Specification

Technical Specification - Piping and Instrumentation Diagrams

Table of Contents

Revision details 3

Introduction 3

Copyright 3

General Terms, Definitions and Acronyms 3

1. General 4

1.1 Introduction 4

1.2 Scope 4

1.3 Compliance and Departures 5

1.4 Proprietary items 6

1.5 References 6

2. P&ID Fundamentals 7

2.1 General 7

2.2 Applicable Standards 7

2.3 Intelligent P&IDs 8

2.4 P&ID Deliverables 9

2.5 Management of Existing P&IDs 11

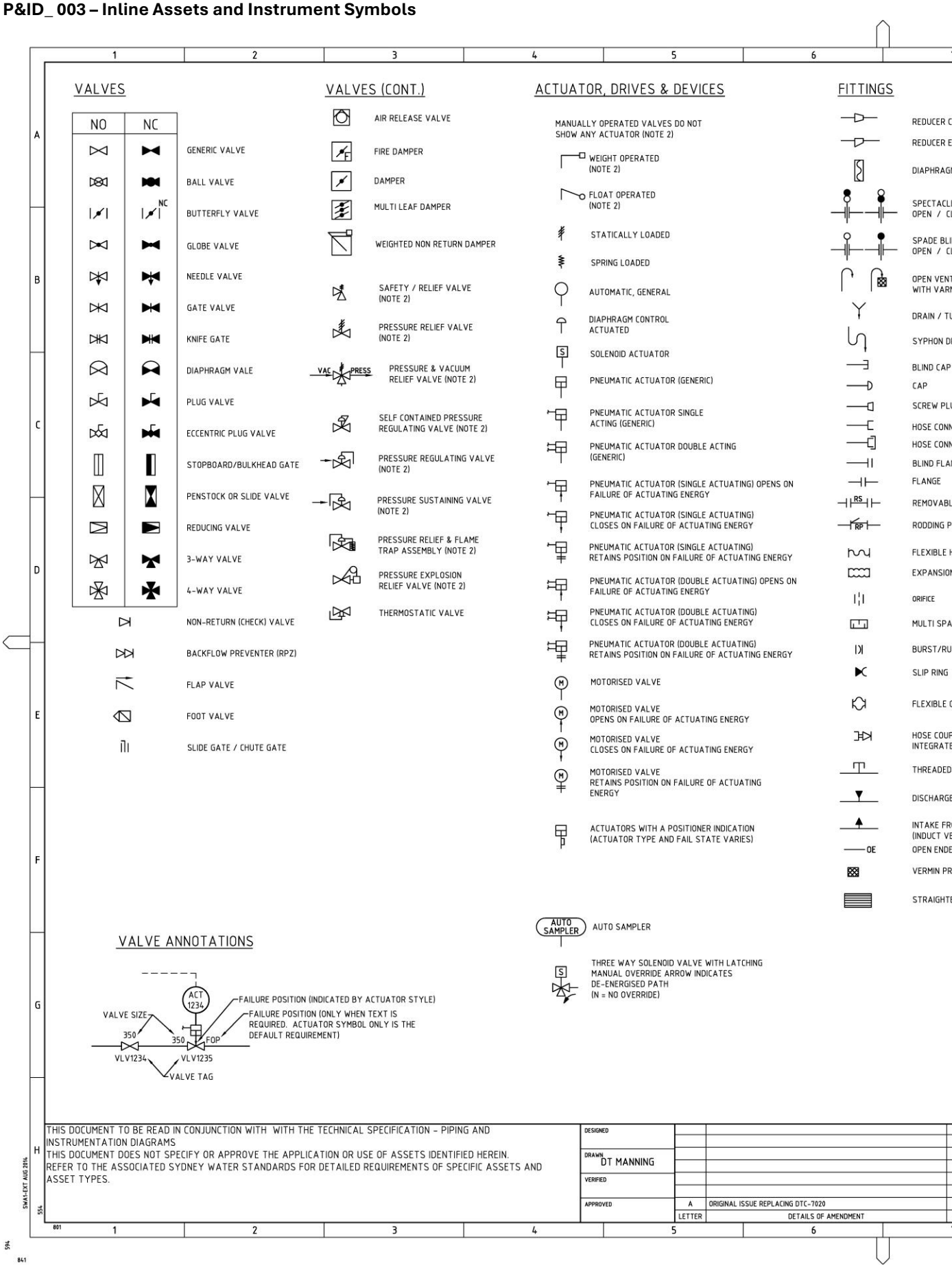
3. P&ID Symbol Sheets 12

3.1 CAD Blocks and Native Files 12

3.2 P&ID_001 – Asset Types and Abbreviations 14

3.3 P&ID_002 - Line Legend and Instrument Symbols 15

3.4 P&ID_ 003 – Inline Assets and Instrument Symbols



.....16
3.5 P&ID_004 – Equipment Symbols 17
3.6 P&ID_005 - Miscellaneous Symbols 18
3.7 P&ID_006 - Redundant Symbols and Legend Reference 19

Ownership 20

Ownership.....20
Change history 20

Appendix 1 Frequently Asked Questions 21

Revision details

Version No.	Clause	Description of revision
1	ALL	New Document

Introduction

This Specification is for the design, drafting and supply of Piping and Instrumentation Diagrams for Sydney Water assets.

Sydney Water makes no warranties, express or implied, that compliance with the contents of this Specification shall be sufficient to ensure safe systems or work or operation.

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General Terms, Definitions and Acronyms

The Terms, Definitions and acronyms listed below are a selection of those specifically relevant to this specification. For a full list of terms and definitions refer to the Sydney Water Digital Engineering Standard Appendix A - Terms and Definitions Reference and the Sydney Water editorial style guide.

Acronym	Definition
P&ID	Piping and Instrumentation Diagram
P3D	AutoCAD Plant 3D (authoring application)
DE	Digital Engineering
SWC	Sydney Water Corporation

1. General

1.1 Introduction

This Specification establishes the minimum requirements for the design, drafting, development and delivery of Piping and Instrumentation Diagrams (P&IDs) for Sydney Water assets. P&IDs are critical engineering documents used throughout the asset lifecycle to communicate:

- process intent
- equipment configuration
- piping systems
- instrumentation
- control functions
- operational requirements

They support planning, design, construction, commissioning, operation, maintenance and asset management activities across all of Sydney Water's assets.

The purpose of this Specification is to achieve a consistent approach to P&ID creation across Sydney Water projects by standardising symbology, conventions, drafting requirements and associated data attributes. Standardisation improves the reusability, repeatability, quality, readability and maintainability of P&IDs while enabling greater interoperability between engineering documentation, asset information systems and Digital Engineering environments.

This Specification introduces a standardised symbol library and drawing layout conventions, supported by structured data requirements to facilitate the capture and exchange of engineering and asset information. By adopting consistent symbols and associated metadata, Sydney Water can improve data quality, reduce ambiguity between projects, support integration with digital design tools such as AutoCAD Plant 3D, and more effectively leverage P&ID data, the development of digital asset models and Digital Twin initiatives.

The use of consistent P&ID standards also delivers whole-of-life benefits by improving information handover, reducing rework, supporting asset maintenance and enhancing the reliability of information used within Sydney Water.

This Specification is intended to replace the requirements currently contained within Sydney Water Deemed to Comply (DTC) drawings DTC-7018, DTC-7019 and DTC-7020 and any other previous P&ID drafting specifications, symbol libraries and guidance. The requirements defined herein supersede those DTC drawings and all previous specifications, symbols and guidance unless otherwise stated by Sydney Water.

This Specification is not intended to be a stand-alone document. Project-specific requirements, design documentation and other Sydney Water standards and specifications must be applied in conjunction with this Specification.

1.2 Scope

This Specification covers the minimum requirements for the creation, modification, review and acceptance of Piping and Instrumentation Diagrams (P&IDs) for Sydney Water projects and assets.

The Specification applies to all personnel and organisations involved in the development, verification, approval or use of P&IDs, including Sydney Water employees, consultants, designers, contractors, delivery partners and asset operators.

The requirements of this Specification apply to P&IDs developed for all Sydney Water assets and systems. This includes the creation of new P&IDs, modification of existing P&IDs and review activities undertaken throughout the asset lifecycle.

AutoCAD Plant 3D is Sydney Water's standard and preferred platform for the creation and management of P&IDs. Where an alternative software platform is used, the resulting P&ID must comply with the requirements of this Specification, including the use of Sydney Water standard symbology, naming conventions and associated data structures.
This Specification defines requirements for Standard P&ID symbology, drawing layout and presentation standards. For requirements specific to the setup and use of AutoCAD Plant 3D refer to the Digital Engineering Standard Appendix J: BIM Design Guide.

This Specification does not define:

- detailed process design requirements
- instrumentation design requirements
- process fluid type codes
- piping material codes or requirements
- control philosophies
- asset numbering
- asset operational requirements

These requirements must be addressed through the applicable Sydney Water standards, Technical specifications, project specifications and design documentation.

Where discrepancies exist between this Specification and project-specific requirements, the matter must be referred to Sydney Water for resolution.

1.3 Compliance and Departures

All Sydney Water projects creating, modifying, reviewing or delivering Piping and Instrumentation Diagrams (P&IDs) shall comply with the requirements of this Specification.

Where an existing asset, project requirement, software limitation or other circumstance prevents compliance with a requirement of this Specification, the proposed departure shall be documented and submitted to Sydney Water for review and approval.

Any approved departure shall:

- clearly identify the clause(s) affected
- describe the reason for the departure
- document the proposed alternative approach
- assess any impacts on asset information, interoperability, maintainability or future reuse

Departures shall not be implemented unless approved by Sydney Water.

Where no approved departure exists, full compliance with this Specification shall be required.

1.4 Proprietary items

This Specification establishes requirements for P&ID symbology, drafting conventions and associated data structures and does not nominate proprietary products or equipment.

1.5 References

Document type	Title
Compliance obligations	Not applicable
Policies and procedures	Sydney Water Digital Engineering Standard Sydney Water Digital Engineering Standard, Appendix B: Asset Information Requirements Sydney Water Digital Engineering Standard, Appendix J: BIM Design CPDMS0021 WAC Drawing Asset Information Specification
Industry Standards	ISO 14617 Graphical Symbols for Diagrams ISO 10628-1 Diagrams for the Chemical and Petrochemical Industry: Specification of Diagrams ISO 10628-2 Diagrams for the Chemical and Petrochemical Industry: Graphical Symbols ISA 5.1 Instrumentation Symbols and Identification
Other documents	Technical Specification - Instrumentation and Control (HSS0009) Technical Specification - Mechanical (BMIS0209) Asset Data Requirements (D0001844) AutoCAD Plant 3D Project Template DTC-7018 (superseded by this document) DTC-7019 (superseded by this document) DTC-7020 (superseded by this document)

2. P&ID Fundamentals

2.1 General

A Piping and Instrumentation Diagram (P&ID) is a schematic representation of a process system that communicates the functional relationship between process equipment, piping systems, valves, instruments, control systems and operational interfaces.

P&IDs are used throughout the asset lifecycle to support planning, design, safety reviews, construction, commissioning, operation, maintenance and modification of Sydney Water assets. As the primary process schematic, the P&ID serves as a common reference for engineering disciplines, operations personnel, maintainers and asset managers.

P&IDs shall provide a clear and consistent representation of the design intent of a system. The level of detail presented shall be sufficient to describe the process operation, to inform the process control philosophy, show asset tags and relationships without introducing unnecessary complexity or construction-level detail.

P&IDs are not intended to represent:

- Physical equipment dimensions or geometry.
- Equipment location or spatial arrangement.
- Detailed piping routing.
- Detailed electrical design information, electrical device schedules or complete instrumentation asset inventories.
- Structural, architectural, electrical or civil design information not required for process understanding.

All P&IDs developed for Sydney Water shall prioritise:

- Process intent representation.
- Clarity of communication.
- Consistency of presentation.
- Ease of interpretation.
- Accuracy of engineering information.
- Compatibility with digital engineering workflows.
- Structured asset information suitable for lifecycle management.

2.2 Applicable Standards

In addition to this Specification, P&IDs shall be developed in accordance with the latest editions of the relevant standards and Sydney Water specifications as detailed in 1.5 References.

Where requirements differ between referenced standards, the requirements of this Specification shall take precedence unless otherwise directed by Sydney Water.

Where a requirement is not specifically addressed within this Specification, the principles contained within ISO 14617-1, ISO 14617-2, ISO 10628-1, ISO 10628-2 and ISA-5.1 are to be adopted.

2.3 Intelligent P&IDs

2.3.1 Intelligent P&IDs

An Intelligent Piping and Instrumentation Diagram (P&ID) is a P&ID developed using a data-centric authoring platform in which graphical symbols represent engineering objects that contain structured information and maintain defined relationships with other engineering objects, rather than existing solely as graphical elements.

In a traditional CAD environment, a P&ID is primarily a graphical drawing consisting of lines, symbols and text. While the drawing may visually represent a process system, the authoring software does not inherently recognise the engineering meaning of the graphical content. Equipment, valves, instruments and pipelines are represented as CAD objects with little or no associated engineering intelligence.

In an Intelligent P&ID environment, equipment, valves, instruments, pipelines and other process assets are represented by intelligent engineering objects that contain associated properties, metadata and object relationships. Examples of information that may be associated with an intelligent object include:

- asset tag
- asset name
- asset classification
- line number
- status
- process attributes
- operational information
- other engineering or asset information required by Sydney Water

This information forms part of the P&ID and can be used to support validation, reporting, coordination and asset information management activities.

The key difference between traditional CAD-based P&IDs and Intelligent P&IDs is that traditional P&IDs primarily communicate engineering information visually, whereas Intelligent P&IDs communicate engineering information through both graphical representation and structured data. As a result, Intelligent P&IDs function as both engineering drawings and engineering information sources

The use of Intelligent P&IDs supports improved consistency, standardisation and quality across projects by enabling controlled tagging, structured information capture, automated validation and more efficient management of engineering information. Intelligent P&IDs also improve the reusability of information throughout the asset lifecycle by enabling engineering and asset information to be retained, validated and reused beyond the completion of an individual project

Within the industry, the terms Smart P&ID and Intelligent P&ID are often used interchangeably. For the purposes of this Specification, Sydney Water adopts the term Intelligent P&ID to describe P&IDs that combine standardised graphical representation with structured engineering and asset information. This terminology has been selected to provide consistency across Sydney Water documentation and to avoid confusion with vendor-specific product names and marketing terminology.

Sydney Water regards Intelligent P&IDs as engineering information assets rather than drawing deliverables alone. The use of standardised Intelligent P&IDs supports improved project consistency, increased drawing reusability, more efficient project delivery, improved asset information quality, and provides a foundation for Digital Engineering initiatives, future Digital Twin capabilities and ongoing operational value throughout the asset lifecycle.

2.3.2 Intelligent P&IDs at Sydney Water

Sydney Water has adopted Intelligent P&IDs as the mandatory approach for all new P&ID development unless otherwise approved by Sydney Water Digital Engineering.

All new P&IDs shall be created using Sydney Water's approved Intelligent P&ID workflows and shall incorporate structured engineering information in addition to graphical representation.

Modifications to existing P&IDs shall utilise Intelligent P&ID workflows where the existing source information is available in a compatible authoring environment.

The use of Intelligent P&IDs supports the objectives of this Specification by enabling the consistent application of standardised symbology, drafting conventions and associated engineering information across all projects and operational assets.

To support consistency and interoperability, Sydney Water maintains a standard AutoCAD Plant 3D project template incorporating approved symbol libraries (refer to 3.1 CAD Blocks and Native Files), project settings and supporting content. The template provides a common starting point for the development of Intelligent P&IDs and assists in reducing project-specific variations in drafting practices and asset representation.

The use of a common Intelligent P&ID authoring environment improves drawing consistency, facilitates the reuse of engineering information between projects and supports the long-term management of P&ID information throughout the asset lifecycle.

Sydney Water regards Intelligent P&IDs as engineering information assets that provide value beyond the completion of individual projects. Standardised Intelligent P&IDs support improved information quality, more efficient project delivery, ongoing asset management activities and provide a foundation for future Digital Engineering and Digital Twin initiatives.

Sydney Water has adopted AutoCAD Plant 3D as the standard authoring platform for the creation and management of Intelligent P&IDs. All new Intelligent P&IDs and modifications to existing Sydney Water Plant 3D P&IDs shall utilise the current Sydney Water Plant 3D project template unless otherwise approved by Sydney Water Digital Engineering.

2.4 P&ID Deliverables

P&IDs developed for Sydney Water shall be provided as two separate deliverables to support both document management and ongoing engineering use.

- The first deliverable is the controlled P&ID drawing submitted to Sydney Water's Electronic Document Management System (EDMS). This serves as the official engineering document for review, approval, construction, operation and maintenance purposes.

- The second deliverable is the native Intelligent P&ID authoring project. This preserves the underlying engineering intelligence, object relationships, structured data and project configuration that cannot be fully retained within the EDMS environment.

The Intelligent P&ID is the source authoring model from which the controlled drawing is generated.

The provision of both deliverables ensures that Sydney Water retains both the controlled document record and the Intelligent P&ID required to support future project delivery, Digital Engineering initiatives and ongoing reuse of engineering information.

The Intelligent P&ID shall be regarded as the source authoring model for the corresponding EDMS drawing deliverable. The EDMS drawing shall be generated from the Intelligent P&ID and both deliverables shall remain consistent in design intent, asset representation, tagging and engineering information.

The Intelligent P&ID within the Plant 3D project will be retained by the Sydney Water Digital Engineering and made available to future projects to edit on request to digital.engineering@sydneywater.com.au.

2.4.1 EDMS Deliverables

P&ID drawing deliverables shall be submitted to Sydney Water's Electronic Document Management System (EDMS) in accordance with applicable document control and submission requirements.

The EDMS deliverable represents the approved engineering drawing and shall be considered the controlled project record.

EDMS deliverables shall comply with Sydney Water requirements for drawing numbering, title blocks, document control and submission procedures.

2.4.2 Intelligent P&ID Deliverables

Where Intelligent P&IDs are developed, the complete native Intelligent P&ID project shall also be submitted as a separate deliverable to those submitted to EDMS. The Intelligent P&ID deliverable shall comprise an unaltered copy of the AutoCAD Plant 3D project, including all associated drawings, databases, project configuration files and supporting content required to maintain the functionality of the project.

The Intelligent P&ID deliverable is required because the engineering intelligence contained within a Plant 3D project cannot be fully retained within the EDMS environment. Submission of the native project ensures that engineering information, object relationships, asset associations, validation capability and project configuration remain available for future reuse and modification.

The primary purpose of the Intelligent P&ID deliverable is to improve the efficiency of future project delivery by allowing subsequent projects to build upon, modify and extend existing Intelligent P&IDs rather than recreate information from static drawings.

The Intelligent P&ID deliverable also aligns with Sydney Water Digital Engineering objectives and supports future Digital Twin capabilities.

2.4.3 P&ID Minimum Delivery Data Requirements

Intelligent P&IDs shall contain structured engineering information sufficient to support engineering, operations, asset management and future Digital Engineering use cases. Minimum information requirements shall comply with the Sydney Water Digital Engineering Standard Appendix B: Asset Information Requirements (AIR). Information represented within Intelligent P&IDs shall be consistent with corresponding information contained within other project deliverables, including 3D models and asset information deliverables.

Table 1: Example minimum data requirements

Asset Class	Minimum Information
Equipment	Asset Tag, Asset Name, Equipment Type, Status
Manual Valves	Asset Tag, Valve Type, Size, Status
Control Valves	Asset Tag, Valve Type, Control Function, Size, Actuator Type, Status
Instruments	Asset Tag, Instrument Type, Loop Number, Status
Pipelines	Line Number, Service Type, Material Specification, Size, Status
Process Connections	Identification and relationship to connected assets

The AIR remains the governing source for attribute requirements, mandatory data fields and detailed information requirements by asset class.

The Project Delivery design team is responsible for ensuring that information contained within Intelligent P&IDs is accurate, complete and consistent with associated engineering deliverables at each project delivery stage.

2.5 Management of Existing P&IDs

Where an existing P&ID is being edited by a project (in any way), the following rules apply.

a) The Sydney Water EDMS system must record the drawing as being checked out to the project.

b) The intelligent P&IDs to be requested from Sydney Water Digital Engineering, who will provide a copy for editing by the project. The Digital Engineering team will maintain a register of who has checked out which intelligent drawings.

c) Existing standard “WAC Drawing Asset Information Specification” process to be flowed. For example:

   a. Title block shall be updated to the latest Sydney Water Title block.

   b. The drawing number shall be updated to the current SWC convention.

   c. Where a drawing number is updated the previous drawing number shall be added to the “This Drawing Supersedes” field in the title block.

d) During project delivery stages existing unaffected areas of the drawing are to be covered in a light grey, semi-transparent, solid hatch to indicate that it is existing and not affected by the project. The hatch shall be removed before delivery at WAC.

e) Where the existing drawing is a P3D drawing the existing assets are to have the Status field changed to “Existing”, or other suitable status as required to differentiate them from the project.

f) Tie-in points should be shown with unique numbers where existing piping systems connect to new systems.

g) All new work involving changes to piping or tagged assets on existing P&IDs shall be developed using Plant 3D intelligent P&ID workflows. Note: Areas of the existing P&ID unaffected by project scope does not need to be converted to intelligent P&ID elements.

h) Existing drawing content directly affected by the scope of works shall be updated to comply with the requirements of this Specification.

i) Project teams are encouraged to correct identified non-compliances outside the immediate scope of work where practical and cost-effective to do so.

j) Where significant remediation of legacy content is required, the extent of remediation shall be agreed with Sydney Water Digital Engineering as part of project scope definition.

k) Projects shall not be deemed automatically responsible for full drawing remediation unless specifically included within the approved project scope.

3. P&ID Symbol Sheets

The following sheets are provided here for reference. The master reference for P&ID symbology is the CAD version included as DWG files in the AutoCAD Plant 3D project template available on Delivery Portal.

3.1 CAD Blocks and Native Files

The symbol sheets included within this Specification are provided as a visual reference only. The master source for all approved Sydney Water P&ID symbols is the native CAD content provided within the Sydney Water AutoCAD Plant 3D project template.

The Plant 3D project template contains the approved P&ID symbols, classes, Plant 3D tool palettes, project configuration and associated content required to develop Intelligent P&IDs in accordance with this Specification. Where differences exist between the symbol sheets contained within this document and the native CAD content, the native CAD content contained within the latest Sydney Water Plant 3D project template shall take precedence. Sydney Water will update this document to align with future template revisions as required.

Project teams shall utilise the approved Sydney Water Plant 3D project template and associated symbol library when creating new Intelligent P&IDs or modifying existing Sydney Water Plant 3D P&IDs. The use of project-specific or non-approved symbols shall be avoided unless approved by Sydney Water.

The latest Sydney Water Plant 3D project template and associated CAD content can be obtained from the Sydney Water Delivery Portal (Ref-1080) (*https://swdelivery.com.au/reference/1080*).

The location of the native AutoCAD P&ID symbol library within the template is: \SW-Plant3D-Template\PID DWG\P&ID001-6.dwg, it can also be seen in the Plant 3D Project Manager.

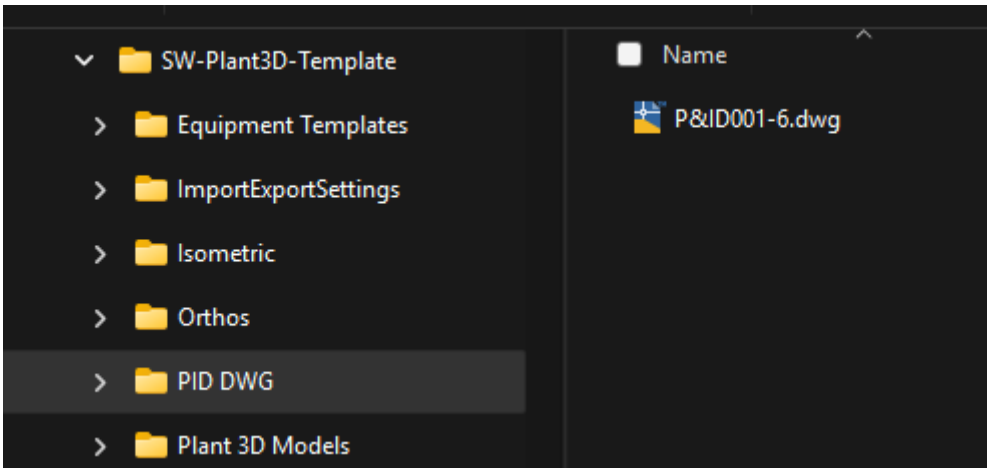


Figure 1: P&ID Symbols Drawing path within the Plant 3D project template

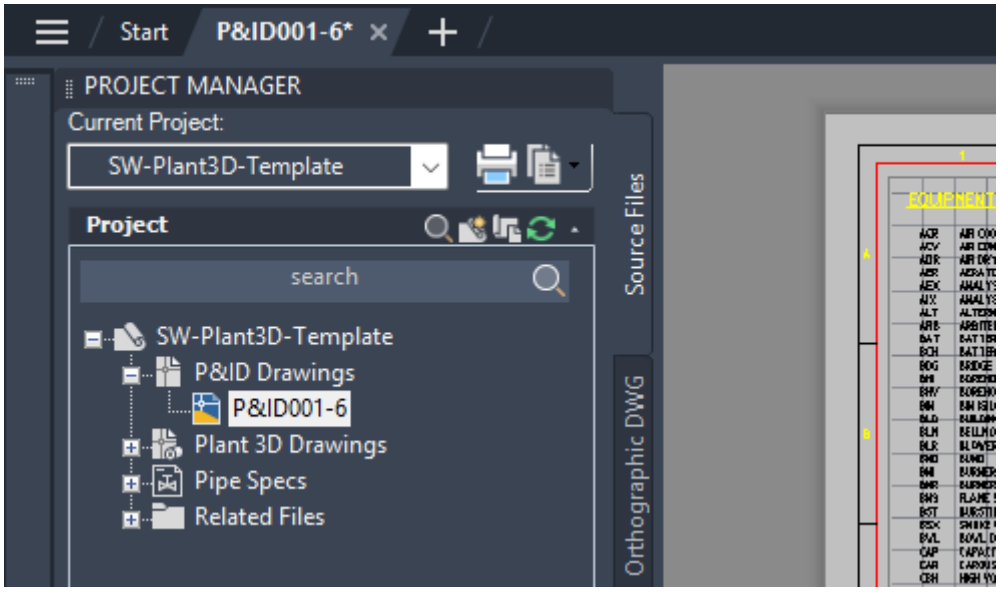


Figure 2: P&ID Drawing in Plant 3D Project Manager

New symbols shall not be introduced into Sydney Water P&ID deliverables without approval from Sydney Water Digital Engineering. Requests and proposals for new symbols, modifications to existing symbols, or additions to the Sydney Water P&ID symbol library should be submitted to Sydney Water Digital Engineering for review and incorporation into future template updates.

3.2 P&ID_001 – Asset Types and Abbreviations

EQUIPMENT PREFIXES

ACR	AIR COOLER
ACV	AIR CONTROL VALVE
ADR	AIR DRYER
AER	AERATOR OR PADDLE
AEX	ANALYSER ELEMENT
AIX	ANALYSER INDICATOR
ALT	ALTERNATOR
ARB	ARBITER
BAT	BATTERY
BCH	BATTERY CHARGER
BDG	BRIDGE (FIXED)
BHI	BOREHOLE INCLINED
BHV	BOREHOLE VERTICAL
BIN	BIN (SILO OR HOPPER)
BLD	BUILDING
BLM	BELLMOUTH
BLR	BLOWER
BND	BUND
BNI	BURNER IGNITER
BNR	BURNER
BNS	FLAME SENSOR
BST	BURSTING DISC
BSX	SMOKE OR FIRE DETECTOR*
BWL	BOWL DRIVE (CENTRIFUGE)
CAP	CAPACITOR BANK
CAR	CAROUSLE (BAGGING)
CBH	HIGH VOLTAGE CIRCUIT BREAKER
CBL	LOW VOLTAGE CIRCUIT BREAKER
CBM	MEDIUM VOLTAGE CIRCUIT BREAKER*
CEQ	COOLING EQUIPMENT
CFG	CENTRIFUGE
CGP	CHLORINE GAS PROTECTION PANEL
CHB	CHAMBER
CHN	CHANNEL
CLR	CLARIFIER
CLT	CHLORINATOR
CNL	CANAL
COM	COMMUNICATIONS PANEL
CON	CONVEYOR
CPO	CONTROLLED POWER OUTLET
CNB	CHAIN BLOCK/PULLEY
CPR	COMPRESSOR
CRN	CRANE
CRU	CRUSHER
CRX	LIFTING EQUIPMENT STRUCTURES (DAVIT)
CTW	COOLING TOWER
CYC	CYCLONE
CYL	CYLINDER
DAM	DAM
DEC	DECANTER
DIF	DIFFUSER
DIG	DIGESTER
DIS	DISTRIBUTION BOARD
DMP	PULSATION DAMPER
DRM	DRUM
EEX	ELECTRICAL EQUIPMENT
EJR	EDUCTOR
ELP	ELECTRICAL PANEL
ENG	ENGINE
EVP	EVAPORATOR
FAN	FAN
FAR	FLAME ARRESTER
FCR	FLOW CONTROLLER (IN WETLANDS)
FDR	FEEDER
FEN	FENCE
FFQ	FIRE FIGHTING EQUIPMENT*
FIP	FIRE INDICATOR PANEL*
FIX	FLOW INDICATOR OR GAUGE / ROTAMETER
FLT	FILTER
FTP	FEILD TERMINATION PANEL
FTR	FLAME TRAP
GAL	GALLERY
GAT	GATE
GBX	GEARBOX
GDP	GAS DETECTION PANEL
GEN	GENERATOR
HOS	HOIST
HSE	EMERGENCY STOP OR PULL-WIRE
HSX	HANDSTATION OR SELECTOR SWITCH
HTR	HEATER OR BOILER
HVD	HIGH VOLTAGE DISTRIBUTION
HVS	HIGH VOLTAGE STARTER
HXR	HEAT EXCHANGER
HYD	HYDRAULIC POWER PACK
HYV	HYDRANT (VALVE)*
IGV	INLET GUIDE VANE
KLX	KLAXON, SIREN, HOOTER, BELL
LCP	LOCAL CONTROL PANEL
LFT	LIFT(PASSENGER OR SERVICE LIFT)*
LID	LID
LIT	LIGHTING/LIGHTS
LIX	LEVEL INDICATOR OR SIGHT GLASS
LVD	LOW VOLTAGE DISTRIBUTION

EQUIPMENT PREFIXES (CONT.)

LVS	LOW VOLTAGE STARTER
MAC	MACERATOR
MCC	MOTOR CONTROL CENTER
MCR	MUNCHER
MHL	MANHOLE
MIX	MIXER, FLOCCULATOR OR AGITATOR
MSX	MOISTURE SWITCH
MTR	MOTOR
NRV	NON-RETURN OR REFLUX VALVE
OGD	OFF GAS DESTRUCTOR
OZG	OZONE GENERATOR
PBD	PRESSURE BOARD
PEN	PENSTOCK
PLT	PLANT EQUIPMENT
PMI	PERSON MACHINE INTERFACE
PMP	PUMP (FIXED OR VARIABLE)
POL	POWER POLE
PPE	PERSONAL PROTECTIVE EQUIPMENT
PRN	PRINTER
PRS	PRESS
PRV	PRESSURE RELIEF/REGULATING/REDUCING VALVE
PST	PRIMARY SEDIMENTATION TANK
PSV	PRESSURE SUSTAINING VALVE*
PTY	PROPERTY
PVL	PASTEURISING VESSEL
RAD	RADIO
RDR	CARD SWIPE/READER
RIO	REMOTE IMPUT/OUTPUT RACK
ROM	ROOM
ROU	REVERSE OSMOSIS UNIT
RPZ	REDUCED PRESSURE ZONE (BACKFLOW PREVENTER)
RTU	REMOTE TELEMETRY UNIT
SBD	STOPBOARD
SCA	SWITCHGEAR & CONTROLGEAR ASSEMBLY
SCB	SCRUBBER
SCN	SCREEN
SCP	SCRAPER
SCV	SCOUR VALVE
SCW	SCREW CONVEYOR
SEP	SEPARATOR
SEQ	SAFETY EQUIPMENT*
SFT	SHAFT
SHR	SHREDDER
SIL	SILENCER
SIP	SECURITY INDICATOR PANEL
SIR	SIREN
SKM	SKIMMER
SMP	SUMP
SMR	SAMPLER
SOV	SOLENOID OPERATED VALVE
SPK	SPEAKER
SSS	SEWER SEPTIC SYSTEM*
STN	STRAINER
STR	STRUCTURE
SUB	SUBSTATION
SVC	SOLENOID VALVE CLOSE
SVO	SOLENOID VALVE OPEN
SWR	SWITCH ROOM
TBG	TRAVELLING BRIDGE
TEP	TELEMETRY PANEL
TEX	TEMPERATURE ELEMENT
TFI	TRICKLING FILTER
THB	THERMOBLENDER
TLY	TROLLEY
TNK	TANK, WELL OR VESSEL
TRF	TRANSFORMER
TRP	TRAP
TRY	TRANSFORMER YARD
TUN	TUNNEL
TWR	TOWER
UPS	UNINTERRUPTED POWER SUPPLY
UTY	UTILITY STATION (ALL TYPES)
UVB	ULTRA VIOLET BANK
VAC	VACUUM PUMP
VEH	VEHICLE
VEN	VENTILATION PANEL OR SYSTEM
VIB	VIBRATION, HAMMEROR SHAKER
VLV	VALVE
VSD	VARIABLE SPEED DRIVE
VSH	VENT SHAFT
VSL	PRESSURE VESSEL
WBR	WEIGHBRIDGE
WEL	WELL
WEQ	WORKSHOP EQUIPMENT
WER	WEIR
WIN	WINCH
WPR	WASHPACTOR

INSTRUMENT PREFIXES

AAM	AMMONIA DETECTOR/TRANSMITTER/ANALYSER
ACD	CARBON DIOXIDE DETECTOR/TRANSMITTER/ANALYSER
ACL	CHLORINE DETECTOR/TRANSMITTER/ANALYSER
ACM	CARBON MONOXIDE DETECTOR/TRANSMITTER/ANALYSER
ACN	CONDUCTIVITY TRANSMITTER
ACT	ACTUATOR
ADO	DISSOLVED OXYGEN DETECTOR/TRANSMITTER
AEX	ANALYSER ELEMENT
AHS	HYDROGEN SULPHIDE DETECTOR/TRANSMITTER
AHY	HYDROGEN GAS DETECTOR/TRANSMITTER
AIX	ANALYSER INDICATOR
AMN	METHANE TRANSMITTER
ANI	NITRATE TRANSMITTER
ANP	ANALYSER PANEL
AOP	ORTHO-PHOSPHATE TRANSMITTER
AOR	OXYGEN REDUCTION TRANSMITTER
AOX	OXYGEN TRANSMITTER/ANALYSER
APH	pH TRANSMITTER/ANALYSER
ARB	ARBITER
ARC	RESIDUAL CHLORINE TRANSMITTER/ANALYSER
ASB	SLUDGE BLANKET LEVEL TRANSMITTER
ASC	CHLORINE LEAK DETECTOR
ASO	OZONE LEAK DETECTOR
ASS	SUSPENDED SOLIDS TRANSMITTER
ATP	TOTAL PHOSPHORUS TRANSMITTER
ATU	TURBITY TRANSMITTER
ATX	ANALYSER TRANSMITTER
AUI	ULTRA VIOLET INTENSITY TRANSMITTER
BCH	BATTERY CHARGER
BEA	BEACON, WARNING OR ALARM LAMP
BGS	BREAK GLASS SWITCH
BNI	BURNER IGNITER
BNS	FLAME SENSOR
BSX	SMOKE OR FIRE DETECTOR
CBH	HIGH VOLTAGE CIRCUIT BREAKER
CBL	LOW VOLTAGE CIRCUIT BREAKER
CBM	MEDIUM VOLTAGE CIRCUIT BREAKER
DTX	DENSITY TRANSMITTER
EEX	ELECTRICAL EQUIPMENT
EIP	EVACUATION INDICATION PANEL
ESL	POWER SWITCH FAIL
ETC	CURRENT TRANSMITTER
ETK	KILOWATT TRANSMITTER
ETP	POWER FACTOR TRANSMITTER
ETV	VOLTAGE TRANSMITTER
FCV	FLOW CONTROL VALVE*
FEX	FLOW ELEMENT
FIX	FLOW INDICATOR OR GAUGE /ROTAMETER
FSA	FLOW SWITCH*
FSH	FLOW SWITCH HIGH
FSL	FLOW SWITCH LOW
FTX	FLOW TRANSMITTER
GPD	GAS DETECTOR* (OTHER THAN ALREADY SPECIFIED)

INSTRUMENT PREFIXES (CONT.)

HSE	EMERGENCY STOP OR PULL-WIRE
HSX	HANDSTATION OR SELECTOR SWITCH
LEX	LEVEL ELEMENT
LIS	LOCAL ISOLATING SWITCH
LIX	LEVEL INDICATOR OR SIGHT GLASS
LSA	LEVEL SWITCH
LSH	LEVEL SWITCH HIGH
LSL	LEVEL SWITCH LOW
LTX	LEVEL TRANSMITTER
MSX	MOISTURE SWITCH
MTX	MOISTURE TRANSMITTER
PCV	PRESSURE CONTROL VALVE
PFC	POWER FACTOR CORRECTION
PIX	PRESSURE INDICATOR OR GAUGE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLP	PLC PANEL
PMI	PERSON MACHINE INTERFACE
PSA	PRESSURE SWITCH*
PSH	PRESSURE SWITCH HIGH
PSL	PRESSURE SWITCH LOW
PTX	PRESSURE TRANSMITTER
SIX	SPEED INDICATOR
SLD	SLUDGE BLANKET LEVEL INDICATOR*
SSH	SPEED SWITCH HIGH
SSL	SPEED SWITCH LOW
STX	SPEED TRANSMITTER
TEP	TELEMETRY PANEL
TEX	TEMPERATURE ELEMENT
TIX	TEMPERATURE INDICATOR OR GAUGE
TSH	TEMPERATURE SWITCH HIGH
TSL	TEMPERATURE SWITCH LOW
TTX	TEMPERATURE TRANSMITTER
TW	THERMOWELL*
VTX	VIBRATION TRANSMITTER
WSH	TORQUE SWITCH
WTX	WEIGHT TRANSMITTER
ZEX	POSITION ELEMENT
ZSA	POSITION SWITCH
ZSC	LIMIT SWITCH CLOSED
ZSH	BELT DRIFT (CONVEYOR) SWITCH
ZSL	LIMIT SWITCH LOWERED
ZSO	LIMIT SWITCH OPEN
ZSP	LIMIT SWITCH PARKED
ZSR	LIMIT SWITCH RAISED
ZSX	POSITION SWITCH
ZTX	POSITION TRANSMITTER

FLUIDS ABBREVIATION

AA	AGITATION AIR
ACA	CITRIC ACID (AQUEOUS)
ACH	ACETIC ACID*
AER	AERATION AIR
AG	AMMONIA GAS*
AH	AMMONIA HYDROXIDE
AIR	AIR*
AL	ALUM (ALUMINUM SULPHATE)
ALS	ALUM SOLUTION*
AS	ANTI-SCALANT
BC	BIOCIDE*
BD	BACKWASH DISCHARGE
BIO	BIOSOLIDS*
BS	BACKWASH SUPPLY
BR	SALT/BRINE*
BWW	BACKWASH WASTEWATER*
CA	COMPRESSED AIR (700 kPa)
CE	CHLORINE EJECTOR WATER
CEN	CENTRATE*
CG	CHLORINE GAS
CIP	CLEAN IN PLACE FLUID
CLS	CHLORINE SOLUTION
CLV	CHLORINE GAS UNDER VACUUM
CN	CALCIUM NITRATE*
CO2	CARBON DIOXIDE*
CWS	COOLING WATER SUPPLY*
CWR	COOLING WATER RETURN*
DG	DIGESTER GAS*
DI	DIESEL*
DS	DIGESTED SLUDGE (AEROBIC ONLY)
EDT	EDTA (ETHYLENE DIAMINE TETRA ACETIC ACID)*
ETH	ETHANOL
FA	FOUL AIR*
FBW	FILTER BACKWASH WATER*
FC	FERRIC CHLORIDE (IRON SALTS)
FCL	FERROUS CHLORIDE (IRON SALTS)*
FE	FILTERED EFFLUENT*
FES	FERRIC SULPHATE*
FG	FUEL GAS*
FLT	FILTRATE (MBR OR U/F FILTRATE)
FLW	FILTERED WATER*
FM	FIRE MAIN
FS	FERMENTED SLUDGE*
FSN	FERMENTED SUPERNATANT*
FW	FOUL WATER*
GR	GRIT
HA	HYDROCHLORIC ACID
HFS	HYDROFLUOSILICIC ACID*
HTS	HOT SLUDGE*
HW	HOT WATER*
HYD	HYDROGEN PEROXIDE*
IA	INSTRUMENT AIR*
IW	INDUSTRIAL WATER
KMN	POTASSIUM PERMANGANATE*

FLUIDS ABBREVIATION (CONT.)

LP	LIME POWDER*
LPG	LIQUIFIED PETROLEUM GAS*
LPS	LIME POWDER SOLUTION*
MA	MEDICAL AIR
MH	MAGNESIUM HYDROXIDE*
MLR	MIXED LIQUOR RECYCLE*
ML	MIXED LIQUOR
MN	METHANOL
NAC	SODA ASH*
OSP	OFF SPEC PERMEATE
PAC	POWDERED ACTIVATED CARBON*
PD	PUMPED DRAINAGE RETURN*
PES	POLYMER SOLUTION*
PESC	CATIONIC POLYMER SOLUTION*
PESN	NON-IONIC POLYMER SOLUTION*
PG	PROCESS GAS*
POL	POLYELECTROLYTE / POLYMER*
PS	PRIMARY SLUDGE*
PW	POTABLE WATER
RAS	RETURN ACTIVATED SLUDGE
RAW	RAW WATER*
RE	RECLAIMED EFFLUENT
ROP	RO PERMEATE*
RS	RAW SLUDGE
RW	RECYCLED WATER*
SA	SCOUR AIR
SB	SODIUM BISULPHITE
SC	SCUM
SCS	SCRUBBER CAUSTIC SOLUTION*
SCN	SCREENINGS*
SD	SUCROSE / LIQUID SUGAR*
SDS	SITE DRAINAGE SYSTEM*
SE	SECONDARY EFFLUENT*
SEW	SEWAGE (RAW AND PRIMARY TREATED)
SHC	SODIUM HYPOCHLORITE
SHX	SODIUM HYDROXIDE (CAUSTIC)
SN	SUBNATANT
SPL	SPENT PICKLE LIQUOR*
SPN	SUPERNATANT*
SUL	SULPHURIC ACID
SW	STORM WATER
TE	TERTIARY EFFLUENT
TS	THICKENED SLUDGE
TSW	TREATED STORM WATER*
TWAS	THICKENED WASTE ACTIVATED SLUDGE**
WAS	WASTE ACTIVATED SLUDGE*
WCS	WASTE CHEMICAL SOLUTION*
WFP	SUPERNATANT RETURN

GENERAL ABBREVIATIONS

AG	ABOVE GROUND
UG	UNDERGROUND

VALVE NORMAL CONDITION:

NO	NORMALLY OPEN VALVE (DEFAULT)
NC	NORMALLY CLOSED VALVE

ACTUATOR FAIL STATES:

G	GENERIC (UNSPECIFIED)
GP	GENERIC (UNSPECIFIED) WITH POSITIONER
FO	FAIL OPEN
FC	FAIL CLOSED
FL	FAIL LAST (RETAINS POSITION)
FOP	FAIL OPEN WITH POSITIONER
FCP	FAIL CLOSED WITH POSITIONER
FLP	FAIL LAST (RETAINS POSITION) WITH POSITIONER

ASSET STATUS:

NEW	ASSET STATUS IS NEW (PART OF PROJECT SCOPE)
EXIST	ASSET STATUS IS EXISTING ON SITE (WAC ASSET)
DEMO	ASSET TO BE DEMOLISHED
FUTURE	PROPOSED OR ALLOWANCE FOR FUTURE PROJECT ASSETS (NOT IN CURRENT PROEJCT SCOPE)

ASSET NUMBERING & LABELING SYSTEMS

EQUIPMENT

PMP 4 5 01
- 01 – ITEM NUMBER
- 5 – SUB NUMBER
- 4 – AREA
- PMP – EQUIPMENT CODE

LINE NUMBERING

450-RSW-D2B-1234
- 1234 – PIPELINE SERIAL NO. (OPTIONAL)
- D2B – PIPE MATERIAL CODE AND SUB CODE
- RSW – SERVICE
- 450 – PIPE LINE SIZE

PIPING MATERIAL

D2 B
- B – PIPE MATERIAL SUB CODE
- D2 – PRIMARY MATERIAL CODE

NOTES:

1. PREFIXES SHOWN HERE ARE EXAMPLES OF COMMON TYPES USED. FOR FULL LISTS REFER TO THE FOLLOWING MASTER SOURCES
   - 1.1. EQUIPMENT PREFIXES: D0001844 ASSET DATA REQUIREMENTS (REF0884) AND SYDNEY WATER ASSET MANAGEMENT TEAM
   - 1.2. INSTRUMENTS PREFIXES: D0001844 ASSET DATA REQUIREMENTS (REF0884) AND SYDNEY WATER ASSET MANAGEMENT TEAM
   - 1.3. FLUID CODES: BMIS0209 TECHNICAL SPECIFICATION – MECHANICAL (REF0289)
     THE FLUID CODES LIST INCLUDES ACCEPTABLE CODES NOT LISTED IN BMIS0209.
2. ASSET NUMBERING FORMATS ARE DEFINED IN D0001844 ASSET DATA REQUIREMENTS (REF0884) AND MANAGED BY THE SYDNEY WATER ASSET MANAGEMENT TEAM
3. *DENOTES A TYPE THAT IS NOT IN THE MASTER SOURCE LIST FOR THAT TYPE.

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REFER TO THE ASSOCIATED SYDNEY WATER STANDARDS FOR DETAILED REQUIREMENTS OF SPECIFIC ASSETS AND ASSET TYPES.

DESIGNED
DRAWN: DT MANNING
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LETTER	DETAILS OF AMENDMENT	APP'D	DATE
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STANDARD DRAWING
PROCESS & INSTRUMENTATION DIAGRAM
ASSET TYPES AND ABBREVIATIONS

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SWA1.DOT AUG 2016

3.3 P&ID_002 - Line Legend and Instrument Symbols

LINE LEGEND

PIPING LINES

- 500-PE-B4-12345 — MAJOR PROCESS – INCLUDING RECIRC, WASTING, SLUDGE, PROCESS RETURNS ETC.
- 250-RS-B4-12346 — CHEMICAL DOSING – INCLUDING FILL, TRANSFER, DOSING ETC.
- 50-IW-B4-123457 — SERVICES AND SAMPLING – INCLUDING RE, PW, IW, CA, ETC.
- 250-RS-B4-12348 — FUTURE PROCESS LINE(APPLIED AS ABOVE)
- 250-RS-B4-12348 — HEAT TRACING
- 250-RS-B4-12348 — INSULATION – THERMAL
- 250-RS-B4-12348 — INSULATION – ACOUSTIC

INSTRUMENTATION LINES

- INSTRUMENETATION CONNECTION TO PROCESS, OR MECHANICAL LINK, OR INSTRUMENT SUPPLY
- ELECTRICAL SIGNAL
- SOFTWARE SIGNAL
- PNEUMATIC SIGNAL
- CAPILLARY SIGNAL
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC SIGNAL OR SONIC SIGNAL (WITH WIRING OR TUBING)
- ELECTROMAGNETIC SIGNAL OR SONIC SIGNAL (NOT GUIDED)
- CROSSING LINES
- LOC — LIMIT OF CONTRACT (TEXT PLACED IN CONTRACT)
- TP XXX — TIE IN POINT
- SPECLEFT / SPECRIGHT, FIELDLEFT / FIELDRIGHT — CHANGE OF PIPELINE CONDITIONS
  NOTE: FIELDLEFT AND FIELD RIGHT MAY BE BLANK OR INDICATE ANY NUMBER OF PIPELINE CONDITIONS THAT MAY CHANG AT THIS POINT (E.G. UG/AG).
- DRG — CONTINUATION TO/FROM ANOTHER DRAWING
- DRG — CONTINUATION TO/FROM ANOTHER DRAWING – DUAL FLOW

LIST OF CONTROL SYMBOLS

- XXX 1234 — INSTRUMENT, LOCALLY MOUNTED
- XXX 1234 — LOCAL CONTROL PANEL, INSTRUMENT ON FRONT OF PANEL
- XXX 1234 — LOCAL CONTROL PANEL, INSTRUMENT BEHIND PANEL
- XXX 1234 — CONTROL ROOM PANEL, INSTRUMENT ON FRONT OF PANEL
- XXX 1234 — CONTROL ROOM PANEL, INSTRUMENT BEHIND PANEL
- XXX 1234 — STATUS INDICATION, e.g. PUMP RUNNING LIGHT LOCALLY MOUNTED
- XXX 1234 — STATUS INDICATION, e.g. PUMP RUNNING LIGHT CONTROL ROOM PANEL, INSTRUMENT ON FRONT OF PANEL
- XXX 1234 — STATUS INDICATION e.g. PUMP RUNNING LIGHT LOCAL CONTROL PANEL, INSTRUMENT ON FRONT OF PANEL
- XXX 1234 — STATUS INDICATION, e.g. PUMP RUNNING LIGHT LOCAL CONTROL PANEL, INSTRUMENT BEHIND PANEL
- M — MOTOR CONTROL CENTRE
- I — LOGIC CIRCUITRY, INTERLOCK UNDEFINED LOGIC
- OR — LOGIC CIRCUITRY, INTERLOCK LOGICAL
- NOT — LOGIC CIRCUITRY, INTERLOCK LOGICAL NOT
- I M — MANUAL INTERLOCK WITH DESIGNATED MAN/PLC SELECTOR SWITCH
- I — SHARED COMMON LOGIC CIRCUITRY e.g. PLC, COMPUTER SYSTEM ETC..
- XXX 1234 — COMPUTER AND INTERFACE FUNCTION WITH SHARED FUNCTIONS FOR DISPLAY AND/OR CONTROL & LOCAL ACCESSIBILITY FOR OPERATOR e.g. PLUG IN LAP TOP
- XXX 1234 — COMPUTER AND INTERFACE FUNCTION WITH SHARED FUNCTIONS FOR DISPLAY AND/OR CONTROL & LOCAL ACCESSIBILITY AT A CENTRAL PANEL e.g. SCADA ONLY
- XXX 1234 — COMPUTER AND INTERFACE FUNCTION WITH SHARED FUNCTIONS FOR DISPLAY AND/OR CONTROL & LOCAL ACCESSIBILITY AT A LOCAL PANEL e.g. LOCAL PANEL
- XXX 1234 XXX 1234 — TWO OR MORE COMPUTER INTERFACE FUNCTIONS SHARING THE SAME COMPUTER SOFTWARE IN SCADA
- XXX 1234 — COMPUTER AND INTERFACE FUNCTION WITH LOCAL ACCESSIBILITY FOR OPERATOR e.g. SCADA
- XXX 1234 — COMPUTER AND INTERFACE FUNCTION WITH ACCESSIBILITY AT A CENTRAL PANEL e.g. SCADA
- XXX 1234 — COMPUTER AND INTERFACE FUNCTION WITH ACCESSIBILITY AT A LOCAL PANEL
- PLC — PROGRAMMABLE LOGIC CONTROLLER
- RTU — REMOTE TELEMETRY UNIT
- VSD — VARIABLE SPEED DRIVE
- SS — SOFT STARTER

PRIMARY PIPING MATERIAL CODES

PRIMARY PIPING CODE LISTED ONLY (SUB-CODES NOT SHOWN).
FOR FULL PIPING MATERIAL DETAIL REFER TO BMIS0209 TECHNICAL SPECIFICATION MECHANICAL.
FOR FULL DETAIL OF SUB CODES REFER TO THE PIPING MATERIAL SPECIFICATION DETAIL SHEETS

CODE	PIPE
A1	COPPER, AS 1432, TYPE B, ANNEALED TEMPERED
B1	MILD STEEL, TO AS 1074, MEDIUM, GALVANISED
B2	MILD STEEL TO AS 1579, WELDED AND OR FLANGED HOT DIPPED GALVANISED AND/OR CEMENT LINED WHERE INDICATED
B3	MILD STEEL SCHEDULE PIPE TO, AS 4041, FLANGED OR WELDED, HOT DIP GALVANISED
B4	STAINLESS STEEL, GRADE 316, SEAM WELDED. SCHEDULE PIPE TO SUIT APPLICATION
B5	STAINLESS STEEL, GRADE 316, SPIRAL WELDED. MINIMUM THICKNESS = 2mm
B6	MILD STEEL SCHEDULE 40 WELDED OR FLANGED FOR T< 45°C. STAINLESS STEEL GRADE 304L OR 316L SCHEDULE 40 FOR T> 45°C.
B7	CARBON STEEL SCHEDULE PIPE, TO AS4041. FLANGED OR WELDED, NO INTERNAL SURFACE TREATMENT
B8	STAINLESS STEEL TUBE, GRADE 316, TO AS 4041.
C1	DUCTILE IRON, RUBBER RING JOINT AS 2280. PRESSURE CLASS PIPE & FITTINGS
C2	DUCTILE IRON, FLANGED JOINT AS 2280. FLANGED CLASS PIPE & FITTINGS
D1	UPVC, AS 1477, CLASS 18
D2	UPVC RAINWATER PIPE, AS 1273
D3	PLASTIC ABS, AS 3518 CLASS TO SUIT APPLICATION
D4	GRP POLYESTER BASED, AS 2634 & AS 3571, CLASS TO SUIT APPLICATION
D5	UPVC, AS 1254, STORM WATER PIPES
D6	PVC-C TO ASTM D1784, CLASS 23447-B
D7	POLYETHYLENE SERIES 1 TO AS 4130
D8	UPVC TO AS 1260, GRADE SN10 FOR DN100 AND SN8 FOR > DN100
D10	PVC-U TO ASTM D1785 SCHEDULE 80
E1	REINFORCED CONCRETE PIPE TO AS 4058 OR FRC PIPE TO AS 4139. RUBBER RING/ELASTOMETRIC JOINTS
E2	REINFORCED CONCRETE PIPE TO AS 4058 OR FRC PIPE TO AS 4139.
E3	REINFORCED CONCRETE PIPE TO AS 4058 PVC LINED.

AREA INDICATION ON DRAWINGS

- EXISTING EQUIPMENT
- TO BE DEMOLISHED
- FUTURE EQUIPMENT
- VENDOR PACKAGE

HAND STATION FUNCTIONALITY STYLES REFERENCE

	DIALS	BUTTONS					
	FORWARD/ REVERSE SELECTOR (LATCHED OPERATION ONLY)	START (LATCHED)	STOP (LATCHED)	JOG FORWARD	JOG REVERSE	EMERGENCY STOP	LATCHED STOP
TYPE 1 (DEFAULT)		X	X				X
TYPE 2		X	X		X		X
TYPE 3	X	X	X				X

HANDSTATION REPRESENTATION

HSX 1234 — TYPE 1

TO BE SHOWN LINKED WITH AN ELECTRICAL LINE TO THE ASSET MOTOR SYMBOL. SEE EXAMPLE ON P&ID_004

NOTE: THE SYMBOL IS A DEDICATED HANDSTATION SYMBOL AND NOT A"INSTRUMENT, LOCALLY MOUNTED" SYMBOL

NOTES:

1. REFER TO NOTES ON SHEET 1

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LINE LEGEND & INSTRUMENT SYMBOLS

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3.4 P&ID_ 003 – Inline Assets and Instrument Symbols

VALVES

NO	NC	
		GENERIC VALVE
		BALL VALVE
	NC	BUTTERFLY VALVE
		GLOBE VALVE
		NEEDLE VALVE
		GATE VALVE
		KNIFE GATE
		DIAPHRAGM VALE
		PLUG VALVE
		ECCENTRIC PLUG VALVE
		STOPBOARD/BULKHEAD GATE
		PENSTOCK OR SLIDE VALVE
		REDUCING VALVE
		3-WAY VALVE
		4-WAY VALVE

NON-RETURN (CHECK) VALVE

BACKFLOW PREVENTER (RPZ)

FLAP VALVE

FOOT VALVE

SLIDE GATE / CHUTE GATE

VALVES (CONT.)

AIR RELEASE VALVE

FIRE DAMPER

DAMPER

MULTI LEAF DAMPER

WEIGHTED NON RETURN DAMPER

SAFETY / RELIEF VALVE (NOTE 2)

PRESSURE RELIEF VALVE (NOTE 2)

VAC PRESS PRESSURE & VACUUM RELIEF VALVE (NOTE 2)

SELF CONTAINED PRESSURE REGULATING VALVE (NOTE 2)

PRESSURE REGULATING VALVE (NOTE 2)

PRESSURE SUSTAINING VALVE (NOTE 2)

PRESSURE RELIEF & FLAME TRAP ASSEMBLY (NOTE 2)

PRESSURE EXPLOSION RELIEF VALVE (NOTE 2)

THERMOSTATIC VALVE

ACTUATOR, DRIVES & DEVICES

MANUALLY OPERATED VALVES DO NOT SHOW ANY ACTUATOR (NOTE 2)

WEIGHT OPERATED (NOTE 2)

FLOAT OPERATED (NOTE 2)

STATICALLY LOADED

SPRING LOADED

AUTOMATIC, GENERAL

DIAPHRAGM CONTROL ACTUATED

S SOLENOID ACTUATOR

PNEUMATIC ACTUATOR (GENERIC)

PNEUMATIC ACTUATOR SINGLE ACTING (GENERIC)

PNEUMATIC ACTUATOR DOUBLE ACTING (GENERIC)

PNEUMATIC ACTUATOR (SINGLE ACTUATING) OPENS ON FAILURE OF ACTUATING ENERGY

PNEUMATIC ACTUATOR (SINGLE ACTUATING) CLOSES ON FAILURE OF ACTUATING ENERGY

PNEUMATIC ACTUATOR (SINGLE ACTUATING) RETAINS POSITION ON FAILURE OF ACTUATING ENERGY

PNEUMATIC ACTUATOR (DOUBLE ACTUATING) OPENS ON FAILURE OF ACTUATING ENERGY

PNEUMATIC ACTUATOR (DOUBLE ACTUATING) CLOSES ON FAILURE OF ACTUATING ENERGY

PNEUMATIC ACTUATOR (DOUBLE ACTUATING) RETAINS POSITION ON FAILURE OF ACTUATING ENERGY

M MOTORISED VALVE

M MOTORISED VALVE OPENS ON FAILURE OF ACTUATING ENERGY

M MOTORISED VALVE CLOSES ON FAILURE OF ACTUATING ENERGY

M MOTORISED VALVE RETAINS POSITION ON FAILURE OF ACTUATING ENERGY

ACTUATORS WITH A POSITIONER INDICATION (ACTUATOR TYPE AND FAIL STATE VARIES)

FITTINGS

REDUCER CONCENTRIC

REDUCER ECCENTRIC

DIAPHRAGM SEAL

SPECTACLE BLIND OPEN / CLOSED

SPADE BLIND OPEN / CLOSED

OPEN VENT / OPEN VENT WITH VARMINT SCREEN

DRAIN / TUNDISH

SYPHON DRAIN

BLIND CAP

CAP

SCREW PLUG

HOSE CONNECTION

HOSE CONNECTION WITH CAP

BLIND FLANGE

FLANGE

RS REMOVABLE SPOOL

RP RODDING POINT

FLEXIBLE HOSE

EXPANSION JOINT

ORIFICE

MULTI SPACE ORIFICE

BURST/RUPTURE DISK

SLIP RING

FLEXIBLE COUPLING

HOSE COUPLING WITH INTEGRATED NRV

THREADED TAPPING POINT

DISCHARGE TO ATMOSPHERE

INTAKE FROM ATMOSPHERE (INDUCT VENT)

OE OPEN ENDED PIPE

VERMIN PROOF MESH

STRAIGHTENING VANES

INSTRUMENTS

POSITIVE DISPLACEMENT FLOWMETER

ULTRASONIC FLOWMETER

TURBINE FLOWMETER

MAGNETIC FLOWMETER

MASS FLOWMETER

VARIABLE AREA FLOW METER

TARGET FLOWMETER

PITOT TUBE FLOW METER

VENTURI FLOW ELEMENT

VORTEX FLOW SENSOR

I/P CURRENT / PRESSURE CONVERTER

RADAR LEVEL SENSOR

ULTRASONIC LEVEL SENSOR

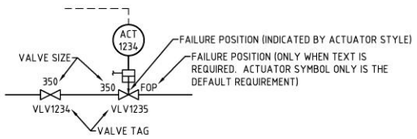
HYDROSTATIC PRESSURE SENSOR

FLOAT SWITCH (SENSOR NOT ACTUATOR)

CALIBRATION CYLINDER

IA INSTRUMENT AIR CONNECTION

VALVE ANNOTATIONS



AUTO SAMPLER AUTO SAMPLER

S THREE WAY SOLENOID VALVE WITH LATCHING MANUAL OVERRIDE ARROW INDICATES DE-ENERGISED PATH (N = NO OVERRIDE)

NOTES:

1. ALL PNEUMATIC ACTUATORS ARE SUPPLIED WITH INSTRUMENT AIR AND ASSOCIATED INSTRUMENT AIR CONTROL VALVES. THESE ARE NOT REQUIRED TO BE SHOWN ON P&IDS, AND ARE OMITTED. ALL INSTRUMENT AIR OR HYDRAULIC CONNECTION ARE INFERRED BY THE PRESENCE OF THE ACTUATOR. REFER TO INSTRUMENT AND CONTROL DRAWINGS FOR FULL DETAILS
2. ALL ACTUATORS ARE TO HAVE AN INSTRUMENT SYMBOL (INSTRUMENT, LOCALLY MOUNTED) TO SHOW THE ACTUATOR NUMBER. REFER TO P&ID_004 FOR CORRECT REPRESENTATION OF CONTROL VALVES AND ACTUATOR TAGGING.
3. IN AUTOCAD PLANT 3D ALL ACTUATED VALVES ARE CONSIDERED "CONTROL VALVES" AND ARE INSTRUMENTS. THIS IS BECAUSE ALL CONTROL ACTUATORS REQUIRE A CONNECTION TO A CONTROL SYSTEM AND COORDINATION WITH ELECTRICAL AND I&C DISCIPLINES. THE ACTUATOR TAG IS ALWAYS THE SAME NUMBER AS THE VALVE WITH A PREFIX OF ACT. ALL TAGGED ACTUATORS A SHALL BE INDICATED WITH A LOCALLY MOUNTED INSTRUMENT SYMBOL. VALVES THAT ARE LOCALLY CONTROLLED ONLY (E.G. WEIGHT OR FLOAT ACTUATED, PRESSURE SAFETY, PRESSURE SUSTAINING OR REGULATING VALVES) DO NOT REQUIRE THE ADDITION OF THE ACTXXXX SYMBOL FOR A TAG NUMBER. REFER TO DIAGRAM "EQUIPMENT REPRESENTATION AND TAGGING" ON SHEET 4

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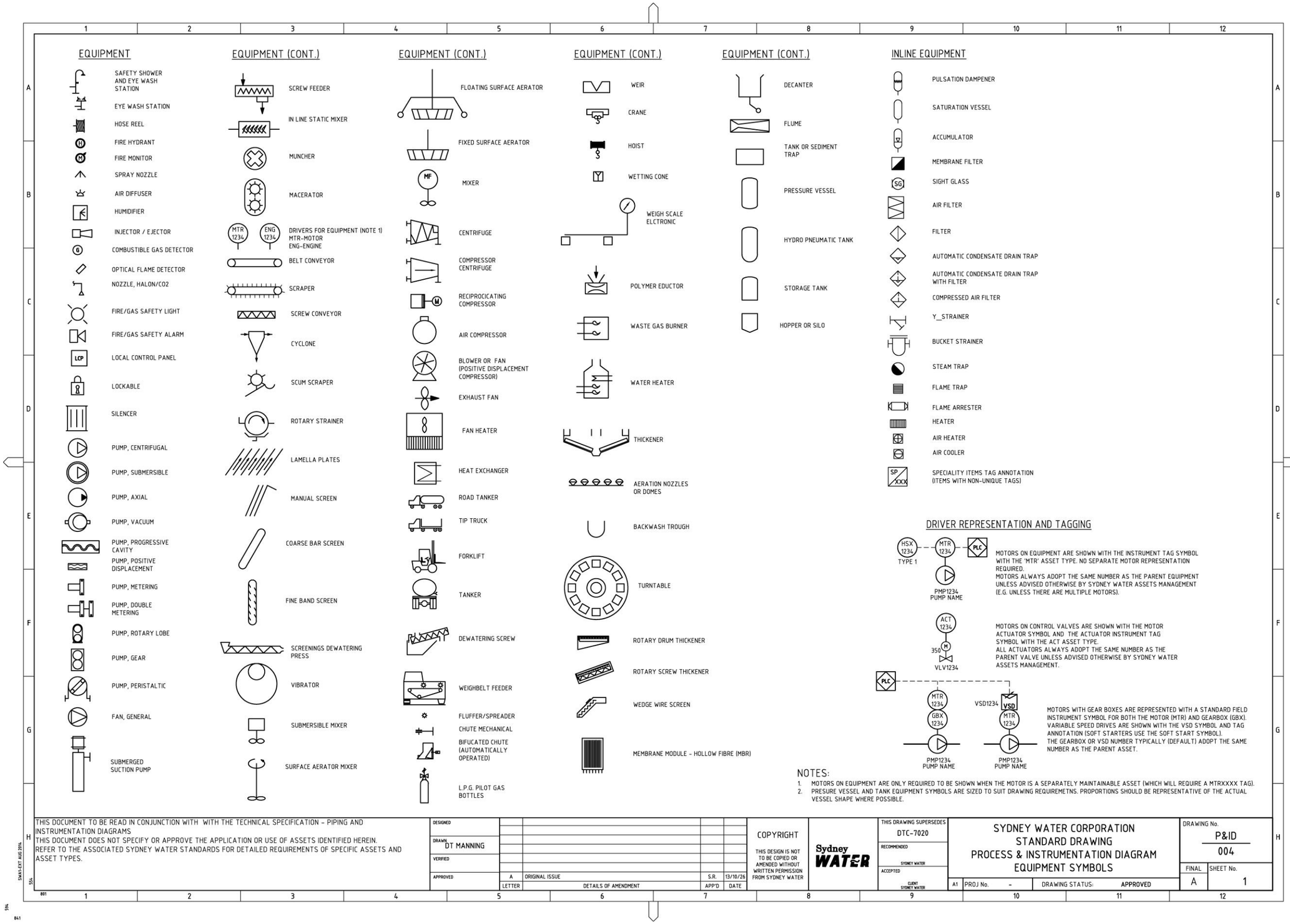
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3.5 P&ID_004 – Equipment Symbols



3.6 P&ID_005 - Miscellaneous Symbols

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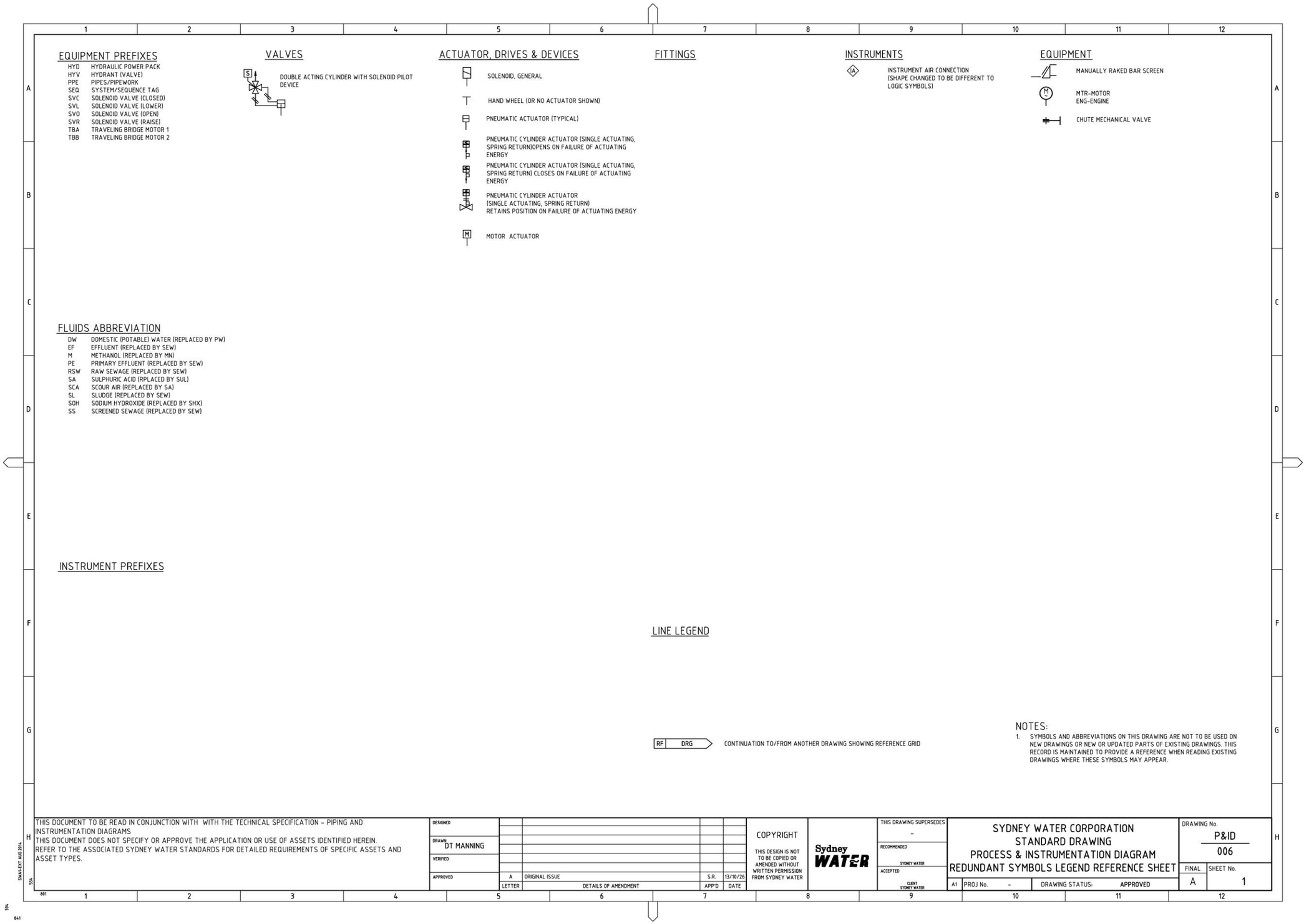
SYDNEY WATER CORPORATION
STANDARD DRAWING
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MISCELANIOUS SYMBOLS

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3.7 P&ID_006 - Redundant Symbols and Legend Reference



Ownership

Ownership

Role	Title
Group	Operational Technology – Digital Engineering
Owner	Digital Engineering Manager
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Change history

Version No.	Prepared by	Date	Approved by	Issue date
1	David Manning BIM Delivery Lead	13/10/2026	Shane Reilly: Digital Engineering Manager	13/10/2026

Appendix 1 Frequently Asked Questions

A1.1 Can I create P&IDs in basic CAD software like AutoCAD?

Yes, Basic CAD software such as AutoCAD can be used with approval from Sydney Water Digital Engineering. Basic CAD software such as AutoCAD can be used to create traditional P&IDs, provided the drawings comply with the requirements of this Specification, including Sydney Water's approved symbols, naming conventions and drawing standards.

However, traditional CAD drawings are primarily graphical and do not contain the engineering intelligence and structured asset information available in Intelligent P&IDs. For new projects, Sydney Water's preferred approach is to create Intelligent P&IDs using a suitable intelligent authoring platform so that engineering information can be reused throughout the asset lifecycle

A1.2 Are symbols for basic P&IDs supplied by Sydney Water?

Yes. Sydney Water provides a standard P&ID symbol library for use across all projects. The symbol sheets included in this Specification are provided for reference, while the master source of approved symbols is contained within the Sydney Water AutoCAD Plant 3D project template, available from the Delivery Portal (*https://swdelivery.com.au/reference/1080*).

Using the Sydney Water symbol library helps ensure that P&IDs look consistent across projects and can be easily understood by designers, operators, maintainers and project teams. If a project requires a symbol that is not currently available, Sydney Water Digital Engineering should be consulted before creating a new symbol.

A1.3 Is it mandatory for my project to use AutoCAD Plant 3D for Intelligent P&IDs?

No. AutoCAD Plant 3D is Sydney Water's standard and preferred platform for Intelligent P&IDs and should be used for most projects. Alternative software may be used where approved by Sydney Water Digital Engineering, provided it can produce compliant Intelligent P&IDs and the required structured engineering information.

In practice, using Plant 3D is usually the simplest and lowest-risk option because it already includes Sydney Water's approved symbols, configuration and workflows.

A1.4 What data fields in the AIR are required to be included for P&ID assets?

The required data fields are defined in the Sydney Water Digital Engineering Standard Appendix B: Asset Information Requirements (AIR). The exact requirements depend on the asset type and the project stage.

Refer to the AIR “Attribute Details” sheet referring to the columns for “Assets” and “Pipelines”. Attribute details for Assets and for Pipelines apply to both the P&ID and the 3D Model. In an ideal workflow the data from the P&D will flow to the 3D model through a linked synchronisation.

A1.5 Where can I find the Sydney Water AIR?

Sydney Water Digital Engineering Standard Appendix B: Asset Information Requirements (AIR) is available on the Sydney Water Delivery Portal: https://swdelivery.com.au/reference/1236.