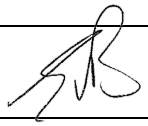
STANDARD OPERATING PROCEDURE

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Fixed Assets Procedure.

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SUMMARY VERSION CONTROL

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Note: Only latest amendments and/or additions are reflected in italics in the body of the document.

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1. PURPOSE

The purpose of this Fixed Asset standard operating procedure (SOP) is to ensure that a clear procedure exists for the recording of all fixed asset related transactions. A clear process exists for the accurate computation of the impact of fixed asset transactions (e.g., Revaluation, impairment etc.) All fixed assets require by Transnet pipelines are tracked in the system correctly and physically secured against unauthorized access and theft.

All relevant Transnet Pipelines departments are fully aware of what is required in the computation and recording of transactions related to the fixed assets. Provide guidance on fair and accurate statement of fixed assets transactions at Transnet Pipeline for the period in which they were acquired, transferred or disposed.

This procedure is prepared in the context of Transnet Pipelines management's responsibility to safeguard assets and ensure effective utilization of existing resources and compliance with Public Finance Management Act (PFMA), with further objectives to:

- Emphasize a culture of accountability over Transnet Pipeline Assets.
- Control the operational risks to which Transnet Pipelines is exposed (e.g., moving assets without the proper procedure being followed.).
- Provide a formal set of financial procedures, which can be implemented to ensure Transnet Pipelines financial policies are achieved.
- Ensure that these effective controls are communicated to management and staff through clear and comprehensive written documentation.

2. APPLICABILITY

This work instruction applies to Transnet pipelines with regards to fixed assets in respect of Additions, Capital Work in Progress, Disposals, and internal transfers, maintenance, and depreciation. It must be read in conjunction with International Financial Reporting Standards (IFRS).

3. REFERENCE DOCUMENTS

- IAS 16 — Statement on Property plant and equipment; and
- IAS 36 — Statement on Impairments.
- IAS 23 — Borrowing Cost
- IAS 38 — Intangible Assets
- IFRS 16- Leases
- Transnet Property, Plant and Equipment Policy

4. DEFINITIONS AND ABBREVIATIONS

4.1 Definitions

SAP	Enterprise Resource Planning (ERP) Version ECC6 system which is a software system used for operational planning and administration for optimizing internal financial and business processes
Amortization	It is the systematic allocation of the depreciable amount of the intangible asset over its useful life.
Borrowing Costs	Borrowing Costs are interest and other costs incurred in connection with the borrowing of funds
Carrying Amount	Amount at which an asset is included in the balance sheet after deducting accumulated depreciation and accumulated impairment losses thereon
Cash Generating Unit	It is the smallest identifiable unit that comprises of more than one asset to perform its function i.e., each cannot perform on its own.
Component	A component is an item that is significant in relation to the cost of the asset. Each component has its own useful life.
Cost	It is the amount of cash and cash equivalents paid or the fair value of the other consideration given to acquire an asset at the time of its acquisition or construction.
Depreciation	Depreciation is a systematic allocation of the depreciable amount of an asset over its estimated useful life.
Depreciable Amount	The depreciable amount is the historic and revalued cost, less the estimated residual value.
Development	Development is the application of research findings or other knowledge to a plan or design to produce new or substantially improved materials, devices, products, processes, systems, or services prior to the commencement of commercial production or use,

Discount Rate	The discount rate is the post-tax rate that reflects current market assessments of the time value of money and the risks specific to the asset.
Estimate of future cash flow	This relates to projections of cash flows or outflows from the continuing use of the asset.
Fair Value	The fair value is the amount for which an asset could be exchanged between knowledgeable, willing parties in an arm's length transaction.
Impairment	An asset is impaired when it's net book value or carrying amount is hi her than its recoverable amount.
Interchangeable Units/ Rotables	Units held to replace defective units on an asset to ensure the asset is continuously kept in service and not a separate asset on their own. The useful life of the interchangeable units is always less than or equal to the useful life of the asset on which they are used.
Net Selling Price	The net selling price is the amount obtainable from the sale of an asset in an arm's length transaction between knowledgeable, willing parties less the cost of disposal.
Property, Plant & Equipment PPE	Tangible items held by the entity for use in the production or supply of goods or services for rental to others or for administrative purposes and are expected to be used during more than one period.
Qualifying Asset (In the context of borrowing costs	This is an asset that necessarily takes a substantial period to get ready for its intended use or sale.
Recoverable Amount	The recoverable amount is what the entity expects to recover from the future use of an asset, including its residual value on disposal. It is the higher of the assets value in use and the net realizable value.
Research	It is original and planned investigation undertaken with the prospect of gaining scientific or technical knowledge and understanding.
Residual Value	The residual value of an asset is the estimated amount that an entity would currently obtain from disposal of the asset after deducting estimated disposal costs, if the asset were already of the age and condition expected at the end of its useful life.
Transaction date	The transaction date is the date on which the significant risks and rewards of ownership of an asset has been transferred or as service has been performed.
Useful Life	The useful life refers to the period over which an asset is expected to be available for use by the entity.
Value in use	The present value of estimated future cash flows expected to arise from the continuing use of an asset and from its disposal at the end of its useful life.

4.2 Abbreviations

CEO	Chief Executive Officer
CFO	Chief Financial Officer
FRM	Financial Reporting Manager
IFRS	International Financial Reporting Standards
IAS	International Accounting Standards
PPE	Property, Plant and Equipment
CGT	Capital Gains Taxes
SARS	South Africa Revenue Services
PFMA	Public Finance Management Act
CWIP	Capital Work in Progress
WBS	Work breakdown structure

5. ACCOUNTABILITY, RESPONSIBILITY AND AUTHORITY

5.1 Any departures from the approved policies and procedures stated in this manual will require the prior written approval from both of the following persons:

- Chief Executive Officer and
- Chief Financial Officer

6. PROCEDURE.

6.1 Fixed Asset transactions are fairly stated and accounted for

Control Objectives:

All fixed assets must be fairly stated and accounted for in the correct period for —

i Additions
ii Capital Work in Progress.
iii Disposals and Internal Transfers
iv Maintenance Costs
v Depreciation Costs

Appropriate Controls exist for identifying capital assets at the time of recording, receipt or payment.

6.1.1 Asset Recognition of Property, Plant and Equipment (PPE)

Per IAS16, any tangible item of PPE is recognized as an asset when:

- It is probable that future economic benefits associated with an asset will flow to the entity, and the cost of the asset to the entity can be measured reliably.
- When a project is initiated, the Project Manager, Asset Manager & Investment Manager agree on a project breakdown structure and structure the project according to assets being built as well as components.
- The Asset Manager assesses whether the project meets the definition of a qualifying asset. Where assets are deemed qualifying assets, borrowing costs are capitalized according to 5.1.4 below.
- All costs associated with the item are processed to the Capital Work in Progress account and reviewed by the FA Manager monthly to ensure all costs are capitalized in terms of IFRS.
- On completion of the Asset, the project manager concerned signs off a project completion certificate (refer Annexure 1), to confirm that the asset is available for use.
- Once the asset is available for use, a Masterflle Amendment form (MFA) — (refer Annexure 2)- is completed by the Fixed Asset Controller for approval by the Fixed Asset Manager and where additions exceed R 3 million these are reviewed by the Financial Reporting Manager.
- The MFA form clearly states whether the asset will be capitalized as a whole or in components.
- An asset in the applicable asset class is created in the Book and Tax register.
- When an asset is created, the Fixed Asset Controller assigns an external sequential number based on the SAP number derived from the SAP Asset module.
- Every capital purchase is done through a WBS (work breakdown structure), which is based on the annual Capex Budget.
- Requisitions or Procurement of goods and services are made against a specific WBS element, approved by the Project Manager.
- Project status is reviewed monthly and a status summary is submitted and reviewed by the Financial Reporting Manager/Fixed Asset Manager to ensure all completed projects are closed, preventing further allocation of costs to the project.
- Once the MFA form is approved the item is transferred from the CWIP account (E.g., account no. 402000) to the Fixed Asset Register.

6.1.1.1 Components of cost.

The cost of an item of PPE comprises its purchase price, including import duties and non-refundable purchase taxes, and any directly attributable costs of bringing the asset to working condition and location for its intended use. Examples of directly attributable costs as defined in paragraph 17 of IAS 16 are:

- The cost of site preparation.
- Initial delivery and handling costs.
- Installation costs and assembly costs.
- Professional fees such as for architects and engineers.
- The estimated cost of dismantling and removing the asset and restoring the site.
- Any trade discounts and rebates are deducted in arriving at the purchase price.
- Cost of testing whether the asset is functioning properly after deducting the net proceeds from selling any items produced while bringing the asset to location.

The following costs are directly attributable to an asset and can be capitalized:

- Project manager and project team costs (e.g., Project time, flights, accommodation)
- Insurance
- Project security costs

Paragraph 19 of IAS 16, states that the following costs cannot be capitalized:

- Cost of opening a new facility
- Cost of introducing a new product or service (including costs of advertising and promotional activities)
- Cost of conducting business in a new location or with a new class of customer (including costs of staff training
- Administration and other general overhead costs

Administration and overhead costs include:

- Stationery
- Meal Costs
- Telephone expenditure
- Copy charges
- Courier costs

- Parking
- Visa Applications

In addition, the following costs cannot be capitalized:

- Senior management costs on projects, including flights and accommodation, as management is not directly involved in the construction of the asset.
- Pre-feasibility costs as these are research costs.
- Training costs is identified in the statement as costs that cannot be capitalized. These costs are operating costs and incurred when the PPE is capable to be used by management.

Note: Cost is accumulated over the period of the project and is capitalized 90 days upon completion of the project.

6.1.2 Components

If any part of an item of PPE has a cost that is significant in relation to the total cost of the item and each component has a separate useful life, the asset concerned is split into the applicable components.

All assets at Transnet Pipelines are componentized according to components as specified.(Annexure 3)

6.1.3 Subsequent Expenditure.

Expenditure on PPE after initial acquisition (excluding the cost of disposal) is classified as: Improvements, Conversions, Repairs & Maintenance.

6.1.3.1 Improvements

Expenditure on assets which qualify as improvements to assets, are capitalized against the assets.

- Expenditure is only classified as improvements if the expenditure is planned with sole intention of increasing the originally assessed performance of the asset by:
- Extending its useful life including an increase in its capacity.
- Substantially improving the quality of output. • Substantially reducing operating costs.

6.1.3.2 Conversions

Costs to permanently convert assets, resulting in a different type or use of an asset, including the carrying value of the existing asset, which is withdrawn, is capitalized as a new asset.

6.1.3.3 Repairs and Maintenance.

All subsequent expenditure, which cannot be classified as improvements or conversions, is written off to the income statement, for example:

- Incidental improvements to assets necessitated by i.e., technological changes.
- Temporary conversions to assets
- Replacements of parts of an asset
- Restoring or maintaining originally assessed standards of performance.

Repairs and maintenance carried out as part of a normal program are expensed as maintenance costs.

The Capital WIP Account is reviewed monthly by the Fixed Asset Manager/Financial Reporting Manager to identify amounts not suitable for capitalisation.

6.1.3.4 Capitalized Maintenance (Copex)

The maintenance expenditure account is reviewed by the Fixed Asset Manager. Where items such as inspection and refurbishment of assets are performed, these are capitalized against the equipment concerned.

- Other costs specific to Transnet Pipelines include — • Intelligent pigging surveys •Coating surveys.
- Crack detection and repair
- Repair of pipeline defects
- Tank inspections and refurbishments • Wash away repairs to servitudes.

6.1.3.5 Accident repair costs.

Accident repair costs are expensed as such in the income statement, whether it is an insured, retained, or uninsured loss.

The relevant amounts recovered from the insurance in respect of the insured losses are credited to miscellaneous revenue.

Internal labor and materials used to repair damaged items will be capitalized to the relevant asset.

Where new assets are purchased to replace damaged assets, these are capitalized as per the supplier's price.

When incidents are not finalized at year end, the estimated repair costs incurred as well as the estimated insurance proceeds; are provided for in full.

The accrual raised from the insurance proceeds is only raised when they are almost guaranteed payment from the insurance company.

Damaged assets or assets damaged beyond repair are impaired to zero book value and derecognized from the asset register.

The carrying value of assets withdrawn due to an insured or uninsured incident as well as costs of disposal is written off to the income statement.

6.1.3.6 Servitudes

A servitude is a right of use granted to Transnet Pipelines by a landowner for the unlimited right to use the land through which the pipelines run.

Servitude rights obtained over another entity's property is capitalized and depreciated over the life of the servitude. This may be the case where the servitude is for a period.

Servitudes are normally included as costs of the pipeline (not considered material in relation to the costs of the pipeline.

Refer to Appendix 4 for the schedule on servitude lives.

6.1.3.7 Foreign Exchange Purchases

Foreign currency transactions in respect of non-monetary items (i.e., property, plant, and equipment) is accounted for at the rates ruling on transaction dates, except where the underlying asset is carried at fair value denominated in the foreign currency, in which case the asset is translated into South African Rand at the exchange rate ruling when the fair value was determined.

In an embedded derivative contract, the asset is recorded at the forward rate prevailing at the inception of the contract on the date of delivery.

For cash flow hedges, the asset is recorded at spot at the transaction date, net of transfers to equity.

6.1.4 Borrowing Costs

Borrowing costs are recognized as an expense in the period in which they are incurred, except to the extent that they are capitalized.

Borrowing costs that are directly attributable to the acquisition, construction or production of a qualifying asset are capitalized as part of the cost of that asset.

A qualifying asset is an asset that takes a substantial period to get ready for its intended use/sale.

6.1.4.1 Commencement of capitalisation.

The capitalisation of borrowing costs, as part of the cost of a qualifying asset commence when:

- Expenditures for the asset is being incurred.
- Borrowing costs are being incurred, and
- Activities that are necessary to prepare the asset for its intended use or sale are in progress.

6.1.4.2 Suspension of capitalisation

Capitalisation of borrowing costs are suspended during extended periods in which active development is interrupted.

6.1.4.3 Cessation of capitalisation

Capitalisation of borrowing costs ceases when substantially all the activities necessary to prepare the qualifying asset for its intended use or sale are complete.

6.1.5 Decommissioning Costs

The cost of PPE comprises "the initial estimate of the costs of dismantling and removing the item and restoring the site on which it is located, the obligation for which an entity incurs either when the item is acquired or as a consequence of having used the item during a particular period for purposes other than to produce inventories during that period."

6.1.5.1 Decommissioning Provision

Transnet Pipelines recognizes a provision for decommissioning costs and includes it in the initial costs when the specific Pipeline Asset is brought into use:

- The estimate is based on the cost of the following activities:
- End capping of mainlines and feeder lines and filling them with inhibited water (these lines will not be uplifted).
- Removal of all block valves, control valves and valve chambers.
- Backfilling of existing valve chamber locations with soil and grass.
- Demolishing of all above ground structures, chambers, buildings, foundations, and bund walls at depots.
- Demolishing of all storage and other tanks.
- Upliftment of all pumps including pump body, motor, and base plate; and
- Rehabilitation of the ground and grass at the decommissioned depots.

Cost estimate includes field cost, EPCM, contingency and owner's cost.

The activities relating to decommissioning will be reviewed by the technical department and cost estimate adjusted accordingly.

The provision is calculated as the net present value of all costs to be incurred in future.
i.e., in 75 years', time.

The procedure followed in respect of determining this provision is as follows:

- Estimate the total cost of decommissioning the pipeline, by determining the value of the different activities as highlighted above.
- Inflate these costs by a conservative inflation rate. This rate can be obtained from the Transnet Group Financial Planning Department.
- Costs should be inflated over an average period for which Management perceive that the Pipeline will be taken out of service i.e., 75 years.
- Calculate the net present value of these cash flows by discounting all future cash flows by the long-term government bond rate. This rate can also be obtained from the Transnet Group Treasury.

6.1.6 Depreciation

Depreciation is raised on the depreciable amount (Cost less Residual Amount) of PPE on the straight-line method over the estimated useful life and is charged directly to the Income Statement by an automatic posting once the depreciation run is performed.

The depreciation charge distinguishes between depreciation raised at cost and at revaluation.

Depreciation is accounted for as soon as the asset is available for use i.e. When the asset is commissioned or when we receive 'beneficial occupation" of the asset.

Depreciation ceases when the asset is withdrawn from service or when the asset qualifies as an "Asset held for sale".

The Fixed Asset Analyst reviews the reasonableness of the depreciation calculation monthly to ensure that there is no negative depreciation that was posted by the system and compares this to budget estimates.

Any variances or differences are sent to the Fixed Asset Manager.

6.1.7 Useful Life

The useful life of an asset is defined in terms of the asset's expected utility to the organization.

Depreciation rates are in accordance with rates set out by Transnet IFRS Accounting policy (refer to Annexure 3 for useful lives) and in conjunction with the ADL useful lives provided after valuation of assets.

6-1.8 Review of Useful Life

On an annual basis the useful life of the assets is reviewed with the assistance of the external valuators.

If expectations are significantly different from the previous estimates, the useful life and residual value are prospectively adjusted.

Before any adjustments are processed on SAP, an MFA (refer Annexure 2) form is completed by the Fixed Asset Controller and forwarded to the FRM for approval.

Once the necessary approval is obtained, the useful life and residual value adjustments are processed on SAP.

6.1.9 Residual Value

Due to the specialized nature of Pipelines assets as well as the fact that there is no external market for the sale of pipelines; the residual value of the Pipeline Network is valued at zero.

6.1.10 Wear and Tear Rates

Wear & tear rates need to comply with the Tax Policies as set out by Transnet Wear and Tear Policy which is in accordance with SARS (Practice Note 19 of the Income Tax Act).

6.1.11 Intangible Assets

An intangible asset is recognized if:

- It is probable that future economic benefits attributable to the asset will flow to the entity, and.
- The cost of the asset can be measured reliably.

6.1.11.1 Computer Software.

All computer software for a mainframe or PC environment, whether developed or purchased is capitalized at cost.

6.1,11.2 Research and Development

Research and development costs include all costs directly and indirectly attributable to research and development activities but exclude selling and general administrative costs.

General research costs are not capitalized but rather written off in the income statement as incurred.

Development costs in respect of the erection, purchase, or improvement of assets to be tested in practice are capitalized.

All other development costs are written off in the income statement as incurred.

%ese assets are depreciated over their expected useful lives.

6.1.12 Capital Spares/Rotaries'

6.1.12.1 Spare Parts Identification.

Spare parts and servicing equipment are usually carried as INVENTORY and recognized in profit and loss when consumed.

However, major spare parts and standby equipment QUALIFY as property, plant, and equipment when:

An entity expects to use them during MORE THAN ONE PERIOD, or, ii. If they can be used ONLY IN CONNECTION with an item of property, plant, and equipment.

6.1-12.2 Utilization of Capital Spares.

The item remains in the asset class "Capital Spares" until utilized.

At the time of utilization, the item is transferred from Capital Spares to the asset concerned.

There are two scenarios which may exist:

1. The capital spare is used to replace a part that has been damaged beyond repair.

2. The existing capital spare is sent for repairs whilst the new item from the "Capital Spares" asset class is transferred to the main asset.
3. Capital spares are transferred to the main asset at net book value (after depreciation).
4. The useful life of the transferred spare takes on the life of the lower of the remaining useful life of the main asset and economic life of the spare.

An MFA is completed and approved by Head Office before any adjustments are processed on SAP.

6.1.13 Retirements

Retirement is the last stage in the life cycle of an asset.

It is the stage when an asset is withdrawn from operating and depreciating.

An asset is withdrawn from the Asset Register in the following situations:

1. Transfer of an asset.
2. Disposal / Scrapping of an asset.

6.1.13.1 Transfers.

There are 3 types of transfers:

1. Intra-company transfer - the movement of assets between Transnet Pipelines business units (Plants).
2. Temporal Intra-company transfer.
3. Inter-company transfer the movement of assets between Transnet Pipelines and other Transnet divisions.

Transfers take place at the carrying value to ensure the values for accounting purposes and tax purposes are kept intact, i.e., the Cost and the Accumulated Depreciation/Accumulated Wear & Tear is transferred.

Transfers are accounted for in the same accounting month by both entities.

6.1.13.1.1 Intra Company Transfer

A request to transfer an asset is forwarded via e-mail to the Fixed Asset Manager by the Depot Manager of the transferring division.

A G160 (refer to Annexure 4) is completed in triplicate by the transferring divisions Depot Manager.

This is signed off by the transferring division's Depot Manager.

A copy is retained by the depot and the other two copies sent with the asset.

At the receiving division, the security guard at the gate stamps the G160 with an official Transnet Pipeline stamp and sign.

When arriving at the depot, the Depot Manager completes the details on the G160 relating to the receiving division and signs it off.

A signed copy is sent back to the transferring division.

The signed copy is then forwarded to the Fixed Assets Department at Head Office by the receiving divisions Depot Manager the Asset Registers for both Depots are updated accordingly.

An MFA form is completed by the asset controller and approved by the Fixed Asset Manager.

The Fixed Asset Department adjusts the cost centers and location of the asset to reflect the correct division in which the asset resides.

6.1.13.1.2 Temporal Intra Company Transfer

A G161 form is used for temporary transfers. The transferring and receiving depots notify the Fixed Assets Department with their intentions to temporarily transfer assets to another depot in writing.

Both transferring and receiving depot sign the G161 form and forward to Head Office as a formal notification of the temporal transfer.

This information is crucial for annual assets verification process.

6.1.13.1.3 Inter Company Transfers

Request to transfer assets is forwarded to the Fixed Asset Accountant/Manager via e-mail either from the receiving division or an internal department within Transnet Pipelines.

The Fixed Asset Accountant/Manager prepares a submission to the FRM, Chief Financial Officer or the Chief Executive to authorize the transfer.

The Fixed Asset Accountant/Manager must prepare the Transnet transfer form i.e., T760 (refer to Annexure 5).

The asset values reflected on the T760 must be the carrying amount of those assets up to the date of transfer.

The T760 is faxed/emailed to the receiving division.

The asset register is updated by recording a disposal in Transnet Pipelines books.

Effectively the following will occur in the accounts:

Dr. Intercompany Debtor

Cr. Asset Cost

A RC16 (refer to Annexure 6) is filled out to transfer the value from Transnet Pipelines to the books of the receiving division.

The RC16 is processed in the same accounting month for both divisions.

6.1.13.2 Asset Disposal / Scrapping

In accordance with IAS 16, the carrying amount of an item of property, plant & equipment is derecognized:

(a) on disposal; or

(b) when no future economic benefits are expected from its use or disposal.

• Asset Disposal / Scrapping can be divided into 3 main areas:

1. Disposal of Immovable Property

2. Disposal of Movable Property

3. Disposal of nonferrous scrap metal

- A withdrawal of an asset occurs when a Depot Manager identifies an asset which is deemed to be disposed of or scrapped. Once the initial identification is performed the Depot Manager assesses the condition of the asset
- The Depot Manager also ascertains whether there is a need for the asset in another depot within Transnet Pipelines or Transnet. If so, the process for the transfer of the asset is put in motion as per 5.1.11.1 above.
- In the case of the disposal of immovable property, a decision for disposal is taken by the Executive Management of Transnet Pipelines. In this case, the property is transferred to Transnet's Property' custodian who disposes of the property.
- If the asset concerned is not of an equipment nature, a suitable specialist within the organization performs this assessment. (e.g., IT equipment should be assessed by the IT Manager).
- In the case of non-ferrous metal scrap, this is disposed of in terms of the Transnet wide directive.
- If there is no need for the asset in another depot, the Depot Manager/Cost center managers prepares a G159 form and submits it to the Fixed Assets Department and notifies the Fixed Asset Analyst to prepare the G159 template (Refer Annexure 7) as well as an MFA document to approve the adjustment of the SAP System. The MFA is signed by the Fixed Asset Manager.
- The Depot Manager and relevant Controlling Manager (e.g., Technical Manager) endorse the request to withdraw documents, which is forwarded to the Plant Property and Equipment Manager at the Head Office.
- The Chief Financial Officer and Chief Technical Officer support the withdrawal and endorse the withdrawal document. The documents are then forwarded to the CEO for approval.
- The Group Chief Operating Officer has final approval for the disposal/scrapping of assets as currently determined by the DOA. If this DOA is changed at any time, the relevant personnel with the relevant DOA will approve.
- Once approval for withdrawal is obtained, the asset is transferred to the asset class.
- "Non-current assets held for sale" and Depreciation of the asset ceases. The assets are scrapped from the asset register.

- The Fixed Asset Analyst notifies the Materials Manager of all assets approved for scrap and sends all G159 forms back to Depot Managers so they can tick off all assets to be collected by the scrapping companies/officials.
- The asset is disposed of in terms of reverse logistics procedures.
- On disposal of the asset, the asset is written off to the Income Statement, which is set off against the proceeds received on sale of the asset.

6.1.13.3 Derecognition

The carrying amount of an item of property, plant and equipment should be derecognized:

- on disposal; or
- when no future economic benefits are expected from its use or disposal.

Gains or losses arising from derecognition are calculated as the difference between the net disposal proceeds and the carrying amount of the asset at the date of disposal and is recognized as profit or loss in the income statement when the asset is derecognized. A gain should not be classified as revenue.

In determining the date of disposal, the criteria in IAS 18: Revenue relating to the recognition of revenue from the sale of goods is applied.

These are as follows:

- all significant risks and rewards of ownership of the goods can be passed to the buyer; • the entity no longer has effective control over the asset or managerial involvement; • the amount of revenue can be measured reliably; • it is probable that economic benefits associated with the disposal transaction will flow to the entity; and • the costs incurred or to be incurred in respect of the disposal transaction can be measured reliably.

6.1.13.4 Partial Derecognition of an asset.

In some cases, a portion of an asset or a component may be replaced regardless of whether the replaced part has been depreciated separately or not. If it is not practicable to determine the carrying amount of the replaced part, the cost of the replacement is used as an indication of what the cost of the replaced part was at the time it was acquired or constructed.

- If the replaced part was not previously recognized as a separate component, the carrying amount of the replaced part at date of derecognition should be determined. This may be measured by determining the proportion of original cost attributable to that component and applying that ratio to the carrying value of the asset at the date of derecognition.

The consideration receivable on disposal of an item of property, plant and equipment is recognized initially at its fair value. If payment for such an item is deferred, the consideration is recognized at the cash price equivalent, with the difference being accounted for as interest in accordance with IAS 18.

6.1.13.5 Noncurrent assets held for sale.

Non-current assets held for sale are recognized according to IFRS 5.

Immediately before classification as held for sale, the measurement of the assets (and all assets and liabilities in a disposal group) is brought up to date in accordance with applicable IFRSs. Then, on initial classification as held for sale, non-current assets and disposal groups are recognized at the lower of carrying amount and the fair value less costs to sell.

Impairment losses on initial classification as held for sale are included in profit or loss, even when there is a revaluation. The same applies to gains and losses on subsequent re-measurement.

6.1.13.6 Write Back to Fixed Assets register.

If assets are re-commissioned after withdrawal, the asset is capitalized at the lower of the carrying value at the time of withdrawal or the fair value, plus the costs to prepare the asset for its intended use.

The write back of the asset is credited to the Income Statement.

The MFA is completed and approved by the Fixed Asset Manager/Divisional Financial Reporting Manager before any adjustments are affected on SAP.

6.1.14 Mothballed Assets

Mothballing of assets occurs when individual assets no longer generate economic benefits, but the individual components are combined to form a cash-generating asset.

Should the need exist for the mothballing of one or more asset, a motivation explaining the details of this requirement and the expected benefits to Transnet Pipelines, is prepared by the Technical Department and submitted for approval by the CEO.

The mothballed assets are transferred to the "Mothballed Assets" asset class and the carrying amount of the asset is written off.

Where assets are re-instated back to active use, the carrying amount of the mothballed assets will be re-instated.

The completion and approval of the MFA is a prerequisite to any adjustments on SAP in respect of the above.

6.1.15 Impairment Assets

In terms of IAS 36, an impairment test is performed to ascertain whether the carrying amount as indicated in the financial statements of Transnet Pipelines equals the recoverable amount of a cash generating unit.

If any of the questions are answered in the affirmative (i.e., "Yes") this means at least part of the asset base has been impaired.

Examples of such indicators are:

- Major increase in exchange rates, labor indices, steel prices etc.
- Major line taken out of operation.

- Decrease in market share for transportation of certain products.

The Fixed Asset Manager performs an impairment test annually but consider for impairment at each reporting period.

The impact of the impairment is equal to the difference between carrying amount and the recoverable amount.

The recoverable amount of a cash generating unit is the higher of the value in use or the net selling price. There is only one cash generating unit within Transnet Pipelines i.e., Pipeline Network and the recoverable amount equals the value in use as there is no active market for Pipelines.

The value in use is determined as follows:

1. Income and expenditure for the first 15 years must be in accordance with Transnet Pipelines Business Plan.

2. Depreciation and any non - cash flow costs must be subtracted from net profit to determine cash flows.

3. These cash flows are projected over the remaining useful life of the Pipeline.

4. Revenue streams are projected from year 16 using a reasonable growth rate. Normally a conservative rate equal to the forecasted inflation rate is used.

5. Costs are projected from year 16 using the forecasted inflation indicators as set out in the annual economic parameters provided by Transnet Corporate Planning.

6. The net present value of all cash flows is discounted at the weighted average cost of capital assigned by Transnet. These rates are updated annually and are available from the Transnet Corporate Planning section.

7. Refer to Annexure 9 and Annexure 10 for guidance - 6.15.1

6.1-15.1 Accounting for Impairment

If the asset was previously revalued, the Impairment losses are charged directly to equity (NDR) to the extent of the revaluation reserve in respect of that asset.

However, an impairment, which is more than the revaluation reserve relating to the asset, is accounted for as follows:

- Reduce the revaluation surplus to the extent of the revaluation surplus in respect of the asset.
- The excess on revaluation surplus is charged to the income statement.

If no revaluation surplus exists, the impairment is charged directly to the income statement.

If the value of a previously impaired asset subsequently increases, the impairment loss is reversed to the extent of the previous impairment. Any increase in value more than the previous impairment is allocated to a Revaluation Surplus (NDR)

The completion and approval of the MFA by the FRM is a prerequisite to any adjustments on SAP in respect of the above.

6.1.16 Revaluation

Some items of property plant and equipment may experience significant and volatile movements in fair value, thus necessitating conducting a revaluation at regular intervals.

Transnet Accounting Policy stipulates a Fixed Asset Revaluation exercise must be conducted every three years and that an index calculation be applied in intervening years. Pipeline networks are carried at their revalued amounts, being the fair value at the date of revaluation, less any subsequent accumulated depreciation and subsequent accumulated impairment losses. The Group applies the Depreciated Replacement Cost (DRC) and Discounted Cash Flows (DCF) methods to revalue the assets. Formal revaluations using the DRC are performed by independent professional valuation experts on a three-year cycle, and indices are applied in the intervening periods, where appropriate.

Management assesses the reasonableness of the fair values determined using the different methods and selects the point within the range that is most representative of the fair value of the assets in the circumstances. This includes consideration of such factors as the economic and operating environment of the assets, the impact of regulatory decisions where applicable, the age and condition of the assets, the specialized nature of certain assets, expected volumes and future cash flows, as well as the sensitivity of each method to these factors in selecting the point within the range that is most representative of the fair value of the assets in the circumstances. The Discounted Cash Flows (DCF). Depreciated Replacement Cost (DRC) and Net Book Value (NBV) should be considered.

6.1.16.1 Revaluation Criteria

In the context of the criteria above, Transnet Pipelines revalues its Pipeline Network, which incorporates:

1. liquid and gas transmission pipelines
2. Mechanical, electrical, civil and control instrumentation assets
3. Master control center at Durban head office,
4. Firefighting equipment at stations, fuel loading systems, tanks, feeder lines and pumps & Cathodic protection.

The Modern Equivalent Asset Valuation (MEAV) forms the basis of Transnet Pipeline's valuation.

This is usually the replacement cost of the Pipeline Network determined by appraisal which is normally undertaken by professionally qualified valuators.

Transnet Pipelines uses an external valuator to assess the value of the Pipeline.
Network

6.1.16.2 Impact of Revaluation on Financial Statements

6.1.16.2.1 Assets revalued for the first time.

If an asset is re-valued for the first time and re-valued up, the impact will be an increase (Dr) in the value of the asset and an increase (Cr) in the Non-Distributable Reserves (NDR).

If an asset is re-valued for the first time and re-valued down, the impact will be a decrease in the value of assets and a debit to the income statement.

6.1.16.2.2 Asset previously Re-valued — (existing NDR)

If an asset was previously re-valued, and a revaluation surplus exists in respect thereof:

- A downward revaluation will result in a reduction of the NDR to the extent of the NDR.
- Should the downward revaluation exceed the extent of the NDR, the excess will be debited directly to the income statement.
- An upward revaluation will result in a debit to the value of assets and a credit to NDR, (equity)
- If the asset was previously re-valued down and resulted in a debit to the income statement at the time:
- Any subsequent revaluation downwards will result in a further debit to the income statement and a further decrease in the value of asset.
- Any revaluation upward will result in a credit to the income statement to the extent of the previous debit. Any excess on the previous debit will result in a credit to NDR.

6.1.16,3 Depreciation of Revalued Assets.

Depreciation is raised on the re-valued depreciable amount of the asset and charged to the income statement.

6.1.16.4 Disposal of Revalued Assets

The profit or loss on disposal of re-valued assets is calculated on the re-valued carrying amount and is accounted for in the income statement.

The revaluation surplus included in equity is transferred directly to retained earnings when the surplus is realized.

The entire surplus is realized on the retirement or disposal of the asset.

6.1-16.5 Revaluation Calculation.

Refer to the Revaluation Model Procedure for revaluation calculation.

6.1.16.6

6.2 Security of Fixed Assets.

Control Objective:

Fixed assets are physically secured against unauthorized access and theft.

6.2.1 Physical Verification of Fixed Assets

The Depot Manager is responsible for the safeguarding the assets of the organization. The Fixed Assets Manager ensures all fixed assets of the organization are verified on a periodic basis and reconciled to the fixed assets register.

For above ground Pipeline related assets — this is performed every year by the depot manager and every three years on selected sites by the valuator for certain sites.

For other movable items and inventory-controlled pools — this is performed every year by December.

The objective of this verification process is to confirm the accuracy, validity, and completeness of the organization's Property, Plant and Equipment, which is recorded in the Fixed Assets Register.

6.2.1.1 Pre-Verification Procedures

A copy of the assets register will be submitted by Assets Department (Fixed Asset Analyst or Controller) either by fax or e-mail to all relevant Depot Managers.

The Depot Manager allocates the function of physical verification to a person with sufficient technical knowledge, known as the verifier, to correctly identify the assets as per the asset register.

The verifier will check the asset number on the asset register against the asset number on the physical asset.

Should the asset numbers and descriptions agree to the Asset Register then the verifier will mark this item with a tick on the asset register.

Assets identified to be physically present at the depot but are no longer being used by the depot are marked as "obsolete" on the asset register. The Depot Manager confirms all obsolete items and physically marks these items as such and separates them from all workable assets.

The Depot Manager is responsible for performing a spot check of the physical verification carried out by the verifier and is required to sign off the asset register as being verified prior to submission to the Assets Department.

All asset registers are submitted to the Asset Department.

The asset department is responsible for —

- Performing a Test check of selected depots to ensure the asset verification procedures were carried out accurately.
- All amendments that need to be made to the asset register because of any variances in the asset register report.

6.2.1.2 General Procedures

Every asset must be physically checked, counted, and compared to the Fixed Asset Register (FAR) report.

All assets verified are tagged by a sticker to indicate it was considered during the physical verification.

The asset count is conducted from the fixed asset register to the ground, and vice versa.

Discrepancies between the fixed asset register and the physical verification are recorded on the separate schedules (working papers)

Prior to concluding the exercise, the Depot Manager ensures all assets are tagged with a sticker as an indication that all assets were verified.

6.2.1.3 Completion and Discrepancies

Upon completion of the count, the fixed asset register and completed schedules are signed by the count team and verified by the Depot Manager.

A summary/ of the physical verification exercise performed by depots is prepared, signed by the Depot Manager, and submitted to the Fixed Assets Analyst at Head Office.

The Fixed Asset Analyst is responsible for the investigation of any discrepancies and documents explanations on the working papers and corrective steps where necessary

The correction of discrepancies identified is performed in compliance with the fixed assets policy and procedures (e.g., authorization of asset disposals/scrapping and write back of assets identified on the ground but not in the register.)

6.2.1.4 Tagging of Assets

The asset tagging process was introduced to ensure all assets are tagged and accounted for on the asset register.

The fixed asset controller identifies all assets that are capitalized on a monthly basis. The fixed asset controller forwards this list to the project manager/end users to tag the new asset. Cost center managers are accountable to ensure the assets under their cost centers are tagged and traceable to the asset register.

End users or cost center managers then print the asset tags containing the asset number or a unique identifier and affix the tag to the body of the asset.

In the instance whereby an asset cannot be tagged, a unique identifier or serial number can be used to trace these assets to the asset register.

The fixed asset controller is responsible to ensure the asset register is updated with the unique identifier. A MFA form is signed and approved by the Fixed Asset Manager/FRM before any changes to the system are made.

7. RECORDS

- Fixed Asset Masterfile Amendment (MFA) form
- G160 — Transfer of assets from one Transnet Pipeline depot to another.
- 1760 Transfer between Transnet business units
- RC16 Transfer between Transnet business units
- Form G159 - Scrapping form — Authority to withdraw assets from the asset register.

8. ANNEXURES

- Annexure 1 — Project Completion Certificate
- Annexure 2 — Fixed Asset Masterflle Amendment (MFA) form

- Annexure 3 – Asset Useful Lives
- Annexure 4 — G160 — Transfer of assets from one Transnet Pipeline depot to another.
- Annexure 5 — T760 Transfer between Transnet business units:
- Annexure 6 — RC16 Transfer between Transnet business units
- Annexure 7 - Form G159 — Scrapping form — Authority to withdraw assets from the asset register.
- Annexure 8 — Impairment Questionnaire

TRANSNET PIPELINES

11364

HW FIRE

DOCUMENT MANAGEMENT PLAN

11364-A1073-Rev B

HO1436-P-0001

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DOCUMENT MANAGEMENT PLAN

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1 INTRODUCTION

This Document Management Plan outlines the comprehensive framework and procedures for managing project documentation for the Witbank and Howick Fire System Upgrade Projects. A simplified workflow of the document transmittal process is provided in Annexure A.

Beginning with a detailed reference to the governing documents and specifications, the plan establishes the standards and protocols that guide all documentation activities throughout the project lifecycle. It defines the order of precedence for resolving conflicts between employer documentation, ensuring clarity and consistency in document control.

Central to the plan is the centralisation of documentation using the Microsoft SharePoint Team Site platform, which facilitates secure access, submission, and retrieval of project documents by both *Employer* and *Contractor* people. The plan details the assignment of access permissions, the process for submitting and updating the list of authorised users, and the protocols for maintaining the *Contractor* Documentation Register (CDR).

Furthermore, the plan describes the document transmittal and filing structure, specifying the use of Teams channels and SharePoint libraries for organising technical, administrative, and commercial documents. It emphasizes the importance of accurate metadata, outlines the procedures for document review and approval, and sets forth the requirements for electronic submission and in-person presentation of documentation.

Through these structured processes, the Document Management Plan ensures that all project documentation is controlled, traceable, and compliant with both contractual and regulatory requirements, supporting effective collaboration and project delivery.

2 REFERENCED DOCUMENTS AND SPECIFICATIONS

The *Contractor* refers to the following referenced documents for further information and additional requirements of the Document Management Plan.

Document Number	Document Name
DOC-STD-0001	Contractor Documentation Submittal Requirements
TPL-DM-P-0001	Transnet Pipelines Document Management Procedure
TPL-TECH-DO-STD-001	Drawing Standard PL100
TPL-TECH-DO-STD-002	Drawings Office Standard PL101
TPL-TECH-DO-STD-003	Drawings Office Standard PL102
TPL-TECH-DO-STD-004	General Drawing Standard PL103
TPL-TECH-DO-WI-001	Handover of As-built and Other Documents to Drawings Office Work Instruction
PL117653	P&ID Legend Typical Sheet 1 of 3
PL117653	P&ID Legend Typical Sheet 2 of 3
PL117653	P&ID Legend Typical Sheet 3 of 3

3 ORDER OF PRECEDENCE

Conflicts between *Employer* documentation will be implemented according to an order of precedence as follows:

1. Works Information
2. Document Management Plan (11364-A1073/HO1436-P-0001)
3. Contract Documentation Submittal Requirements (CDSR)
4. Document Management Procedure (TPL-DM-P-0001)
5. Drawing Office Standard (PL100)
6. Drawing Office Standard (PL101)
7. Drawing Office Standard (PL102)
8. General Drawing Standard (PL103)
9. Handover of As Built and Other Documents to Drawings Office (Work Instruction)

4 DOCUMENT CENTRALISATION

To centralise documentation and enable access for the project team, the *Employer* builds a website on the Microsoft SharePoint Team Site platform that the *Contractor* makes use of when submitting and retrieving all project documentation.

The *Contractor* adds the external Microsoft Entra tenant organisation nominated by the *Employer* to facilitate sharing of information between the *Employer* and the *Contractor.*

5 ACCESS AND PERMISSIONS

Access and permissions to the SharePoint Team Site are assigned by the *Project Manager* to the relevant *Employer* and *Contractor* people, that will include amongst others, project managers, contract managers, documentation control and members of the technical team.

Within 14 calendar days of the *Contract* award date, the *Contractor* submits a complete list of people to the *Project Manager* who are to be added to the SharePoint Team Site. Access requests to the *Project Manager* from the *Contractor* for additional resources to be added are only considered on the 25th of each successive month. The *Contractor* submits requests to the *Project Manager* to add additional resources on the 25th of each month.

The *Contractor* utilises the SharePoint list prepared by the *Project Manager* to submit requests for additional resources.

The following information is included for each person to be added.

1. Full Name
2. Identity Number
3. Email Address
4. First Name
5. Last Name
6. Job Title
7. Department
8. Company/Employer Name
9. Manager
10. Access requirements – Technical and Administrative / Commercial / Both

The *Project Manager* grants access to the people within five (5) working days of receiving a valid access request.

6 FORMAT IN WHICH DOCUMENTATION IS TRANSMITTED

The *Project Manager* and *Contractor* share documentation electronically using the SharePoint Team Site.

During in-person meetings, the *Contractor* presents full-sized colour hard copies of all documents that will be referenced during the meeting and provides the *Employers* people with hard copy duplicates in readable format of the documents when required to do so by the *Project Manager*.

The *Contractor* does not submit scanned copies of documents, unless the documents are a hand-mark up of meeting records.

The *Contractor* does not include password protection and security restrictions on documents. All documents are marked-up and edited using standard PDF editing tools or Microsoft document review features.

All documents are sent both in their native format and as a PDF. 3D models to be reviewed are sent in Navisworks format. The *Contractor* includes a 3D model in .ifc format with shop detailed drawings submitted for review.

7 CONTRACTOR DOCUMENTATION SCHEDULE (CDS)

The *Employer* does not provide the *Contractor* with the Contractor Documentation Schedule.

The *Contractor* populates the Contractor Documentation Register (refer section 8) that meet the requirements of the Works Information and the Accepted Programme.

8 CONTRACTOR DOCUMENTATION REGISTER (CDR)

The *Contractor* Documentation Register (CDR) is a SharePoint list describing all documents produced by the *Contractor,* that the *Contractor* generates, populates, manages and maintains.

The *Employer* creates the columns of the CDR SharePoint list that is located on the Teams site channel named *Contractor* Documentation Register.

The *Project Manager* periodically accesses the CDR and reviews the *Employer* document number and other information assigned to the items in the list. The *Contractor* includes documents on the list at least 10 working days prior to formally transmitting the respective document to the *Employer* and includes the *Employers* document number on the *Contractors* document. The *Project Manager* advises the *Contractor* of the changes required to the CDR before the document is transmitted to the *Project Manager* for the first time.

The *Contractor* maintains the document status with the corresponding document revision on the CDR according to one of the following:

1. Work in Progress/Draft (applies to documents that have not yet been shared by the *Contractor)*
2. Submitted - Squad Check Acceptance
3. Submitted - Presentation Acceptance
4. Updates Pending (for documents reviewed by the *Project Manager* while the *Contractor* implements changes)

5. Accepted
6. Obsolete/Superseded

The *Contractor* populates the CDR as follows. The *Project Manager* reviews and advises the *Contractor* of the required changes.

Column Heading	**Data Populated by**
Employer Document Number	*Contractor*
Discipline (as per SYS-P-0001 Annexure A Table A1)	*Contractor*
Document Type (as per SYS-P-0001 Annexure A Table A3)	*Contractor*
Document / Drawing Description / Title	*Contractor*
Contractor Document Number	*Contractor*
Document Status	*Contractor*
Document Status Revision	*Contractor*

9 DOCUMENT TRANSMITTAL AND FILING STRUCTURE

The SharePoint Team Site setup by the *Employer* consists of two groups, the Technical and Administrative channels and the Commercial channels, that are used to control and restrict access using SharePoint permission-based access rules configured and administered by the *Project Manager*.

The *Contractor* submits and retrieves documentation using the appropriate repository on the SharePoint Team Site, or, if possible, through the allocated Team using the Microsoft Teams application.

The *Contractor* and the *Project Manager* upload and maintain documents and data in the respective channels and document libraries in accordance with the Document Management Plan.

The *Contractors* and *Employers* people access documents and data in the channels listed in the tables below, with typical examples of documents and data that will be included under each channel for guidance. The *Project Manager* adds additional channels, Document Categories and other metadata when deemed necessary.

The *Contractor* produces and maintains his own document filing and management system, and except for the Transmitted Documents and CDR channels, only uploads final documents to the respective Team channels for documents with the following lifecycle status:

1. Accepted
2. Information
3. Superseded

The *Contractor* updates the metadata for all documents that are overtaken by recent versions as

'Superseded'.

The *Contractor* maintains all documents that are work in progress, draft phase or pending resubmission and acceptance, on his own document filing and management system.

9.1 Technical and Administrative Channels

The *Contractors* and *Employers* people have access to documents and data within the Teams channels listed in the table below.

Where assigned as such in the below table, The *Employer* or the *Contractor* uploads, populates and maintains the metadata properties of the document.

Item	Teams Channel	Document Category / Types	Uploaded and Maintained By
1	*Employers* Design	Tender drawings	*Employer*
		Conceptual 3D Model	*Employer*
		Survey information and data collected by the *Employer* during the pre-tender stage	*Employer*
2	*Employer* standards and *Employer* specifications	All	*Employer*
3	*Contractor* Documentation Register (CDR) (refer Section 8)	List	*Contractor*
4	Transmitted Project Documents by the *Contractor*	All administrative and technical documents	*Contractor*
5	Transmitted Project Documents by the *Employer*	All administrative and technical documents	*Employer*
6	Survey information and data collected by the *Contractor*	Topographical engineering surveys	*Contractor*
		Point Cloud	*Contractor*
		3D Model	*Contractor*
		Geotechnical Engineering Surveys	*Contractor*
7	The *Contractors* approved Design and Engineering documents	Municipal Drawings	*Contractor*
		Basis of Design Documents	*Contractor*
		The *Contractors* Engineering Datasheets (product datasheets filed elsewhere)	*Contractor*
		Drawings	*Contractor*
		Design calculations	*Contractor*
		HAZOP	*Contractor*
		Reports	*Contractor*
		Equipment List	*Contractor*
		Line List	*Contractor*
		Tie-in list	*Contractor*
		Electrical Load List	*Contractor*
		LUX levels	*Contractor*
		Hazardous Area Reports and Drawings	*Contractor*

Item	Teams Channel	Document Category / Types	Uploaded and Maintained By
		Instrument Index and List	*Contractor*
		I/O Schedules	*Contractor*
		Cable Schedule	*Contractor*
8	Plant, Materials and Product Datasheets	Brochures of Plant and Materials	*Contractor*
		Technical Documents of Plant and Materials	*Contractor*
9	Health, Safety and Security	Health and Safety Specification	*Employer*
		Construction Permit	*Employer*
		Approved EMP and HSE Plans	*Contractor*
		Key Contractor and Subcontractor staff list with contact details	*Contractor*
		Safety Induction Records / Safety Appointments	*Contractor*
		Health and Safety Statistics	*Contractor*
		Monthly Safety and Audit Reports	*Contractor*
		Medical Examinations (Entry and Exit)	*Contractor*
		Legal Registers	*Contractor*
		Method Statements	*Contractor*
		Risk Assessments	*Contractor*
		HSE Handover files and Datapacks	*Contractor*
10	Environmental	Environmental Specification	*Employer*
		Construction Environmental Management Plan	*Contractor*
		Application for Authorisations (Basic Assessment / Record of Decisions, EMP's)	*Contractor*
		Environmental Impact Assessment (EIA)	*Contractor*
		Environmental Audits	*Contractor*
		Environmental NCR's	*Contractor*
		Environmental Handover Files	*Contractor*
11	Site Records	Progress Photographs	*Contractor*
		Daily Site Records	*Contractor*
		Overtime and Weekend Work Requests	*Contractor*
12	Progress Reports	Basis of Schedule	*Contractor*
		Accepted Programmes	*Contractor*
		Progress Reports	*Contractor*
13	Project Minutes	Fortnightly Engineering Meetings	*Contractor*
		Site Progress Meetings	*Contractor*
		Monthly Safety Meetings	*Contractor*
		Design Review Meetings	*Contractor*
14	Request for Information (RFI) Registers and Technical Clarifications	RFI SharePoint List	*Contractor*
		Field Engineering Queries (FEQ's)	*Contractor*

Item	Teams Channel	Document Category / Types	Uploaded and Maintained By
15	Quality Assurance	Project Quality Control Plan	*Contractor*
		Test Reports / NCR's	*Contractor*
		Project Quality Audits	*Contractor*
		Concession Register	*Contractor*
		Approved Quality Assurance files and QCP's	*Contractor*
		Handover Files and Datapacks	*Contractor*
16	Commissioning and Handover	Commissioning Execution Plan	*Contractor*
		Defects Registers	*Contractor*
		Records of System Commissioning	*Contractor*
		Certificates of Compliance	*Contractor*
		Discipline Readiness Certificates	*Contractor*
		Ready for Commissioning Certificates	*Contractor*
		Ready for Operation Certificate	*Contractor*
		Defects Certificate	*Contractor*

9.2 Commercial Channels

The *Contractors* and *Employers* people have access to documents and data within the Teams channels listed in the table below.

The Commercial Channels are located within the same Team as the Technical and Administrative channels but are only visible to people nominated by the *Contractor* as well as the *Employers* people.

Where assigned as such in the below table, The *Employer* or the *Contractor* uploads, populates and maintains the metadata properties of the document.

Item	Teams Channel	Document Category / Types	Uploaded and Maintained By
17	Approved Contract Document	Contract document	*Employer*
		Works Information	*Employer*
		Supplier Development	*Employer*
		Employers Organogram	*Employer*
		Contractors Organogram	*Employer*
		CV's of the Contractors Key Persons	*Employer*
18	Transmitted Commercial Documents by the *Contractor*	All commercial documents	*Contractor*
19	Transmitted Commercial Documents by the *Employer*	All commercial documents	*Employer*
20	Commercial Minutes	Contract Kick-off meeting	*Employer*
		Monthly Contract Progress Meetings	*Contractor*
		Risk Reduction Meetings	*Employer*
21	Risk Register	List	*Employer*

Item	Teams Channel	Document Category / Types	Uploaded and Maintained By
22	NEC Notices	Early Warnings	*Employer / Contractor*
		Project Managers Instructions (PMI's)	*Employer*
		Compensation Event Quotations	*Contractor*
		Approved Compensation Events	*Employer*
23	Financial Management	Supplier and Skills Development	*Contractor*
		Cash Flows	*Contractor*
		Project Insurance Policies, Guarantees and Performance Bonds	*Contractor*
		The Contractors payment certificates and invoices	*Contractor*

10 DOCUMENT METADATA

The *Contractor* correctly and completely populates all document metadata fields to ensure that metadata is not missing from any document and that the metadata correlates accurately to the content of the document.

The *Project Manager* decides which document metadata fields are marked as "Required", the *Contractor* populates all metadata fields whether they are marked as required or not.

11 DOCUMENT TRANSMITTAL

11.1 General

The *Contractor* and *Project Manager* send documents for Information and for Acceptance through individual transmittals, except when a document provided for information is also important to the document review process.

The *Contractor* transmits all documents to the *Project Manager* with the *Employers* document number clearly visible on the cover page.

The *Contractor* and the *Project Manager* mark each individual document as "Issued" using the Issued column within the Document Set when the documents have been uploaded, and the documents are ready to be transmitted. The system automatically notifies the reviewer the documents are ready once the documents are marked as "Issued".

The *Contractor* and *Project Manager* adjust the issue date of the document to match the date for which the "Issued" column is selected.

The *Project Manager* reviews user access data from the SharePoint tracking system to assess when documents are issued and received between the *Contractor* and the *Project Manager.*

11.2 *Contractor* Transmittals

The *Contractor* transmits documents to the *Project Manager* through the "Transmitted Project Documents by the *Contractor*" or the "Transmitted Commercial Documents by the *Contractor*" channels.

The *Employer* reviews the document submissions using the native version where deemed necessary by the *Project Manager*.

The *Project Manager* decides the convention of the unique document transmittal number the *Contractor* uses, that generally follows a project reference number, the letter C, and a unique identifier starting with A or U, then followed by a unique number, starting at 101, shown as follows:

Project Reference Number – C – A101 for Technical and Administrative Documents
Project Reference Number – C – U101 for Commercial Documents

The *Contractor* sends individual emails for each transmittal to the address specified by the *Project Manager* whenever documents are issued. Each email from the *Contractor* contains a link to the relevant Document Set transmittal.

The *Project Manager* does not sign and return the *Contractor's* transmittal document that may accompany their document submissions. The *Contractor* may upload and include their own transmittal documents for information only with the batch of transmitted documents.

The *Contractor* uses the provided metadata fields to specify the intent on the transmittal as either:

1. Response

   The document submission requires further action and a response from the *Employer*

2. Information

   The document submission is for the *Employers* information only and is also used to transmit documents that have been accepted by the *Employer*.

The *Contractor* uses the provided metadata fields to specify the required response on the transmittal as either:

1. Acceptance – Squad Check

   The *Employers* people conduct a squad check review of the *Contractors* submission, and the *Project Manager* either accepts, accepts with comments or rejects the submission. Refer to Section 12 for further information.

2. Acceptance - Presentation

   The *Contractor* presents the submission for acceptance by the *Project Manager* during an online or in-person review with the *Employers* people.

3. None

   No response required from the *Project Manager*

The *Contractor* submits documents to the *Project Manager* for 'Acceptance – Presentation' at least 5 working days prior to the review session. The *Contractor* records all comments from the *Employers* people during the review session and updates the document before resubmitting for 'Acceptance – Squad Check'. The *Contractor* submits the comments recorded during the review session with the final document submission for acceptance.

11.3 *Employer* Transmittals

The *Project Manager* transmits documents to the *Contractor* through the "Transmitted Project Documents by the *Employer*" or the "Transmitted Commercial Documents by the *Employer*" channels.

The *Project Manager* uses a similar document transmittal number to the *Contractor,* except the letter E is used instead of C, as follows:

Project Reference Number – E – A101 for Technical and Administrative Documents
Project Reference Number – E – U101 for Commercial Documents

The *Project Manager* uses metadata to specify the intent on the transmittal as either:

1. Response

   The document submission requires further action and a response from the *Contractor.*

2. Information

   The document submission is for the *Contractors* information only.

The *Employer* uses metadata to specify the response on the transmittal as either:

1. Accepted

   The *Project Manager* has accepted the document. The *Contractor* uploads the approved document to the relevant Teams channel.

2. Accepted with comments

   The *Project Manager* has accepted the document subject to the comments being incorporated into the document and resubmitted for final acceptance. The *Contractor* proceeds, updates and resubmits the document for final acceptance.

3. Rejected

   The *Project Manager* rejects the document. The *Contractor* updates and resubmits the document to the *Project Manager* for acceptance before proceeding.

4. None

   No response required from the *Contractor.*

12 SQUAD CHECK PROCEDURE

The *Contractor* attaches the *Employers* squad check form and squad check comment sheet template to the front cover of all document submissions to the *Project Manager* that are issued for 'Acceptance – Squad Check'.

The *Contractor* indicates on each squad check form the submission date, the document number, the intent of the submission, and corresponding revision. Squad check forms are attached as the front cover to documents that possess a unique document number.

The *Project Manager* copies the documents transmitted by the *Contractor* for 'Acceptance – Squad Check' to the *Employer* transmittals channel, where the *Employers* people perform squad checks on the *Contractors* document submission.

System notifications regarding documents identified by the selected "Field" metadata column are directed to the appropriate reviewers from the *Employer* and the *Employer's* Owner's Engineer as outlined below:

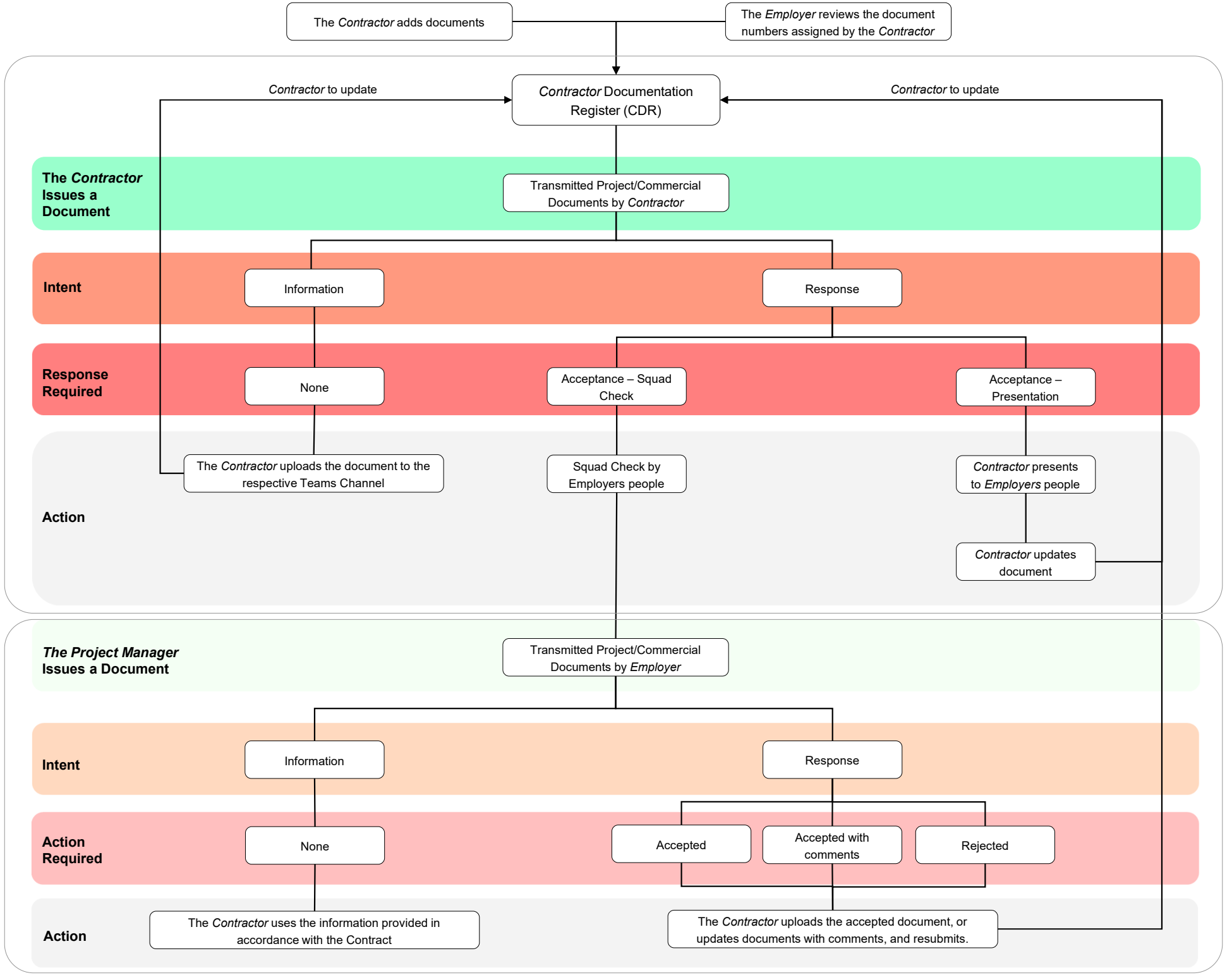
Item	Field	***Employer* Review Person**
1	Civil	*Project Manager* Lead Civil Engineers *Supervisor* Document Control
2	Commercial	*Project Manager* Lead Quantity Surveyor Procurement Lead Quality Contracts Lead Document Control Supplier Development Planner
3	Electrical	*Project Manager* Lead Electrical Engineers *Supervisor* Document Control
4	Instrumentation	Lead Instrumentation Engineers *Supervisor* Document Control
5	Environmental	Environmental Specialist Document Control
6	Fire	Fire Specialist Lead Fire Engineer Lead Mechanical Engineers Lead Process Engineers Operations Specialist *Supervisor* Document Control
7	Health and Safety	Health and Safety Specialist

Item	Field	*Employer* Review Person
		Document Control
8	Security	Security Specialist Document Control
9	Mechanical	Fire Specialist Lead Fire Engineer Lead Mechanical Engineers Lead Process Engineers Operations Specialist *Supervisor* Document Control
10	Structural	Lead Structural Engineers *Supervisor* Document Control

The document management system automatically sends reminder notifications to the *Employers* people on the submission day, five days after submission, two days before the submission deadline, and on the document review submission due date.

The *Employers* people review the documents submitted for ‘Acceptance – Squad Check” and include their comments on the document or squad check form as appropriate. The *Project Manager* submits the documents to the *Contractor* on the document due date with the comments received from the *Employers* people.

ANNEXURE A - DOCUMENT TRANSMITTAL WORKFLOW


The *Contractor* adds documents
The *Employer* reviews the document numbers assigned by the *Contractor*
Contractor to update
Contractor Documentation Register (CDR)
Contractor to update
The *Contractor* Issues a Document
Transmitted Project/Commercial Documents by *Contractor*
Intent
Information
Response
Response Required
None
Acceptance – Squad Check
Acceptance – Presentation
Action
The *Contractor* uploads the document to the respective Teams Channel
Squad Check by Employers people
Contractor presents to *Employers* people
Contractor updates document
***The Project Manager* Issues a Document**
Transmitted Project/Commercial Documents by *Employer*
Intent
Information
Response
Action Required
None
Accepted
Accepted with comments
Rejected
Action
The *Contractor* uses the information provided in accordance with the Contract
The *Contractor* uploads the accepted document, or updates documents with comments, and resubmits.

Note: If hardcopy, check electronic system for latest revision

Transnet Capital Projects Document Management

Contractor Documentation Submittal Requirements

DOC-STD-0001

Prepared by: R. Herholdt — Date: 21/09/2009

Reviewed by: N Uys, ~~Q Koen, G Whyte~~ — Date: 6/09/2009.

Approved by: C. Lesch / A. Wilson — Date: 13/10/09

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1. Purpose

This standard outlines the documentation requirements that are to be implemented by the *Contractor* for the preparation, submission, receipt, review, and collection of Technical and (or) Deliverable Documentation, as detailed in the Contractor Documentation Schedule (CDS).

Contractor documentation is of the utmost importance for the in-house Engineering activities as the information contained in the *Contractor's* documentation interfaces with several other disciplines for the Engineering, e.g., Mechanical, Structural, Piping, Control and Instrumentation, Electrical, etc.

The supply of high quality documentation within the time required as defined in the '*Works Information*', Contractor Documentation Schedule (CDS), and *Contract* must be considered as one of the main objectives by the *Contractor*.

2. Scope

This scope defines the *Contractor's* responsibilities in terms of the preparation of all the *Contractor* Deliverables required for each *Contract*.

3. References

- ISO 9001:2000 - Quality Management Systems Requirements
- SANS 10111 - Code of Practice for Engineering Drawings
- SANS 10143 - Building Drawing Practice
- DOC-FAT-0001 - Contractor Documentation Schedule (CDS)
- DOC-FAT-0002 - Contractor Documentation Register (CDR)
- DOC-FAT-0003 - Contractor Review Label (CRL)
- DOC-FAT-0004 - Contractor Review Label (CRL) for drawings

4. Definitions / Abbreviations

4.1 Definitions

'As-Built' Document	Is a final record of what was actually installed / constructed according to the Fabrication / Construction *Contractor*, and includes all deviations or changes from the approved AFC document(s). As-Built document(s) are required to reflect the same degree of detail as the original document(s). As-Built document(s) shall be done by all *Contractors*.
Contract	Formal document evidencing agreement between *Employer* and *Contractor* for supply of on site or off site services (generic term used for Purchase Orders, Contracts and Service Orders in this Procedure).
Contractor	The party to a contract that provides services to the *Employer* (generic term used for Vendors, Suppliers, Contractors, Consultants, etc.).
Controlled Document	Any document where its revision and distribution are recorded to ensure that Project Team Members holding a copy of the document have the current revision, and will receive future revisions, subject to a formal review and approval process.
Documentation	Collective term used to describe drawings and documents, e.g., letters, faxes, drawings, specifications, reports, manuals, standards, publications, software, etc.
Document Control	The function that ensures systematic registration, distribution, retrieval, status reporting, and storage of revision controlled documentation, typically Technical and (or) Deliverable documentation.
Document Management	Is the over-arching term used to describe the management of documentation on a Project.
Employer	The party to a Contract or Purchase Order to whom the goods are supplied or for whom the work or services are performed. For this project Transnet Capital Projects is the *Employer.*
Employer's Documentation	Shall mean all documentation issued to *Contractors* by the Project.
Engineering Deliverables	Technical documentation generated by Engineering, i.e. drawings, drawing registers, Engineering Document Registers, calculations, requisitions, equipment lists, design specifications, etc.

'For Record' Document	A set of record drawings / documents conforming to the marked up prints, drawings and other data, handed over to the *Employer* as part of the Project Handover Procedure.
Master Document	The original wet signed (signature) document which is held by Project Office Document Control.
Native/Source Document	Original electronic file format of documentation.
Project Deliverables	Is any document, drawing, report, register, task, etc.
Project Manager	The Project Manager is appointed by the *Employer*, and his role is to manage the Contract for the *Employer*.
Squad Checking	The review of technical documentation by multiple Engineering disciplines in order to ensure co-ordination, communication and interface between the various disciplines; done in an area specifically allocated for the review of documentation; the process / activity is controlled by Document Control but the work is executed by the Engineering Team.
Tender Document	The formal document that expresses the terms, both Commercial and Technical, against which a Tenderer submits its Tender for Contracts.
Transmittal	Is documented evidence of the formal distribution of documentation to recipients which display Transmittal No., Title, Date, Issue Reason, Revision No. etc. It is evidence of distribution and receipt of documentation.
Uncontrolled Document	Any copy of a document where distribution is not required to be recorded, and that does not require revision control or formal review.
Working Document	The main working copy of an original document where proposed changes are recorded for incorporating into subsequent revisions.
'*Works Information*'	Shall refer to the *Works Information* as defined in the Contract

4.2 Abbreviations

AB	As-Built / Recorded Documentation

AFC	Approved For Construction
CDR	Contractor Documentation Register
CDS	Contractor Documentation Schedule
CRL	Contractor Review Label
DC	Document Control
DCIS	Document Control Instruction Sheet
EDMS	Electronic Document Management System
FN	Final
RE	Responsible Engineer

5. Responsibilities

5.1 *Contractor*

The *Contractor* is responsible for submitting all documentation, required by the Contract, via Document Control to the relevant *Project Manager*, to comply with the requirements of this standard.

The *Contractor* is responsible for setting up and maintaining his own internal Document Control Process to ensure traceability and accountability for all information submitted to the *Project Manager*, and all information issued to Sub-Contractors.

5.2 *Sub-Contractors*

The *Contractor* is responsible for providing the *Sub-Contractors* with all the relevant information, and for ensuring that the *Sub-Contractors* applies the Standard, and submit their data via the *Contractor* for formal submission to the *Project Manager*. (If the *Contractor* sub-contracts work, he is responsible for providing the Works as if he had not sub-contracted.)

6. Procedure

6.1 Documentation to be Submitted

6.1.1 Contractor Documentation Schedule (CDS) (DOC-FAT-0001)

The CDS states the Employer's requirements for:

- The document types to be submitted by the *Contractor* at various stages of the Contract
- The timing for documentation to be submitted by the Contractor
- The *Project Manager* completes the Contractor Documentation Schedule (CDS) and includes it with the Enquiry and Contract as an attachment / annexure to the 'Works Information' document. The *Contractor* submits documentation as required by the Contractor Documentation Schedule (CDS), within the time specified in the Contract All documentation shall be submitted according to the dates specified in the Contractor Documentation Schedule (CDS).

6.2 Contractor Documentation Register (CDR) (Annexure B)

The Contractor Documentation Register (CDR) is a list of documentation that the *Contractor* is to submit in accordance with the *Contract*. The *Contractor* is to use the Contractor Documentation Schedule (CDS) as the basis for developing the Contractor Documentation Register (CDR). The CDS is the minimum requirement, and the *Contractor* is still responsible to include all documentation on the CDR required for the successful completion of the contract even if no CDS has been included in the *Contract*.

The title of the documentation shall adequately define and describe the facility and equipment where applicable. The Contractor Documentation Register (CDR) must be submitted within 2 weeks of the *Contract* award date, unless otherwise indicated on the Contractor Documentation Schedule (CDS) or in the Contract. Once the Contractor Documentation Register (CDR) is submitted, the *Project Manager* in conjunction with Document Control assigns document numbers to each document. The Contractor Documentation Register (CDR) is reviewed and returned to the *Contractor* as defined elsewhere in this Standard. The *Contractor* is to use the exact document numbers and titles as provided and listed by the *Project Manager* on the Contractor Documentation Register (CDR), on each of the documents.

The Contractor Documentation Register (CDR) is a 'live' document that shall be updated and re-submitted by the *Contractor* on a regular basis to reflect any changes made, e.g., updated planned / actual submission dates or addition of new documents requiring new numbers. Changes to a row(s) of the register shall be highlighted in colour across the entire row(s).

The Contractor Documentation Register (CDR) shall be submitted in Excel (electronic format) as well as PDF format upon each submission to the Project, and shall also be submitted with the final documentation, unless otherwise agreed as per par 6.3.

The forecast and actual submission dates shall reflect the dates of the next issue of the documentation, and once this submission reaches conclusion the dates are to be updated to reflect the next issue, i.e., the as-built documentation submission dates.

6.3 Format in which Documentation is to be submitted

Although the aim of this Standard is to encourage all documentation to be managed and submitted electronically the *Contractor* can apply to the *Project Manager* to have these requirements changed to accept only paper copies of all documentation

6.4 Documentation Preparation Requirements

6.4.1 Quality

Documentation shall be of the highest quality to allow immediate and accurate use by the Project Manager, i.e., without any need for interpretation due to possible illegibility, or prints / copies of poor quality.

Any illegible or indecipherable drawings will be systematically rejected and returned to the *Contractor*, who shall in no case allege documentation being rejected and returned as a reason for any delay affecting delivery.

All documentation shall have sufficient borders for punching as required for filing purposes.

6.4.2 Standards and Codes

All documentation shall conform to the latest revisions of the following, i.e.,:-

- SANS 10111 - Code of Practice for Engineering Drawings, or
- SANS 10143 - Building Drawing Practice, or
- ISO 9001:2000 - Quality Management Systems Requirements

6.4.3 Language

All drawings and documents shall be in English.

6.4.4 Units and Dimensions

All units and dimensions on the *Contractor's* documentation shall be in SI units, unless otherwise specified.

6.4.5 Sizes of Documentation

6.4.5.1 Drawings

The following standard drawing sizes shall be used:

- A3 - 277 x 420mm
- A2 - 420 x 594mm
- A1 - 594 x 841mm
- A0 - 841 x 1189mm

Note:

- Drawings wider than A0 are not acceptable to the *Project Manager*
- Hard copy drawings shall be printed out at actual size, e.g., shall not print A1 size when drawing size is A0
- A4 drawings are prohibited unless issued as part of a document.

6.4.5.2 Other Documents

All the *Contractor's* documentation other than drawings shall be prepared on standard A3 or A4 size sheets suitable for insertion into an A4 (W71) hard-core binder (file).

All documentation shall have sufficient borders to allow for punching.

6.4.6 Documentation with Multiple Sheets

6.4.6.1 Drawings

If a series of drawings of a particular area is produced by the *Contractor* (e.g., loop diagrams which may have fifty (50) or more sheets) one sequential drawing number shall be used with a series of sheet numbers.

Where more than one sheet is used, the first sheet (numbered 01) shall incorporate an index for all the other sheets in the series, including their current revision status and date.

6.4.6.2 Documents

The *Contractor's* documents with several sheets (e.g., data sheets, reports, etc.) shall be compiled as sets, i.e., a multi sheet document identified as a single document with a single document number. Thus, each sheet is identified individually, e.g., "sheet 10 of 15" and all documents shall be numbered from page 2 onwards.

Each set shall include a Table of Contents and the identification data shall as a minimum contain the following, i.e., the document number, revision number, page number and continuation information shall appear on every page of the multiple page documents. The front sheet of each document shall be page 1; however the number or wording "page 1" is not shown on the first page.

6.4.7 Details Required on Documentation

Each drawing and document shall be identified with the following information, i.e.,:-

- Project Name and Number
- Contract Number or Purchase Order Number
- Equipment Tag Number(s) (if applicable)
- Manufacturer's model / type (if applicable)
- Official Name of *Contractor's* Company
- *Contractor's* Reference Number
- Project Document or Drawing Number
- Electronic File Name (identical to the *Employer's* Document or Drawing Number and not the *Contractor's* Document or Drawing Number)
- Identification and signature of Originator, Checker, Approver, PR Eng, etc.
- Complete Descriptive Title
- Revision

- Date

6.5 Electronic Documentation Requirements

No "Protection" or "password" will be placed on electronic files.

Electronic submissions shall conform to the minimum quality standard as listed below, i.e.,:-

- File Formats to be submitted
- All deliverables submitted by the *Contractor* must be supplied in the formats listed below, and be editable using the software listed in Table 1. Only exceptions that have prior approval from the *Project Manager* will be accepted. Software used shall be the latest generation, and where appropriate, shall be regularly upgraded**.**

Note:

All electronic documents shall be submitted in Adobe Acrobat (PDF) format and the 'Native' file shall be included at the final submission.

6.5.1 Table 1: Acceptable File Formats

Document Type	Description
Drawings	Native: Micro Station 2003 or later
	Published In: Adobe Acrobat (PDF) version 7 or later
Data Sheets (other than instrumentation)	Native: MS Excel 2003 or later
	Published In: Adobe Acrobat (PDF) version 7 or later
Data Sheets (Instrumentation)	Native: As per software used or as otherwise specified in Contract
	Published In: Adobe Acrobat (PDF) version 7 or later
Engineering Data Lists	Native: MS Excel 2003 or later
	Published In: Adobe Acrobat (PDF) version 7 or later
Calculation Outputs / Results	Native: As per software used or as otherwise specified in Contract
	Published In: Adobe Acrobat (PDF) version 7 or later
Document Viewers – Redlining	Adobe Acrobat v7 minimum with "Comments" enabled
All Reports	Native: MS Word 2003 or later
	Published In: Adobe Acrobat (PDF) version 7 or later
Report supporting Data including: Calculations, Charts,	Native: As per software used or as otherwise specified in Contract

Graphs, Indexes, etc.	Published In: Adobe Acrobat (PDF) version 7 or later
Manuals	Native: MS Word 2003 or later
	Published In: Adobe Acrobat (PDF) version 7 or later
General Documents	Native: MS Word 2003 or later
	Published In: Adobe Acrobat (PDF) version 7 or later
Presentations	Native: MS PowerPoint 2003 or later
	Published In: Adobe Acrobat (PDF) version 7 or later
Colour Photographs / Scanned Images	Native File format: JPG Compression level 1%
Graphic Imagery	Published images in: TIF uncompressed or WMF
	Native image format: Corel Draw 7 CDR file
	Adobe Photoshop 7.0 PSD
	PowerPoint 2000 PPT file
Project Schedules	Native: Primavera P6 (preferred)
	Native: MS Project
	Published In: Adobe Acrobat (PDF) version 7 or later
Databases (preferred)	MS SQL Server 2000
Databases (non-preferred)	ODBC compliant
	Microsoft Access 2003
Data Compression	Software: WinZip 8.0
Other General Project Data	Native: Microsoft Office 2003 application or later
	Published In: Adobe Acrobat (PDF) version 7 or later

6.5.1.1 Native File

Native files shall be clean of all extraneous fonts, formats and styles to ensure inadvertent reformatting and format adjustments or difficulties that do not eventuate in downstream handling of documents.

6.5.1.2 Adobe Acrobat (.PDF) Files

PDF files shall be of a high quality and without dark background shading as definition may otherwise become lost.

The quality of Adobe Acrobat (.PDF) files shall be such that a hardcopy of a laser printed A1 Adobe Acrobat (.PDF) drawing can clearly be read in A3 size. Similarly A3 and A4

Adobe Acrobat (.PDF) file quality shall be such that hardcopy of a laser printed A3 or A4 Adobe Acrobat (.PDF) document can clearly be read in A4 size.

The Contractor shall physically test and confirm this prior to transmitting Adobe files.

PDF files shall be saved as "Reader Extent" to make provision for the use of electronic signatures.

PDF files shall be "Optimized" to improve Quality and then "Reduce File Size" through Adobe.

6.5.1.3 Databases

Databases shall be presented in compatible format on CD Rom as specified in Table 1. Multi format documents (created from several files) shall be combined and submitted as a single Adobe Acrobat (.PDF) file.

6.5.1.4 Drawing Files

These shall be submitted in Adobe Acrobat (.PDF) and the 'Native' file format shall be submitted on the final submission unless otherwise specified. 'Native' files shall include reference / border files, etc.

A single file shall be submitted per document, i.e., under no circumstances shall different drawings with different numbers appear on one sheet under one file name, nor shall a drawing with multiple sheets be saved into one electronic file.

All CAD drawings shall be contained in one single merge file, any form of ex Ref or Reference File will not be accepted.

6.5.1.5 Sketches

These shall be A3 or A4 size scanned as Adobe Acrobat (.PDF) file.

6.5.1.6 Text Documents

Each page of a single document shall be collated into one file. (The "wet" signature Contractor Review Label (CRL) coversheet, where required, is inserted at the beginning of the document prior to review).

6.5.1.7 Tables / Diagrams

These shall be A4 and A3 size only.

6.5.1.8 Reports

Reports containing Word, Excel, DGN, DWG, brochures, etc., shall be compiled as one Adobe Acrobat (.PDF) file.

Note:

Original colour hardcopies shall be scanned in colour to ensure all details of paper documents.

6.5.1.9 Photo's / Video's

Prints should be submitted of conventional photographs or prints and digital files of electronic images, or as specified by the Project Manager.

6.5.2 Security

Files shall be clear of known viruses and extraneous (irrelevant) macro's. The *Contractor* shall at all times have the latest generation of virus protection software. The *Contractor* shall ensure appropriate security systems are in place to prevent unauthorized electronic distributions and (or) unauthorized editing or manipulation of electronic files.

6.5.3 Scanning Requirements

Where possible 'native' files shall be converted to PDF rather than scanned from hardcopy.

Where this cannot be done all drawings and documents shall be manually scanned black and white except where colour image and fonts are required or necessary.

The settings below should be adhered to where possible and may vary depending on scanning software used. Where images rendered with these settings are unreadable, operators shall use their discretion, and adjust colour depth and resolution accordingly.

6.5.3.1 Scan Settings

- Resolution:-

  Black and White - 200 dpi

  Colour - 100 dpi

  Fine Line Drawings - 300 dpi

- Image Type:-

  Black and White - 1 Bit

  Colour Line Drawings - 8 Bit (256 colours) minimum

  Colour photos and rendered images - 24 Bit

  Use automatic threshold to determine the white and black points

- Other Criteria to Adhere to:-

  Rotate to correct reading (i.e., viewable at correct orientation)

  De-skew (i.e., straighten if on a slant)

De-speckle (i.e., remove background dirt)

Optimized (i.e., reduce file size)

Note:

When a scanned drawing is printed to be re-scanned, subsequent to, e.g., mark-ups or signatures, then it shall be scanned at a setting of 400 dpi.

6.6 Documentation Numbering

Once the Contractor Documentation Register (CDR) has been submitted by the *Contractor*, Document Control will allocate the *Employer's* documentation numbers on the Contractor Documentation Register (CDR) and return it to the *Contractor*.

A unique sequence number is allocated to each document and remains the same for each submittal of that specific document.

The *Contractor* shall use the *Employer's* document numbers and titles exactly as per the Contractor Documentation Register (CDR) on all documentation submitted.

Electronic file names for all documentation shall be exactly as per the *Employer's* documentation numbers, including the revision number.

7. Revising Documentation

All documentation carries a revision block, which must be completed in full before submitting to the *Project Manager*, and typically denotes the following:-

- NO. - Revision Number, e.g., 00, 01, etc.
- DESCRIPTION - Describes the status, e.g., Issued for Tender and a brief description of the changes made.
- BY - Person responsible for revising the document
- CHK'D - Person responsible for checking the revised document
- APP'D - Person responsible for approving the revised document
- DATE - Date of the revised document

7.1 Revision Notes

The revision block should record each change in revision with a brief but specific description of the changes made.

Terms such as "Minor Revision" or "General Revisions" shall be avoided in favour of a more specific notation.

More than one line may be used but only the revision number and date together with the relevant initials shall appear in the top line.

7.2 Indicating Revisions

Revisions shall be clearly identified by placing a revision triangle with the correct revision number in the right hand column in the case of documents, and is adjacent to the area on the document that has been changed.

All revisions made on drawings shall be enclosed by a cloud except in cases where to add a cloud detracts from the readability of the drawing. At subsequent revisions all clouds and revision triangles from the previous formal revision shall be removed from the drawing.

7.3 As-Built / Final Revisions

Should documentation require changes upon completion of Construction, it shall be revised to an "As-Built" status, as well as bear the wording "Certified As-Built", which is indicated in the revision block of the documentation.

Should documentation not require any changes upon completion of Construction, it shall be revised to a "Final" status, as well as bear the wording "Certified Final", which is indicated in the revision block of the documentation.

8. Documentation Submission

8.1 Documentation Submission Format

All documentation shall be submitted under cover of a *Contractor's* Transmittal Note.

8.2 Electronic Transmission

The Contractor Documentation Schedule (CDS) defines which documentation shall be transmitted electronically. All electronic documentation shall be transmitted on CD ROM unless otherwise agreed as per Par 6.3.

Documentation submitted on CD ROM shall be contained in a zip file with the Transmittal Note enclosed.

Note:

In the event of documentation required urgently and the *Contractor* is not able to submit a CD ROM and (or) hard copy format timeously, then e-mail transmission may take place (but in extreme cases only)

Per e-mail - the file size may not exceed 5 MB and the Transmittal Note shall be attached.

The *Contractor* is still required to submit the relevant CD ROM to Document Control without delay.

When sending an e-mail the *Contractor* shall ensure that the subject field of the e-mail is completed as follows, i.e.,:

- Contract Number – *Contractor's* Transmittal Number and Description of documentation transmitted.

8.3 Hard Copy Transmission

Documentation shall be submitted in printed hard copy format unless otherwise stated on the Contractor Documentation Schedule (CDS).

8.4 Transmittal Notes (Annexure A)

All documentation shall be submitted under cover of the *Contractor's* Transmittal Note indicating all *Contract* references (i.e., Project No, *Contract* No, etc.), Project Documentation Number(s), Revision Number, Title and Chronological listing of transmitted documentation.

The *Contractor's* Transmittal Note shall state the purpose / issue reason of the documentation submission.

Documentation for different purposes must be sent on separate *Contractor* Transmittal Notes. The *Contractor* shall note that documentation will be rejected if this requirement is not met.

The *Contractor* Transmittal shall be signed, date stamped and returned to the *Contractor* by Document Control.

8.5 Formats and Quantities of Documentation

The required number of copies and formats of documents / drawings shall be specified in the Contractor Documentation Schedule (CDS).

A typical example of quantities and formats would be as follows:-

- Pre-Construction – Hard copy and PDF (to be specified in 'CDS')
- Construction – Hard copy and PDF (to be specified in 'CDS')
- As-Built – Red Lined – Hard copies (Normally 3 off) (to be specified in CDS')
- Certified As-Built / Final – Hard copies (full size) and CD ROMs containing PDF and 'Native' file formats (to be specified in 'CDS')

8.6 Address for Submission

The address of submission will be as specified in the *Contract* and all submissions will be identified with the Contract Number, and the responsible *Project Manager*. All deliveries will be made to Document Control who will distribute the documentation to the relevant *Project Manager*.

9. Review and Acceptance of *Contractor* Documentation

The *Contractor* submits documentation as the *Contract* requires to the *Project Manager* via Document Control for review and acceptance.

9.1 Contractor Review Label (CRL)

The purpose of the Contractor Review Label (CRL) is for the *Project Manager* to assign a review code to the reviewed documentation denoting the status of the documentation after consolidation of comments. The Contractor Review Label (CRL) is to be inserted by the *Contractor* as follows:-

9.1.1 First Submission of Documentation

The first revision is revision '0', with subsequent revisions '1', '2', '3', etc.

9.1.2 Review of Documentation

Acceptance of documentation by the Project will in no way relieve the *Contractor* of their responsibility for the correctness of information, or conformance with the requirements. This responsibility rests solely with the *Contractor*.

Once documentation has been reviewed by the Project, all comments are consolidated and a review code is assigned on the Contractor Review Label (CRL) to the original reviewed / marked-up drawing / document by the *Project Manager*.

9.1.2.1 Review Codes for Contractor Documentation

The Review Code resulting from the review is as follows, i.e.,:-

- Code C1 – Accepted

  The *Contractor's* design / submission of documentation is accepted and the *Contractor* only needs re-submit documentation only if major changes have been made. The next submission will be the for Approval of "Redline" and / or "Final " documentation.

- Code C2 – Accepted with Comments. Revise and Resubmit

  In the event that the Project returns documentation with comments noted, the *Contractor* shall, within the '*period of reply'* as defined in the *Contract Data*, make the required changes and submit the revised documentation for further review on the next revision.

- Code C3 – Not Accepted. Revise and Resubmit for Review

  In the event that the Project returns documentation with "Not Accepted, Revise and Re-submit" the *Contractor* , within the '*period of reply'*, make the required changes and re-submit the revised documentation on a new revision for further review. Should these revisions necessitate changes in other related documentation, the *Contractor* shall make the appropriate changes and re-submit all the revised related documentation for further review. The *Contractor* shall not proceed with any activities controlled by the *Contractor's* documentation until it has been re-submitted and acceptance indicated.

  The *Contractor* revises and re-submits documentation but on the next revision until a review code 'C1' is achieved. This review process shall not entitle the *Contractor* to submit any claims due to time loss.

- Code C4 – Review Not Required

  Documentation signed at "Code C4" level is considered to be for information only and does not require further submission, and shall not be returned to the *Contractor*. However, Document Control shall issue a Transmittal only to the *Contractor* in this regard as notification.

9.1.2.2 Return of Reviewed Documentation

The original reviewed / marked-up drawing / document is scanned to PDF format and a copy is returned to the *Contractor* indicating the *Project Manager's* further instructions.

Return of the reviewed documentation is either in hard copy format, in which case the original reviewed / marked-up drawing / document is returned, or on CD.

Contractors will be advised by e-mail or fax (accompanied by a copy of the Project's Transmittal Note) that documentation is available for their collection.

9.1.3 Review Period

The *Contractor* shall allow the *Project Manager* the *'period of reply'* to review and respond to the *Contractor's* submission of documentation, i.e., from time of receipt by the *Project Manager* to the time of dispatch by the *Project Manager*. However, work shall proceed without delay in the event of late return of the documentation by the *Project Manager* with prior notification in writing by the *Contractor*.

9.1.4 Revised Documentation

On receipt of the reviewed documentation the *Contractor* shall make any modifications requested / marked-up and re-submit the revised documentation within *'the period of reply'* on the Contractor Documentation Schedule (CDS). Queries regarding comments / changes should be addressed with the *Project Manager* prior to re-submittal.

Any re-submittals, which have not included the changes / comments identified, will be marked with the applicable review code and returned to the *Contractor* to be corrected and re-submitted. The *Contractor* shall re-issue the revised documentation incorporating all comments on a new revision and other specified details not included in the previous issue within *'the period of reply'* of receipt of the marked-up documentation.

All revised data shall be submitted in its entirety and shall reflect the revision control numbers, and shall also indicate which documentation the revised documentation supersedes, if applicable.

In the case of drawings every sheet has its own revision number and is revised as an individual document.

In the case of documents all sheets under cover of one document number shall be under the same revision number and be re-submitted, even if the revision is a minor one.

10. As-Built / Final Documentation

This is Certified 'As-Built / Final Accepted' documentation or documentation for which no further review is required. The final documentation shall form part of the final *Contractor* Manual(s) or Data Packs

Contractors shall provide the 'As-Built' documentation that form part of the Operating, Instruction and Maintenance Manuals that were issued and accepted prior to 'As-Built' conditions for inclusion in these types of manuals by the *Project Manager*.

10.1 Definition of Final and As-Built Status of Documentation

10.1.1 "Final" Documentation

This applies to "As Manufactured and Delivered to Site".

Documentation submitted subsequently by the *Contractor* once "Final" status is reached shall be indicated as such in the Revision Notes Block as "Final" and shall also reflect the New Revision Number on the document in the revision block provided.

10.1.2 "As-Built" Documentation

This applies to "As Constructed or As Installed".

The Contractor Documentation Schedule (CDS) shall indicate the documents which are to be brought to "As-Built" status, and must be submitted only after practical completion when the documentation qualifies for "As-Built" status, and the period after completion by which they must be finalized.

10.2 Preparation of As-Built Documents

10.2.1 Transnet Capital Projects Documents

The *Contractor* responsible for completing the construction / installation works shall prepare three (3) marked up hard copies of the applicable documents to represent the As-Built condition(s). The mark-ups shall be in RED pencil or pen and be complete and accurate.

Once prepared the As-Built mark-up documentation is transmitted to Transnet Capital Projects for updating of the original design documentation.

Documents / drawings updated with information known by the *Project Manager* and as provided by *Contractors* at the completion of their *Contracts* is utilized by the *Project Manager* to update Engineering Deliverables / drawings to this status, i.e., "For Record Purposes".

Note:

File naming convention on drawings / documents shall be in accordance with the Project numbers assigned on the Contractor Documentation Register (CDR).

10.2.2 Design, Supply and Install Contractor Documents

Contractors responsible for the design, supply and installation of equipment are responsible for producing As-Builts of their own documentation.

The *Contractor* shall prepare three (3) marked up hard copies of the applicable documents to represent the As-Built condition(s). The mark-ups shall be in RED pencil or pen and be complete and accurate.

Once prepared the As-Built mark-up documentation is transmitted to the *Project Manager* for Approval through the normal process. Once approved C1 the *Contractor* can proceed to update his drawings and submit as part of the final package

The mark-ups are returned to the *Contractor* so that they can produce the As-Built revisions.

11. Installation, Maintenance and Operating Manuals and Data Books

These shall be supplied by the *Contractor* as manuals in an A4 hard covered, red, grease and waterproof binder using two (2) ring type binders.

Drawings and charts larger than A4 shall be folded and those greater than A3 shall be enclosed in an A4 plastic pocket of adequate strength.

Manuals shall be well indexed and user friendly. Manuals shall include a summarized Table of Contents and in manuals comprising a number of files / volumes there should be one summarized Table of Contents in each of the files / volumes. The draft Table of Contents shall be submitted for review to the Project Manager prior to the compilation and official submittal of the manuals. The technical content of manuals shall be specified by the *Project Manager.*

The originals of all brochures shall be issued to the *Project Manager*. When a general brochure is applicable to a range of equipment, then the specific item, catalogue number or model number shall be stated, which is best achieved by introducing a separate index page, which cross-references the specific item to a tag number.

The address, phone numbers, fax numbers and reference numbers of all *Sub-Contractors* shall be provided.

Where manuals include drawings that still need to be revised to “As-Built” status, and such manuals are required prior to ‘As-Built’ status, the manual will not be considered to be in its final form until the “As-Built” version of each such drawing has been incorporated.

The required number of copies of the manual(s) shall be as specified by the *Project Manager* and submitted per type or model number of equipment included in the contract, or as specified by the *Project Manager*.

A typical example of what the binder / file(s) shall be marked with on the spine and the front cover is as follows: -

- Project Name
- Manual Title, e.g., Installation, Maintenance and Operating Manual
- FBS No. and Title
- Manual Numbering (e.g., Volume 1 of 2, etc.)
- Contract Number
- Contractor Name

12. Cancelling and Superseding Documentation

The Document Control Procedure for cancelling and superseding is as follows:-

12.1 Superseding

If the document / drawing has been transmitted anywhere and is to be replaced by a different document number / drawing number, then it is superseded. The superseded item should go up a revision and always have the new drawing or document number written across it, as the normal practice.

The Document Controller is to check that this has been done on the drawing or document, and the revision title block should be preceded with:-

- e.g. "SUPERSEDED by 222057-2-211-M-GA-0030 …."

12.2 Cancelling

If the item is to be cancelled, it means the item has been previously transmitted and it is not being replaced by another drawing number / document number. In this case the Document Controller should check that the revision has gone up, the word “CANCELLED” is written across the drawing / document and the word "CANCELLED" is placed at the beginning of the revision title block

13. Records

All documents generated in terms of this standard are to be retained by Transnet Capital Projects as records in accordance with the requirements of Project Procedure DOC-P-0013.

Note: If hardcopy, check electronic system for latest revision

Annexure A – Typical Transmittal Note

TRANSNET

Document Transmittal Note

TO :		DATE :	
LOCATION :		FROM :	DOCUMENT CONTROL
ATTENTION :		ORIGINATOR :	
		PROJECT No :	
		TRANSMITTAL NO. :	

PURPOSE OF ISSUE *(indicate with an "X" in the appropriate block)*

☐ APPROVED FOR CONSTRUCTION	☐ FOR APPROVAL	☐ AS - BUILT
☐ APPROVED FOR DESIGN	☐ FOR INFORMATION ONLY	☐ FINAL HANDOVER
☐ FOR TENDER PURPOSES / ENQUIRY	☐ FOR REVIEW / COMMENTS	☐ OTHER (please specify)
☐ FOR CONTRACT / PURCHASE / SERVICES	☐ RETURN OF DOCUMENTATION	

ADDITIONAL REMARKS BY ORIGINATOR *(if applicable)*

DOCUMENT NUMBER	REV.	DESCRIPTION	COPY QTY	FORMAT E or H

DISTRIBUTION :

NAME	E = Electronic H = Hardcopy

Sent by : _____ Received by : _____ Date : _____

Signature : _____ Signature : _____

PLEASE CONFIRM RECEIPT BY SIGNING ONE COPY OF THE TRANSMITTAL AND RETURN TO DOCUMENT CONTROL AS SOON AS POSSIBLE

DOC-TMP-0003 Rev.02

Note: If hardcopy, check electronic system for latest revision

Annexure B – Typical Example of CDR (can be supplied electronically)

TRANSNET CAPITAL PROJECTS

Project Number:_____

Contract Number: _____

Register Document Number: _____

TCP Document Number	Document Title (Description)	Contractor's Document number	Rev	Forcasted Submission date	Actual Submission Date	For-mat	Reason for Issue

DOC-FAT-0002.xls 1

GENERAL DRAWING STANDARD (PL103)

DOCUMENT APPROVAL PROCESS

NAME		POSITION/MEETING NO.	SIGNATURE	DATE
Originator:	Zandile Moloi	Drawing Office Manager		11 Feb 2026
Approver:	Petros Khumalo	Senior Support Services Manager		11 February 2026
Original date: 15 June 2016				15 June 2016
Effective date:				12 Feb 2026

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1. INTRODUCTION

The objective of this General Drawing Standards Document is to establish a set of approved drawing standards and codes of practise that shall be required to be adhered to by both Contractor and Client in the preparation of Engineering Documentation for and on behalf of Transnet Pipelines, a Division of Transnet Ltd. By ensuring comprehensive, consistent and uniform means of presentation of information, these Standards and Codes of Practise are intended to facilitate rapid comprehension by the users of the information and thus assist in the maintenance and fault finding of installed technology.

2. SCOPE

2.1 GENERAL

This document defines as a minimum, the general responsibilities for the provision of all Engineering Documentation, whether it be by the Client or Contractor, for and on behalf of Transnet Pipelines. In this regard, providers of Engineering Documentation are required to familiarise themselves with all applicable Standards and Codes of Practise listed herein, and to ensure compliance in the execution of any work in terms of this document. Failure to comply may render the provider liable for corrections at his own cost.

These Standards and Codes of Practise should be read in conjunction with all other Specifications and drawings as issued for a particular contract. Where discrepancies occur, these must be brought to the attention of Transnet Pipelines in writing before commencement of work. In the event of any conflict between the contents of any documents forming part of a contract (as listed in the Schedule of Contract Documents) and this document, the former shall prevail.

2.2 APPLICATION TO WORK ACTIVITIES

The Standards and Codes of Practise contained herein are suitable for use whenever Engineering Documentation is required to be produced and includes amongst others the following:

- Design Sketches
- Technical Papers and literature
- Equipment Identification and Tagging
- Construction Drawings
- Specifications, both Functional and Technical
- Installation, operating and maintenance instructions, drawings and records

Design should include 3D model approach and reference to model guidelines at stipulated frequency.

3. REFERENCE DOCUMENTATION

The following standard specifications are to be used for reference purposes. It is expected of Tenderers that they be familiar with the applicable clauses and that these will be adhered to in the execution of any work in terms of this specification.

A. Standards and Recommended Practices for Instrumentation and Control, 11th Edition, Instrument Society of America.

ANSI/ISA-S5.1-2009	Instrument Symbols and Identification
ANSI/ISA - S 5.2-1992	Binary Logic Diagrams for Process Operations
ANSI/ISA-S5.3-1983	Graphic Symbols for Distributed Control, Shared Display Instrumentation, Logic and Computer Systems
ANSI/ISA - S 5.5-1985	Graphic Symbols for Process Displays

B. Graphical Symbols for Electrical Diagrams NRS 002-2000 second edition.

C. International Electrotechnical Commission Standards for Electrical Drawings

IEC Publication 60027	Letter Symbols to be used in Electrical Technology
IEC Publication 60050	International Electrotechnical Vocabulary
IEC Publication 60617	Graphical Symbols for Diagrams

D. American Society of Mechanical Engineers (ASME)

ASME Y32.11 - 1961	Graphical Symbols for Process Flow Diagrams
ASME Y32.2.3 - 1994	Graphical Symbols for Pipe Fittings, Valves & Piping.

E.	TPL-TECH-I-POL-001	Measurement Policy
F.	TPL-TECH-I-POL-002	Control Policy
G.	TPL-TECH-I-POL-003	Instrumentation Policy
H.	SANS-10111-1-2011	Engineering Standards
I.	009-TPL-TECH-OPS-20259	Model 3D Review Procedure

4. ABBREVIATION

For understanding these Standards, the following abbreviations apply.

ANSI : American National Standards Institute
C & I : Control and Instrumentation
IEC : International Electrotechnical Commission
ISA : Instrument Society of America
SABS : South African Bureau of Standards
ASA : American Standards Association

5. EQUIPMENT & INSTRUMENT SYMBOLOGY STANDARD

This specification details general drawing standards to be adhered to in the production of Engineering Documentation for and on behalf of Transnet Pipelines.

5.1 UNITS AND LANGUAGE

5.1.1 All drawings shall conform to SI (System International) units

5.1.2 All notes, comments and text shall be in the English language.

5.2 SIZES

5.2.1 All drawings shall be supplied on standard sized media as listed in Table 1 below:

Table 1. Sizes of Drawing Sheets (SABS 0111-1990 Table 1).

DESIGNATION	TRIMMED SIZE (mm)	WIDTH OF BORDER (mm)
A0	841 X 1189	20
A1	594 X 841	20
A2	420 X 594	15
A3	297 X 420	15
A4	210 X 297	15

5.2.2 Media exceeding A0 length may be used only where necessary e.g. long sections / pipe profiles etc, but with prior approval from Transnet Pipelines.

5.2.3 Where possible, the following drawing sizes shall be adhered to in the production of Engineering Documentation. Where undecided, the smallest of the recommended sizes that is consistent with clarity should be used wherever possible. Deviations from the under mentioned drawing sizes shall require prior approval from Transnet Pipelines.

DOCUMENTATION TYPE	DRAWING SIZE
Process Drawings	
Piping & Instrumentation Diagrams	A1
Process Flow Diagrams	A1
Metering & Instrumentation	
Instrument Schedules/ Data Sheets	A4
Instrument Hookup Diagrams	A4
Instrument Location Diagrams	A1
Loop Drawings	A4
Panel GA / Layout Diagrams – Internal & External	A1
Panel Wiring Diagrams	A1/A4
Cable Schedules	A1/A4
Cable Block/ Routing/ Interconnection Diagrams	A1
Safety Integrity Levels (SILs) Report	A4
HAZOP Report	A4
Software Documentation	
Engineering Design / Functional Design Spec (EDS/FDS)	A4
Plant Input/ Output (I/O) Schedules	A4
Metering Configuration Documentation	A4
Metering Detailed Design Spec (DDS)	A4
Site Acceptance Test (SAT)	A4
Electrical Documentation	
Electrical Load & Fault Calculations	A4
Single Line Diagrams	A1/A4
Panel GA / Layout Diagrams – Internal & External	A1
Electrical Schematic & Wiring Diagrams	A1
Cable Schedules	A1/A4
Cable Block/ Routing/ Interconnection Diagrams	A1

Protection settings schedule and curves	A4
Cable schedule to include – de-rating factor Philosophy / calculations, cable lengths, Volt drop calculations	A2
Earthing Single line diagrams	A1
Electrical equipment data sheets	A4
Hazardous area equipment certification	A4
Site and manifold Hazardous area classification drawings	A1
High Voltage yards structural equipment design and foundation drawings	A3
Heating Ventilation & Air Conditioning (HVAC)	A1
Hazardous Area Classification Diagrams	A1

Mechanical Documentation

General Arrangement Diagrams, Installations	As required
3D CAD views of Piping, Structural Steel & Mechanical	As required
3D model Isometric views	As required
Underground Drawings	As required
Layout Drawings	As required

*(Refer to 009-TPL-TECH-OPS-20259 document) *

Civil/Site Layout Drawings

Site Layout Diagrams	A0/A1
Cable, Racking & Trenching Layout Diagrams	A0/A1
Survey Drawings	A0/A1
Earthing Reticulation Diagrams	A0/A1
Location Drawings (Plot Plans)/ 3D CAD views	A0/A1
Structural Arrangement Drawings	A0/A1
Structural Fire Protection Drawings	A0/A1
Structural Steel Detail Drawings	A0/A1
Foundation Drawings	A0/A1
Pipe/ Ducting Support Drawings	A0/A1
Weight/ Structural Analysis Design Reports	A4/A3

5.3. TEXT SIZES & CORRESPONDING LINE THICKNESSES

5.3.1. One of the following sets of standard text sizes and corresponding line thicknesses shall be used:

Table 2. Text Size & Line Thickness (SABS 0111 1990 Table 2).

SET 1	
Text Size	Line Thickness
1.8 mm	0.18 mm
2.5 mm	0.25 mm
3.5 mm	0.35 mm
5 mm	0.5 mm
7 mm	0.7 mm
10 mm	1.0 mm

SET 2	
Text Size	Line Thickness
2.0 mm	0.2 mm
3.0 mm	0.3 mm
5.0 mm	0.5 mm
7.0 mm	0.7 mm
10.0 mm	1.0 mm
14.0 mm	1.4 mm

5.4. LINE TYPES

5.4.1. MECHANICAL DIAGRAMS

5.4.1.1. The following line types shall be adhered to in the production of Mechanical manufacturing drawings:

Table 3. Types of Lines (SABS 0111 1990 Table 3)

LINE	DESCRIPTION APPLICATION
A	Visible outlines/edges
B	Dimension, projection and leader lines cross hatching, short centre lines, imaginary lines of intersection, outlines of revolved sections
C	Break lines
D	Hidden features
E	Centre lines and lines of symetry, pitch circles, paths of motion, repeated details
F	Cutting planes
G	Limit of maximum or final maching
H	Existing or adjacent parts, alternative and extreme positions of movable parts, developed views and bend lines, feature located in front of a cutting plane, portions to be removed

5.4.2. PROCESS DIAGRAMS

5.4.2.1. Line Types to be adhered to in the production of Process Diagrams (e.g. Piping & Instrumentation Diagrams, Flow Diagrams) are defined in Transnet Pipelines Specification PL 102 Equipment, Instrument and Electrical Symbology Standards Document, Table 3.

5.5. SCALES

5.5.1. All engineering drawings shall be produced to one of the standard scales defined below, or should the need arise, a multiple of ten thereof:

10:1	1:2	1:50	1:1000
5:1	1:5	1:100	1:2000
2:1	1:10	1:200	1:2500
1:1	1:20	1:250	1:5000

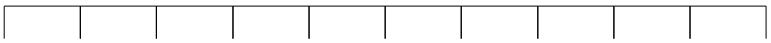
5.5.2 Conceptual drawings not drawn to scale shall be marked as "NTS" in **the box provided in the title block. Plot scales shall be noted** elsewhere on the drawing in these cases.

5.5.3 Where details (either enlarged or reduced), are drawn on the same sheet as the subject, the scale shall be indicated on the drawing, directly under the title of the detail.

5.5.4 Metric Reference Scale

All original drawings shall be marked with a metric reference scale at the bottom of the drawing, placed symmetrically about a centring mark near the frame of the border. The scale shall be 100 mm in length, with a maximum width of 5 mm and marked off in units of 10 mm.

Metric Reference Scale. (SABS 0111 Drg 10759/E)



5.6. TOLERANCES

5.6.1. Tolerances shall be indicated on all manufacturing drawings, whether as a general note, or on specific dimensions.

5.7 DIMENSIONS/NOTES

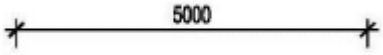
5.7.1. All manufacturing drawings shall be comprehensively dimensioned and annotated, to ensure that manufacturing methods, sizes and materials etc are clear to the manufacturer.
5.7.2. All detailed dimensions shall be in millimetres.
5.7.3. Dimensions are not to be exploded.

Examples:

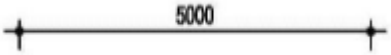
Dimension with arrows



Dimension with oblique lines



Dimension with dots



Leader



5.8 TITLE BLOCK

5.8.1. All drawings are to bear the Transnet Pipelines title block (ANNEXURE A), with the space allocated for the Transnet Pipelines drawing number. The format for the drawing number should follow the following guidelines:

Format: XXXXX-NNN-A-AAAA-NNNN-NN

Section	Description	Examples of valid data
XXXXXX	Project number	Free-text field up to twelve (12) alpha-numeric characters long, may include a mixture of alphabets, numbers & special characters.
NNN	Depot Code	Refer to Annexure B
A	Discipline code	C (Civil) (Annexure A) Table A1*
AAAA	Document type	SL (site layout) (Annexure A) Table A2*
NNNN	Sequential number by document category	0001
N	Sheet number – only used for drawings	01

*Incorporating Transnet standard document numbering codification: SYS-P-001(a) v1.0

5.8.2. A space of either 25 mm high may be added to the top or 40 mm high may be added to the left-hand side of the Transnet Pipelines title block, in which space the Contractor's details and title block may be added.

5.8.3. A further space of not more than 8 mm high may be added in the same area for the Contractor's drawing number.

5.8.4. The Contractor shall indicate the persons responsible for producing the drawing, the title, scale, project name, date, revision etc. in the spaces provided for in the Transnet Pipelines title block. (ANNEXURE A hereof)

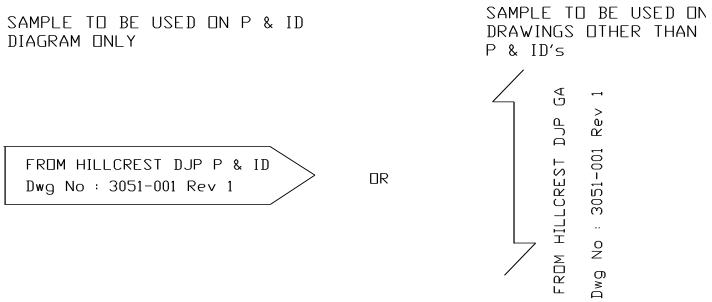
5.8.5. On application, Transnet Pipelines will supply, free of charge, one "soft copy AutoCAD version" of their title block.

5.9. REFERENCE DRAWINGS

5.9.1. Where applicable, all reference drawings shall be noted in an appropriate place, on all drawings.

5.9.2. Smaller series drawing (A4 and A3) may bear reference drawing numbers as a note, in an appropriate position, on the drawing.

5.9.3. Where a drawing is of sufficient complexity and size that warrants being split over several pages, continuation lines shall be conveyed by means of either of the under mentioned symbols. Note that the direction of the arrow shall indicate the direction of information flow.



5.10. CONTRACTOR'S AMENDMENT BLOCKS

5.10.1. All amendments made to existing drawings shall be indicated by the placement of the following information within a Revision Block included as part of the Drawing Border:

- Drawing Revision Number — Marked as the next consecutive alpha character.
- Revision Date — Date on which the amendment was made.
- Name — Name of Draughtsman responsible
- Description — Description of the amendment made.

5.10.2. Revision Numbers ascribed to Engineering Design Drawings (prior to completion of a project and production of AS BUILTS) shall be placed in the Contractor's Amendment Block and shall be numbered numerically commencing with the numerals 001. AS BUILT Drawings shall be indicated by the last revision number contained in the Contractor's Amendment Block.

5.10.3. To indicate the most recent amendments made to a drawing, all amendments relating to the most recent revision number shall be highlighted by means of a "cloud" symbol placed around the modification with the Revision Number inserted within. Only the most recent amendments shall be highlighted on a drawing in this manner.

5.11. LAYOUT

5.11.1. All drawings shall be laid out in a logical and legible manner and shall comply fully with all provisions as detailed in the Drawing Standards Document PL 100. Where Typical Drawing Layouts have been included in the Drawing Standards Document, Contractors shall be required to ensure compliance to such standards. Where Typical Drawing Layouts have not been defined, all proposed layouts shall be required to be approved by the nominated Transnet Pipelines representative prior to commencement of draughting work.

5.11.2. All orthographic projections are to be in the first angle.

5.11.3. Typical Drawing Layout Standards have been defined for the following documentation types and are required to be complied within the compilation of Engineering Documentation:

(PL 100 APPENDICE B Documentation Layout Standards/Typical)

Process Drawings
Piping & Instrumentation Diagrams (P&IDs)
Process Flow Diagrams (PFDs)
Hazop Studies

Metering & Instrumentation
Instrument Schedules
Instrument Data Sheets
Instrument Hook-up Diagrams
Loop Reports/ Drawings
Panel Layout and General Arrangements
Panel Wiring Diagrams
Cable Schedules (Refer to Electrical Typical)
Cable Block Diagrams (Refer to Electrical Typical)
Cable Interface Wiring Diagrams

Electrical Documentation
Single Line Diagrams
Electrical Schematic & Wiring Diagrams
Panel Layout and General Arrangements
Cable Schedules
Cable Block Diagrams
Cable Interface Wiring Diagrams
Connection/ Hook-up Diagrams
Heating Ventilation & Air Conditioning (HVAC)
Hazardous Area Classification Diagrams

Mechanical Documentation
General Arrangement/ 3D CAD views of Piping, Structural Steel & Mechanical, Installations.
Layout Drawings/ 3D model Isometric views
Underground Drawings
*(Refer to 009-TPL-TECH-OPS-20259 document) *

Civil/Site Layout & Survey Documentation
Trenching and Services Layout Diagrams
Earthing Reticulation Diagrams
Cable Routing Reticulation Diagrams
Structural Arrangement Drawings
Structural Fire Protection Drawings
Structural Steel Detail Drawings
Foundation Drawings
Pipe/ Ducting Support Drawings

5.12. SYMBOLOGY

5.12.1. PROCESS DIAGRAMS, METERING AND INSTRUMENT DRAWINGS

All Process Diagram and Metering & Instrument Diagram symbols shall comply with those stipulated in the Equipment, Instrument and Electrical Symbology Standards Document PL 102 Tables 1 to 10. Symbols defined in this Standard cover production of the following Document types:

Process Drawings
Piping & Instrumentation Diagrams
Process Flow Diagrams

Metering & Instrumentation
Instrument Schedules
Instrument Data Sheets
Instrument Hookup Diagrams
Instrument Location Diagrams
Loop Drawings
Panel GA / Layout Diagrams – Internal & External
Panel Wiring Diagrams
Cable Schedules
Cable Block Diagrams
Cable Interconnection Diagrams
Cable Routing Diagrams

Software Documentation
Engineering Design / Functional Design Specs
Plant I/O Schedules
Flow Charts
Software Listing

Graphical instrument/equipment symbols have been based on compliance with ISA Standards 11th Edition Vol 1. Standards and Recommended Practices for Instrumentation and Control, and American Society of Mechanical Engineers Standards ASA 732.11 / 232.2.3.:

5.12.2. MANUFACTURING / MACHINING DRAWINGS

5.12.2.1. MACHINING SYMBOLS / ROUGHNESS VALUES

5.12.2.1.1. Machining and surface finish symbols and roughness values shall comply with the Code of Practice for Engineering Drawing SABS 0111/1990 as amended.

5.12.2.2. WELDING SYMBOLS

5.12.2.2.1. All welding symbols used shall comply with the Code of Practice for Welding, SABS 044 parts I and II, as amended.

5.12.3. ELECTRICAL DRAWINGS

5.12.3.1. All cable and wire sizes, values of resistance, breaking capacity of switches and ratings of equipment shall be clearly specified on a drawing.

5.12.3.2. ELECTRICAL SYMBOLS

All Electrical Diagram symbols shall comply with those stipulated in the Equipment, Instrument and Electrical Symbology Standards Document PL 102 Section 5. Symbols defined in these Standard covers production of the following Document types:

Electrical Documentation
Single Line Diagrams
Panel GA / Layout Diagrams – Internal & External
Electrical Schematic & Wiring Diagrams
Cable Schedules
Cable Block Diagrams
Cable Interconnection Diagrams
Cable Routing Diagrams

5.12.3.3. Graphical Symbols for Electrical Diagrams NRS 002-2000 second edition

5.12.4. OTHER DRAWINGS

5.12.4.1. All other drawings using symbols, must state the standard used, or else **have a key as to the meaning** of such symbols.

5.13. DRAWING LAYER CONTROL

5.13.1. The following Layer structures shall be utilised by the Contractor in the provision of all Engineering Design Drawings. All Layer Descriptors shall comprise of alphanumeric characters and shall be descriptive in nature.

5.13.2. PROCESS DIAGRAMS

All Process Diagrams shall comply with the following Layer structure:

0	General
ALCOHOL	Alcohol Manifold Piping
AUX	Auxiliary Manifold Piping
BORDER	Border
CDRAIN	Closed Drain System
CDRAINHID	Closed Drain System - below ground
DEFPOINTS	
DIESEL	Diesel Manifold Piping
EFFLUENT	Effluent System
FIRE	Fire System
FUTURE	Future Equipment, Piping
INSTR-ATTR	Instrument Attributes
INSTR-LINE	Instrument Piping
MAIN	Main Manifold Piping
NEW	
ODRAIN	Open Drain System
ODRAINHID	Open Drain System - below ground
PETROL	Petrol Manifold Piping
PIPE-ATTR	Pipe Attributes
TEXT	
TITLE	Title Block
ULP	Unleaded Manifold Piping

Layers defined in this Standard cover production of the following Document types:

Process Drawings

Piping & Instrumentation Diagrams
Process Flow Diagrams

5.13.3. METERING & INSTRUMENTATION DIAGRAMS

All Metering & Instrumentation Diagrams shall comply with the following Layer structure:

0	General
BORDER	Border
DEFPOINTS	
DIM	Dimensions
FUTURE	Future Installations
INSTR-ATTR	Instrument Attributes
INSTR-LINE	Instrument Piping
NEW	
PROCESS	Process Connections
PNEU	Pneumatics
TEXT	
TITLE	Title Block

Layers defined in this Standard cover production of the following Document types:

Metering & Instrumentation

Instrument Schedules
Instrument Data Sheets
Instrument Hookup Diagrams
Instrument Location Diagrams
Loop Drawings
Panel GA / Layout Diagrams – Internal & External
Panel Wiring Diagrams
Cable Schedules
Cable Block Diagrams
Cable Interconnection Diagrams
Cable Routing Diagrams

5.13.4. ELECTRICAL SWITCHGEAR DIAGRAMS

All Electrical Diagrams shall comply with the following Layer structure:

0	General
BORDER	Border
C1	Control Circuitry 1
C2	Control Circuitry 2
C3	Control Circuitry 3
C4	Control Circuitry 4
DEFPOINTS	
ELEC-ATTR	Electrical Attributes
FUTURE	Future Installations
MAIN	
NEW	
T1	Power Circuitry 1
T2	Power Circuitry 2
T3	Power Circuitry 3
T4	Power Circuitry 4
TEXT	
TITLE	Title Block

Layers defined in this Standard cover production of the following Document types:

Electrical Documentation
Single Line Diagrams
Panel GA / Layout Diagrams – Internal & External
Electrical Schematic & Wiring Diagrams
Cable Schedules
Cable Block Diagrams
Cable Interconnection Diagrams
Cable Routing Diagrams
Hazardous Area Classification Diagrams

5.13.5. Mechanical Diagrams, Manifold Piping and General Arrangements

All Mechanical Diagrams shall comply with the following Layer structure:

0	General
BORDER	Border
CDRAIN	Closed Drain System
CDRAINHID	Closed Drain System - below ground
DEFPOINTS	
DIMENSION	Dimensions
FUTURE	Future Equipment, Piping
HIDDEN	Hidden - underground
MAIN	
NEW	
ODRAIN	Open Drain System
ODRAINHID	Open Drain System - below ground
PLINTH	Plinth Details
PIPE-ATTR	Pipe Attributes
TEXT	
TITLE	Title Block

Layers defined in this Standard cover production of the following Document types:

Mechanical Documentation
General Arrangement/ 3D CAD views of Piping, Structural Steel & Mechanical, Installations.
Layout Drawings/ 3D model Isometric views
Underground Drawings
*(Refer to 009-TPL-TECH-OPS-20259 document) *

5.13.6. CIVIL / SITE LAYOUT DIAGRAMS

All Civil/Site Layout Diagrams shall comply with the following Layer structure:

0	General
AUX	Auxiliary Manifold Piping
BORDER	Border
BUND	Bund
BUNDW	Bund Wall
CABLE	Cable Reticulation
CDRAIN	Closed Drain System
CDRAINHID	Closed Drain System - below ground
DEFPOINTS	
DRAIN	Drainage
EARTH	Earthing System
EFFLUENT	Effluent System
FENCE	Fencing
FIRE	Fire System
FUTURE	Future Equipment, Piping
INSTR-ATTR	Instrument Attributes
INSTR-LINE	Instrument Piping
MAIN	Main Manifold Piping
NEW	
ODRAIN	Open Drain System
ODRAINHID	Open Drain System - below ground
PIPE-ATTR	Pipe Attributes
RACK	Racking Reticulation
TEXT	
TITLE	Title Block
TRENCH	Trenching Reticulation
ZONE0	Hazardous Area Classification Zone 0
ZONE1	Hazardous Area Classification Zone 1
ZONE2	Hazardous Area Classification Zone 2

Layers defined in this Standard cover production of the following Document types:

Civil/Site Layout Drawings

Trenching and Services Layout Diagrams
Earthing Reticulation Diagrams
Cable Routing Reticulation Diagrams
Structural Arrangement Drawings
Structural Fire Protection Drawings
Structural Steel Detail Drawings
Foundation Drawings
Pipe/ Ducting Support Drawings

5.14. SCOPE OF SUPPLY

5.14.1. PRESENTATION

5.14.1.1. All documentation shall be professionally reproduced and bound to the satisfaction of the nominated Transnet Pipelines representative. At least one set of documentation shall be marked as a "MASTER" set and shall be presented in electronic medium suitable for reproduction. All binders and binding methods used, shall be approved by Transnet Pipelines prior to the documentation being bound.

5.14.2. SUPPLY REQUIREMENTS

Unless stipulated elsewhere in a Contract Document, the Contractor shall be required to provide the following Documentation:

5.14.2.1. ENGINEERING DESIGN DOCUMENTATION (PRIOR TO CONSTRUCTION)

The Contractor shall be required to prepare and submit to the Engineer three prints of each working drawing/design specification for approval. One print/copy of each drawing/specification shall be returned to the Contractor once approved. Notwithstanding any approval of design or working drawings by Transnet Pipelines or a nominated representative, the responsibility for the correct functioning of the system shall rest entirely with the Contractor.

As a minimum, the following documentation is required to be approved by Transnet Pipelines prior to commencement of construction activities:

Process Drawings

Piping & Instrumentation Diagrams
Process Flow Diagrams

Metering & Instrumentation

Instrument Schedules
Instrument Data Sheets (if different from Transnet Pipelines standard Data Sheets)
Instrument Hookup Diagrams (if different from Transnet Pipelines standard Hookups)
Loop Drawings (if different from Transnet Pipelines standard Loop Drawings)
Panel GA / Layout Diagrams – Internal & External
Panel 220V/24V Power Distribution and Barrier Layout schedules
Control System Architecture Diagrams
Communication Architecture & Interconnection Diagrams
Instrument Junction Box Layout Diagrams
Cable Block Diagrams

Software Documentation

Engineering Design Specification (Software Functional Design Specification)
Plant I/O Schedules
Flow Charts

Electrical Documentation

Electrical Load & Fault Calculations
Single Line Diagrams
Panel GA / Layout Diagrams – Internal & External
Electrical Schematic & Wiring Diagrams
Cable Block Diagrams
Hazardous Area Classification Diagrams
Heating Ventilation & Air Conditioning (HVAC)

Mechanical Documentation

General Arrangement/ 3D CAD views of Piping, Structural Steel & Mechanical.
Layout Drawings/ 3D model Isometric views
Underground Drawings
*(Refer to 009-TPL-TECH-OPS-20259 document) *

Civil/Site Layout & Survey Documentation

Site Layout Diagrams
Cable, Racking & Trenching Layout Diagrams
Earthing Reticulation Diagrams
Structural Arrangement Drawings
Foundation Drawings

5.14.2.2. FINAL CONTRACT DOCUMENTATION

Unless stipulated elsewhere in a Contract Document, the Contractor shall provide as a Minimum the following Final Contract Documentation:

5.14.2.2.1. MAINTENANCE AND OPERATING LITERATURE

Maintenance and Operating Literature is deemed to form an integral part of all equipment supplied and shall require to be supplied along with all equipment installed on Transnet Pipelines sites. Supply shall include comprehensive data on servicing, fault-finding, repairs, procedures and full particulars with diagrams of how the equipment functions. All technical literature, calculations and drawings, which will enable Engineering Staff to be fully informed on electrical, control and mechanical aspects, shall be included.

5.14.2.2.2. AS BUILT DOCUMENTATION

Process Drawings
Piping & Instrumentation Diagrams (P&IDs)
Process Flow Diagrams (PFDs)
Hazop Studies

Metering & Instrumentation

Instrument Schedules/ Data Sheets
Instrument Hook-up/ Location Diagrams
Loop Drawings
Panel GA / Layout Diagrams – Internal & External
Panel Wiring Diagrams
Panel 220V/24V Power Distribution and Barrier Layout schedules
Control System Architecture Diagrams
Communication Architecture & Interconnection Diagrams
Instrument Junction Box Layout Diagrams
Cable Schedules
Cable Block/ Interconnection/ Routing Diagrams
Safety Integrity Levels (SILs) Report

Software Documentation

Engineering Design Specification (Software Functional Design Specification)
Plant I/O Schedules
Flow Charts
Detail Software Listings

Electrical Documentation

Electrical Load & Fault Calculations
Single Line Diagrams
Panel GA / Layout Diagrams – Internal & External
Electrical Schematic & Wiring Diagrams
Cable Schedules
Cable Block/ Interconnection/ Routing Diagrams
Protection settings schedule and curves.
Cable schedule to include – de-rating factor philosophy / calculations, cable lengths, volt drop calculations.
Earthing Single line diagrams.
Electrical equipment data sheets.
Hazardous area equipment certification.
Site and manifold Hazardous area classification drawings.
High Voltage yards structural equipment design and foundation drawings.
Heating Ventilation & Air Conditioning (HVAC)
Hazardous Area Classification Diagrams

Mechanical Documentation

General Arrangement/ 3D CAD views of Piping, Structural Steel & Mechanical.
Layout Drawings/ 3D model Isometric views
Underground Drawings
Piping – Analysis, Calculations, Studies, Reports
*(Refer to 009-TPL-TECH-OPS-20259 document) *

Civil/Site Layout & Survey Documentation

Trenching and Services Layout Diagrams
Earthing Reticulation Diagrams
Cable Routing Reticulation Diagrams
Structural Arrangement Drawings
Structural Fire Protection Drawings
Structural Steel Detail Drawings
Foundation Drawings
Pipe/ Ducting Support Drawings
Weight Reports
Structural Analysis Design Reports

5.14.2.2.3. SPECIAL DOCUMENTATION

- Operators Manual/s describing the equipment, system or plant from an operational viewpoint. This shall include any special or supervisory facilities.

- Technical Manual/s which describe the overall configuration of the system, capabilities of the system, how changes are to be made to the configuration of the system and all maintenance and special procedures necessary for Transnet Pipelines to maintain the equipment installed. This manual/s shall encompass both software and hardware requirements and shall be project orientated. Drawings (i.e. Wiring diagrams, dimensioned mechanical components/equipment etc.), excluding basic illustrations contained in manuals – Copies of these drawings are to be supplied separately with the "As-built" drawings and registered in the appropriate drawing index.

5.14.2.3. FINAL CONTRACT DOCUMENTATION COPIES. (See also 5.16 for specific requirements for the supply of "As-built" documentation.

Unless stipulated elsewhere in a Contract Document, the Contractor shall provide as a minimum the following number of copies of Final Contract Documentation:

- Master Control Centre – one full set-in soft format (USB drive, Hard Drive)
- Drawing Office/Library – one MASTER set in soft format (USB drive, Hard Drive)
- Workshops – one full set-in soft format each (USB drive, Hard Drive)
- Depot – one full set-in soft format (USB drive, Hard Drive)
- Project Manager and those designated - one full set-in soft format (USB drive, Hard Drive)

5.14.2.4. Before being submitted to Transnet Pipelines, all Final Contract Documentation and AS BUILT Drawings shall be examined for compliance with onsite detail by the Contractor and signed as such.

5.14.2.5. All documentation (inclusive of software) shall be supplied with a comprehensive Indexing system, to enable ease of access to drawing files. This index shall include as a minimum, the file names, drawing title, brief description, Contractor's/consultant's name and Drawing number, pipeline name etc. Transnet Pipelines shall provide a Microsoft Excel spreadsheet with the correct headings within the appropriate columns. Where possible, indexes shall be integral to the packages used; where not possible, indexes shall be presented in a Microsoft compatible database format.

5.14.2.6. Final Contract Documentation shall be submitted to the Engineer within eight weeks of the Contract completion date.

5.14.3. SOFTWARE PLATFORMS.

5.14.3.1. The following Software Platforms are used by Transnet Pipelines and are required to be utilised by the Contractor for compilation of all Engineering Documentation as follows:

Word Processing	Microsoft Word for Microsoft Windows 10.
Spreadsheets	Microsoft Excel for Microsoft Windows 10.
Database	Microsoft Access for Microsoft Windows 10.
Draughting	AutoCAD 2024 or later.
Survey	ESRI ArcGIS.

5.14.3.2. The following Engineering Design Documentation types are currently installed on software platforms as detailed below, within Transnet Pipelines. Contractors will be required to provide the under mentioned documentation on the same software platforms.

Process Drawings

Piping & Instrumentation Diagrams	AutoCAD
Process Flow Diagrams	AutoCAD

Metering & Instrumentation

Instrument Schedules	MS Excel
Instrument Data Sheets	MS Excel
Instrument Hook-up Diagrams	MS Excel (Embedded AutoCAD)
Instrument Location Diagrams	AutoCAD
Loop Drawings	AutoCAD
Panel GA / Layout Diagrams – Internal & External	AutoCAD
Panel Wiring Diagrams	AutoCAD
Cable Schedules	AutoCAD
Cable Block Diagrams	AutoCAD
Cable Routing Diagrams	AutoCAD
Cable Interface Wiring Diagrams	AutoCAD

Electrical Documentation

Electrical Load & Fault Calculations	MS Excel
Single Line Diagrams	AutoCAD
Panel GA / Layout Diagrams – Internal & External	AutoCAD
Electrical Schematic & Wiring Diagrams	AutoCAD
Cable Schedules	AutoCAD
Cable Block Diagrams	AutoCAD
Cable Routing Diagrams	AutoCAD
Cable Interface Wiring Diagrams	AutoCAD
Protection settings schedule and curves	MS Excel
Cable schedule to include – de-rating factor philosophy / Calculations, cable lengths, Volt drop calculations	MS Excel
Earthing Single line diagrams	AutoCAD
Electrical equipment data sheets	MS Excel
Hazardous area equipment certification	AutoCAD
Site and manifold Hazardous area classification Drawings	AutoCAD
High Voltage yards structural equipment design and foundation drawings	AutoCAD
Hazardous Area Classification Diagrams	AutoCAD

Mechanical Documentation

General Arrangement/ 3D CAD views of piping	AutoCAD
Layout Drawings/ 3D model Isometric views	AutoCAD
Underground Drawings	AutoCAD
Piping – Analysis, Calculations, Studies, Reports	As required
3D model reviews	As required

Civil/Site Layout Drawings

Trenching and Services Layout Diagrams	AutoCAD
Earthing Reticulation Diagrams	AutoCAD
Cable Routing Reticulation Diagrams	AutoCAD
Structural Arrangement Drawings	AutoCAD
Structural Fire Protection Drawings	AutoCAD
Structural Steel Detail Drawings	AutoCAD
Foundation Drawings	AutoCAD
Pipe/ Ducting Support Drawings	AutoCAD
Weight Reports	As required
Structural Analysis Design Reports	As required

Survey Drawings/Diagrams ESRI ArcGIS / AutoCAD

Drawing Index Microsoft Excel

5.14.4. OWNERSHIP AND COPYRIGHT

5.14.4.1. The Contractor shall be required to grant to Transnet Pipelines a non-exclusive copyright, in accordance with the provisions of Section 22 of the Copyright Act 1978:
To copy any plan, diagram, drawing, specification, bill of quantities, design calculation, application software or similar document generated for and on behalf of Transnet Pipelines

- To make free and unrestricted use thereof for its own purposes, modify the same or have it modified by a third party for any reason
- To provide copies thereof to a third party (contractors or consultants) of Transnet Pipelines for the purposes of Tendering or Consultancy
- No separate or extra payment shall be due by Transnet Pipelines in respect of any non-exclusive licence granted in terms of this clause.

5.14.4.2. The Transnet Pipelines emblem included in the title block is subject to copyright law, and therefore, must in no way be altered, distributed, defaced or tampered with, or handled in any way that will be an infringement on the copyright thereof.

5.15. ALIGNMENT SHEETS

5.15.1. TYPE

5.15.1.1. Aerial Photo strip type alignment sheets shall be supplied

5.15.1.2. A minimum of 500 m of photographed area is to be recorded on either side of the pipeline

5.15.2. SCALE

5.15.2.1. Horizontal 1:5000

5.15.2.2. Vertical 1:500 (Profile / long section)

5.15.3. MEDIA

5.15.3.1. Electronic: 1 copy "PDF" Format

1 Copy in AutoCAD

1 Copy in Native format. (Where applicable)

5.15.3.2. Paper - Bond or similar – Min 80 gsm

5.15.3.3. Max size A0 (841 mm x 1189 mm)

5.15.4. CONTOURS

5.15.4.1. Contours at 2 m intervals are to be marked up on the alignment sheets

5.15.5. L.O. SYSTEM

5.15.5.1. Relevant coordinate grids must be marked up on all alignment sheets

5.15.5.2. L.O. systems used must correspond with those used on the servitude diagrams produced by the Land Survey Office.

5.15.5.3. L.O. systems used must be noted in the title block or on the grid lines

5.15.5.4. Each alignment sheet shall bear an accurately determined North indicating arrow

5.15.6. PROFILE (LONG SECTION)

5.15.6.1. Each alignment sheet shall have a relevant land and piping profile drawn at the bottom of the sheet.

5.15.7. BOUNDARIES

5.15.7.1. All boundaries are to be recorded on alignment sheets, including, cadastral and municipal boundaries, and property boundaries adjoining the pipe servitude.

5.15.7.2. All farm names and numbers, lots, subs, erfs etc. are to be recorded on alignment sheets

5.15.8. CROSSINGS

5.15.8.1. All crossings of existing services are to be recorded on the alignment sheets, indicating the type of service e.g. road, 22 kV overhead power lines, rivers, etc. (roads must be identified by name and/or number).

5.15.8.2. Existing services crossed, are to be reference coded as ES1, ES2, ES3 etc.

5.15.8.3. Copies of all documentation with regard, to the crossing of existing services, such as, deeds, agreements, and way leaves etc., are to be bound into book form and indexed to correspond with the reference codes on the alignment sheets

5.15.8.4. Lengths and diameters of sleeves or culverts are to be indicated on the alignment sheets.

5.15.8.5. Any crossing reference drawing numbers are to be recorded in the space provided

5.15.9. MARKERS

5.15.9.1. The exact position of all routes, distance, offset and street markers are to be recorded on alignment sheets

5.15.9.2. Route markers are to be numbered from the preceding distance marker e.g. between the origin of the pipeline and the first distance marker (km1) the route markers shall be numbered M0/1, M0/2, M0/3 etc. and between distance markers km13 and km14, the route markers shall be numbered M13/1, M13/2 etc.

5.15.9.3. Distance markers are to be placed to indicate the actual length of pipe

5.15.9.4. Distance markers are to be numbered sequentially from the origin, with the origin being 0 km

5.15.9.5. Offset markers are to be clearly marked as such, and their actual position, with relation to the centre line of the pipe, indicated.

5.15.10. PIPE PROTECTION

5.15.10.1. All pipe protection measures are to be indicated on the alignment sheets (e.g. wrappings, rock shield etc.), as to the full extent of such pipe protection

5.15.11. WALL THICKNESS

5.15.11.1. The pipe wall thickness is to be marked on each alignment sheet.

5.15.11.2. Changes in pipe wall thickness shall be clearly and accurately marked on the alignment sheets

5.15.12. BLOCK VALVES

5.15.12.1. Block valves will be numbered sequentially starting with BV1.

5.15.13. CATHODIC PROTECTION EQUIPMENT

5.15.13.1. The position of all cathodic protection equipment shall be clearly and accurately recorded on alignment sheets (e.g. rectifiers, test points, cross bonds, cable routes, anode beds etc.)

5.15.13.2. Rectifiers are to be numbered sequentially as, R1, R2, R3 etc., with R1 being the closest rectifier to the origin

5.15.13.3. Test points are to be numbered sequentially from the block valves e.g. the test point at block valve 3 shall be numbered 3/1 and the next test point between block valves 3 and 4 shall be numbered 3/2 etc.

5.15.14. GENERAL

5.15.14.1. Any reference drawings shall be noted in the space allocated on the alignment sheets

5.15.14.2. The type and position of all pipefittings is to be accurately recorded on the alignment sheets e.g. thread o rings, pig signals, stopple fittings etc.

5.15.14.3. Any cable routes (e.g. pig signal cables etc.) are to be accurately recorded on the alignment sheets

5.15.14.4. Each alignment sheet shall have a key to the symbols used on it

5.15.14.5. All road and river names, where affected by the pipeline, are to be recorded on the alignment sheets

5.15.14.6. All alignment sheets shall have "cut lines" at both ends, to enable the matching up of consecutive alignment sheets

5.15.14.7. Key plans of the pipe route shall be supplied on 1:50 000 scale topo cadastral maps. (Transparencies)

5.16. SPECIFIC REQUIREMENTS "AS-BUILT" DOCUMENTATION

5.16.1. SPECIFIC REQUIREMENTS

5.16.2. General: All Manuals (technical, operating etc.), Standards and Specifications:

ELECTRONIC COPY REQUIREMENTS:

One Electronic copy of the "As built"/ Final in PDF Format (must be able to print copies), plus one electronic copy in the Native original format (where applicable) in which it was produced. Both copies to be accessible (with the necessary controls) from the Electronic Document Management System provided for the specific project. E.g. SAP, SharePoint etc.

5.16.3. ALL DRAWINGS AND DIAGRAMS:

ELECTRONIC COPY REQUIREMENTS:

One Electronic copy of the "As built"/Final in PDF Format (must be able to print copies), plus one electronic copy in "AutoCAD 2016 or earlier" (where applicable) and one electronic copy in the Native original format (e.g., MS Office formats, AutoCAD drawings, etc.) in which it was produced. All copies to be accessible (with the necessary controls) from the Electronic Document Management System provided for the specific project. `E.g. SAP, SharePoint etc.

5.16.4. MECHANICAL ENGINEERING DOCUMENTS:

Certificates, tests and data packs

The original signed document of Conformance certificates, Test certificates, Material certificates and Data packs must be supplied together with one scanned copy in PDF format.

Manuals

Any Technical, Operating, Equipment or Maintenance Manuals received from Vendors in original Hardcopy (published, not scanned) format must be supplied in that format (4 originals) together with a scanned copy in PDF Format.

Any Technical, Operating, Equipment or Maintenance Manuals received from Vendors in original electronic format (i.e. published in electronic format) must be supplied as one electronic format copy and one printed copy (Suitably bound and referenced).

5.16.5. ELECTRICAL ENGINEERING DOCUMENTS:

Certificates

The original signed documents of "Certificate of Compliance" and "Hazardous area equipment certification" must be supplied together with one scanned copy in PDF format.

Manuals

Any Technical, Operating, Equipment or Maintenance Manuals received from Vendors in original Hardcopy (published, not scanned) format must be supplied in that format (4 originals) together with a scanned copy in PDF Format.

Any Technical, Operating, Equipment or Maintenance Manuals received from Vendors in original electronic format (i.e. published in electronic format) must be supplied as one electronic format copy and one printed copy. (Suitably bound and referenced).

Drawings and Diagrams

In addition to 5.16.3, the following site / pump station specific documentation must be supplied (2 As-Built Hardcopy Prints).

1. Single Line Diagrams.
2. Panel GA / Layout Diagrams – Internal & External.
3. Electrical Schematic & Wiring Diagrams.
4. Cable Block Diagrams.
5. Cable Routing Diagrams.
6. Earthing Single line diagrams.
7. Site and manifold Hazardous area classification drawings.

5.16.6. Handover of As-Built and Other Documents from Transnet Pipelines Technical Projects to Transnet Pipelines Drawing Office must be as per TPL-TECH-DO-WI-001. (See Appendices C).

1. DOCUMENT CHANGE HISTORY:

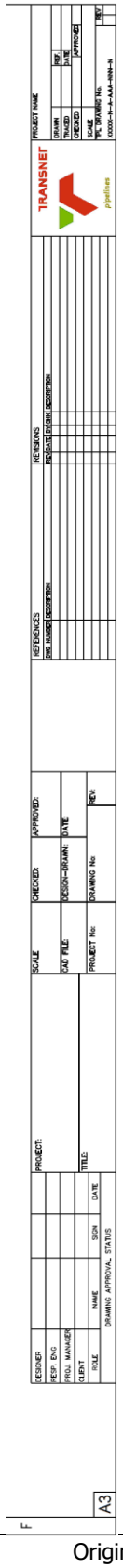
The owner of this document is responsible for the revision and control of the document, including updating of the table below, which contains the history of the document with details of each revision.

Date	Previous Rev No.	New Rev No.	Details of Revision
15.01.99	00	01	Document approved for distribution.
30.07.99	01	02	Additions made to Scope of Supply.
01.08.07	02	03	Additions made to Scope of Supply & deliverables. Transnet Pipelines logo added.
22.07.10	03	04	Additions made to Scope of Supply & deliverables. Specific requirements added.
12.06.2012	04	05	New Transnet Standard Template Adopted
07.06.2016	05	06	Document review & New Template
20.02.2024	06	07	Document update & Drawing numbering format changed
23.04.2024	07	08	Included Transnet Standard document & discipline codes, & TPL depot codes.
10.09.2025	08	09	SOP 009-TPL-TECH-OPS-20259 added on page 4 &14

This table summarises what has been changed in the document so that it is easy to keep track of the effected changes.

7. APPENDICES

APPENDICE A: SAMPLE TITLE BLOCK



APPENDICE B:

DRAWING STANDARD PL100

TRANSNET PIPELINES			
Document Name	Document Number	Revision Number	Page
Drawing Standard (PL100)	TPL-TECH-DO-STD-001	05	1 of 6

APPENDICE C:

HANDOVER OF AS BUILT AND OTHER DOCUMENTS FROM TECHNICAL PROJECTS TO DRAWING OFFICE

TRANSNET PIPELINES			
Document Name	Document Number	Revision Number	Page
Handover of As-Built and Other Documents from Technical Projects to Drawing Office	TPL-TECH-DO-WI-001	00	2 of 6

ANNEXURE A

Table A1 – Discipline Codes (Technical & Non-Technical documents)

Code	Discipline Description
AR	Architectural
BI	Building & Infrastructure
CI	Civil
EL	Electrical
EN	Environmental
FP	Fire
GE	General – non discipline specific (incl. Marine; Dredging; Light Houses; Aviation)
GO	Geotechnical
IC	Instrumentation and Control
ME	Mechanical
N	PERWAY
O	OHTE
PE	Process Engineering
PI	Piping
PM	Project Management
SC	Security / CCTV / ICT
SIG	Signals
SRV	Servitude
STL	Structural Steel
X	EPCM
Y	Professional Services Contract / Supplier / Supply Contracts

ANNEXURE A

Table A2 – Document Types

Code	Description	Additional (doc type) Descriptions	Class
ACC	Accruals		Commercial
ACT	ACT	Government ACT	General
ADD	Addendum	(for all 'general' documents)	Commercial
ADJ	Adjudication	Tender Adjudication & Evaluations	Commercial
ADV	Advertisements		General
AG	Agenda		General
AGR	Agreement	Non-Disclosure Agreements / Service Level Agreement	Commercial
AIA	Approved Inspection Authority		Technical
AL	Alignment Sheet		Drawing
ANX	Annexure	Appendix	General
AP	Access Permit	Permit to Work	Technical
		General Permits / Site Access	Technical
APP	Appointments	Key Personnel	General
AR	Arrangement Drawing		Drawing
ART	Article	News Articles	General
AS	Assembly Drawing		Drawing
ASS	Assessment	Control Self-Assessment (CSA)	General
		Organisational Transition Impact Assessment	General
		Social Impact Assessment (SIA)	General
		Socio Economic Impact Assessment (SEIA)	General
ATP	Advice to Procurement		Commercial
AU	Audits	Compliance Quality, Environmental & Safety Audits	General
AUC	Audio Clip		General
BC	Business Case	(Project specific)	General
BG	Bank Guarantee		Commercial
BoQ	Bill of Quantity	Bill of Material	Technical
BQ	Bill of Quantity (Drawings)	Bill of Material (Drawings)	Drawing
BoS	Basis of Schedule		Technical
BS	Bending Schedule		Drawing
BUD	Budget		Commercial
BUL	Bulletin	Newsletter	General
CAL	Calculation		Technical
CBA	Cost Benefit Analysis		General
CC	Contractual Claim		Commercial
CE	Compensation Event		Commercial

CF	Cash flow		Commercial
CHR	Charter (project specific)		General
CK	Checklist		General
CoC	Certificate of Compliance		Technical
CR	Concession Request		Commercial
CRQ	Change Request	Change Control	Technical
CRT	Certificate	Takeover / Handover / Completion / Payment	Technical
CS	Cable Schedule		Drawing
CT	Cable Termination		Drawing
CTA	Contract Addendum		Commercial
CTD	Contract Document		Commercial
CTN	Contractor Notification	***NEC Specific***	Commercial
CTV	Contract Variation		Commercial
DB	Data Book		Technical
DC	Design Criteria	Basis of Design	Drawing
DCF	Delegation Consent Form	Contract Value	Commercial
DCN	Design Change Notice	Engineering Change Request	Technical
DD	Daily Diaries		Commercial
DE	Detail Drawing		Drawing
DEV	Development		General
DIA	Diagram		Technical
DIC	Dictionary		General
DoA	Delegation of Authority		General
DoI	Declaration of Interest		General
DS	Data Sheet		Technical
EA	Environmental Authorization		Technical
EIA	Environmental Impact Assessment		Technical
EL	Equipment List		Technical
EM	E-mail		General
EMP	Environmental Management Plan		Technical
EMPr	Environmental Management Programme		Technical
EN	Enquiry(s)		Commercial
EOI	Expression of Interest		General
ES	Estimate		Commercial
EV	Earned Value	Earned Value Indicators	Commercial
EVA	Earned Value Analysis		Commercial
EVM	Earned Value Management		Commercial
EWI	Early Warning Incoming		Commercial
EWO	Early Warning Outgoing		Commercial
FAQ	Frequently Asked Questions		General
FAT	Forms and templates		General
FBS	Facility Breakdown Structure		Technical
FD	Fabrication Details		Drawing
FEQ	Field Engineering Query		Commercial
FS	Fact Sheet		General
FW	Frameworks	Critical Controls Framework	General

		Environmental Management Framework	General
		Governance Framework	General
		Long Term Planning Framework	General
		Port Development Framework	General
		Sustainable Development Framework	General
FX	Facsimile		General
GA	General Arrangement		Drawing
GL	Guideline	Guide	General
HAN	Hand-out	Leaflet	General
HD	Hook-up Diagram		Drawing
HF	Hydraulic Flow Diagram		Drawing
IN	Index	Instrument Index, various Indices	General
IND	Induction	Safety / Projects / General	General
INS	Instruction	Service Manager's / Employer's Agents / DSTI / Supervisor's / Work Instruction / Site Instruction	General
INV	Invoice		Commercial
IOM	Installation and Operating Manual		Technical
IP	Image and Photograph		General
IS	Piping Isometric Drawing		Drawing
TP	Inspection Test plan		Technical
JNL	Journals		General
JV	Joint Venture		General
LA	Layout		Drawing
LD	Loop Diagram		Drawing
LET	Letter		General
LIC	License		General
LIS	Lists		General
LL	Line List (drawings)		Drawing
LOG	Log (documents)	Action Log / Lessons Learned Log	General
LS	Load Summary Data Sheet		Drawing
LTI	Lost Time Injury		Technical
MA	Manual	Handbook	Technical
MP	Map		Drawing
MCA	Multi Criteria Analysis		Technical
MD	3D Model Drawing		Drawing
MEM	Memorandum		General
ML	Motor List		Drawing
MM	Minutes of Meetings	Projects / Contracts / Safety / General	General
MOU	Memorandum of Understanding		General
MR	Media Responses	General 'Responses'	General
MS	Method Statement		Technical
MTO	Material Take Off		Technical
MTX	Matrix	Approval Matrix	General
		Classification Matrix	General
		Deliverables Matrix	General
		Distribution Matrix	General
		PSO Tools Matrix	General
		RACI Matrix	General
		Regulatory Compliance Universe Matrix	General

		User Permissions Matrix	General
NCR	Non-Conformance Report		Technical
NDT	Non-Destructive Testing		Technical
NOT	Notification	Budget Change Notice / Notification	Commercial
		Credit / Debit Notes / Notification	Commercial
		Defects Notice / Notification	Technical
		Delivery Notes / Notification	Commercial
		Notice / Notification	Commercial
ORG	Organogram	Org Structure	General
ORS	Owner Requirements Specification	User Requirements Specification	Technical
P	Procedure		General
PAP	Payment Application		Commercial
PB	Performance Bond		Commercial
PBC	Programme Business Case	(Programme specific)	General
PBR	Programme Brief		General
PBS	Package Breakdown Structure	(note: lowest level components of WBS)	Technical
PCH	Programme Charter		General
PCI	Project Insurance Certificate		Commercial
PCN	Project Change Notice		Commercial
PD	Power Distribution Diagram	Power Distribution Layout	Drawing
PDO	Programme Dossier	(Programme specific)	General
PEP	Project Execution Plan		Technical
PES	Procurement Execution Strategy		General
PF	Process Flow (Diagram)		Drawing
		Flow Charts	General
		Process Flow Diagram	General
		Process Flow Map	General
		Various Management Processes	General
		Visio	General
		Workflow	General
PI	Piping & Instrumentation Diagram		Drawing
PL	Plans (drawings)		Drawing
PLN	Plans (documents)	Benefits Realisation Management Plan	General
		Closeout Plan	General
		Compliance Control Plan	General
		Construction Management Plan	General
		Development Plan	General
		Functional Execution Plan	General
		Health & Safety Management Plan	General
		Integrated Development Plan	General
		Issue Management Plan	General
		Legal and Regulatory Compliance Plan	General
		National Infrastructure Plan	General
		Occupational Management Plan	General
		Operational Readiness Plan	General
		Organisational Readiness Plan	General
		Preparation Plan	General
		Programme Assurance Plan	General
		Programme Benefits Sustainment Plan	General
		Programme Benefits Transition Plan	General
		Programme Change Management Plan	General
		Programme Closure Plan	General
		Programme Commissioning Plan	General

		Programme Contract Management Plan	General
		Programme Control Plan	General
		Programme Cost and Financial Management Plan	General
		Programme Design Blueprint and Design Principles Plan	General
		Programme Execution, Monitoring and Control Plan	General
		Programme Governance Plan	General
		Programme Independent Reviews Plan	General
		Programme Infrastructure Management Plan	General
		Programme Knowledge and Document Management Plan	General
		Programme Management Plan	General
		Programme Post Implementation Review Plan	General
		Programme Procurement Management Plan	General
		Programme Quality Management Plan	General
		Programme Requirements Management Plan	General
		Programme Resource Management Plan	General
		Programme Safety and Health Management Plan	General
		Programme Schedule Management Plan	General
		Programme Scope Management Plan	General
		Programme Stakeholder Management Plan	General
		Programme Sustainability Management Plan	General
		Proposals	General
		Project Quality Plan	General
		Risk Management Plan	General
		Strategic Alignment Plan	General
		Tranche Management Plan	General
		Transition Management Plan	General
		Transnet Infrastructure Plan	General
		Work Package Plan	General
		Work Plan	General
PLP	Project Lifecycle Process		General
PM	Process Map		General
PMB	Performance Measurement Baseline		General
PMD	Programme Mandate		General
PMI	Project Manager's Instruction	(ECC Contract) NEC specific	Commercial
PMN	Project Manager's Notification	(ECC Contract) NEC specific	Commercial
PO	Purchase Order		Commercial
POL	Policy		General
PPP	Procurement Package Plan		Commercial
PR	Press Release		General
PRM	Programme Roadmap		General
PRS	Presentation		General
PSA	Project Specific Agreement		Commercial
PSR	Project Status Report		General
QCP	Quality Control Plan		Technical
QD	Quality Dossier	Data Pack	Technical
		Environmental File	Technical
		Quality File	Technical
		Safety File	Technical
QRA	Quantitative Risk Analysis		Technical

QUO	Quotation		Commercial
RA	Risk Assessment	Risk Analysis (RA) / Safety Risk Assessment (SRA)	General
RCU	Regulatory Compliance Universe		General
RD	Reinforcing Details		Drawing
REG	Registers	Assumptions & Constraints Register	General
		Attendance Register	General
		Benefits Realization Tracking Register	General
		Decision Register	General
		Document Transmittal Register	General
		Drawing Register	General
		Equipment Requirements Register	General
		Governance Decision Register	General
		Issue Register	General
		Programme Asset Management Register	General
		Programme Integration Management Register	General
		Regulatory Compliance Tracking Register	General
		Risk Register	General
		Skills Requirements Register	General
		Stakeholder Register	General
REQ	Requisition	Engineering Requisition / Request	General
RFI	Request for Information		Technical
RFP	Request for Purchase		Commercial
RFQ	Request for Quotation		Commercial
RoD	Record of Decision		General
RPT	Reports	Assurance Report	General
		Cash Flow Report	General
		Closeout Report	General
		Contract Closeout Report	General
		Cost & Financial Report	General
		Environmental Audit Report	General
		Environmental Impact Report	General
		Factory Acceptance Test Report	General
		Final Report	General
		Financial Closure Report	General
		Gate Review Report	General
		Knowledge Transition Report	General
		Procurement Package Report	General
		Programme Closure Recommendations	General
		Programme Dashboard Report	General
		Programme Viability Report	General
		Project Closeout Report	General
		Quality Audit Report	General
		Safety Audit Report	General
		Safety Incident Report	General
		Safety Report	General
		Supplier Performance Review Report	General
SC	Schedule (Drawing)	Assemble / Design / Input-Output / Testing	Drawing
SCH	Schedule	Project Activity Program	Technical
SD	Schematic Diagram		Drawing
SDB	Sustainable Development Blueprint		General
SE	Sections	Cross Sections	Drawing
SES	Site Establishment		General
SI	Site Information		Commercial

SoW	Scope of Work	Works' information	Technical
SK	Sketch		Drawing
SL	Single Line Diagram		Drawing
SP	Specifications		Technical
SPN	Super's Notification	NEC specific	Commercial
SQ	Squad Check	Document Reviews	General
ST	Standard (Drawing)		Drawing
STD	Standard		General
STM	Statements	Final Statement / Financial Statement	Commercial
STR	Strategy	Commissioning Strategy	General
		Lessons Learned Strategy	General
		Market Demand Strategy	General
		Programme Management Strategy	General
		Regulatory Compliance Strategy	General
STU	Study		General
TE	Tender Evaluation		Commercial
TEA	Tender Addendum		Commercial
TML	Timeline	Programme Baseline / Programme Timeline	General
TN	Tender		Commercial
TO	Task Order	Works Order	Commercial
ToR	Terms of Reference		General
TQ	Technical Query		General
TRI	Transmittal (Incoming)		General
TRO	Transmittal (Outgoing)		General
TYP	Typical (Drawing)	characteristics	Drawing
VE	Value Engineering		General
VIC	Video Clip		General
VIP	Value Improvement Process		General
VL	Valve List		Drawing
WA	Warranty	Guarantee / Warrants	Commercial
WBS	Work Breakdown Structure		General

Annexure B

Depot Codes

DEPOT NAME	DEPOT CODE
Airport	APT
Alrode	ALR
Benoni	BIR
Bethlehem	BEM
Bethlehem TOP	BHT
Coalbrook	CBK
Durban	DNR
Duzi	DUZ
Empangeni	EMG
Fort Mistake	FTM
Fynnlands	FYN
Hillcrest	HLR
Hilltop	HTP
Howick	HWR
Island View	IVW
Jameson Park	JMP
Klerksdorp	KRP
Kendal	KDL
Kroonstad	KRO
Ladysmith	LAY
Ladysmith TOP	LST
Langlaagte	LLA
Magdala	MGA
Mahlabatini	MAT
Mnambithi	MBT
Mngeni	MGN
Mooi River	MRR
National Operations Centre	NOC
Newcastle	NCS
Pietermaritzburg	PZB

DEPOT NAME	DEPOT CODE
Pietermaritzburg TOP	PMT
Potchefstroom	PCM
Pretoria West	PWT
Quagga	QGA
Rustenburg	RTR
Sasolburg	SBG
Scheepersnek	SCN
Secunda	SEC
Standerton	SNR
Tarlton	TLR
Twini	TNI
Van Reenen	VRN
Villiers	VLR
Volksrust	VRR
Vrede	VDE
Vrede-T	VDE-T
Waltloo	WAO
Warden	WDN
Wilge	WIL
Witbank	WIR
Transnet Pipelines Head Office	PHO9
Depot	DEP

Line Codes

AREA	CODE
IVW - JMP	PL1
JMP - ALR	PL2
ALR - LLA	PL3
KDL - WAO	PL4
SBG - KRO	PL5
JMP - APT	PL6

PUMP SYMBOLOGY

- CENTRIFUGAL PUMP
- DOSING PUMP
- POSITIVE DISP. PUMP
- COMPRESSOR
- SCREW PUMP
- FOAM PUMP
- WATER PUMP
- HAND PUMP
- VERTICAL SPINDEL PUMP
- CAN PUMP

VALVE SYMBOLOGY

- 3-WAY VALVE
- 4-WAY VALVE
- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- DIAPHRAGM VALVE
- EXPANDING PLUG VALVE
- PLUG VALVE
- NEEDLE VALVE
- GATE-PARALLEL VALVE
- GATE-WEDGE VALVE
- GATE-KNIFE VALVE
- GLOBE VALVE
- PRESSURE SUSTAINING VALVE
- PRESSURE RELIEF VALVE
- THERMAL RELIEF VALVE
- UNSPECIFIED VALVE
- UNSPECIFIED VALVE (BUTT-WELDED)
- SPHERE HANDLING VALVE
- CONTROL VALVE
- SPRING OPPOSED ACTUATOR CYLINDER
- SOLENOID VALVE
- BURSTING DISK
- PRESSURE CONTROL VALVE
- ON/OFF SOLENOID OPERATED CONTROL VALVE
- PRESSURE REGULATING SOLENOID OPERATED CONTROL VALVE
- BALL FLOAT VALVE
- PRESSURE/VACUUM VENT
- BREATHER VALVE

PIPING/MECHANICAL SYMBOLOGY

- SPHERE RELEASE FINGER
- SIGHT GLASS
- HOSE COUPLING
- ACTUATOR – PNEUMATIC
- ACTUATOR – ELECTRIC
- MANUAL VALVE WITH POSITION FEEDBACK
- SAFETY END CLOSURE

PIPING/MECHANICAL SYMBOLOGY (cont'd)

- DRIP CUP
- DRY BREAK COUPLING
- END CAP
- FLANGE BLIND
- FLANGE INSULATING
- FLANGE SET
- PLUG
- FLEXIBLE HOSE
- GOOSE NECK
- SLOP INJECTOR
- JAIL BARS
- SPECTACLE LINE BLIND – OPEN
- SPECTACLE LINE BLIND – CLOSED
- SPADE LINE BLIND – OPEN
- SPADE LINE BLIND – CLOSED
- VENT & DRAIN RING
- STOPPLE FITTING
- ORIFICE PLATE
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER BOTTOM FLAT
- ECCENTRIC REDUCER TOP FLAT
- EYE WASH & EMERGENCY SHOWER
- FLEXIBLE JOINT
- VORTEX BREAKER
- ISOLATION JOINT
- BOOT
- LINE END CAP
- LINE INSULATION
- WEATHER HOOD
- FLASHBACK MANHOLE
- FAN
- OIL SKIMMER

FIRE SYSTEM SYMBOLOGY

- BALL PRESSURE PROPORTIONER
- FIRE HYDRANT SINGLE
- FIRE HYDRANT DOUBLE
- FIRE HYDRANT QUADRUPLE
- HYDRANT FOAM
- FOAM POURER
- FLAME ARRESTOR
- HIGH BACK PRESS. GENERATOR
- OSC MONITOR
- FIXED MONITOR
- FOAM SPRINKLER NOZZLE
- WATER SPRINKLER NOZZLE
- TANK DRENCHING NOZZLE
- HYDROCARBON LIQUID DETECTOR
- TEMPERATURE ALARM FIRE DETECTOR
- FLAME DETECTOR
- BREAK GLASS UNIT
- HYDROCARBON GAS DETECTOR

GENERAL SYMBOLOGY

- PIPE BREAK
- BATTERY LIMIT
- RATING CHANGE
- AREA CHANGE
- LIMIT OF SUPPLY
- CROSS OVER POINT
- FLOW DIRECTION
- SLOPE
- SPEC BREAK (TOP OF LINE)
- SPEC BREAK (BTM OF LINE)
- SPEC BREAK (RHS)
- SPEC BREAK (LHS)
- LINE NUMBER BREAK
- TIE-IN POINT
- GRADE

EQUIPMENT SYMBOLOGY

- DEAERATOR
- FLOW STRAIGHTENER
- LIQUID TRAP
- BI-DIRECTIONAL PROVER
- UNI-DIRECTIONAL PROVER
- STRAINER BASKET
- STEAM TRAP
- "Y" STRAINER
- "T" STRAINER
- AIR ELIMINATOR
- HYDROMETER
- THERMO WELL
- LOADING ARM
- REMOTE CONTROL PANEL
- FLOATING ROOF
- FLOATING BLANKET
- PLATE OIL SEPARATOR
- DISPERSION NOZZLE
- HEAT EXCHANGER
- TEMPERATURE SENSOR SURFACE MOUNT
- EARTHING CONNECTION
- JIB CRANE
- HOIST

GENERAL FUNCTION SYMBOLS

INSTRUMENT FUNCTION

- FIELD LOCATION ANALOG SIGNAL
- PRIMARY LOCATION ANALOG SIGNAL
- AUXILIARY LOCATION ANALOG SIGNAL

PLC FUNCTION

- FIELD LOCATION ANALOG SIGNAL
- PRIMARY LOCATION ANALOG SIGNAL
- AUXILIARY LOCATION ANALOG SIGNAL
- FIELD LOCATION DIGITAL SIGNAL
- PRIMARY LOCATION DIGITAL SIGNAL
- AUXILIARY LOCATION DIGITAL SIGNAL

COMPUTER FUNCTION

- COMPUTER FUNCTION FIELD MOUNTED
- COMPUTER FUNCTION PRIMARY LOCATION
- COMPUTER FUNCTION AUXILIARY LOCATION

INTERLOCK & MATH FUNCTIONALITY

- INTERLOCK/ESD/PURGE AIR
- ROOT EXTRACTION
- AVERAGING
- PROPORTIONAL
- INTEGRAL
- DERIVATIVE
- SIGNAL CONVERSION
  X=E – VOLTAGE
  X=I – CURRENT
  X=H – HYDRAULIC
  X=O – E.M.AGNETIC, SONIC
  X=P – PNEUMATIC
  X=R – RESISTANCE (ELECT.)
  X=A – ANALOG
  X=B – BINARY
  X=D – DIGITAL

LINE SYMBOLOGY

- INTERNAL SYSTEM LINK
- ELECTRIC SIGNAL
- MECHANICAL LINK
- PRIMARY PROCESS LINK
- PRIMARY PROCESS LINK (UNDERGROUND)
- SECONDARY PROCESS LINK
- SECONDARY PROCESS LINK (UNDERGROUND)
- UNDEFINED SIGNAL
- PNEUMATIC SIGNAL
- HYDRAULIC SIGNAL
- CAPILLARY TUBE
- ELECTROMAGNETIC SIGNAL (GUIDED)
- ELECTROMAGNETIC SIGNAL (UNGUIDED)
- PNEUMATIC BINARY SIGNAL
- ELECTRIC BINARY SIGNAL

ACTUATED AND CONTROL VALVES

MOTORISED MANUAL — ZV

MOTORISED — XV

MANUAL — ZV

CONTROL — CV

SPECIAL PIPING ITEMS

WXAT	AIR TRAP
WXBS	BAR SPHERE
WXFA	FLAME ARRESTOR
WXFC	FLEXIBLE HOSE CONNECTION
WXFH	FLEXIBLE HOSE
WXFJ	FLEXIBLE JOINT
WXFV	FOOT VALVE
WXHC	HOSE CONNECTOR (CARBON)
WXHF	HOSE CONNECTOR (FOAM CONNECTION)
WXHW	HOSE CONNECTOR (WATER)
WXHA	HOSE CONNECTOR (AIR)
WXLK	LOCKABLE VALVE
WXSR	STRAINER
WXSS	SAFETY SHOWER & EYE BATH
WXST	SPHERE TEE
WXVB	BALL VALVE
WXVC	CHECK VALVE

ABBREVIATIONS

BF	BOTTOM FLAT (REDUCER)
D	DRAIN
FL	FAIL LAST
FW	FULL WATER (HYDROSTATIC PRESSURE)
H	HIGH
HDPE	HIGH DENSITY POLYETHELENE
HFC	HEAD FACILITIES CONTRACTOR
HH	HIGH HIGH
IF	INSULATION FLANGE
L	LOW
LC	LOCKED CLOSED VALVE
LL	LOW LOW
LO	LOCKED OPEN VALVE
NC	NORMALLY CLOSED VALVE
NF	NORMAL FILL
NLL	NORMAL LIQUID LEVEL
NO	NORMALLY OPEN VALVE
P	PROCESS INTERLOCK
RS	REMOVABLE SPOOL
S	SAFETY INTERLOCK
TF	TOP FLAT (REDUCER)
US	UTILITY STATION
UWP	UTILITY WATER POINT
V	VENT

GENERAL FUNCTION SYMBOLS

- ROTAMETER
- ULTRASONIC FLOWMETER
- POSITIVE DISPLACEMENT FLOWMETER
- TURBINE FLOWMETER
- SPHERE DETECTOR SWITCH
- COUNTER
- CORIOLIS FLOWMETER
- ELECTRICAL START/STOP STATION

TANKS SYMBOLOGY

- WATER TANK 5000 m³
- ACCUMULATOR TANK 5000 m³
- SLOP TANK 250 m³
- FOAM TANK 250 m³
- TRANS TANK 250 m³
- ADDITIVE TANK 250 m³
- SUMP TANK 250 m³
- SEP. TANK 250 m³

SHEET 1 OF 3

REVISIONS

REV	BY	CHK	APP	DATE	DESCRIPTION
B	AZ		ZM	13/10/2022	UPDATE AS PER THE LATEST NMPP LEGEND (2684358-E-A00-PR-PD-001)
A	ZM		RP	16/09/2013	REDRAWN FROM KENTZ DR NO. A2AE050003-K0A-2716

TRANSNET pipelines

P&ID LEGEND
TYPICAL

PROJECT NAME

DRAWN	Z.M.	REF.	-
TRACED	CAD	DATE	16-09-2013
CHECKED		APPROVED	R.P.
SCALE	N.T.S.		
DRAWING NO.	PL 117653	REV.	B

EQUIPMENT TAG IDENTIFICATION STANDARD

FI	FLOW INDICATOR
FO	FLOW ORIFICE
FS	FLOW SWITCH
FT	FLOW TRANSMITTER
H	HIGH
HH	HIGH HIGH
L	LOW
LL	LOW LOW
LCV	LEVEL CONTROL VALVE
LI	LEVEL INDICATOR
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
PCV	PRESSURE CONTROL VALVE
PRV	PRESSURE RELIEF VALVE
PI	PRESSURE INDICATOR
PT	PRESSURE TRANSMITTER
TI	TEMPERATURE INDICATOR
UA	FIRE ALARM
UY	FIRE OUTPUT
XS	HAND SWITCH
XSC	HAND SWITCH - CLOSED
XSO	HAND SWITCH - OPEN
XV	CONTROL VALVE

WHERE MULTIPLE INSTRUMENTS OR VALVES ARE ASSOCIATED WITH A ZONE, AN ALPHANUMERIC SUFFIX IS APPENDED TO THE TAG TO UNIQUELY IDENTIFY THE DEVICE.. FOR EXAMPLE: TWO LEVEL SWITCHES INSTALLED ON A TANK WILL BE TAGGED LS xxxA AND LS xxxB.

IN TERMINAL FACILITIES WHERE TANK BUNDS ARE UNIQUELY IDENTIFIED, INSTRUMENT AND VALVE TAG IDENTIFIERS WILL REFERENCE THE BUND TO WHICH THE EQUIPMENT HAS BEEN ALLOCATED. FOR EXAMPLE: ACTUATED VALVES ASSOCIATED WITH TANK BUND A WILL BE TAGGED XV xxx A1, XV xxx A2 etc.

EQUIPMENT TAG AREA

ZONE IDENTIFIERS ARE ALLOCATED ON A CONSECUTIVE BASIS, USING THE FIRE SYSTEM GROUP IDENTIFIER OF '18' FOR THE FIRST TWO DIGITS.

180	TEMPORARY
181	FIRE PUMP 1
182	FIRE PUMP 2
183	FOAM PUMP 1
184	FOAM PUMP 2
185	MAIN LINE PUMP HOUSE
186	MANIFOLD
187	TANK FARM
188	SPILL BASIN
189	ROAD LOADING

VALVE POSITION

LC	LOCKED CLOSED
LO	LOCKED OPEN
NC	NORMALLY CLOSED
NO	NORMALLY OPEN

EQUIPMENT TAG LOCATION

PANEL PUSHBUTTONS AND INDICATION LAMPS UNIQUELY IDENTIFY THE PANELS IN WHICH THEY ARE INSTALLED BY MEANS OF AN ALPHANUMERIC SUFFIX, AS FOLLOWS

A	PROCESS CONTROL SYSYEM
B	CONTROL ROOM
C	FIRE PUMP HOUSE
D	GUARD HOUSE
E	SPILL BASIN
F	HAND STATION

EQUIPMENT LABELLING STANDARD

1. FIRE SYSTEM VALVES SHALL BE LABELLED WITH THE FOLLOWING OPERATIONS CODES:

   MFx - MUNICIPALITY WATER SUPPLY VALVES
   WSx - WATER INLET VALVES
   WDx - WATER DISCHARGE VALVES
   WRx - WATER RETURN VALVES
   FSx - FOAM CONCENTRATE INLET VALVES
   FDx - FOAM CONCENTRATE DISCHARGE VALVES
   FRx - FOAM CONCENTRATE RETURN VALVES
   FCx - FOAM CONCENTRATE CIRCULATION VALVES
   FAx - FOAM PREMIX INLET VALVES
   JPAx - JOCKEY PUMP SUCTION VALVES
   JPEx - JOCKEY PUMP DISCHARGE VALVES
   JBEx - JOCKEY PUMP BYPASS VALVES

   WHERE 'x' = CONSECUTIVE NUMBER RUNNING FROM UPSTREAM TO DOWNSTREAM DEVICES.

2. FIRE SYSTEM PIPELINES WITHIN THE FIRE PUMP HOUSE WILL BE LABELLED AS FOLLOWS:

   - WATER
   - PREMIX
   - FOAM
   - FLOW DIRECTION WILL BE INDICATED

FIRE SYSTEM PIPELINE IDENTIFICATION

AA - SSS - P - XXX - MM - NNNN

WHERE:

AA = STATION AREA IDENTIFIER
SSS = SERVICE — FW = FIRE WATER; FC = FOAM CONCENTRATE; FMP = FOAM PREMIX
P = PRESSURE RATING — A = CLASS 150; B = CLASS 300; HFE = CLASS 16 HDPE
MM = MATERIAL SPEC — CS = CARBON STEEL; PE = HDPE; SS = STAINLESS STEEL

FIRE SYSTEM PIPELINE COLOR CODING

1. FIRE SYSTEM PIPELINES WITHIN THE FIRE PUMP HOUSE WILL BE COLOR CODED TO INDICATE DUTY, AS FOLLOWS:

   - FIRE WATER = SIGNAL RED
   - FOAM CONCENTRATE = ROYAL BLUE
   - FOAM PREMIX = WHITE

FIRE SYSTEM DESIGN BASIS

DESIGN BASIS

1. ALL FIXED FIRE WATER / FOAM SYSTEMS SHALL BE DEVELOPED IN ACCORDANCE WITH THE TPL FIRE PROTECTION DESIGN STANDARD: FIXED FIRE WATER / FOAM SYSTEMS (REF: PYP/W1/6/21/1185), AND SHALL COMPLY WITH SANS CODE 10089, SUPPLEMENTED BY RELEVANT NFPA CODES AND STANDARDS.
2. A RISK BASED APPROACH SHALL BE USED TO DETERMINE FIRE FIGHTING REQUIREMENTS PER SITE. FIRE WATER AND FOAM REQUIREMENTS SHALL BE DETERMINED FOR THE HIGHEST FIRE RISK WITH THE LARGEST SURFACE AREA IN A DEPOT (LARGEST CREDIBLE RISK SCENARIO).
3. FIRE WATER STORAGE CAPACITY SHALL BE PROVIDED FOR ONE HOUR'S FIRE FIGHTING AT THE MAXIMUM SUPPLY DEMAND PLUS WEEKLY SYSTEM TESTING AND WASHING. TWO INDEPENDENT SOURCES OF FIRE WATER SHALL BE PROVIDED AT DESIGN PRESSURE AND FLOW.
4. FOAM CONCENTRATE STORAGE CAPACITY SHALL BE PROVIDED FOR ONE HOUR'S FIRE FIGHTING AT THE MAXIMUM SUPPLY DEMAND.
5. A MINIMUM OF TWO DIESEL ENGINE DRIVEN FIRE WATER PUMPS CAPABLE OF DELIVERING WATER AT DESIGN PRESSURE AND FLOW SHALL BE PROVIDED. FIRE PUMPS SHALL BE COMPLIANT WITH NFPA20 AND SANS 10089.
6. DIESEL FUEL TANKS SHALL BE SIZED TO ALLOW FOR ONE HOUR OF FIRE FIGHTING AND WEEKLY TESTING.
7. SPILL BASIN CAPACITY SHALL PROVIDE FOR A 10 YEAR 1 HOUR STORM PLUS A FIVE MINUTE FULL FLOW SPILLAGE PLUS ONE HOUR FIRE FIGHTING AT MAXIMUM DEMAND.

CONTROL PHILOSOPHY

8. FIRE SYSTEMS WILL BE CONTROLLED FROM A MAIN FIRE CONTROL PANEL LOCATED WITHIN THE FIRE PUMP HOUSE, AS WELL AS FROM SCENARIO CONTROL PANELS LOCATED WITHIN THE FIRE PUMP HOUSE, CONTROL ROOM AND SECURITY BUILDINGS.
9. THESE CONTROL PANELS WILL PROVIDE A SITE REPRESENTATION OF ALL ZONES AND WILL ENABLE THE MONITORING AND CONTROL OF ALL ASSOCIATED EQUIPMENT. THE MAIN FIRE CONTROL PANEL WILL SUPPORT THE CONTROL OF INDIVIDUAL DEVICES, WHEREAS THE SCENARIO PANELS WILL ENABLE THE INITIATION OF PRE-PROGRAMMED FIRE FIGHTING SCENARIOS.
9. INTERLOCKING BETWEEN ZONES MAY BE PERMITTED WHERE REQUIRED.
10. A LIMITED INTERFACE SHALL BE PROVIDED BETWEEN THE FIRE CONTROL SYSTEM AND THE PROCESS CONTROL SYSTEM ON RESPECTIVE SITES FOR ALARMING PURPOSES ONLY.
11. A DETAILED INTERFACE SHALL BE PROVIDED BETWEEN THE FIRE CONTROL SYSTEM AND THE SITUATIONAL MANAGEMENT SYSTEM LOCATED REMOTELY IN THE NATIONAL OPERATIONS CENTRE. THIS INTERFACE WILL ENABLE THE MONITORING AND CONTROL OF ALL ASSOCIATED FIRE SYSTEM EQUIPMENT.

INSTRUMENTATION

7. FLAME DETECTORS SHALL BE PROVIDED ON UNMANNED SITES AND ON MANNED SITES IN AREAS OF POOR VISIBILITY, FOR ALARMING PURPOSES ONLY. IN CERTAIN APPLICATIONS, DOUBLE KNOCK DETECTION MAY BE USED TO TRIGGER FIRE FIGHTING WITHIN A ZONE.
8. HYDROCARBON LIQUID LEVEL DETECTORS SHALL BE PROVIDED WITHIN CLOSED STORAGE TANK BUNDS, FOR ALARMING PURPOSES ONLY.
9. IN TERMINAL APPLICATIONS, THERMAL HEAT DETECTION SHALL BE PROVIDED TO DETECT TANK RIM SEAL FIRES WITHIN STORAGE TANKS.
10. MANUAL CALL STATIONS MAY BE PROVIDED WITHIN ZONES FOR ALARMING PURPOSES ONLY. MANUAL CALL STATIONS LOCATED IN ROAD TANKER LOADING/OFFLOADING GANTRIES WILL AUTOMATICALLY INITIATE FIRE FIGHTING WITHIN THE ZONE.

INSTRUMENT IDENTIFICATION

	FIRST LETTER		SUCCEEDUNG - LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	CONTROL*			CONTROL	CLOSE*
D	DENSITY*	DIFFERNTIAL			
E	VOLTAGE		SENSOR (PRIM. ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE		VIEW, DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	USER'S CHOICE	MOMENTARY			MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE RESTRICT.		OPEN*
P	PRESSURE,VACUUM		POINT TEST CONN.		
Q	QUANTITY	INTEGRATE, TOTALISE			
R	RADIATION		RECORD		
S	SPEED FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION,MECHANICAL ANALYSIS			VALVE, DAMPER LOUVER	
W	WEIGHT, FORCE		WELT		
X	ON / OFF*	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR FINAL CTRL ELEMENT	

* FUNCTIONAL IDENTIFICATION VERIFIED BY TPL (ANSI / ISA - S5.1 - 1984)

EQUIPMENT & INSTRUMENT TAG NUMBERING STANDARD

X X X X F N N N

FUNCTIONAL IDENTIFIER

First Letter (4)		Succeeding Letter (4)		
Measured or Initialising variable	Modifier	Readout or Passive Function	Output Function	Modifier
A Analysis		Alarm		
B Burner, Combustion		User's choice	User's choice	User's choice
C Control *			Control	Close*
D Density *	Differential			
E Voltage		Sensor (Primary Element)		
F Flow Rate	Ratio (fraction)			
G User's choice		Glass, Viewing device		
H Hand				High
I Current (Electrical)		Indicate		
J Power	Scan			
K Time, Time schedule	Time rate of Change		Control Station	
L Level		Light		Low
M User's choice	Momentary			Middle, Intermediate
N User's choice		User's choice	User's choice	User's choice
O User's choice		Orifice, Restriction		Open*
P Pressure, Vaccum		Point (test), Connection		
Q Quantity	Integrate, totalize			
R Radiation		Record		
S Speed, Frequency	Safety		Switch	
T Temperature			Transmit	
U Multivariable		Multifunction	Multifunction	Multifunction
V Vibration, Mechanical Analysis			Valve, Damper, Louvre	
W Weight, Force		Well		
X On / Off	X Axis	Unclassified	Unclassified	Unclassified
Y Event, State of Presence	Y Axis		Relay, Compute, Convert	
Z Position, Dimension	Z Axis		Driver, Actuator Unclassified Final Control Element	

ITEM IDENTIFIER - INSTRUMENTATION

Device Group No.		Uni. No.
01 - 09	Mainline Pumpsets	
01	Main. Pumpset No. 1	1
02	Main. Pumpset No. 2	2
03	Main. Pumpset No. 3	3
04	Main. Pumpset No. 4	4
05	Main. Pumpset No. 5	5
06	Main. Pumpset No. 6	6
07	Main. Pumpset No. 7	7
08	Main. Pumpset No. 8	8
09	Main. Pumpset No. 9	9
10-49	High Pressure Manifolds	
10-17	HP Manifold 1	
10	Receiver	
11	Interface handling	
12	HP Routing	
13	Sump	
14	Purge Air Fans	
15	Pressurisation fans	
16	Lube Oil Pumps	
17	Inhibitor/DRA injection	
18	Fire Systems	
19	Services, Miscellaneous	
20-27	HP Manifold 2 Sub Allocations as per Manifold 1	
28	Fire Systems	
29	Services, Miscellaneous	
30-37	HP Manifold 3	
38	Fire Systems	
39	Services, Miscellaneous	
40-47	Manifold 4 Sub Allocations as per Manifold 1	
48	Fire Systems	
49	Services, Miscellaneous	
50-69	Booster Pumps / Refractionator	
50	Booster Pumps / Refractionator	
51	Accumulator/Booster Pump 1	
52	Accumulator/Booster Pump 2	
53	Accumulator/Booster Pump 3	
54	Accumulator/Booster Pump 4	
55	Accumulator/Booster Pump 5	
56	Accumulator/Booster Pump 6/ IRP Tank Farm	
57	Accumulator/Booster Pump 7/ IRP Heat Exchanger	
58	Accumulator/Booster Pump 8/ IRP Dist Column	
59	Accumulator/Booster Pump 9/ IRP Reflux Drum	
60	Accumulator/Booster Pump 10/ IRP Fired Heater	
61	Accumulator/Booster Pump 11	
62	Accumulator/Booster Pump 12	
63	Accumulator/Booster Pump 13	
64	Accumulator/Booster Pump 14	
65	Accumulator/Booster Pump 15	
66	Accumulator/Booster Pump 16	
67	Accumulator/Booster Pump 17	
68	Accumulator/Booster Pump 18	
69	Accumulator/Booster Pump 19	
70-99	Low Pressure Manifolds	
70	Rail Loading	
71	Road Loading Bay 1	
72	Road Loading Bay 2	
73	Road Loading Bay 3	
74		
75	Tank Farm (2)	
76	Tank Farm (3)	
77		
78		
79		
80	LP Routing - General	
81	LP Routing - Manifold 1	
82	LP Routing - Manifold 2	
83	LP Routing - Manifold 3	
84	Blending	
85	Tank Farm(1)	
86	Prover - Manifold 1	
87	LP Routing - Manifold 5	
88	LP Routing - Manifold 6	
89	LP Routing - Crude	
90	LP Routing - Catpoly	
91	LP Routing - Avtur	
92	LP Routing - Manifold 4	
93	LP Routing - Intermix	
94	Prover - Manifold 2	
95	Prover - Manifold 3	
96	Prover - Manifold 4	
97		
98		
99	LP Sump	

ELECTRICAL TAG NUMBERING

X N N Y

DEVICE TYPE

A	Distribution Centre, Starter Panels
B	Transducers (Photo, Prox, Thermo)
C	Capacitors
D	
E	Lighting, Fans
F	Fuse, Overvolt, Arrestor
G	generator, Batteries, Accumulator
H	Signalling devices (Siren Buzzer)
I	
J	
K	Relays, Contactors
L	Inductors, Coils, Chokes
M	Meters
N	
O	
P	Measure, Indicating, Test Equip
Q	Circuit Breaker, Isolator
R	Resistors, Heating Elements
S	Switches, Selectors
T	Transformers, Regulators
U	Modulators, Changers, Converters
V	Tubes, Semi-conductors (Diodes)
W	Transmission, (Cables), Aerials
X	Terminals, Plugs, Sockets, J/B's
Y	Electric Lock, Clutch, Brakes
Z	Miscellaneous

UNIQUE ID NUMBER

1	Consecutive
2	0 - 99
3	
4	
5	
6	
7	
8	
9	
0	

DEVICE FUNCTION

A	Aux Function
B	Direction of Movement
C	Counting
D	Differentiation
E	Function On
F	Protection
G	Testing
H	Indication
I	
J	Integration
K	Inching
L	Conductor Designation
M	Main Function
N	Measurement
O	
P	Proportional
Q	State (Start, Stop, Limiting)
R	Reset, Clearing
S	Storage, Recording
T	Time Measurement
U	
V	Speed
W	Addition
X	Multiplication
Y	Analog
Z	Digital

PLANT & EQUIPMENT IDENTIFICATION

X N N

OPERATIONAL CODE

A	Accumulator	0	0	
B	Booster	1	1	Petrol - 93 Octane
C	Consignee / or	2	2	
D	Distributor	3	3	Diesel
E		4	4	ULP - 91 Octane
F	Prover Transfer	5	5	Petrol - 97 Octane
G	Blender	6	6	ULP - 95 Octane
H	Header	7	7	Alcohol
I	Isolation	8	8	Avtur
J		9	9	
K				
L	Launcher			
M	Meter			
N	Reverse Pump			
O				
P	Main Pumps			
Q	Purge / Press Fans			
R	Receiver			
S	Strainer			
T	Tank			
U	Lube System			
V				
W				
X	Aux Pumps			
Y	Meter Prover			
Z				

X X X

OPERATIONAL CODE

A	Accumulator	A		A Inlet
B	Booster	B		B
C	Consignee / or	C	Caltex	C
D	Distributor	D		D
E		E	Tepco	E Discharge
F	Prover Transfer	F	Natref	F
G	Blender	G	Zopc	G
H	Header	H	Shell	H
I	Isolation	I		I
J		J		J Control
K		K	Sasol 2&3	K Bypass
L	Launcher	L	Pipeline (internal client)	L
M	Meter	M	Engen	M
N	Reverse Pump	N	BP	N Transfer
O		O		O
P	Main Pumps	P		P
Q	Purge / Press Fans	Q		Q
R	Receiver	R	Sasol 1	R Reverse
S	Strainer	S		S
T	Tank	T	Total/Torsa	T
U	Lube System	U	Zenex	U
V		V	Vuyo Petroleum	V Vent
W		W		W Drain
X	Aux Pumps	X	Exel	X Launch
Y	Meter Prover	Y		Y
Z	Miscellaneous - Effluent	Z		Z
		0		0
		1		1
		2		2
		3		3
		4		4
		5		5
		6		6
		7	Intermix	7
		8	Avtur	8
		9	Crude Oil	9

REFRACTIONATOR

X X — SEQUENTIAL NUMBER STARTING 001. 002 etc.

OPERATIONAL CODE

T	Tanker
TW	Column
DM	Drum
FH	Fire Heater
EX	Exchanger
PM	Pump
FT	Filter
PG	Packaged Unit
XX	Miscellaneous

MISCELLANEOUS

SPT	Sample Point
SP	Special Piping Item
IAM	Instrument Air Manifold
ATM	Atmosphere
FW	Fire Water

M M

MATERIAL SPEC.

A1AP	Carbon Steel
LF	Galvanised Carbon Steel
UP	UPVC

I

INSUL

Ih	Hot Insulation
Ip	Personal Protection
N	No Insulation

LETTER COMBINATIONS FOR INSTRUMENT SYMBOLS

	MEASURED VARIABLE	CONTROLLERS: RECORDING	INDICATOR	BLIND	CONTROL VALVES	READOUT DEVICES: RECORDING	INDICATING	HIGH	LOW	COMB	SWITCHES AND ALARMS: RECORDING	INDICATING	BLIND	SOLEN. RELAYS, COMP. DEVICES	PRIMARY ELEMENT	TEST POINT	WALL / PROBE	VIEW. DEVICE GLASS	SAFETY DEVICE	FINAL ELEMENT
A	ANALYSIS	ARC	AIC	AC		AR	AI	ASH	ASI	ASHL	ART	AIT	AT	AY	AE	AP	AW			AV
B	BURNER / COMBUSTION	BRC	BIC	BC		BR	BI	BSH	BSI	BSHL	BRT	BIT	BT	BY	BE		BW	BG		BZ
C	CONTROL				CV									CY						CV
D	DENSITY					DR	DI				DRT	DIT								
E	VOLTAGE	ERC	EIC	EC		ER	EI	ESH	ESL	ESHL	ERT	EIT	ET	EY	EE					EZ
F	FLOW RATE	FRC	FIC	FC	FCV,FICV	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE	FP		FG		FV
FQ	FLOW QUANTITY	FQRC	FQIC			FQR	FQI	FQSH	FQSL			FQIT	FQT	FQY	FQE					FQV
FF	FLOW RATIO	FFRC	FFIC	FFC		FFR	FFI	FFSH	FFSL						FE					FFV
G	USER'S CHOICE																			
H	HAND			HIC	HC				HS											HV
I	CURRENT	IRC		IIC		IR	II	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE					IZ
J	POWER	JRC		JIC		JR	JI	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE					JV
K	TIME	KRC		KIC	KC	KR	KI	KSH	KSL	KSHL	KRT	KIT	KT	KY	KE					KV
L	LEVEL	LRC		LIC	LC	LR	LI	LSH	LSL	LSHL	LRT	LIT	LT	LY	LE		LW	LG		LV
M	USER'S CHOICE																			
N	USER'S CHOICE																			
O	USER'S CHOICE																			
P	PRESSURE / VACUUM	PRC		PIC	PC	PCV	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE	PP			PSV, PSE	PV
PD	PRESSURE / DIFFERENTIAL	PDRC		PDIC	PDC	PDCV	PDR	PDI	PDSH	PDSL		PDRT	PDIT	PDT	PDY	PE	PP				PDV
Q	QUANTITY	QRC		QIC			QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE					QZ
R	RADIATION	RRC		RIC	RC		RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE		RW			RZ
S	SPEED / FREQUENCY	SRC		SIC	SC	SCV	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE					SV
T	TEMPERATURE	TRC		TIC	TC	TCV	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE	TP	TW		TSE	TV
TD	TEMPERATURE / DIFFERENTIAL	TDRC		TDIC	TDC	TDCV	TDR	TDI	TDSH	TDSL		TDRT	TDIT	TDT	TDY	TE	TP	TW			TDV
U	MULTIVARIABLE						UR	UI							UY						UV
V	VIBRATION / MACHINERY ANALYSIS						VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE					VZ
W	WEIGHT / FORCE	WRC		WIC	WC	WCV	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE					WZ
WD	WEIGHT / FORCE DIFFERENTIAL	WDRC		WDIC	WDC	WDCV	WDR	WDI	WDSH	WDSL		WDRT	WDIT	WDT	WDY	WE					WDZ
X	ON / OFF				XV									XT	XY						XV
Y	EVENT / STATE / PRESENCE			YIC	XC		YR	YI	YSH	YSL				YT	YY	YE					YZ
Z	POSITION / DIMENSION	ZRC		ZIC	ZC	ZCV	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE					ZV
ZD	GAUGING / DEVIATION	ZDRC		ZDIC	ZDC	ZDCV	ZDR	ZDI	ZDSH	ZDSL		ZDRT	ZDIT	ZDT	ZDY	ZDE					ZDV

SHEET 2 OF 3

REVISIONS

REV	BY	CHK	APP	DATE	DESCRIPTION
D	AZ	ZM		13/10/2022	UPDATE AS PER THE LATEST NMPP LEGEND (2684358-E-A00-PR-PD-002)
C	AZ	ZM		14/06/2021	900# CLASS RATING ADDED
B	ZM	RP		26/08/2014	REFRACTIONATOR CODES ADDED
A	ZM	RP		27/01/2014	REDRAWN FROM PL5023-008/2 AND ADDITIONAL INFO FROM CHRIS M.

TRANSNET pipelines

P&ID LEGEND
TYPICAL

PROJECT NAME

DRAWN	Z.M.	REF.	-
TRACED	CAD	DATE	27-01-2014
CHECKED	K.N.	APPROVED	R.P.
SCALE	N.T.S.		

DRAWING No. PL 117653 REV D

AREA PREFIX

A	A

AREA	AREA NAME
01	FYNNLAND COP
02	DURBAN DWP
03	HILLCREST DJP
04	HILLCREST DWP
05	
06	
07	HOWICK DJP
08	HOWICK DWP
09	LADYSMITH DJP
10	LADYSMITH DWP
11	VAN REENEN
12	DEPOT BETHLEHEM TOP
13	DEPOT BETHLEHEM
14	DEPOT KROONSTAD
15	MAGDALA DJP
16	DEPOT SALOLBURG
17	DEPOT COALBROOK
18	DEPOT ALRODE
19	DEPOT POTCHEFSTROOM
20	DEPOT KLERKSDORP
21	DEPOT AIRPORT
22	DEPOT WALTLOO
23	DEPOT PRETORIA WEST
24	DEPOT LANGLAAGTE
25	DEPOT TARLTON
26	DEPOT RUSTENBURG
27	DEPOT WITBANK
28	DEPOT NEWCASTLE
29	VOLKSRUST DWP
30	DEPOT STANDERTON
31	DEPOT SECUNDA
32	EMPANGENI COP
33	MAHLABATINI COP
34	SCHEEPERSNEK COP
35	QUAGGA COP
36	DEPOT KENDAL
37	DEPOT MEYERTON
38	MNGENI COP
39	DUZI COP
40	MOOI RIVER COP
41	FORT MISTAKE COP
42	WILGE COP
43	INTERMIX REFACTIONATOR
44	DEPOT JAMESON PARK
45	JUNCTION ELARDUS PARK
46	
47	
48	
49	FYNNLANDS
50	COASTAL TERMINAL
51	TRUNKLINE PUMP STATION #1
52	TRUNKLINE PUMP STATION #2
53	TRUNKLINE PUMP STATION #3
54	TRUNKLINE PUMP STATION #4
55	TRUNKLINE PUMP STATION #5
56	TRUNKLINE PUMP STATION #6
57	TRUNKLINE PUMP STATION #7
58	TRUNKLINE PUMP STATION #8
59	INLAND TERMINAL
59	JMP PUMP STATION #1 (ALRODE 16")
59	JMP PUMP STATION #2 (ALRODE 12")
59	JMP PUMP STATION #3 (KENDAL)
59	JMP PUMP STATION #4 (AIRPORT–FUTURE)
–	PL1 TRUNKLINE (24")
–	PL2 JMP–ALRODE (16")
–	PL3 ALRODE–LANGLAAGTE (16")
–	PL4 KENDAL–WALTLOO (16")
–	PL10 JMP–ORTIA (FUTURE,10")
–	VREDE KDC

PROCESS EQUIPMENT NUMBERING

A	A	X	X	X	N	N	N

(SEE AREA PREFIX)

PREFIX		ID NUMBER	
PRV	PRESSURE RELIEF VALVE	NN	001–999
PSV	PRESSURE SUSTAINING VALVE		001–999
TRV	THERMAL RELIEF VALVE		001–999
PCV	DAMPER		As Per PL101
COM	AIR COMPRESSOR		01–99
DM	DRUM (incl. Catchpots)		01–99
FH	FIRED HEATER		01–99
HC	HOIST/WINCH		01–99
HX	HEAT EXCHANGER		01–99
KC	CRANE		01–99
PP	GENERAL PUMP (PNEUMATIC, DIESEL, ETC)		01–99
RO	ORIFICE		01–99
TW	COLUMN		01–99
YC	LOADING ARM		01–99

NOZZLES ID CODE PREFIX	TANK/VESSEL NOZZLE IDENTIFICATION
A	PROCESS INLETS
B	PROCESS OUTLETS
D	DRAIN NOZZLES
G	LEVEL GAUGE OR GAUGE GLASS NOZZLES
H	HANDHOLE NOZZLES
L	LEVEL INSTRUMENT NOZZLES
M	MANWAY NOZZLES
P	PRESSURE INSTRUMENT NOZZLES
S	SAMPLE OR ANALYSER NOZZLES
T	TEMPERATURE INSTRUMENT NOZZLES
V	VENT NOZZLES
W	RELIEF VALVE NOZZLES

PIPING IDENTIFIER DEFINITION

A	A	P	X	X	X	M	M	N	N	N	N

(SEE AREA PREFIX)

CODE	FLUID MEDIUM	PRESSURE RATING		LINE SIZE – PIPE	METRIC SIZE–NB	MATERIAL SPEC		ID NUMBER		
DIE1	DIESEL (ULS & LS)	A	CLASS 150	1/2"	15	BR	BRASS		TM1 & FYN	0000–0799
DIE2	DIESEL (ULS & LS)	B	CLASS 300	3/4"	20	BZ	BRONZE			7500–7999
DLS1	LOW SULPHUR DIESEL (LP)	C	CLASS 600	1"	25	CI	CAST IRON		PS1	0800–0999
DLS2	LOW SULPHUR DIESEL (HP)	HFE	CLASS 16 HDPE	1 1/2"	40	CS	CARBON STEEL		PS3	1000–1999
DULS1	ULTRA LOW SULPHUR DIESEL (LP)	AJL	CLASS 150	2"	50	CU	COPPER		PS5	3000–3999
DULS2	ULTRA LOW SULPHUR DIESEL (HP)	GF	CLASS 150	3"	80	GI	GALVANISED INSULATED	NNNN	TM2 & JP	6000–6999
DR01	OPEN DRAINS	ASB	CLASS 150	4"	100	GS	GALVANISED STEEL		DS5	7000–7499
DR02	CLOSED DRAINS	G	CLASS 125	6"	150	CSU			DS4	9000–9499
FMP	FOAM PREMIX	AF	CLASS 150	8"	200	GG			FIRE SYSTEM	9500–9999
INT	INTERFACE	AFL	CLASS 150	10"	250	PE	HDPE			
JET1	JET FUEL (LP)	CPL	CLASS 600	12"	300	SS	STAINLESS STEEL			
JET2	JET FUEL (HP)	D	CLASS 900	14"	350					
PET1	PETROL (ULP 93 & 95)	DPL	CLASS 900	16"	400					
PET2	PETROL (ULP 93 & 95)	HFB	PN 8 HDPE	18"	450					
P93UL1	93 UNLEADED PETROL (LP)	HFD	PN 12,5 HDPE	20"	500					
P93UL2	93 UNLEADED PETROL (HP)	SA	CLASS 150	24"	600					
P95UL1	95 UNLEADED PETROL (LP)									
P95UL2	95 UNLEADED PETROL (HP)									
MP01	REFINED PRODUCTS (LP)									
MP02	REFINED PRODUCTS (HP)									
RV01	RELIEF LINE (LP)									
RV02	RELIEF VALVE (HP)									
UA01	UTILITY AIR									
WM	MUNICIPAL WATER									
WU	UTILITY WATER									
WB	BOREHOLE WATER									
OW	OILY WATER SEWER									
SW	STORM WATER SEWER									
FW	FIRE WATER									

REVISIONS

REV	BY	CHK	APP	DATE	DESCRIPTION
A	AZ		ZM	13/10/2022	UPDATE AS PER THE LATEST NMPP LEGEND (2684358–E–A00–PR–PD–003)

TRANSNET pipelines

P&ID LEGEND

TYPICAL

PROJECT NAME

DRAWN	A.Z.	REF.	–
TRACED	CAD	DATE	13–10–2022
CHECKED	K.N.	APPROVED	Z.M.
SCALE	N.T.S.		

DRAWING No. PL 117653 REV A

DRAWING OFFICE STANDARD (PL100)

DOCUMENT APPROVAL PROCESS

NAME		POSITION/MEETING NO.	SIGNATURE	DATE
Originator:	Zandile Moloi	Drawing Office Manager		11 August 2025
Approver:	Petros Khumalo	Senior Support Services Manager	PKhumalo	11 August 2025
Original date: 15 June 2016				
Effective date:	11 August 2025			

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1. INTRODUCTION

The objective of this Drawing Standards Document is to establish a set of approved drawing standards and codes of practise that shall be required to be adhered to by both Contractor and Client in the preparation of Engineering Documentation for and on behalf of Transnet Pipelines, a Division of Transnet Limited. By ensuring comprehensive, consistent and uniform means of presentation of information, these Standards and Codes of Practise are intended to facilitate rapid comprehension by the users of the information, and thus assist in the maintenance and fault finding of installed technology.

2. SCOPE

2.1. General

This document defines as a minimum, the general responsibilities for the provision of all Engineering Documentation, whether it be by the Client or Contractor, for and on behalf of Transnet Pipelines. In this regard, providers of Engineering Documentation are required to familiarise themselves with all applicable Standards and Codes of Practice listed herein, and to ensure compliance in the execution of any work in terms of this document. Failure to comply may render the provider liable for corrections at his own cost.

These Standards and Codes of Practise should be read in conjunction with all other Specifications and drawings as issued for a particular contract. Where discrepancies occur, these must be brought to the attention of Transnet Pipelines in writing before commencement of work. In the event of any conflict between the contents of any documents forming part of a contract (as listed in the Schedule of Contract Documents) and this document, the former shall prevail.

This Drawing Standards Document PL100 incorporates two sections as follows:

Section A - General Standards

Incorporating Standards PL 101 to PL 103, detailing Plant and Equipment Tag Numbering, Symbology and General Drawing Standards to be adhered to in the production of Engineering Documentation for and on behalf of Transnet Pipelines

Section B - Documentation Typicals/ Design Documentation

Incorporating typicals of all Drawing and Documentation Types. These typicals have been incorporated into the Standards Document for the purposes of conveying both layout and content requirements to be adhered to in the production of Engineering Documentation for and on behalf of Transnet Pipelines.

Prior to commencement of design, contractors are required to request typicals of all relevant Drawings and Documentation to be produced, and should ensure adherence in both content and layout standards.

Where Contractors wish to deviate from specified typicals, either in layout or information content, approval will be required to be obtained from Transnet Pipelines prior to commencement of work.

Typicals exist for the following types of documentation:

Process Flows/ Diagrams Documentation Standards
- Piping & Instrumentation Diagrams (P&IDs)
- Process Flow Diagrams (PFDs)
- Heating Ventilation & Air Conditioning (HVAC)
- Hazardous Area Classification Diagrams
- Hazop Studies

Metering & Instrumentation Documentation Standards
- Instrument Schedules
- Instrument Data Sheets
- Instrument Hook-up Diagrams
- Loop Reports/ Drawings
- Panel Layout and General Arrangements
- Panel Wiring Diagrams
- Cable Schedules (Refer to Electrical Typicals)
- Cable Block Diagrams (Refer to Electrical Typicals)
- Cable Interface Wiring Diagrams
- Safety Integrity Levels (SILs) Report

Software Documentation Standards
- Plant Input/ Output (I/O) Schedules
- Flow Charts
- Software Listings

Electrical Documentation Standards
- Single Line Diagrams
- Electrical Schematic & Wiring Diagrams
- Panel Layout and General Arrangements
- Cable Schedules
- Cable Block Diagrams
- Cable Interface Wiring Diagrams
- Connection/ Hook-up Diagrams

Mechanical Documentation Standards
- General Arrangement/ 3D CAD views of Piping, Structural Steel & Mechanical, Installations.
- Layout Drawings/ 3D model Isometric views
- Underground Drawings
- Piping – Analysis, Calculations, Studies, Reports

Civil/Site Layout & Survey Documentation Standards

- Trenching and Services Layout Diagrams
- Earthing Reticulation Diagrams
- Cable Routing Reticulation Diagrams
- Structural Arrangement Drawings
- Structural Fire Protection Drawings
- Structural Steel Detail Drawings
- Foundation Drawings
- Pipe/ Ducting Support Drawings
- Weight Reports
- Structural Analysis Design Reports

2.2. Application to Work Activities

The Standards and Codes of Practice contained herein are suitable for use whenever Engineering Documentation is required to be produced and includes amongst others the following:

- Design Sketches
- Technical Data and manufacturer's technical literature
- Equipment Identification and Tagging
- Construction Drawings
- Specifications, both Functional and Technical
- Installation, operating and maintenance instructions, drawings and records

3. REFERENCE DOCUMENTATION

The following standard specifications are to be used for reference purposes and need to be noted by Tenderers in order to signify familiarity and compliance with the requirements. It is expected of Tenderers that they be familiar with the applicable clauses and that these will be adhered to in the execution of any work in terms of this specification.

A. Standards and Recommended Practices for Instrumentation and Control, 11th Edition, Instrument Society of America.

- ANSI/ISA-5.1-2009 : Instrumentation Symbols and Identification
- ISA-S5.3-1983 : Graphic Symbols for DCS/Shared Display Instrumentation, Logic & Computer Systems
- ISA-S5.4-1991 : Instrument Loop Diagrams
- ANSI/ISA-S5.5-1985 : Graphic Symbols for Process Displays

B. Graphical Symbols for Electrical Diagrams NRS 002-2000 second edition

C. International Electro technical Commission Standards for Electrical Drawings

- IEC Publication 27 : Letter Symbols to be used in Electrical Technology
- IEC Publication 50 : International Electro technical Vocabulary
- IEC Publication 617 : Graphical Symbols for Diagrams

D. SANS-10111-1-2011 Engineering Standard

E. TPL-TECH-I-POL-001 - Measurement Policy
F. TPL-TECH-I-POL-002 - Control Policy
G. TPL-TECH-I-POL-003 - Instrumentation Policy

4. ABBREVIATIONS

For the purpose of understanding these Standards, the following abbreviations apply.

ANSI	:	American National Standards Institute
C & I	:	Control and Instrumentation
IEC	:	International Electrotechnical Commission
ISA	:	Instrument Society of America
SABS	:	South African Bureau of Standards
ASA	:	American Standards Association

5. APPENDICES

General Standards

- PL 101 - Plant & Equipment Tag Numbering Standards
- PL 102 - Equipment, Instrument and Electrical Symbology Standards
- PL 103 - General Drawing Standards

6. DOCUMENT CHANGE HISTORY:

The owner of this document is responsible for the revision and control of the document, including updating of the table below, which contains the history of the document with details of each revision.

Date	Previous Rev No.	New Rev No.	Details of Revision
15.01.99	00	01	Document approved for distribution
30.07.99	01	02	Doc Typicals – Typicals and Rev No's added
15.04.01	02	03	Doc Typicals – Changed to On Request basis
12.06.12	03	04	New Transnet Standard Template Adopted
13.04.16	04	05	Document review & New Template

This table summarises what has been changed in the document so that it is easy to keep track of the effected changes.

DRAWING OFFICE STANDARD (PL101)

DOCUMENT APPROVAL PROCESS

NAME		POSITION/MEETING NO.	SIGNATURE	DATE
Originator:	Zandile Moloi	Drawing Office Manager		20/06/2016
Approver:	Petros Khumalo	Technical Support Manager		30-06-2016
Original date: 15 June 2016				
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1. INTRODUCTION

The purpose of this standard is to establish a uniform means of designating and identifying plant and equipment installed on the respective pump station sites within Transnet Pipelines, a Division of Transnet Limited. The designation systems detailed below have been designed to cater for both technical as well as financial/management requirements and are proposed to be integrated on both the AutoCAD P&ID (technical) and SAP R3 (financial/management) platforms throughout Transnet Pipelines. (For details of integration onto the SAP R3 platform, the reader is referred to Addendum No.1 attached).

By ensuring a comprehensive, consistent and uniform means of plant and equipment designation, it is hoped that this Standard will assist in the rapid identification of plant and equipment installed at the respective Transnet Pipelines sites, assimilation of design information associated with the plant and equipment installed, and assistance with the maintenance and fault finding history of installed technology.

2. SCOPE

2.1. General

This document defines identification and tag numbering standards to be adhered to in the tagging and identification of the following instrumentation, plant & equipment as installed on the respective Transnet Pipelines Pump Station sites:

- Process Plant (e.g. receivers, strainers etc.)
- Process Equipment (e.g. valves, pumps, motors etc.)
- Electrical Distribution Equipment (e.g. transformers, breakers, etc.)
- Instrumentation
- Electrical and Instrument Panels (Switchgear, DB Boards, PLC Panels, Junction Boxes)
- Electrical & Instrument Cabling
- Process Piping

These Standards are required to be adhered to by both Client and Contractor alike, for and on behalf of Transnet Pipelines. Both Client and Contractor will be required to familiarise themselves with all applicable Standards and Codes of Practise listed herein, and to ensure compliance in the execution of any work in terms of this document. Failure to comply may render the provider liable for corrections at his own cost.

These Standards should be read in conjunction with all other specifications and drawings as issued for a particular contract. Where discrepancies occur, these must be brought to the attention of Transnet Pipelines in writing before commencement of work. In the event of any conflict between the contents of any documents forming part of a contract (as listed in the Schedule of Contract Documents) and this document, the former shall prevail.

2.2. Application to Work Activities

The Standards contained herein are suitable for use whenever plant and equipment are required to be identified or tagged, for the purposes of engineering design or installation on any of the respective Transnet Pipelines Pump Station Sites. These Standards thus cover designation of the following plant and equipment:

- Process Plant (e.g. receivers, strainers etc.)
- Process Equipment (e.g. valves, pumps, motors etc.)
- Electrical Distribution Equipment (e.g. transformers, breakers, etc.)
- Instrumentation
- Electrical and Instrument Panels (Switchgear, DB Boards, PLC Panels, Junction Boxes)
- Electrical & Instrument Cabling
- Process Piping

3. REFERENCE DOCUMENTATION

3.1. Plant and Equipment can be identified on Transnet Pipelines Sites using two forms of Identifiers; namely, by Function using the Function Designation System (identified by the prefix " = "), or by Location using the Location Designation System (identified by the prefix " + "). In this regard the following documentation included in the Appendices (Appendix 1) attached details each Standard:

FUNCTIONAL DESIGNATION	PL 118736	Plant & Equipment
	PL 118737	Instrumentation
	PL 118738	Panels
	PL 118739	Cabling
	PL 118740	Process Piping
LOCATION DESIGNATION	PL 118741	Panels

3.2. The following standard specifications are to be used for reference purposes and need to be noted by Tenderers in order to signify familiarity and compliance with the requirements. It is expected of Tenderers that they be familiar with the applicable clauses and that these will be adhered to in the execution of any work in terms of this specification.

A. Standards and Recommended Practices for Instrumentation and Control, 11th Edition, Instrument Society of America.

- ANSI/ISA-5.1-2009 : Instrumentation Symbols and Identification
- ISA-S5.3-1983 : Graphic Symbols for DCS/Shared Display Instrumentation, Logic & Computer Systems
- ISA-S5.4-1991 : Instrument Loop Diagrams
- ANSI/ISA-S5.5-1985 : Graphic Symbols for Process Displays

B. Graphical Symbols for Electrical Diagrams NRS 002-2000 second edition

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- IEC Publication 27 : Letter Symbols to be used in Electrical Technology
- IEC Publication 50 : International Electro technical Vocabulary
- IEC Publication 617 : Graphical Symbols for Diagrams

D. SANS-10111-1-2011 Engineering Standard

E. TPL-TECH-I-POL-001 - Measurement Policy
F. TPL-TECH-I-POL-002 - Control Policy
G. TPL-TECH-I-POL-003 - Instrumentation Policy

4. ABBREVIATIONS

For the purpose of understanding these Standards, the following abbreviations apply.

ANSI	:	American National Standards Institute
C & I	:	Control and Instrumentation
IEC	:	International Electrotechnical Commission
ISA	:	Instrument Society of America
SABS	:	South African Bureau of Standards
ASA	:	American Standards Association

5. PLANT & EQUIPMENT IDENTIFIERS

The following types of plant and equipment may be identified by use of Plant and Equipment Identifiers, which are allocated to unique pieces of plant and equipment installed at functional locations within a Transnet Pipelines Site:

- Process Plant (e.g. receivers, strainers etc.)
- Process Equipment (e.g. valves, pumps, motors etc.)
- Electrical Distribution Equipment (e.g. transformers, breakers, etc.)

[Composition of Process Plant & Equipment Identifiers conform to the Ops Code Standard as adopted by Transnet Pipelines and as detailed in Control and Instrumentation Policy No. C&I 700/94/001 April 1994. Composition of Electrical Distribution Equipment Identifiers conform to HT Distribution Equipment Identification Schemas as determined by Transtel Control (SARS Distribution)].

The reader is referred to the following Plant & Equipment Identification Standard as is included in the Appendices:

FUNCTIONAL DESIGNATION PL 118736 Plant & Equipment

5.1. Process Plant Identifier Assignment Rules

Used to identify process plant installed on the respective Transnet Pipelines Pump Station sites. Note that Process Plant usually comprises of a **grouping of process vessels, equipment, and**

instrumentation that combine to perform a common function e.g. piping, valves and instrumentation that combine to form a piece of process plant called a Receiver.

Assignment Rules

1. Each Plant item shall be identified by means of a two digit Station Identifier (and prefix "="), followed by a three digit alphanumeric Function Identifier (Ops Code) in compliance with PL 118736.

2. The first letter of the Ops Code Identifier shall convey the function of the equipment in the plant.

3. The second and third characters of the Ops Code Identifier shall comprise of a double-digit consecutive number used to uniquely identify the particular piece of process plant and shall be allocated per Pump station on a consecutive basis. (e.g. where three Auxiliary Pumps exist these shall be identified as X01, X02, X03 irrespective of their function).

   In multiproduct dedicated manifolds, the third letter may be used to identify the product type associated with the particular piece of process plant as follows:

   3 Diesel - 500ppm
   6 ULP - 95 Octane
   8 Avtur
   14 ULP - 93 Octane
   33 Diesel 50ppm
   76 Crude oil

4. VALVES, ACTUATORS & SWITCHBOXES

   Valve actuators and switchboxes are identified by the addition of a prefix to indicate function (in full compliance with ISA Standard S5.1), as follows:

   CV ANN Modulating/Control Valve Actuator
   XV ANN On/Off Valve Actuator
   ZV ANN Hand Valve with Switchbox
   HV ANN Hand Valve without Switchbox

   Process Plant Examples: (Allocated on a Pump Station basis).

Main Pump	P01	Main Line Pump No. 1
	P02	Main Line Pump No. 2
	P03	Main Line Pump No. 3
	P04	Main Line Pump No. 4
Accumulator Pump	A01	Accumulator Pump No. 1
	A02	Accumulator Pump No. 2

Booster Pump	B01	Booster Pump No. 1
	B02	Booster Pump No. 2
Auxiliary Pumps	X01	Sump Pump
	X02	Sump Pump
	X03	Lube Pump
	X04	Lube Pump
	X05	Inhibitor Pump
	X06	Inhibitor Pump
	X07	Petrol Blend Pump
	X08	Diesel Blend Pump
	X09	Petrol Prover Transfer Pump
	X10	Diesel Prover Transfer Pump
	X11	ULP Blend Pump
	X12	ULP Prover Transfer Pump
	Q01	Purge Air Fan 1
	Q02	Purge Air Fan 2
	Q03	Pressurisation Fan 1
	Q04	Pressurisation Fan 2
Meters	M01	Turbine/Positive Displacement Meter No 1.
	M02	Turbine/Positive Displacement Meter No 2.
Strainers	S01	Main Line Strainer
	S02	Main Line Strainer
	S03	Main Line Strainer
	S04	Main Line Strainer
	S05	Petrol Header Strainer (Delivery Station)
	S06	Petrol Header Strainer (Delivery Station)
	S07	Diesel Header Strainer (Delivery Station)
	S08	Diesel Header Strainer (Delivery Station)
	S09	ULP Header Strainer (Delivery Station)
	S10	ULP Header Strainer (Delivery Station)

5.2. Equipment Identifier Assignment Rules

Used to identify unique pieces of process equipment (e.g. valves, motors, actuators etc.) installed at functional locations within the respective Transnet Pipelines sites.

Assignment Rules.

1. Each Plant item shall be identified by means of a two digit Station Identifier (and prefix "= "), followed by a three digit alphanumeric Function Identifier (Ops Code) in compliance with PL 118736.

2. The first letter of the Ops Code Identifier shall convey the function of the equipment in the plant. Thus all equipment associated with the operation of the Receiver for example, shall be assigned the first letter “R”.

   For Example:

   The Inlet Valve on Meter Prover Y01 shall be designated Y1A.
   The Discharge Valve on Launcher L02 shall be designated L2E.

3. The second letter of the Ops Code Identifier shall comprise of a single digit consecutive alphanumeric used to uniquely identify a particular piece of equipment. This character may be used to identify either the product type or origination (company from where the product was supplied) associated with the particular piece of equipment as follows:

   - 3 Diesel 500ppm
   - 6 ULP - 95 Octane
   - 8 Avtur
   - 14 ULP - 93
   - 33 Diesel - 50ppm
   - 73 Crude oil
   - C Caltex
   - S Shell
   - BP British Petroleum
   - R Sasol
   - T Total
   - M Engen
   - E Petro SA
   - U Zenex
   - W Vopak

   For Example:

   A Consignee Valve supplying Caltex shall be identified as CC1.
   A Header valve on a ULP (95 Octane) manifold shall be identified as H6A.

4. The third letter of the Ops Code Identifier shall convey additional information regarding the function of the designated equipment.

   For Example:
   Receiver Inlet Valve shall be identified as R1A, with A indicating functionality (Inlet).

   Where two Prover Drain valves exist on Meter Prover Y01, these shall be identified as Y1W and Y2W respectively, function as denoted by the third character taking precedence over the second alphanumeric indicating product type or origination.

5.3. Electrical Distribution Equipment Identifier Assignment Rules

Used to identify unique pieces of electrical distribution equipment (e.g. transformers, alternators, breakers, links etc.) installed at functional locations within the respective Transnet Pipelines sites.

Assignment Rules.

1. Each Plant item shall be identified by means of a two digit Station Identifier (and prefix "= "), followed by a three digit alphanumeric Function Identifier (Control Code) in compliance with PL 118736.

2. The first letter of the Control Code Identifier shall convey the function of the equipment in the plant.

   For Example:
   Main Incomer Transformer shall be designated M1.
   Incomer Breaker feeding the 3.3 kV MV Panels shall be designated F11.

3. The second and third characters of the Control Code Identifier shall comprise of a double-digit consecutive number used to uniquely identify the particular piece of process plant and shall be allocated per Pump station on a consecutive basis.

   The second and third characters may be used to convey additional information such as supply voltage in the case of Breakers and Links, where:

   50 – 59 denotes 11 kV supply upwards
   10 – 19 denotes 3.3 kV supply
   30 – 39 denotes 380 V supply

Electrical Distribution Equipment Examples: (Allocated on a Pump Station basis).

3.3 kV Main Incomer Transformer No. 1		M1
3.3 kV Main Incomer Transformer No. 2		M2
380 V Aux Transformer No. 1		A1
380 V Aux Transformer No. 2		A2
3.3 kV Incomer Breaker No. 1	(MV Panel)	F11
3.3 kV Incomer Breaker No. 2	(MV Panel)	F12
380 V Incomer Breaker No. 1	(LV Panel)	F31
380 V Incomer Breaker No. 2	(LV Panel)	F32
Incomer Supply No. 1 / 2	(3.3 kV AC)	E01/E02
Auxiliary Supply No. 1 / 2	(380 V AC)	E03/E04
Control & Tripping Supply	(110/50 V DC)	E05
Standby Generator	(380 V AC)	E06

6. INSTRUMENT IDENTIFIERS

Instrumentation may be identified by use of Instrument Identifiers, which are allocated to instrumentation installed at functional locations within a Transnet Pipelines Site.

Composition of these Identifiers conforms to the ISA Standard ANSI/ISA-S5.1-1984 Instrument Symbols and Identification.

The reader is referred to the following Plant & Equipment Identification Standard as included in the Appendices.

FUNCTIONAL DESIGNATION PL 118737 Instrumentation

6.1. Assignment Rules

1. Each Plant item shall be identified by means of a two digit Station Identifier (and prefix "= "), followed by a four digit alphanumeric Function Identifier (ISA Standard S5.1) and three digit unique Item Identifier.

2. The Function Identifier shall comprise of a first letter, which is used to indicate the primary function of the instrument / equipment item (i.e. the measured or initiating variable), and one or more succeeding letters, covering the functions of the instrument. Where no identifiable functions exist, these succeeding letters may be omitted.

3. The Function Identifier shall be made according to function and not construction. Thus a differential pressure recorder used for flow measurement, shall be identified as FR and not PDR.

4. When used as part of an instrument loop, the first letter of the functional identifier shall be selected according to the measured or initiating variable and not according to the manipulated variable. Thus a control valve varying flow according to the dictates of a level controller shall be denoted LCV and not FCV.

5. The succeeding letters of the functional identifier shall be used to designate one or more readout or passive functions and one or more output functions or both. A modifying letter may be used, if required, in addition to the succeeding letters, to denote alarming features, provided that these alarm signals constitute separate signals fed back to the control system/controller. In the event of alarm signals being derived from within a control system/controller itself, this alarm functionality may be denoted by the attachment of alarm prefixes to the outside the device symbol bubble itself. (i.e. has no impact on the device tag number).

6. The sequence of identification letters shall thus begin with the first letter (denoting primary function). Readout or passive function letters shall follow these in any sequence, and finally output letters in any sequence except for the output letter C (Control), that shall precede output letter V (Valve). All modifying letters, if used shall be interposed so that they immediately follow the letters they modify.

7. A multiple function device may be symbolised on a diagram by as many multiple device bubbles as there are measured variables, outputs and/or functions. Thus a Coriolis Mass Flowmeter with dual outputs of flow and temperature and located on the Diesel LP Manifold, may be identified with two tangent bubbles, inscribed FT 821 and TT 821 respectively.

8. The number of functional letters grouped for one instrument should be kept to a minimum according to the judgement of the user. The total number of letters within one group shall not exceed four.

9. The unique Item Identifier shall comprise of a three-digit numeral, the first two digits indicating the Device Group to which the instrument belongs and the third letter a consecutive number unique to the device. Device Group selection shall be selected according to function and not location. Thus a densitometer located remotely from a launcher (e.g. near a receiver) and used for Interface Control shall be assigned the Launcher Device Group number and not the Receiver Device Group number.

10. Item Identification digit allocations as detailed in Standard PL 118737 have been designed to cater for all applications as currently existing on Transnet Pipelines Pump Station Sites.

11. Item Identifiers shall be allocated on an individual instrument/equipment basis and not on an instrument/equipment loop basis. (This represents a deviation from recommendations as contained in the ISA Standard S5.1.).

12. Where two devices or sensors form part of a single measurement entity, and consequently have been assigned the same functional identification, a suffix may be appended to the Tag number to identify the respective devices or sensors.

    For Example: Where dual turbine meter pickups return dual pulse trains 90 degrees out of phase for the purposes of calculating product flow, and where the resultant flow measurement has been assigned the Tag number FT 811, the dual pickup sensors may be identified as FE 811A and FE 811B respectively.

13. PUMP STATION IDENTIFICATION.
    As per ISA Standard S5.1, and in order to assist in integration with both the AutoCAD P&ID and SAP R3 Business Management Platforms, Tag numbers for all Instrumentation and Equipment carry a prefix, used to identify the Transnet Pipelines Pump Station at which the equipment is located. Integration into the SAP R3 Platform requires the identification of managerial/cost centres and consequently the Pump Station identifier comprises of a four digit alpha numeric prefix, whereas integration into the AutoCAD P&ID Platform requires the identification of only the Pump Station at which the equipment is installed and thus the identifier comprises of a two digit integer prefix.

14. SOFTWARE MNEUMONIC DESIGNATION. In order to assist in the identification of more than one signal fed back to a control system/controller from a unique instrument or piece of equipment, a three digit alphanumeric suffix may be appended to the Tag Number and used for both software mneumonic identification as well as core identification numbering of the respective signals.

    Suffixes defined to date are as follows:

    Actuated Valve signals

OP	Valve Open Feedback
CL	Valve Closed Feedback
SL	Valve in Local/Off
O	Open Valve command
C	Close Valve command

    Pump Starter signals

IRC	Start Pump command
IRT	Stop Pump command
PTR	Pressure Trip command
TVR	Mechanical Trip command
TOP	Thermal Overload Trip feedback
ELP	Earth Leakage Trip feedback
ERP	Electronic Protection Relay Failure feedback
FBL	Fuse Blown Trip feedback
SLO	Switchgear in Local/Off
PON	Pump Running feedback
POF	Pump Stopped feedback
RES	Remote Emergency Stop Trip feedback
MTR	Master Trip Relay Active feedback
SPH	Max Starts per Hour Exceeded Trip feedback
VT	Control Voltage Failure feedback
VSF	VSD Fault f/b (equivalent to ERP)
VSR	VSD Ready f/b (equivalent to MTR)

    Fan signals

IRC	Start Fan command
IRT	Stop Fan command
TOP	Thermal Overload Trip feedback
FON	Fan Running feedback
FOF	Fan Stopped feedback

    HV/MV Incomer signals

OP	Breaker/Link Open f/b
CL	Breaker/Link Closed f/b
SLO	Breaker in Local f/b
TCF	Trip Circuit Faulty f/b

MTR	Master Trip Relay f/b
BRS	Breaker Racked Out f/b
OCP	Over Current Trip f/b
ELP	Earth Fault Trip f/b
BEF	Balanced Earth Fault Trip f/b
BGF	Buchholtz Gas Fail Alarm f/b
OTP	Oil Temp Hi Alarm f/b
ERP	Electronic Protection Relay Fail f/b

Other signals

FB	Fault Bit
SB	Status Bit
PV	Process Variable
SP	Setpoint Variable
AHH	Process Trip High
AH	Process Alarm High
ALL	Process Trip Low
AL	Process Alarm Low

Instrument Identifier Examples:

PT	121	Pressure Transmitter located on HP Manifold (Routing Device Group)
PI	121	Pressure Gauge located on HP Manifold (Routing Device Group)
TE	121	Temperature Probe or primary measuring element
TT	121	Temperature Transmitter located on HP Manifold (Routing Device Group)
DX	811	Densitometer Source (Radioactive) located on Petrol LP Manifold.
DE	811	Densitometer Detector (Ionisation Chamber) located on Petrol LP Manifold.
FE	121	Flow element located on the HP manifold (Routing Device Group)
FT	121	Flow measurement located on the HP manifold (Routing Device Group)
ZI	101	Sphere detector located on the Receiver.

7. PANEL IDENTIFIERS

Electrical & Instrument Panels shall be identified by use of unique Panel Identifiers (both by Function and Location), allocated to panels installed at functional locations within a Transnet Pipelines Site.

Composition of these Identifiers conforms to the International Electrotechnical Commission Standards IEC Publication 750 Table 1.

The reader is referred to the following Plant & Equipment Identification Standard as included in the Appendices.

FUNCTIONAL DESIGNATION	PL 118738	Panels
LOCATION DESIGNATION	PL 118741	Panels

7.1. Assignment Rules – Functional Designation

1. Each Panel (and components thereof) shall be identified by means of a Functional and Location Identifier. The Functional Identifier shall comprise of a two digit Station Identifier (and prefix " = "), followed by a five digit alphanumeric Panel Identifier. Panel components may be uniquely identified by the addition of a three digit alphanumeric suffix and design typicals identified by the addition of a four digit alphanumeric suffix.

2. The first three characters of the Panel Identifier shall be is used to indicate the primary function of the panel (e.g. LV will indicate that the panel's primary function is that of LV Distribution, JB will indicate that the panel's primary function is that of Instrument marshalling etc.).

3. The last two digits of the Panel Identifier shall comprise of a two digit number used to uniquely identify the Panel in question. In all cases other than Instrument Junction Boxes and Control Panels, this unique integer number shall fall within the range as indicated in the Standard PL 118738, and shall be numbered in a consecutive manner. In the case of Instrument Junction Boxes and Control Panels however, this integer number shall be the same as the Instrument Group Identifier, thus identifying the Instrument Group to which the J/B has been associated. (Note that Instrumentation are marshalled in Junction Boxes on the basis of Device Groups).

4. Where Panels comprise of separate cubicles/tiers that contain equipment or marshalling unique to an individual piece of Process Plant/Equipment, these separate cubicles/tiers may be uniquely identified by means of an equipment identifier of the same format as detailed in Section 5 of this standard.

For example, an LV Panel LV 01 containing a cubicle housing a starter for auxiliary motor X01, may be uniquely identified by the Functional Identifier "= LV01 X01". In cases where only one LV Distribution Panel is likely to exist on the Station, this identifier may be shortened to read "= LV X01". In the case where an MV panel tier houses a starter for mainline pump set P01, the tier may be uniquely identified by the Functional Identifier "= MV01 P01". In cases where only one MV Distribution Panel is.

5. Equipment components within panels may be uniquely identified using an additional Component Identifier, comprising of an alphanumeric first character (to identify component function) followed by a two digit integer number (used to uniquely identify the component). Component Identification is indicated by the addition of a minus sign "-" as a suffix to the identifier. Composition of these Identifiers conforms to the International Electrotechnical Commission Standards IEC Publication 750 Table 1.

6. Where identical or typical design schemas exist, these may optionally be indicated by an additional Document Typical Identifier, comprising of an alphanumeric first character (to

identify document type) followed by a two digit integer number (used to uniquely identify the design schema standard. Design Typical Identifiers are indicated by the addition of a full stop sign "." as a suffix to the identifier. Note that Document Typical Identifiers may only appear in Documentation Headers i.e. may never form part of the Panel or Component Identifier.

Panel Identifier Examples:

LV 01	LV Distribution Panel 01
LV 21	Control Voltage Distribution Panel (may reside in Panel LV01 as a separate cubicle)
LV01 X01	Sub Distribution Cubicle of Panel LV01 containing Aux Motor Starter X01
	OR
LV X01	Sub Distribution Cubicle of Panel LV01 containing Aux Motor Starter X01
MV01	MV Incomer Panel 01
MV01 F11	Sub Distribution Cubicle of Panel MV01 containing Incomer Breaker F11
	OR
MV F11	Sub Distribution Cubicle of Panel MV01 containing Incomer Breaker F11
MV01 P01	Sub Distribution Cubicle of Panel MV01 containing Motor Starter P01
	OR
MV P01	Sub Distribution Cubicle of Panel MV01 containing Motor Starter P01
ETM 01	PLC Remote I/O Distribution Panel associated with MV Switchgear P01
ETL 01	PLC Remote I/O Distribution Panel associated with LV Panel LV01
DH 11	Density Hut Control Panel associated with Launcher Device Group 11
JB 10	Instrument Junction Box associated with Receiver Device Group 10
JB P01	Instrument Junction Box associated with Mainline Pumpset P01
FH01	Fire Hut Control Panel 01

7.2. Assignment Rules – Location Designation

Each Panel (and components thereof) shall be identified by means of a Functional and Location Identifier. The Location Identifier shall comprise of the Functional Identifier as detailed in Section 7.1 above (and prefix "+ "), followed by a three digit alphanumeric Tier/Row Identifier. Tier/Row Identification shall be indicated by the addition of a full stop sign "." as a suffix to the identifier.

Panel Identifier Examples:

LV01 X01.3F2	Aux Motor Starter Cubicle located in LV Panel LV01, Tier 3, Row 2
MV01 F11.1F	3.3 kV Incomer Breaker F11 located in MV Panel MV01, Tier 1

8. ELECTRICAL & INSTRUMENT CABLE IDENTIFIERS

Electrical & Instrument Cabling may be identified by use of Cable Identifiers, which are allocated to cabling installed at functional locations within and outside of Transnet Pipelines Pump Station confines.

The reader is referred to the following Plant & Equipment Identification Standard as included in the Appendices.

FUNCTIONAL DESIGNATION PL 118739 Cabling

8.1. Assignment Rules

1. Each Cable shall be identified by means of a Cable Identifier comprising of the following components:
   - single digit Type Identifier used to identify whether the cable is used for power or control purposes
   - a Functional Descriptor of the equipment to which the cable is terminated (either source or destination)
   - a Signal Type Identifier which may be used to indicate additional information under the following circumstances only:
     - on Instrument Multicores to indicate signal type (discrete or analogue)
     - on Electrical Cables running to motors, to differentiate between functions (heater versus emergency stop)

2. For details on Functional Descriptors, the reader is referred to Transnet Pipelines Specification PL727 “Cabling, Racking, Trenching & Earthing Installation Codes of Practice” Section 8.5.

9. PROCESSING PIPING IDENTIFIERS

Process Piping may be identified by use of Piping Identifiers, which are allocated to piping installed at functional locations within and outside of Transnet Pipelines Pump Station confines.

The reader is referred to the following Plant & Equipment Identification Standard as included in the Appendices.

FUNCTIONAL DESIGNATION PL 118740 Process Piping

9.1. Assignment Rules

1. Each Plant item shall be identified by means of a two digit Station Identifier (and prefix “= “), followed by a nine digit alphanumeric Function Identifier.

2. The Function Identifier shall comprise of a first letter used to denote Pressure Rating, followed by a three digit ID used to identify Line Size, followed by a two digit ID used to identify Material Composition, followed by a three digit number used to uniquely identify the pipe in question.

3. Process Piping Identifiers shall be allocated to P & ID Diagrams below the process line where drawn on the horizontal, and to the right of process lines were drawn vertically.

10. APPENDICES

Plant and Equipment can be identified on Transnet Pipelines Sites using two forms of Identifiers; namely, by Function using the Function Designation System (identified by the prefix "= "), or by Location using the Location Designation System (identified by the prefix "+ "). In this regard the following documentation attached details each Standard:

FUNCTIONAL DESIGNATION	PL 118736	Plant & Equipment
	PL 118737	Instrumentation
	PL 118738	Panels
	PL 118739	Cabling
	PL 118740	Process Piping
LOCATION DESIGNATION	PL 118741	Panels

ADDENDUM No 1

EQUIPMENT, ELECTRICAL AND INSTRUMENT TAG NUMBERING STANDARDS - INTEGRATION INTO THE SAP/R3 BUSINESS MANAGEMENT PLATFORM.

Equipment/Electrical/Instrument Tag Numbering Standards have been integrated into a Structure **Indicator** defined within the SAP R3 Business Management platform and used for the purposes of equipment, electrical and instrument identification, specification, historic tracking and management reporting functionality. This Structure Indicator, as utilised by SAP R3, comprises of two separate parts, namely, a **Functional Location Identifier** which describes the specific location in the plant at which the equipment is installed, and an **Equipment/Instrument/Electrical Identifier** as defined in the respective Tag Numbering Standards attached. Incorporation of the Equipment, Instrument and Electrical Tag Numbering Systems into the Structure Indicator ensures integration between the AutoCAD P&ID Design and SAP R3 Business Management platforms.

Table A1. Structure Indicator.

STRUCTURE INDICATOR

FUNCTIONAL LOCATION IDENTIFIER — EQUIPMENT IDENTIFIER

X - X - XXXX - X - XXX - X - XXX - XXXXXXXXX

1 2 3 4 5 6 7 8

where

1. **Company Code** P for Transnet Pipelines.
2. **District Code** H for Head Office, N for Northern District, S for Southern District.
3. **Depot Code** Refer to Table A2 below.
4. **Depot Sub-Code** O for Operational, N for Non Operational cost allocation.
5. **Pipeline Code** Currently under investigation. PL1 for Multiproducts (12 inch), PL2 for Gas (18 inch), PL3 for Crude (16 inch), PL11 for NMPP (24 inch), SHR for Shared.
6. **Line Function Code** M for Mechanical, E for Electrical, C for Civil, I for Instrument, S for Services, T for Info Tech etc.
7. **Process/Plant Code** Refer to Table A3 below.
8. **Equipment Identifier** Refer to Tag Numbering Standards attached.

P - N - ALR1 - O - PL1 - M - R01 - XVR1A
P - N - ALR1 - O - PL1 - I - P01 - TT011
P - S - HWK - O - PL2 - E - X01 - K01
P - S - HTP1 - O - PL11 - I - P01 - PT011

A.1 FUNCTIONAL LOCATION IDENTIFIER.

The Functional Location Identifier is used to define the exact location of equipment/ instrumentation on a Transnet Pipelines Pump Station site. As such the Identifier has been split ito several parts called **codes** defined below.

A.1.1 Company Code

Used to identify the company to which the equipment belongs. This code is usually given the letter "**P**" to denote Transnet Pipelines.

A.1.2 District Code

Used to identify the District responsible for the management and maintenance of the equipment. The following options have currently been defined:

N for Northern Districts
S for Southern Districts
H for Head Office

A.1.3 Depot Code

Used to identify the Depot to which the equipment belongs. This code has been defined on managerial/cost centre basis. The following options have currently been defined:

Table A2. Depot Codes

Depot Name	Operations SAP R3	Technical SAP R3	M & I SAP R3	M & I AutoCAD P&ID
Airport	APT1			21
Alrode	ALR1	ALR2	ALR3	18
Benoni	BIR1			Not Allocated
Bethlehem	BEM1			13
Bethlehem TOP	BHT1			12
Coalbrook	CBK1	CBK2		17
Durban	DNR1			02
Duzi	Duzi			
Empangeni	EMG1	EMG2		32
Fort Mistake	FTM1			
Fynnlands	FYN1			01
Hillcrest	HLR1			03 (DJP) , 04 (DWP)
Hilltop	HTP1			
Howick	HWR1			07 (DJP) , 08 (DWP)
Jameson Park-1438	JMP			
Jameson Park TPL-1475	JMP1			
Klerksdorp	KRP1			20
Kendal	KDL1			36

Table 2. Continued

Depot Name	Operations SAP R3	Technical SAP R3	M & I SAP R3	M & I AutoCAD P&ID
Kroonstad	KRO1	KRO2		14
Ladysmith	LAY1	LAY2		09 (DJP) , 10 (DWP)
Ladysmith TOP	LST1			Not Allocated
Langlaagte	LLA1			24
Magdala	MGA1			15
Mahlabatini	MAT1			33
Mnambithi	MBT1			
Mngeni	MGN1			
Mooi River	MRR1			
Newcastle	NCS1			28
Pietermaritzburg	PZB1	PZB2		05
Pietermaritzburg TOP	PMT1			06
Potchefstroom	PCM1			19
Pretoria West	PWT			23
Quagga	QGA1			35
Rustenburg	RTR1			26
Sasolburg	SBG1			16
Scheepersnek	SCN1	SCN2		34
Secunda	SEC1			31
Standerton	SNR1	SNR2		30
Tarlton	TLR1	TLR2		25
Twini	TNI1			
Van Reenen	VRN1			11
Villiers	VLR1			
Volksrust	VRR1			29
Vrede				
Waltloo	WAO1			22
Warden	WDN1			
Wilge	WIL1			
Witbank	WIR1			27
Transnet Pipelines Head Office	PHO9			Not Allocated
Transnet Pipelines Northern District	NDO9			Not Allocated
Transnet Pipelines Southern District	SDO9			Not Allocated

A.1.4 **Depot Sub Code**

Used to assign equipment costs into operational and non-operational cost categories. The following two options are available:

O for operational costs
N for non-operational costs

A.1.5 **Pipeline Code**

Used to assign equipment to particular pipelines. Currently under evaluation by Transnet Pipelines. An initial proposal has been defined as follows:

PL1 for the Multiproducts (12 inch) pipeline
PL2 for the Gas (18 inch) pipeline
PL3 for the Crude (16 inch) pipeline
PL11 for the NMPP (24 inch) pipeline
SHR for shared equipment

A.1.6 **Line Function Code**

Used to define the Line Function responsible for the maintenance of the equipment. The following options have currently been defined:

C	for Civil
E	for Electrical
F	for Fire and Effluent
G	for General
I	for Metering and Instrumentation
M	for Mechanical
S	for Services
T	Information Technology

A.1.7 **Process Plant Code**

Used to define the location of process plant installed on the respective Transnet Pipelines sites. Note that Process Plant is defined as a **grouping of equipment and instrumentation that combine to perform a common function** e.g. piping, valves and instrumentation that combine to form a piece of process plant called a Receiver. Identification of Process Plant conforms to the Ops Code standard as adopted by Transnet Pipelines and detailed in PL 101 Section 5.1.

Table A3. Ops Code Definition (Process Plant)

X	X	X

OPERATIONAL CODE TABLE					
A	Accumulator	A		A	Inlet
B	Booster	B		B	
C	Consignee/or	C	Caltex	C	
D	Distributor	D		D	
E		E	Petro SA	E	Discharge
F	ProverTransfer	F		F	
G	Blender	G		G	
H	Header	H		H	
I	Isolation	I		I	
J		J		J	Control
K		K		K	Bypass
L	Launcher	L		L	
M	Meter	M	Engen	M	
N	Reverse Pump	N	BP	N	Transfer
O		O		O	
P	Main Pumps	P		P	
Q	Fans	Q		Q	
R	Receiver	R	Sasol	R	Reverse
S	Strainer	S	Shell	S	
T	Tank	T	Total	T	
U	Lube System	U		U	
V		V		V	Vent
W		W	Vopak	W	Drain
X	Aux Pumps	X		X	Launch
Y	Meter Prover	Y		Y	
Z		Z		Z	
		1			
		2			
		3	Diesel 500ppm		
		4			
		5			
		6	ULP-95 Octane		
		7			
		8	Avtur		
		9			
		14	Ulp -93 Octane		
		33	Diesel 50ppm		
		76	Crude Oil		

Note: For an adequate understanding of the Table above, please refer to the Assignment Rules below.

Assignment Rules.

1. Each Plant item shall be identified by means of a three digit alphanumeric identifier in compliance with Table 1.

2. The first letter shall convey the **functional location** of the equipment in the plant.

3. The second and third characters shall comprise of a double-digit consecutive number used to uniquely identify the particular piece of process plant and shall be allocated per Pump station on a consecutive basis. (E.g. where three Auxiliary Pumps exist these shall be identified as X01, X02, X03 irrespective of their function).

   In multiproduct dedicated manifolds, the third letter **may** be used to identify the product type associated with the particular piece of process plant as follows:

   3 Diesel 500ppm
   6 ULP - 95 Octane
   8 Avtur
   14 ULP - 93
   33 Diesel - 50ppm
   73 Crude oil

4. No separators (e.g. Dashes) shall be used to separate characters in the identifier.

Process Plant Examples: (Allocated on a Pump Station basis).

Main Pump	P01	Main Line Pump No. 1
	P02	Main Line Pump No. 2
	P03	Main Line Pump No. 3
	P04	Main Line Pump No. 4
Accumulator Pump	A01	Accumulator Pump No. 1
	A02	Accumulator Pump No. 2
Booster Pump	B01	Booster Pump No. 1
	B02	Booster Pump No. 2
Auxiliary Pumps X01	Sump Pump	
	X02	Sump Pump
	X03	Lube Pump
	X04	Lube Pump
	X05	Inhibitor Pump
	X06	Inhibitor Pump
	X07	Petrol Blend Pump
	X08	Diesel Blend Pump
	X09	Petrol Prover Transfer Pump
	X10	Diesel Prover Transfer Pump
	X11	ULP Blend Pump
	X12	ULP Prover Transfer Pump

	Q01	Purge Air Fan 1
	Q02	Purge Air Fan 2
	Q03	Pressurisation Fan 1
	Q04	Pressurisation Fan 2
Meters	M01	Turbine/Positive Displacement Meter No 1.
	M02	Turbine/Positive Displacement Meter No 2.
Strainers	S01	Main Line Strainer
	S02	Main Line Strainer
	S03	Main Line Strainer
	S04	Main Line Strainer
	S05	Petrol Header Strainer (Delivery Station)
	S06	Petrol Header Strainer (Delivery Station)
	S07	Diesel Header Strainer (Delivery Station)
	S08	Diesel Header Strainer (Delivery Station)
	S09	ULP Header Strainer (Delivery Station)
	S10	ULP Header Strainer (Delivery Station)

11. DOCUMENT CHANGE HISTORY:

The owner of this document is responsible for the revision and control of the document, including updating of the table below, which contains the history of the document with details of each revision.

Date	Previous Rev No.	New Rev No.	Details of Revision
15.01.99	00	01	Document approved for distribution.
23.05.00	01	02	Phase II revisions added.
15.04.01	02	03	Instrument Group ID Allocations revised. Plant & Equip Identification Stds clarified.
01.08.07	03	04	Transnet Pipelines logo added.
12.06.2012	04	05	New Transnet Standard Template Adopted Updating the Reference Documentation
25.05.2016	05	06	Document review & update & New Template

This table summarises what has been changed in the document so that it is easy to keep track of the effected changes.

DRAWING OFFICE STANDARD (PL102)

DOCUMENT APPROVAL PROCESS

NAME		POSITION/MEETING NO.	SIGNATURE	DATE
Originator:	Zandile Moloi	Drawing Office Manager		20/06/2016
Approver:	Petros Khumalo	Technical Support Manager		30-06-2016
Original date: 15 June 2016				
Effective date: 06 July 2016				

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1. INTRODUCTION

The purpose of this standard is to establish a uniform means of designating plant, equipment, instrumentation and electrical switchgear as installed on the respective pump station sites within Transnet Pipelines, on technical drawings and in documentation. By ensuring a comprehensive, consistent and uniform means of representing plant, equipment and instrumentation on technical drawings and in documentation, it is hoped that this Standard will assist in the rapid identification of equipment and instrumentation, as well as correct interpretation of information presented.

2. SCOPE

2.1. GENERAL

This document defines graphical symbology standards to be adopted when representing all plant, equipment, instrumentation and electrical switchgear on technical drawings and in documentation. Plant, equipment and instrumentation symbology has been based on the Instrument Society of America Standards ISA S5.1-1984 and ISA S5.3-2009 respectively, and supplemented to include Transnet Pipelines specific equipment. Electrical Switchgear symbology has been based on the International Electrotechnical Commission Standards IEC Publication 60617 as adopted by SABS/NRS 002-2000.

It is not the intent of these Standards to mandate the usage of each type of symbol for each occurrence of a generic device within the overall control system, which may result in undue complexity, but rather to enable the designer the facility to use internationally recognised symbology to convey the level of detail required to accurately reflect the process.

In this regard, symbology and rules of usage as defined within this Standard are required to be adhered to by Client and Contractor alike, for and on behalf of Transnet Pipelines, a Division of Transnet Ltd. Both Client and Contractor will be required to familiarise themselves with all applicable Standards and Codes of Practice listed herein, and to ensure compliance in the execution of any work in terms of this document. Failure to comply may render the provider liable for corrections at his own cost.

These Standards should be read in conjunction with all other specifications and drawings as issued for a particular contract. Where discrepancies occur, these must be brought to the attention of Transnet Pipelines in writing before commencement of work. In the event of any conflict between the contents of any documents forming part of a contract (as listed in the Schedule of Contract Documents) and this document, the former shall prevail.

2.2. APPLICATION TO WORK ACTIVITIES

The Standards contained herein are suitable for use whenever plant, equipment, instrumentation or electrical switchgear are required to be represented in technical drawings and in documentation. These Standards thus cover designation of plant, equipment, instrumentation and electrical switchgear in the following types of documentation:

- Flow Diagrams, process and mechanical
- Piping and Instrumentation diagrams
- Instrumentation system diagrams
- Electrical switchgear diagrams
- Specifications, purchase orders, manifests and other lists
- Construction Drawings
- Technical Papers, literature and discussions
- Tagging of Instruments
- Installation, operation and maintenance instructions, drawings and records

3. REFERENCE DOCUMENTATION

The following standard specifications are to be used for reference purposes. It is expected of Tenderers that they be familiar with the applicable clauses and that these will be adhered to in the execution of any work in terms of this specification.

A. Standards and Recommended Practices for Instrumentation and Control, 11th Edition, Instrument Society of America.

ANSI/ISA-S5.1-2009	Instrument Symbols and Identification
ANSI/ISA - S 5.2-1992	Binary Logic Diagrams for Process Operations
ANSI/ISA-S5.3-1983	Graphic Symbols for Distributed Control, Shared Display Instrumentation, Logic and Computer Systems
ANSI/ISA - S 5.5-1985	Graphic Symbols for Process Displays

B. Graphical Symbols for Electrical Diagrams NRS 002-2000 second edition.

C. International Electrotechnical Commission Standards for Electrical Drawings

IEC Publication 27	Letter Symbols to be used in Electrical Technology
IEC Publication 50	International Electrotechnical Vocabulary
IEC Publication 617	Graphical Symbols for Diagrams

D. American Society of Mechanical Engineers (ASME)

ASME Y32.11 - 1961	Graphical Symbols for Process Flow Diagrams
ASME Y32.2.3 - 1994	Graphical Symbols for Pipe Fittings, Valves & Piping.

4. ABBREVIATION

For the purpose of understanding these Standards, the following abbreviations apply.

ANSI	:	American National Standards Institute
C & I	:	Control and Instrumentation
IEC	:	International Electrotechnical Commission
ISA	:	Instrument Society of America
SABS	:	South African Bureau of Standards
ASA	:	American Standards Association

5. EQUIPMENT & INSTRUMENT SYMBOLOGY STANDARD

Equipment / Instrument Symbols as defined in the tables contained in Appendix A conform to the following standards:

A. Standards and Recommended Practices for Instrumentation and Control, 11th Edition, Instrument Society of America.

ANSI/ISA-S5.1-2009	Instrument Symbols and Identification
ANSI/ISA - S 5.2-1992	Binary Logic Diagrams for Process Operations
ANSI/ISA-S5.3-1983	Graphic Symbols for Distributed Control, Shared Display Instrumentation, Logic and Computer Systems
ANSI/ISA - S 5.5-1985	Graphic Symbols for Process Displays

B. American Society of Mechanical Engineers (ASME)

ASME Y32.11 - 1961	Graphical Symbols for Process Flow Diagrams
ASME Y32.2.3 - 1994	Graphical Symbols for Pipe Fittings, Valves & Piping.

The symbol descriptions listed to the right of each symbol are intended to serve as guidelines for applicability and have been supplemented by comments where further clarity may be required.

5.1. SYMBOL DEFINITIONS (Refer to Appendix A)

Table 1 General Instrument or Function Symbols
Table 2 Interlock and Math Functionality
Table 3 Line Symbology
Table 4 Fire System Symbology
Table 5 General Symbology
Table 6 Pump Symbology
Table 7 Valve Symbology
Table 8 Mechanical Symbology
Table 9 Equipment Symbology
Table 10 Tank Symbology

5.2. RULES FOR USAGE

5.2.1 . Individual pieces of equipment and instrumentation shall be uniquely identified on technical drawings and documentation via means of the symbols defined above. Where pieces of equipment / instrumentation have easily defined or recognisable relationships, these need not be individually tagged on a diagram. For example, an orifice plate need not be separately tagged to the differential pressure transmitter, for the purposes of flow measurement. Also, where there is a primary element connected to another instrument on a diagram, use of a symbol to represent the primary element on the diagram is optional.

5.2.2 . Where an instrument/equipment has more than one function and denotation of these are necessary to gain a full understanding of the process, these functions may be individually reflected by symbols located alongside one another and tagged separately. Use of contiguous symbols may thus be used to reflect the following additional functionality:

- Interfacing between associated instruments e.g. hardwiring, internal system links, backup.
- Instrument integrated multiple functions.

5.2.3. Brief explanatory notation may be added adjacent to the symbol or line to clarify instrument functionality e.g. a lead analyser may have the letters Pb placed adjacent to the symbol to indicate the function of the analyser; a temperature probe may have the letters PT100 placed adjacent to the symbol to indicate the element type.

5.2.4. Where math functionality is performed within an instrument (e.g. square root extraction) such functionality may be indicated by means of explanatory notation placed adjacent to the instrument symbol.

5.2.5. Orientation and sizing of symbology should be selected with neatness and legibility in mind. Function Block designation and Tag Numbers should always be drawn on the horizontal.

5.2.6. Electrical, pneumatic or other power supply to an instrument need not be shown, unless it is essential to an understanding of the function or operation of an instrument or loop.

5.2.7. The sequence in which instruments or functions are connected on a diagram should reflect the functional logic and need not necessarily correspond to the signal connection sequence. For example, an analogue instrument using voltage feedback requires parallel wiring whereas an instrument using current feedback requires series wiring, although both are represented in documentation using identical symbology.

5.2.8. The degree of detail to be applied to each document or drawing lies is entirely at the discretion of the user. For example, sketches and technical papers usually contain simplified symbology whereas P & ID Diagrams and Process Flow Diagrams may show all in-line components. In all cases, consistency should be exercised for each document /drawing type, and in this regard the reader is required to familiarise himself with examples of drawings included in the Drawing Standards Document in order to ascertain degree of detail requirements.

5.2.9. Interlocking Functionality. For the sake of clarity and in order to prevent technical drawings from becoming cluttered, only hardwired interlocking functionality need be reflected on technical drawings produced for and on behalf of Transnet Pipelines. All other interlocking functionality shall be defined in Software Documentation and Functional Design Specifications accompanying the installation of Control Systems technology.

5.2.10. Where graphical symbols are similar in nature and may cause misinterpretation, cautionary notes should be added to the document/drawing, in order to assist in interpretation.

5.2.11. Alarm and Trip Functionality. All derived tags (alarm and trip functionality) shall be represented by the placement of additional notation alongside the instrument symbol on a drawing. In this regard the following notation has been derived to date:

PAHH	Press Trip High
PAH	Press Alarm High
PALL	Press Trip Low
PAL	Press Alarm Low
dP/dT	Rate of Change
PDA	Deviation from Setpoint

6. EQUIPMENT & INSTRUMENT SYMBOLOGY STANDARD

Electrical Switchgear Symbology used shall conform to the International Electrotechnical Commission Standards IEC Publication 60617 as adopted by SABS/NRS 002-2000 (Amended 1994).

Lists of the more commonly used symbols have been included in Appendix B for reference purposes. The symbol descriptions listed to the right of each symbol are intended to serve as guidelines for applicability and have been supplemented by comments where further clarity may be required.

7. APPENDICES
APPENDIX A

Equipment & Instrument Symbol Tables

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General Instrument or Function Symbols

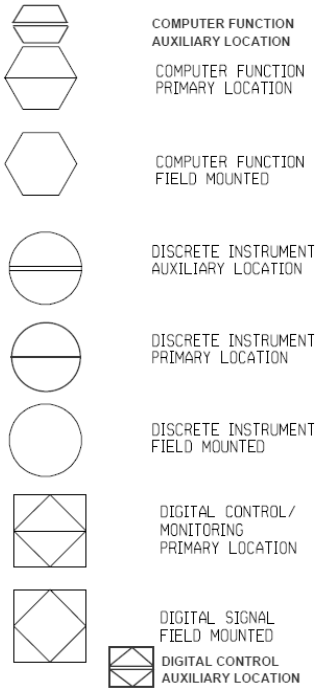


Table 2
Interlock and Math Functionality

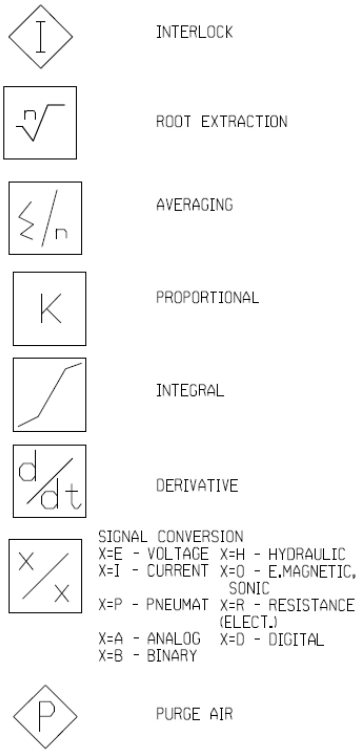


Table 3
Line Symbology

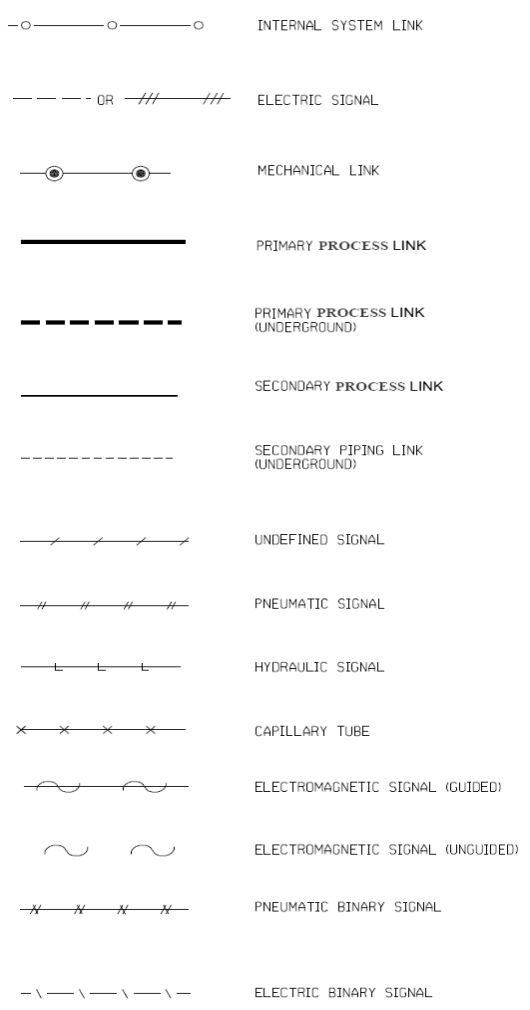


Table 4
Fire System Symbology



Table 5
General Symbology

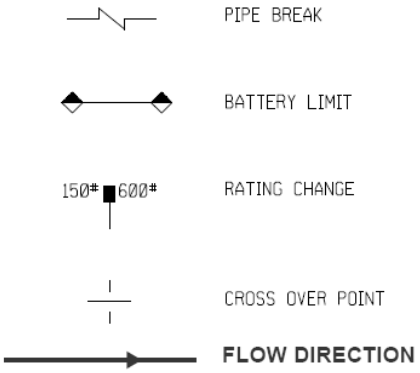


Table 6
Pump Symbology

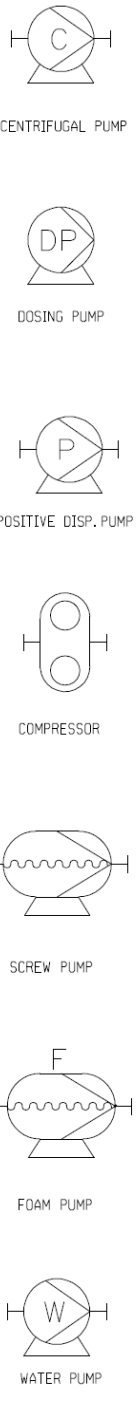


Table 7
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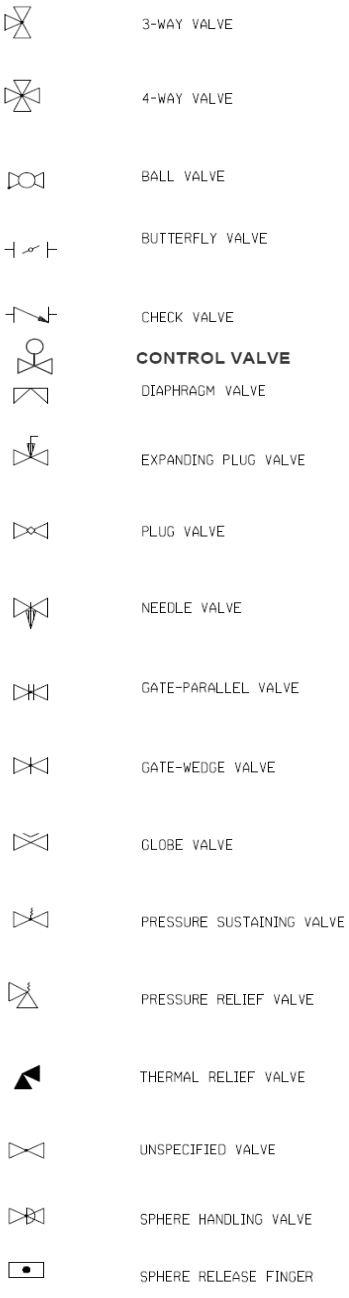


Table 8
Mechanical Symbology

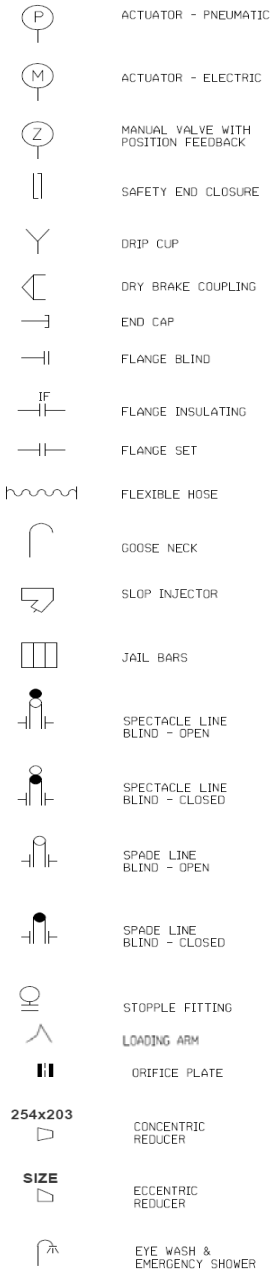


Table 9
Equipment Symbology

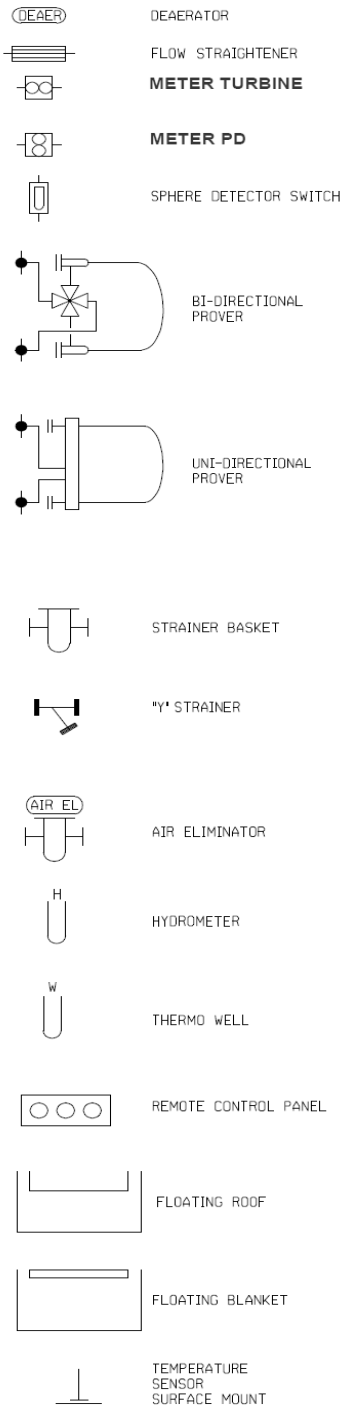
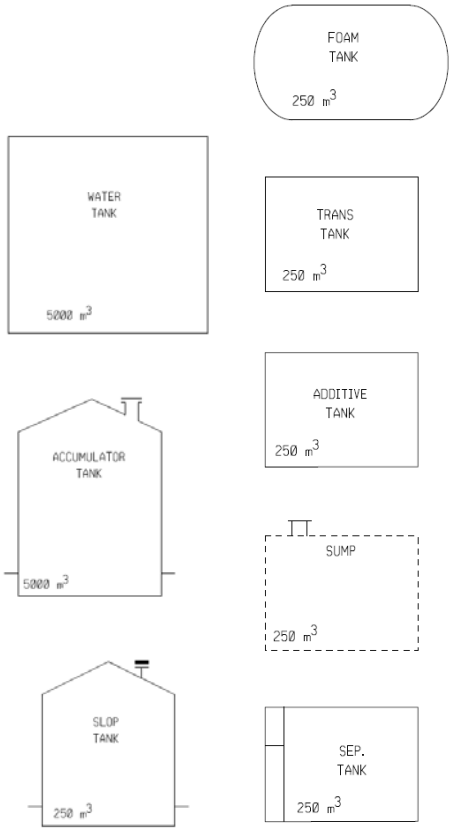


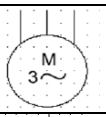
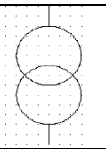
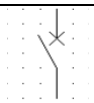
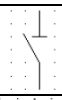
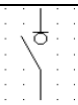
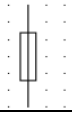
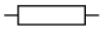
Table 10
Tank Symbology



APPENDIX B

Electrical Switchgear Symbol Tables

Graphical Symbols for Electrical Diagrams NRS 002-2000 second edition.

	Earth general symbol Earthing, general symbol, Ground (US) general symbol; Grounding (US) general symbol		Coil, general symbol, Winding general symbol Inductor; Choke
	Make contact, general symbol, switch, general symbol		Semiconductor diode, general symbol
	Break contact		Induction motor, three phase, squirrel cage
	Change-over break before make contact		Transformer with two windings, general symbol (form 1)
	Circuit Breaker		Rectifier
	Disconnector, Isolator		Primary cell
	Switch-disconnector, On-load isolating switch		Lamp, general symbol lamp Signal lamp, general symbol
	Operating device, general symbol; Relay coil, general symbol Operating coil of a selector (form 1)		Direct current
	Fuse, general symbol		Alternating current
	Resistor, general symbol		
	Capacitor, general symbol		

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Date	Previous Rev No.	New Rev No.	Details of Revision
15.01.99	00	01	Document approved for distribution.
12.06.12	01	02	New Transnet Standard Template Adopted
26.05.16	02	03	Document review and update & New Template

This table summarises what has been changed in the document so that it is easy to keep track of the effected changes.

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NRS 002:2000

Second edition

Rationalized User Specification

GRAPHICAL SYMBOLS FOR ELECTRICAL DIAGRAMS

Preferred requirements for applications in the Electricity Supply Industry

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Foreword

This specification has been prepared by the NRS Project Management Agency for use in the Electricity Supply Industry in South Africa as a compilation of a subset of internationally accepted symbols: it has not been specifically approved by a technical committee or user group. It is intended to be a ready source of reference for the industry.

This second edition of NRS 002 has been prepared to incorporate amendments to the relevant parts of IEC 60617 that have been published since the first edition of NRS 002 was prepared.

The specific contribution of Dott Browse of Eskom in the compilation of this specification is acknowledged.

Comments are invited from interested parties and correspondence should be directed to the NRS Standardization Manager, c/o the Electrotechnical Standards Manager, SABS, Private Bag X191, Pretoria, 0001.

Introduction

The objective of this specification, which details preferred symbols for use on electrical diagrams and drawings, is to reduce the number of variations in symbols.

The numbering of symbols is in accordance with the IEC reference numbers.

In an attempt to establish a degree of uniformity and in order to standardize,

a) the choice of alternative symbols has been rationalized;

b) the letter "V" for voltage/volts is used throughout in preference to the alternative "U";

c) the symbol "θ" for temperature is used throughout in preference to the alternative "t";

d) a black dot, symbol 03-02-01, is used for all connections;

e) a small circle is used throughout to represent the hinge-point of symbols representing contacts and switchgear; and

f) the line representing the moving contact part of switchgear is drawn thicker than the other lines.

The symbols have been created in electronic format for use in a computer-aided design (CAD) cell library and are available, on disks, with this edition of NRS 002. The cells were developed in Microstation SE® and can be used with various drawing software packages through conversion.

The symbols have been selected from different parts of IEC 60617. The graphical symbols for diagrams used are those that are most common. Certain graphical symbols for reticulation system plans have been added.

SPECIFICATION

Graphical symbols for electrical diagrams

Preferred requirements for applications in the Electricity Supply Industry

1 Scope

This specification contains graphical symbols, typically for use in electrotechnical diagrams for heavy current equipment and associated control equipment.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this specification. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision, and parties to agreements are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. Information on currently valid national and international standards and specifications can be obtained from the South African Bureau of Standards.

IEC 60027-1:1995, *Letter symbols to be used in electrical technology – Part 1: General.*

IEC 60050:(all parts), *International Electrotechnical Vocabulary (IEV).*

IEC 60076-1:1993, *Power Transformers – Part 1: General.*

IEC 60375:1972, *Conventions concerning electric and magnetic circuits.*

IEC 60445:1988, *Identification of equipment terminals and of terminations of certain designated conductors, including general rules of an alphanumeric system.*

IEC 60617-2:1996, *Graphic symbols for diagrams – Part 2: Symbol elements, qualifying symbols and other symbols having general application.*

IEC 60617-8:1996, *Graphic symbols for diagrams – Part 8: Measuring instruments, lamps and signalling devices.*

IEC 60617-11:1966, *Graphic symbols for diagrams – Part 11: Architectural and topographical installation plans and diagrams.*

ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange.*

3 Definitions

For the purposes of this specification, the following definitions apply:

3.1 block symbol: A simple graphical symbol, representing an assembly of items and intended to indicate the function of the assembly, neither giving details about the items nor taking account of all connections.

NOTE Block symbols are generally used in diagrams where a single-line representation is applied. They may also be used in diagrams with all input connections shown.

3.2 general symbol: A symbol, usually simple, common to a whole family of items, and characteristic of that family.

3.3 graphical symbol: A figure, mark or character conventionally used on a diagram or other document to represent an item or a concept.

3.4 qualifying symbol: A symbol added to another to provide additional information.

NOTE 1 Qualifying symbols cannot normally be used on their own but a general symbol may sometimes be used for qualifying purposes. Thus the general symbol for an auto-transformer may be added to that for a motor starter to produce the symbol for an auto-transformer starter.

NOTE 2 The term "supplementary symbol" has been used in the past with the same meaning as qualifying symbol.

3.5 symbol element: A simple figure with a defined meaning, which has to be combined with other figures to form the complete symbol for a device or a concept.

For example, the symbol for a d.c. compound wound generator is assembled from symbol elements representing the machine, series and shunt field windings, bushes and terminals. When symbol elements are combined in this way, their arrangement is not necessarily related to the physical structure of the device symbolized.

4 General

4.1 General structure

Clause 5, which has the general heading *Symbols*, is structured as follows:

5.1 Symbol elements, qualifying symbols and other symbols having general application

It relates to outlines and enclosures, qualifying symbols for types of current and voltage, variability, direction of force, motion and flow, etc., mechanical controls, earth and frame connections.

5.2 Conductors and connecting devices

It relates to conductors, flexible, screened or twisted, coaxial, terminals, junctions, plugs, sockets and cable sealing ends.

5.3 Passive components

It relates to resistors, capacitors, inductors and delay lines.

5.4 Semiconductors

It relates to diodes, transistors and thyristors.

5.5 Production and conversion of electrical energy

It relates to windings, generators, motors, transformers and power converters.

5.6 Switchgear, controlgear and protective devices

It relates to contacts, switches, temperature-sensitive and touch-sensitive switches, proximity switches, switchgear and controlgear, motor starters, all-or-nothing relays, measuring relays, fuses, gaps and arresters.

5.7 Measuring instruments, lamps and signalling devices

It relates to indicating, integrating and recording instruments, thermocouples, telemetering devices, clocks, lamps, horns and bells.

5.8 Architectural and topographical installation plans and diagrams

It relates to generating stations, substations, conductors, wiring, socket outlets, switches, lighting outlets and fittings, light poles, ducts and water mains.

4.2 Terminology

Whenever possible, the names of the devices and concepts symbolized in this specification correspond to those used in IEC 60050.

4.3 Presentation of symbols

The symbols in this specification have been drawn to a size convenient for comprehension, but efforts have also been made to give them suitable sizes relative to each other. The symbols are laid out in such a way that the distance between connecting lines is a multiple of a certain modulus. The multiple of the modulus has been chosen to provide enough space for the usual terminal designations.

In most cases, the symbols are directly applicable on a diagram and they can be put on a grid in a CAD system (see Introduction).

Although the symbols are presented without a background grid, a grid was used in their preparation.

4.4 Numbering of symbols

Each symbol has a serial number, which is the same number as the corresponding symbol in IEC 60617. This number is composed of three groups:

a) the first group (two digits) identifies the part number of IEC 60617 in which that symbol is specified. Numbers for symbols not specified in any part of IEC 60617 start with the digits "00";

b) the second group (two digits) identifies the number of the section in that part; and

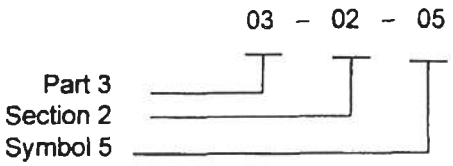
c) the third group (two digits) identifies the number of the symbol in that section.

Each one of these groups is separated from the next group by a hyphen.

In each part of IEC 60617, the sections are numbered from 01 to 99.

In each section, the symbols are numbered from 01 to 99 (not always consecutively, since some symbols of IEC 60617 have not been included).

Example:



Some symbols have serial numbers with a suffix, for example, "-A" or "-02A". This suffix identifies a symbol that does not appear in IEC 60617, but that is related to the symbols adjacent to it.

NOTE Such symbols are included because they are used at present, but their further use should be avoided if possible.

4.5 Use of symbols

The list of symbol elements, qualifying symbols and general symbols has been made as complete as possible, but only a limited number of examples of combined symbols are given. If the symbol for a particular device or design cannot be found in this specification, it should be possible to produce it by an appropriate combination of accompanying symbols or by further reference to IEC 60617.

The sizes of symbols relative to one another may be changed to suit the circumstances of a given diagram or application, for example different symbol sizes are often used for power transformers and measuring transformers. Also, if a symbol is used to qualify another, its size is often reduced. The relative proportions of the symbols should be retained when they are reduced or enlarged.

Different line thicknesses may be used for conductor symbols. The minimum size of symbol and line thickness shall conform to microfilm standards and shall be the minimum permitted by the reproduction method used, as in the case of technical publications.

Symbols may be turned or mirror-imaged if this does not affect their meaning. Unless otherwise stated, the orientation shown in this specification is not mandatory.

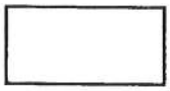
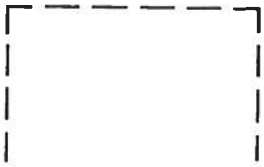
For clarity, symbols are usually shown with connecting lines. Unless otherwise stated, the arrangement shown is only one example of the ways in which connecting lines may be drawn.

Supplementary information can be added to most symbols. This specification gives examples of this practice only in those cases where there is a recommended method for the presentation of such information.

5 Symbols

5.1 Symbol elements, qualifying symbols and other symbols having general application

5.1.1 Symbol elements – Outlines and enclosures

IEC No.	Symbol	Description	Remarks
02-01-01	Form 1 	Item Equipment Functional Unit	Suitable symbols or legends shall be inserted in or added to the symbol outline to indicate the item, equipment or function.
02-01-02	Form 2 		
02-01-03	Form 3 		
02-01-04	Form 1 	Envelope (tank) Enclosure	An outline of another shape may be used. If the enclosure has special protective features, attention may be drawn to these by a note. The use of the envelope symbol is optional. It may be omitted if no confusion will arise. The envelope shall be shown if there is a connection to it. If necessary, the envelope may be split.
02-01-05	Form 2 		
02-01-06		Boundary line	Used to indicate items associated physically, mechanically or functionally. Any combination of short and long strokes may be used.
02-01-07		Screen (shield)	The screen may be drawn in any convenient shape.

5.1.2 Qualifying symbols

5.1.2.1 Types of current and voltage

IEC No.	Symbol	Description	Remarks
02-02-03	Form 2 ⎓	Direct current	Symbol 02-02-01 and 02-02-02 shall not be used.
02-02-04	~	Alternating current	The numerical value of the frequency or frequency range may be added at the right-hand side of the symbol.
02-02-05	~ 50 Hz	Alternating current of 50 Hz	
02-02-06	~ 100 kHz to 600 kHz	Alternate current of frequency range 100 kHz to 600 kHz	The voltage may also be indicated at the right-hand side of the symbol.
02-02-07	3/N ~ 400/230 VHz	Alternating current: three-phase with neutral, 50 Hz, 400 V (230 V between phase and neutral) 3N may be replaced by 3 + N	The number of phases and the presence of a neutral may be indicated at the left-hand side of the symbol.

5.1.2.1 (concluded)

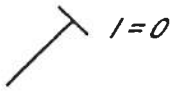
IEC No.	Symbol	Description	Remarks
02-02-09		Alternating current, different frequency ranges The following symbols may be used when it is necessary on a given drawing to distinguish between the different frequency ranges. Relatively low frequencies (example: power frequencies or sub-audio frequencies)	
02-02-10		Medium frequencies (example: audio)	
02-02-11		Relatively high frequencies (example: super audio, carrier and radio frequencies)	
02-02-13	+	Positive polarity	
02-02-14	—	Negative polarity	
02-02-15	N	Neutral	
02-02-16	M	Mid-wire	

5.1.2.2 Variability

Variability is non-inherent when the variable quantity is controlled by an external device, for example, when the resistance is controlled by a regulator.

Variability is inherent when the variable quantity depends on qualities of the device itself, for example, when the resistance changes with change of voltage or with change of temperature.

The sign for variability should be drawn across the main symbol at about 45° to the centre line of the symbol.

IEC No.	Symbol	Description	Remarks
02-03-01		Variability, non-inherent	
02-03-02		Variability, non-inherent, non-linear	
02-03-03		Variability, inherent	Information on the controlling quantity, e.g. voltage or temperature, may be shown near the symbol.
02-03-04		Variability, inherent, non-linear	The remark on symbol 02-03-03 applies.
02-03-05		Pre-set adjustment	Information on the conditions under which adjustment is permitted may be shown near the symbol.
02-03-06		Pre-set adjustment permitted only at zero current	

5.1.2.2 (concluded)

IEC No.	Symbol	Description	Remarks
02-03-07		Variability in steps Stepping action	A figure indicating the number of steps may be added.
02-03-08		Variability, non-inherent in five steps	
02-03-09		Continuous variability	
02-03-10		Pre-set adjustment, continuously variable	

5.1.2.3 Direction of force or motion

An arrow may be used to indicate the direction in which the movable part of a symbol has to move to give a required effect (see, for example, symbol 02-04-02).

An arrow may also indicate the direction of a force or the direction of motion of the physical part symbolized. In such cases, a note to indicate the viewpoint may be required.

The effect caused by movement may be explained by means of symbols or text.

IEC No.	Symbol	Description	Remarks
02-04-01		Rectilinear force or motion in the direction of the arrow	
02-04-02		Bidirectional rectilinear force or motion Frequency is increased when wiper 3 is moved towards terminal 2	
02-04-03		Unidirectional rotation in the direction of the arrow, e.g. clockwise	

5.1.2.3 (concluded)

IEC No.	Symbol	Description	Remarks
02-04-04		Bidirectional rotation	
02-04-05		Bidirectional rotation, limited in both directions	
02-04-06		Reciprocating motion	

5.1.2.4 Direction of flow

IEC No.	Symbol	Description	Remarks
02-05-01		Propagation, energy flow, signal flow, one way, e.g. of energy, signal, information	
02-05-02		Propagation, both ways, simultaneously Simultaneous transmission and reception	
02-05-03		Propagation, both ways, not simultaneously Alternate transmission and reception	
02-05-04		Transmission	The dot may be omitted if the sense is unambiguously given by the arrowhead in combination with the symbol to which it is applied.
02-05-05		Reception	The dot may be omitted if the sense is unambiguously given by the arrowhead in combination with the symbol to which it is applied.

5.1.2.4 (concluded)

IEC No.	Symbol	Description	Remarks
02-05-06		Energy flow from the busbars	
02-05-07		Energy flow towards the busbars	
02-05-08		Bidirectional energy flow	

5.1.2.5 Operational dependence on a characteristic quantity

IEC No.	Symbol	Description	Remarks
02-06-01	$>$	Operating when the characteristic quantity is higher than the setting value	
02-06-02	$<$	Operating when the characteristic quantity is lower than the setting value	
02-06-03	$\gtrless$	Operating when the characteristic quantity is either higher than a given high setting or lower than a given low setting	
02-06-04	$= 0$	Operating when the value of the characteristic quantity becomes zero	
02-06-05	≈ 0	Operating when the value of the characteristic quantity differs from zero by an amount that is very small compared with the normal value	

5.1.2.6 Effect or dependence

IEC No.	Symbol	Description	Remarks
02-08-01		Thermal effect	
02-08-02		Electromagnetic effect	
02-08-04		Magnetic field effect or dependence	
02-08-05		Delay	

5.1.2.7 Radiation

Arrows pointing towards a symbol denote that the device symbolized will respond to incident radiation of the indicated type.

Arrows pointing away from a symbol denote the emission of the indicated type of radiation by the device symbolized.

Arrows located within a symbol denote a self-contained radiation source.

IEC No.	Symbol	Description	Remarks
02-09-01		Radiation, non-ionizing, electromagnetic (e.g. radio waves, visible light or light emission)	
02-09-02		Coherent radiation, non-ionizing (e.g. coherent light)	

5.1.2.8 Signal waveforms

IEC No.	Symbol	Description	Remarks
02-10-01		Positive-going pulse	
02-10-02		Negative-going pulse	
02-10-03		Pulse of alternating current	
02-10-04		Positive-going step function	
02-10-05		Negative-going step function	
02-10-06		Sawtooth wave	

5.1.3 Other symbols having general application

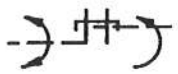
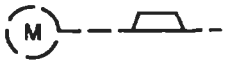
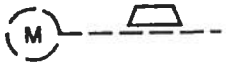
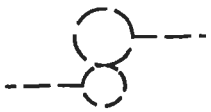
5.1.3.1 Mechanical controls

IEC No.	Symbol	Description	Remarks
02-12-01	Form 1	Mechanical connection (link) Pneumatic connection (link) Hydraulic connection (link)	
02-12-02		Mechanical connection with indication of force or motion	
02-12-03		Mechanical connection with indication of direction of rotation	The arrow is assumed to be placed in front of the connection symbol.
02-12-04	Form 2		Symbol 02-12-04 is to be used if the space is too restricted to permit the use of 02-12-01.

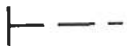
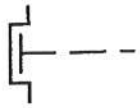
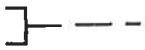
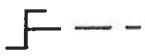
5.1.3.1 (continued)

IEC No.	Symbol	Description	Remarks
02-12-05 02-12-06	Form 1  Form 2 	Delayed action	Delayed action in the direction of movement from the arc towards its centre ("Parachute" effect).
02-12-07		Automatic return	The triangle is pointed in the return direction.
02-12-08		Detent Non-automatic return Device for maintaining a given position	
02-12-09		Detent, disengaged	
02-12-10		Detent, engaged	
02-12-11		Mechanical interlock between two devices	
02-12-12		Latching device, disengaged	
02-12-13		Latching device, engaged	
02-12-14		Blocking device	
02-12-15		Blocking device engaged, movement to the left is blocked	
02-12-16		Clutch Mechanical coupling	

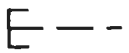
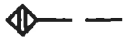
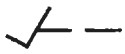
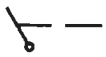
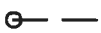
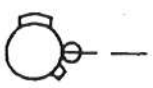
5.1.3.1 (concluded)

IEC No.	Symbol	Description	Remarks
02-12-17		Mechanical coupling, disengaged	
02-12-18		Mechanical coupling, engaged	
02-12-19		Bidirectional and rotating coupling devices (free wheel)	
02-12-20		Brake	
02-12-21		Electric motor with brake applied	
02-12-22		Electric motor with brake released	
02-12-23		Gearing	

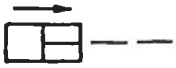
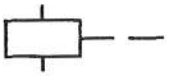
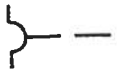
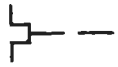
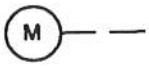
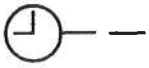
5.1.3.2 Operating devices and methods

IEC No.	Symbol	Description	Remarks
02-13-01		Manually operated control, general case	
02-13-02		Manually operated control with restricted access	
02-13-03		Operated by pulling	
02-13-04		Operated by turning	

5.1.3.2 (continued)

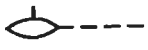
IEC No.	Symbol	Description	Remarks
02-13-05		Operated by pushing	
02-13-06		Operated by proximity effect	
02-13-07		Operated by touching	
02-13-08		Emergency switch (mushroom-head safety feature)	
02-13-09		Operated by handwheel	
02-13-10		Operated by pedal	
02-13-11		Operated by lever	
02-13-12		Operated by removable handle	
02-13-13		Operated by key	
02-13-14		Operated by crank	
02-13-15		Operated by roller	
02-13-16		Operated by cam	If desired, a more detailed drawing of the cam may be shown. This applies also to a profile plate.
02-13-17		Cam profile	
02-13-18		Profile plate Cam profile (developed representation)	
02-13-19		Operated by cam and roller	

5.1.3.2 (concluded)

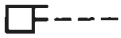
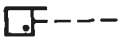
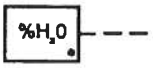
IEC No.	Symbol	Description	Remarks
02-13-20		Operated by stored mechanical energy	Information showing the form of stored energy may be added in the square.
02-13-21		Operated by pneumatic or hydraulic control, single acting	
02-13-22		Operated by pneumatic or hydraulic control, double acting	
02-13-23		Operated by electromagnetic actuator	
02-13-24		Operated by electromagnetic over-current protection	
02-13-25		Operated by thermal actuator, e.g. thermal relay, thermal over-current protection	
02-13-26		Operated by electric motor	
02-13-27		Operated by electric clock	

5.1.3.3 Control by non-electrical quantities

Letter symbols from IEC 60027-1 may be used to denote operating quantities other than those shown below (for example, pressure or speed). They should be enclosed in a rectangle if ambiguity could otherwise arise.

IEC No.	Symbol	Description	Remarks
02-14-01		Control by fluid level	
02-14-02		Control by number of events Control by a counter	

5.1.3.3 (concluded)

IEC No.	Symbol	Description	Remarks
02-14-03		Control by flow	
02-14-04		Control by gas flow	
02-14-05		Control by relative humidity	

5.1.3.4 Earth and frame connections, equipotentiality

IEC No.	Symbol	Description	Remarks
02-15-01		Earth	General symbol. Supplementary information may be given to define the status or the purpose of the earth if this is not readily apparent.
02-15-02		Noiseless earth	
02-15-04		Frame Chassis	

5.1.3.5 Miscellaneous

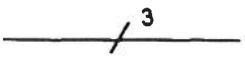
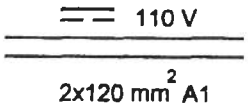
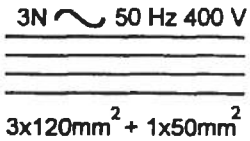
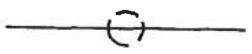
IEC No.	Symbol	Description	Remarks
02-17-01		Fault (indication of assumed fault location)	
02-17-02		Flashover Breakthrough	
02-17-03		Permanent magnet	

5.1.3.5 (concluded)

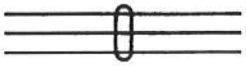
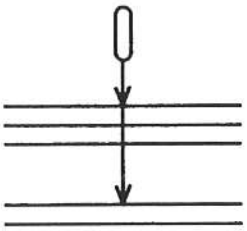
IEC No.	Symbol	Description	Remarks
02-17-04		Moving (e.g. sliding) contact	
02-17-05		Test point indicator	
02-17-06		Changer Converter	General symbol. If the direction of change is not obvious, it may be indicated by an arrow-head on the outline of the symbol, e.g. see symbol 06-14-06. A symbol or legend indicating the input or output quantity, waveform, etc., may be inserted in each half of the general symbol to show the nature of the change (see 5.5). The diagonal line from this symbol is used in the form of a solidus to show a converting function.
02-17-08		Identifier of analogue signals	The symbol shall be used only when it is necessary to distinguish between analogue and digital signals.
02-17-09		Identifier of digital signals	Digital. This symbol shall be used only when it is necessary to distinguish between digital and other forms of signals and connections See also clause 1 in ISO/IEC 646.

5.2 Conductors and connecting devices

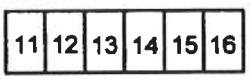
5.2.1 Conductors

IEC No.	Symbol	Description	Remarks
03-01-01		Conductor Group of conductors Line Cable Circuit Transmission path	Single-line representation of conductors. When a single line represents a group of conductors, their number may be indicated by adding either small strokes or one stroke and a figure.
03-01-02	Form 1 	*Example:* Three conductors	Additional information may be indicated as follows: *Above the line:* type of current, system of distribution, frequency and voltage.
03-01-03	Form 2 		*Below the line:* the number of conductors of the circuit followed by a multiplication sign and the cross-sectional area of each conductor. If different sizes of conductors are used, their particulars should be separated by a plus sign. The conductor material may be indicated by its chemical symbol.
03-01-04		*Examples:* Direct current circuit, 110 V, two aluminium conductors of 120 mm²	
03-01-05		Three-phase circuit, 50 Hz, 400 V, three conductors of 120 mm² with neutral of 50 mm²	
03-01-06		Flexible conductor	
03-01-07		Screened conductor	

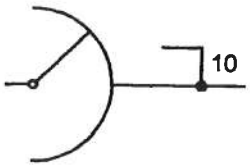
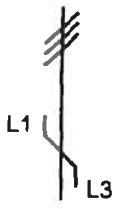
5.2.1 (concluded)

IEC No.	Symbol	Description	Remarks
03-01-08		Twisted conductors, two conductors shown	
03-01-09		Conductors in a cable, three conductors shown	
03-01-10		*Example:* Two conductors out of five in a cable	If several conductors are in a cable (or twisted together or in a screen) but the lines representing them on a diagram are not adjacent to each other, the method shown below may be used.
03-01-11		Coaxial pair	If the coaxial structure is not maintained, the tangential line should be drawn on the coaxial side only.
03-01-12		*Example:* Coaxial pair connected to terminals	
03-01-13		Coaxial pair with screen	

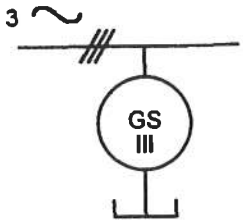
5.2.2 Terminals and connections of conductors

IEC No.	Symbol	Description	Remarks
03-02-01	•	Connection of conductors	
03-02-02	o	Terminal	Used on schematic and key diagrams.
03-02-03	 	Terminal strip (examples shown with terminal markings) Terminal markings may be added	Used on wiring and cabling diagrams.

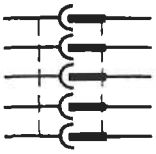
5.2.2 (continued)

IEC No.	Symbol	Description	Remarks
03-02-04		T- connection	
03-02-05		Symbol 03-02-04 shown with junction symbol	Other than at a terminal.
03-02-06		Junction of conductors at a terminal	
03-02-07	Form 1 	Double junction of conductors	Other than at a terminal.
03-02-08	Form 2 	Form 2 shall only be used if required by layout considerations	
03-02-09		Connection common to a group of similar items "n" shall be replaced by the total number of circuits	The total number of similar items may be indicated by a figure near the common connection symbol.
03-02-10		*Example:* Multiplied uniselector banks shown for 10 banks	Deleted. Transferred to annex A: 03-A1-02 (see IEC 60617)
03-02-11		Interchange of conductors, change of phase sequence or inversion of polarity, shown for n conductors in single-line representation	The interchanged conductors may be indicated.
03-02-12		*Example:* Change phase of sequence	For the identification of the conductors, IEC 60445 applies.

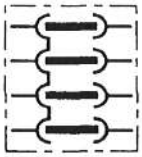
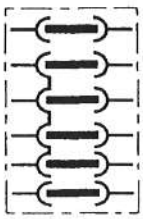
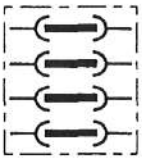
5.2.2 (concluded)

IEC No.	Symbol	Description	Remarks
03-02-13		Neutral point Point at which multiple conductors are connected together to form the neutral point in a multiphase system	
03-02-14		*Example:* Synchronous generator, three-phase, both leads of each phase brought out, shown with external neutral point	

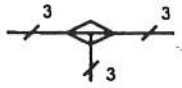
5.2.3 Connecting devices

IEC No.	Symbol	Description	Remarks
03-03-01		Socket (female) Pole of a socket	
03-03-03		Pole of a plug Plug (male)	
03-03-05		Plug and socket (male and female)	
03-03-07		Multipole plug and socket, shown with six poles: multi-line representation	
03-03-08		Single-line representation	
03-03-15		Coaxial plug and socket	If the coaxial plug or socket is connected to a coaxial pair, the tangential line(s) should be appropriately extended.

5.2.3 (concluded)

IEC No.	Symbol	Description	Remarks
03-03-17	Form 1 	Connecting link, closed	
03-03-46	Form 2 	Connecting link, open	Vertical representation. Horizontal representation.
03-03-47			
03-03-20		Plug and socket type connector, e.g. U-link: male-male *Example of test blocks:*	
03-03-48		Four-way test block with auxiliary short-circuiting contacts	Used in current transformer circuits.
03-03-49		Six-way test block with auxiliary short-circuiting contacts on four of the ways	Used in current transformer circuits.
03-03-50		Four-way test block	Used in voltage circuits. The dotted lines drawn between the socket symbol examples denote an auxiliary short-circuiting device that operates on the withdrawal of the plug from the socket.

5.2.4 Cable fittings

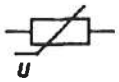
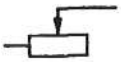
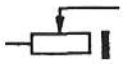
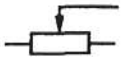
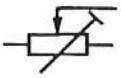
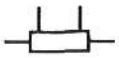
IEC No.	Symbol	Description	Remarks
03-04-01		Cable sealing end, shown with one three-core cable	Multi-line representation.
03-04-50			Single-line representation.
03-04-03		Straight-through joint box, shown with three conductors	Multi-line representation.
03-04-04			Single-line representation.
03-04-05		Junction box, shown with three conductors with T-connections	Multi-line representation.
03-04-06			Single-line representation.

5.3 Passive components

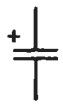
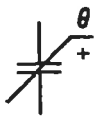
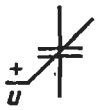
5.3.1 Resistors

IEC No.	Symbol	Description	Remarks
04-01-01		Resistor	General symbol.
04-01-03		Variable resistor Adjustable resistor	
04-01-04		Voltage dependent resistor Varistor (Resistor with inherent non-linear variability, voltage dependent)	Metrosil.

5.3.1 (concluded)

IEC No.	Symbol	Description	Remarks
04-01-49		Temperature dependent resistor with negative resistance-temperature coefficient	Thermistor.
04-01-50		Temperature dependent resistor with positive resistance-temperature coefficient	Ballast resistor. Vertical representation.
04-01-05		Resistor with sliding contact	
04-01-06		Resistor with sliding contact and off-position	
04-01-07		Potentiometer with sliding contact	
04-01-08		Potentiometer, pre-set	
04-01-09		Resistor with fixed tappings (taps), two shown	
04-01-10		Shunt Resistor with separate current and voltage terminals	
04-01-11		Carbon-pile resistor	
04-01-12		Heating element	

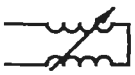
5.3.2 Capacitors

IEC No.	Symbol	Description	Remarks
04-02-01		Capacitor	General symbol.
04-02-03		Lead-through capacitor Feed-through capacitor	
04-02-05		Polarized capacitor, e.g. electrolytic	
04-02-07		Variable capacitor Adjustable capacitor	
04-02-09		Capacitor with pre-set adjustment	
04-02-15		Temperature dependent polarized capacitor, where deliberate use is made of the temperature coefficient, e.g. ceramic capacitor	
04-02-16		Voltage dependent polarized capacitor where deliberate use is made of the voltage dependent characteristic, e.g. semiconductor capacitor	

5.3.3 Inductors

IEC No.	Symbol	Description	Remarks
04-03-01		Inductor Coil Winding Choke NOTE If it is desired to show that the inductor has a magnetic core, a single line may be annotated to indicate non-magnetic materials and it may be interrupted to indicate a gap in the core	For transformer windings, see 5.5.
04-03-03		*Examples:* Inductor with magnetic core	
04-03-04		Inductor with gap in magnetic core	

5.3.3 (concluded)

IEC No.	Symbol	Description	Remarks
04-03-05		Continuously variable inductor, shown with magnetic core	
04-03-06		Inductor with fixed tappings, two shown	
04-03-07		Inductor with moving contact, variable in steps	
04-03-08		Variometer	

5.4 Semiconductor devices

5.4.1 Symbol elements

IEC No.	Symbol	Description	Remarks
05-01-01		Semiconductor region with one ohmic connection	The horizontal line is the semiconductor region and the vertical line is the ohmic connection.
05-01-02	Form 1 	Semiconductor region with several ohmic connections, example shown with two ohmic connections	
05-01-03	Form 2 		
05-01-04	From 3 		
05-01-05		Conduction channel for depletion type devices	
05-01-06		Conduction channel for enhance-ment devices	
05-01-07		Rectifying junction	

5.4.1 (continued)

IEC No.	Symbol	Description	Remarks
		Junction than influences a semi-conductor layer by means of an electric field, e.g. in a junction field effect transistor	
05-01-09		P-region that influences an N-layer	
05-01-10		N-region that influences a P-layer	
		Indication of the conductivity type of the channel for insulated gate field effect transistors (IGFETS)	
05-01-11		N-type channel on a P-type substrate, shown for a depletion type IGFET	
05-01-12		P-type channel on an N-type substrate, shown for an enhance-ment type IGFET	
05-01-13		Insulated gate	For an example with multi-ple gates, see symbol 05-05-17.
		Emitter on a region of dissimilar conductivity type	
05-01-14		P-emitter on N-region	The slanting line with arrow represents the emitter.
05-01-15		Several P-emitters on N-region	
05-01-16		N-emitter on P-region	
05-01-17		Several N-emitters on P-region	

5.4.1 (concluded)

IEC No.	Symbol	Description	Remarks
05-01-18		Collector on a region of dissimilar conductivity type	The slanting line represents the collector.
05-01-19		Several collectors on a region of dissimilar conductivity type	
05-01-20		Transition between regions of dissimilar conductivity types, either P to N, or N to P	The short slanting line indicates the point of change along the horizontal from P to N, or from N to P. No ohmic connection shall be made to the short slanting line.
05-01-21		Intrinsic region separating regions of dissimilar conductivity type thus giving either a PIN or a NIP structure	The intrinsic region lies between the linked slanting lines. Any ohmic connection to the region 1 shall be made between the short slanting lines and not to them.
05-01-22		Intrinsic region between regions of similar conductivity type giving either a PIP or a NIN structure	
05-01-23		Intrinsic region between a collector and a region of dissimilar conductivity type giving either a PIN or a NIP structure	The connection to the collector is made to the long slanting line.
05-01-24		Intrinsic region between a collector and a region of similar conductivity type giving either a PIP or a NIN structure	

5.4.2 Qualifying symbols particular to semiconductor devices

If necessary, a special function or property essential for circuit operation may be indicated by a qualifying symbol placed adjacent to, or forming part of the symbol of, the device.

IEC No.	Symbol	Description	Remarks
05-02-01		Schottky effect	
05-02-02		Tunnel effect	
05-02-03		Unidirectional breakdown effect	
05-02-04		Bidirectional breakdown effect	
05-02-05		Backward effect (unitunnel effect)	

5.4.3 Examples of semiconductor diodes

IEC No.	Symbol	Description	Remarks
05-03-01		Semiconductor diode	General symbol.
05-03-02		Light-emitting diode (LED)	General symbol. See also symbol 08-10-01.
05-03-03		Temperature testing diode Diode where use is made of its temperature dependence	
05-03-04		Variable capacitance diode	Varactor.
05-03-05		Tunnel diode	
05-03-06		Breakdown diode, unidirectional Voltage regulator diode	Esaki diode. Zener diode.
05-03-07		Breakdown diode, bidirectional	

5.4.3 (concluded)

IEC No.	Symbol	Description	Remarks
05-03-08		Backward diode	Unitunnel diode.
05-03-09		Bidirectional diode	Diac. Varistor.

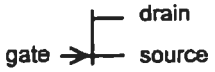
5.4.4 Examples of thyristors

IEC No.	Symbol	Description	Remarks
05-04-01		Reverse blocking diode thyristor	
05-04-02		Reverse conducting diode thyristor	
05-04-03		Bidirectional diode thyristor	Diac.
05-04-04		Triode thyristor, type unspecified	This symbol is used to represent a reverse blocking triode thyristor, if it is not necessary to specify the type of gate.
05-04-05		Reverse blocking triode thyristor, N-gate	Anode-side controlled.
05-04-06		Reverse blocking triode thyristor, P-gate	Cathode-side controlled.
05-04-07		Turn-off triode thyristor, gate not specified	
05-04-08		Turn-off triode thyristor, N-gate	Anode-side controlled.
05-04-09		Turn-off triode thyristor, P-gate	Cathode-side controlled.
05-04-10		Reverse blocking thyristor, tetrode type	
05-04-11		Bidirectional triode thyristor	Triac.

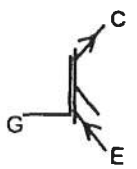
5.4.4 (concluded)

IEC No.	Symbol	Description	Remarks
05-04-12		Reverse conducting triode thyristor, gate not specified	
05-04-13		Reverse conducting triode thyristor, N-gate	Anode-side controlled.
05-04-14		Reverse conducting triode thyristor, P-gate	Cathode-side controlled.

5.4.5 Examples of transistors

IEC No.	Symbol	Description	Remarks
05-05-01		PNP transistor	
05-05-02		NPN transistor with collector connected to the envelope	
05-05-03		NPN avalanche transistor	
05-05-04		Unijunction transistor with P-type base	
05-05-05		Unijunction transistor with N-type base	
05-05-06		NPN transistor with transverse biased base	
05-05-07		PNIP transistor with ohmic connection to the intrinsic region	
05-05-08		PNIN transistor with ohmic connection to the intrinsic region	
05-05-09		Junction field effect transistor with N-type channel	The gate and source connections shall be drawn in line. 

5.4.5 (concluded)

IEC No.	Symbol	Description	Remarks
05-05-10		Junction field effect transistor with P-type channel	
05-05-11		IGFET, enhancement type, single gate, P-type channel without substrate connection	For an example with multiple gates, see symbol 05-05-17.
05-05-12		IGFET, enhancement type, single gate, N-type channel without substrate connection	
05-05-13		IGFET, enhancement type, single gate, P-type channel with substrate connection brought out	
05-05-14		IGFET, enhancement type, single gate, N-type channel with substrate internally connected to source	
05-05-15		IGFET, depletion type, single gate, N-type channel without substrate connection	
05-05-16		IGFET, depletion type, single gate, P-type channel without substrate connection	
05-05-17		IGFET, depletion type with two gates, N-type channel with sub-strate connection brought out	In the case of multiple gates, the primary gate and the source connection shall be drawn in line.
05-05-18		Insulated gate bipolar transistor (IGBT), enhancement type, P-channel	The letters E, G and C which represent the ter-minal names "emitter", "gate", and "collector" res-pectively, may be omitted unless confusion is likely.

5.4.6 Examples of photosensitive and magnetic field sensitive devices

IEC No.	Symbol	Description	Remarks
05-06-01		Light dependent resistor Photoconductive device with asymmetrical conductivity	
05-06-02		Photodiode Photoconductive device with symmetrical conductivity	
05-06-03		Photovoltaic cell	
05-06-04		Phototransistor, PNP type shown	

5.5 Production and conversion of electrical energy

5.5.1 Qualifying symbols for winding interconnections

5.5.1.1 Separate windings

IEC No.	Symbol	Description	Remarks
06-01-01		One winding	The number of separate windings should be indicated: - either by the number of strokes drawn, or - by adding a figure to the symbol.
		Examples:	Symbol 06-01-01 may also be used to represent windings that can be externally connected in various ways.
06-01-02		Three separate windings	
06-01-03		Six separate windings	
06-01-04		*Examples:* Three-phase winding, phases not interconnected	
06-01-05		*m*-phase winding, phases not interconnected	
06-01-06		Two-phase winding, four-wire	

5.5.1.2 Internally connected windings

The method of connecting transformer windings may also be indicated by codes (see IEC 60076-1).

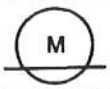
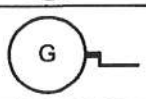
IEC No.	Symbol	Description	Remarks
06-02-05		Three-phase winding, delta	This symbol may be used to symbolize a multiphase polygon connection of windings by adding a figure to denote the number of phases.
06-02-06		Three-phase winding, open delta	
06-02-07		Three-phase winding, star	This symbol may be used to symbolize a multiphase star connection of windings by adding a figure to denote the number of phases.
06-02-08		Three-phase winding, star, with neutral brought out	
06-02-09		Three-phase winding, zigzag or interconnected star	
06-02-10		Six-phase winding, double delta	
06-02-11		Six-phase winding, polygon	
06-02-12		Six-phase winding, star	
06-02-13		Six-phase winding, fork with neutral brought out	

5.5.2 Machines

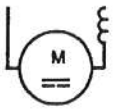
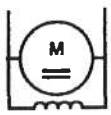
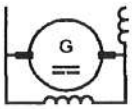
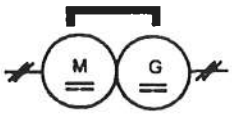
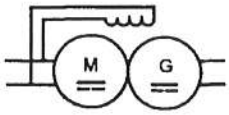
5.5.2.1 Elements of machines

IEC No.	Symbol	Description	Remarks
		Differentiation between windings having different functions	
06-03-01		Commutating or compensating winding	
06-03-02		Series winding	
06-03-03		Shunt winding or separate winding	
06-03-04		Brush (on slip ring or commutator)	Brushes are shown only if necessary. For example of application, see symbol 06-05-03.

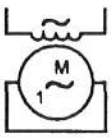
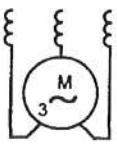
5.5.2.2 Types of machines

IEC No.	Symbol	Description	Remarks
06-04-01		Machine The asterisk* shall be replaced by a letter designation as follows: C: Rotary converter G: Generator GS: Synchronous generator M: Motor MG: Machine capable of use as a generator or motor MS: Synchronous motor	General symbol. Symbol 02-02-04 may be added, as shown in 5.1.2.1.
06-04-02		Linear motor	General symbol.
06-04-03		Stepping motor	General symbol.
06-04-04		Hand generator (magneto caller)	

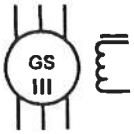
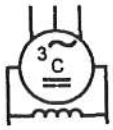
5.5.2.3 Examples of direct current machines

IEC No.	Symbol	Description	Remarks
06-05-01		Series motor, DC	
06-05-02		Shunt motor, DC	
06-05-03		Generator, DC, compound excited (short shunt), shown with terminals and brushes	
06-05-04		Rotary converter, d.c. to d.c. with common permanent magnet field	
06-05-05		Rotary converter, d.c. to d.c. with common field winding	Rotary converter, d.c. to d.c. with common exitation winding.

5.5.2.4 Examples of alternating current commutator machines

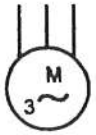
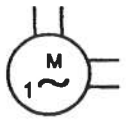
IEC No.	Symbol	Description	Remarks
06-06-01		Series motor, single-phase	
06-06-02		Repulsion motor, single-phase	
06-06-03		Series motor, three-phase	

5.5.2.5 Examples of synchronous machines

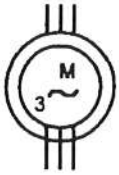
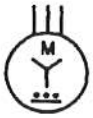
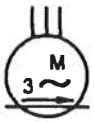
IEC No.	Symbol	Description	Remarks
06-07-01		Synchronous generator, three-phase, permanent magnet	
06-07-02		Synchronous motor, single-phase	
06-07-03		Synchronous generator, three-phase, star-connected, with neutral brought out	
06-07-04		Synchronous generator, three-phase, both leads of each phase winding brought out	
06-07-05		Synchronous rotary converter, three-phase, shunt excited	

5.5.2.6 Examples of induction type (asynchronous) machines

The general symbol for a machine (06-04-01) should be used to represent an asynchronous machine if no external connections to the rotor exist, for example, in a squirrel cage motor. An inner circle, representing the rotor, should be shown in those cases where external connections exist (see, for example, symbol 06-08-03).

IEC No.	Symbol	Description	Remarks
06-08-01		Induction motor, three-phase, squirrel cage	
06-08-02		Induction motor, single-phase, squirrel cage	

5.5.2.6 (concluded)

IEC No.	Symbol	Description	Remarks
06-08-03		Induction motor, three-phase, with wound rotor	
06-08-04		Induction motor, three-phase, star-connected, with automatic starter in the rotor	
06-08-05		Linear induction motor, three-phase, movement limited to one direction	

5.5.3 Transformers and reactors

Two forms of symbol are shown for the same type of transformer:

Single-line form – Form 1
Multi-line form – Forms 2 and 3

Forms 1 and 3 use a circle to represent each winding. Its use is preferably restricted to single-line representation. Symbols for transformer cores are not used with this form.

Form 2 uses symbol 04-03-01 to represent each winding. The number of half circles may be varied to differentiate between certain windings.

Form 3 is an alternative symbol form for three-phase transformers and induction regulators.

For the representation of transformer cores, see note to symbol 04-03-01.

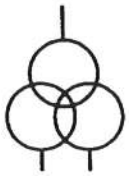
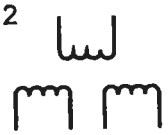
In the case of symbols for current and pulse transformers, straight lines, representing windings, may be used with either form (see 5.5.3.5).

IEC 60375 gives a method of indicating the instantaneous voltage polarities of coupled electric circuits. For an example of application, see symbol 06-09-03.

The strokes on the leads on the single-line form may be omitted if so desired.

The appropriate vector symbols for transformer winding connections are used in accordance with IEC 60076-1.

5.5.3.1 General symbols

IEC No.	Symbol	Description	Remarks
06-09-01	Form 1 	Transformer with two windings The instantaneous voltage polarities may be indicated in form 2 of the symbol. *Example:* Transformer with two windings, shown with instantaneous voltage polarity indicators	Single-line form.
06-09-02	Form 2 		Multi-line form.
06-09-03			Instantaneous currents entering the marked ends of the windings produce aiding fluxes.
06-09-04	Form 1 	Transformer with three windings	Single-line form.
06-09-05	Form 2 		Multi-line form.
06-09-06	Form 1 	Auto-transformer	HV side. Single-line form. LV side.
06-09-07	Form 2 		Multi-line form.
06-09-08	Form 1 	Choke Reactor	Single-line form.
06-09-09	Form 2 Use symbol 04-03-01		Multi-line form.

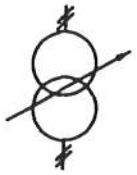
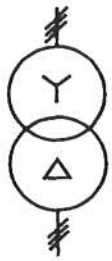
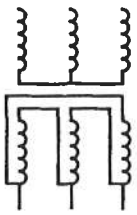
5.5.3.1 (concluded)

IEC No.	Symbol	Description	Remarks
06-09-10	Form 1 	Current transformer Pulse transformer	Single-line form.
06-09-11	Form 2 		Multi-line form.

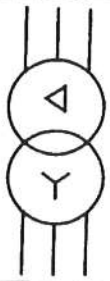
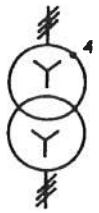
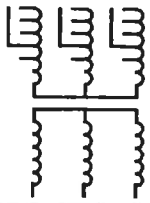
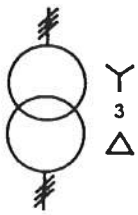
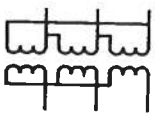
5.5.3.2 Examples of transformers with separate windings

IEC No.	Symbol	Description	Remarks
06-10-01	Form 1 	Single-phase transformer with two windings and screen	Single-line form
06-10-02	Form 2 		Multi-line form
06-10-03	Form 1 	Transformer with centre tapping on one winding	Single-line form.
06-10-04	Form 2 		Multi-line form.

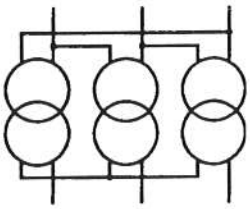
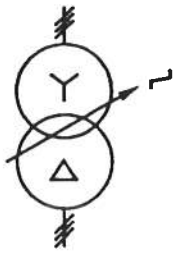
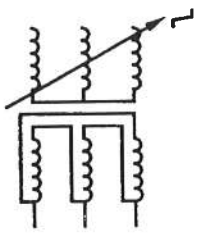
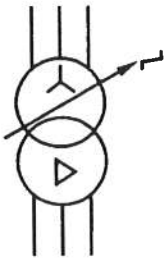
5.5.3.2 (continued)

IEC No.	Symbol	Description	Remarks
06-10-05	Form 1 	Transformer with variable coupling	Single-line form.
06-10-06	Form 2 		Multi-line form.
06-10-07	Form 1 	Three-phase transformer, connection star-delta Yd 11	Single-line form.
06-10-08	Form 2 		Multi-line forms.

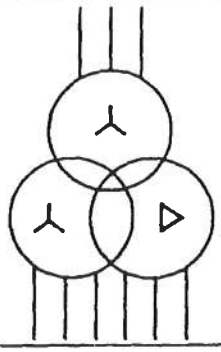
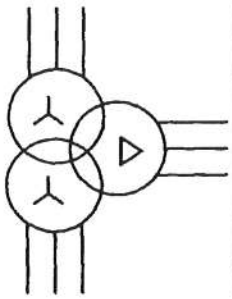
5.5.3.2 (continued)

IEC No.	Symbol	Description	Remarks
06-10-50	Form 3 		Multi-line forms.
06-10-09	Form 1 	Three-phase transformer without four tappings (taps), connection star-star	Each primary winding is shown with four available connection points in addition to those at winding ends.
06-10-10	Form 2 		
06-10-11	Form 1 	Three-phase bank of single-phase transformers, connection star-delta	
06-10-12	Form 2 		

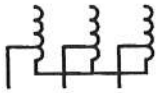
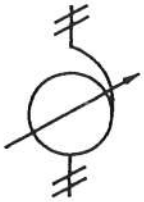
5.5.3.2 (continued)

IEC No.	Symbol	Description	Remarks
06-10-49			Multi-line forms.
06-10-13	Form 1 	Three-phase transformer with on-load tap changer, connection star-delta	
06-10-14	Form 2 		
06-10-48	Form 3 		Multi-line form.
06-10-15	Form 1 		Single-line form.

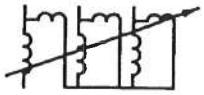
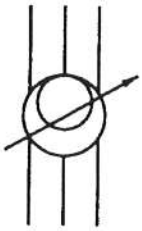
5.5.3.2 (concluded)

IEC No.	Symbol	Description	Remarks
06-10-47		Three-phase transformer, connection star-star-delta	Alternative to symbol 06-10-18 Alternative to symbol 06-10-47
06-19-46			

5.5.3.3 Examples of auto-transformers

IEC No.	Symbol	Description	Remarks
06-11-01	Form 1 	Auto-transformer, single-phase	HV side. Single-line form. LV side.
06-11-02	Form 2 		Multi-line form.
06-11-03	Form 1 	Auto-transformer, three-phase, connection star	Single-line form.
06-11-04	Form 2 		
06-11-05	Form 1 	Auto-transformer, single-phase with voltage regulation	Single-line form.
06-11-06	Form 2 		Multi-line form.

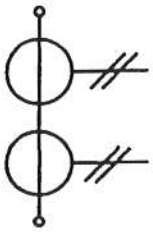
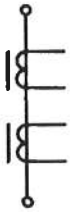
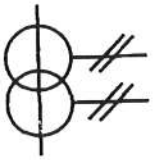
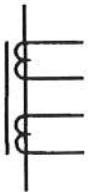
5.5.3.4 Examples of induction regulators

IEC No.	Symbol	Description	Remarks
06-12-01	Form 1 	Three-phase induction regulator	Single-line form.
06-12-02	Form 2 		
06-12-50	Form 3 		Multi-line form.

5.5.3.5 Examples of measuring transformers and pulse transformers

IEC No.	Symbol	Description	Remarks
	Use appropriate symbol in 5.5.3.1	Voltage transformer	
06-13-01	Form 1 	Voltage transformer	
06-13-50	Form 2 		

5.5.3.5 (concluded)

IEC No.	Symbol	Description	Remarks
06-13-02	Form 1 	Current transformer with two cores with one secondary winding on each core	The terminal symbols shown at the end of the primary circuit indicate that only a single device is represented. The terminal symbols may be omitted if terminal designations are used. In form 2, core symbols may be omitted.
06-13-03	Form 2 		
06-13-04	Form 1 	Current transformer with two secondary windings on one core	In form 2, the core symbol shall be drawn.
06-13-49	Form 2 		
06-13-05	Form 1 	Current transformer with one secondary winding with one tapping	Single-line form.
06-13-06	Form 2 		Multi-line form.

5.5.4 Power converters

The symbols 06-14-02 to 06-14-06 (inclusive) are shown in the horizontal representation. For vertical representation, the connecting lines are to be drawn in a vertical plane, without the symbol. For an example of application, see symbol 06-14-06A.

IEC No.	Symbol	Description	Remarks
06-14-01		Converter	General symbol.
06-14-02		D.C./D.C. converter	
06-14-03		Rectifier	
06-14-04		Rectifier in full wave (bridge) connection	
06-14-05		Inverter	
06-14-06		Rectifier/inverter	Horizontal representation.
06-14-50			Vertical representation.

5.5.5 Primary cells and accumulators

IEC No.	Symbol	Description	Remarks
06-15-01		Primary cell and accumulator Secondary cell Battery of primary or secondary cells	The longer line represents the positive pole, the shorter one the negative pole.

5.6 Switchgear, controlgear and protective devices

5.6.1 General

Subclauses 5.6.2 and 5.6.3 give preferred symbols for contact units and switchgear. Each symbol depicts the function of a contact or a switching device, without necessarily being related to the construction of the device it represents.

The movement of all two-position contacts, switches and controlgear from the unoperated to the operated position is from left to right for the vertical representation shown. For horizontal representation, the symbol is rotated counter-clockwise through 90°, the movement then being from below to above, or clockwise.

The line representing the moving contact is drawn thicker for clarity.

5.6.2 Contacts

5.6.2.1 Qualifying symbols

IEC No.	Symbol	Description	Remarks
07-01-01		Contact function	
07-01-02		Circuit-breaker function	
07-01-03		Disconnector (isolator) function	
07-01-04		Switch-disconnector (isolating-switch) function	
07-01-05		Automatic release function	
07-01-06		Position switch function Limit switch function	This qualifying symbol can be applied to simple contact symbols to indicate position or limit switches if there is no need to show the means of operating the contact. In complicated cases, where it is desirable to show the means of operation, symbols 02-13-16 to 02-13-19 should be used instead. This symbol is placed on both sides of the contact symbol when the contact is mechanically operated in both directions.

5.6.2.1 (concluded)

IEC No.	Symbol	Description	Remarks
07-01-07	◁	Spring-return function	This symbol may be used to indicate spring-return function. When this convention is invoked, its use should be appropriately referenced. This symbol should not be used together with qualifying symbols 07-01-01, 07-01-02, 07-01-03 and 07-01-04. In many cases, symbol 02-12-07 may be used.
07-01-08	o	Non-spring-return (stay put) function	This symbol may be used to indicate non-spring-return function. When this convention is invoked, its use should be appropriately referenced. This symbol should not be used together with qualifying symbols, 07-01-01, 07-01-02, 07-01-03 and 07-01-04. In many cases, symbol 02-12-08 may be used.

5.6.2.2 Contacts with two or three positions

IEC No.	Symbol	Description	Remarks
07-02-01	Form 1 	Make contact	
07-02-02	Form 2 		This symbol is also used as the general symbol for a switch.
07-02-03		Break contact	
07-02-04		Change-over break-before-make contact	
07-02-05		Change-over contact with off-position in the centre	

5.6.2.2 (concluded)

IEC No.	Symbol	Description	Remarks
07-02-06	Form 1 	Change-over make-before-break contact (bridging)	
07-02-07	Form 2 		
07-02-08		Contact with two makes	
07-02-09		Contact with two breaks	

5.6.2.3 Passing contacts with two positions ("fleeting" contacts)

IEC No.	Symbol	Description	Remarks
07-03-01		Passing make contact closing momentarily when its operating device is actuated	
07-03-02		Passing make contact closing momentarily when its operating device is released	
07-03-03		Passing make contact closing momentarily when its operating device is actuated or released	

5.6.2.4 Early and late operating contacts

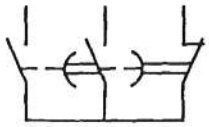
IEC No.	Symbol	Description	Remarks
07-04-01		Make contact (of a multiple contact assembly), which is early to close relative to the other contacts of the assembly	
07-04-02		Make contact (of a multiple contact assembly), which is late to close relative to the other contacts of the assembly	

5.6.2.4 (concluded)

IEC No.	Symbol	Description	Remarks
07-04-03		Break contact (of a multiple contact assembly), which is late to open relative to the other contacts of the assembly	
07-04-04		Break contact (of multiple contact assembly), which is early to open relative to the other contacts of the assembly	

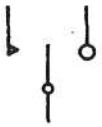
5.6.2.5 Examples of contacts with intentional delay

For the sake of uniformity, the qualifying symbols 02-12-05 and 02-12-06 shall be placed on the left-hand side of the appropriate make or break contact symbol.

IEC No.	Symbol	Description	Remarks
07-05-01		Make contact, delayed when the device containing the contact is being activated	
07-05-02		Make contact, delayed when the device containing the contact is being deactivated	
07-05-03		Break contact, delayed when the device containing the contact is being activated	
07-05-04		Break contact delayed when the device containing the contact is being deactivated	
07-05-05		Make contact, delayed both when the device containing the contact is being activated and when it is being deactivated	
07-05-06		*Example:* Contact assembly with one make contact not delayed, one make contact delayed when the device containing the contact is being activated and one break contact delayed when the device containing the contact is being deactivated	

5.6.2.6 Examples of spring-return and non-spring-return (stay put) contacts

The remarks on symbols 07-01-07 and 07-01-08 apply. Other qualifying symbols shall be placed on the left-hand side of the main symbol.

IEC No.	Symbol	Description	Remarks
07-06-01		Make contact with automatic return	
07-06-02		Make contact without automatic return Stay put make contact	
07-06-03		Break contact with automatic return	
07-06-04		Two-way contact with off-position in the centre and automatic return from one position (shown to the left), and without automatic return in the opposite position	

5.6.3 Switches, switchgear and starters

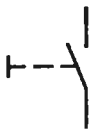
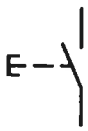
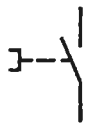
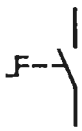
Devices with "push" or "pull" operation normally have automatic return. It is therefore not necessary to show the automatic return symbol (02-12-07). On the other hand, a detent symbol (02-12-08) should be shown in those cases where non-return exists.

Devices operated by turning do not usually have automatic return. It is therefore not necessary for the detent symbol (02-12-08) to be shown. On the other hand, the automatic return symbol (02-12-07) should be shown in those cases where an automatic return exists.

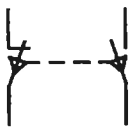
The use of symbol 02-12-04 (form 2) is preferred in conjunction with symbols for single-pole switches.

Qualifying symbols shall be placed on the left-hand side of the main symbol.

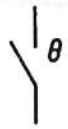
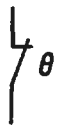
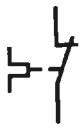
5.6.3.1 Single-pole switches

IEC No.	Symbol	Description	Remarks
07-07-01		Manually operated switch	General symbol.
07-07-02		Push-button switch, make contact and automatic return	
07-07-03		Pull-switch with make contact and automatic return	
07-07-04		Turn-switch and make contact without automatic return	

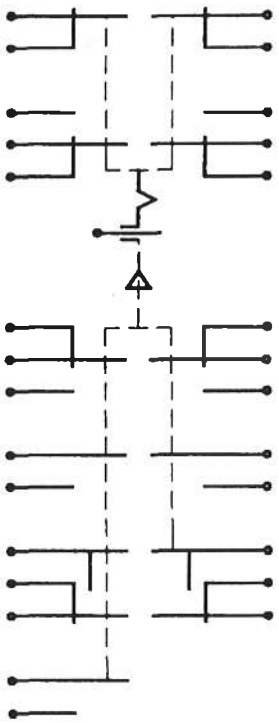
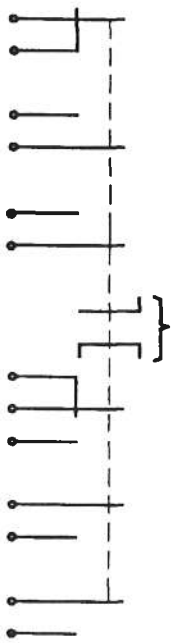
5.6.3.2 Position and limit switches

IEC No.	Symbol	Description	Remarks
07-08-01		Position switch, make contact	
07-08-02		Position switch, break contact	
07-08-03		Position switch mechanically operated in both directions with two separate circuits	
07-08-04		Position switch with positive opening operation of the break contact	

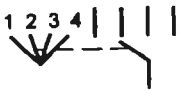
5.6.3.3 Temperature-sensitive switches

IEC No.	Symbol	Description	Remarks
07-09-01		Temperature-sensitive switch, make contact	θ may be replaced by the operating temperature conditions.
07-09-02		Temperature-sensitive switch, break contact	θ may be replaced by the operating temperature conditions.
07-09-03 07-09-03		Self-operating thermal switch (e.g. bi-metal), break contact	It is important to distinguish between a contact as shown and a contact of a thermal relay, which in detached representation may be shown as follows: 
07-09-04		Gas discharge tube with thermal element Starter for fluorescent lamp	

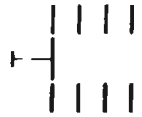
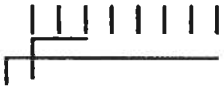
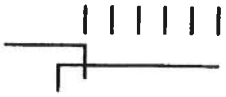
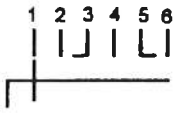
5.6.3.4 Examples of multipole and multiposition switches

IEC No.	Symbol	Description	Remarks
07-11-01		Three-position lever-operated switch, locking in the upper position and with spring return from the lower position to the middle one, shown with the terminals	
07-11-02		Button-operated switch in which one set of contacts is operated by pushing the button (non-locking) and another set by turning it (locking), shown with the terminals	The bracket indicates that there is only one actuator.

5.6.3.4 (continued)

IEC No.	Symbol	Description	Remarks
07-11-03		Button-operated switch in which the same set of contacts may be operated in two different ways: either by turning (with locking) or pushing (with spring return), shown with the terminals	
07-11-04		Multi position switch (6 positions shown)	
07-11-05		Multi position switch	To be used with a small number of positions (4 positions shown).
07-11-06		Example with position diagram  The operating device (for example, hand-wheel) can be turned only from positions 1 to 4 and back  The operating device can be turned in the clockwise direction only  The operating device can be turned in the clockwise direction, without limitation and may be turned in the counter-clockwise direction only between positions 3 and 1	It is sometimes convenient to indicate the purpose of each switch position by adding text to the position diagram. It is also possible to indicate limitations of movement of the operating device as in the examples.

5.6.3.4 (concluded)

IEC No.	Symbol	Description	Remarks
07-11-07		Four-position switch, manually operated, having four independent circuits	
07-11-08		Single-pole, four-position switch in which position 2 cannot be connected	
07-11-09		Single-pole, six-position switch with a wiper that bridges only while passing from one position to the next	
07-11-10		Single-pole, multiposition switch with a wiper that bridges three consecutive terminals in each switch position	
07-11-11		Multiposition switch A wiper bridges three non-consecutive terminals in each position, but omits one intermediate terminal in each switch position	
07-11-12		Single-pole, multiposition switch for cumulative parallel switching	
07-11-13		One pole of a six-position, multipole switch The pole shown makes early than the other poles when the wiper moves from position 2 to 3, and breaks later than the other poles when the wiper moves from positions 5 to 6. When the wiper moves in the opposite direction the early make becomes a late break and vice versa	

5.6.3.5 Block symbols for complex switches

There are many ways in which complex switching functions can be achieved mechanically, for example, by rotary wafer switches, slide switches, drum controllers and cam-operated contact assemblies. There are also many ways in which the switching functions may be symbolized on circuit diagrams.

Studies have shown that there is no unique system of symbolization that is superior in every application. The system used should be chosen with due regard to the purpose of the diagram and the degree of complexity of the switching device it is desired to symbolize.

This section presents one possible method of symbolizing complex switches. To facilitate understanding, each example includes a constructional drawing of the device symbolized. The method shown here uses a general symbol for a complex switch, which has to be supplemented by a table of connections. Two examples are shown.

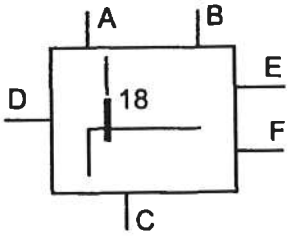
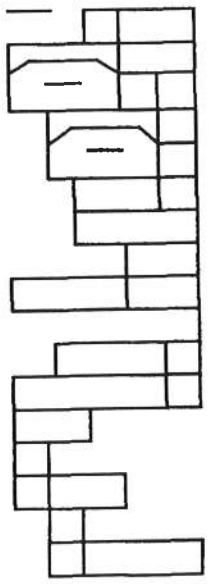
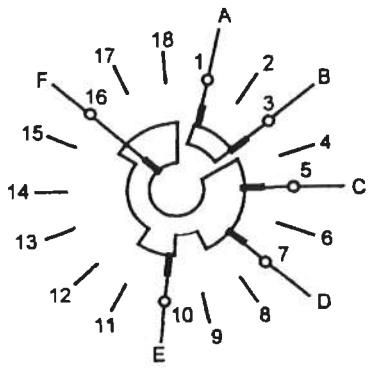
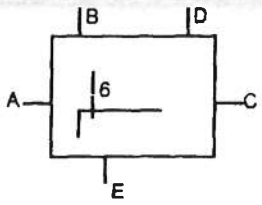
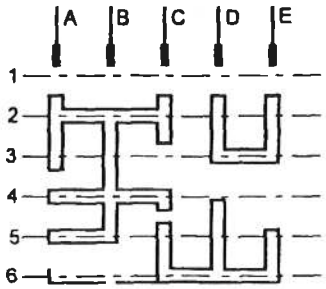
<table>
<tr><th>IEC No.</th><th>Symbol</th><th>Description</th><th>Remarks</th></tr>
<tr><td>07-12-01</td><td>  </td><td>Complex switch</td><td>General symbol.</td></tr>
<tr><td>07-12-02</td><td> 

Table of connections</td><td>Examples:

18-position rotary wafer switch with six terminals, here designated A to F, constructed as shown below (switch shown in position 1)</td><td></td></tr>
<tr><td>Position</td><td>Interconnections of terminals
A B C D E F</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>07-12-50

1
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18</td><td>  </td></tr>
<tr><td></td><td></td><td>07-12-49
 
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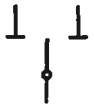
5.6.3.5 (concluded)

IEC No.	Symbol	Description	Remarks
07-12-03	 Table of connections Position | Interconnections of terminals A B C D E 1 + + 0 0 2 + + + 0 0 3 + + 0 0 4 + + + + - 5 + + - - - 6 - - -	Six-position rotary drum switch with five terminals, constructed as shown below: 	The symbols + - and 0 indicate the terminals that are connected together at any position (rest position or intermediate position) of the switch, i.e. terminals having the same indicating symbols, e.g. +, are inter-connected. Where additional symbols are required, the characters available on a typewriter should be used, e.g. ×, =. The letters shown are not part of the symbol.

5.6.3.6 Switchgear and controlgear

IEC No.	Symbol	Description	Remarks
07-13-02		Contactor	Main make contact of a contactor (contact opened in the unoperated position).
07-13-03		Contactor with automatic tripping initiated by a built-in measuring relay or release	
07-13-04		Contactor Main break contact of a contactor (contact closed in the unoperated position)	
07-13-05		Circuit-breaker	

5.6.3.6 (concluded)

IEC No.	Symbol	Description	Remarks
07-13-06		Disconnector (isolator)	
07-13-07		Two-way disconnector (isolator) with off-position in the centre	
07-13-08		Switch-disconnector (on-load isolating switch)	
07-13-09		Switch-disconnector with automatic tripping initiated by a built-in measuring relay or release	

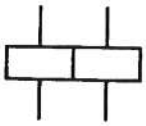
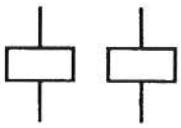
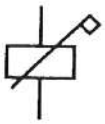
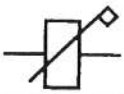
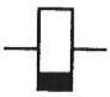
5.6.3.7 Block symbols for motor starters

IEC No.	Symbol	Description	Remarks
07-14-01		Motor starter	General symbol. Qualifying symbols may be shown inside the general symbol to indicate particular types of starters. See symbols 07-14-05, 07-14-07 and 07-14-08.
07-14-02		Starter operated in steps	The number of steps may be indicated.
07-14-03		Starter regulator	
07-14-04		Starter with automatic release	
07-14-05		Direct on line contactor starter for reversing motor	

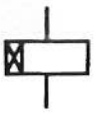
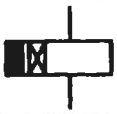
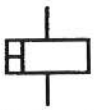
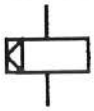
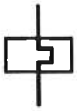
5.6.3.7 (concluded)

IEC No.	Symbol	Description	Remarks
07-14-06		Star-delta starter	
07-14-07		Auto-transformer starter	
07-14-08		Starter regulator with thyristors	

5.6.4 Electromechanical all-or-nothing relays

IEC No.	Symbol	Description	Remarks
07-15-01		Operating device	General symbol.
		Examples:	
07-15-03		Operating device with two separate windings, assembled representation	
07-15-05		Operating device with two separate windings, detached representation	
07-15-50		Operating device with flag indicator. Horizontal representation	
07-15-49		Vertical representation	
07-15-07		Relay coil of a slow-releasing relay. Horizontal representation	
07-15-48		Vertical representation	

5.6.4 (concluded)

IEC No.	Symbol	Description	Remarks
07-15-08		Relay coil of a slow-operating relay	
07-15-09		Relay coil of a slow-operating and slow-releasing relay	
07-15-10		Relay coil of a high speed relay (fast operating and fast releasing)	
07-15-14		Relay coil of a mechanically latched relay	
07-15-21		Operating device of a thermal relay	

5.6.5 Measuring relays and related devices

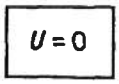
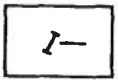
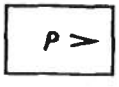
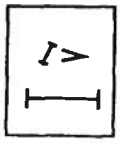
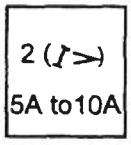
5.6.5.1 Block symbol and qualifying symbols

IEC No.	Symbol	Description	Remarks
07-16-01		Measuring relay or relative device The asterisk has to be replaced by one or more letters or qualifying symbols indicating the parameters of the device, in the following order: a) characteristic quantity and its mode of variation; b) direction of energy flow; c) setting range; d) resetting ratio; e) delayed action; and f) value of time delay.	Letter symbols for characteristic quantities should be in accordance with IEC 60027. Qualifying symbols will be found in 5 of IEC 60617-2. Symbols 07-16-02, 07-16-04 and 07-16-07 show how a letter and qualifying symbols may be combined. A figure giving the number of similar measuring elements may be included in the symbol, as shown in symbol 07-17-05. The symbol may be used as a functional symbol representing the whole of the device, or as a symbol representing only the actuating element of the device.

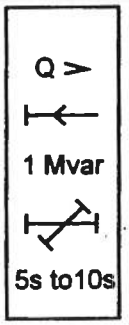
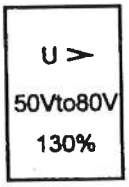
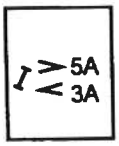
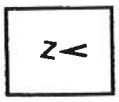
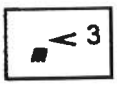
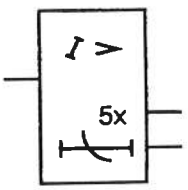
5.6.5.1 (concluded)

IEC No.	Symbol	Description	Remarks
07-16-02		Voltage failure-to-frame (frame potential in case of fault)	
07-16-03		Residual voltage	
07-16-04		Reverse current	
07-16-05		Differential current	
07-16-07		Earth fault current	
07-16-08		Current in the neutral conductor	
07-16-11		Inverse time-lag characteristic	

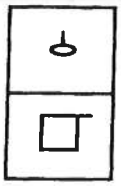
5.6.5.2 Examples of measuring relays

IEC No.	Symbol	Description	Remarks
07-17-01		No voltage relay	
07-17-02		Reverse current relay	
07-17-03		Underpower relay	
07-17-04		Delayed over-current relay	
07-17-05		Over-current relay with two current elements and a setting range of 5 A to 10 A	

5.6.5.2 (concluded)

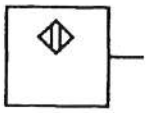
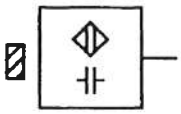
IEC No.	Symbol	Description	Remarks
07-17-06		Maximum reactive power relay: – energy flow towards the busbars – operating value 1 Mvar – time-lag adjustable from 5 s to 10 s	
07-17-07		Undervoltage relay: – setting range 50 V to 80 V – resetting ratio 130 %	
07-17-08		Current relay with maximum and minimum settings, shown with limits 3 A and 5 A	
07-17-09		Under-impedence relay	
07-17-10		Relay detecting short-circuits between windings	
07-17-12		Phase-failure detection relay in a three-phase system	
07-17-13		Locked-rotor detection relay operating by current measuring	
07-17-14		Over-current relay with two outputs, one active when the current is above five times the setting value, the other is active depending on the inverse time-lag characteristic setting of the device	

5.6.5.3 Other devices

IEC No.	Symbol	Description	Remarks
07-18-01		Buchholz protective device (gas relay)	
07-18-02		Auto-reclose device	

5.6.6 Proximity and touch-sensitive devices

5.6.6.1 Sensors and detectors

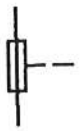
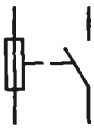
IEC No.	Symbol	Description	Remarks
07-19-01		Proximity sensor	
07-19-02		Proximity sensing device, block symbol	The method of operating may be indicated.
07-19-03		*Example:* Capacity proximity detector operating on the approach of solid material	
07-19-04		Touch sensor	

5.6.6.2 Switches

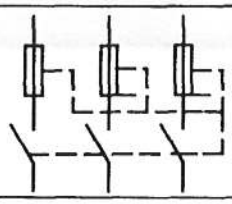
IEC No.	Symbol	Description	Remarks
07-20-01		Touch-sensitive switch, make contact	
07-20-02		Proximity switch, make contact	
07-20-03		Proximity switch, operated on the approach of a magnet, make contact	
07-20-04		Proximity switch, operated on the approach of iron, break contact	

5.6.7 Protective devices

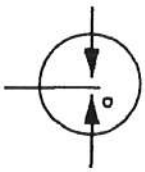
5.6.7.1 Fuses and fuse switches

IEC No.	Symbol	Description	Remarks
07-21-01		Fuse	General symbol.
07-21-02		Fuse with the side that remains live after blowing, indicated by a thick line	
07-21-03		Fuse with mechanical linkage (striker fuse)	
07-21-04		Fuse with alarm contact, three terminals	
07-21-05		Fuse with separate alarm circuit	

5.6.7.1 (concluded)

IEC No.	Symbol	Description	Remarks
07-21-06		Three-phase switch with automatic release by any one of the striker fuses	
07-21-07		Fuse switch	
07-21-08		Fuse disconnector (fuse isolator)	
07-21-09		Fuse switch disconnector (on-load isolating fuse switch)	

5.6.7.2 Gaps and arresters

IEC No.	Symbol	Description	Remarks
07-22-01		Gap	
07-22-02		Double spark-gap	
07-22-03		Surge arrester	
07-22-04		Protective gas discharge tube	
07-22-05		Symmetric protective gas discharge tube	

5.7 Measuring instruments, lamps and signalling devices

5.7.1 Indicating, recording, integrating instruments and general symbols

The asterisk within the symbols of this section shall be replaced with one of the following:

a) the letter symbol for the unit of the quantity measured, or a multiple or submultiple thereof (see symbols 08-02-01 and 08-02-07);

b) the letter symbol for the quantity measured (see symbols 08-02-05 and 08-02-06);

c) the chemical formula (see symbol 08-02-13);

d) graphical symbol (see symbol 08-02-08).

The symbol or formula used should be related to the information displayed by the instrument regardless of the means used to obtain the information.

Letter symbols for units and for quantities shall be selected from IEC 60027-1.

Provided IEC 60027-1, or the letter symbols for chemical elements, do not apply, other letter symbols may be used, if they are explained on the diagram or in referenced documents.

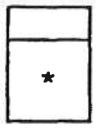
If the letter symbol for the unit of the quantity measured is used, it may be necessary to show the letter symbol for the quantity as supplementary information. It should be placed below the unit letter symbol (see symbol 08-02-02).

Supplementary information concerning the quantity measured, and any necessary qualifying symbol may be shown below the quantity letter symbol.

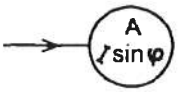
If for more than one quantity is indicated or recorded by an instrument, the appropriate symbol outlines shall be placed attached in line, horizontally or vertically (see symbols 08-03-02 and 08-04-14).

IEC No.	Symbol	Description	Remarks
08-01-01		Indicating instrument The asterisk shall be replaced in accordance with the rules given in 5.7.1	
08-01-50		Recording instrument The asterisk shall be replaced in accordance with the rules given in 5.7.1	

5.7.1 (concluded)

IEC No.	Symbol	Description	Remarks
08-01-02		Integrating instrument Energy meter The asterisk shall be replaced in accordance with the rules given in 5.7.1	The symbol may also be used for a remote instrument that repeats a reading transmitted from an integrating meter (e.g. see symbol 08-04-11). The outline may be combined with that for a recording instrument to represent a combined instrument (e.g. see symbol 08-04-14). Symbol elements, qualifing symbols and other symbols having general application may be used to specify the direction of energy flow (e.g. see symbols 08-04-04 to 08-04-07). The number of rectangles at the top of the symbol indicates the number of different summations by a multi-rate meter (e.g. see symbol 08-04-08).

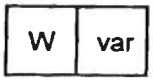
5.7.2 Examples of indicating instruments

IEC No.	Symbol	Description	Remarks
08-02-01		Voltmeter	
08-02-02		Reactive current ammeter	
08-02-03		Maximum demand indicator actuated by an integrating meter	

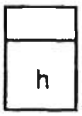
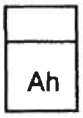
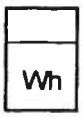
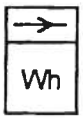
5.7.2 (concluded)

IEC No.	Symbol	Description	Remarks
08-02-04		Varmeter	
08-02-05		Power-factor meter	
08-02-06		Phase meter	
08-02-07		Frequency meter	
08-02-08		Synchronoscope	
08-02-09		Wavemeter	
08-02-10		Oscilloscope	
08-02-11		Differential voltmeter	
08-02-12		Galvanometer	
08-02-13		Salinity meter	
08-02-14		Thermometer Pyrometer	
08-02-15		Tachometer	

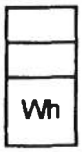
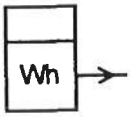
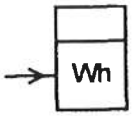
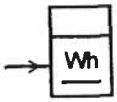
5.7.3 Examples of recording instruments

IEC No.	Symbol	Description	Remarks
08-03-01		Recording wattmeter	
08-03-02		Combined recording wattmeter and varmeter	
08-03-03		Oscillograph	

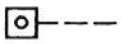
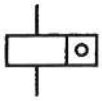
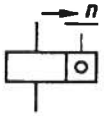
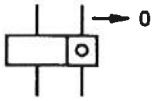
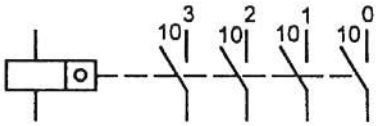
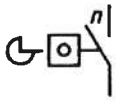
5.7.4 Examples of integrating instruments

IEC No.	Symbol	Description	Remarks
08-04-01		Hour meter	
08-04-02		Ampere-hour meter	
08-04-03		Watt-hour meter	
08-04-04		Watt-hour meter, measuring energy transmitted in one direction only	
08-04-05		Watt-hour meter, measuring the energy flow from the busbars	
08-04-06		Watt-hour meter, measuring the energy flow towards the busbars	
08-04-07		Watt-hour meter, counting in both energy flow directions (towards or from busbars)	

5.7.4 (concluded)

IEC No.	Symbol	Description	Remarks
08-04-08		Multi-rate watt-hour meter, two-rate shown	
08-04-09		Excess watt-hour meter	
08-04-10		Watt-hour meter with transmitter	
08-04-11		Remote meter (repeater), actuated by a watt-hour meter	
08-04-12		Remote meter (repeater) with printing device, actuated by a watt-hour meter	
08-04-13		Watt-hour meter with maximum demand indicator	
08-04-14		Watt-hour meter with maximum demand recorder	
08-04-15		Var-hour meter	

5.7.5 Counting devices

IEC No.	Symbol	Description	Remarks
08-05-01	Use symbol 02-14-02: 	Counting function of a number of events	Qualifying symbol.
08-05-02		Pulse meter (electrically operated counting device)	
08-05-03		Pulse meter manually pre-set to *n* (reset if *n* = 0)	
08-05-04		Pulse meter electrically reset to 0	
08-05-05		Pulse meter with multiple contacts	Respective contacts close once at every unit (10°), ten (10^1), hundred (10^2), thousand (10^3) events registered by the counter.
08-05-06		Counting device, cam driven and closing a contact at every *n* events	

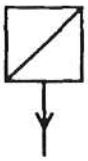
5.7.6 Thermocouples

IEC No.	Symbol	Description	Remarks
08-06-01		Thermocouple, shown with polarity symbols	
08-06-03		Thermocouple with non-insulated heating element	
08-06-04	Simplified form 		

5.7.6 (concluded)

IEC No.	Symbol	Description	Remarks
08-06-05		Thermocouple with insulated heating element	
08-06-06	Simplified form 		

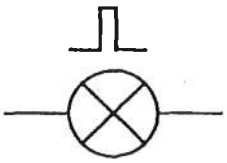
5.7.7 Telemetering devices

IEC No.	Symbol	Description	Remarks
08-07-01	Use symbol 02-17-06: 	Signal translator	General symbol.
08-07-02 Delete		Telemetering transmitter	
08-07-03 Delete		Telemetering receiver	

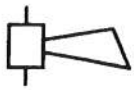
5.7.8 Electric clocks

IEC No.	Symbol	Description	Remarks
08-08-01		Clock Secondary clock	General symbol.
08-08-02		Master clock	
08-08-03		Clock with contact	

5.7.9 Lamps and signalling devices

IEC No.	Symbol	Description	Remarks
08-10-01		Lamp Signal lamp	General symbol. If it is desired to indicate the colour, a notation using the following codes is placed adjacent to the symbol: RD : red YE : yellow GN : green BU : blue WH : white If it is desired to indicate the type of lamp, a notation using the following code is placed adjacent to the symbol: Ne : neon Xe : xenon Na : sodium vapour Hg : mercury I : iodine IN : incandescent EL : electroluminescent ARC : arc FL : fluorescent IR : infra-red UV : ultraviolet LED : light-emitting diode
08-10-02		Signal lamp, flashing type	
08-10-03		Indicator, electromechanical Annunciator element	
08-10-04		Electromechanical position indicator with one de-energized (shown) and two operated positions	

5.7.9 (concluded)

IEC No.	Symbol	Description	Remarks
08-10-05		Horn	
08-10-06	Preferred form 	Bell	
08-10-08		Single-stroke bell	
08-10-09		Siren	
08-10-10	Preferred form 	Buzzer	
08-10-12		Whistle, electrically operated	Horizontal representation.
08-10-13		Indicator lamp energized by a built-in transformer	

5.8 Architectural and topographical installation plans and diagrams

5.8.1 Generating stations and substations

5.8.1.1 General symbols

A rectangular outline may be used instead of a square.

On small-scale maps it may be desirable to replace the hatched areas in the symbols by completely filled-in areas.

IEC No.	Symbol	Description	Remarks
11-01-01		Generating station (planned)	
11-01-02		Generating station (in service)	
11-01-03		Combined electric and heat generating station (planned)	
11-01-04		Combined electric and heat generating station (in service)	
11-01-05		Substation (planned)	
11-01-06		Substation (in service)	

5.8.1.2 Specific types of generating stations and substations

IEC No.	Symbol	Description	Remarks
11-02-01		Hydroelectric generating station (planned)	
11-02-02		Hydroelectric generating station (in service)	
11-02-03		Thermoelectric generating station (coal, lignite, oil, gas, etc.) (planned)	
11-02-04		Thermoelectric generating station (coal, lignite, oil, gas, etc.) (in service)	
11-02-07		Geothermic generating station (planned)	
11-02-08		Geothermic generating station (in service or unspecified)	
11-02-09		Solar generating station (planned)	
11-02-10		Solar generating station (in service)	
11-02-11		Wind generating station (planned)	
11-02-12		Wind generating station (in service)	

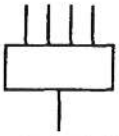
5.8.2 Installations in buildings

5.8.2.1 Identification of specific conductors for schematic diagrams

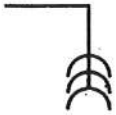
The symbols shown in this section may be replaced by letter symbols given in IEC 60445.

IEC No.	Symbol	Description	Remarks
11-11-01		Neutral conductor	
11-11-02		Protective conductor	
11-11-03		Combined protective and neutral conductor	
11-11-04		*Example:* Three-phase wiring with neutral conductor and protective conductor	

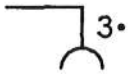
5.8.2.2 Wiring for layout diagrams

IEC No.	Symbol	Description	Remarks
11-12-01		Wiring going upwards	
11-12-02		Wiring going downwards	
11-12-03		Wire passing through vertically	
11-12-04		Box, general symbol	
11-12-05		Connection or junction box	
11-12-06		Consumer's terminal with wiring Service entrance equipment	
11-12-07		Distribution centre shown with five conduits	

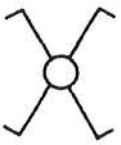
5.8.2.3 Socket outlets for layout diagrams

IEC No.	Symbol	Description	Remarks
11-13-01		Socket outlet (power) Receptacle outlet (power)	Symbol 03-03-01 is used.
11-13-03		Multiple socket outlet (power), three outlets shown	
11-13-04		Socket outlet (power) with protective contact	
11-13-05		Socket outlet (power) with shutter	
11-13-06		Socket outlet (power) with single pole switch	
11-13-07		Socket outlet (power) with interlocked switch	
11-13-08		Socket outlet (power) with isolating transformer, e.g. shaver outlet	
11-13-09		Socket outlet (telecommunications) NOTE Designations are used to distinguish different types of outlet in accordance with the following: TP : telephone M : microphone ◀ : loudspeaker FM : frequency modula-tion TV : television TX : telex DP : data processing	General symbol.

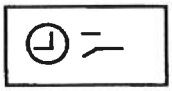
5.8.2.3 (concluded)

IEC No.	Symbol	Description	Remarks
00-13-01		Socket outlet Three-phase	Not in IEC 60617.
00-13-02		Socket outlet Three-phase switched	Not in IEC 60617.
00-13-03		Dedicated socket outlet	Non-standard. Not in IEC 60617.

5.8.2.4 Switches for layout diagrams

IEC No.	Symbol	Description	Remarks
11-14-01		Switch, general symbol	
11-14-02		Switch with pilot light	
11-14-03		Period limiting switch, single-pole	
11-14-04		Switch, two-pole	
11-14-05		Multiposition switch, e.g. for different degrees of lighting. Single-pole	
11-14-06		Two-way switch. Single-pole	For schematic (see symbol 07-02-05).
11-14-07		Intermediate switch	Equivalent circuit diagram. 
11-14-08		Dimmer	

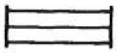
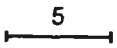
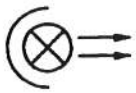
5.8.2.4 (concluded)

IEC No.	Symbol	Description	Remarks
11-14-09		Pull-cord switch, single-pole	
11-14-10		Push-button	
11-14-11		Push-button with indicator lamp	
11-14-12		Push-button with restricted access (glass cover, etc.)	
11-14-13		Period limiting equipment	
11-14-14		Time switch	
11-14-15		Key-operated switch Watchman's system device	

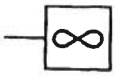
5.8.2.5 Lighting outlets and fittings for layout diagrams

IEC No.	Symbol	Description	Remarks
11-15-01		Lighting outlet position. The symbol is shown with wiring	
11-15-02		Lighting outlet on wall. The symbol is shown with wiring from the left	
11-15-03		Lamp general symbol The symbol may be qualified as shown in IEC 60617-8	Symbol 08-10-01 is used.

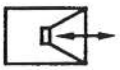
5.8.2.5 (concluded)

IEC No.	Symbol	Description	Remarks
11-15-04		Luminaire, general symbol Fluorescent lamp	
11-15-05		*Examples:* Luminaire with three fluorescent lamps	
11-15-06		Luminaire with five fluorescent lamps	
11-15-07		Projector, general symbol	
11-15-08		Spotlight	
11-15-09		Floodlight	
11-15-10		Auxiliary apparatus for discharge lamp The symbol shall be used only when the auxiliary apparatus is not incorporated in the luminaire	
11-15-11		Emergency lighting luminaire on special circuit	
11-15-12		Self-contained emergency lighting luminaire	

5.8.2.6 Miscellaneous symbols for layout diagrams

IEC No.	Symbol	Description	Remarks
11-16-01		Water heater, shown with wiring	
11-16-02		Fan, shown with wiring	

5.8.2.6 (concluded)

IEC No.	Symbol	Description	Remarks
11-16-03		Time clock	For schematic diagram, see 08-08-01.
11-16-04		Electric lock	
11-16-05		Intercommunication instrument	
00-16-01		Disconnector (isolator)	Used with water heaters, fans, coolers, etc. Not in IEC 60617.

5.8.3 Reticulation systems

The symbols shown in this section are not included in IEC 60617and have been selected from symbols used by certain of the larger supply authorities in the Republic of South Africa.

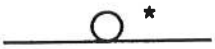
NOTE Certain items are designated as planned items to cater for the drawing and installation instruction systems of certain supply authorities.

IEC No.	Symbol	Description	Remarks
00-17-01		Underground cable	
00-17-02		Planned underground cable	
00-17-03	Form 1 	Cable joint	Form 1 is the preferred symbol for a cable joint. Form 2 may be used where there is a space constraint on the plan.
00-17-04	Form 2		
00-17-05		Underground services The asterisk * shall be replaced by a qualifying letter designation Standard qualifying letters are: T : Telkom services W : water pipes S : sewerage pipes SW : storm water pipes	General symbol. Other letters may be used to suit a specific application, however, a suitable legend shall appear on the plan.

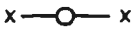
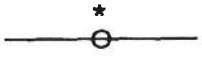
5.8.3 (continued)

IEC No.	Symbol	Description	Remarks
00-17-06		Cable ducts	If required, a user may label the symbol to indicate the number and size of ducts.
00-17-07		Planned cable ducts	
00-17-08		Overhead mains	The position of the symbol on the plan does not necessarily indicate the "in-situ" pole position.
00-17-09		Planned overhead mains	The gap in the line may be used to indicate pole separation distances.
00-17-10		Pole	
00-17-11		Planned pole	
00-17-12		Earth spike	
00-17-13		Pole-mounted transformer	Further intelligence may be added by adaptation of the basic symbol, e.g. a pole on each side of the transformer would indicate an "H" pole mounting.
00-17-14		Planned pole-mounted transformer	A label may be added to indicate the transformer rating.
00-17-15		Aerial stay	
00-17-16		Planned aerial stay	
00-17-17		Strut	
00-17-18		Planned strut	
00-17-19		Stay	
00-17-20		Planned stay	

5.8.3 (continued)

IEC No.	Symbol	Description	Remarks
00-17-21		Miniature substation	The transformer rating may be inserted in the centre block.
00-17-22		Planned miniature substation	
00-17-23		Substation	General symbol.
00-17-24		Planned substation The asterisk * shall be replaced by a qualifying letter designation. Standard qualifying letters are: T : transformer substation D : distribution substation MVC : medium-voltage consumer MSC : multiple service connection	General symbol. Other letters may be used to suit a specific application, however, a suitable legend shall appear on the plan.
00-17-25		Service pillar	General symbol.
00-17-26		Planned service pillar The asterisk * shall be replaced by a qualifying letter designation. Standard qualifying letters are: D : distribution pillar M : multiple metering unit I : multiple metering unit with individual isolation	General symbol. Other letters may be used to suit a specific application, however, a suitable legend shall appear on the plan.
00-17-27		Consumer's distribution unit	
00-17-28		Planned consumer's distribution unit	

5.8.3 (concluded)

IEC No.	Symbol	Description	Remarks
00-17-29		Shackle pole	
00-17-30		Planned shackle pole	
00-17-31		Pole with double outreach streetlights	
00-17-32		Planned pole with double outreach streetlights	
00-17-33		Pole with single outreach streetlight	
00-17-34		Planned pole with single outreach streetlight	
00-17-35		Pole with floodlight	
00-17-36		Planned pole with floodlight	
00-17-37		High mast floodlights	
00-17-38		Planned high mast floodlights	
00-17-39		Post-top luminaire	
00-17-40		Planned post-top luminaire	
00-17-41		Earth fault indicator	General symbol.
00-17-42		Pole-mounted line break equipment The asterisk *shall be replaced by a qualifying letter designation. Standard qualifying letters are: A/R : auto-recloser SEC : sectionalizer L/L : line link F/S : fused switch	General symbol. Other letters may be used to suit a specific application, however, a suitable legend shall appear on the plan.

Bibliography

IEC 60617:(all parts), *Graphical symbols for diagrams.*

IEC 61346-1, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 1: Basic rules.*

General index

The letter codes for the type of item in the third column of the general index conform to Table E.1 of IEC 61346-1. However, 2.5 of that standard permits the use of alternative codes, depending on the item's use. The codes shown in the index are those most commonly used.

Description	Symbol No	Letter Code
A		
Accumulator	06-15-01	G
Accumulators; Battery of	06-15-01	G
Adjustable capacitor	04-02-07	C
Adjustable resistor	04-01-03	R
Adjustment, pre-set	02-03-05	
Alternating current	02-02-04	
Ampere-hour meter	08-04-02	P
Annunciator element	08-10-03	H
Arrester, surge arrester	07-22-03	F
Auto-reclose device	07-18-02	A,K
Auto-transformers		
single-phase		
form 1	06-11-01	T
form 2	06-11-02	T
single-phase with voltage regulation		
form 1	06-11-05	T
form 2	06-11-06	T
three-phase, connection star		
form 1	06-11-03	T
form 2	06-11-04	T
B		
Backward diode	05-03-08	V
Bell	08-10-06	
Bell, single-stroke	08-10-08	
Boundary line	02-01-06	
Box (For architectural diagrams) (general symbol)	11-12-04	
Box		
cable sealing end	03-04-01	X
junction	03-04-05	X
straight-through joint	03-04-03	X
Brake	02-12-20	
Break contact	07-02-03	
delayed when reclosing	07-05-04	
early to open	07-04-04	
late to open	07-04-03	
with spring return	07-06-03	
with two breaks	07-02-09	
Breakthrough, flashover	02-17-02	
Breakdown diode, bidirectional	05-03-07	V
Breakdown diode, unidirectional	05-03-06	V
Brush	06-03-04	
Buchholz protective device	07-18-01	F,S
Button-operated multipole switch (one set of contacts)	07-11-03	S
Button-operated multipole switch (two sets of contacts)	07-11-02	S
Buzzer	08-10-10	H
C		
Cable fittings		
cable sealing end	03-04-01	X
junction box	03-04-05	X
straight-through joint box	03-04-03	X

Description	Symbol No.	Letter code
C (continued)		
Cables		
ducts (see Reticulation systems)		
general symbol	03-01-01	W
joint (see Reticulation systems)		
underground (see Reticulation systems)		
Capacitor		
adjustable	04-02-07	C
feed-through	04-02-03	C
general symbol	04-02-01	C
lead-through	04-02-03	C
polarized	04-02-05	C
variable	04-02-07	C
with pre-set adjustment	04-02-09	C
Cell		
photovoltaic	05-06-03	B,G
primary	06-15-01	G
Change-over contact		
break before make	07-02-04	
make before break (bridging)	07-02-06	
Changer		
general symbol	02-17-06	U
Chassis (connection)	02-15-04	
Choke	04-03-01	L
Circuit-breaker	07-13-05	Q
Circuit (general symbol)	03-01-01	W
Clock; Electric		
general symbol	08-08-01	P
master	08-08-02	P
secondary	08-08-01	P
with switch	08-08-03	P
Coaxial plug and socket	03-03-15	X
Coaxial pair		
connected to terminals	03-01-12	
general symbol	03-01-11	W
with screen	03-01-13	
Coil	04-03-01	L
Collector for semiconductor devices	05-01-18	
Complex switch		
eighteen-position rotary wafer switch with six terminals	07-12-02	S
six-position rotary drum switch with five terminals	07-12-03	S
Conductor		
flexible	03-01-06	W
general symbol	03-01-01	W
group of	03-01-01	W
in cable	03-01-09	W
screened	03-01-07	W
twisted	03-01-08	W
Conductor; Identification of (For architectural diagrams)		
combined protective and neutral	11-11-03	
neutral	11-11-01	
protective	11-11-02	
Connecting devices		
coaxial plug and socket	03-03-15	X
connecting link		
closed	03-03-17	X
open	03-03-19	X
multipole plug and socket		
multi-line representation	03-03-07	X
single-line representation	03-03-08	X
plug (male)	03-03-03	X
plug and socket	03-03-05	X
plug and socket type connector		
male-male	03-03-20	X

Description	Symbol No.	Letter code
C (continued)		
pole of a socket	03-03-01	X
socket (female)	03-03-01	X
Connecting link		
closed	03-03-17	X.S
open	03-03-19	X.S
Connection of conductor		
change of phase sequence	03-02-11	
common to group of similar items	03-02-09	
connection	03-02-01	
interchange of conductors	03-02-11	
inversion of polarity	03-02-11	
junction	03-02-05	
junction double		
form 1	03-02-06	
form 2	03-02-07	
neutral point in multiphase system	03-02-13	
Connector, male-male	03-03-20	
Consumer's distribution unit (see Reticulation systems)		
Consumer's terminal	11-12-06	
Contact		
break	07-02-03	
break, which is early to open	07-04-04	
break, which is late to open	07-04-03	
break, delayed when reclosing	07-05-04	
break, with automatic return	07-06-03	
change-over make before break (bridging)	07-02-06	
make	07-02-02	
make delayed when closing	07-05-02	
make delayed when opening and closing	07-05-05	
make which is early to close	07-04-01	
make which is late to close	07-04-02	
make with automatic return	07-06-01	
make without automatic return (stay put)	07-06-02	
passing make closing momentarily during operation	07-03-01	
passing make closing momentarily during operation and release	07-03-03	
passing make closing momentarily during release	07-03-02	
two-way with centre-off position	07-02-05	
with two breaks	07-02-09	
with two makes	07-02-08	
Contact moving	02-17-04	
Contactor (contact closed)	07-13-04	K.Q
Contactor (contact open)	07-13-02	K.Q
Contactor with automatic release	07-13-03	K.Q
Contacts (qualifying symbols)		
function		
automatic release	07-01-05	
circuit-breaker	07-01-02	
contactor	07-01-01	
disconnector	07-01-03	
isolating-switch	07-01-04	
isolator	07-01-03	
limit switch	07-01-06	
non-spring return	07-01-08	
position switch	07-01-06	
spring return	07-01-07	
stay put	07-01-08	
switch-disconnector	07-01-04	
Continuous variability	02-03-09	
Control of non-electrical quantities		
by counter	02-14-02	
by flow	02-14-03	
by fluid level	02-14-01	
by number of events	02-14-02	
by relative humidity	02-14-05	

Description	Symbol No.	Letter code
C (concluded)		
Controls; Mechanical		
automatic return	02-12-07	
brake	02-12-20	
clutch	02-12-16	
delayed action	02-12-05	
detent	02-12-08	
disengage	02-12-09	
engaged	02-12-10	
device		
blocking	02-12-14	
blocking engaged	02-12-15	
for maintaining a given position	02-12-08	
latching disengaged	02-12-12	
latching engaged	02-12-13	
gearing	02-12-23	
hydraulic connection (link)	02-12-01	
mechanical connection (link)	02-12-01	
mechanical coupling	02-12-16	
disengaged	02-12-17	
engaged	02-12-18	
mechanical interlock	02-12-11	
non-automatic return	02-12-08	
pneumatic connection (link)	02-12-01	
Converters		
d.c. to d.c. rotary, with common field winding	06-05-05	G.U
d.c.to d.c. rotary, with common permanent magnetic field	06-05-04	G.U
dynamotor	06-05-04	G.U
general symbol	02-17-06	U.B
rotary transformer d.c./d.c.	06-05-04	G.U
synchronous, three-phase, shunt excited	06-07-05	G.U
Converter; Power		
direct current	06-14-02	U
general symbol	06-14-01	U
inverter	06-14-05	U
rectifier	06-14-03	U
rectifier in full wave (bridge) connection	06-14-04	
rectifier/inverter	06-14-06	U
Counting device, cam driven	08-05-06	P
Counting function (qualifying symbol)	08-05-01	
Current and voltage; Types of (qualifying symbols)		
alternating	02-02-04	
medium frequencies	02-02-10	
relatively high frequencies	02-02-11	
relatively low frequencies	02-02-09	
direct		
form 2	02-02-03	
mid-wire	02-02-16	
negative polarity	02-02-14	
neutral	02-02-15	
positive polarity	02-02-13	
D		
Delay	02-08-05	
Dependence		
magnetic field effect	02-08-04	
Detent	02-12-08	
disengaged	02-12-09	
engaged	02-12-10	
Diac	05-03-09	V
Differential voltmeter	08-02-11	P
Dimmer	11-14-08	Q.S

Description	Symbol No.	Letter code
D (concluded)		
Diodei Semiconductor		
Esaki	05-03-06	V
Varactor	05-03-04	V
backward	05-03-08	B
bidirectional	05-03-09	V
breakdown, bidirectional	05-03-07	V
breakdown, unidirectional	05-03-06	V
general symbol	05-03-01	V
light-emitting (general symbol)	05-03-02	V.H
photo-	05-06-02	B.V
tunnel	05-03-05	V
unitunnel	05-03-08	V
variable capacitance	05-03-04	V
voltage regulator	05-03-06	V
where use is made of its temperature dependence	05-03-03	V
Direction		
of flow (see Flow)		
of force (see Force)		
of motion (see Motion)		
of rotation (see Rotation)		
Disconnector	07-13-06	Q
two-way with centre-off position	07-13-07	Q
(isolator) used with water heater, fans, coolers, etc.	00-16-01	
Distribution centre (For architectural diagrams)	11-12-07	A
Double spark gap	07-22-02	F
E		
Earth and frame connections		
chassis	02-15-04	
frame	02-15-04	
general symbol	02-15-01	
noiseless	02-15-02	
Earth fault indicator (see Reticulation systems)		
Earth spike (see Reticulation systems)		
Effect		
electromagnetic	02-08-02	
magnetic field	02-08-04	
thermal	02-08-01	
Electric lock	11-16-04	Y
Electromagnetic		
effect	02-08-02	
radiation, non-ionizing	02-09-01	
Emergency lighting luminaire		
on special circuit	11-15-11	E
self-contained	11-15-12	E
Emergency switch	02-13-08	S.Q
Enclosure (symbol element)		
form 1	02-01-04	
form 2	02-01-05	
Envelope (symbol element)		
form 1	02-01-04	
form 2	02-01-05	
Equipment (symbol element)	02-01-01	
Esaki diode	05-03-06	
F		
Fan	11-16-02	E
Fault	02-17-01	

Description	Symbol No.	Letter code
F (concluded)		
Feed-through capacitor	04-02-03	C
Field effect transistor		
with N-type channel	05-05-09	V
with P-type channel	05-05-10	V
Flashover		
Flow; Direction of		
alternate transmission and reception	02-05-03	
bidirectional energy flow	02-05-08	
energy flow, from the busbars	02-05-06	
energy flow, one way	02-05-01	
energy flow towards the busbars	02-05-07	
propagation, both ways, not simultaneously	02-05-03	
propagation, both ways, simultaneously	02-05-02	
propagation, one way	02-05-01	
reception	02-05-05	
signal flow, one way	02-05-01	
simultaneous transmission and reception	02-05-02	
transmission	02-05-04	
Force; Direction of		
bidirectional	02-04-02	
unidirectional	02-04-01	
Four-position switch, manually operated with four independent circuits	07-11-07	S
Frame (connection)	02-15-04	
Frequency meter	08-02-07	P
Functional unit (symbol element)	02-01-01	
Fuse disconnector	07-21-08	Q.F
Fuse isolator	07-21-08	Q.F
Fuse switch disconnector	07-21-09	Q.F
Fuse		
general symbol	07-21-01	F
striker	07-21-03	F
with alarm contact	07-21-04	F
with mechanical linkage	07-21-03	F
with separate alarm circuit	07-21-05	F
Fuse disconnector	07-21-08	Q.F
Fuse switch	07-21-07	Q.F
disconnector	07-21-09	Q.F
on-load isolating	07-21-09	Q.F
three-phase with automatic release	07-21-06	Q.F
G		
Galvanometer	08-02-12	P
Gap	07-22-01	F
double spark	07-22-02	F
Gas relay	07-18-01	F.B
Gearing	02-12-23	
Generating stations (general symbols)		
combined electric and heat		
in service	11-01-04	
planned	11-01-03	
station		
in service	11-01-02	
planned	11-01-01	
substation		
in service	11-01-06	
planned	11-01-05	

Description	Symbol No.	Letter code
G (concluded)		
Generating stations; Specific types		
hydroelectric in service	11-02-02	
planned	11-02-01	
solar		
in service	11-02-10	
planned	11-02-09	
thermoelectric		
in service	11-02-04	
planned	11-02-03	
wind		
in service	11-02-12	
planned	11-02-11	
Generator		
d.c. compound excited (short shunt)	06-05-03	G
hand	06-04-04	G
magneto caller	06-04-04	G
Ground and frame connections		
chassis	02-15-04	
frame	02-15-04	
general symbol	02-15-01	
noiseless	02-15-02	
Group of conductors	03-01-01	
H		
Hand generator	06-04-04	G
Heating element	04-01-12	R.E
High mast floodlight (see Reticulation systems)		
Horn	08-10-05	H
Hour meter	08-04-01	P
Hydroelectric generating station	11-02-01	
I		
Identifier		
of analogue signals	02-17-08	
of digital signals	02-17-09	
IGFET transistor		
depletion type with two gates, N-type channel	05-05-17	V
depletion type, single gate, N-type channel	05-05-15	V
enhancement type, single gate, P-type channel	05-05-11	V
Indicating instrument		
differential voltmeter	08-02-11	P
frequency meter	08-02-07	P
galvanometer	08-02-12	P
general symbol	08-01-01	P
maximum demand indicator	08-02-03	P
oscilloscope	08-02-10	P
phase meter	08-02-06	P
power-factor meter	08-02-05	P
pyrometer	08-02-14	P
reactive current ammeter	08-02-02	P
salinity meter	08-02-13	P
synchronoscope	08-02-08	U.C
tachometer	08-02-15	P
thermometer	08-02-14	P
varmeter	08-02-04	P
voltmeter	08-02-01	P
wavemeter	08-02-09	P
Indicator; Test point	02-17-05	
Indicator (Instrument)		
electromechanical	08-10-03	H
electromechanical position	08-10-04	H

Description	Symbol No.	letter code
I (concluded)		
Induction motor		
single-phase, squirrel cage	06-08-02	M
three-phase, star-connected, with automatic starter in the rotor	06-08-04	M
three-phase, with wound rotor	06-08-03	M
three-phase, squirrel cage	06-08-01	M
Induction regulator, three-phase		
form 1	06-12-01	T
form 2	06-12-02	T
Inductor		
choke	04-03-01	L
continuously variable	04-03-05	L
variometer	04-03-08	L
with fixed tappings	04-03-06	L
with gap in magnetic core	04-03-04	L
with magnetic core	04-03-03	L
with moving contact, variable in steps	04-03-07	L
Interview variability	02-03-03	S
Inherent, non-linear variability	02-03-04	
Instrument, intercommunication	11-16-05	A.B
Instruments; Integrating (see Integrating instruments)		
Instruments; Measuring (general symbols)		
energy meter	08-01-03	P
indicating	08-01-01	P
integrating	08-01-03	P
recording	08-01-02	P
Instruments; Recording (see Recording instrument)		
Instruments; Indicating (see Indicating instrument)		
Integrating instruments		
ampere-hour meter	08-04-02	P
excess watt-hour meter	08-04-09	P
general symbol	08-01-03	P
hour meter	08-04-01	P
import-export watt-hour meter	08-04-07	P
multi-rate watt-hour meter	08-04-08	P
remote meter (repeater) with printing device, actuated by a watt-hour meter	08-04-12	P
remote meter (repeater), actuated by a watt-hour meter	08-04-11	A
var-hour meter	08-04-15	P
watt-hour meter	08-04-03	P
watt-hour meter, measuring energy transmitted in one direction only	08-04-04	P
watt-hour meter, measuring the energy flow towards the busbars	08-04-06	P
watt-hour meter, measuring the energy flow from the busbars	08-04-05	P
watt-hour meter with maximum demand indicator	08-04-13	P
watt-hour meter with maximum demand recorder	08-04-14	P
watt-hour meter with transmitter	08-04-10	P
Intercommunication instrument	11-16-05	A.B
Intermediate switch	11-14-07	Q.S
Inverter	06-14-05	U
Isolator, with centre-off position	07-13-07	Q
J		
Junction box	03-04-05	X
Junction		
of conductors	03-02-05	
of conductors, double	03-02-06	
K		
Key-operated switch	11-14-15	Q.S

Description	Symbol No.	Letter code
L		
Lamp	11-15-04	E
general symbol	08-10-01	E.H
signal (general symbol)	08-10-01	H
Latching device		
disengaged	02-12-12	
engaged	02-12-13	
Light dependent resistor	05-06-01	B.R
Light-emitting diode (general symbol)	05-03-02	V.H
Lighting outlet and fitting		
auxiliary apparatus for discharge lamp	11-15-10	E
emergency lighting luminaire on special circuit	11-15-11	E
floodlight	11-15-09	E
fluorescent lamp (general symbol)	11-15-04	E
lamp (general symbol)	11-15-03	E
luminaire (general symbol)	11-15-04	E
pole-mounted (see Reticulation systems)		
position	11-15-01	X
position on wall	11-15-02	X
post top (see Reticulation systems)		
projector (general symbol)	11-15-07	E
self-contained emergency lighting luminaire	11-15-12	E
spotlight	11-15-08	E
Limit switch		
break contact	07-08-02	S.Q
make contact	07-08-01	S.Q.
mechanically operated in both directions with two separate circuits	07-08-03	S
Line-break equipment, pole mounted (see Reticulation systems)		
Line		
general symbol	03-01-01	W
Line boundary	02-01-06	
Linear motor		
general symbol	06-04-02	M
three-phase, movement limited to one direction	06-08-05	M
Link		
hydraulic	02-12-01	
mechanical	02-12-01	
pneumatic	02-12-01	
Lock, electric	11-16-04	
Luminaire (general symbol)	11-15-04	E
M		
Machines		
general symbol	06-04-01	
hand generator	06-04-04	G
linear motor(general symbol)	06-04-02	M
Magneto caller	06-04-04	G
stepping motor(general symbol)	06-04-03	M
Machines; Elements of		
brush	06-03-04	
commutating winding	06-03-01	
compensating winding	06-03-01	
separate winding	06-03-03	
series winding	06-03-02	
shunt winding	06-03-03	
Magnet permanent	02-17-03	
Magnetic		
field dependence	02-08-04	
field effect	02-08-04	

Description	Symbol No.	Letter code
M (concluded)		
Magneto caller	06-04-04	G
Make contact	07-02-02	
delayed when closing	07-05-02	
delayed when opening and closing	07-05-05	
early to close	07-04-01	
late to close	07-04-02	
passing closing momentarily during operation	07-03-01	
passing closing momentarily during operation and release	07-03-03	
passing closing momentarily during release	07-03-02	
without spring return	07-06-02	
with spring return	07-06-01	
with two makes	07-02-08	
Master clock	08-08-02	P
Maximum demand indicator	08-02-03	P
Measuring instrument (general symbols)		
energy meter	08-01-03	P
indicating instrument	08-01-01	P
integrating instrument	08-01-03	P
recording instrument	08-01-02	P
Measuring relays (see Relays; Measuring)		
Measuring transformers (see Transformers; Measuring)		
Mechanical controls (see Controls)		
Mid-wire (qualifying symbol)	02-02-16	
Motion; Direction of		
bidirectional	02-04-02	
bidirectional rotation	02-04-04	
limited in both directions	02-04-05	
reciprocating	02-04-06	
unidirectional	02-04-01	
unidirectional rotation	02-04-03	
Motor		
a.c. series, single-phase	06-06-01	M
a.c. series, three-phase	06-06-03	M
d.c. two-wire series	06-05-01	M
d.c. two-wire shunt	06-05-02	M
induction, linear, three-phase, movement limited to one direction	06-08-05	M
induction, single-phase, squirrel cage	06-08-02	M
induction, three-phase, star-connected, with automatic starter in rotor	06-08-04	M
induction, three-phase, squirrel cage	06-08-01	M
induction, three-phase, with wound rotor	06-08-03	M
linear (general symbol)	06-04-02	M
repulsion, single-phase	06-06-02	M
stepping (general symbol)	06-04-03	M
synchronous, single-phase	06-07-02	M
Moving contact	02-17-04	
Multiposition switch		
bridging	07-11-10	S
for cumulative parallel switching	07-11-12	S
Multiposition switch (in architectural diagrams)	11-14-05	Q.S
Mushroom-head safety feature	02-13-08	
N		
Negative polarity	02-02-14	
Neutral	02-02-15	
Non-inherent non-linear variability	02-03-02	
Non-inherent variability	02-03-01	
Non-linear, inherent variability	02-03-04	
Non-linear, non-inherent variability	02-03-02	

Description	Symbol No.	Letter code
N (concluded)		
NPN transistor		
avalanche	05-05-03	V
with collector connected to the envelope	05-05-02	V
with transverse biased base	05-05-06	V
O		
On-load isolating fuse switch	07-21-09	Q.F
On-load isolating switch	07-13-08	Q
Operating device of a relay		
general symbol	07-15-01	
with two separate windings		
assembled representation	07-15-03	
detached representation	07-15-05	
Operation; Methods of		
by cam	02-13-16	
by cam and roller	02-13-19	
by crank	02-13-14	
by electric clock	02-13-27	
by electric motor	02-13-26	
by electromagnetic actuator	02-13-23	
by electromagnetic over-current protection	02-13-24	
by emergency push-button switch	02-13-08	
by hand wheel	02-13-09	
by key	02-13-13	
by lever	02-13-11	
by pedal	02-13-10	
by proximity effect	02-13-06	
by pulling	02-13-03	
by pushing	02-13-05	
by removable handle	02-13-12	
by roller	02-13-15	
by stored mechanical energy	02-13-20	
by thermal actuator	02-13-25	
by touching	02-13-07	
by turning	02-13-04	
hydraulic control, double acting	02-13-22	
hydraulic control, single acting	02-13-21	
manual, general case	02-13-01	
manual, with restricted access	02-13-02	
pneumatic control, double acting	02-13-22	
pneumatic control, single acting	02-13-21	
Operational dependence on a characteristic quantity becoming zero	02-06-04	
differing from zero by an amount which is very small compared with the normal value	02-06-05	
either higher than a given high setting or lower than a given low setting	02-06-03	
higher than the setting value	02-06-01	
lower than the setting value	02-06-02	
Oscillograph	08-03-03	P
Oscilloscope	08-02-10	
Outlet		
on wall	11-15-02	X
position, lighting	11-15-01	X
receptacle (power) (general symbol)	11-13-01	X
receptacle (telecommunication) (general symbol)	11-13-09	X
socket (power) (general symbol)	11-13-01	X
socket (telecommunication) (general symbol)	11-13-09	X
Outlines and enclosures (symbol elements)		
enclosure	02-01-04	
envelope	02-01-04	
equipment	02-01-01	
functional unit	02-01-01	
item	02-01-01	
tank	02-01-04	

Description	Symbol No.	Letter Code
O (concluded)		
Overcurrent		
relay delayed	07-17-04	K
relay with two current elements	07-17-05	K
relay with two outputs	07-17-14	K
Overhead mains (see Reticulation systems)		
P		
Period limiting equipment	11-14-13	Q.S
Permanent magnet	02-17-03	
Phase meter	08-02-06	P
Photoconductive device		
with asymmetrical conductivity	05-06-01	B.V
with symmetrical conductivity	05-06-02	B.R
Photodiode	05-06-02	B.V
Phototransistor	05-06-04	B.V
Photovoltaic cell	05-06-03	B.G
Plug (male)	03-03-03	X
Plug and socket	03-03-05	X
coaxial	03-03-15	X
multipole	03-03-07	X
Plug and socket type connector, male-male	03-03-20	X
PNIN transistor	05-05-08	V
PNIP transistor	05-05-07	V
PNP transistor	05-05-01	V
Polarity		
negative	02-02-14	
positive	02-02-13	
Polarized capacitor	04-02-05	C
temperature dependent	04-02-15	C
voltage dependent	04-02-16	C
Pole	00-17-10	
Pole-mounted equipment (see Reticulation systems)		
Pole-mounted transformer (see Reticulation systems)		
Position switch		
break contact	07-08-02	S.Q
make contact	07-08-01	S.Q
mechanically operated in both directions with two separate circuits	07-08-03	S.Q
Positive polarity	02-02-13	
Potentiometer		
pre-set	04-01-08	R
with sliding contact	04-01-07	R
Power-factor meter	08-02-05	P
Pre-set adjustment	02-03-05	
Primary cell	06-15-01	G
Primary cells; Battery of	06-15-01	G
Propagation		
both ways, not simultaneously	02-05-03	
both ways, simultaneously	02-05-02	
one way	02-05-01	
Protective gas discharge tube	07-22-04	F.V
Protective gas discharge tube, symmetric	07-22-05	F.V
Proximity detector, capacitive	07-19-03	B
Proximity sensing device (block symbol)	07-19-02	B
Proximity sensor	07-19-01	B
Proximity switch	07-20-02	S
operated on the approach of a magnet	07-20-03	S
operated on the approach of iron	07-20-04	S
Pull-switch	07-07-03	S
Pulse meter	08-05-02	P
electrically reset to zero	08-05-04	P
manually pre-set to *n*	08-05-03	P
with multiple contacts	08-05-05	P

Description	Symbol No.	Letter code
P (concluded)		
Push-button emergency switch	02-13-08	
Push-button switch	07-07-02	
with indicator lamp	11-14-11	Q.S
with restricted access	11-14-12	Q.S
Pyrometer	08-02-14	P
R		
Radiation		
coherent, non-ionizing	02-09-02	
electromagnetic, non-ionizing	02-09-01	
Reactive current ammeter	08-02-02	P
Receiver; telemetering	08-07-03	U
Receptacle outlet (power)	11-13-01	X
Receptacle outlet (telecommunications)	11-13-09	X
Recording instrument		
combined recording wattmeter and varmeter	08-03-02	P
general symbol	08-01-02	P
oscillograph	08-03-03	P
recording wattmeter	08-03-01	P
Recording wattmeter	08-03-01	P
Recording wattmeter and varmeter, combined	08-03-02	P
Rectifier		
inverter	06-14-06	U
general symbol	06-14-03	U
in full wave (bridge) connection	06-14-04	U
Regulator, three-phase induction		
form 1	06-12-01	T
form 2	06-12-02	T
Relay coil of a		
high speed relay	07-15-10	
mechanically latched relay	07-15-14	
slow-operating and slow-releasing relay	07-15-09	
slow-operating relay	07-15-08	
slow-releasing relay	07-15-07	
thermal relay	07-15-21	
Relays and related devices; Measuring (block symbol)	07-16-01	K
qualifying symbols		
current in the neutral conductor	07-16-08	
differential current	07-16-05	
earth fault current	07-16-07	
inverse time-lag characteristic	07-16-11	
residual voltage	07-16-03	
reverse current	07-16-04	
voltage failure to frame	07-16-02	
Relays; Measuring; Examples of		
current	07-17-08	K
delayed over-current	07-17-04	K
detecting inter-turn short-circuits	07-17-10	K
locked-rotor detection	07-17-13	K
maximum reactive power	07-17-06	K
no voltage	07-17-01	K
over-current relay with two outputs	07-17-14	K
over-current with two current elements	07-17-05	K
phase-failure detection	07-17-12	K
reverse current	07-17-02	K
under-impedance	07-17-09	K
underpower	07-17-03	K
undervoltage	07-17-07	K

Description	Symbol No.	Letter code
R (continued)		
Remote meter (repeater)	08-04-11	P
with printing device	08-04-12	P
Repulsion motor, single-phase	06-06-02	M
Resistor		
adjustable	04-01-03	R
carbon-pile	04-01-11	R
general symbol	04-01-01	R
light dependent	05-06-01	B.R
variable	04-01-03	R
voltage dependent	04-01-04	R
with fixed tappings (taps)	04-01-09	R
with separate current and voltage terminals	04-01-10	R
with sliding contact	04-01-05	R
with sliding contact and off-position	04-01-06	R
Reticulation systems, symbols for plans		
aerial stay	00-17-15	
aerial stay, planned	00-17-16	
cable ducts	00-17-06	
cable ducts, planned	00-17-07	
cable joint		
form 1	00-17-03	
form 2	00-17-04	
consumer's distribution unit	00-17-27	
consumer's distribution unit, planned	00-17-28	
earth fault indicator	00-17-41	
earth spike	00-17-12	
high mast floodlight	00-17-37	
high mast floodlight, planned	00-17-38	
miniature substation	00-17-21	
miniature substation, planned	00-17-22	
overhead mains	00-17-08	
overhead mains, planned	00-17-09	
pole	00-17-10	
pole, planned	00-17-11	
pole, shackle	00-17-29	
pole shackle, planned	00-17-30	
pole-mounted line-break equipment (general symbol), with qualifying letters for type	00-17-42	
pole-mounted transformer	00-17-13	
pole-mounted transformer, planned	00-17-14	
pole with floodlight	00-17-35	
pole with floodlight, planned	00-17-36	
pole with double outreach streetlight	00-17-31	
pole with double outreach streetlight, planned	00-17-32	
pole with single outreach streetlight	00-17-33	
pole with single outreach streetlight, planned	00-17-34	
post top	00-17-39	
post top, planned	00-17-40	
service pillar	00-17-25	
service pillar, planned	00-17-26	
stay	00-17-19	
stay, planned	00-17-20	
strut	00-17-17	
strut, planned	00-17-18	
substation (general symbol), with qualifying letters for type	00-17-23	
substation, planned (general symbol), with qualifying letters for type	00-17-24	
underground cable	00-17–01	
underground cable, planned	00-17-02	
underground services (general symbol), with qualifying letters for type of service	00-17-05	

Description	Symbol No.	Letter code
R (concluded)		
Reverse blocking		
diode thyristor	05-04-01	V
thyristor, tetrode type	05-04-10	V
triode thyristor, N-gate	05-04-05	V
triode thyristor, P-gate	05-04-06	V
Reverse conducting		
diode thyristor	05-04-02	V
triode thyristor, gate not specified	05-04-12	V
triode thyristor, N-gate	05-04-13	V
triode thyristor, P-gate	05-04-14	V
Rotation; Direction of		
bidirectional	02-04-04	
limited in both directions	02-04-05	
unidirectional	02-04-03	
S		
Salinity meter	08-02-13	P
Screen	02-01-07	
Secondary clock	08-08-01	B
Semiconductor devices (qualifying symbols)		
backward effect	05-02-05	
breakdown effect		
bidirectional	05-02-04	
unidirectional	05-02-03	
Schottky effect	05-02-01	
tunnel effect	05-02-02	
unitunnel effect	05-02-05	
Semiconductor diode	05-03-01	
Esaki	05-03-06	V
bidirectional	05-03-09	V
breakdown, bidirectional	05-03-07	V
breakdown, unidirectional	05-03-06	V
general symbol	05-03-01	V
light-emitting (general symbol)	05-03-02	V.H
tunnel	05-03-05	V
unitunnel	05-03-08	V
Varactor	05-03-04	V.C
variable capacitance	05-03-04	V.C
voltage regulator	05-03-06	V
where use is made of its temperature dependence	05-03-03	V.B
Semiconductors (symbol elements)		
channel for transistor IGFET		
N-type on P-type substrate	05-01-11	
P-type on N-type substrate	05-01-12	
collector		
on a region of dissimilar conductivity type	05-01-18	
several collectors on a region of dissimilar conductivity type	05-01-19	
conduction channel		
for depletion type devices	05-01-05	
for enhancement devices	05-01-06	
emitter		
N on P-region	05-01-16	
P on N-region	05-01-14	
several N on P-region	05-01-17	
several P on N-region	05-01-15	
gate, insulated	05-01-13	
junction		
N-region that influences a P-layer	05-01-10	
P-region that influences an N-layer	05-01-09	
rectifying	05-01-07	

Description	Symbol No.	Letter code
S (continued)		
Semiconductors (Symbol elements) (continued)		
region		
with one ohmic connection	05-01-01	
with several ohmic connections		
form 1	05-01-02	
form 2	05-01-03	
form 3	05-01-04	
region, intrinsic, separating		
a collector and a region of dissimilar conductivity type	05-01-23	
a collector and a region of similar conductivity type	05-01-24	
regions of dissimilar conductivity	05-01-21	
regions of similar conductivity type	05-01-22	
transitions between regions of dissimilar conductivity types	05-01-20	
Sensor		
proximity	07-19-01	B
touch	07-19-04	B
Shackle pole (see Reticulation systems)		
Shield	02-01-07	R
Shunt	04-01-10	
Signal lamp		
flashing type	08-10-02	H
general symbol	08-10-01	H
Signal waveforms		
negative-going pulse	02-10-02	
negative-going step function	02-10-05	
positive-going pulse	02-10-01	
positive-going step function	02-10-04	
pulse of alternating current	02-10-03	
sawtooth	02-10-06	
Siren	08-10-09	H
Socket (female)	03-03-01	X
dedicated	00-13-03	
general symbol	11-13-01	X
multiple	11-13-03	X
receptacle outlet (general symbol)	11-13-01	X
three-phase	00-13-01	
three-phase, switched	00-13-02	
with interlocked switch	11-13-07	X
with isolating transformer	11-13-08	X
with protective contact	11-13-04	X
with shutter	11-13-05	X
with single-pole switch	11-13-06	X
Socket outlet (telecommunications)	11-13-09	X
Solar generating station, in service	11-02-10	
Solar generating station, planned	11-02-09	
Spark gap, double	07-22-02	F
Starter; Motor (block symbols)		
auto-transformer	07-14-07	A,Q
direct on line contactor, for reversing motor	07-14-05	A,Q
full voltage contactor, for reversing motor	07-14-05	A,Q
general symbol	07-14-01	A,Q
operated in steps	07-14-02	A,Q
regulator	07-14-03	A,Q
regulator with thyristors	07-14-08	A,Q
star-delta	07-14-06	A,Q
with automatic release	07-14-04	A,Q
Stay (see Reticulation systems)		
Stepping action	02-03-07	
Stepping motor (general symbol)	06-04-03	M
Strut (see Reticulation systems)		
Substation; Generating stations		
general symbol	11-01-05	
Substation (specific) with qualifying letters for type (see Reticulation systems)		
Substation, miniature (see Reticulation systems)		

Description	Symbol No.	Letter code
S (continued)		
Switch (for architectural diagrams)		
dimmer	11-14-08	Q.S
general symbol	11-14-01	Q.S
intermediate	11-14-07	Q.S
key-operated	11-14-15	Q.S
multiposition	11-14-05	
period limiting, single-pole	11-14-03	Q.S
pull cord, single-pole	11-14-09	Q.S
push-button	11-14-10	Q.S
period limiting	11-14-13	Q.S
time	11-14-14	Q.S
with indicator lamp	11-14-11	Q.S
with restricted access	11-14-12	Q.S
time	11-14-14	Q.S
two-pole	11-14-04	Q.S
two-way, single-pole	11-14-06	Q.S
watchman's system device	11-14-15	Q.S
with pilot light	11-14-02	Q.S
Switch (Proximity and touch sensitive)		
proximity, make contact	07-20-02	S
operated on the approach of a magnet, make contact	07-20-03	S
operated on the approach of iron, break contact	07-20-04	S
touch-sensitive, make contact	07-20-01	S
Switch; Complex		
eighteen-position rotary wafer switch with six terminals	07-12-02	S
six-position rotary drum with five terminals	07-12-03	S
Switch; Diverse		
limit		
break contact	07-08-02	S.Q
make contact	07-08-01	S.Q
mechanically operated in both directions with two separate circuits	07-08-03	S.Q
position		
break contact	07-08-02	S.Q
make contact	07-08-01	S.Q
temperature-sensitive		
break contact	07-09-02	S.Q
make contact	07-09-01	S.Q
thermal, self-operating, break contact	07-09-03	S.Q
Switch; Multipole and multiposition		
button-operated, one set of contacts operated by pushing and another by turning	07-11-02	S
button-operated, the same set of contacts operated in two different ways	07-11-03	S
single-pole		
four-position, manually operated with four independent circuits	07-11-07	S
multiposition, bridging	07-11-10	S
multiposition for cumulative parallel switching	07-11-12	S
six-position, bridging	07-11-09	S
three-position lever-operated and non-identical return conditions	07-11-01	S
Switch; Single-pole		
emergency push-button	02-13-08	S.Q
manually operated, general symbol	07-07-01	S.Q

Description	Symbol No.	Letter code
S (concluded)		
pull-switch	07-07-03	S
push-button	07-07-02	S
turn-switch	07-07-04	S.Q
Switch-disconnector	07-13-08	Q
with automatic release	07-13-09	Q
Switchgear and controlgear		
circuit-breaker	07-13-05	Q
contactor (contact closed in the unoperated position)	07-13-04	K.Q
contactor (contact open in the unoperated position)	07-13-02	K.Q
contactor with automatic release	07-13-03	K.Q
disconnector	07-13-06	Q
two-way with centre-off position	07-13-07	Q
isolator	07-13-06	Q
with centre-off position	07-13-07	Q
on-load isolating switch	07-13-08	Q
switch-disconnector	07-13-08	Q
with automatic release	07-13-09	Q
Synchronoscope	08-02-08	P
Synchronous machines		
converter, three-phase, shunt excited	06-07-05	G
generator, three-phase, both leads of each phase winding brought out	06-07-04	G
generator, three-phase, permanent magnet	06-07-01	G
generator, three-phase, star-connected with neutral brought out	06-07-03	M
T		
Tachometer	08-02-15	P
Tank (symbol element)	02-01-04	
Telemetering devices		
signal translator (general symbol)	08-07-01	U
receiver	08-07-03	U.B
transmitter	08-07-02	U.B
Temperature-sensitive switch		
break contact	07-09-02	S
make contact	07-09-01	S
Terminal	03-02-02	X
Terminal strip	03-02-03	X
Test point indicator	02-17-05	
Thermal		
actuating device, relay	07-15-21	
effect	02-08-01	
Thermal switch, self-operating, break contact	07-09-03	S.Q
Thermocouple		
shown with polarity symbols	08-06-01	B
with insulated heating element	08-06-05	B
simplified form	08-06-06	B
with non-insulated heating element	08-06-03	B
simplified form	08-06-04	B
Thermoelectric generating station	11-02-03	
Thermometer	08-02-14	P
Three-position lever-operated multiposition switch	07-11-01	S
Thyristor		
diode, bidirectional	05-04-03	V
diode, reverse blocking	05-04-01	V
diode, reverse conducting	05-04-02	V
tetrode type, reverse blocking	05-04-10	V
triode, bidirectional	05-04-11	V

Description	Symbol No.	Letter code
T (continued)		
triode, reverse blocking, N-gate	05-04-05	V
triode, reverse blocking, P-gate	05-04-06	V
triode, reverse conducting, gate not specified	05-04-12	V
triode, reverse conducting, N-gate	05-04-13	V
triode, reverse conducting, P-gate	05-04-14	V
triode, turn-off, gate not specified	05-04-07	V
triode, turn-off, N-gate	05-04-08	V
triode, turn-off, P-gate	05-04-09	V
triode, type unspecified	05-04-04	V
Time clock	11-16-03	P
Time switch	11-14-14	Q.S
Touch-sensitive switch, make contact	07-20-01	S
Touch sensor	07-19-04	B
Transformer		
single-phase with two windings and screen		
form 1	06-10-01	T
form 2	06-10-02	T
three-phase bank of single-phase, connection star-delta		
form 1	06-10-11	T
form 2	06-10-12	T
three-phase, connection star-zigzag		
form 1	06-10-15	
form 2	06-10-16	
three-phase with four tappings		
form 1	06-10-09	T
form 2	06-10-10	T
three-phase with on-load tap charger, connection star-delta		
form 1	06-10-13	T
form 2	06-10-14	T
three-phase, connection star-delta		
form 1	06-10-07	T
form 2	06-10-08	T
three-phase, three winding, connection star-star-delta		
form 1	06-10-17	T
form 2	06-10-18	T
with centre tapping on one winding		
form 1	06-10-03	T
form 2	06-10-04	T
with variable coupling		
form 1	06-10-05	T
form 2	06-10-06	T
Transformer; Measuring		
current, with one secondary winding with one tapping		
form 1	06-13-06	T
form 2	06-13-07	T
current, with two cores and two secondary windings		
form 1	06-13-02	T
form 2	06-13-03	T
current, with two secondary windings on one core		
form 1	06-13-04	T
form 2	06-13-05	T
voltage	06-13-01	T
Transformers (general symbols)		
auto-transformer		
form 1	06-09-06	T
form 2	06-09-07	T

Description	Symbol No.	Letter code
T (concluded)		
Transformers (general symbols) (continued)		
choke		
form 1	06-09-08	
form 2	06-09-09	
current		
form 1	06-09-10	T
form 2	06-09-11	T
pulse		
form 1	06-09-10	T
form 2	06-09-11	T
reactor		
form 1	06-09-08	L
form 2	06-09-09	L
with three windings		
form 1	06-09-04	T
form 2	06-09-05	T
with two windings		
form 1	06-09-01	T
form 2	06-09-02	T
with two windings, shown with instantaneous voltage polarity indicators	06-09-03	
Transistor		
IGFET depleted one gate, N-type, without substrate connection	05-05-15	V
IGFET depleted one gate, P-type, without substrate connection	05-05-16	V
IGFET depleted two gates, N-type, with substrate connection brought out	05-05-17	V
IGFET enhanced one gate, N-type, channel with substrate internally connected	05-05-14	V
IGFET enhanced one gate, P-type, with substrate connection brought out	05-05-13	V
IGFET enhanced one gate, N-type without substrate connection	05-05-12	V
IGFET enhanced one gate, P-type without substrate connection	05-05-11	V
NPN avalanche	05-05-03	V
NPN with collector connected to the envelope	05-05-02	V
NPN with transverse biased base	05-05-06	V
PNIN with ohmic connection to the intrinsic region	05-05-08	V
PNIP with ohmic connection to the intrinsic region	05-05-07	V
PNP	05-05-01	V
junction field effect with N-type channel	05-05-09	V
junction field effect with P-type channel	05-05-10	V
photo-	05-06-04	B.V
unijunction with N-type base	05-05-05	V
unijunction with P-type base	05-05-04	V
Translator, signal (general symbol)	08-07-01	U
Transmitter (Instrument)		
telemetering	08-07-02	U.B
Transmitter, telemetering	08-07-02	U.B
Triac	05-04-11	V
Tube		
protective gas discharge	07-22-04	F
protective gas discharge, symmetric	07-22-05	F
Tunnel diode	05-03-05	V
Turn-off		
triode thyristor, gate not specified	05-04-07	V
triode thyristor, N-gate	05-04-08	V
triode thyristor, P-gate	05-04-09	V
Turn-switch	07-07-04	S.Q
Two-way contact with centre-off position	07-02-05	
Two-way switch, single-pole	11-14-06	Q.S
U		
Unijunction transistor with N-type base	05-05-05	V
Unijunction transistor with P-type base	05-05-04	V
Unitunnel diode	05-03-08	V

Description	Symbol No.	Letter code
V		
Var-hour meter	08-04-15	P
Varactor	05-03-04	V.C
Variability		
continuous	02-03-09	
in steps	02-03-07	
inherent	02-03-03	
inherent, non-linear	02-03-04	
non-inherent	02-03-01	
non-inherent, non-linear	02-03-02	
pre-set adjustment	02-03-05	
stepping action	02-03-07	
Variable capacitance diode	05-03-04	V.C
Variable capacitor	04-02-07	C
Variable resistor	04-01-03	R
Variometer	04-03-08	L
Varistor	04-01-04	R
Varmeter	08-02-04	P
Voltage dependent resistor	04-01-04	R
Voltage regulator diode	05-03-06	V
Voltmeter	08-02-01	P
differential	08-02-11	P
W		
Watchman's system device	11-14-15	Q.S
Water heater	11-16-01	E
Watt-hour meter	08-04-03	P
Wattmeter and varmeter combined, recording	08-03-02	P
Wattmeter, recording	08-03-01	P
Waveform of signals (see Signal waveforms)		
Wavemeter	08-02-09	P
Whistle, electrically operated	08-10-12	H
Wind generating station	11-02-11	
Winding	04-03-01	L
Winding; Internally connected		
six-phase, double delta	06-02-10	
six-phase, fork with neutral brought out	06-02-13	
six-phase, polygon	06-02-11	
six-phase, star	06-02-12	
three-phase, delta	06-02-05	
three-phase, interconnected star	06-02-09	
three-phase, open delta	06-02-06	
three-phase, star	06-02-07	
three-phase, star, with neutral brought out	06-02-08	
three-phase, zigzag	06-02-09	
Winding; Separate		
m-phase, phases not interconnected	06-01-05	
one winding	06-01-01	
six separate	06-01-03	
three-phase , phases not interconnected	06-01-04	
three separate	06-01-02	
two-phase, four-wire	06-01-06	
Winding for machines		
commutating	06-03-01	
compensating	06-03-01	
separate	06-03-03	

Description	Symbol No.	Letter code
W (concluded)		
Winding for machines (continued)		
series	06-03-02	
shunt	06-03-03	
Wiring (for architectural)		
box (general symbol)	11-12-04	X
connection box	11-12-05	X
consumer's terminal with wiring	11-12-06	X.A
distribution centre	11-12-07	A
going downwards	11-12-02	
going upwards	11-12-01	
junction box	11-12-05	X
passing through vertically	11-12-03	
service entrance equipment	11-12-06	X.A

SAP Equipment Registration Form

SAP Equipment Registration List (NEW EQUIPMENT)

This form is to be completed when requesting that equipment be captured in SAP
Return form to District Superuser (PM)
(Please fill in all relevant fields where possible)

Depot/Plant (eg. Alrode Ops or ALR1)	Equipment description (eg.ACTUATOR, VALVE)		COST CENTRE

Type (eg.ACT IQ16,VALVE GATE)	Type Description (eg. VALVE FULL BORE)	Size (eg. ACT Kw or HP, VALVE 300mm)	Rating or RPM (eg.VALVE #600, ACT RPM)

Make (eg.VALVE GROVE, ACT ROTORK)	Model (eg. B5)	Serial No. (eg. XS5-234/101432)	Year of Manufacture (eg. 1999)

Functional Location (eg. P-N-ALR1-P01-P01-P1E)	Asset No (eg. PD123456)	Vendor	Purchase price

Requested by	Date	Signature	

For office use only:

Captured in SAP by	SAP No.	Date	Signature

SAP Equipment Registration List

List to be completed where a number of **new equipment** is to be captured in SAP

Please fill in as much details as possible

Depot/Plant	Equipment description	Type	Type Description	Size	Rating/RPM	Make	Model	Serial No.	Year of Manufacture	Functional Location	Asset No	Quantity	Cost centre	Purchase price	SAP Number
Tarlton	(eg.ACTUATOR, VALVE)	(eg.ACT IQ16,VALVE GATE)	(eg. VALVE FULL BORE)	(eg. ACT Kw or HP, VALVE 12")	(eg.VALVE #600, ACT RPM)	(eg.VALVE GROVE, ACT ROTORK)	(eg. B5)	(eg. XS5-234/101432)	(eg. 1999)	(eg. P-N-ALR1-P01-P01-P1E)	(eg. PD123456)			Unit Excl VAT (ZAR)	
Tarlton	Valve	Butterfly	Main Manifold Feed Isolation	6"	17.2 bar				2016	Valve Bank 1	FD050	1			

Requested by_____ Date_____ Signature_____

Captured in SAP by_____ Date_____ Signature_____

Transnet Pipelines

Capital & Strategic Projects, Research & Development, Continuous Improvement

DOCUMENT MANAGEMENT PROCEDURE

Document number	TPL-DM-P-0001
Revision number	00
Status	Approved for Use
Effective date	01 November 2024
Review date	01 October 2026

SUMMARY REVISION CONTROL

REV. NO.	NATURE OF AMENDMENT	PAGE NO.	DATE REVISED
00	Approved for Use		

DOCUMENTATION SIGN-OFF SHEET

I, the undersigned hereby approve this procedure.

ROLE	CAPACITY/ FUNCTION	SIGNATURE	DATE
Prepared By:	Saajid Moosa Manager: Document/Knowledge Management		21/10/2024
Reviewed by:	Shoaib Bux Senior Manager: Project Controls (Acting)		21/10/2024
Accepts document for adequacy and practicability. Comments:			
Approved by:	Russell Bradbrooke General Manager: Capital & Strategic Projects, R&D and CI		22/10/24
Approves document for use. Comments:			

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1. PURPOSE

This document aims to establish a standardized approach for the implementation and management of Document Management Processes and Systems within Transnet Pipelines (TPL) Capital Projects department. By defining clear guidelines and responsibilities, the document ensures the consistent handling of business and project-related documentation throughout the entire project lifecycle, from initiation to closeout including hand-over, archiving and disposal.

The purpose is to maintain the integrity, accessibility, and security of all documents, thereby supporting the successful execution and completion of projects while adhering to Transnet Pipelines' operational and regulatory requirements.

2. APPLICABILITY

This methodology applies to all TPL Capital Project employees and contractors/consultants involved in the management and implementation of Document Management Processes and Systems within project execution.

This procedure is applicable to all documentation types, including technical, commercial, contractual, and general business documents, ensuring consistency, compliance, and security across the organization. Additionally, it outlines the procedures for document control, revision management, storage, distribution, hand-over and archiving, providing a comprehensive framework for managing documentation effectively across all TPL Capital Projects.

3. REFERENCE DOCUMENTS

NAME	REFERENCE NUMBER	APPLICABLE SECTIONS
Capital Projects Project Lifecycle Process / Overview Manual	PRM-M-0001 Rev 1	*Section 5.7*
Transnet Integrated Management System (TIMS) - 010 Document Data @ Records Management	TRN-IMS-GR-PROC-010	*Entire Document*

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NAME	REFERENCE NUMBER	APPLICABLE SECTIONS
Review and Approval Procedure / Squad Check	TPL-DM-P-0002	*Draft*
Handover As-Builts & Technical to Drawing Office	TPL-TECH-DO-WI-001	*Entire Document*
ISO 9001:2015		*Entire Document*
Drawing Office Standard	TPL-TECH-DO-STD-0004	*Entire Document*
Documentation Deliverables Matrix	TPL-DM-FAT-0001	*Entire Document*
SYS-P-0001	Document Management Codification Procedure	*Entire Document*

4. DEFINITIONS AND ABBREVIATIONS

TPL	Transnet Pipelines
PM	Project Manager
SDC	Senior Document Controller
SMPC	Senior Manager: Project Controls
DC	Document Controller
DCIS	Document Control Instruction Sheet
TIMS	Transnet Integrated Management System
MDKM	Manager: Document & Knowledge Management
R&D	Research and Development
CI	Continuous Improvement
PSR	Project Status Report
WBS/FBS	Work Breakdown Structure/Facility Breakdown Structure
Capital Projects	Capital & Strategic Projects, R&D and CI
Transmittal	A note/form used to distribute documentation from one party to another and retained as proof of delivery or receipt.
SharePoint online	SharePoint is a collection of enterprise content and knowledge management system
Native/Source File	The original electronic file generated by the program in which the document is prepared. This format will only be published or distributed while the document is being circulated or distributed for review and comments.

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Master Document	The original wet signed (signature) document which is held by Document Control.
Published file	The converted Acrobat file, which is created after the approval of the document, and is accessible to all users. PDF copies of all the revisions of a document will be retained as part of the lifecycle history of the document.

5. ACCOUNTABILITY, RESPONSIBILITY AND AUTHORITY

5.1 Executive Management

The Executive Manager (General Manager) has the responsibility and authority for ensuring compliance with this methodology and shall reserve ownership and approval thereto.

5.2 Senior Manager: Project Controls Manager

The SMPC (Senior Manager: Project Controls) has the responsibility for ensuring that this methodology is implemented for all TPL Capital & Strategic Projects.

5.3 Project / Team Managers

The Project Managers/Team Managers (all disciplines within TPL Projects) shall ensure that this methodology is implemented and adhered to by all members of the Project team and that the relevant tools are fully utilized.

5.4 Manager: Document & Knowledge Management

The MDKM (Manager: Document & Knowledge Management) shall ensure that all members of the TPL Capital Projects team are trained to a level required to apply this methodology and to use the tools involved to access, manage and control of project documentation.

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5.5 Senior Document Controller

The SDC (Senior Document Controller) assigned to this programme/project shall ensure that regular status reports are supplied on the status of the various project/program related documentation and to maintain an up-to-date document register reflecting latest information.

Oversee and manage DC assigned to the programme/project, providing leadership and guidance to ensure document control processes are properly implemented.

Responsible for training and upskilling Document Controllers under their supervision, ensuring all team members are proficient in document control standards and systems.

Continuously monitor and enhance the document control processes to ensure efficiency and compliance with project requirements.

5.6 Document Controller

The DC (Document Controller) assigned to a Project shall ensure that regular status reports are supplied on the status of all project/contract related documentation and to maintain an up-to-date document register reflecting latest information.

They will also be responsible for basic training to project team members on document control processes, ensuring proper understanding and compliance with documentation procedures.

The DC will be under the direction and guidance of the Senior Document Controller, depending on the complexity of the Project.

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6. PROCEDURE/METHODOLOGY

6.1 Function of Document Control

The sole function and mission of TPL Capital Projects Document Management is to manage, control and maintain the integrity of TPL Business and Project documents while allowing easy retrieval, archiving, access, reference, classification and distribution of documentation.

Document Control achieves this function through the following objectives:

- Provide safe storage and backup of all documents.
- Provide access to the latest Approved documentation and Revision Control.
- Provide a clear record of approved deliverables per project phase and over the life of the project.
- Provide measures to maintain restricted access to confidential documents.
- Provide an accurate and complete archive of Capital Projects documents at the end of each project phase as well as at the end of the project.
- Provide the control of reviews and approvals of documents.
- Provide proof and track of all distributions of documents.
- Provide documentation reports for auditing purposes.
- Ensure that all project and contract-related documentation adheres to standardized templates and meets the highest quality standards.
- Provide Document Management input into Project Works Information/Scope of Work for all Tender documentation.

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6.2 Management of Documentation

6.2.1 Identification

TPL Capital Projects Document Control identifies business and project documentation in accordance with SYS-P-0001 (Group Document Management Business Codification) and TPL-TECH-DO-STD-001 (Drawing Office Standard).

All documentation must have a unique document number assigned which can be requested from DC, documentation issued for distribution or use on a project without a number will be rejected and returned to originator for rework.

6.2.1.1 Technical Project Documents

All technical documents shall be numbered according to the following convention.

Table 1 – Technical Drawing Numbering Convention

Part in order of Mask	Description	Examples of valid data
AANNNN	Project Number	HO1298
NNN	Depot Code	IVW
NNA	WBS – Optional	000
A	Discipline Code	M (As per SYS-P-0001)
AA	Document Type (for drawings this will be limited to two characters)	GA (As per SYS-P-0001)
NNNN	Sequential Number by document category.	0002
(NN)	Sheet no – note only for drawings	01/02/03

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Technical Drawing Numbering Example:

Example Number	Definition
HO1298-IVW-000-M-GA-0002-02	The 2nd sheet of the 2nd Mechanical GA for the IVW Tanks Project

The technical document uniqueness will be a combination of the project number, Depot, WBS, discipline, document type, sequential document number and in the case of drawings the sheet number. The document revision number will be an attribute of the document.

6.2.1.2 Project Documents

Table 2 – Project Document Numbering Convention

Part in order of Mask	Description	Examples of valid data
AANNNN	Project Number	HO1298
AAA	Document Type	RPT (Report)
NNNN	Sequential Number by document category.	0001

Project Documents Numbering Example:

Example Number	Definition
HO1298-RPT-0001	IVW Tanks Project – Report No. 0001

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The document uniqueness will be a combination of the project number, document type and sequential document number. The document revision number will be an attribute of the document.

6.2.1.3 Contract and Package Related Project Documentation

All contract related documentation will be numbered as per below mask using the Contract Number from Procurement:

Table 3 - Contract & Package Document Numbering Convention

Part in order of Mask	Description	Examples of valid data
AANNN	Project Number	HO1298
NNNA	Contract/Package Number	TPL-2024-02-0005-56313-RFQ
AAA	Document Type	PMI
NNNN	Sequential Number by document category.	0005

Contract and Package Document Numbering Example:

Example Number	Definition
HO1298- TPL-2024-02-0005-56313-RFQ-PMI-0005	Project Managers Instruction – No. 0005 under the IVW Tanks Project's EPCM Contract.

The document uniqueness will be a combination of the project number, package/contract number, document type and sequential document number. The document revision number will be an attribute of the document.

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6.2.1.4 Business Functional Documents

Table 4 – General Document Numbering Convention

Part in order of Mask	Description	Examples of valid data
TPL	Transnet Pipelines	TPL
AA	Functional Category	DM *Table 5 below*
AAA	Document Type	P *As per SYS-P-0001*
NNNN	Sequential Number by document Category and Doc. Type	0001

Business Functional Document Example:

Example Number	Definition
TPL-DM-P-0001	TPL Document Management Procedure No. 0001

Functional Categories:

Table 5

Functional Category	*Code*
Project Management	PM
Reporting	RP
Construction	CM
Document Management	DM
Knowledge Management	KM
Project Controls	PC
Cost Control/ Management	CC
Planning	PL
Quantity Surveying	QS
Engineering	EN
Contract & Procurement	CP
Research & Development	RD
Continuous Improvement	CI
Business Development	BD

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6.2.1.5 Document Metadata Attributes

The format of document metadata as prescribed and set in SYS-P-0001 is as follows:

- Type - Format of document (either native or pdf)
- Name - Document number
- Rev No - Revision status of current document
- Title - Document description/title
- Project - Project Description and project Number.
- Status - State of current document (either Final or Draft)
- Originator - Person who initiated the document.
- Modified Date - Date when the document was uploaded or updated (auto generated)
- Modified by - Person who uploaded or updated the document (auto generated.

Example of the metadata layout of the EDMS will be reflected once the selected system has been implemented:

6.2.2 Document Submission, Review and Approval

TPL Capital Project DC shall implement project document review(s) and approval(s) process as per the Squad Check procedure TPL-DM-P-0002.

The project document controller shall capture and maintain records reflecting the content and decision of all reviews.

The Originator of the document is responsible to validate the suggested changes incorporate the relevant changes/comments into the document.

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The process workflow for DC will be in accordance with Annexure E, thus ensuring all documentation undergo a Review and Approval process prior to registration and distribution.

6.2.2.1 General Documentation

All project/contract documentation shall be submitted to DC for capturing, control and safekeeping. All project documentation shall be issued and distributed through DC. Document control shall prepare, generate, capture and manage transmittals/emails for such distribution.

6.2.2.2 Correspondence

All project correspondence of any nature and form shall be forwarded to Document Control for capturing and safekeeping. Project managers shall apply Transnet Information Classification Policy, Records Management Policy at their discretion to determine the criticality and value of information and thereafter advise and instruct Document Controllers whether to capture correspondence.

Day-to-day correspondence, by way of e-mail shall be sent to dedicated DC e-mail address allocated to various regions around all depots/Projects/Programmes (e.g. TPL Doc Control (TPLProjectsDC@transnet.net).

All documentation whether incoming or outgoing, shall be distributed via DC which will maintain complete registers of all correspondence. Unless documentation has been registered by Document Control it will not be considered as official. Document Control will be responsible to upload all approved project correspondence into the applicable EDMS.

6.2.3 Revision Control

TPL Capital Projects DC applies document management principles to manage the life cycle of documents through stringent revision control.

6.2.3.1 General Documents

General Documents include business and project documents (Templates, Policies, etc.)

6.2.3.1.1 "Draft" Documents

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All draft documents shall be assigned, and clearly marked with a single "**Single Numeric**" revision (e.g. 0, 1, 2 etc)

6.2.3.1.2 "Approved" Documents

All approved documents shall be assigned, and clearly marked with "**Double Numeric**" Revisions (e.g. 00, 01, 02 etc)

6.2.3.2 Drawings

6.2.3.2.1 "Tender" Drawings

All Tender drawings shall be assigned, and clearly marked with "**Alpha-numeric**" revisions (e.g. 0A, 0B, 0C etc)

6.2.3.2.2 "Approved" Drawings

All approved drawings shall be assigned, and clearly marked with "Double **Numeri**c" Revisions (e.g. 00, 01, 02, etc)

6.2.3.2.3 "As Built" Drawings

All approved As-Built drawings shall be assigned, and clearly marked with "**Alphabetic**" Revisions (e.g. ZZ etc).

6.2.4 Document Management tools and Repositories.

6.2.4.1 Document Numbering

All Document numbers generated must be in line with SYS-P-0001 and TPL-TECH-DO-STD-001 and using elements of Table 5 (Functional Categories).

6.2.4.2 Share Point

All TPL Capital Projects employees will have "read only" access to the TPL Capital Projects Transnet SharePoint portal Site. Only authorized personnel will be granted "read/write" access to restricted portal sites. All requests for access for project documentation shall be done via the Project Manager and DC via email.

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6.2.5 Publishing Documents on the Repositories

All business and project documents shall for security purposes be published in formats which will prevent unauthorized alteration or modification. Therefore, all business and project shall be published in "PDF" format. All native files shall be captured and managed in the repositories which are only accessible by Document Control and respective Discipline work area employees,

6.2.6 Document Control Reporting

Document controllers shall generate status reports reflecting the progress of document deliverables per discipline in accordance with the project deliverables matrix (TPL-DM-FAT-0005). Such reports shall be generated monthly for PSR or as and when the project manager(s) make requests for such reports.

6.2.7 Document Control Audits

Document Control shall conduct periodic audits with the purpose of assessing internal compliance with Document Control procedures and identifying opportunities for improving internal procedures to provide better support to projects. Document Control Audits both internal and external shall be conducted by the SDC and MDKM respectively.

The SDC shall conduct audits half yearly on their allocated projects/programs and shall generate reports reflecting their findings, exceptions and recommendations.

6.2.8 Distribution

Distribution and approval of project documentation shall be affected in accordance with the Project Manager's instruction, Document Control Instruction Sheet and the Deliverables Matrix.

6.2.9 Storage & Filing

TPL Capital Projects DC understands the value of business information and the preservation thereof, and accordingly provides limited secure filing and storage for business and project documentation.

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6.2.9.1 Storage

In case of hardcopies, Document Control office shall store Project Documents in approved secured storage areas which are accessible only by Document Control.

Paper documentation shall be stored in appropriate, secure and access-controlled storage areas as required by the Transnet ICT Physical and Environmental Security Standard as per TIMS Document, Date and Records Management Procedure (TRN-IMS-GRP-PROC-010)

6.2.9.2 Filing / Hardcopy & Electronic

All Document Controllers shall create, control and manage clearly marked project and/or contracts files which will contain all project and contract data and documentation, the preferred method will be for a fully electronic filing system created in SharePoint or the selected EDMS system.

All technical documents (e.g. drawings, maps etc) which for valid reasons cannot be filed in the project file shall be stored, hung in the dedicated drawings racks and or hangers which shall be housed in approved secured storage areas which are accessible only by Document Control.

All engineering information will be handed over to the Drawing Office for records and storage.

6.2.10 Archiving and Disposal of Business and Project Documentation

TPL Capital Projects shall archive business and project documentation in accordance with TIMS Document, Date and Records Management Procedure (TRN-IMS-GRP-PROC-010).

The selected archiving facility provided must be in a secure, climate-controlled archive room or off-site storage facility.

Document Management will periodically review archived documents for retention compliance and maintain a register of all retrieval and return activities.

Access will be controlled and restricted to authorized personnel only.

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Documents will be periodically reviewed for retention compliance and those exceeded will be disposed by shredding or other approved methods, a register of disposals will be utilized as per TIMS Document, Data and Records Management (010).

6.3 Project Support

The DC function extends to the execution of projects, and its sole mission is to facilitate and control the delivery of project documentation. Document Controllers will support project by registering, capturing, filing, distributing, storing and reporting on project document deliverables.

All Document Controllers shall be duly appointed to the project through Mobilisation forms as Annexed in TPL-PL-P-0001 (Planning Procedure).

6.3.1 Requesting Document Control Services

DC shall be requested by way of completing the Document Control Instruction Sheet (DCIS) and/or direct requests by e-mails where and when it is necessary to do so. The DCIS shall be obtainable from DC as per Annexure C

6.3.2 Project Deliverables

The SDC and DC shall facilitate and control the delivery of project document deliverables. These deliverables shall be determined and confirmed by the SDC/DC and the Project Manager at project initiation. SDC/DC shall report the progress on the delivery of documents deliverables throughout the lifecycle of the project.

6.3.3 Project Close-out and Handover

The project document handover process shall be conducted in accordance with procedure TPL-TECH-DO-WI-001 (Handover As-Builts & docs from Technical to Drawing Office).

Handover document requirements will be confirmed and agreed between the Depot/Facility Manager and PM.

The handover will be done either electronically via the EDMS or hardcopy as agreed.

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7. RECORDS

All hardcopy and electronic documentation created by TPL Capital Projects will be saved in the appropriate Project and Contract filing structures (Annexure A & B), either in a physical project file or within the designated EDMS.

8. ANNEXURES

A – PROJECT FILE INDEX (TPL-DM-FAT-0001)

B – CONTRACT FILE INDEX (TPL-DM-FAT-0002)

C – DOCUMENT CONTROL INSTRUCTION SHEET (TPL-DM-FAT-0003)

D – TRANSMITTAL (TPL-DM-FAT-0004)

E – DOCUMENT DELIVERABLES MATRIX (TPL-DM-FAT-0005)

F – DOCUMENT CONTROL PROCESS FLOW (TPL-DM-WF-0001)

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ANNEXURE A – PROJECT FILE INDEX (TPL-DM-FAT-0001)

FILE REFERENCES
PROJECT ADMINISTRATION

File Section	Project File Index
P.01	**SCOPE MANAGEMENT**
	01. Project Registration Form
	02. Joint Venture-JV Agreements
	03. Client / Owner Requirement Specification (ORS)
	04. Project Scope of Work / Project Brief
	05. Project Business Case
	06. Project Execution Plan (PEP)
	07. Project Insurance Policies & Guarantees
	08. Project Definition *(PSA & WBS)*
	09. Project Life Cycle Process (PLP) / Gate Review
	10. Scope Changes and Approvals *(PCN)*
	11. Project Closeout Plan / Report
P.02	**TIME MANAGEMENT**
	01. Baseline/Project Schedules (P6)
	02. Project Integrated Schedules *(Updates / Forecasts)*
	03. Contractor Schedules *(refer contract Index section: C.02.12)*
	04. Latest Project Progress Curves
P.03	**FINANCIAL MANAGEMENT**
	01. Baseline Estimates / Budgets / BOQ's / EPCM Estimates
	02. Project Financial Model
	03. Project CAP Forms / Warrants
	04. Contingency Review
	05. Project Cash Flow and Cost Reports
	06. Invoices *(Project; EPCM)*
P.04	**QUALITY MANAGEMENT**
	01. Project Quality Plan
	02. Reports *(Project Reviews; Test Reports; NCR's)*
	03. Project Quality Audits
	04. Concession Register
P.05	**HR MANAGEMENT**
	01. Project ORG Chart / Responsibility Chart / Matrix / Contacts List
	02. Project Man-Plan *(Manhour Histograms)*
	03. Staff Forms *(Mobilization; Demobilization; Secondments)*
	04. Projects Reports *(SAP; PRM)*
	05. Delegation of Authority *(NEC Appointments - Project Manager + Supervisor)*
P.06	**COMMUNICATION MANAGEMENT**
	01. Minutes of Meetings *(Project / Client / Engineering Progress; General)*
	02. **Incoming** Correspondence *(fax; letters; memo; transmittals; emails)*
	03. **Outgoing** Correspondence *(fax; letters; memo; transmittals; emails)*
	04. Reports (Registers)
	05. Communications (EPCM & Contractor)
	06. EPCM - Request for Information (RFI)
	07. EPCM - Early warning (EW)
	08. EPCM - Requests (REQ)
	09. EPCM - Compensation Events (CE)
P.07	**RISK MANAGEMENT**
	01. Baseline Project Risk Register
	02. Risk Management Plan / Register
	03. Project Risk Reviews *(Workshops; Minutes of Meetings; Risk List)*
P.08	**HEALTH & SAFETY MANAGEMENT**
	01. Plans - *(Health & Safety / Functional Executional Plan)*
	02. Health & Safety Standards
	03. Safety Induction Records / Safety Appointments
	04. Health & Safety Statistics / Specifications
	05. Site Access Certificates *(*internal projects)*
	06. Minutes of Meetings
	07. Reports *(Monthly Safety Report; Safety Audit Report; Safety NCR's; SOC's)*
	08. Medical Examinations *(Entry & Exit)*
	09. Legal Registers
P.09	**ENVIRONMENTAL MANAGEMENT**
	01. Construction Environmental Management Plan
	02. Application for Authorizations *(Basic Assessment / ROD's / EMP's)*
	03. Environmental Specification *(Project / Standard)*
	04. Environmental Impact Assessment (EIA)
	05. Environmental Audits
	06. Environmental NCR's
	07. Licenses
P.10	**PROCUREMENT MANAGEMENT**
	01. Procurement Package Plan (PPP)
	02. **Tender 1**
	03. **Tender 2**
	01. Tender Document
	02. Site Clarification
	03. Tender Addendums
	04. Tender Clarification Minutes
	05. TEAR Document
	06. Procurement Schedule (EPCM)
P.11	**ENGINEERING** ***(separate Design file)***
	01. Design Basis
	02. Geotechnical
	03. Surveys
	04. Drawings
	05. Images & Photos
	06. Technical Specifications & Reference Documents
	07. Reports
	08. Technical Minutes of Meetings
	09. Data Sheets
	10. Design Calculations
	11. Engineering Change Notice (ECN)
	12. Drawing Register

ANNEXURE B – CONTRACT FILE INDEX (TPL-DM-FAT-0002)

FILE REFERENCES CONTRACTS ADMINISTRATION	
File Section	**Contract File Index (NEC)**
C.01	**CONTRACT DOCUMENT**
	01. Contract Document *(approved)*
	02. Performance Bond *(original secured in safe custody / fire proof safe)*
	03. Contractor Drawings
	04. Supplier Development
	05. Contractor Key Resource (CV)
	06. Progress Photo's
	07. Dispute Resolution
C.02	**CONTRACTOR - CORRESPONDENCE**
	01. Minutes of Meetings (*Contract Progress / Employer / Construction / Kick-off)*
	02. **Incoming** Correspondence (*fax / letters / memo / transmittals / emails)*
	03. **Outgoing** Correspondence *(fax / letters / memo / transmittals / emails)*
	04. Principal Controlled Insurance Certificate PCI & Declarations
	05. Dairies *(Daily / Site)*
	06. Site Instructions
	07. Early Warnings-EW's *(Contractor / Employer)*
	08. Field Engineering Queries-FEQ's
	09. Project Managers Instruction-PMI's
	10. Contract Notifications / Request for Information-RFI's
	11. Compensation Events-CE's *(Contractor / Employer)*
	12. Construction Program / Schedule
	13. Registers *(CE's / EW's / Risk / PMI's / Meeting Minutes)*
	14. Overtime Authorization
	15. Contractor Progress Report
C.03	**CONTRACTOR - PAYMENTS / COSTS**
	01. Invoices / Payment Applications / Certificates *(Application Schedule of Dates)*
	02. Baseline Estimates / Budgets / Bill of Quantities-BOQ's
	03. Contract Cash Flows
	04. Contract Contingency Reviews
	05. Contract Claims
	06. Quantity Re-measurements
C.04	**CONTRACTOR - QUALITY**
	01. Contractor Quality Control Plan (QCP) & Method Statement
	02. Project / Contractor Quality Plan (QP)
	03. Quality Audits
	04. QC Test Reports / Test Certificates
	05. Non-Conformance Reports-NCR's
	06. Concessions + Register
	07. Defects List
	08. Quality Dossier / Data Pack / Data Book ***(in separate file)***
C.05	**CONTRACTOR - RISK**
	01. Contract Risk Register
	02. Minutes of Meetings
	03. Risk Reduction
C.06	**CONTRACTOR - HEALTH & SAFETY**
	01. Safety Appointments
	02. Safety Inductions
	03. Medicals
	04. Lost Time Injury-LTI / Incident Reports / Strike Action Plan
	05. Planned Task Observation Forms / Daily Safety Task Instruction-DSTI
	06. Method Statements *(incl. Risk Assessment)*
	07. Permits *(Access Permits / Permit to Work / Excavation Permit)*
	08. Safe Work Procedures-SOPS
	09. Health & Safety Specification
	10. Toolbox Topics
	11. Visible Field Leadership-VFL
	12. Principal Health & Safety Management Plan
	13. Reports *(Monthly Safety Report / Safety Audit Report / Safety TEAR Report / Safety NCR's)*
C.07	**COMMISSIONING**
	01. Commissioning Functional Executional Plan
	02. Punch Lists
	03. Check Out Acceptance Certificates
	04. Take Over Certificates
	05. Care, Control, Custody Certificates
	06. Occupational Plan
C.08	**CLOSEOUT**
	01. Asset Capitalization Forms
	02. Final Account Statement-FAS
	03. Completion Certificates / Certificate of Compliance-COC's
	04. Financial Closeouts
	05. Health & Safety Closeout Reports
C.09	**EPCM PACKAGED DOCUMENTS** *(incudes.....SoW / BoQ / SCH / ES, etc.)*

ANNEXURE C - DOCUMENT CONTROL INSTRUCTION SHEET (TPL-DM-FAT-0003)

Document Control Instruction Sheet

PROJECT No : ______________________ CONTRACT No : ______________________

TO : Document Control DATE : ______________________

ORIGINATOR : ______________________ DISCIPLINE : ______________________

PLEASE ISSUE THE ATTACHED ENGINEERING DOCUMENTS

Please Stamp and Issue: *(indicate with an "X" in the appropriate block)*

- [ ] APPROVED FOR CONSTRUCTION
- [ ] APPROVED FOR DESIGN
- [ ] FOR TENDER PURPOSES / ENQUIRY
- [ ] FOR PURCHASE
- [ ] FOR CONTRACT / SERVICES
- [ ] FOR CLIENT APPROVAL
- [ ] FOR INFORMATION ONLY
- [ ] FOR REVIEW
- [ ] OTHER (PLEASE SPECIFY)

DOCUMENT NUMBER	REV.

DISTRIBUTION	NUMBER OF COPIES		ELECTRONIC COPY VIA	
	QTY	T	EMAIL	C D

Additonal Instructions for Document Control (Please Specify):

C D = Compact Disc
T = Transmittal

Originator's Signature:______________________

DOCUMENT CONTROL USE ONLY

Transmittal No./'s : ______________________

Doc Control Signature : ______________________

Date : ______________________

ANNEXURE D – TRANSMITTAL (TPL-DM-FAT-0004)

TRANSNET

Document Transmittal Note

TO :		DATE :	
LOCATION :		FROM :	
ATTENTION :		ORIGINATOR :	
		PROJECT No :	
		TRANSMITTAL NO. :	HOXXXX-TRO-0001

PURPOSE OF ISSUE *(indicate with an "X" in the appropriate block)*

[ ] APPROVED FOR CONSTRUCTION	[ ] FOR APPROVAL	[ ] AS - BUILT
[ ] APPROVED FOR DESIGN	[ ] FOR INFORMATION ONLY	[ ] FINAL HANDOVER
[ ] FOR TENDER PURPOSES / ENQUIRY	[ ] FOR REVIEW / COMMENTS	[ ] OTHER
[ ] FOR CONTRACT / PURCHASE / SERVICES	[x] RETURN OF DOCUMENTATION	

ADDITIONAL REMARKS BY ORIGINATOR *(if applicable)*

Issue For Action

DOCUMENT NUMBER	REV.	DESCRIPTION	COPY QTY	FORMAT E or H

NAME

Sent by : _____ Received by : _____ Date : _____

Signature : _____ Signature : _____

Annexure E_DOCUMENT DELIVERABLES MATRIX

TPL DELIVERABLES MATRIX	PROJECT No.:		CONTRACT No.:	
	PROJECT TITLE / DESCRIPTION:	Master Deliverables	CONTRACT DESCRIPTION:	
	DOCUMENT LIST No.:		CONTRACTOR NAME:	
	DOCUMENT REVISION:		DATE PREPARED:	

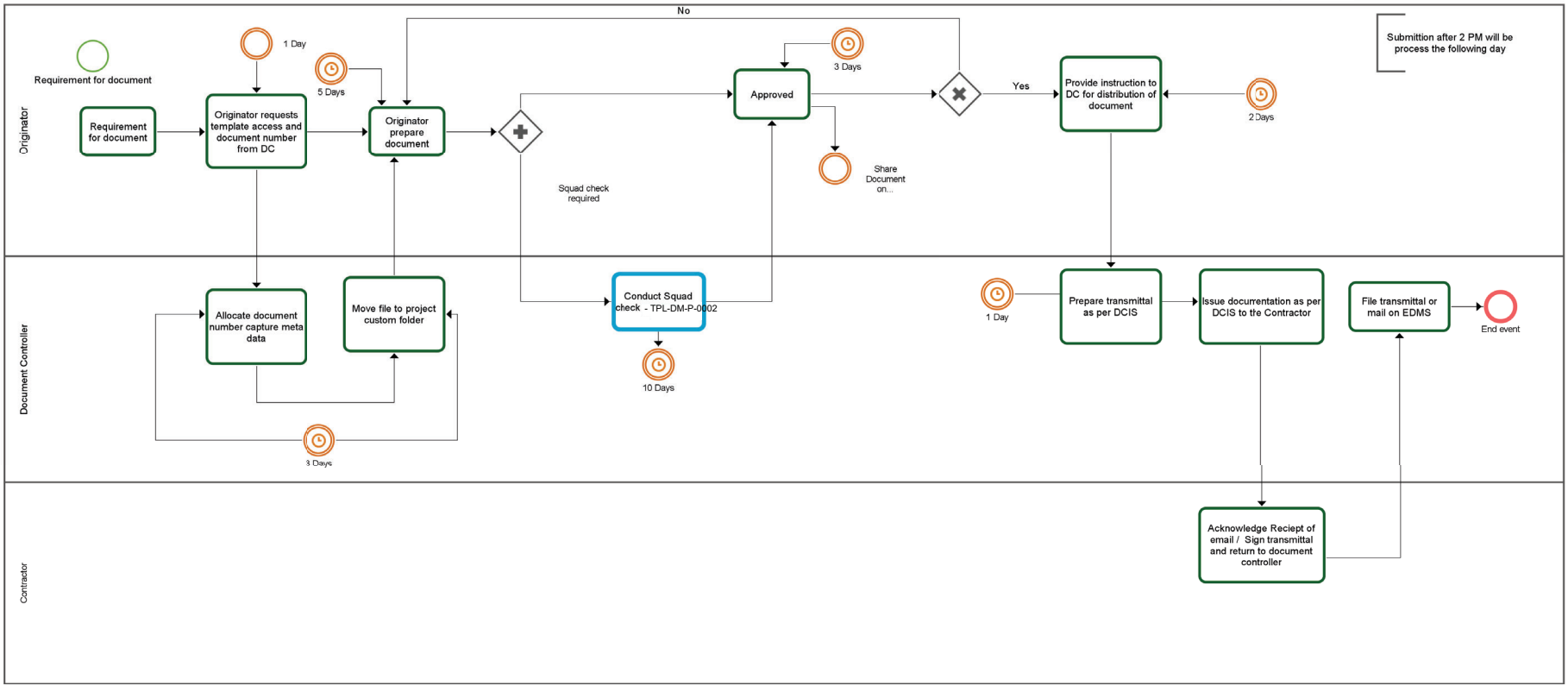
Item	Deliverable	Included in PSR	Included in PSA	Included in Close-Out File	Document Frequency (ie. Weekly, Monthly, or at Closeout)	Expected Delivery Date	Actual Delivery Date	Source Application	TPL DELIVERABLES			FORMAT		
												Hardcopy	Electronic	
									PLANNED	ISSUED	% age	Paper	PDF	Native
P.01 SCOPE MANAGEMENT											#DIV/0!			
P.01.01	Project Registration							Word / Excel			#DIV/0!			
P.01.02	Project Brief - JV Agreements							Word / Excel			#DIV/0!			
P.01.03	Owner Requirement Specification (Client ORS)							Word / Excel	1		0			
P.01.04	Project Scope of Work (SOW)	Y						Word / Excel	1		0			
P.01.05	Project Business Case							Word / Excel			#DIV/0!			
P.01.06	Project Execution Plan (PEP)	Y						Word / Excel	1		0			
P.01.07	Project Insurance Policies and Guarantees	Y						Word / Excel	1		0			
P.01.08	Project Definition - Project Specific Agreement / FEP / FBS / WBS / PES							Word / Excel			#DIV/0!			
P.01.09	PLP Gate Review	Y						Word / Excel			#DIV/0!			
P.01.10	Scope Changes and Approvals - Project Change Notification (PCN)	Y						Word / Excel			#DIV/0!			
P.01.11	Project Closeout Plan / Report	Y						Word / Excel	1		0			
P.02 TIME MANAGEMENT											#DIV/0!			
P.02.01	Baseline Schedules	Y						Word / Excel	1		0			
P.02.02	Project Schedule Updates							Word / Excel			#DIV/0!			
P.02.03	Contractor Schedules							Word / Excel			#DIV/0!			
P.02.04	Project Progress Curves							Word / Excel			#DIV/0!			
P.02.05	Forecasts							Word / Excel			#DIV/0!			
P.03 FINANCIAL MANAGEMENT											#DIV/0!			
P.03.01	Estimates / Budgets (BOQ's / Baseline & EPCM Estimates)							Word / Excel	1		0			
P.03.02	Project Financial Model							Word / Excel			#DIV/0!			
P.03.03	Project Control Plan										#DIV/0!			
P.03.04	Project CAP Forms / Warrants							Word / Excel			#DIV/0!			
P.03.05	Contingency Review							Word / Excel			#DIV/0!			
P.03.06	Project Cash Flow and Cost Reports							Word / Excel			#DIV/0!			
P.03.07	Invoices - Project / EPCM							Word / Excel			#DIV/0!			
P.04 QUALITY MANAGEMENT											#DIV/0!			
P.04.01	Project Quality Control Plan	Y						Word / Excel			#DIV/0!			
P.04.02	Reports - (Project Reviews / Test Reports / NCR's)							Word / Excel			#DIV/0!			
P.04.03	Project Quality Audits	Y			Monthly			Word / Excel			#DIV/0!			
P.04.04	Concession Register							Word / Excel			#DIV/0!			
P.05 HR MANAGEMENT											#DIV/0!			
P.05.01	Project ORG Chart - (Responsibility Charts / Matrix / Contacts List)	Y						Word / Excel			#DIV/0!			
P.05.02	Project Man-Plan - (Manhour Histograms)							Word / Excel			#DIV/0!			
P.05.03	Staff Forms - (Mobilisation / De-mobilisation & Secondments)							Word / Excel			#DIV/0!			
P.05.04	Project Reports - SAP / PRM							Word / Excel			#DIV/0!			
P.06 COMMUNICATION MANAGEMENT											#DIV/0!			
P.06.01	Minutes of Meetings							Word / Excel			#DIV/0!			
P.06.02	Incoming Correspondence							Word / Excel			#DIV/0!			
P.06.03	Outgoing Correspondence							Word / Excel			#DIV/0!			
P.06.04	Registers							Word / Excel			#DIV/0!			
P.07 RISK MANAGEMENT											#DIV/0!			
P.07.01	Baseline Project Risk Register							Word / Excel			#DIV/0!			
P.07.02	Risk Management Register							Word / Excel			#DIV/0!			
P.07.03	Risk Management Plan							Word / Excel			#DIV/0!			
P.07.04	Project Risk Reviews / Workshops / Meeting Minutes / Risk List							Word / Excel			#DIV/0!			
P.08 HEALTH AND SAFETY MANAGEMENT											#DIV/0!			
P.08.01	Functional Executional Plan							Word / Excel			#DIV/0!			
P.08.02	Health and Safety Plan							Word / Excel			#DIV/0!			
P.08.03	Health and Safety File							Word / Excel			#DIV/0!			
P.08.04	Safety Induction Records / Safety Appointments							Word / Excel			#DIV/0!			
P.08.05	Health and Safety Statistics				Monthly			Word / Excel			#DIV/0!			
P.08.06	Health and Safety Specifications										#DIV/0!			
P.08.07	Site Access Certificates							Word / Excel			#DIV/0!			
P.08.08	Minutes of Meetings							Word / Excel			#DIV/0!			
P.08.09	Health and Safety Reports - (NCR's / SOC's / Audits)							Word / Excel			#DIV/0!			
P.08.10	Medical Examinations - (Entry / Exit)							Word / Excel			#DIV/0!			
P.09 ENVIRONMENTAL MANAGEMENT											#DIV/0!			
P.09.01	Construction Environmental Management Plan							Word / Excel			#DIV/0!			
P.09.02	Application for Authorisations - (Basic Assessment / ROD's / EMP's)	Y						Word / Excel	1		0			
P.09.03	Standard Environmental Specification							Word / Excel			#DIV/0!			
P.09.04	Project Environmental Specification										#DIV/0!			
P.09.05	Environmental Impact Assessment (EIA)	Y							1		0			
P.09.06	Environmental Audits							Word / Excel			#DIV/0!			
P.09.07	Environmental NCR's							Word / Excel			#DIV/0!			
P.10 PROCUREMENT MANAGEMENT (PRE-CONTRACT AWARD)											#DIV/0!			
P.10.01	Contract Strategy - CAP01 Forms							Word / Excel			#DIV/0!			
P.10.02	Confidentiality Agreements							Word / Excel			#DIV/0!			
P.10.03	Sole Source Approval							Word / Excel			#DIV/0!			
P.10.04	RFT and Routing Guide							Word / Excel			#DIV/0!			
P.10.05	Addenda							Word / Excel			#DIV/0!			
P.10.06	Tenders	Y						Word / Excel			#DIV/0!			
P.10.07	Minutes of Meetings - Site Inspection / Tender Clarification / Tender Negotiation	Y						Word / Excel			#DIV/0!			
P.10.08	Procurement Package Plan	Y						Word / Excel			#DIV/0!			
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P.10.17	Letter of Regret							Word / Excel			#DIV/0!			
P.10.18	TEAR Document	Y						Word / Excel	1		0			
P.11 ENGINEERING / DESIGN											#DIV/0!			
P.11.1	GENERAL										#DIV/0!			
P.11.1.01	Document Index							Word / Excel			#DIV/0!			
P.11.1.02	Drawing Registers							Word / Excel			#DIV/0!			
P.11.1.03	Design Criteria	Y						Word / Excel	1		0			
P.11.1.04	Design Calculations										#DIV/0!			
P.11.1.05	Discipline Scope of Work							Word / Excel			#DIV/0!			
P.11.1.06	Design Basis								1		0			
P.11.1.07	Engineering Work Plan	Y									#DIV/0!			
P.11.1.08	Equipment List / Line List / Motor List / Valve List							Word / Excel			#DIV/0!			
P.11.1.09	Instrument Index							Word / Excel			#DIV/0!			
P.11.1.10	I/O Schedules							Word / Excel			#DIV/0!			
P.11.1.11	Standards and General Specifications							Word / Excel			#DIV/0!			
P.11.1.12	Project Specific Specifications and Data Sheets (Equipment, Installation, Functional etc.)							Word / Excel			#DIV/0!			
P.11.1.13	Technical Minutes of Meetings							Word / Excel			#DIV/0!			
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X.04 FABRICATION DATA BOOK (PER DISCIPLINE)											#DIV/0!			
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C.01.02	Incoming Correspondence - Emails / Transmittals / Letters							Word / Excel			#DIV/0!			
C.01.03	Outgoing Correspondence - Emails / Transmittals / Letters							Word / Excel			#DIV/0!			
C.01.04	PCI Certificate							Word / Excel			#DIV/0!			
C.01.05	Daily Reports							Word / Excel			#DIV/0!			
C.01.06	Project Change Notifications (PCN)							Word / Excel			#DIV/0!			
C.01.07	Early Warnings (EW) - Contractor / Employer							Word / Excel			#DIV/0!			
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C.02.04	Contract Cash Flows							Word / Excel			#DIV/0!			
C.02.05	Contract Contingency Reviews							Word / Excel			#DIV/0!			
C.03 QUALITY ASSURANCE											#DIV/0!			
C.03.01	Quality Control Plan (QCP)							Word / Excel			#DIV/0!			
C.03.02	Quality Functional Execution Plan							Word / Excel			#DIV/0!			
C.03.03	Minutes of Meetings Quality Review							Word / Excel			#DIV/0!			
C.03.04	Quality Audits							Word / Excel			#DIV/0!			
C.03.05	QC Test Reports - Test Certificates							Word / Excel			#DIV/0!			
C.03.06	Non-Conformance Reports (NCR)							Word / Excel			#DIV/0!			
C.03.07	Punch List - Defects List							Word / Excel			#DIV/0!			
C.04 RISK											#DIV/0!			
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C.05.02	Safety Inductions							Word / Excel			#DIV/0!			
C.05.03	Medicals							Word / Excel			#DIV/0!			
C.05.04	Incident Reports / Lost Time Injury (LTI)							Word / Excel			#DIV/0!			
C.05.05	Planned Task Observation Forms							Word / Excel			#DIV/0!			
C.05.06	Method Statements							Word / Excel			#DIV/0!			
C.05.07	Safe Work Procedures							Word / Excel			#DIV/0!			
C.05.08	Health and safety Specification							Word / Excel			#DIV/0!			
C.05.09	Toolbox Topics							Word / Excel			#DIV/0!			
C.05.10	DSTI Records (Daily Safety Task Instruction)							Word / Excel			#DIV/0!			
C.05.11	Safety NCR's							Word / Excel			#DIV/0!			
C.05.12	Principal Health and Safety Management Plans							Word / Excel			#DIV/0!			
C.06 COMMISSIONING											#DIV/0!			
C.06.01	Commissioning Functional Execution Plan							Word / Excel			#DIV/0!			
C.06.02	Punch Lists							Word / Excel			#DIV/0!			
C.06.03	Check Out Acceptance Certificates							Word / Excel			#DIV/0!			
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C.06.06	Occupation Plan							Word / Excel			#DIV/0!			
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C.07.01	Asset Capitalisation Forms							Word / Excel			#DIV/0!			
C.07.02	Final Account Statement (FAS)	Y						Word / Excel			#DIV/0!			
C.07.03	Completion Certificates / COC's Certificate of Compliance	Y						Word / Excel			#DIV/0!			
C.07.04	Financial Closeout	Y						Word / Excel			#DIV/0!			
C.07.05	Health and Safety Closeout Reports	Y						Word / Excel			#DIV/0!			
C.08 CONTRACT											#DIV/0!			
C.08.01	Contract Document	Y						Word / Excel			#DIV/0!			
X.01 DOCUMENT CONTROL											#DIV/0!			
X.01.01	Drawing Register							Excel			#DIV/0!			
X.01.02	"Wet" Signature Deliverables (Latest Revision)	Y						Excel	1		0			
TOTALS									16	0	0			

Legend:

Y Yes

DESIGNATION / APPROVALS		
TRANSNET CAPITAL PROJECTS REPRESENTATIVES	SIGNATURE	DATE
PROJECT DIRECTOR		
SENIOR PROGRAMME MANAGER		
PROJECT MANAGER		

Annexure F_ Document Control Process Flow_TPL-DM-WF-0001



Handover of As Built and Other Documents to Drawing Office (Work Instruction)

DOCUMENT APPROVAL PROCESS

NAME		POSITION/MEETING NO.	SIGNATURE	DATE
Originator:	Zandile Moloi	Drawing Office Manager		08 August 2024
Approver:	Petros Khumalo	Senior Support Services Manager	PKhumalo	10 April 2025
Original date: 13 June 2016				
Effective date: 08 August 2024				

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1. PURPOSE:

This standard outline the documentation requirements that are to be implemented by the project managers for the preparation, submission, receipt, review and collection of Technical and (or) deliverable Documentation and Hand over of Documents to the Drawing Office.

2. SCOPE AND APPLICABILITY:

Handover of As Built and Other Documents from Technical Projects to Drawing Office.

3. HEALTH AND SAFETY PRECAUTIONS

All Relevant Health and Safety Issues Covered by the Acts and Regulations.

4. ROLES & RESPONSIBILITIES:

- **Technical Project Managers** – Ensure that the contractor certifies that all final documentation in each of the foregoing areas reflects the 'As-built' status of the facility by ensuring all changes.
- **Document Controller** – Receives all information from Technical Project Managers and verifies information with Drawing Office Team.
- **Drawing Office Manager** – Custodian of As-built and Technical Documentation.

5. TERMS AND DEFINITIONS:

None

6. EQUIPMENT/MATERIAL REQUIRED:

None

7. PROCEDURE:

7.1 Documentation Submission

7.1.1 **Document Submission Format** – All Documentation shall be submitted under a cover of a Transmittal Note.

7.1.2 **Electronic Transmission** – All electronic documentation shall be transmitted on USB drive unless otherwise agreed. *Please Note: Documentation submitted on USB drive must be correctly indexed and submitted with an electronic register (MS Excel).*

7.1.3 **Hard Copy Transmission** – Documentation shall be submitted in printed hard copy format only on request by Project Manager and or by Drawing Office Manager.

7.1.4 **Transmittal Notes** - All documentation shall be submitted under cover of the Transmittal Note indicating all Contract references (i.e., Project No, Contract No, etc.), Project Documentation Number(s), Revision Number, Title, and Chronological listing of transmitted documentation. The Transmittal Note shall state the purpose / issue reason for the documentation submission. The Transmittal shall be signed, date stamped and returned to the Project Manager by Document Control. *Please note: Documents must be checked by Project Manager. The Document Controller from the Drawing Office will assist the Project Manager in creating a transmittal note.*

7.1.5 **Formats and Quantities of Technical and Non-Technical Documentation –** The required number of copies and formats of documents / drawings. A typical example of quantities and formats would be as follows: -

- Preliminary / Pre-Construction – PDF formats
- Construction – PDF formats
- Red Lined – PDF formats
- Certified As-Built / Final – USB drive containing 'Native' file (Drawing in .DWG) and PDF file formats.

7.2 **Final and As-Built Documentation Hand Over –** Upon completion of a Project. The Project Manager is to collect all final and As-Built Documentation from contractors and hand over documentation and drawing to the TPL Drawing Office. Project Managers as to notify the Document Controller or Drawing Office Manager the status of the documentation received. Once Project Manager is ready to hand over documentation the document submission requirements must be adhere to.

8. QUALITY CONTROL

None

9. RECORDS:

- ISO 9001:2000 – Quality Management Systems Requirements.
- SANS 10111 – Code of Practice for Engineering Drawings.
- SANS 10143 – Building Drawing Practice.
- Drawing Office Standard

10. REFERENCES:

- Document Transmittal Note (Attached)

TRANSNET pipelines

Document Transmittal Note

TO :	(Company)	DATE :	(Current Date)
LOCATION :	(Address)	FROM :	(Sender)
ATTENTION :	(Name of Reciever)	PROJECT NO.	(Contract/ Project Number)
		PROJECT DESCRIPTION	(Name of Project)
		TRANSMITTAL NO. :	(Next Sequential Number given by Doc Controller)

PURPOSE OF ISSUE *(indicate with an "X" in the appropriate block)*

☐ APPROVED FOR CONSTRUCTION	☐ FOR APPROVAL	☐ AS - BUILT
☐ APPROVED FOR DESIGN	☐ FOR INFORMATION ONLY	☐ FINAL HANDOVER
☐ FOR TENDER PURPOSES / ENQUIRY	☐ FOR REVIEW / COMMENTS	☐ OTHER
☐ FOR CONTRACT / PURCHASE / SERVICES	☐ RETURN OF DOCUMENTATION	

ADDITIONAL REMARKS BY ORIGINATOR *(if applicable)*

☐ ALL DOCUMENTS OR DRAWINGS HANDOVER ☐ ← Status of documentation

☐ PART OF DOCUMENTS OR DRAWINGS HANDOVER ☐

DOCUMENT NUMBER	REV.	DESCRIPTION	COPY QTY	FORMAT E or H
			1	H

DISTRIBUTION :

NAME

E = Electronic
H = Hardcopy

Sent by : _____ Received by : _____ Date : / /

Signature : _____ Signature : _____ Time : _____

PLEASE CONFIRM RECEIPT BY SIGNING ONE COPY OF THE TRANSMITTAL AND RETURN TO TECHNICAL DOCUMENT CONTROL AS SOON AS POSSIBLE (SHELDON MOONUSAMY)

INTERNAL PURPOSE ONLY (DRAWING OFFICE) *(indicate with an "X" in the appropriate block)*

☐ CREATE CHANGE MASTER ☐ UPLOADED ONTO SAP CHANGE MASTER REFERENCE

Name: _____ Signature : _____ Date : / /

Time : _____

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11. DOCUMENT CHANGE HISTORY:

The owner of this document is responsible for the revision and control of the document, including updating of the table below, which contains the history of the document with details of each revision.

Date	Previous Rev No.	New Rev No.	Details of Revision
13/06/2016	00	00	New Template
08/08/2024	00	01	Electronic Transmission edited

This table summarises what has been changed in the document so that it is easy to keep track of the effected changes.

SUMMARY VERSION CONTROL

VERSION NO.	NATURE OF AMENDMENT	PAGE NO.	DATE REVISED
1	Converted to new format with information and edited with latest requirements		01/08/2025

Note: Only latest amendments and/or additions are reflected in italics in the body of the document

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1. PURPOSE

The purpose of this of this Standard Operating Procedure is to establish guidelines for layout, plot plan, equipment, civil, piping, instrumentation and electrical model reviews during the Engineering and Construction phases of the Project. The purpose of a 3D equipment and piping model review is to assess constructability, accessibility, maintainability and safe operation of the plant.

2. APPLICABILITY

This Standard Operating Procedure applies to contactors and designers and project development for the Business

3. DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

3.2 Abbreviations

4. ACCOUNTABILITY, RESPONSIBILITY AND AUTHORITY

Project office and drawing office adherence to the guidelines to implement and guide standardization

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5. STANDARD OPERATING PROCEDURE

Number of client model reviews to be done

5.1. The formal reviews envisaged are the 30%, 60%, 90% and 100% 3D model reviews. The main purpose of these reviews is as follows:

90% model review does not end the process as there are minor and as built changes to complete the handover of a 100% model at end of document stage

This document is envisaged as a guide to meet expectations and to be formally clarified and agreed prior to reviews scheduled and minimal changed expected. Level of detail for equipment and buildings and some instances internals of for every % of review needs a bit of clarification and needs to be done prior to review preferably during project design clarification.

Level of accuracy to be declared prior to each step and impacts to be discussed and clarified of the below requirements
Specifications to be clarified and agreed including TPL specifications

5.1.1. 30% model review:

Approved/ proposed plot plan and layout

Earth works

Layout including bunds and equipment

All process pipelines 3" and above (main runs and herringbones of drain lines)

Civil and structural supports

Structures and platforms and staircases
Assess constructability including rigging study
Review all operational and maintenance aspects
Review all equipment nozzle locations and appurtenances.

5.1.2. 60% model review

Review all process lines not reviewed during the 30% review

Confirm that equipment is modelled in accordance with the vendor information.

Review all operational and maintenance aspects
Review all safety aspects of the design.
Major E&I rack runs

5.1.3. 90% model review

All E&I cable racking and routing and locations to be reviewed.

The balance of the lines.

5.1.4. 100% model review

Minor changes – to be agreed with client
As built updating and finalization prior to handover docs

The schedule of these reviews shall be finalized considering the model status required for the different review models.

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5.2. Model status required before arranging the model reviews

As a general guideline the status of the model required to justify a 30%, 60%, 90% or 100% model review are as described below in point 3.1 to 3.3.

Any deviation from this standard is to be agreed between the contractor and the client before the model review will proceed. Exception lists will be populated and decision register completed

5.2.1. 30% Model status to be presented at the review

The model presented at a 30% model review includes the following

- Proposed / Approved Plot plan and fence lines Proposal to finalize plot plan layout
- Access roads in and out of depot within local municipal approvals and guides
- HAZOP'ed P&ID's
- Signed off and marked up P&Ids related to 30% modelling
- Existing services – confirmed

- Fenceline and fences/ gates and access routes in and out
- Earthworks levels and requirements
- All buildings and structures
- Bund walls and tank farm / manifold locations and floors (slopes) low point drain pits
- Roads, kerbs and access ways including emergency escape and maintainability
- Proposal of equipment layouts
- Confirm that equipment is modelled in accordance with the datasheets.
- All equipment including all nozzles based on mechanical datasheets and catalogue information. Review all equipment nozzle locations and appurtenances.
- Confirmed equipment heights to ensure drain lines will have 1:100 slope.
- Drop zones for maintenance and rigging purposes (plan and study)

- All process lines included
- Vent, drain, relief lines main headers and herring bones
- Applicable to process piping, Fire system, oily water, storm water, potable water
- Major Electrical/ instrument sleeving and draw boxes
- Proposal of Major cable trays and supports Major instrument racks and junction boxes

- Pipe racking and sleeper ways pipe bridges and requirements Civil and structural supports
- Underground services and crossings including isolation valve and instrument chambers
- Oily water and storm water
- Potable water layouts
- Major structures and platforms and staircases
- Major civil structures and access ways

- Major Security mast, draw boxes and lighting infrastructure
- Assess constructability including rigging study
- Review all operational, maintenance and legal compliance aspects

5.2.2. 60% Model status to be presented at the review

The model presented at a 60% model review includes the following

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- Signed off comments from the 30% model review. Included complete review of all modified piping due to impacts of the 30% comments
- Signed off P&IDS and marked up P&Ids related to 60% modelling
- Signed off plot plan
- All equipment including all nozzles and connections based on vendor drawings approved for fabrication (B approval) excluding package units.
- Space indication and orientation for packaged units.
- All structures, operating and maintenance platforms.
- All building and accessories, HVAC and structural steel
- Building internals based on drawing and access requirements
- All access routes (routine and emergency)
- All process lines not reviewed during the 30% review (including supports, hangers etc)
- Underground detection complete
- Utility stations, Safety showers and eye baths
- Drop zones for maintenance rigging purposes
- Applicable to process piping, Fire system, oily water, storm water, potable water
- Electrical/ instrument sleeving and draw boxes
- structures and platforms and staircases
- Review all operational, maintenance and legal compliance aspects

5.2.3. 90% Model status to be presented at the review

The model presented at a 90% model review includes the following

- Signed of comments from the 60% model review. Included complete review of all modified piping due to impacts of the 60% comments
- All equipment including all nozzles and connections based on vendor drawings approved for fabrication (B approval) including package units.
- All structures, operating and maintenance platforms.
- A|l building and accessories and structural
- All access routes (routine and emergency)
- All piping (including supports, hangers etc)
- Utility stations Safety showers and eye baths
- Drop zones for maintenance rigging purposes
- All field mounted instrumentation, analysers, junction boxes and cable racks, including all associated equipment and pipe nozzles
- Review all operational, maintenance and legal compliance aspects (signage)

5.2.4. 100% review

- Minor changes – to be agreed with client
- As built updating and finalization prior to handover docs

5.3. Internal 3D model reviews

The model shall be reviewed during an internal model review by contractor/ Designer/ representative prior to the client model review meeting. This internal model review will be

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conducted under the leadership of the piping lead engineer in conjunction with a multi-disciplinary design team.

During this review the team will decide which lines/ equipment will be offered to the client to review and use the associated colour coding. Any deviation from the model status as described in section 3 must be agreed with the client prior to the review.

The following information must be available at the model review:

- Unit area plot plan
- Underground layout drawing
- Snapshot of area (color coded)
- Register of all drawings with the revisions that were used for modelling.
- P&ID's. These P&ID's will reflect the latest design and therefore may be hand marked up.
- A complete list of lines and equipment which are going to be offered for review. (if this is not the complete design then this will be a partial review and not a completed % review)

5.3.1. Colour coding

The following colour code is to be followed while preparing the review file for lines:

Bright Green - Ready for internal review:

Once the design of a line is complete, the design engineer will change the colour of the line to bright green. All lines that are bright green will be presented to the design team during the internal model review.

Dark Green — Not ready for client review:

All lines that are not ready for internal model review will remain dark green. These lines are therefore not ready for review. During the internal model review the design team will judge whether a line is ready to be presented to the client. In the event where a line requires significant change and is deemed not ready for the client review the line colour will be changed from bright green to orange pending the implementation of the review comments. No dark green lines will be reviewed during the client model review.

Orange — Ready for client review.

(Client preference of colour coding per product as a solution to minimise confusion to be resolved by contractor and client during clarification meetings prior to review)

All bright green lines will be reviewed during the internal model review. When the design team is satisfied with the quality of the line the colour of the line will be changed to orange indicating that the line is ready for client review. During the client review, only orange lines will be reviewed.

Client **3D model reviews**

Pink - Client comments incorporated

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The minutes of the model review will be issued to the design engineers. These comments will be incorporated into the model. Once the comments have been incorporated the line colour will be changed to pink. (if any changes caused other lines to be modified these will then also change to orange for client review)

These lines will be checked during the model comments sign-off session. The lines will be reviewed during the sign-off session but merely checked to confirm that the comments were correctly implemented.

Sky Blue - Release for construction

Once all comments are correctly incorporated the lines will be release for construction and the line colour will be changed to sky blue

Equipment

The following colour code is to be followed while preparing the review file for equipment:

Cyan - Issued for internal review

Equipment with a cyan colour is modelled based on catalogue information and mechanical datasheets. The equipment will be reviewed by the design team

Orange - Issued for client review

Once the design team is satisfied that the equipment accurately reflects the catalogue information and mechanical datasheets, the colour of the equipment is changed to orange. These pieced of equipment is to be reviewed during the client review.

Sky Blue - Released for fabrication/ construction

Once the equipment is release for fabrication the colour will change to sky blue. This implies that nozzle orientation and nozzle loads have been issued to the vendor for fabrication

5.4. Client 3D model review meeting

5.4.1. The Contractor shall arrange the review with the client and ensure that all required parties are present at the review.

5.4.2. The review will be chaired by an contractor representative and led by the Piping Lead Engineer with the attendance of the client. Other disciplines shall also be given the opportunity to participate whenever they consider appropriate.

5.4.3. The review model shall be viewed by means of a projected image onto a wall mounted screen. This facilitates easy viewing for all the participants.

5.4.4. Only lines colour coded for client review shall be reviewed.

5.4.5. Equipment shall only be reviewed to confirm that the equipment conforms to the design documentation with the exception of nozzle orientation and appurtenances which can be reviewed during the 30% model review. The design documents will be reviewed as part of the squad check process and not as part of the model review.

5.4.6. All comments made during the review will be added to the model as a label. Snapshots, taken of these labels, will be issued as the part of the minutes of meeting.

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These labelled comments can be seen by all participants on the screen and it is the responsibility of every participant in the review to ensure that these comments are captured correctly and unambiguously.

5.4.7. In the event that significant changes are made during the model review, the lead piping engineer will terminate the model review of the line/equipment and will revert it back to design review stage.

5.5. Reporting

5.5.1. The Piping Lead Engineer shall issue the minutes of meeting within 5 working days after the model review meeting. These minutes shall include an attendance register and all the labelled comments made during the review. (Snapshots and comments)

5.5.2. A summary of the minutes indicating all actions to be taken, as well as indicating items requested by the client that are considered additional scope, are to be issued with the minutes.

5.5.3. With the minutes a statement as to the necessity of follow-up design reviews is to be made.

5.5.4. Formal acceptance and reply to address the short comings or disagreements

5.6. Close out of model review comments

5.6.1. No additional scope will be incorporated based on the model review comments unless instructed by the Client to proceed.

5.6.2. The next review will not commence until previous model review comments are signed off. Only the comments will be addressed during the sign off session. The lines will not be reviewed again. The sign off session can be arranged as a separate session or as the beginning of the next review. In either event the next model review will not commence without these comments signed off. Comments need to be signed off by the party that made the comment

5.6.3. Once the comments are signed off the colour code of the line will be updated.

6. RECORDS

7. ANNEXURES

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