Specification
For

STP SCADA and PLC Implementation

Pr9845

Unitywater

Documents Details

This document is only valid on the day it was printed.

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Written Direction Control

Document Sponsor	Infrastructure Technical Standards Committee
Document Author (Owner)	Manager Capital Delivery, SIS
Subject Matter Expert	Control Systems Engineer, Network Operations
References	Refer to Section 3 of this document

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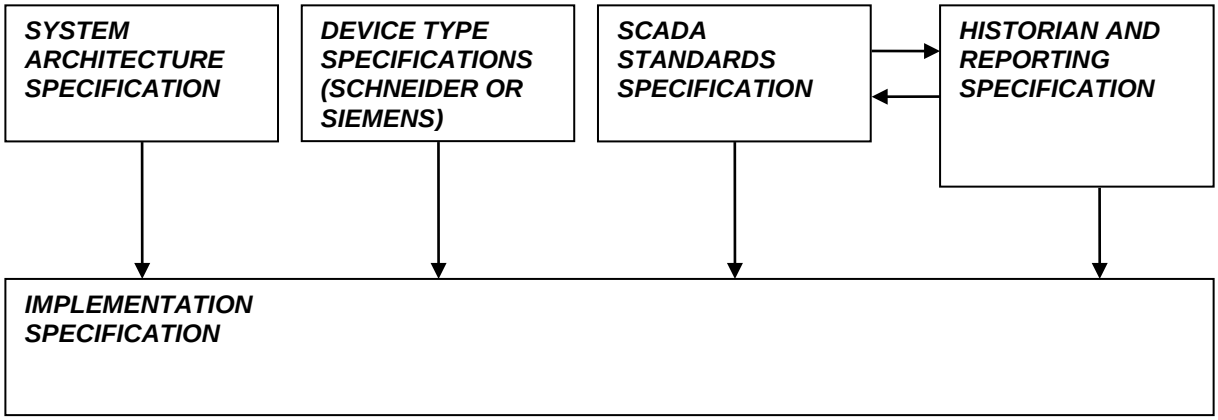
1. Purpose

1.0.1 Unitywater has produced a set of specifications for the supply, development and implementation of SCADA and PLC systems for its Sewage Treatment Plants. The purpose of these specifications is to provide the document users with clear directions of Unitywater's requirements, and to encourage standardisation.

1.0.2 These specifications have been developed to align with Unitywater's Water Supply and Sewerage Reticulation Telemetry SCADA system where appropriate and with due regard for the international ASM standard. The figure below shows the structure of this document set.

Figure 1 – Document Hierarchy



2. Scope

2.0.1 This Specification defines the methodology involved with implementing and managing all PLC and SCADA library standards throughout the control systems lifecycle of a Treatment Plant. This document along with all others in the series as per the figure above shall be referenced to produce a fully compliant system library.

2.0.2 Depending upon the location and project specific requirements there are two sets of specifications and libraries that suit two vendors being Schneider Electric and Siemens. Unitywater shall determine which vendor equipment is to be utilised generally via the project specific specification.

2.0.3 The Device Type Specification and related PLC code library are specific to the vendor selected, with the overall documentation set and library sharing the same dependencies.

3. References

3.1. General

Document Number	Title
Pr9833	STP SCADA and PLC Architecture (formerly UWDMDR-D-TS-0001)
UWDMDR-D-TS-0002	Unitywater Treatment Plant PLC & SCADA Specifications – Device Type Specification (Schneider PLC)

Document Number	Title
Pr9834	SCADA and PLC Standard Specification (formerly UWDMDR-D-TS-0003)
Pr9846	SCADA and PLC Historian and Reporting Specification (formerly UWDMDR-D-TS-0004)
Pr9845	SCADA and PLC – Implementation Specification (formerly UWDMDR-D-TS-0005) - *this Document*
Pr9844	SCADA and PLC Device Type (Siemens PLC) (formerly UWDMDR-D-TS-0006)
Pr9835	Electrical Installation at Treatment Plants (formerly UWDSTD-E-TS-0001)
Pr8843	Major Projects Specification for Drawing, Document and Equipment Tag Numbering

3.2. Applicable Legislation and Regulation

Not applicable.

3.3. Codes of Practice (ratified by Legislation)

Not applicable.

3.4. Codes of Practice (not ratified by Legislation)

Not applicable.

3.5. International and Australian Standards

Not applicable.

4. Definitions/Abbreviations

Term	Definition
ASM	Abnormal Situation Management
DB	Data Block
DFB	Derived Function Block
FBD	Function Block Diagram – programming language
ICS	Industrial Control System
Integrator	Person/Entity responsible for the supply, installation and commissioning of the control system
P&ID	Process and Instrumentation Diagram
PLC	Programmable Logic Controller – An Industrial computer used for automation of electromechanical processes
SCADA	Supervisory Control And Data Acquisition
SFC	Sequential Function Chart – programming language

Term	Definition
UW	Unitywater

5. Overview

5.0.1 The Unitywater control system libraries MUST be utilised in accordance with this specification to develop the Treatment Plant's control system. If it is deemed that additional functionality or modifications to the libraries are required throughout the development of the Treatment Plant control system, the change management process detailed in section 8.9 of this Document shall be followed.

6. Functional Specification

6.0.1 The Contractor shall produce a Functional Specification that meets the requirements of the P&IDs and process Functional Description.

6.0.2 The Functional Specification shall be written in such a way that is easy to understand and interpret, and shall include complete functionality details to allow the control system to be developed.

6.0.3 The structure of the Functional Specification shall align with the structure of the Functional Description as far as practical in terms of the order of sections of plant for example. Please refer to the project specification for more detailed requirements for the Functional Specification.

6.0.4 The Functional Specification shall be submitted for review and approval before any software is developed

7. Plant Tag Naming Convention

7.0.1 Unitywater has a specification for drawing, documentation and equipment tag numbering, *Pr8843 Unitywater Major Projects Specification for Drawing, Document and Equipment Tag Numbering*. This Specification identifies the procedure for developing drawing, document and tag numbers for works at Sewage Treatment Plants. This section builds on this numbering system and describes the tag naming convention to be utilised within the control system.

7.0.2 Equipment tag numbers shall be determined in accordance with the project specification.

7.0.3 Only Unitywater approved equipment tag numbers shall be utilised within the control system.

7.0.4 The following tag naming convention shall be followed for naming all PLC tags. All tags are to be constructed as a series of alpha-numeric characters, with a maximum of 32 characters, in the format:

DeviceIdentifier|DeviceNumber|SubDeviceNumber_SignalTypePrefix|TagFunctionAAAAQQQQd_eFfffff

7.0.5 Table 1 – PLC Tag Naming Convention Structure contains an overview of this naming convention, with the specific requirements of each component detailed in the following subsections of this document.

Table 1 – PLC Tag Naming Convention Structure

Abbreviation	Description	Naming Rules	Example
AAAA	Device identifier	1-4 Upper case alphabetic characters	MTR, PMP or PSLL
QQQQ	Device number	4 Numeric characters	1305
d	Sub device number	1 Upper case alphabetic character	A, B, C etc.
e	Signal type prefix	1 Lower case alphabetic character	c, i, q
Ffffff	Tag function	3-10 Upper/lower (title case) alphabetic characters	Clsd (for closed)

An example PLC tag is as follows:

- PMP1201_cLdemSP: Inlet Works Pump 1 Low Demand SCADA Setpoint

7.0.6 The naming of the database objects within ClearSCADA is defined in *Pr9834 - STP SCADA and PLC Standard Specification* (formerly UWDMDR-D-TS-0003).

7.1. Plant Identifier

7.1.1 Plant Identifiers are to be six alphabetic characters in length, and are to utilise a standardised Unitywater Identifier.

7.1.2 A single example Identifier is provided below. A comprehensive list of active plant identifiers is available on request from Unitywater.

Table 2 - Tag Naming Convention – Plant Identifiers

Identifier	Description
CLMSTP	Coolum STP

7.2. Device Identifiers

7.2.1 The device Identifier tag component aligns with *Pr8843 Unitywater Major Projects Specification for Drawing, Document and Equipment Tag Numbering*, Equipment Numbering System and Instrumentation Numbering System sections.

7.2.2 Equipment shall use the associated code from Table 7 of the Equipment Numbering System section, while instrumentation shall use a code derived using the conventions defined in Table 8 of the Instrumentation Numbering System section.

7.3. Device Number

7.3.1 The device number tag component shall align with *Pr8843 Unitywater Major Projects Specification for Drawing, Document and Equipment Tag Numbering*, Plant Equipment Numbering System section.

7.3.2 The four digit device number is comprised of two, two digit components:

NN: Plant Area/ Plant Sub-Area

QQ: Sequential Number

7.3.1 The Device Number component shall be determined using the convention documented Table 6 of the Plant Equipment Numbering System section.

7.4. Sub- Device Number

7.4.1 The Sub-Device number is an optional tag component comprised of a single uppercase alphabetical letter (i.e. A – Z) which is allocated sequentially.

7.4.2 The Sub-Device number is to be utilised to distinguish between multiple variables of the same type for a single device.

7.5. Signal Type Prefix

7.5.1 The Signal Type Prefix is to be determined using the convention documented Table 6.

Table 3 - Tag Naming Convention – Signal Type Prefixes

Identifier	Description
a	Alarm signal generated in PLC – passed up to SCADA
c	Control signal from SCADA to PLC
s	Status signal generated in PLC – passed up to SCADA
i	PLC input signal from the field
q	PLC output signal to the field
m	Internal PLC input / output

7.6. Tag Function

7.6.1 The tag function component shall be determined using the convention documented in Table 4 - Tag Naming Convention – Tag Function.

7.6.2 Abbreviations shall be concatenated where appropriate, for example RunFwd for Run Forward function.

Table 4 - Tag Naming Convention – Tag Function

Abbreviation	Function
A or Alm	Alarm
AHH	Alarm high high
AH	Alarm high

Abbreviation	Function
AL	Alarm low
ALL	Alarm low low
Avail	Available
Aut	Auto
Cas	Cascade
Cls	Close (command)
Clsd	Closed (position)
Clsng	Closing (busy)
Comms	Communications
Cur	Current
DB	Deadband
Dty	Duty
En	Enable
End	Enabled
Estp	Emergency stop
FtCls	Fail to close (not reaching closed limit in allowed timeframe)
FtOpn	Fail to open (not reaching open limit in allowed timeframe)
FtStt	Fail to start (not receiving run feedback in allowed timeframe)
FtStp	Fail to stop (not receiving stopped feedback in allowed timeframe)
FB	Feedback
Flw	Flow
Flt	Fault
Frq	Frequency
Fwd	Forward
H	High
HH	High
Hlty	Healthy
Hrs	Hours
IL	Interlock
Isol	Isolator
L	Low
LDem	Low Demand
LL	Low low

Abbreviation	Function
Man	Manual
Max	Maximum
Min	Minimum
Mins	Minutes
Mode	Auto/manual mode (on = manual, off = auto)
OP/MV	Output/manipulated value
Opn	Open (command)
Opnd	Opened (position)
Opng	Opening (busy)
OOS	Out Of Service
Pls	Pulse
Prx	Proximity
Rst	Reset
Swbd	Switchboard
Pol	Polarity
Pos	Position
Pri	Primary
PV	Process value
Pwr	Power
Rdy	Ready
Ref	Reference
Rev	Reverse
Run	Run
Rung	Running
Sby	Standby
Sec	Secondary
Secs	Seconds
Sim	Simulation
SP	Setpoint
Spd	Speed
Stp	Stop
Stpng	Stopping (busy)
Stt	Start

Abbreviation	Function
Sttng	Starting (busy)
P/Gain	Proportional gain/gain (pid controller)
Tm	Time
TDer	Derivative (pid controller)
Td	Today
TI	Integral (pid controller)
Trq	Torque
Tmp	Temperature
Tmpry	Temporary
Vib	Vibration
Wght	Weight
Vlt	Voltage
Yd	Yesterday

8. PLC Programming Standards

8.1. PLC Programming Overview

8.1.1 All PLC code shall conform to the standards defined within IEC 61131-3 PLCs – Programming Languages.

8.1.2 PLC programs are to be written in a simple and straightforward manner, such that the program may be analysed and understood in a minimal amount of time. Function Block Diagram (FBD) is the preferred language to be utilised, but where appropriate Sequential Function Chart (SFC) and IEC ladder logic are also acceptable with approval from Unitywater.

8.1.3 The use of Set/Reset blocks is to be minimised as far as practicable, with a preference for latching logic utilising And/Or blocks for example.

8.1.4 The Integrator shall utilise the provided PLC device library which consists of function blocks, data blocks, and derived data types as detailed in the relevant Device Type Specification.

8.1.5 The Integrator shall utilise these library objects as far as practicable in developing the PLC program. The provided library objects shall not be modified in any manner. Where a library object cannot be utilised, such as physical I/O being unsuitable, a new object shall be created based off the library object with details submitted to Unitywater for approval prior to development.

Where new library objects are created, document for these shall be provided in a format similar to the Device Type Specification.

8.1.6 Prior to Factory Acceptance Testing being undertaken the PLC code shall be submitted to Unitywater for standards compliance checking and approval.

8.2. Tag/Variable Descriptions

8.2.1 The tag description shall comprise of the long hand version the tag. As such it will be a plain English description that contains the following information (where applicable):

- Device;
- Device Number;
- Sub Device Number;
- Signal Type;
- Tag Function.

For example, tag PMP1201_cLDEMSP will have a tag description of “Inlet Works Pump 1 Low Demand SCADA Setpoint”.

8.2.2 Every tag or variable shall have a description entered.

8.3. Code Commenting

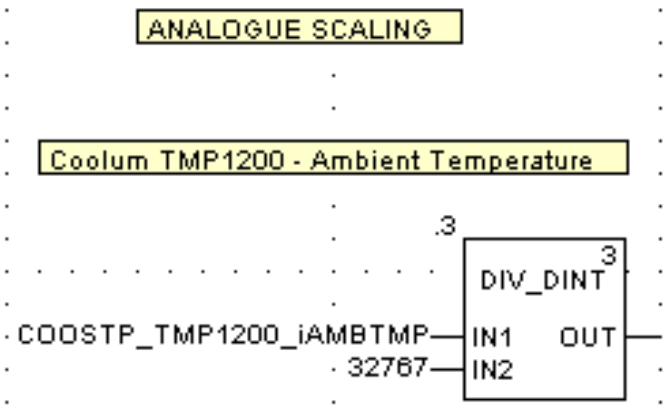
8.3.1 The following guidelines shall be followed in regards to commenting PLC code.

8.3.2 Each section shall be identified with a title that describes the section’s overall function.

8.3.3 Each sub section shall be identified with a title that describes its function.

8.3.4 The objective of the code comments is to convey the operation of a particular rung or function block, to describe its functionality and how it works within the overall program. Where appropriate the comments will include Plant Equipment Numbers and descriptions of controlled devices.

Figure 2 - Example of Code commenting



8.4. Code Hierarchy

8.4.1 Schneider PLC Architecture

8.4.1.1 Unity Pro enables you to use a modular programming approach by the organization of code into:

- Tasks;
- Sections;

- Sub-routines (SRs).

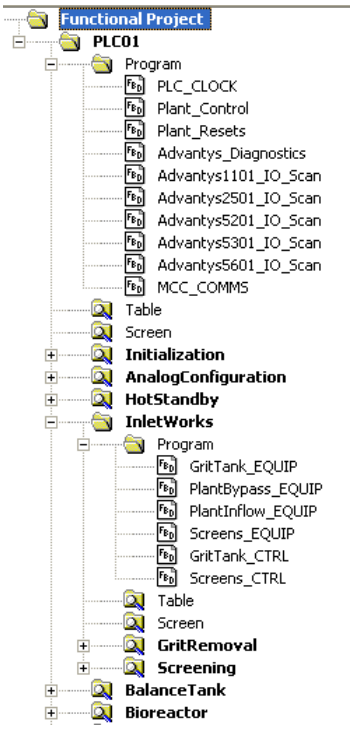
8.4.1.2 When several tasks are used to distribute code, the multitask system enables you optimize performance and adapt the program to best meet the requirements of the process to be automated.

- The obligatory Mast task (periodic or cyclic) contains the main part of the program;
- The Fast task (periodic) is used to execute the parts of the application that require priority processing. It is intended for use with short-cycle processes to avoid lower cycle tasks (Mast, Aux) reaching their maximum (watchdog) cycle time;
- Auxiliary tasks (periodic) which are available only if the Mast task is periodic and are used to execute parts of the application with lower processing priority;
- Events which are used to execute parts of the application that are assigned the highest priority should the I/O modules or Programmable timers report that certain external events have occurred.

8.4.1.3 Proper use should be made of the appropriate execution areas to ensure that critical tasks are executed continuously and scan times are not excessive.

8.4.1.4 The various areas of the plant should be separated into logical sections with sub-routines used to separate the various functions of each plant area.

Figure 3 - Example of Using Sub- routines to Separate Tasks



8.4.2 Siemens PLC Architecture

8.4.2.1 Similarly for the Siemens PLC architecture, proper use shall be made of the appropriate execution areas (Organisational Blocks, for example OB1, OB32) to

ensure that critical tasks are executed continuously and scan times are not excessive.

8.4.2.2 The various areas of the plant shall be separated into logical sections with sub-routines used to separate the various functions of each plant area. These sections and sub-routines shall be implemented utilising Function (FC) blocks.

For example:

- FC20 – Inlet Works (Inlet works general logic);
- FC21 – Screening (Inlet works screening equipment logic);
- FC22 – Grit Removal (Inlet works grit removal equipment logic).

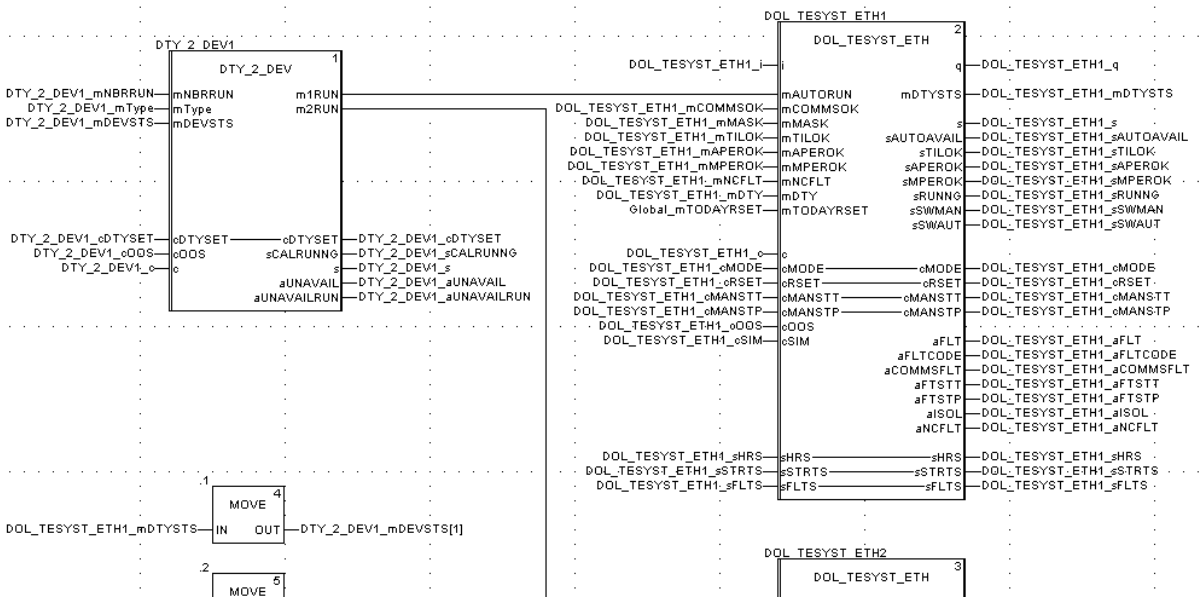
8.5. Code Layout

8.5.1 A consistent approach to code layout shall be used at all times and across all areas to minimise the time taken to locate code responsible for repeat functions within a section.

This includes analogue scaling, alarming and the mapping of signals to the SCADA system.

This also reduces the risk of inadvertently over-writing data by ensuring that variables are only written to once in one section of the code. When multiple writes are required this should happen within adjacent rungs where appropriate. An exception to this is the first scan setting of bits in a start-up routine.

Figure 4 - A consistent approach should be used for the layout of code



8.6. Memory Base Addressing Rules

8.6.1 Variable addressing in the PLC shall be organised with respect to the variables data type and what the actual variable represents. The following table illustrates this relationship:

Table 5 - PLC Memory base addressing rules

Data Type	Description	Address Range
Boolean	Alarm/Status	%MW02001-%MW02500
Boolean	Control	%MW02501-%MW03000
Real/Integer	Set point	%MW03001-%MW13000
Real/Integer	Trend	%MW13001-%MW23000
Real/Integer	Status/Statistics	%MW23001-%MW33000
Integer	Field Devices	%MW00001-%MW02000

8.7. Internal Variable Management

8.7.1 Internal variables shall be managed to prevent duplicate use. A group of internal variables large enough to support current and future program requirements should be defined for each program section before coding of the section.

8.7.2 An external data map shall be used to keep track of the use of these variables. This may be in the format of an Excel spread sheet or similar file. An up to date copy of this data map shall be provided to Unitywater along with the code. Each internal variable shall be labelled with a consistent format that identifies the code section to which they belong, the function of the variable within the code and the data type. In addition, each variable shall have a comment that describes its use to aid fault finding.

8.7.3 Unused internal variables defined for each section will be labelled as [Section]Spare[xx][DataType] and shall be relabelled as they are used and the external data map updated to reflect this.

8.8. Common Object Relationships

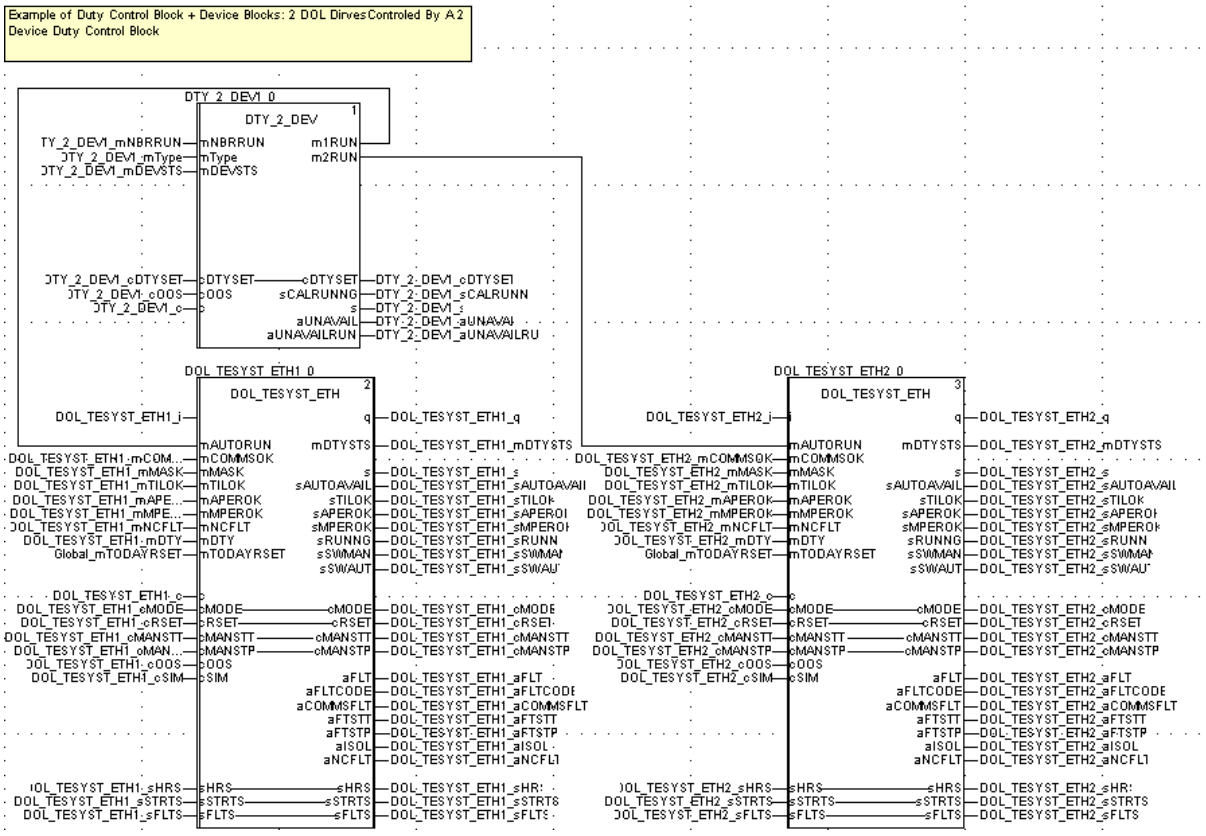
8.8.1 Objects defined in the Device Type Specification are designed to be used in conjunction with each other. This process helps standardise the way in which the process logic is written and improves ease of logic replication. The following are some possible object relationships:

8.8.2 Duty control + Devices

8.8.2.1 This is commonly used when there is a requirement for duty control of multiple pumps, motors or valves. The duty device controls the request to start for the connected devices. The request call can be derived with additional functions outside the duty device; this will determine the amount of devices to run.

8.8.2.2 The duty device will manage the selection of the duty sequence and availability, e.g. level control would determine the duty request number of devices required to run, the higher the level the more pumps required to lower the level. The duty device would then control which device is available and next to run and hence start the device.

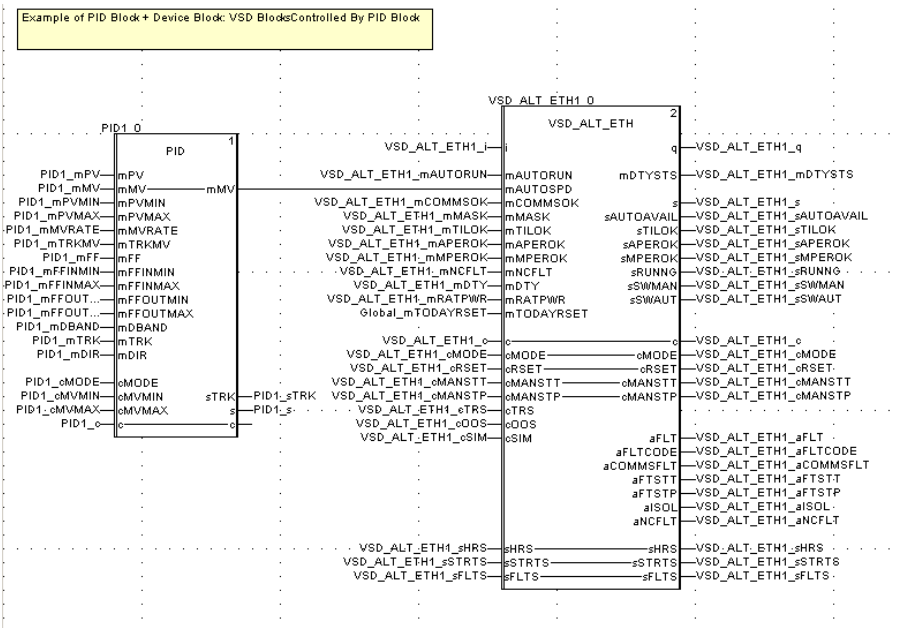
Figure 5 - Duty control + devices example



8.8.3 PID control + Device

8.8.3.1 This is commonly used when there is a requirement for process stability when controlling a level, flow, pressure or analytical measurement of a particular process. This is used to control VSD speed, valve position, and dosing controllers.

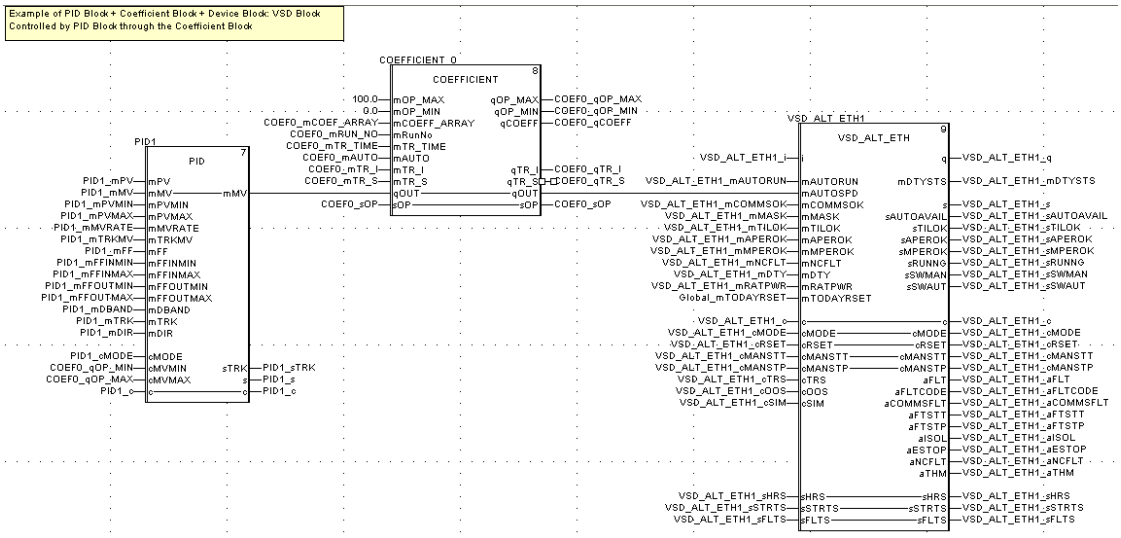
Figure 6 - PID + device example



8.8.4 PID control + Co efficient + Device

8.8.4.1 This is to be used when the requirements are similar to the PID control + Device control detailed above, with the exception that multiple devices are used. A co efficient is used between the PID output and the devices to regulate the gain accordingly.

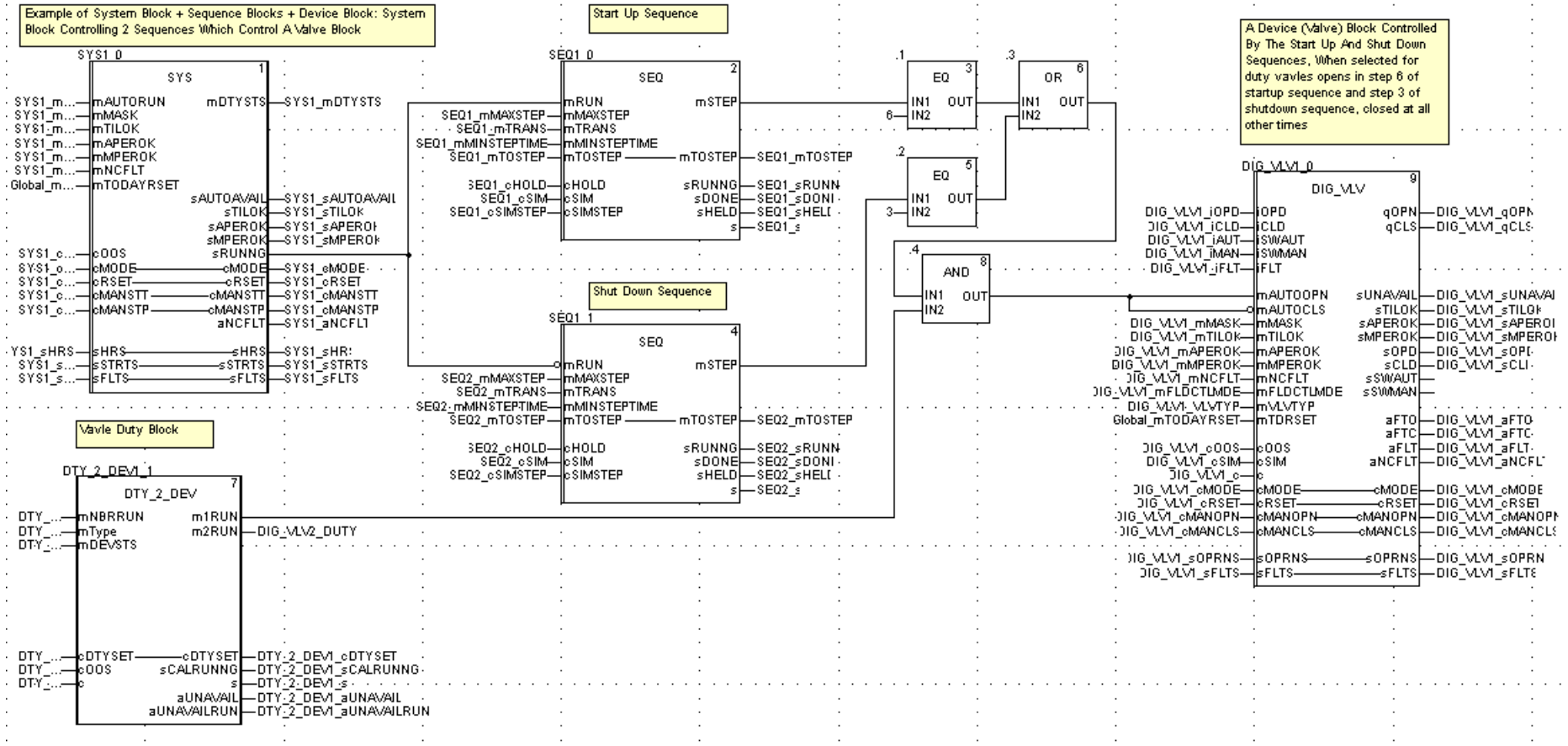
Figure 7 - PID + co-efficient + device example



8.8.5 System control + Sequence Control + Duty + Device

8.8.5.1 This is commonly used to wrap a whole process area, for instance a belt filter press is a whole system, with many sequences and potentially many duty devices.

Figure 8 - System control + sequence control + duty + device example



8.9. Control Logic Functionality

8.9.1 The control logic functionality to be implemented shall meet the requirements detailed in the Functional Specification, Functional Description and project specifications.

8.9.2 Additional requirements are detailed below which shall be incorporated into the Functional Specification.

8.9.3 Plant Power Restoration and PLC Restart Logic

8.9.3.1 This section applies to whenever there is a restoration of electrical power to the plant, either whole of plant or to an individual switchboard. It also applies whenever the PLC is restarted.

8.9.3.2 The intention is for the plant to recover gracefully via a staged start-up of equipment, with no operator intervention and to minimise peak mechanical and electrical loads.

8.9.3.3 The overall plant start-up sequence shall be initiated by either a restoration of power supply to the whole plant (incoming mains or generator supply) or by a PLC restart.

8.9.3.4 Where there are multiple supply points to a plant separate sequences are required for the equipment related to each supply, with suitable offsets to prevent simultaneous start-up of equipment via different sequences.

8.9.3.5 The overall plant start-up sequence (or sequences) shall enable via a staged sequence the control of the areas and sub-areas of the plant, as a signal in the Auto Permissive logic for that area/sub-area.

8.9.3.6 Each area or sub-area's system Auto Permissive logic shall also include all switchboard phase failure relays relevant to equipment in that area/sub-area.

8.9.3.7 The area or sub-area system's normal start-up sequence shall include the staged start of individual equipment where appropriate (for example a small delay between starting each mixer in a section).

8.9.3.8 Additionally each item of equipment (motor, valve, instrument, etc.) shall have a Fault Reset issued following a PLC restart or upon restoration of power, to clear any transient faults and ensure equipment is able to start with no operator intervention.

This shall be achieved via a PLC first scan reset pulse and a time delayed reset pulse from the phase failure relay of the relevant switchboard that supplies that item of equipment.

8.9.3.9 The PLC first scan reset pulse shall be suitably delayed (generally several seconds) to ensure system stability and scanning of I/O has commenced. Similarly the healthy state of the local phase failure relay shall be time delayed to ensure power and equipment stabilisation before attempting reset.

9. SCADA Programming Standards

9.1. SCADA Programming Overview

9.1.1 The Integrator shall develop the SCADA configuration in accordance with *Pr9834 STP SCADA and PLC Standard Specification* utilising the provided SCADA library.

9.1.2 The SCADA library contains the standard templates, symbols, colours, system pages, security configuration and other objects as detailed in the SCADA Standard Specification and the relevant Device Type Specification.

9.1.3 The Integrator shall utilise these library objects as far as practicable in developing the SCADA configuration.

9.1.4 Unitywater shall provide a ClearSCADA database containing the SCADA library, as per the database structure detailed in the SCADA Standard Specification.

9.1.5 The library objects are located within the "~Config" top level folder in the database. The "~Config" folder shall not be modified by the Integrator without authorisation from Unitywater.

9.1.6 If site specific symbols, templates or other objects are required then a "~Config" folder shall be created underneath the Plant folder (same level as Major Area) with a similar structure to the main "~Config" folder with Unitywater's approval.

9.1.7 Where a library object cannot be utilised, such as physical I/O being unsuitable, a new object shall be created based off the library object with details submitted to Unitywater for approval. Unitywater may elect to integrate these additional objects into the standard library.

Where new library objects are created, documentation for these shall be provided in a format similar to the Device Type Specification.

9.1.8 Prior to Factory Acceptance Testing being undertaken the SCADA database shall be submitted to Unitywater for standards compliance checking and approval.

9.2. Mimic Screen Development

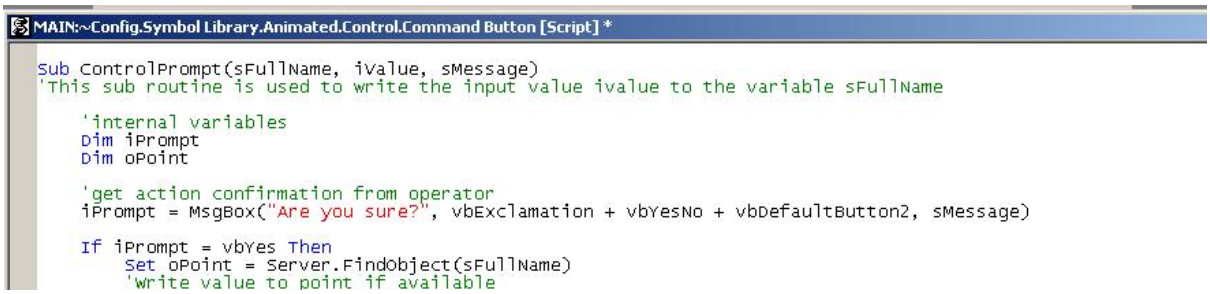
9.2.1 The requirements for screen development are defined in *Pr9834 STP SCADA and PLC Standard Specification.*

9.3. Logic Code Commenting

9.3.1 The following guidelines should be followed when commenting SCADA logic code:

- Each set of functions shall be identified with a title comment that describes the sets overall function;
- Each function within a set will be identified with a title comment that describes the function;
- Within each function the objective of the code comments is to convey the operation of a particular line or group of lines of code to assist maintenance and facilitate future changes as required.

Figure 9 - Example of SCADA code commenting



10. Change Management

10.1.1 If a change or an addition to the Treatment Plant Control System Library is required then the change management process detailed in the flow chart below shall be followed and the application submitted to Unitywater.

An example of a change management application form is included in Appendix 1 of this Document.

10.1.2 Changes to any of the following items are covered by this process:

- PLC Firmware;
- PLC Hardware configuration;
- PLC Software;
- SCADA database changes;
- Deployment process;
- Security.

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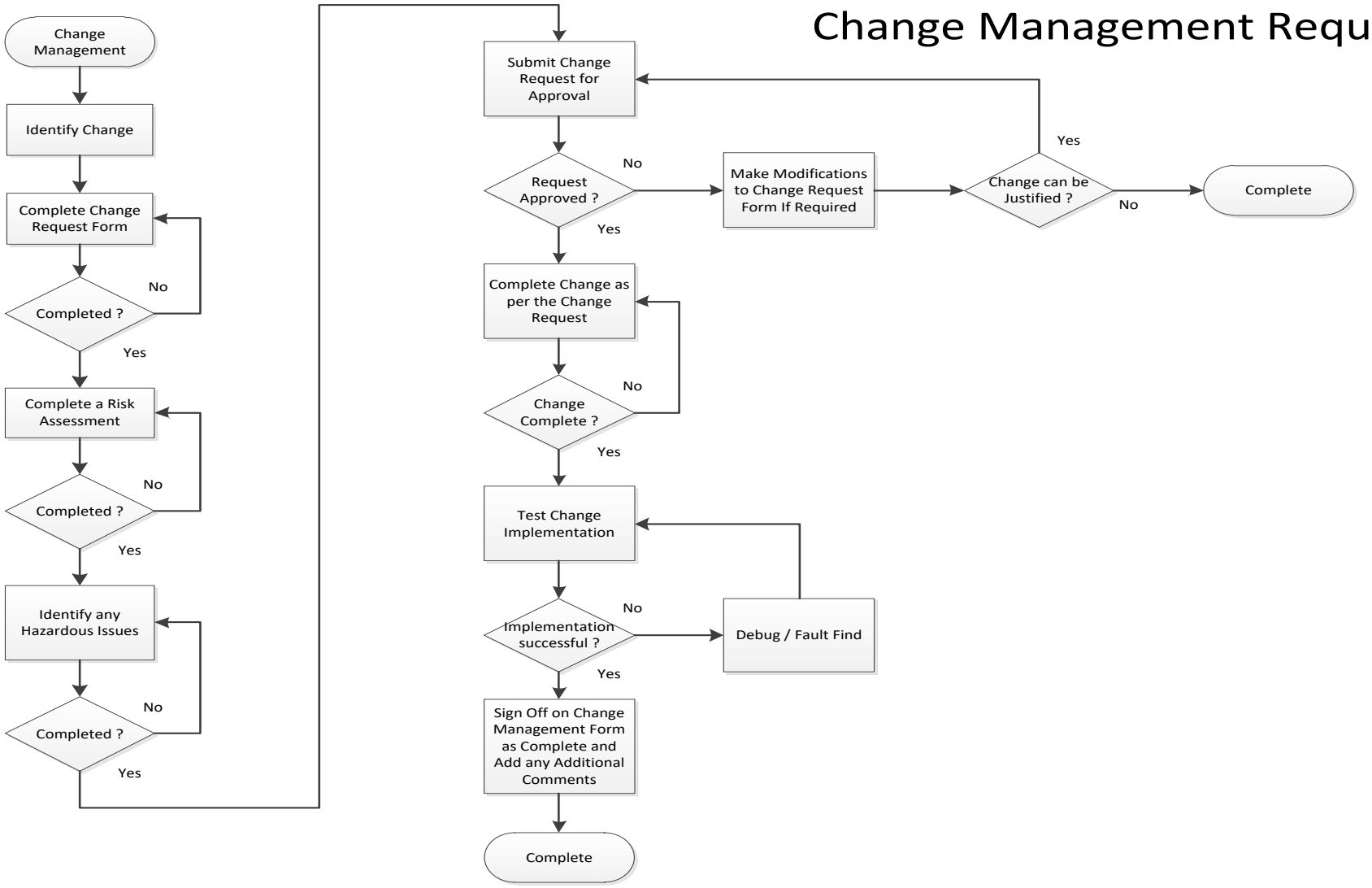
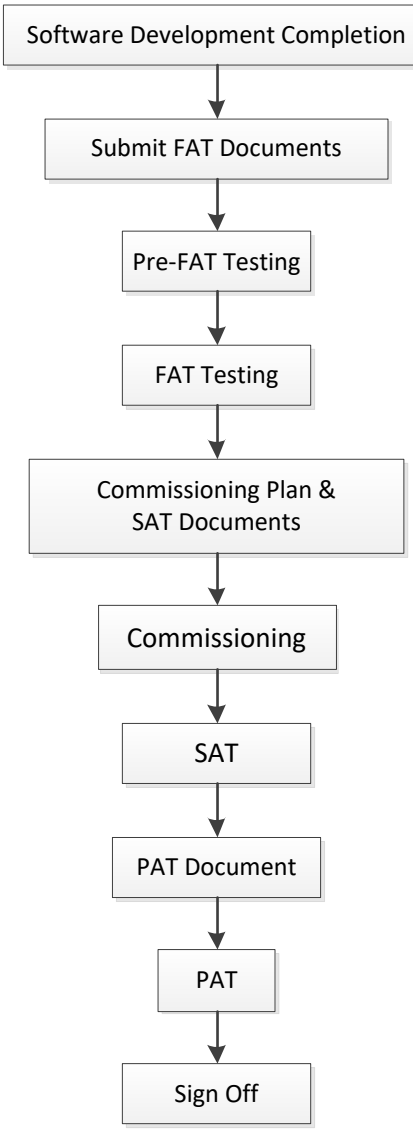


11. Testing

11.0.1 A test process shall be mandatory for all new and existing systems to confirm correct operation. This testing scheme shall be used for but not be limited to:

- Hardware configurations;
- Software configurations;
- Communication configurations;
- Inspection and testing plans;
- Signoff.

11.0.2 The flowchart below standardises the procedure which shall be followed in order to ensure changes and/or additions to an existing system are coherent and seamless.



11.1. Software development completion

11.1.1 This step is considered complete when the Software for the plant control system has been completed and complies with the PLC and SCADA Programming Standards and meets all of the control and functional requirements detailed in the developed functional specification.

11.2. Submit FAT documents

11.2.1 FAT documents shall be prepared and submitted to Unitywater as detailed in the project specifications.

11.2.2 The procedures to carry out the FAT shall be well defined and documented. Each test procedure shall be described in a logical sequence. It is recommended that personnel with experience suitable for the intended process application and control system deals with the FAT planning. This will ensure that the software is robust in design and meets the process design requirements.

Please see example below:

			South Caboolture WTP ClearSCADA Upgrade	**South Caboolture WTP ClearSCADA Upgrade**	**Revision: 1**																		
			FAT & SAT Inspection Test Plan	**FAT & SAT Inspection Test Plan**	**Project No: 1038**																		
Test No.	**Section**	**Test Description**	**Tag Description**	**Expected Results**	**Siemens**	**Scaling**			**State**		**Device**	**SCADA**				**Verification**							
					Register No.	**Raw**	**Engin.**	**Units**	**On**	**Off**		**Effects**	**Page**	**Alarm Page**	**Trend**	**Date**	**AA**	**UW**	**Comment No.**				
1.1		Site Overview - Alarms	Trigger alarm on devices for each sub-area	Red alarm boundary is displayed on the corresponding sub-area									Site Overview (Layer 1)			12/12/2011	OK						
		Site Overview - Displays & Indicators	Change flow, level indicator values from PLC	Correct value is displayed on screen									Site Overview (Layer 1)			12/12/2011	OK						
		Site Overview - Link	Select Area Overview (INLT, BITR,BIHD) link on screen	The corresponding Area (layer 2) is displayed								If link is selected from ViewX head 1, the Area Overview will be displayed on ViewX head 2	Site Overview (Layer 1)			12/12/2011	OK						
2.1		Inlet Works Area Overview - Alarms	Trigger alarm on devices for each sub-area	Red alarm boundary is displayed on the corresponding device indicator									INLT Area Overview (Layer 2)			12/12/2011	OK						

		Inlet Works Area Overview - Displays & Indicators	Change device status, flow, level indicator values from PLC	Correct value is displayed on screen								INLT Area Overview (Layer 2)			12/12/2011	OK		
		Inlet Works Area Overview - Link	Select Sub-Area link on screen	The corresponding Area (layer 3) is displayed								INLT Area Overview (Layer 2)			12/12/2011	OK		
2.2		Biological Treatment Area Overview - Alarms	Trigger alarm on devices for each sub-area	Red alarm boundary is displayed on the corresponding device indicator								BITR Area Overview (Layer 2)			12/12/2011	OK		
		Biological Treatment Area Overview - Displays & Indicators	Change device status, flow, level indicator values from PLC	Correct value is displayed on screen								BITR Area Overview (Layer 2)			12/12/2011	OK		
		Biological Treatment Area Overview - Link	Select Sub-Area link on screen	The corresponding Area (layer 3) is displayed								BITR Area Overview (Layer 2)			12/12/2011	OK		
2.3		Biosolid Handling Area Overview - Alarms	Trigger alarm on devices for each sub-area	Red alarm boundary is displayed on the corresponding device indicator								BIHD Area Overview (Layer 2)			12/12/2011	OK		
		Biosolid Handling Area Overview -	Change device status, flow, level indicator values from PLC	Correct value is displayed on screen								BIHD Area Overview			12/12/2011	OK		

		Displays & Indicators											(Layer 2)					
		Biosolid Handling Area Overview - Link	Select Sub-Area link on screen	The corresponding Area (layer 3) is displayed									BIHD Area Overview (Layer 2)			12/12/2011	OK	
2.4		Chemical Area Overview - Alarms	Trigger alarm on devices for each sub-area	Red alarm boundary is displayed on the corresponding device indicator									CHEM Area Overview (Layer 2)			12/12/2011	OK	
		Chemical Area Overview - Displays & Indicators	Change device status, flow, level indicator values from PLC	Correct value is displayed on screen									CHEM Area Overview (Layer 2)			12/12/2011	OK	
		Chemical Area Overview - Link	Select Sub-Area link on screen	The corresponding Area (layer 3) is displayed									CHEM Area Overview (Layer 2)			12/12/2011	OK	
3.1		Inlet Works Overview	Compare with CitectSCADA Project & P&ID Drawings	Layout is similar with the all devices are present												12/05/2011	OK	
		Inlet Works AC110	Compare with CitectSCADA Project & P&ID Drawings	Correct Device Number, Description and Type							DOL					12/05/2011	OK	
		Inlet Works AC110 - Status/Control	Change status (e.g. run, stop) and/or PV	Correct value is displayed on both ClearSCADA and Citect							DOL					12/05/2011	OK	
		Inlet Works AC110 - Alarm	Trigger an alarm on device	Correct alarm is triggered, on both ClearSCADA and Citect							DOL	Alarm is display				12/05/2011	OK	

											ed on alarm screen								
		Inlet Works BL111	Compare with CitectSCADA Project & P&ID Drawings	Correct Device Number, Description and Type						SS					12/05/2011	OK		
		Inlet Works BL111-Status/Control	Change status (e.g. run, stop) and/or PV	Correct value is displayed on both ClearSCADA and Citect						SS					12/05/2011	OK		
		Inlet Works BL111-Alarm	Trigger an alarm on device	Correct alarm is triggered, on both ClearSCADA and Citect						SS	Alarm is displayed on alarm screen				12/05/2011	OK		
		Inlet Works BL112	Compare with CitectSCADA Project & P&ID Drawings	Correct Device Number, Description and Type						SS					12/05/2011	OK		
		Inlet Works BL112-Status/Control	Change status (e.g. run, stop) and/or PV	Correct value is displayed on both ClearSCADA and Citect						SS					12/05/2011	OK		

11.3. Pre-FAT testing

11.3.1 This shall be carried out in house by the integrator prior to the witnessed Factory Acceptance Testing (FAT). Unitywater reserves the right to attend the pre-FAT to witness completeness. Pre-FAT requirements are detailed further in the project specifications.

11.4. Factory Acceptance Testing (FAT)

11.4.1 FAT is to be conducted on the PLC and associated hardware and software together. The tests shall be executed during the final part of the design and engineering phase before the final installation at the plant.

11.4.2 The full plant process and control functionality shall be tested. This test shall be witnessed and approved by Unitywater before the next phase begins. FAT requirements are detailed further in the project specifications.

11.5. Commissioning Plan & Site Acceptance Testing (SAT) documents

11.5.1 The procedures to carry out the SAT shall be outlined in the Commissioning Plan. The SAT documents shall be a logical progression from the FAT process.

11.5.2 Commissioning Plan requirements are detailed further in the project specifications.

11.6. Commissioning

11.6.1 The Integrator shall carry out the commissioning in accordance with the approved Commissioning Plan. Commissioning and SAT requirements are detailed further in the project specifications.

11.7. Site Acceptance Testing (SAT)

11.7.1 The procedures detailed in the SAT document shall be used to verify that the system has been installed and configured correctly.

11.7.2 Emphasis shall be on demonstrating that the system and application operate successfully with site specific variations. Commissioning and SAT requirements are detailed further in the project specifications.

11.8. Performance Acceptance Testing (PAT)

11.8.1 Any requirements for Performance Acceptance Testing shall be as detailed in the project specifications.

11.9. Sign off

11.9.1 The requirements for sign off shall be as detailed in the project specifications.

Appendix 1 - Change Management Template Example

Change Management Form					
			Form No. _____		
Change Initiation					
Initiator:			Date of Request:		
Company:			Position:		
Project Name:			Contact Number:		
Assets Involved:			Proposed Start Date:		
Conditions for Change					
Change Condition: *(please tick)*		Temporary	Proposed End Date:		
		Permanent	Evaluator:		
		Emergency			
This Change Relates to: *(please tick)*		PLC Firmware		PLC Hardware	
		PLC Software		SCADA Database	
		SCADA Screen		Deployment Process	
		Revision Control		Roll Back Process	
		Security		Distribution	
		Other			
Change Description:					
Change Justification:					

Change Evaluation			
Position	**Name**		
Site Superintendent:			
Site Safety Rep			
Environmental Advisor			
Operations Engineer			
Systems Engineer			
Senior Systems Engineer			
Change Category		Major	Comment:
		Minor	
Risk Assessment Completed		Yes	Comment: ***DO THEY HAVE RISK ASSESMENT??***
		No	
Hazard Issues Identification		Yes	Comment:
		No	

Cost Estimate				
Change Authorisation				
Change Authorised		**YES**		**No**
Reason for Decision				
Name:			Signature:	
Additional Notes:				