc.), who work with and generate Eskom information. The exchange of information between Eskom and third-parties is typically carried out through Transmittal events. These Transmittals, as well as the associated drawings and documents, are captured in Engineering Design and Document Management System (EDDMS) which is SmartPlant for Owner Operators (SPO) either as Incoming Transmittals (information being submitted to Eskom by third-party contractors), or as Outgoing Transmittals (information being submitted by Eskom to third-party contractors).

In order to centralise the storage and dissemination of information submitted to Eskom as part of transmittals, the business adopts a centralised collaboration platform where such information can be managed effectively prior to loading to the relevant destination system (SPO, Hyperwave, etc.).

Microsoft ® SharePoint™ ("SharePoint") will be leveraged to enhance Transmittal Management, by providing a supplemental platform for receiving information submitted to Eskom through traditional channels (hard-copy, flash drives, email, Zendto) as well as a new mechanism for direct upload of information to Eskom. The information is required to be managed prior to loading into the relevant destination system. SharePoint will also serve as an externally accessible platform to enhance the security and traceability of data submission to third-party contractors once downloaded from the source Eskom system, and to automate the submission of a download link to the third -party contractor. Eskom Generation or Asset Management Technology makes use of a SharePoint Transmittal Management system. Acknowledgement of receipt will happen automatically within the SharePoint environment. See Doc Number [21] and [22] for further details.

Third-party contractors' will continue to submit files in hard copy accompanied by soft copies/native files or on removable media (e.g. CD or Flash drive) to Eskom due to file sizes, network constraints, etc. that prevent the submission of information to Eskom via email channels or through the new SharePoint site.

3.9 ISSUING OF NEW DRAWING NUMBERS

- a) Request for drawing number shall be requested in writing to the designated Eskom Document controller. All drawing numbers will be centrally allocated for all plants and projects with a designated document/drawing controller that will assign the drawing numbers.
- b) Under no circumstance will the requester be allowed to change drawing titles or the drawing for a purpose other than what was requested, without approval from Eskom allocated document controllers.

3.10 SUPERSEDED OR CANCELLED DRAWINGS

- a) A superseded or cancelled drawing is one that is no longer in use.
- b) It is important to note that when a drawing has been registered and an identification number has been allocated, this cannot be changed once it has been distributed or authorized. This changed status of the document must be captured in the MRI (master Record Index) of drawings for the relevant status, and if it is a controlled copy, the necessary notification that the drawing has been cancelled or superseded must be issued as part of the process. All superseded drawings shall be marked clearly 'superseded by the new drawing number'. Conversely, a drawing which supersedes another must clearly state the number of that drawing which it supersedes. A revision must be added.
- c) All superseded or cancelled drawings are to be retained in the archive system.
- d) A superseded or cancelled drawing numbers shall never be used for any other created drawings. These numbers will remain dormant.
- e) If drawing numbers are allocated as a batch the requestor must provide Eskom with a Fully Detailed MDL providing all the required meta-data needed to complete the drawing record in the EDDMS.

3.11 DRAWING CHECKING PROCEDURE

The following is a guideline to be followed to check all drawings:

- a) Once the draftsman has completed a drawing, a check print must be issued to the responsible engineer or Chief Draftsman. The check print must be clearly stamped 'CHECK PRINT'.

The responsible engineer or Chief Draftsman must check the drawing against the relevant marked up drawing. This should be done with the relevant stakeholders to ensure due process and standards have been applied and the physical drawing content is acceptable. If the electronic functionality like SPO "View and Mark-up" are used the same rules for mark/correction will apply. Checks include:

- i. With the codification officer to ensure that all tagged items comply with the site codification system as required.
- ii. The check by an alternate draftsman is performed to ensure that the drawing standards are adhered to and that all the marked-up items have been incorporated as required.
- iii. A standard checklist for drawings APPENDIX B: DRAWING CHECKLIST shall be used as a basis for checking that the drawing standards are adhered to.
- iv. The checks done by the Drawing Office checkers, the data controllers and the responsible engineer are to ensure that the design changes are incorporated as required.
- v. Once the responsible engineer or draftsman has completed checking a drawing, the check print must be signed and dated, and the full name of the checker must be recorded on the drawing.
- vi. The drawing must then be returned to the responsible draftsman. All discrepancies or queries must be clearly marked up utilizing the following colour code system, and reviewed with the responsible draftsman:
 - Red - Corrections or Add info
 - Yellow - Delete
 - Blue - Comments (will not be drafted)
 - Green - Correct

- b) The drafterperson must back-draft the 'CHECK PRINT' drawing and reissue the drawing to the responsible engineer or DO Supervisor as a revised 'CHECK PRINT' for rechecking. Once no more discrepancies are marked up on the 'CHECK PRINT' by the responsible engineer or DO Supervisor and he/she has signed off the drawing, the drawing is ready to be issued for authorization and approval.
- c) If required, the drawing must be issued to Eskom for checking in accordance with paragraph 0.
- d) Each drawing issued to Eskom for checking must be issued together with a Transmittal Form.
- e) Each drawing issued to Eskom for checking must be clearly stamped 'CHECK PRINT'.
- f) A responsible engineer or drafterperson to check the drawing and resolve all the items listed on the markup.
- g) If required, the drawing must be issued to the Contractor or responsible Drawing Office for updating/back-drafting
- h) Once a checked drawing is received, the responsible drafterperson will review the drawing and revise the drawing accordingly.
- i) The drawing must then be rechecked in accordance with this procedure.
- j) Once all the marked-up changes are on the drawing have been resolved by Eskom, the drawing will be reviewed, authorized and approved in accordance with the applicable workflow stipulated in 240-83904158 – CADD Office Workflow Guideline.

3.12 NONCONFORMANCE REPORTING

To be done according to Eskom Approved NCR process as outlined by [1] ISO9001.

3.13 CAD SOFTWARE REQUIREMENT

Eskom standard CAD software applicable is (Microstation and SmartPlant Enterprise).

3.14 ELECTRONIC FORMAT OF DRAWINGS ISSUED TO ESKOM

- a) All drawings submitted to Eskom shall comply with Eskom Standard drawing applications version, at that specific time.
- b) All drawings must be issued to Eskom in both native CADD, .dgn format and PDF/TIF format, on each submission
- c) PDF/TIF files must be created using the native CADD program
- d) Drawings issued to Eskom may not be "Write Protected" or encrypted as Eskom must do the necessary configuration management on these documents upon receipt.

3.15 DATA INTEGRITY OF DRAWINGS

Contractors shall submit drawings that are in line with Eskom standard software in paragraph 3.13. The contractor shall perform Quality Check on their submission and to make sure that drawings are not distorted and or loss of any data.

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3.16 REGISTRATION OF DRAWINGS

- a) All drawings must be registered by Eskom on the Electronic Document Management System (EDMS) See paragraph 6.1 Minimum Drawing Meta-data required. See [8].
- b) Contractors shall maintain a Drawing Register which records at least the following information in line with SPO/EDMS requirements:
 - Eskom Drawing Number.
 - Contractor Drawing Number
 - Eskom Change Request Number.
 - Drawing Title.
 - Filename.
 - Contractor Revision.
 - Eskom Revision.
- c) The Contractor's drawing register must be made available to Eskom for audit on request.

3.17 REVISION CONTROL

The drawing revision shall be clearly identified by placing a Revision Triangle and Revision Letter or Number, in the revised area(s) of the drawing. A brief but informative statement of the revision made, and where applicable the appropriate change order, project or other reference code, shall be shown in revision block. It is to be noted NO preceding "0" is required before revs 0-9. The system sequentially counts for this. For each Revision on a PRELIMINARY basis prior to implementation and verification of the AS-BUILT status the use of an numeric followed by an alpha shall be used e.g. 0a, 0b, 0c, 0d etc with a specific revision cell added to the sheet so as to capture all the revision information between the AS-BUILT statuses.

The following is also applicable to drawing revisions;

- The Eskom revision number will be revised by the Draftsman and captured by the designated Eskom Document Controller once a change has been registered and closed out in accordance with the Eskom EDMS requirements.
- All Eskom drawings revisions must be numeric. No alpha characters will be used with drawing numbers
- Eskom revision numbers cannot be created or changed by Contractors.
- Each revision of the drawing shall increase the revision number sequentially.
- Each revision of a drawing shall be accompanied with a list of the comments made by the Employer on the previous revision, if applicable and the response/corrective action taken by the Contractor.

3.17.1 Drawing Revision Status

Drawing revision shall be done as per the below in line the design review procedure described in [9].

Project Phase	Engineering Baseline	Drawing Status	Revision Number	
Concept	SRD	Preliminary	0a,b,c	+0a,b,c Increment
	Concept	Preliminary	0a,b,c	+0a,b,c Increment
Definition	Basic	Preliminary	0a,b,c	+0a,b,c Increment
Execution	Contract Award	Preliminary	0a,b,c	+0.a,b,c Increment
	Detailed Design	Preliminary	0a,b,c	+0.a,b,c Increment
	IDR	Issue for Construction	0	+0.1 Increment to 1
	As Built	As Built	1	+0.1 Increment to 2
	Handover	As Built	1	+0.1 Increment to 2

Table 1: Revision Table

3.17.2 Revision Detailing

Whenever there is engineering change that results in drawing update, the updated part or section of the drawing will be marked with a cloud and the revision triangle placed along to identify the affected part of plant/system.

The revision cloud shall be removed once change or modification has been implemented and the 'As Built' drawing is generated. Once the update is accepted the cloud will be removed.

3.17.3 Drawing Status Stamps

The use of drawing "status stamps" a watermark, rubber stamp, or cell may be used. Only the following list of stamps shall be used:

- PRELIMINARY
- ISSUED FOR TENDER
- ISSUED FOR INFORMATION ONLY
- ISSUED FOR CONSTRUCTION
- AS BUILT

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- CONTROLLED COPY
- SUPERSEDED
- CANCELLED
- Controlled Copy
- CHECK PRINT

3.17.4 Revision Information for Eskom Title Block

The following information must be completed each time a drawing is revised by Eskom.

- Accredited drawing office abbreviation.
- Revision number.
- Date of revision.
- Brief description of the revision.
- Draftsperson's initials.
- Checker's initials.
- Authorizer's initials.
- Approver's initials.
- Codification approver's initials.

3.17.5 Revision Information for Contractor Title Block

The following information must be completed each time a drawing is revised by a Contractor:

- Revision number.
- Date of revision.
- Brief description of the revision.
- Draftsperson's initials.
- Checker's initials.
- Authorizer's initials.
- Approver's initials.

3.17.6 Document classification

All drawings shall be classified as the technical documentation classification and designation standard [11]. For example, piping and instrumentation (P&ID) classification number D000043.

3.18 SIGNATURE APPLICATION ON DRAWINGS

Drawings that are still in developmental phase (preliminary) will be signed physically or through the electronic signature (e.g. Adobe). The phase could include approved for concept design, basic or detail design. Once the drawing has been approved through the design review process and is ready to be issued for construction/manufacturing, the drawing shall be signed only through physical/manual signature process or Eskom Electronic Signature System (EESS) as described in [10].

Legacy drawings or “As Built” drawings that are updated according to the engineering change process for plant modification or maintenance shall be signed manually or by electronic signature during revision. Once the update copy has been finalised through review process, the revised copy shall be signed manually or using EESS.

The originator and other persons involved in production of the drawing shall apply their legal signature on the final issue.

3.19 CONTRACTOR INFORMATION BACKUP

- a) The Contractor must ensure that all drawing data is backed up on a regular basis.
- b) The Contractor shall advise Eskom which backup methodology will be utilized, and this backup methodology must be in a format accessible to Eskom.
- c) The maximum period between backups must not exceed 24 hours.
- d) The backups must be carried out utilizing an off-site rotating backup system.

3.20 STANDARD SEED FILES

It is imperative all contractors/sub-contractor and Eskom staff make use of the Eskom Standard Drawing Seed in creation of all drawings.

3.20.1 Layer, Colours and Line Weights

The draftsperson must ensure that the layers as stipulated in 0 are adhered to.

Should the named levels not be sufficient to complete, the spare drawing layers can be utilised or to the specific Generation requirements. Colour and line weights should be done according to discipline and Generation specification.

3.20.2 Standard Text

- a) The name of the standard text style is “TextDetail” for normal text or “TextHeading” for heading text and shall be used with the following attributes:

- font ESCOMFT82 or, where Eskom font is unavailable, Arial.

-Level “TextDetail” or “TextHeading”

- Line weight 1
- Line style 0
- Colour 0.
- Text size, 2.5 x 2 for “TextDetail” and 3.5 x 2.5 for “TextHeading”
- ESCOMFT82 must be added to the system folder after the software installation.

For V8i – C:\ProgramData\Bentley\DescartesStandAlone V8i (SELECTseries 5)\Workspace\System\Fonts

For CONNECT Edition – C:\Program Files\Bentley\Bentley Descartes CONNECT Edition\DescartesStandAlone\Default\Fonts

3.20.3 Standard Dimension Style

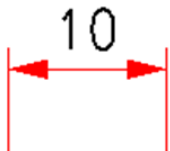
- The drafterperson must use the appropriate dimension style for all dimensioning.
- The dimension style uses the 'TextDetail' text style and will therefore be adjusted to the same settings.
- The drafterperson must ensure that the correct level is selected when placing dimensions (level name "Dimensions", level number 22).

DIMENSION STYLES

- Dimensions to be assigned to the level named "Dimensions"
- Dimension lines to be weight 0, style 0, red (colour 3)
- All text to follow the "TextDetail" text style
- Extension line offset and Extension to be set at 0.5 (0.5 x text height = 1.25mm)
- where dimensions are less than 1mm, A leading 0 shall be applied e.g. 0.1mm
- All arrow heads shall have a length of 1 (1 x text height = 2.5mm) and width of 0.5 (0.5 x text height = 1.25mm)
- Dimensions attributes are to follow the Eskom standard dimension styles named and listed as follows:

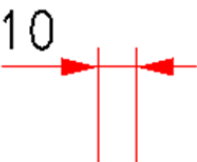
"Standard dimensions"

- To be used as typical dimension style



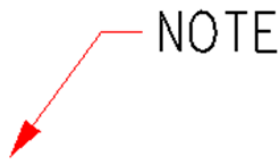
"Small Dimensions"

- Dimension style with reversed arrow heads to be used for dimensions where the dimension text can no longer fit between extension lines without arrow heads clashing

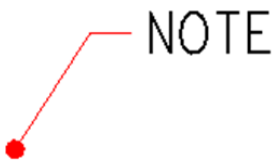


"Notes Arrow"

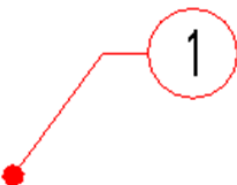
- To be used to add notes with an arrow pertaining to content of the drawing view/detail terminated on the edge of the item
- Within reason, a leader line with a length of 1 (1 x text height = 2.5mm) with an offset of 0.5 (0.5 x text height = 1.25mm) shall be used

**“Notes Dot”**

- To be used to add notes with an arrow pertaining to content of the drawing view/detail terminated on the surface of the item
- Within reason, a leader line with a length of 1 (1 x text height = 2.5mm) with an offset of 0.5 (0.5 x text height = 1.25mm) shall be used
- the diameter of the dot shall be 1.25mm. In MicroStation, this equates to an Arrow head height and width set at 2 and the terminator set to “dot”

**“Item number Dot”**

- To be used to indicate item numbers terminated on the surface of the item
- A leader line with a length of 1 (1 x text height = 2.5mm) with an offset of 0.5 (0.5 x text height = 1.25mm) shall be used
- the diameter of the dot shall be 1.25mm. In MicroStation, this equates to an Arrow head height and width set at 2 and the terminator set to “dot”
- The Circle around the item number “Text Frame” shall be set to “Circle” and have a fixed “Frame Scale” of 2 (2 x text height = 5mm Diameter)
- For item numbers greater than 99, a “Frame Scale” of 2.5 will be used

**“Item number Arrow”**

- To be used to indicate item numbers terminated on the edge of the item
- A leader line with a length of 1 (1 x text height = 2.5mm) with an offset of 0.5 (0.5 x text height = 1.25mm) shall be used
- The Circle around the item number “Text Frame” shall be set to “Circle” and have a fixed “Frame Scale” of 2 (2 x text height = 5mm Diameter)
- For item numbers greater than 99, a “Frame Scale” of 2.5 will be used



3.20.4 Abbreviations

Abbreviations shall only be used when necessary due to space limitations and shall follow Eskom standard abbreviation guidelines. See Document 240-109607662 Eskom Plant Labelling Abbreviation Standard.

3.20.5 Projections

Unless directed otherwise, all drawings shall be prepared using Third Angle Projection. Any view deviating from Third Angle shall be clearly titled.

3.20.6 Section and detail labelling

Sectioning and detailing shall be done according to SANS 10111 [2], if there is additional detailing it will be guided by the relevant discipline within Eskom.

3.20.7 Scan Resolution

All scanned documents and drawings are to be clear and legible to a minimum resolution of 200dpi for documents and 300dpi for drawings.

4. STANDARD DRAWING SHEETS AND TITLE BLOCKS

4.1 USE OF MULTIPLE SHEETS

Drawing sheets are used for cases when a group of drawings logically belongs together and should be read in conjunction with each other. Examples would Logic Diagrams, Functional Control Diagrams, Civil Reinforcing drawings and Schedules, etc.

Where sheets are used, the title block should contain the number of sheets. Sheet numbers are numerical e.g.: 0.63/45626 SHEET 1.

Where there are multiple sheets with a number of no less than fifty (50) sheets, an index sheet will be created to capture drawing description of each drawing.

All Eskom drawings sheets sizes shall comply with the ISO standard A0, A1, A2, A3, and A4. Figures 1 and 2. Are to be used unless specified otherwise by the Divisional or Discipline requirements.

A title block is the form on which the actual drawing is a section. The title block includes the border and the various sections for providing quality, administrative and technical information. The importance of the title block cannot be minimized as it includes all the information which enables the drawing to be interpreted, identified and archived.

The title shall include sufficient information to identify the type of drawing e.g. general arrangement, or detail. It shall also clearly describe in a precise way what the drawing portrays.

The notes below relate to the title boxes included in the title block to convey the necessary information.

The basic requirements for a title block located at the bottom right of a drawing are:

- These items shall be written in a rectangle which is at the most 190mm wide.
- The drawing shall also include a symbol identifying the projection. The main scale and the linear dimension units if other than “mm”.

4.2 TITLING OF DRAWINGS

It is most important that the drawing title accurately describes what appears on the drawing since the title will be used as the basis for any electronic search in the Drawing Management System in the future. Generic titles or generalisations should be avoided. Be specific and use words in the title that will help to identify the drawing at a later stage.

To ensure compatible, consistent and meaningful titles are used, titles shall consist of a minimum of three lines as follows:

1st line – Plant Name

2nd line – Equipment, Type or Service Description

3rd line – Specific description of the items or detail depicted by the drawing

4.3 ESKOM STANDARD TITLE BLOCK


		-	-									P
(E1)	(E2)	(E3)		(E4)	(E5)	(E6)	(E7)	(E8)	(F1)	(F2)		
D.O.	REV	DATE	** REVISION **				REV BY	CHKD BY	KKS APPR	APPR BY	REFERENCE DRAWINGS	
APPROVED BY:			CLASSIFICATION				POWER STATION NAME (A1) DRAWING TYPE (A2) UNIT XX/AREA (A3) DESCRIPTION (A4) DESCRIPTION (A4)					Q
(B5) INITIAL AND SURNAME:			(A11)									
(B6) PR ENG/PR TECH ENG No.:			(A12)									
(B7) DATE: - -			(D3)									
(B8) SIGNATURE:												
CODIFICATION BY:												
(C1) (C2)			(D2)									
CHECKED BY:												
(B3) (B4)												
CREATED BY:			ESKOM DRAWING No.					SHT	REV			
(B1) (B2)								(A7)	(A8)			
SCALE		(A10)	(D1)	ESKOM HOLDINGS SOC Ltd REG No 2002/015527/30								
19			20			21			22	(A9)	AOL	
DRAWING CLASSIFICATION: CONTROLLED DISCLOSURE												

Figure 1: Standard Title Block

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4.4 CONTRACTORS TITLE BLOCK


		-	-									P
		-	-									
(E1)	(E2)	(E3)		(E4)		(E5)	(E6)	(E7)	(E8)	(F1)	(F2)	
D.O.	REV	DATE	** REVISION **				REV BY	CHKD BY	KKS APPR	APPR BY	REFERENCE DRAWINGS	
APPROVED BY:				CLASSIFICATION				POWER STATION NAME (A1) DRAWING TYPE (A2) UNIT XX/AREA (A3) DESCRIPTION (A4) DESCRIPTION (A4)				
(B5) INITIAL AND SURNAME:				(A11)								
(B6) PR ENG/PR TECH ENG No.:				PBS PATH (A12)								
(B7) DATE: - -				(D3)								
(B8) SIGNATURE:				(D3)								
CODIFICATION BY:								CONTRACTOR DRAWING No. (A5)				
(C1) (C2)				(D2)								
CHECKED BY:								ESKOM DRAWING No. (A6)				
(B3) (B4)				 Eskom								
CREATED BY:								SHT (A7) REV (A8)				
(B1) (B2)				(D1)								
SCALE		(A10)		ESKOM HOLDINGS SOC Ltd REG No 2002/015527/30				(A9)				
19				20				21			22	AOL
DRAWING CLASSIFICATION: CONTROLLED DISCLOSURE												

Figure 2: Contractors Title Block

4.5 DESCRIPTION FOR COMPLETING TITLE BLOCK

Table 2: Description detail for Title Block

Item No.	Field Description
DRAWING INFORMATION	
A1	POWER STATION NAME / SUB STATION NAME OR DISTRIBUTION STATION NAME e.g. MEDUPI POWER STATION
A2	DRAWING TYPE Indicates the type of drawing: P&ID, ISO, GA, etc.
A3	UNIT XX / AREA Indicates the Unit Number and/or plant area
A4	TITLE LINE 01-02-03 It should be as descriptive as possible and should preferably not contain any abbreviations.
A5	CONTRACTORS DRAWING, SHEET No. AND REVISION No. The contractors unique drawing number
A6	ESKOM DRAWING No. This is the unique Eskom drawing number. If a sequence of drawing numbers has been issued to the contractor, the contractor will complete this field. Alternatively this field will be completed by Eskom.
A7	ESKOM SHT No. The sheet number of the contractors drawing.
A8	ESKOM REV No.

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	The number of the contractors drawing revision.
A9	PAPER SIZE The paper size of the original drawing. This is field is completed to indicate the paper size to which the scale is applicable.
A10	SCALE Indicates the scale to which the drawing has been created.
A11	CLASSIFICATION The Document Class number in accordance with IEC 61355, paragraph 3.17.6.
A12	PBS PATH Field indicates the PBS node, e.g. 6 0LAC10.
CHECKING AND APPROVAL	
B1	CREATED BY Name and Surname of the person who created the drawing and the date that the drawing was created. The second part of this field is the date drawn.
B2	DATE CREATED The date the drawing was created.
B3	CHECKED BY Name and Surname of the person who checked the drawing and the date that the drawing was checked.
B4	DATE CHECKED The date the drawing was checked.
B5	APPROVED BY INITIAL AND SURNAME The initial and surname of the professional registered engineer who approved the drawing.
B6	THE PROFESSIONAL REGISTRATION OF THE APPROVING ENGINEER Number of the professional registered Engineer/Techologist who approved the drawing.
B7	DATE APPROVED The date the drawing was approved.
B8	SIGANTURE OF APPROVING ENGINEER The signature of the registered engineer who approved the drawing.
CODIFICATION	
C1	CODIFICATION BY Name and Surname of the person who codified the drawing and the date that the drawing was codified. If the contractor is not able to provide the coding, this should be performed by the responsible ESKOM person.
C2	DATE CODIFIED The date the drawing was codified.
COMPANY LOGOS	
D1	ESKOM LOGO This field is reserved for the ESKOM logo
D2	CONTRACTORS LOGO This field is reserved for the contractor's logo

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D3	SUB CONTRACTORS LOGO This field is reserved for the sub-contractor's logo if required
REVISION HISTORY The data displayed in this section shall reflect the complete history of the drawing.	
E1	D.O. Drawing office number where the revision originated. For ESKOM use only.
E2	REV. The revision number of the drawing.
E3	DATE The date the drawing is revised.
E4	REVISION DESCRIPTION Information describing the changes to drawing. Add request number and/or ECN
E5	REVISED BY Initials of the person performing the changes.
E6	CHKD BY Initials of the person who checked the changes to the drawing.
E7	KKS/AKZ/RDS_PP or Coding APPR (IF APPLICABLE) Initials of the person who codified the drawing. If the contractor is not able to provide the coding, this should be performed by the responsible ESKOM person.
E8	APPR BY Initials of the professional registered engineer who approved the changes to the drawing.
REFERENCE DRAWINGS	
F1	DRAWING NUMBER The number of the reference drawing/s
F2	REFERENCE DRAWING/S DESCRIPTION The description of the reference drawing/S

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5. PAPER SIZES

The standard for drawing sheet sizes is the A series. The basic size in this series is the A0 size (1189mm x 841mm) which has an area of about 1 m². The sides of every size in the series are in the ratio $\sqrt{2}$ = 1.414: 1 and each size is half the area of the next larger size.

Table 3: Sheets Sizes

Drawing Sheet Size	Size in millimeters
A0	1189 x 841
A1	841 x 594
A2	594 x 420
A3	420 x 297
A4	297 x 210

6. ARCHIVING AND RECORDS STORAGE

All storage and archiving of drawing records and engineering documentation/information shall be in line with Eskom Documentation Management Procedure [16], Standard for Management System Documents Correspondence and Records [17] and Writing and Controlling Management System Documents [18].

6.1 META DATA REQUIRED

6.1.1 Drawing Meta Data

The drawing Meta data in Table 4 is mandatory for capture with each engineering record that is generated. All Meta data shall be aligned to the SPO meta-data Specification and requirements [8].

Table 4: Drawing Meta Data

Meta Data	Example
Eskom Drawing Number:	0.57/12342
Full Drawing Title:	Duvha Power Station, Coal Milling Plant, Service Air P&ID
Drawing Sheet:	2
Sub-sheet:	-
Latest Revision:	12
Sheet Print Size:	A0
Information Classification:	Level 3 – Controlled Disclosure
IEC Classification:	D000043 (P&ID)
Discipline:	Mechanical
Drawing Status:	As Built and Approved
Authorized Date:	2000/01/10
Authorized by:	D van Rensburg – D&S Manager
Functional Responsibility (Information Owner):	Boiler Plant Engineering Section Duvha Power Station

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Meta Data	Example		
Cross Reference Drawing No. and Title	0.57/6789	Unit #1 Boiler House Floor Lay-Out	
	0.57/14555	Milling Plant Service Air Supply Compressor	
	0.57/1433	Coal Milling Plant General Arrangement	
Relevant Plant Code(s)	01NM30D050 01NM20D050		
Manufacturer's/OEM Name:	Babcock & Wilcox		
Manufacturer's/OEM Drawing No.:	1433/13257889		
Construction Contract No.:	OPY11282		
Media Format:	MicroStation – DGN		
Index Reference:	C 4.1		
Power Station/BU/Site:	Duvha Power Station		
Station ID:	0.57		
Office of Origin:	Duvha Site Drawing Office		
Location of Original:	MWP Archives		
Retention Period:	Station Life		
Superseded By Drawing No.:	(e.g. if drawings were combined to become 1)		
Drawing Review Date:			
Drawing Master Copies Distributed to:	Duvha Power Station CED		
Latest Revision Originator:	Duvha PS -24		
Site Modification/Deviation No.:	DEV1432-B-1		
MWP Work Request No.:	DUV.001.004		

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7. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Department
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Felix Bosch	Generation Engineering Documentation Manager

8. REVISIONS

Date	Rev.	Compiler	Remarks
November 2014	0.1	J.H. Herndler	Standardise Eskom Drawings
November 2014	0.2	J.H. Herndler	Draft Document for Comments Review
November 2014	1	J.H. Herndler	Final Document Authorised for Publication
March 2016	1.1	C.C Makhanya	Added paragraph 3.19.8 Scanning and resolutions
April 2016	1.2	C.C Makhanya	Draft Document for Comments Review
June 2016	1.3	J.H. Herndler	Consolidation of Care Group Comments
July 2016	1.4	J.H. Herndler	Draft Document for Comments Review 2 nd round
August 2016	1.5	J.H. Herndler	Consolidation of Study Group
August 2016	2	J.H. Herndler	Final Document Authorised for Publication
May 2017	2.1	J.H. Herndler	Document updated to align new referenced document numbers
May 2017	3	J.H. Herndler	Final Document Authorised for Publication (Rev 3)
February 2023	3.1	K Tiro	Update contents and align with international standards
May 2023	3.2	K Tiro	Update Final Draft based on authorisation review
September 2023	3.3	K Tiro	Additional updates complete, final Draft
September 2023	4	K Tiro	Final Rev 4 Document Authorised for Publication

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9. DEVELOPMENT TEAM

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

Name & Surname	Section/Department/Area
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Nonti Bujela	Generation Engineering - CAD
Mangaliso Dlamini	Generation Engineering - CAD
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10. ACKNOWLEDGEMENTS

The following people contributed to the document;

- Dhiren Narsai
- Tau Chokoe

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APPENDIX A: STANDARD LAYERS**Basic Standard Drawing Layers to be used unless for all drawings**

Layer Name	Layer Number	Layer Description	Colour	Line Style	Line Weight
Default	0	MicroStation Default Level	0	0	0
Clouds	21	Clouds	3	0	0
Dimensions	22	Dimensions	3	0	0
HatchPatterns	41	Hatch Patterns	16	0	0
TextCallOut	58	Call Out Bubbles	3	0	0
TextDetail	59	Detailing Text	0	0	1
TextHeading	60	Text Headings	0	0	1
TitleBlock	61	Drawing Title Block	0	0	1
TitleBlockContractor	62	Drawing Title Block For Contractors	0	0	1
Border	63	Drawing Border	0		
CenterLine	64	Center Line	3	4	0
HiddenDetail	65	Hidden Detail	0	2	1
BOM			0	0	1
Bill Of Material			0	0	1

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APPENDIX B: DRAWING CHECKLIST

		<h2 style="text-align: center;">DRAWING CHECKLIST</h2>		CHECKLIST No.	
				DATE	
Drawing/s No.:					
Job number					
Revision:					
Date:					
No.	Description	Complies	Does Not Comply		
1	Eskom section of the title block:				
	Power Station Name				
	Unit number	<input type="checkbox"/>	<input type="checkbox"/>		
	System Plant Group (AKZ/KKS/RDS_PP)/Description	<input type="checkbox"/>	<input type="checkbox"/>		
	Drawing Type	<input type="checkbox"/>	<input type="checkbox"/>		
	Drawing Number in accordance with 240-128353314	<input type="checkbox"/>	<input type="checkbox"/>		
	Drawing classification in accordance with clause A.11.0	<input type="checkbox"/>	<input type="checkbox"/>		
	Drawing Scale	<input type="checkbox"/>	<input type="checkbox"/>		
	Accredited drawing office abbreviation (if revised by Eskom)	<input type="checkbox"/>	<input type="checkbox"/>		
	Revision No.	<input type="checkbox"/>	<input type="checkbox"/>		
	Date of revision	<input type="checkbox"/>	<input type="checkbox"/>		
	Description of revision	<input type="checkbox"/>	<input type="checkbox"/>		
	Drawn by: Draftsperson	<input type="checkbox"/>	<input type="checkbox"/>		
	Checked by: Responsible Engineer or Draftsperson	<input type="checkbox"/>	<input type="checkbox"/>		
	Codification by: Codification Officer	<input type="checkbox"/>	<input type="checkbox"/>		
	Approved by: Pr Eng/Pr Tech Eng including ECSA Registration No	<input type="checkbox"/>	<input type="checkbox"/>		
2	Contractor section of the title block where applicable:				
	Company information including contract details	<input type="checkbox"/>	<input type="checkbox"/>		
	Revision No.	<input type="checkbox"/>	<input type="checkbox"/>		
	Date of revision	<input type="checkbox"/>	<input type="checkbox"/>		
	Description of revision	<input type="checkbox"/>	<input type="checkbox"/>		
	Drawn by: Draftsperson	<input type="checkbox"/>	<input type="checkbox"/>		
	Checked by: Responsible Engineer or Draftsperson	<input type="checkbox"/>	<input type="checkbox"/>		
	Approved by: Pr Eng including ECSA Pr Eng Registration No.	<input type="checkbox"/>	<input type="checkbox"/>		
3	All applicable reference drawings are indicated in the reference drawings section.	<input type="checkbox"/>	<input type="checkbox"/>		
4	All applicable notes are indicated in the notes drawing section.	<input type="checkbox"/>	<input type="checkbox"/>		
5	Text:				
	• in accordance with the standard	<input type="checkbox"/>	<input type="checkbox"/>		
	• spelling is correct	<input type="checkbox"/>	<input type="checkbox"/>		

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	<ul style="list-style-type: none"> standard approved abbreviations are used and applied consistently 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> words spelled out where possible 	<input type="checkbox"/>	<input type="checkbox"/>
6	Dimensions:		
	<ul style="list-style-type: none"> in accordance with the standard 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> indicated showing clear intent 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> do not overlap with other drawing elements 	<input type="checkbox"/>	<input type="checkbox"/>
7	The following drawing symbology in accordance with the standard:		
	<ul style="list-style-type: none"> lines 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> layers 	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> levels 	<input type="checkbox"/>	<input type="checkbox"/>
8	Drawing is legible with no overlapping lines	<input type="checkbox"/>	<input type="checkbox"/>
9	All marked-up items have been incorporated as required	<input type="checkbox"/>	<input type="checkbox"/>
CHECKED BY:			
NAME	DESIGNATION/COMPANY	DATE	SIGNATURE
RECEIVED BY:			
NAME	DESIGNATION	DATE	SIGNATURE

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