Software Design Specification

For

Tyldesley UID - East Lancs - Chemical Storage and Dosing - PLC05

For

United Utilities PLC

Cougar Automation Limited	
Project No:	56938
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Issue History

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A1	27/1/2014	Initial Version – Issue for comments and approval	G.McCormack	Ed Brown

1. INTRODUCTION

This Document is the Software Design Specification for the PLC and HMI system controlling the Chemical Storage and Dosing at the East Lancs Pumping Station.

1.1. Project Scope

The new PLC/HMI Control System (PLC05) will control the Chemical Storage and Dosing equipment to be located on the East Lancs site.

Dosing shall begin as storm flows enter the detention tank and will be flow proportioned to the incoming flow. There is no flow meter to measure detention tank inlet flows, therefore flowrate will be calculated using rate of rise within the detention tank as measured by the ultrasonic level instrument (A5-LIT312).

The Chemical Storage and Dosing plant will consist of the following:

- A5-AV508 Calcium Nitrate Tank Outlet Actuated Valve
- A5-P504 Calcium Nitrate Dosing Pump.
- Shower Cubicle and Eye Bath monitoring

The Chemical Storage and Dosing plant instrumentation will consist of the following:

- A5-FIT112 Calcium Nitrate Dosing Pumps Delivery flowmeter
- A5-LIT312 Detention Tank Ultrasonic Level Instrument (PLC04)
- A5-LIT315 Calcium Nitrate Bulk Storage Tank Ultrasonic Level Instrument
- A5-LS316 Calcium Nitrate Bulk Storage Tank High High Level Switch
- A5-LS317 Calcium Nitrate Storage Tank Bund High Level Switch
- A5-LS318 Dosing Pump PRV catch pot Level Switch
- A5-LS319 Calcium Nitrate Dosing Skid Drip Tray High Level Switch
- A5-LS320 Dosing Line dual containment catch pot Level Switch
- A5-LS321 Dosing Line dual containment catch pot Enclosure Level Switch
- A5-LS322 Emergency Shower Low Level Switch
- A5-LIT323 Chemical Blind Tank Ultrasonic Level Sensor
- A5-LS324 Chemical Blind Tank High High Level Switch
- A5-XS203 Emergency Shower Operated Switch
- A5-XS201 Emergency Eyewash Operated Switch (at Dosing Skid)
- A5-XS202 Emergency Eyewash Operated Switch (at Delivery Station)
- A5-TS601 Emergency Shower Low Temperature Switch.

This scope is to design the process software to standards. PLC communication will be over Ethernet. HMI navigation and Mimics will be E118 compliant. This design will be done in line with the current

UU standards and specifications to provide a more robust and maintainable system. The design of the system is described in this document.

1.2. Process Overview

The Chemical Storage & Dosing PLC (PLC05) will be one of four new PLC's being provided on an Ethernet network at East Lancs PS as part of the overall Tyldesley UID's project. The existing Foul Pump PLC02 will also be modified :-

- PLC01 – New Inlet Screens and Screenings Handling PLC.
- PLC02 – Existing Foul Pump PLC.
- PLC03 – New Storm Pump PLC.
- PLC04 – New Detention Tank PLC.
- PLC05 – New Chemical Dosing PLC.
- PLC06 – Storm Tank PLC
- PLC07 – Ancillary PLC

1.3. Reference Documents

This document should be read in conjunction with the following documentation:

1.3.1. List of Applicable Standard Specifications

Title	Issue	Date
General Specifications		
S01 - General Requirements	9	Oct 12
Electrical / ICA Specifications		
S04 – Design of Electrical and ICA Systems	3.2	Jan 12
E101– LV Control Panels (adopting WIMES 3.01)	15	Jun 11
E103– LV Electric Motors (adopting WIMES 3.02)	8	Mar 11
E104– Electrical Installation (adopting WIMES 3.02 & 3.02A)	12	Nov 09
E106– Instrumentation Components	12	Apr 07
E107– Uninterruptible Power Supplies (adopting WIMES 3.07)	2	Dec 11
E110– Development and Testing of Process Control Software	7	July 11
E111 – Telemetry Interfacing	2	Apr 07
E118 – SCADA Systems & HMIs	8	Dec 10
E120 – Electric Actuators (adopting WIMES 3.08)	3	Oct 10
E121 – LV Electrical Equipment for Package Plant (adopting WIMES 3.04)	2	Mar 11
Environmental and Safety Specifications		
S08 - Management of Environment and Sustainable Development	8	Jun 12
Roles & Responsibilities		
United Utilities AX4 Preferred Intelligent MCC Commissioning Roles and Responsibilities Document	1	Dec 06
Engineering Instructions		
EI006 – Application of UU SS S09	1	Apr 06
EI007 – Defining Significant Changes to Key Design Deliverables	1	May 06
E1031 – ‘Trojan’ Alert for Siemens WINCC and PCS7	1	Jul 10

1.3.2. List of Applicable Project Related Specifications

Title
Cougar Automation Ltd WIG0179_80021608_01_20_61404 PLC05 FDS001 Functional Design Specification 56938 FDS001
Cougar Automation Ltd WIG0179_80021608_01_20_61411 PLC05 SDS001 & WIG0179_80021608_01_20_61418 PLC5 SDS Annexure

1.3.3. List of Project Related Drawings & Documents

Title	Issue	Date
WIG0179/80021608/01/13/71001 – Storm Pump PS P&ID	D	May 2013
WIG0179/80021608/01/13/71002 – Inlet Screens P&ID	D	31 May 2013
WIG0179/80021608/01/13/71003 – Foul Pump Station P&ID	B	04 May 2013
WIG0179/80021608/01/13/71004 – Detention Tank P&ID	C	31 May 2013
WIG0179/80021608/01/13/71005 – Chemical Dosing P&ID	C	31 May 2013
WIG0179/80021608/01/20/61001 – Instrument Schedule	C	24 May 2013
WIG0179/80021608/01/20/61003 – Telemetry Schedule	B	16 May 2013
WIG0179/80021608/01/20/61004 – Actuator Schedule	C	14 May 2013
WIG0179/80021608/01/20/61044 – CP03 Interlock Schedule	D	14 June 2013

1.3.4. References of Applicable UU Standard Module

Title	Issue	Date
Functional Design Specification: Analogue Actuator Module ANLG_ACTR Document ref: ANLG_ACTR_02_07_V1.0.doc	1.0	May 08
Functional Design Specification: DME Pump Block Document ref: DDP1_02_24_V1.0.DOC	1.0	April 12
Functional Design Specification: Analogue Instrument Alarm Module ANLG_INST Document ref: ANLG_INST_04_03_V1.0.doc	1.0	May 08

Title	Issue	Date
Functional Design Specification: Digital Input Processing Module DI DEBOUNCE Document ref: DI_DEBOUNCE_01_01_V1.0.doc	1.0	May 08
Functional Design Specification: Digital Actuator Module 'DIG_ACTR' Document ref: DIG_ACTR_02_06_V1.0.doc	1.0	May 08

2. GLOSSARY OF TERMS

AS	Automation Station
OS	Operator Station
ES	Engineering Station
CAS	Central Archive Server
EICA	Electrical Instrumentation Control and Automation
DCS	Distributed Control System
FDS	Functional Design Specification
HMI	Human Machine Interface
IA	Integrated Alliance
ICA	Instrumentation Control and Automation
IMCC	Intelligent Motor Control Centre
IP	Intellectual Property
IMS	Intelligent Motor Starter
MCC	Motor Control Centre
NOP	Network of Participants
PLC	Programmable Logic Controller
PP	Process Partner
PID	3-term Controller incorporating Proportional, Integral & Derivative terms
SCADA	Supervisory Control and Data Acquisition
SDS	Software Design Specification
SHEQ	Safety Health Environment & Quality
SI	Systems Integration
SSB	Solutions Scope Book
SSP	Solutions Service Provider
UID	Unsatisfactory Intermittent Discharge
URS	User Requirement Specification
VSD	Variable Speed Drive

3. SYSTEM OVERVIEW

The Chemical Storage and Dosing PLC consists of S7-300 PLC (S7-315-2PN/DP) (designated PLC05). The PLC shall be linked to the HMI via an Ethernet network.

The HMI (designated HMI05) will be used to serve as an interface to the control system for the user shall be a Siemens MP277 10'' TouchScreen HMI device.

For a detailed Bill of Materials and System Architecture refer to the SDS Annexure.

Simatic Step 7 software will be used for the configuration and design of the PLC. WinCC Flexible software will be used for the configuration and design of the HMI System Interfaces.

3.1. System Interfaces

The following system components shall be considered while interfacing the complete system.

3.1.1. PLC

The PLC system shall interact with the plant devices via hard-wired connections with digital I/O modules and also over a Profibus network.

The PLC will be interfaced with the controlled plant via Profibus DP networks.

The following devices will communicate over the Profibus DP network:

- Incomer Multi-Function Power Meter
- Calcium Nitrate Tank Level (A5-LIT315)
- Calcium Nitrate Blind Tank Level (A5-LIT323)
- Calcium Nitrate Dosing Pump (A5-P504)

Siemens Step 7 Simatic Manager Version: 5.5 Revision Level: V5.5.0.0 software will be used.

3.1.2. SCADA

There is no SCADA system associated with PLC05 – Chemical Storage and Dosing PLC.

3.1.3. HMI

A Siemens MP277 10" Touch screen HMI shall communicate to the PLC via a Siemens Scalance industrial Ethernet switch. This HMI shall allow the operators to view the status of the related plant, adjust setpoints and view trends etc. The HMI shall be mounted to the door panel.

Siemens WinCC Flexible 2008 SP2 (Service Pack 2) will be used for development of the software.

3.1.4. Inter PLC Communications

The Inter-PLC communications are performed over an Ethernet network via a Siemens Scalance industrial Ethernet switch.

4. PLC PROCESSOR CONFIGURATION

Every CPU has an operating system that organizes all the functions and sequences of the CPU that are not associated with a specific control task. The tasks of the operating system include the following:

- Handling a warm restart and hot restart
- Updating the process image table of the inputs and outputting the process image table of the outputs
- Calling the user program
- Detecting interrupts and calling the interrupt OBs

Detecting and dealing with errors

4.1. PLC CPU315-2PN/DP

Processor CPU 315 2PN/DP PLC is a small to medium program memory CPU. This shall be used for small applications. A micro memory card is required to operate the CPU.

The CPU 315 2PN/DP shall be configured as described below:

PLC CPU 315 2PN/DP		
General		CPU 315-2PN/DP
Rack/Slot	**Part Number**	**Details and Configuration**
0/1	6ES7307-1EA01-0AA0	PS307,120/230VAC, 24VDC
0/2	6ES7315-2EH14-0AB0	CPU 315 2PN/DP
Interface	**MPI/DP**	
	DP Address	2
	Transmission rate (Kbps)	50
	Networked?	Yes
	Operating mode	DP master
	Ethernet	
	IP Address	10.173.248.82
	Subnet mask	255.255.255.0
	Networked?	Yes
Cycle/Clock Memory	Clock Memory	190
	Scan cycle monitoring:	150ms (default)
Retentive Memory Area	Marker Words M0	Max 2048

PLC CPU 315 2PN/DP		
	Timers T0	Max 256
	Counters C0	Unlimited (Limited by RAM capacity only)
Protection	**Report Cause of Stop**	
	Level of Protection	Level 1
	Mode	Test mode
Communication		
Connection resources reserved	PG communication	1
	OP communication	1
	S7 Standard communication	12

5. I/O CONFIGURATION

The following section details the I/O Configuration for the PLC in the control system.

5.1. I/O Configuration

Order No.	Description	Rack	Slot	Address
6ES7 331-7KF02-0AB0	SM-331, 8AI-N	0	4	PIW128 … PIW142
6ES7 321-1BH02-0AA0	DI 16 x DC24VDC	0	5	I 0.0 … I 1.7
6ES7 321-1BH02-0AA0	DI 16 x DC24VDC	0	6	I 2.0 … I 3.7
6ES7 322-1BH01-0AA0	DO 16 x DC24VDC, 0.5A	0	7	Q 0.0 … Q 1.7

6. ETHERNET / PROFINET NETWORKS

6.1. Ethernet Network Description

The PLC is connected to the MP277 HMI by Ethernet to the CPU PN port linked via a Scalance X204-2 Industrial Ethernet switch, (WIG0179/80021608/01/2061418 PLC05 – SDS Annexure - for detailed architecture).

6.2. Ethernet Node Addresses

The configured Ethernet addresses of the network elements are shown below.

Description	Ethernet Address	Subnet Mask
CPU 315-2PN/DP	10.173.248.82	255.255.255.0
MP277 10” Touch HMI	10.173.248.20	255.255.255.0

Inter PLC communications will be provided on an Ethernet network. Data received by the Storm Pumps PLC is dealt with the Function Block Brcv (FB13) and data sent by Storm Pumps PLC is dealt with the Function Block Bsnd (FB12).

The Inter-PLC communications will be over Ethernet. The table below details the node name and address.

Description	Node Name	Node Address
Inlet Screens PLC	PLC01	10.173.248.78
Inlet Screens HMI	HMI01	10.173.248.16
Foul Pump PLC	PLC02	10.173.248.79
Foul Pump HMI	HMI02	10.173.248.17
Storm Pumps PLC	PLC03	10.173.248.80
Storm Pumps HMI	HMI03	10.173.248.18
Detention Tank PLC	PLC04	10.173.248.81
Detention Tank HMI	HMI04	10.173.248.19
Dosing Control PLC	PLC05	10.173.248.82
Dosing Control HMI	HMI05	10.173.248.20
NAS 1 Drive	NAS1	10.173.248.192
Telemetry Panel	TELEM	TBC by UU

7. PROFIBUS CONFIGURATION

7.1. Profibus Introduction

The Profibus configuration shall consist of a Profibus network such that drives, valves and instrumentation shall be split across the networks to spread the network load and increase system availability. The CPU for the CSO Chamber and Storm Pumps PLC03 rack 0 within the MCC03 will be the master of the Profibus network.

7.2. Profibus DP Configuration

The following section details the individual configuration for each Profibus DP network, as configured in the Step 7 Hardware Configurator.

7.2.1. Profibus DP Network #1

Type	CPU 315-2PN/DP	**Order No.**	6ES7315-2EH14-0AB0	**Firmware**	V3.2.1
Network Name		DP			
Network Speed		500 Kbps	**Highest Address**	126	
Operating Mode		DP			

7.3. Profibus PA Configuration

There is no PA network for the Chemical PLC (PLC05).

Profibus Nodes

The following section details the individual configuration for Profibus device, as configured in the Step 7 Hardware Configurator.

All field devices will be on Profibus DP network.

7.4. Drives

7.4.1. Chemical Dosing Pump – A5-P504

Designation	Grundfos A5-P504					
DP Slave Type						
Family			**GSD File**	GRUN0971.GSD		
Network Name	Profibus DP Network		**Node Addr.**	14	**Watchdog**	Y
DP Interrupt Mode	N	**Fail-safe**	N	**Start-up if config. diff**		Y

7.5. Valves

There no valves on the Profibus network.

7.6. Instrumentation DP Network

Field devices will be on a Profibus DP network.

7.6.1. Multifunction Power Meter

Designation	Socomec Diris A40				
DP Slave Type	0				
Family	0	**GSD File**	DIRI0948v3.gsd		
Network Name	Profibus DP Network	**Node Addr.**	11	**Watchdog**	Y

7.6.2. Chemical Tank Level – A5-LIT315

Designation	Pulsar A5-LIT315		
DP Slave Type			
Family		**GSD File**	PULSE07E2.GSD

Network Name	Profibus DP Network		**Node Addr.**	12	**Watchdog**	Y
DP Interrupt Mode	N	**Fail-safe**	N	**Start-up if config. diff**		Y

7.6.3. Blind Tank Ultrasonic Level – A5-LIT323

Designation	Pulsar A5-LIT323				
DP Slave Type					
Family			**GSD File**	PULSE07E2.GSD	
Network Name	Profibus DP Network		**Node Addr.**	13	**Watchdog**	Y
DP Interrupt Mode	N	**Fail-safe**	N	**Start-up if config. diff**		Y

7.7. Instrumentation PA Networks

There is no PA network for PLC05_Chemical PLC.

8. PLC SOFTWARE STRUCTURE

The following section details the core Organisation Blocks: Function Blocks: Functions and Data Blocks associated with a United Utilities Siemens Step 7 project.

8.1. PLC Software Structure (Standard)

Module	Program	Data Blocks
Organisation Blocks		
Main program block	OB1	
Timed Interrupt (100mS)	OB35	
Hardware Interrupt	OB40	
Cycle Time Fault	OB80	
Diagnostic Interrupt	OB82	
I/O_FLT2	OB83	
Organisation Block Not Called	OB85	
Rack Fault	OB86	
Communication Error	OB87	
Start-up routine	OB100	
Access Error	OB122	
Functions		
Totalizer	FC6	
Report System Error	FC49	DB50
Scale	FC105	
Unscale	FC106	
Telemetry Mapping	FC111	DB66-67
Telemetry Temp	FC112	
Profibus_Status	FC122	
Profibus_I/O	FC32	DB130-DB131
Digital Input	FC180	DB180
Digital Output	FC181	DB181
Analogue Input	FC182	DB182
Analogue Output	FC183	DB183
Utilities	FC200	
Revision_Update	FC202	DB2
INT_S5TIME	FC203	

Module	Program	Data Blocks
AI_4-20mA_SCALE	FC207	
Digital Input Debounce	FC300	
Solenoid Valve alarm marshalling to SCADA/HMI	FC306	
Analogue instrument status/alarm marshalling to SCADA/HMI	FC311	
CHEMICAL_CALLS	FC400	
CHEMICAL_INST	FC401	
CHEMICAL_DRV	FC402	
CHEMICAL_VLV	FC403	
CHEMICAL_CNTRL	FC405	
CHEMICAL_ALARM	FC409	
Function Blocks		
BSND Send data from remote partner	FB12	
BRCV Receive data from remote partner	FB13	
Report System Error	FB49	DB49
Solenoid valve control function	FB305	
Analogue instrument signal alarm (HH,H,L,LL) monitoring	FB311	
HMI Date / Time functions	FB368	DB368
Data Blocks		
Revision	DB2	
SFM_DB	DB49	
SFM_GLOBAL_DB	DB50	
Data_To_Telemetry	DB66	
Data_From_Telemetry	DB67	
Profibus_Data_In	DB132	
Profibus_Data_Out	DB133	
DI_Buffer	DB180	
DO_Buffer	DB181	
AI_Buffer	DB182	
Ao_Buffer	DB183	
Alarms	DB309	
Words to HMI	DB360	
Bits to HMI	DB361	
Words from HMI	DB362	
Words to HMI	DB363	
HMI Date Time	DB368	
Diris_PWR_Meter_Data	DB369	

Module	Program	Data Blocks
Instance DBs for Drive(s)	DB420-DB439	
Instance DBs for Solenoid Valve/Penstock	DB440-DB459	
Instance DBs for Analogue Instrument	DB480-DB499	

8.1.1. Organisation Blocks

The Organisation Blocks (OBs) are specific Siemens blocks that represent the interface between the operating system of the CPU and the user program. Called by the operating system, they control cyclic and interrupt driven program execution, startup behavior of the PLC and error handling.

Organisation Block (OB1) shall be modified from the base project configuration to include the specific project functions; function blocks and data blocks.

Organisation Block (OB35) shall be used to include calls to project specific PID loop functions.
NB This routine shall not be used to code the PID loops directly, but shall be used to call individual functions.

Organisation Block (OB100) shall be modified, if required, from the base project configuration to include the specific project requirements for PLC start-up including setting logic to safe / default states.

8.1.2. Function Blocks

The Function Blocks (FBs) are bespoke software modules produced to provide specific functional requirements. The standard project contains two default function blocks (FB49) and (FB368).

Function Block (FB49) is a specific Siemens software block used for 'Report System Error' diagnostics. The block compiles based on the system configuration and the report settings in the dialog via Hardware Configurator in Siemens Step 7 and shall interface with the respective OB's to compile CPU behavior during fault conditions and generate specific alarm messages for display on the HMI. Other associated software modules are Function FC49 and Data Blocks DB49 and DB50.

Function Block (FB368) is a bespoke software block used to interface to the HMI area pointers. The block allows adjustment of the PLC real-time clock via the HMI and to perform regular clock synchronisation. Associated data is stored in Data Block DB368.

8.1.3. Functions

The Functions (FCs) are bespoke software modules produced to provide specific functional requirements. The core functions are used to provide plant IO signal buffering: telemetry interface mapping, along with a utilities and revision update facility.

Function (FC200) is a utility routine used to provide flags and clock pulses that can be used throughout the software.

Function (FC202) is function that allows the user to identify revisions of the software, in line with the United Utilities version control. The revision shall be displayed on the HMI. The revision data shall be stored in Data Block DB2.

Functions (FC180 – FC183) are used as IO signal buffering. Each function is assigned to particular signal types and each individual IO signal is mapped either to / from a dedicated Data Block (DB180 – DB183). The buffered signals are used throughout the software.

Function (FC111) is used to collate data for transfer to the telemetry system and is used in conjunction with Data Block (DB66 – DB67).

8.1.4. Data Blocks

The Data Blocks (DBs) are used to store specific data in an organized, structured format. Along with the data blocks identified in previous sections other standard data blocks are used to provide an interface with the HMI (Data Blocks DB309: DB360: DB361: DB362 and DB363.

Data Blocks (DB180: DB181: DB182 and DB183) used as plant IO buffer storage are configured as 'Non-retentive' data.

9. HMI CONFIGURATION

9.1. General

This section details the standard configuration for HMI's employed on United Utilities control systems

9.1.1. PLC/HMI Communications

9.1.1.1. Control Tags

The following control tags shall be supplied from the PLC within DB368:

- Screen tag number.
- PLC Date/Time
- Logged on bit (indicating user logged into HMI)
- Logged on Hour, Logged on Minute, Logged on Second (giving time that user logged in)

9.1.1.2. Status Tags

The following status tags shall be supplied to the PLC:

- Screen Tag Number
- HMI Date/Time

9.1.1.3. PLC to HMI data

Process Values and statuses shall be read by the HMI from the following PLC data blocks:

- DB309 - Alarms
- DB360 - Words To HMI
- DB361 - Bits To HMI

9.1.1.4. HMI to PLC Data

The HMI shall write Data in the structure of the following PLC data blocks:

- DB362 - Words From HMI
- DB363 - Bits From HMI

Bit values shall be set by the HMI, and then reset after 1 scan by the PLC regardless of whether the PLC acted on the instruction or not. The HMI shall not toggle status or mode bits directly.

9.1.2. Basic Screen Configuration

All screens shall have the following displayed in the fixed area at top of screen:

- Date / Time – Positioned top left of screen title.
- Title – Positioned top middle.
- Alarm Message Indicator – Positioned top right of screen title.
- Text 'Logged/Blank' – Defining whether the terminal is logged on or not and positioned below time.
- Log on time – Positioned below the above text.
- Alarm Indicator - Positioned at top right
- Single Line Alarm Banner – Positioned at bottom of screen

All screens shall have the following 'navigation bar' buttons at the bottom of the screen to allow the user to go to the relevant screen:

- Overview - Access To Main Process Overview Screen
- Current Alarms - Access To Current Active Alarms Screen
- Trends - Access To Trends Menu Screen
- Previous Page - Access To The Previous Mimic Within The Associated Layer
- Next Page - Access To The Next Mimic Within The Associated Layer
- Return - Return To The Previous Selected Mimic

9.1.3. Security

The 'Log On / Off' facility shall reside on the 'main Process Overview' mimic. 'Logging On/Off shall be via a dynamic pushbutton indicating the required action. Pressing the 'Log On' pushbutton shall display a dialogue box which will allow the user to enter both the user name and associated password.

There shall be four levels of security configured on the HMI, using the WinCC Flexible 2008 security system. There shall be an Operator, Supervisor and Engineer password level as well as a System Administrator level. Each user group shall be assigned specific facilities e.g. control actions, parameter adjustment, alarm resetting and acknowledgement etc.

Where no user is logged in then the default 'View only' attributes shall be applied i.e. no control actions permitted

The system shall auto log out after an adjustable period of inactivity (typically set to 30 minutes) after which the user shall be automatically logged off. The user can also log off by pressing the pushbutton on the 'Main Overview' mimic or by logging as a different user.

9.1.4. Standard Screens

The HMI consists of a number of screens, which will be of the following types:

9.1.4.1. Main Overview Screen

This screen displays the key status associated with all the process areas controlled and monitored by the PLC system. Also the screen allows access to process area overview mimics.

This mimic shall include the standard 'navigation bar' as described in section 9.1.2 along with a further 'navigation bar containing pushbuttons allowing the user access to specific functions. These pushbuttons shall be as follows, where appropriate:

- Help - Access to Help Menu Screen
- Log On/Off - System Log On / Off function
- Area Resets - Access To Global / Area Alarm Reset function
- Reports - Access To Configured Reports (if applicable)
- Network Diagnostics - Access To Control System / Network Mimics
- Electrical Network - Access To Electrical System Monitoring Mimics (if applicable)
- Engineering - Access Oper / Engineer Facilities (dependent on User)
- Telemetry - Access To Telemetry Alarm mimics

9.1.4.2. Detailed Process Area Screen

These screens provide detailed status each of individual plant area and also access to any related control screens. Pushbuttons to process area mimics e.g. setpoints; duty selection shall be included on the 'navigation' bar' over the 'Area Specific' button placeholders

9.1.4.3. Control Screens

Control screens provide the operator with a means to control items of plant from the HMI. Each plant item has a standard faceplate showing the status of the plant. Plant control is also possible via this standard faceplate.

9.1.4.4. Setpoint Screens

Set point screens shall display the set points of the plant, each having a description of the set point, a data entry field and the unit of measure. All set point numeric entry boxes shall have upper and lower limits set to the plant upper and lower limit set points. Normally, these limits shall be password protected.

9.1.4.5. Trend Screens

Trend mimics shall be configured as required for the project, providing both real-time and historical data. A menu mimic shall be configured to provide the trend selection, available from any screen.

9.1.5. Standard Screens List

The HMI consists of the following default screens. All other mimics shall be process / project specific

Screen No.	Description
001	Main Process Overview
410	Area Resets
411	Current Alarms
412	Historical Alarms
413	Telemetry Alarms Status
500	Trends Menu
610	Electrical Networks Menu
611	Power Consumption Mimic (If required)
612	Power Monitoring Mimic (If required)
613	Single Line Diagram Mimic (If required)
620	Fieldbus Networks Menu
621	System Architecture Overview
622	Profibus / Fieldbus Networks (If required)
631	PLC Report System Diagnostic Buffer
632	HMI Report System Diagnostic Buffer
641	Date And Time Set-up
642	Password Edit
650	Help Pages Main Menu
651	Help Page – General Object Descriptions
652	Help Page – Drive Status
653	Help Page – Valve Status
655	Help Page – Simocode Status
656	Help Page – Instrument Status
657	Help Page – Alarm Status
658	Help Page – Trends Status
659	Help Page – User Login Levels
660	Help Page – Password Edit
701 - 703	Help Pages – Process Colours (E118)

9.2. HMI Configuration

The following details the basic configuration for the HMI.

Device name	HMI MP277
MPI Network	No
MPI Address	N/A
Ethernet Network	Yes
IP Address	10.173.248.20
Subnet Mask	255.255.255.0
System Language	English (UK)
Date Settings	Regional date set to UK

9.2.1. HMI Screen List (Process Specific)

The following is a list of the configured mimics associated with the process(es) for this project.

Screen No.	Description
001	Main Process Overview
110	Dosing Mimic
111	Wash Stations
211	P504_Dosing Pump Pg1
212	P504_Dosing Pump Pg2
213	AV508 Chemical Tank Outlet Valve
311	Chemical Setpoints
500	Trends Menu
	Real Time Trends
511	Derived Detention Tank Inlet Flow & Chemical Dosing Flowmeter
512	Chemical Storage Tank & Blind Tank Level
513	Derived Detention Tank Inlet Flow & Chemical Dosing Flowmeter Cumulative
	Historical Trends
521	Derived Detention Tank Inlet Flow & Chemical Dosing Flowmeter
522	Chemical Storage Tank & Blind Tank Level
523	Derived Detention Tank Inlet Flow & Chemical Dosing Flowmeter Cumulative

9.3. Configuration Deviation from E118 standard

There are no deviations from the United Utilities E118 Specification.

10. SCADA CONFIGURATION

There is no SCADA system on this project.

10.1. SCADA Hardware Configuration

N/A

10.2. SCADA Software Configuration

N/A

11. REPORTING

There are no report requirements for this project.

12. GENERIC TAGGING

Tagging shall be in the Form – PLANTTAG_STATUS where the status shall be that of the signal when it is high.

Any spare IO shall be tagged – SPARE_xx_Rx_Sx_CHxx

13. STANDARD SOFTWARE USEAGE

The following standard United Utilities PLC Function Blocks have been employed on this project.

Module	FB No.	Data Blocks
Functions		
Solenoid valve control function	FB305	
UU issued Module For Grundfos Dosing Pumps	FB310	
UU issued Module For Analogue Input Processing	FB311	
UU issued Module For Date Time Control	FB368	
Module	**FC No.**	**Data Blocks**
Function Blocks		
Digital Input Debounce	FC300	
Solenoid Valve alarm marshalling to SCADA/HMI	FC305	
Grundfos Dosing Pump alarm marshalling to SCADA/HMI	FB310	
Analogue instrument status/alarm marshalling to SCADA/HMI	FC311	

14. CLOSED LOOP CONTROL DOCUMENTATION

N/A

15. PROCESS MODULE USEAGE

The following process specific PLC Functions / Function Blocks have been created on this project.

Module	Description
FC410	Calls to Control blocks for Chemical Dosing and Storage
FC411	Instrumentation for Chemical Dosing and Storage
FC412	Drives for Chemical Dosing and Storage
FC413	Valves for Chemical Dosing and Storage
FC415	Process code for Chemical Dosing and Storage
FC419	Alarms for Chemical Dosing and Storage

16. APPENDIX 1 – SYSTEM ARCHITECTURE DIAGRAM

Please see WIG0179_80021608_01_20_61418 PLC05 SDS013 Annexure – SDS Annexure

17. APPENDIX 2 – I/O SCHEDULE

Please see WIG0179_80021608_01_20_61418 PLC05 SDS013 Annexure – SDS Annexure

18. APPENDIX 3 – BILL OF MATERIALS

Please see WIG0179_80021608_01_20_61418 PLC05 SDS013 Annexure – SDS Annexure

19. APPENDIX 4 – ALARM SCHEDULE

Please see WIG0179_80021608_01_20_61418 PLC05 SDS013 Annexure – SDS Annexure

20. APPENDIX 5 – INTER PLC COMMUNICATIONS LIST

Please see WIG0179_80021608_01_20_61404 PLC05 FDS005

21. APPENDIX 6 – TAG DATABASE

Please see WIG0179_80021608_01_20_61418 PLC05 SDS013 Annexure – SDS Annexure

22. APPENDIX 7 – NETWORK LOADING CALCULATION

Please see WIG0179_80021608_01_20_61418 PLC05 SDS013 Annexure – SDS Annexure

23. APPENDIX 8 – HARDWARE SETTINGS

N/A

24. APPENDIX 9 – NETWORK SETTINGS

Please see WIG0179_80021608_01_20_61418 PLC05 SDS013 Annexure – SDS Annexure

25. APPENDIX 10- SCADA MIMICS

N/A

26. APPENDIX 11 – HMI MIMICS

Please see “56938 Tyldesley UID Chemical PLC05 – HMI Screens.