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1.0 OVERVIEW

1.1 Scope of Document

The logic specified in this document is intended to provide functional requirements for PLC-G800 Headworks Pre-treatment. Refer to document A-0102-AFRS-G001 for PLC-G800 Raw Sewage Intake, Pumps and Wet Well functional requirements. Refer to document A-0102-AFRS-A001 for general requirements and standard equipment classes. Refer to PCN Alarm, Range and Settings List for operator setting ranges.

This Functional Requirement Specification (FRS) document is intended to provide an initial basis for development of the PLC and HMI application functionality for the specific process area described herein. The Contractor must provide further development of the PLC and HMI functionality described in this document for a complete and functional system. It is written from a technical perspective and is intended to be read in parallel with the Process Control Narratives (PCNs), the associated Process and Instrument Diagrams (P&IDs), the Instrument Loop Drawings (ILDs) and the other PLC related contract documents. In the event of any discrepancy or any ambiguity, the PCNs, P&IDs, ILDs and other contract documents take precedence (in no specific order of importance) over the FRS documents. Any significant discrepancy should be clarified with the Contract Administrator. All discrepancy resolutions should be documented and submitted as part of the as-built markups. If there are discrepancies from a scope of work perspective, the more stringent requirement shall apply. All scope of work discrepancies should be clarified with the Contract Administrator.

Control functions are described using pseudo code and encapsulated in classes (some of which are commonly applicable for similar or identical equipment systems). These classes may therefore be instantiated as necessary to control similar types of equipment throughout the facility. Each class defines a control interface whose inputs and outputs are interconnected to implement the overall process control strategy as defined by the PCNs, P&IDs, ILDs, etc. and the FRS document. The specific area FRS documents are supported by the General FRS document which provides common definitions for software development required throughout the entire facility.

While the FRS documents provide specific guidance with respect to software development, they should not be presumed to be comprehensive of all software development requirements. Ultimately the P&IDs, the PCNs and the ILDs will govern and take precedence. It is the responsibility of the Contractor to utilize its expertise to provide a fully functional set of developed software in accordance with the contract documents even if not described within the FRS document at no additional cost to the contract. It is the specific responsibility of the Contractor to identify, seek clarification and ultimately resolve any issues of ambiguity, interpretation, uncertainties or discrepancies between the FRS documents and the associated contract documents. This responsibility extends to the need for consultation, as necessary, with the process designers, process equipment vendors, the Engineer, the Owner and any other relevant stakeholders to resolve any issue in accordance with the Contractor's legal obligations for the delivery of the work.

The DCS replacement logic specified in this document is intended to provide equivalent functionality to the existing DCS logic. However, there are instances where the functionality was modified because of the inherent differences in implementation between PLC and DCS functionality and architecture.

1.2 Associated Documents

The documents associated with the functional requirements are listed below. Additional P&ID drawings may be referenced in this document.

Table 1.2-1 Associated Documents

Document Number	Description
A-0102-PPCN-G001	HEADWORKS PROCESS CONTROL NARRATIVE

Document Number	Description
A-0102-AFRS-A001	FUNCTIONAL REQUIREMENTS SPECIFICATION GENERAL CLASS DEFINITION
A-0102-AFRS-G001	FUNCTIONAL REQUIREMENTS SPECIFICATION AREA G PROCESS – RAW SEWAGE PUMPS
A-0102-AFRS-G003	FUNCTIONAL REQUIREMENTS SPECIFICATION AREA G HVAC
1-0102-PPID-G201	MECHANICAL SCREENS SCR-G211 AND SCR-G212
1-0102-PPID-G202	MECHANICAL SCREENS SCR-G213 AND SCR-G214
1-0102-PPID-G203	SCREENINGS WASHER/COMPACTORS WCP-G231 AND WCP-G232 AND DISPOSAL BINS
1-0102-PPID-G204	SLUICE WATER PUMPS P-G221 AND P-G222
1-0102-PPID-G301	GRIT TANKS TK-G321 AND TK-G322
1-0102-PPID-G302	GRIT PUMPS P-G323, P-G324 AND P-G325
1-0102-PPID-G303	GRIT TANKS TK-G331 AND TK-G332
1-0102-PPID-G304	GRIT PUMPS P-G335 AND P-G336
1-0102-PPID-G305	GRIT CLASSIFIERS GRP-G341 AND GRP-G342
1-0102-PPID-G306	GRIT BLOWERS B-G353 AND B-G354
1-0102-PPID-G307	CHANNEL AERATION BLOWERS B-G351 AND B-G352
1-0102-PPID-G501	FLUSHING WATER PIPING
1-0102-PPID-G502	NON-POTABLE WATER PIPING
1-0102-PPID-G508	AUTOMATIC STRAINERS STR-G535 AND STR-G536
1-0102-PPID-G510	1000 kW NATURAL GAS GENSET
1-0102-PPID-G901	MISCELLANEOUS

Note: Refer to document A-0102-AFRS-G001 for PLC-G800 Raw Sewage Intake, Pumps and Wet Well P&IDs

2.0 GENERAL REQUIREMENTS

Refer to document A-0102-AFRS-A001 for general requirements and standard classes.

2.1 Graphic Displays

Create Area Overview, Process Graphic and Detail displays as per City of Winnipeg HMI Layout and Animation plan document (612620-0015-40ER-0001) and General Functional Requirements Specification A-0102-AFRS-A001.

The following tables provide guidance on the minimum anticipated groupings of process displays, however, these should not be considered as fully defined and modifications and additions may be required.

Note that only major or representative equipment and devices are explicitly shown in the graphic display tables. Include other devices as required for a complete HMI.

Refer to General Functional Requirements Specification A-0102-AFRS-A001 for Level 1 graphics.

Table 2.1-1 Level 2 Area G Graphic Displays – Headworks Pre-treatment Overview

Group	Content
Mechanical Screens	FI-G1100 Raw Sewage Total Flow Trend and Text LI-G2011 Screens Influent Channel Level Bar Graph and Text TI-G2012 Screens Influent Channel Temperature Bar Graph and Text SGR-G211/2/3/4 Mechanical Screen Status and Run Enabled/Disabled Text LDI-G21(1/2/3/4)3 Mechanical Screen SGR-G211/2/3/4 Differential Level Bar Graph and Text
Grit Tanks	LIC-G3201 Screen Effluent Channel Level Bar Graph and Text LK-G3201 Screen Effluent Channel Level Control Gate to TK-G33(1&2) Grit Tank Status Grit Tanks TK-G32(1&2) - HV-G32(1/2)2 Grit Tank TK-G32(1/2) Inlet Gate Status - LI-G3615 Grit Tanks TK-G32(1&2) Effluent Level Bar Graph and Text - P-G32(3/4/5) Grit Tank TK-G32(1&2) Grit Pumps Status - FI-G32(3/5)1 Grit Tank TK-G32(1/2) Grit Flow Bar Graph and Text Grit Tank TK-G33(1&2) - HV-G33(11/22) Grit Tank TK-G33(1/2) Inlet Gate Status - LI-G3333 Grit Tanks TK-G33(1&2) Effluent Level Bar Graph and Text - XV-G333(1/2) Grit Tanks TK-G33(1&2) Effluent Gate Status - XV-G33(1/2)3 Grit Tank TK-G33(1/2) Grit Pumps Suction Valve Status - P-G33(5/6) Grit Tanks TK-G33(1&2) Grit Pumps Status - FI-G3503 Grit Tanks TK-G33(1&2) Grit Blowers Flow Status Flow Bar Graph and Text

Group	Content
Washers/Compactors, Grit Classifiers and Bins	Washers/Compactors - XV-G23(1/2)1 Sluice Gate Status - WCP-G23(1/2) Washers/Compactor Status - P-G22(1/2) Sluice Screening Water Pump Status - PI-G2202 Sluice Water Pump P-G22(1&2) Discharge Pressure Grit Classifier GRP-341 - XV-G341(1/2) Grit Tank TK-G23(1/2) Slurry Gate Status - XV-G3413 Grit Tanks TK-G331 and TK-G332 Slurry Gate Status - GRP-341 Grit Classifier Status Grit Classifier GRP-342 - XV-G342(1/2) Grit Tank TK-G23(1/2) Slurry Gate Status - XV-G3423 Grit Tanks TK-G331 and TK-G332 Slurry Gate Status - GRP-342 Grit Classifier Status Disposal Bins - ZL-G23(3/4)2 TK-G23(3/4) Disposal Bin in Position Status - YL-G23(3/4)2 TK-G23(3/4) Disposal Bin Ready Status - WI-G23(3/4)1 TK-G23(3/4) Disposal Bin Weight Bar Graph, Trend and Text - YC-G230(4/5/) TK-G23(3/4) Disposal Bin Active/Inactive Status Text - YC-G23(3/4)1 TK-G23(3/4) Disposal Bin Full Status Text
	- YC-G230(6/7) TK-G23(3/4) Disposal Bin Ready For Hauler Status Text
Sum Pumps	P-G52(1/2) Grit Tanks G32(1/2) Sump Pump Status P-G53(1/2) Grit and Screening Building Sump Pump Status
Strainers	STR-G53(5/6) Flushing Water Strainers Status XV-G5345 No Potable Backup Water To Screens Valve Status TI-G5331 Hot Water Heater Outlet Temperature Bar Graph and Text
Electrical	GEN-G791 Natural Gas Generator Status UPS-G760 Area G UPS Status Signals
Area G HVAC	Refer to Functional Requirement Specification A-0102-AFRS-G005 and A-0102-AFRS-G006 for Level 2 HVAC Area Screens. Include the following signals in the Area G HVAC General Screen: AA-G5010 Wet Well Gas Alarm (Red text visible on alarm only) (Hardwired to Area G PLC) AI-G5011 Wet Well % LEL (Via Third Party Communications) AI-G5012 West Wet Well % LEL (Via Third Party Communications)

Group	Content
	AI-G5013 East Wet Well % LEL (Via Third Party Communications) AI-G5014 Wet Well H2S PPM (Via Third Party Communications) XC-G5010 Wet Well Gas Detection Sample Panel Purge Request AA-G5020 Dry Well Gas Alarm (Hardwired to Area G PLC) (Red text visible on alarm only) AI-G5022 Dry Well O2 % (Via Third Party Communications) AI-G5021 Dry Well H2S PPM (Via Third Party Communications) AA-G5911 Area G Generator Room Gas Alarm (Hardwired to Area G PLC) (Red text visible on alarm only) AI-G5911 Area G Generator Room % LEL (Via Third Party Communications)
Area G Miscellaneous	Refer to Functional Requirement Specification A-0102-AFRS-G003 for Level 2 Area Miscellaneous Screens. Include the following signals in the Miscellaneous Screen: Outside and Control Room Door Switches Gallery Motion Detectors Grit Hauler Indication OD-G566 Truck Bay Overhead Door

Table 2.1-2 Level 2 Area B Graphic Displays – Part of Service Building Overview

Group	Content
Area B HVAC	Refer to Functional Requirement Specification A-0102-AFRS-B001 for Level 2 Area Screens. Include the following signals in the Area B HVAC Screen: AA-B5501 Boiler Room Gas Alarm (Hardwired to Area G PLC) AI-B5501 Boiler Room % LEL (Via Third Party Communications)

Table 2.1-3 L3 and L4 Graphic Displays – Headworks Pre-treatment

Display Group	Level	Content
Headworks Pre-treatment Overview Trends	4	(See Trends section below)

Display Group	Level	Content
Mechanical Screens and Grit Tanks	3	SGR-G211/2/3&4 Mechanical Screens Grit Tanks TK-G32(1&2) Grit Tank TK-G33(1&2)
Mechanical Screens	4	SGR-G211/2/3&4 Mechanical Screens Settings and local panel third party information
Grit Tanks TK-G33(1&2)	4	TK-G33(1&2) Settings and Sequence Status Information
Washers/Compactors and Disposal Bins	3	WCP-G23(1&2) Washers/Compactors P-G22(1&2) Sluice Screening Water Pumps TK-G23(3&4) Disposal Bins
Washers/Compactors	4	WCP-G23(1/2) Washers/Compactor Settings and local panel third party information
Bins	4	Bins Settings and Status
Grit	3	P-G32(3,4&5) Grit Pumps for Grit Tanks TK-G32(1&2) P-G33(5&6) Grit Pumps for Grit Tanks TK-G33(1&2) Grit Classifier GRP-34(1&2)
Grit	4	Grit Settings and Sequence Status Information
Blowers	3	B-G351, B-G352, B-G353 and B-G354 with process related third party information
Blowers	4	B-G351, B-G352, B-G353 and B-G354 settings and local panel third party information
Sump Pumps	3	P-G52(1/2) Grit Tanks G32(1/2) Sump Pumps P-G53(1/2) Grit and Screening Building Sump Pump
Strainers	3	STR-G53(5/6) Flushing Water Strainers Status
Electrical	4	Area G Electrical Third Party Information
PCS Status	4	PLC Status and Basic Diagnostics for Main Controller Racks Remote I/O Racks Networking Components (Including switch diagnostic when available) RIO, DIO, Modbus and Profibus devices Other PLCs in the area (E.G. unit or vendor PLCs) Power Supplies

2.2 Trends

Create, at minimum, the following trend displays, with the indicated pens. Create appropriate links from the various graphic screens to the trend displays.

Table 2.2-1 Trends

Trend Group	Content	
Screens Influent Channel	LI-G2011.Out	Influent Channel Level
	TI-G2012.Out	Influent Channel Temperature
SGR-G21(1/2/3/4) Mechanical Screens Level	LI-G21(1/2/3/4)3-1.Out	SGR-G21(1/2/3/4) Mechanical Screen Inlet Level
	LI-G21(1/2/3/4)3-2.Out	SGR-G21(1/2/3/4) Mechanical Screen Outlet Level
Disposal Bin Weight	WI-G23(3/4)1.Out	TK-G23(3/4) Disposal Bin Weight
Sluice Water Pumps	PI-G2202.Out	Sluice Water Pumps P-G22(1&2) Discharge Pressure
Grit Tanks	LIC-G3201.Out	Screen Effluent Channel Level
	LI-G3615.Out	Grit Tanks TK-G32(1&2) Effluent Level
	LI-G3333.Out	Grit Tanks TK-G33(1&2) Effluent Level
Grit Tank TK-G32(1&2) Grit Flow	FI-G32(3/5)1.Out	Grit Tank TK-G32(1/2) Grit Flow
TK-G33(1/2) Grit tank Blowers	FI-G3503.Out	Grit Tanks TK-G33(1&2) Grit Blowers Flow
Channel Aeration Blowers	FI-G3502.Out	Channel Aeration Blowers Flow
Dry Well Flood Level	LI-G56(3/4)1.Out	West/East Dry Well Bar Flood Level
Hot Water Heater	TI-G53331.Out	Hot Water Heater Outlet Temperature

Trend Group	Content	
LEL Wet Well	AI-G5011	Wet Well % LEL (Via Third Party Communications)
	AI-G5012	West Wet Well % LEL (Via Third Party Communications)
	AI-G5013	East Wet Well % LEL (Via Third Party Communications)
H2S Well	AI-G5014	Wet Well H2S PPM (Via Third Party Communications)
	AI-G5021	Dry Well H2S PPM (Via Third Party Communications)
O2 Well	AI-G5022	Dry Well O2 % (Via Third Party Communications)
LEL Generator Room	AI-G5911	Area G Generator Room % LEL (Via Third Party Communications)

2.3 Inputs from Other PLCs

Some variables will be shared among different areas of the plant. They will be communicated via the Fibre Ethernet redundant ring connecting the PLCs. Variables that are read from other PLCs are listed below, along with their default value in the event of a communication failure.

The following table provides guidance on the minimum anticipated variables that are read from other PLC along with their default value in the event of a communication failure, however, these should not be considered as fully defined and modifications and additions may be required.

Input	Description	Source PLC	Value On Communication Error
GBL_K800_XC-G36(2/3)1_OpenReq	HRC Train (1/2) Influent Channel Gate Open Request	PLC-K800	Last
GBL_K800_HA-K1(1/2)06_Alm	HRC (1/2) Process Stop Hand Switch Summary	PLC-K800	Last
GBL_K800_HA-K1(1/2)06_AlmErr	HRC (1/2) Process Stop Hand Switch Summary Bad Quality	PLC-K800	True
GBL_K800_XC-G36(2/3)2_OpenReq	HRC Train (1/2) Influent Flushing Water Open Request	PLC-G800	False

2.4 Logic and variables for other PLCs

The following sections provide guidance on the minimum anticipated variables and logic required from this PLC for other PLCs, however, these should not be considered as fully defined and modifications and additions may be required.

Variable	Description	Source
GBL_G800_XC-G36(2/3)1_Rdy	XV-G3621 HRC Train (1/2) Influent Channel Gate Ready	XC-G36(2/3)1.Rdy
GBL_G800_XC-G36(2/3)1_ConfOpn	XV-G3621 HRC Train (1/2) Influent Channel Gate Confirmed Open	XC-G36(2/3)1.ConfOpn
GBL_G800_XC-G36(2/3)1_ConfCls	XV-G3621 HRC Train (1/2) Influent Channel Gate Confirmed Closed	XC-G36(2/3)1.ConfCls
GBL_G800_XC-G36(2/3)1_Fail	XV-G3621 HRC Train (1/2) Influent Channel Gate Fail Summanry	XC-G36(2/3)1.Fail
GBL_G800_XC-G36(2/3)1_AlmErr	XV-G3621 HRC Train (1/2) Influent Channel Gate Bad Quality	XC-G36(2/3)1.AlmErr
GBL_G800_XC-G36(2/3)2_Rdy	XV-G3622 HRC Train (1/2) Influent Flushing Water Ready	XC-G36(2/3)2.Rdy
GBL_G800_XC-G36(2/3)2_ConfOpn	XV-G3622 HRC Train (1/2) Influent Flushing Water Confirmed Open	XC-G36(2/3)2.ConfOpn
GBL_G800_XC-G36(2/3)2_ConfCls	XV-G3622 HRC Train (1/2) Influent Flushing Water Confirmed Closed	XC-G36(2/3)2.ConfCls
GBL_G800_XC-G36(2/3)2_Fail	XV-G3622 HRC Train (1/2) Influent Flushing Water Fail Summanry	XC-G36(2/3)2.Fail
GBL_G800_XC-G36(2/3)2_AlmErr	XV-G3622 HRC Train (1/2) Influent Flushing Water Bad Quality	XC-G36(2/3)2.AlmErr
GBL_G800_AI-G3611_Out	HRC 1 & 2 Influent Turbidity Value	AI-G3611.Out
GBL_G800_AI-G3611_AlmErr	HRC 1 & 2 Influent Turbidity Bad Quality	AI-G3611.AlmErr
GBL_G800_AI-G3611_CtrlHi_Act	HRC 1 & 2 Influent Turbidity High Control Level and HRC Influent analyzer alarm deactivation delay has elapsed	AI-G3611.CtrlHi AND (XV-G3621.ConfOpn or XV-G3631.ConfOpn for more than AI-G3613_AlmDeact_Setting minutes).
GBL_G800_AI-G3611_CtrlLo	HRC 1 & 2 Influent Turbidity Low Control Level	AI-G3611.CtrlLo
GBL_G800_AI-G3612_Out	HRC 1 & 2 Influent pH Value	AI-G3612.Out
GBL_G800_AI-G3612_AlmErr	HRC 1 & 2 Influent pH Bad	AI-G3612.AlmErr

Variable	Description	Source
	Quality	
GBL_G800_FAL-G3614_Alm	HRC 1 & 2 Influent Turbidity and pH Sensor Low Sample Flow	FAL-G3614.Alm
GBL_G800_FAL-G3614_AlmErr	HRC 1 & 2 Influent Turbidity and pH Sensor Low Sample Flow Bad Quality	FAL-G3614.AlmErr

3.0 IMPLEMENTATION

3.1 Simple Class Instances

The following tables show simple class instance implementations, other instances are shown in the rest of the document. In general, equipment with identical functionality for different systems is not shown.

3.1.1 AnalogCS (Analog Control Station)

Table 3.1-1 Simple AnalogCS Instances

Instance	Destination	Description	CV_In	Alarms (Priority)	Notes
XK-G21(1/2/3/4)1	XV-G21(1/2/3/4)1	Mechanical Screen SCR-G21(1/2/3/4) Channel Inlet Gate	See Notes	(2)	P&ID: PPID-G201 & PPID-G202

Notes:

XK-G21(1/2/3/4)1.CV_In := if(NOT YC-G21(1/2/3/4)9.Running, 0%, If(YC-G21(1/2/3/4)0_Scour_LD_Req, LDIC-G21(1/2/3/4)0.CV,100%)

3.1.2 AnalogIAC (Analog Indication, Alarming and / or On Off Control)

Table 3.1-2 Simple AnalogIAC Instances

Instance	Source	Description	Alarms (Priority)	Notes
LI-G2011	LIT-G2011	Mechanical Screens Influent Channel Level	HiHi(1),Hi(1),Err(2)	P&ID: PPID-G201
TI-G2012	TIT-G2012	Mechanical Screens Influent Channel Temperature	Err(2)	P&ID: PPID-G201
LI-G21(1/2/3/4)3-1	LIT-G21(1/2/3/4)3-1	Mechanical Screen SGR-G21(1/2/3/4) Inlet Level	Err(2)	Read through LIT-G21(1/2/3/4)3 P&ID: PPID-G20(1/2)
LI-G21(1/2/3/4)3-2	LIT-G21(1/2/3/4)3-2	Mechanical Screen SGR-G21(1/2/3/4) Outlet Level	Err(2)	Read through LIT-G21(1/2/3/4)3 P&ID: PPID-G20(1/2)
LDI-G21(1/2/3/4)3	LI-G21(1/2/3/4)3-1.Out - LI-G21(1/2/3/4)3-2.Out	Mechanical Screen SGR-G21(1/2/3/4) Differential Level	Err(2)	P&ID: PPID-G20(1/2)

Instance	Source	Description	Alarms (Priority)	Notes
WI-G23(3/4)1	WIT-G23(3/4)1	Disposal Bin TK-G23(3/4) Weight	Lo(3), Hi(3), HiHi(2),& Err(2)	ExtRst: See note 6 P&ID: PPID-G203
PI-G2202	PIT-G2202	Sluice Water Pump P-G22(1&2) Discharge Pressure	Lo(2), Hi(2) & Err(2)	P&ID: PPID-G204 Enable AlmLo if ((YC-G2210.Running OR YC-G2220.Running) for more than TBDC[1] seconds
LI-G3615	LIT-G3615	Grit Tanks TK-G32(1&2) Effluent Channel Level	Hi(1)& Err(1)	P&ID: PPID-G301
FI-G3231	FIT-G3231	Grit Tank TK-G321 Grit Slurry Flow	Lo(2) & Err(2)	P&ID: PPID-G302 Enable AlmLo if ((YC-G3230.Running OR (YC-G3240.Running AND NOT XC-G3237.ConfCls) OR NOT HL-G3222.ConfCls) for more than TBDC seconds) See note 5
FI-G3251	FIT-G3251	Grit Tank TK-G322 Grit Slurry Flow	Lo(2) & Err(2)	P&ID: PPID-G302 Enable AlmLo if ((YC-G3250.Running OR (YC-G3240.Running AND NOT XC-G3257.ConfCls) OR NOT HL-G3222.ConfCls) for more than TBDC seconds) See note 5
LI-G3333	LIT-G3333	Grit Tanks TK-G33(1&2) Effluent Channel Level	Hi(2), HiHi(1), & Err(1)	CtrlHiSP:= LI-G3333_EffChanFull_Setting P&ID: PPID-G303
FI-G3503	FIT-G3503	Grit Tanks TK-G33(1&2) Grit Blowers Flow	Lo(2) & Err(2)	Enable AlmLo if((YC-G3530.Running or YC-G3540.Running) for more than TBDC seconds) P&ID: PPID-G306
FI-G3502	FIT-G3502	Grit Channel aeration blowers Flow	Lo(2) & Err(2)	AlmLoDly: TBDC seconds P&ID: PPID-G307

[1] PIT-G2202 Low Alarm should be delayed for the pump low discharge pressure delay plus the time it takes to start a pump and get it to minimum pressure so that it alarms only the standby pump does not reach pressure.

Instance	Source	Description	Alarms (Priority)	Notes
TI-G5331	TIT-G5331	Hot Flushing Water Temperature	Hi(2), Lo(2) & Err(2)	P&ID: PPID-G508 Enable AlmLo if (XC-G5341.ConfPos2 OR XC-G5342.ConfPos2 OR XC-G5343.ConfPos2 OR XC-G5344.ConfPos2) for more than TBDC seconds)
EI-G7910	GEN-G791.ET	Natural Gas Generator GS1 Voltage	Err(3)	P&ID: PPID-G510
AI-G3611	AIT-G3611	HRC Influent Turbidity	Hi(3), HiHi(2),& Err(2)	See note 2 CtrlHiSP: see note 3 CtrlLoSP: see note 4 CtrlLoDly:TBDC P&ID: PPID-K101
AI-G3611_TSS	AIT-G3611.Out * AI-G3611_TSS_Ratio_Setting	HRC Influent Total Suspended Solids	N/A	See note 1 P&ID: PPID-K101
AI-G3612	AIT-G3612	HRC Influent pH	LoLo(2),Lo(3), Hi(3), HiHi(2),& Err(2)	See note 2 P&ID: PPID-K101

Note1: AI-G3611_TSS_Ratio_Setting is the “Influent Turbidity to TSS Ratio Setting”. AI-G3611_TSS_Ratio_Setting is a number that can be modified by an operator with security level M or higher. The operator HMI settings should be range checked before being used.

Note 2: AI-G3611 and AI-G3612 process alarms are enabled after XV-G3621.ConfOpn or XV-G3631.ConfOpn for more than an operator configurable time “HRC Influent analyzer alarm and control deactivation delay” (AI-G3613_AlmDeact_Setting in minutes). Analyzer error alarms are always active. AI-G3613_AlmDeact_Setting can be modified by an operator with security level M or higher. The operator HMI settings should be range checked before being used.

Note 3: AI-G3611.CtrlHiSP := AI-G3611_CtrlHi_Setting. AI-G3611_CtrlHi_Setting is “HRC Lag Pump Influent Turbidity Start Value”. AI-G3611_CtrlHi_Setting can be modified by an operator with security level M or higher. The operator HMI settings should be range checked before being used.

Note 4: AI-G3611.CtrlLoSP := AI-G3611_CtrlLo_Setting. AI-G3611_CtrlLo_Setting is “HRC Lag Pump Influent Turbidity Stop Value”. AI-G3611_CtrlLo_Setting can be modified by an operator with security level M or higher. The operator HMI settings should be range checked before being used.

Note 5: FI-G32(3/5)1.AlmLoDly, Grit Tank TK-G32(1/2) Grit Slurry Low Flow Delay, should be longer than the time to it takes to detect and change pumps and restore flow.

Note 6: WI-G23(3/4)1.ExtRst. Reset when bin is removed (falling edge of YL-G23(3/4)2.Out) and after the bin is in place (rising edge of YL-G23(3/4)2.Out) to reset the high and low weigh alarms respectively.

3.1.3 DiscreteCS (indication and alarming for equipment controlled by the PLC with feedback)

Table 3.1-3 Simple DiscreteCS Instances

Instance	Destination	Description	RunAuto	Alarms (Priority)	Notes
YC-G2115	SCR-G211	Mechanical Screen SCR-G211 Hot Wash	KQI-G2115.CtrlHi AND NOT KQI-G5331.CtrlLo AND NOT (YC-G2125.Running OR YC-G2135.Runnig OR YC-G2145.Runnig) AND NOT YC-G2110.Running OR YC-G2115.Running	(3)	ExtAutoStopEnb: True P&ID: PPID-G201
YC-G2125	SCR-G212	Mechanical Screen SCR-G212 Hot Wash	KQI-G2125.CtrlHi AND NOT KQI-G5331.CtrlLo AND NOT (YC-G2115.Running OR YC-G2135.Runnig OR YC-G2145.Runnig) AND NOT YC-G2120.Running OR YC-G2125.Running	(3)	ExtAutoStopEnb: True P&ID: PPID-G201
YC-G2135	SCR-G213	Mechanical Screen SCR-G213 Hot Wash	KQI-G2135.CtrlHi AND NOT KQI-G5331.CtrlLo AND NOT (YC-G2115.Running OR YC-G2125.Runnig OR YC-G2145.Runnig) AND NOT YC-G2130.Running OR YC-G2135.Running	(3)	ExtAutoStopEnb: True P&ID: PPID-G202
YC-G2145	SCR-G214	Mechanical Screen SCR-G214 Hot Wash	KQI-G2145.CtrlHi AND NOT KQI-G5331.CtrlLo AND NOT (YC-G2115.Running OR YC-G2125.Runnig OR YC-G2135.Runnig) AND NOT YC-G2140.Running OR YC-G2145.Running	(3)	ExtAutoStopEnb: True P&ID: PPID-G202
YC-G33(5/6)0	P-G33(5/6)	Grit Tanks TK-G33(1&2) Grit Slurry Pump	YC-G3302.Eqmt(1/2)_CmdRun	(2)	PathNotRunRdyIn: See Note PathFltAutoRst: True Intlk: HA-G2300-2.Alm P&ID: PPID-G304
YC-G34(1/2)0	GRP-G34(1/2)	Grit Classifier GRP-G34(1/2)	YC-G34(1/2)0_RunReq	(2)	Intlk: HA-G34(1/2)0.Alm OR SAL-G34(1/2)5.Alm OR HA-G2300-2.Alm P&ID: PPID-G305
YC-35(3/4)0	B-35(3/4)	Grit Tanks TK-G33(1&2) Grit Blower	YC-G3503.Eqmt(1/2)_CmdRun AND (NOT YC-35(4/3)0.Running for more than TBDC seconds)	(2)	P&ID: PPID-G306
YC-35(1/2)0	B-35(1/2)	Grit Channel aeration blowers	YC-G3502.Eqmt(1/2)_CmdRun AND (NOT YC-35(2/1)0.Running for more than 30 seconds)	(2)	P&ID: PPID-G307

Notes:

YC-G33(5/6)0.PathNotRunRdyIn := NOT (XC-G3313.ConfOpn OR XC-G3323.ConfOpn) OR NOT (XC-G3413.CnfOpn OR XC-G3423.CnfOpn)

3.1.4 DiscreteCS_RunEnb (indication and alarming for equipment enabled by the PLC with feedback)

Table 3.1-4 Simple DiscreteCS_RunEn Instances

Instance	Destination	Description	RunEnbAuto	Alarms (Priority)	Notes
YC-G21(1/2/3/4)0	SCR-G21(1/2/3/4)	Mechanical Screen SCR-G21(1/2/3/4)	YC-G21(1/2/3/4)9.CmdRun AND (XK-G21(1/2/3/4)1.FbkOut > 95% (TBDC) OR YC-G21(1/2/3/4)0_Scour.Running)	(2)	PathNotRunRdyIn: (YC-G2210.Running OR YC-G2220.Running) Off Delay TBDC seconds PathFltAlmDis: True P&ID: PPID-G201 & PPID-G202
YC-G23(1/2)0	WCP-G23(1/2)	Screenings Washing/Compactor WCP- G23(1/2)	YC-G23(3/4)0.CmdOn	(2)	Intlk: HA-G2300-2.Alm P&ID: PPID-G203

3.1.5 DiscreteCS_OnOff (indication and alarming for equipment controlled by the PLC with no feedback)

Table 3.1-5 Simple DiscreteCS_OnOff Instances

Instance	Destination	Description	OnAuto	Alarms (Priority)	Notes
YC-G2330	See YC-G2304	TK-G233 Disposal Bin Active Light	See section 3.2.6 Disposal Bins	Err(4)	EnbManual: False Intlk: HA-G2300-2.Alm P&ID: PPID-G203
YC-G2340	See YC-G2305	TK-G234 Disposal Bin Active	See section 3.2.6 Disposal Bins	Err(4)	EnbManual: False Intlk: HA-G2300-2.Alm P&ID: PPID-G203
YC-G2304	YL-G2304	TK-G233 Disposal Bin Active Light	See section 3.2.6.4 Disposal Bin Active Light	Err(4)	EnbManual: False P&ID: PPID-G203
YC-G2305	YL-G2305	TK-G234 Disposal Bin Active Light	See section 3.2.6.4 Disposal Bin Active Light	Err(4)	EnbManual: False P&ID: PPID-G203
YC-G2331	WL-G2331	TK-G233 Disposal Bin Full	WI-G2331.AlmHi OR HL-G2300-3	Err(4)	EnbManual: False P&ID: PPID-G203
YC-G2341	WL-G2341	TK-G234 Disposal Bin Full	WI-G2341.AlmHi OR HL-G2300-3	Err(4)	EnbManual: False P&ID: PPID-G203
YC-G2306	YL-G2306-(1/2)	TK-G233 Disposal Bin Ready For Hauler	YC-G2306_PickUpSel.SelOut OR HL-G2300-3	Err(4)	EnbManual: False P&ID: PPID-G203
YC-G2307	YL-G2307-(1/2)	TK-G234 Disposal Bin Ready For Hauler	YC-G2307_PickUpSel.SelOut OR HL-G2300-3	Err(4)	EnbManual: False P&ID: PPID-G203
YC-G3340	YS-G3340.Ntfy	TK-G331 and TK-G332 Gates Closed To HVAC PLC	HL-G3311.ConfCls AND HL-G3321.ConfCls AND XC-G3331.ConfCls AND XC-G3332.ConfCls	Err(3)	EnbManual: False P&ID: PPID-G303

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Instance	Destination	Description	OnAuto	Alarms (Priority)	Notes
YC-G7610_Pwr	PNL-G761	Grit and Screenings Building, PNL-G761 Power	True	(3)	EnbManual: True
YC-G5330_Pwr	TK-G533	TK-G533 Tank Hot Water Heater Power	True	(3)	EnbManual: True

3.1.6 DiscreteIA (Discrete Indication and / or Alarming)

Table 3.1-6 Simple DiscreteIA Instances

Instance	Source	Description	Alarms (Priority)	Notes
LAH-G2021	LSH-G2021	Screens Influent Channel Level High	(1)	P&ID: PPID-G201
YC-G2100_OneNotRdy	NOT YC-G2119.Rdy OR NOT YC-G2129.Rdy OR NOT YC-G2139.Rdy OR NOT YC-G2139.Rdy	Screen Unit Not Ready	(2)	P&ID: PPID-G201 & PPID-G202
YC-G2100_TwoNotRdy	Two or more NOT YC-G21(1/2/3/4)9.Rdy	Two or More Screen Units Not Ready	(1)	P&ID: PPID-G201 & PPID-G202
PAL-G2303	PSL-G2303	Washer/Compactor Flushing Water Supply Header Low Pressure	(2)	P&ID: PPID-G203
LAH-G2302	LSH-G2302	Sluice Water Level High	(1)	P&ID: PPID-G203
LAHH-G23(1/2)5	LSHH-G23(1/2)5	Washer/Compactor WCP-G23(1/2) Inlet Hopper Level High	(2)	P&ID: PPID-G203
ZL-G23(3/4)2	ZS-G23(3/4)2	TK-G23(3/4) Disposal Bin in Position	Err(2)	P&ID: PPID-G203
YL-G23(3/4)2	ZL-G23(3/4)2.Out for more than 10 seconds	TK-G23(3/4) Disposal Bin Ready	Err(4)	P&ID: PPID-G203
HL-G2300-1	HS-G2300-1	TK-G233&4 Disposal Bins Remote Mode Bin Selection	Err(3)	P&ID: PPID-G203
HA-G2300-2	HS-G2300-2	Washer/compactors and grit classifiers stop	(1)	AutoRst: 5 Seconds (TBDC) P&ID: PPID-G203
HL-G2300-3	HS-G2300-3	LCP-G230 Light test	Err(4)	P&ID: PPID-G203
HL-G2300-4	HS-G2304	TK-G233 Disposal Bin Active/Inactive Toggle	Err(4)	P&ID: PPID-G203
HL-G2300-5	HS-G2305	TK-G234 Disposal Bin Active/Inactive Toggle	Err(4)	P&ID: PPID-G203
XA-G2301	NOT XL-G2301.ConfOpn	Sluice Fire isolation Valve Not Open	(1)	P&ID: PPID-G203
YC-G2200_NoRunning	NOT (YC- G2210.Running OR YC- G2220.Running)	Sluice Water Pumps Not Running	(1)	Dly: TBDC P&ID: PPID-G203
PAL-G32(3/4/5)4	KY-G32(3/4/5)4	Grit Slurry Pump P G32(3/4/5) Seal Water Pressure Low	(2)	Read through P-G32(3/4/5) VFD P&ID: PPID-G302

Instance	Source	Description	Alarms (Priority)	Notes
YA-G3300_ManDrainReq	LI-G3333.CtrlHi AND (LK-G3201.FbkOut < 5% TBDC) for more than TBDC minutes	Grit Tanks 3 and 4 Manual Drain and Clean Required	(2)	P&ID: PPID-G303
PAL-G3401	PSL-G3401	Grit Classifiers Flushing Water Supply Header Low Pressure	(2)	P&ID: PPID-G305
SAL-G34(1/2)5	SSL-G34(1/2)5	Grit Classifier GRP-G34(1/2) Auger Low Speed	(2)	DisAlm: NOT (YC-G34(1/2)0.Running for more than TBDC seconds) P&ID: PPID-G305
HA-G34(1/2)0	HSS-G34(1/2)0	Grit Classifiers GRP-G34(1/2) Emergency Stop Rope Switch	(2)	Read through P-G34(1/2) Starter P&ID: PPID-G305
XA-G34(1/2)4	(YC-34(1/2)0.Running AND NOT XC-G34(1/2)4.ConfOpn) for more than TBDC seconds	Grit Classifier GRP-G34(1/2) Running With its Wash Water Valve Not Confirmed Open	(2)	P&ID: PPID-G305
PDAH-G34(1/2)1	PDSH-G34(1/2)1	Channel Aeration Blower B-G35(1/2) High Filter Differential Pressure	(2)	P&ID: PPID-G307
LAH-G5212	LSH-G5212	Grit Tank TK-G32(1&2) Sump Level High	(1)	P&ID: PPID-G505
LAH-G5312	LSH-G5312	Grit and Screening Building Sump Level High	(1)	P&ID: PPID-G506
PAL-G5345	PSL-G5345	Screens Flushing Water Supply Header Low Pressure	(2)	P&ID: PPID-G508
AA-G5911	AS-G5911	Generator Room Methane Gas Alarm	(1)	P&ID: PPID-G510
XA-G5911	GDC-G3.Flt	Gas Controller GDC-C3 Fault	(2)	P&ID: PPID-G510
FAL-G3614	FSL-G3614	HRC Influent Turbidity and pH Sensor Low Sample Flow	(2)	P&ID: PPID-K101

Note: Alarm priority as per as per default class definition or as shown between parentheses.

3.1.7 DiscreteIA PCS Status and Electrical (Discrete Indication and / or Alarming)

Table 3.1-7 DiscreteIA PCS Status and Electrical Instances

Instance	Source	Description	Alarms (Priority)	Notes
YL-G8220-(1/2/3)	PSP-G822_ES-(1/2/3)	PSP-G822 Redundancy Module RM0(1/2/3) Loss of Redundancy Alarm	(3)	P&ID: PPID-G902
YL-G8200	CP-G820-1_ES	CP-G820-1 Redundancy Module RM01 Loss of Redundancy Alarm	(3)	P&ID: PPID-G901
YL-G8000	PLC-G800_ES	PLC-G800 Power Supply Alarm	(1)	P&ID: PPID-G902
YL-G8001-0	RIO-G800-1.R0.ES	RIO-G800-1.R0 Power Supply Alarm	(1)	P&ID: PPID-G901

Instance	Source	Description	Alarms (Priority)	Notes
YL-G8001-1	RIO-G800-1.R1.ES	RIO-G800-1.R1 Power Supply Alarm	(1)	P&ID: PPID-G901
YL-G8002-0	RIO-G800-2.R0.ES	RIO-G800-2.R0 Power Supply Alarm	(1)	P&ID: PPID-G901
YL-G8003-0	RIO-G800-3.R0.ES	RIO-G800-3.R0 Power Supply Alarm	(1)	P&ID: PPID-G902
YL-G8003-1	RIO-G800-3.R1.ES	RIO-G800-3.R1 Power Supply Alarm	(1)	P&ID: PPID-G902
YL-G9100	NSW-G910_Flt	Supervisory Network Switch NSW-G910 Alarm	(3)	P&ID: PPID-G902
YL-G92(0/4/5)0	NSW-G92(0/4/5)0_Flt	Primary Control Network Switch NSW-G92(0/4/5) Alarm	(2)	P&ID: PPID-G902
YL-G9220	NSW-G9220_Flt	Primary Control Network Switch NSW-G922 Alarm	(2)	P&ID: PPID-G901
YL-G9210	NSW-G921_Flt	Secondary Control Network Switch NSW-G921 Alarm	(3)	P&ID: PPID-G902
YL-G9201	(YL-G9200.Alm OR YL-G9240.Alm OR YL-G9250.Alm) AND YL-G9210.Alm	Primary And Secondary Control Network Switch Alarm	(1)	
YL-G9300	NSW-G930_Flt	Network Switch NSW-G930 Alarm	(1)	P&ID: PPID-G902
YL-G9310	NSW-G931_Flt	Network Switch NSW-G931 Alarm	(1)	P&ID: PPID-G902
YL-G9320	NSW-G932_Flt	Network Switch NSW-G932 Alarm	(1)	P&ID: PPID-G901
YL-G7(5/6)0	RLY-R7(5/6)5-1_Flt	NGR-R7(5/6)0 Neutral Grounding Resistor Alarm	(3)	EWG-G00(1&3)

Note: Alarm priority as per as per default class definition or as shown between parentheses.

3.1.8 EqmtStatus (indication and alarming for equipment not controlled by the PLC)

Table 3.1-8 Simple EqmtStatus Instances

Instance	Source	Description	Alarms (Priority)	Notes
YL-G52(1/2)0	P-G52(1/2)	Grit Tank TK-G32(1&2) Sump Pump	(2)	P&ID: PPID-G505
YL-G53(1/2)0	P-G53(1/2)	Grit and Screening Building Sump Pump	(2)	P&ID: PPID-G506
YL-G53(5/6)0	STR G53(5/6)	Flushing Water Strainer	(2)	P&ID: PPID-G508
YL-G7910	GS1	Natural Gas Generator GS1	(1) See Note	Natural Gas Generator Not in Auto also has alarm priority 1 P&ID: PPID-G510
YL-G7920	SF-G769	Generator GS1 Cooling Fan F-G792	(2)	P&ID: PPID-G510

3.1.9 PumpBasic (indication and alarming for pumps controlled by the PLC with feedback)

Table 3.1-9 Simple PumpBasic Instances

Instance	Source	Description	RunAuto	Alarms (Priority)	Notes

Instance	Source	Description	RunAuto	Alarms (Priority)	Notes
YC-G22(1/2)0	P-G22(1/2)	Sluice Water Pump P-G22(1/2)	YC-G2200.Eqmt(1/2)_CmdRun	(2)	Dis_PSL:PI-G2202.Out < PI-G2202.AlmLoLmt Dis_PAL_Dly: TBDC PathNotRunRdyIn: XC-G2311.ConfOpn OR XC-G2321.ConfOpn PathFltAutoRst: True Intlk: HA-G2300-2.Alm P&ID: PPID-G204
YC-G3230	P-G323	TK-G321 Duty Grit Slurry Pump	YC-3241.Eqmt1_CmdRun	(3)	PSL: PAL-G3234.Alm PAL_Dly := 0 FSL:FI-G3231.Out< FI-G3231.AlmLoLmt FAL_Dly := TBDC PathNotRunRdyIn: See Note 1 PathFltAutoRst: True Intlk: HA-G2300-2.Alm P&ID: PPID-G302
YC-G3240	P-G324	TK-G32(1&2) Standby Grit Slurry Pump	YC-3241.Eqmt2_CmdRun	(2)	PSL: PAL-G3244.Alm PAL_Dly := 0 FSL: XC-G3237.ConfOpn AND (FI-G3231.Out< FI-G3231.AlmLoLmt) OR XC-G3257.ConfOpn AND (FI-G3251.Out< FI-G3251.AlmLoLmt) PathNotRunRdyIn: See Note 2 PathFltAutoRst: True Intlk: HA-G2300-2.Alm P&ID: PPID-G302
YC-G3250	P-G325	TK-G322 Duty Grit Slurry Pump	YC-3241.Eqmt3_CmdRun	(3)	PSL: PAL-G3254.Alm PathFltAutoRst: True PAL_Dly := 0 FSL:FI-G3251.Out< FI-G3251.AlmLoLmt PathNotRunRdyIn: See Note 3 Intlk: HA-G2300-2.Alm P&ID: PPID-G302

Notes:

1. YC-G3230.PathNotRunRdyIn := NOT (XC-G3411.CnfOpn OR XC-G3421.CnfOpn)
2. YC-G3240.PathNotRunRdyIn := NOT ((XC-G3236.CnfOpn AND XC-G3237.CnfOpn AND XC-G3256.CnfCls AND XC-G3257.CnfCls AND (XC-G3411.CnfOpn OR XC-G3421.CnfOpn)) OR (XC-G3256.CnfOpn AND XC-G3257.CnfOpn AND XC-G3236.CnfCls AND XC-G3237.CnfCls AND (XC-G3412.CnfOpn OR XC-G3422.CnfOpn)))
3. YC-G3250.PathNotRunRdyIn := NOT (XC-G3412.CnfOpn OR XC-G3422.CnfOpn)

3.1.10 ValveD (indication and alarming for discrete valve or damper controlled by the PLC with open and close limits feedback)

Table 3.1-10 Simple ValveD Instances

Instance	Source	Description	OpnReq	Alarms (Priority)	Notes
XC-G2303	XV-G2303	Non Potable Water Washer/Compactor Flushing Water Supply Header Valve	PAL-G2303.Alm	(3)	P&ID: PPID-G203
XC-G2311	XV-G2311	WCP-G231 Washer Compactor Sluice Gate	YC-G2330.CmdOn AND ((YC-G2310.Rdy OR YC-G2310.CmdRunEnb) OR NOT XC-G2321.ConfOpn AND XC-G2311.ConfOpn)	(3)	Intlk: HA-G2300-2.Alm P&ID: PPID-G203
XC-G2321	XV-G2321	WCP-G232 Washer Compactor Sluice Gate	YC-G2340.CmdOn AND ((YC-G2320.Rdy OR YC-G2320.CmdRunEnb) OR NOT XC-G2311.ConfOpn AND XC-G2321.ConfOpn)	(3)	Intlk: HA-G2300-2.Alm P&ID: PPID-G203
XC-G32(1/2)1	XV-G32(1/2)1	Grit Tank TK-G32(1/2) Grit Slurry Line Fluidizing Valve	NOT HV-G32(1/2)2.ConfCls	(2)	P&ID: PPID-G301
XC-G323(6/7)	XV-G323(6/7)	P-G324 Grit Slurry TK-G321 Pump (Suction / Discharge)	YC-G3241.Eqmt2_PathA_Sel	(2)	P&ID: PPID-G302 Intlk: NOT (XV-G3256.ConfCls AND XV-G3257.ConfCls)
XC-G325(6/7)	XV-G325(6/7)	P-G324 Grit Slurry TK-G322 Pump (Suction / Discharge)	YC-G3241.Eqmt2_PathB_Sel	(2)	P&ID: PPID-G302 Inlk: NOT (XV-G3236.ConfCls AND XV-G3237.ConfCls)
XC-G33(1/2)2	XV- G33(1/2)2	TK-G331&2 Aeration Valve	YC-G3300_OpenAerationVlvs	(2 - TBDC)	P&ID: PPID-G303
XC-G333(1/2)	XV- G333(1/2)	TK-G331&2 Effluent Gate	YC-G3300_OpenEffGates	(2 - TBDC)	P&ID: PPID-G303
XC-G33(1/2)3	XV- G33(1/2)3	TK-G33(1/2) Grit Valve	YC-G3301_TK-33(1/2)_PumpGrit	(2)	P&ID: PPID-G304
XC-G34(1/2)4	XV- G34(1/2)4	Grit Classifier GRP-G34(1/2) wash water valve	YC-G34(1/2)0.CmdRun OR YC-G34(1/2)0.Running	(3)	Intlk: HA-G2300-2.Alm P&ID: PPID-G305
XC-G3401	XV-G3401	Non Potable Water Grit Classifiers Water Supply Header Valve	PAL-G3401.Alm	(3)	P&ID: PPID-G305
XC-G3411	XV- G3411	Grit Classifier GRP-G341 Grit Tank TK-G321 Slurry Inlet Valve	YC-G2330.CmdOn AND ((YC-G3419.Rdy OR YC-G3419.CmdRunEnb) OR NOT XC-G3421.ConfOpn AND XC-G3411.ConfOpn)	(2)	Intlk: HA-G2300-2.Alm P&ID: PPID-G305
XC-G3412	XV- G3412	Grit Classifier GRP-G341 Grit Tank TK-G322 Slurry Inlet Valve	YC-G2330.CmdOn AND ((YC-G3419.Rdy OR YC-G3419.CmdRunEnb) OR NOT XC-G3422.ConfOpn AND XC-G3412.ConfOpn)	(2)	Intlk: HA-G2300-2.Alm P&ID: PPID-G305

Instance	Source	Description	OpnReq	Alarms (Priority)	Notes
XC-G3413	XV- G3413	Grit Classifier GRP-G341 Grit Tanks TK-G331 & TK-G332 Slurry Inlet Valve	YC-G2330.CmdOn AND ((YC-G3419.Rdy OR YC-G3419.CmdRunEnb) OR NOT XC-G3423.ConfOpn AND XC-G3413.ConfOpn)	(2)	Intlk: HA-G2300-2.Alm P&ID: PPID-G305
XC-G3421	XV- G3421	Grit Classifier GRP-G342 Grit Tank TK-G321 Slurry Inlet Valve	YC-G2340.CmdOn AND ((YC-G3429.Rdy OR YC-G3429.CmdRunEnb) OR NOT XC-G3411.ConfOpn AND XC-G3421.ConfOpn)	(2)	Intlk: HA-G2300-2.Alm P&ID: PPID-G305
XC-G3422	XV- G3422	Grit Classifier GRP-G342 Grit Tank TK-G322 Slurry Inlet Valve	YC-G2340.CmdOn AND ((YC-G3429.Rdy OR YC-G3429.CmdRunEnb) OR NOT XC-G3412.ConfOpn AND XC-G3422.ConfOpn)	(2)	Intlk: HA-G2300-2.Alm P&ID: PPID-G305
XC-G3423	XV- G3423	Grit Classifier GRP-G342 Grit Tanks TK-G331 & TK-G332 Slurry Inlet Valve	YC-G2340.CmdOn AND ((YC-G3429.Rdy OR YC-G3429.CmdRunEnb) OR NOT XC-G3413.ConfOpn AND XC-G3423.ConfOpn)	(2)	Intlk: HA-G2300-2.Alm P&ID: PPID-G305
XC-G5345	XV-G5345	Non Potable Water Screens Water Supply Header Valve	PAL-G5345.Alm	(3)	P&ID: PPID-G508
XC-G36(2/3)1	XV-G36(2/3)1	HRC Train (1/2) Influent Channel Isolation Gate	GBL_K800_XC-G36(2/3)1_OpenReq	(1)	Intlk: GBL_K800_HA-K1(1/2)06_Alm P&ID: PPID-K101
XC-G36(2/3)2	XV-G36(2/3)2	HRC Train (1/2) Influent Flushing Water	GBL_K800_XC-G36(2/3)2_OpenReq	(3)	Intlk: GBL_K800_HA-K1(1/2)06_Alm OR Intlk: GBL_K800_HA-K1(1/2)06_AlmErr P&ID: PPID-K101

3.1.11 ValveD_ThreeWay (indication and alarming for three way discrete valve or damper controlled by the PLC with position limits feedback)

Table 3.1-11 Simple ValveD Instances

Instance	Source	Description	Pos2Req	Alarms (Priority)	Notes
XC-G534(1/2/3/4)	XV-G534(1/2/3/4)	SGR-G21(1/2/3/4) Wash Water three way valve (Cold Pos.1 / Hot Pos.2)	YC-G21(1/2/3/4)5.CmdRun	(3)	P&ID: PPID-G508

3.1.12 ValveStatus (open/closed status of a locally discrete valve or damper)

Table 3.1-12 Simple ValveStaus Instances

Instance	Source	Description	Alarms (Priority)	Notes
XL-G2301	XV-G2301	Sluice Fire isolation Valve	(1)	P&ID: PPID-G203

Instance	Source	Description	Alarms (Priority)	Notes
HL-G32(1/2)2	HV-G32(1/2)2	Grit Tank TK-G32(1/2) Inlet Gate	(2)	P&ID: PPID-G301
HL-G33(1/2)1	HV-G33(1/2)1	Grit Tank TK-G33(1/2) Inlet Gate	(2)	P&ID: PPID-G303

3.2 G2 – Screenings

P&ID Drawing: PPID-G201 and PPID-G202

Raw wastewater from the influent pump station is discharged to the screens influent channel and distributed between four screen channels. Each channel is equipped with a vendor package mechanical perforated plate screen (SCR-G211, SCR-G212, SCR-G213, SCR-G214) and motorized inlet slide gate (XV-G2111, XV-G2121, XV-G2131, XV-G2141)

3.2.1 Screen Unit Control Station

A screen unit consists of a mechanical screen vendor package and its associated screen channel inlet gate. The screen unit started / stopped by opening / closing its screen inlet channel gate and enabling / disabling its mechanical screen vendor package.

Table 3.2-1 YC-G21(1/2/3/4)9 / Screen SCR-G21(1/2/3/4) Unit Control Station

Instance	YC-G21(1/2/3/4)9		
Class	DiscreteCS		
Inputs	**Parameter**	**Source**	**Type**
	CtrlRem	N/A	
	Flt	XC-G21(1/2/3/4)1.AlmFlt OR YC-G21(1/2/3/4)0.AlmFlt	Link
	RdyIn	XK-G21(1/2/3/4)1.Rdy AND YC-G21(1/2/3/4)0.Rdy	Link
	Run	(XK-G21(1/2/3/4)1.FbkOut > 95% (TBDC) OR YC-G21(1/2/3/4)0_Scour.Running) AND YC-G21(1/2/3/4)0.Rdy	Link
	RunAuto	YC-G2100_3DS.Eqmt(1/2/3/4)_CmdRun	Link
Alarms	N/A		

3.2.2 Screen Unit Duty Selection

The number of screen units in operation at any given time varies depending on the plant influent flow rate and whether the flow is increasing or decreasing. The plant influent flow rate is the sum of the flow rates measured by the four raw sewage pump flow meters (FI-G1100). The operator specifies the flow rate to start and the flow rate to stop operation of the second duty, third duty, and fourth duty screen units at the plant HMI. Operation of the first duty screen unit is always required.

For each screen duty the flow rate to stop should be slightly lower than the associated flow rate to start in order to avoid unnecessary sudden stopping or restarting of the screens caused by fluctuations in the flow rate as the flow increases or decreases.

The second duty screen unit is required when the total plant influent flow rate (FI-G1100.Out) exceeds an operator defined flow setting (YC-G2100_StrLag_Setting) for an operator defined time in seconds (YC-G2100_StrLag_TD_Setting).

The second duty screen unit is not longer required when the total plant influent flow rate (FI-G1100.Out) is below an operator defined flow setting (YC-G2100_StpLag_Setting) for an operator defined time in seconds (YC-G2100_StpLag_TD_Setting).

Table 3.2-2 YC-G2100_RunLag / Second Duty Screen Unit Required

Instance	YC-G2100_RunLag		
Class	DiscreteIA		
Inputs	**Parameter**	**Source**	**Type**
	In	((FI-G1100.Out >= YC-G2100_StrLag _Setting) for more than YC-G2100_StrLag_TD_Setting seconds OR YC-G2100_RunLag.Out) AND NOT ((FI-G1100.Out < YC-G2100_StpLag_Setting) for more than YC-G2100_StpLag_TD_Setting seconds) OR LI-G2011.AlmHi OR LAH-G2021.Alm	Link
Alarms	N/A		

The third duty screen unit is required when the total plant influent flow rate (FI-G1100.Out) exceeds an operator defined flow setting (YC-G2100_Str2Lag_Setting) for an operator defined time in seconds (YC-G2100_Str2Lag_TD_Setting).

The third duty screen unit is not longer required when the total plant influent flow rate (FI-G1100.Out) is below an operator defined flow setting (YC-G2100_Stp2Lag_Setting) for an operator defined time in seconds (YC-G2100_Stp2Lag_TD_Setting).

Table 3.2-3 YC-G2100_Run2Lag / Third Duty Screen Unit Required

Instance	YC-G2100_Run2Lag		
Class	DiscreteIA		
Inputs	**Parameter**	**Source**	**Type**
	In	((FI-G1100.Out >= YC-G2100_Str2Lag_Setting) for more than YC-G2100_Str2Lag_TD_Setting seconds OR YC-G2100_Run2Lag.Out) AND NOT ((FI-G1100.Out < YC-G2100_Stp2Lag_Setting) for more than YC-G2100_Stp2Lag_TD_Setting seconds) AND YC-G2100_RunLag OR LI-G2011.AlmHi OR LAH-G2021.Alm	Link
Alarms	N/A		

The fourth duty screen unit is required when the total plant influent flow rate (FI-G1100.Out) exceeds an operator defined flow setting (YC-G2100_Str3Lag_Setting) for an operator defined time in seconds (YC-G2100_Str3Lag_TD_Setting).

The fourth duty screen unit is not longer required when the total plant influent flow rate (FI-G1100.Out) is below an operator defined flow setting (YC-G2100_Stp3Lag_Setting) for an operator defined time in seconds (YC-G2100_Stp3Lag_TD_Setting).

Table 3.2-4 YC-G2100_Run3Lag / Fourth Duty Screen Unit Required

Instance	YC-G2100_Run3Lag		
Class	DiscreteIA		
Inputs	**Parameter**	**Source**	**Type**
	In	((FI-G1100.Out >= YC-G2100_Str3Lag_Setting) for more than YC-G2100_Str3Lag_TD_Setting seconds OR YC-G2100_Run3Lag.Out) AND NOT ((FI-G1100.Out < YC-G2100_Stp3Lag_Setting) for more than YC-G2100_Stp3Lag_TD_Setting seconds) AND YC-G2100_Run2Lag AND YC-G2100_RunLag OR LI-G2011.AlmHi OR LAH-G2021.Alm	Link
Alarms	N/A		

All the previous duty settings can be modified by an operator with security level M or higher. The operator HMI settings should be checked before being used so that:

- YC-G2100_Str3Lag_Setting >= YC-G2100_Str2Lag_Setting >= YC-G2100_StrLag_Setting
- YC-G2100_StpLag_Setting <= YC-G2100_StrLag_Setting
- YC-G2100_Stp2Lag_Setting <= YC-G2100_Str2LagSetting
- YC-G2100_Stp3Lag_Setting <= YC-G2100_Str3Lag_Setting

The operator assigns the duty screen units at the plant HMI. Since only one or two screen channels will normally be in operation, automatic periodic rotation is recommended in order to maintain all screens in reliable working condition.

Table 3.2-5 YC-G2100_3DS Mechanical Screen Unit Duty Selector SCR-G211 / SCR-G212 / SCR-G213 / SCR-G214 Unit

Instance	YC-G2100_3DS		
Class	Duty3DS		
Inputs	**Parameter**	**Source**	**Type**
	Eqmt1_Fail	YC-G2119.Fail	Link
	Eqmt1_Rdy	YC-G2119.Rdy	Link
	Eqmt1_Running	YC-G2119.Running	Link
	Eqmt1_Auto	YC-G2119.CtrlAuto	Link
	Eqmt2_Fail	YC-G2129.Fail	Link
	Eqmt2_Rdy	YC-G2129.Rdy	Link
	Eqmt2_Running	YC-G2129.Running	Link
	Eqmt2_Auto	YC-G2129.CtrlAuto	Link
	Eqmt3_Fail	YC-G2139.Fail	Link
	Eqmt3_Rdy	YC-G2139.Rdy	Link
	Eqmt3_Running	YC-G2139.Running	Link
	Eqmt3_Auto	YC-G2139.CtrlAuto	Link
	Eqmt4_Fail	YC-G2149.Fail	Link
	Eqmt4_Rdy	YC-G2149.Rdy	Link
	Eqmt4_Running	YC-G2149.Running	Link
	Eqmt4_Auto	YC-G2149.CtrlAuto	Link
	RunReq	True	Const
	RunLagReq	YC-G2100_RunLag.Out	Link
	Run2LagReq	YC-G2100_Run2Lag.Out	Link
	Run3LagReq	YC-G2100_Run3Lag.Out	Link
	Run3LagEn	True	Const
	StopMode	True	Const
Alarms	(1) – Emergency / Call Out Priority		

3.2.3 Screen Channel Scouring

An inlet grit gate seating area deposit scourge will be periodically performed to reduce grit deposition, which could impede proper closing. The gates of the operating channels will be periodically partially closed to increase the velocity through the gate opening in order to scour grit deposits from the gate seating area.

A retentive timer accumulates the run enable time for each screen (KQI-G21(1/2/3/4)5). If the accumulator exceeds the hot washing due “Screen Channel Scour Repeat Cycle Time” (KQI-G2100_ScourCycle_Setting [Hrs.]) a screen channel scour cycle will be initiated if no other screen is in operation, only one screen is required due to raw sewage flows and there is no high level in the screens influent channel.

The scour is performed for the “Screen Channel Scour Run Time” (YC-G2100_ScourRunTime_Setting [seconds]), by modulating the screen channel inlet gate to maintain “Screen Channel Scour Level Differential” (LDIC-G2100_ScourLD_Setting [mm]) between the screen influent channel (as measured by LI-G2011) and the screen influent channel level sensor (as measured by LI-G21(1/2/3/4)3-1).

KQI-G2100_ScourCycle_Setting, YC-G2100_ScourRunTime_Setting and LDIC-G2100_ScourLD_Setting are real numbers that can be modified by an operator with security level M or higher. The operator HMI settings should be range checked before being used.

Table 3.2-6 KQI-G21(1/2/3/4)0_Scour / Screen SCR-G21(1/2/3/4) Run Enable Accumulated Time For Channel Scour [Hrs] (Operator Resettable)

Instance	KQI-G21(1/2/3/4)0		
Class	AccumulatorIAC		
Inputs	Parameter	Source	Type
	PV_In	If(YC- G21(1/2/3/4)5.RunEnb,1,0)	Link
	TimeFactor	3600 (Accumulates hours)	Const
	UnitConv	1	Const
	CtrlHiSP	KQI-G2100_ScourCycle_Setting	Link
	AccumRstEnable	1 (Operator reset enabled)	Const
	ExtRst	YC-G21(1/2/3/4)0_Scour_Done	Link
Alarms	N/A		

3.2.3.1. YC-G21(1/2/3/4)0_Scour / Screen Channel Scour Control Station

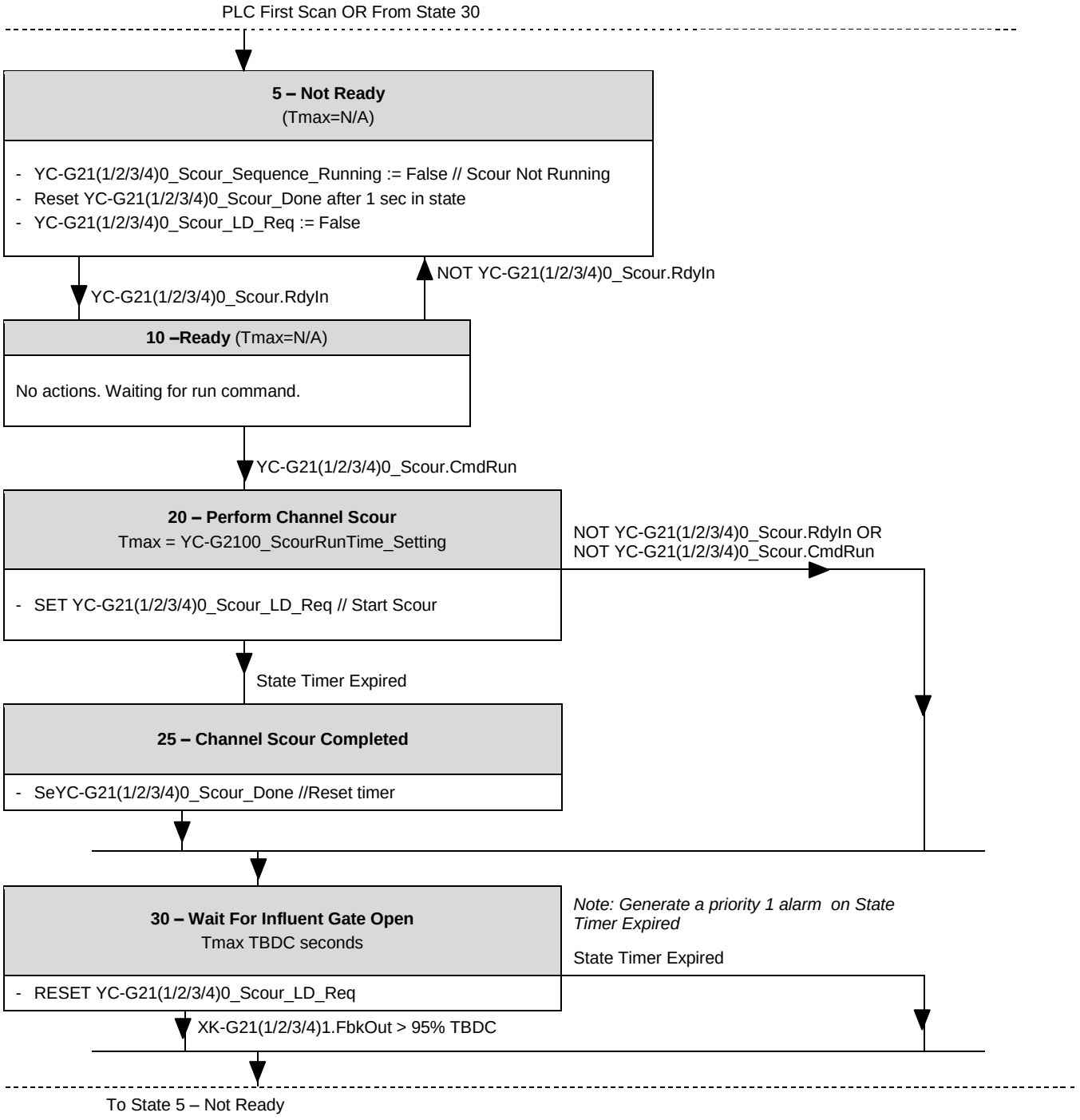
Table 3.2-7 YC-G21(1/2/3/4)0_Scour / Screen SCR-G21(1/2/3/4) Channel Scour Control Station

Instance	YC-G21(1/2/3/4)0_Scour		
Class	DiscreteCS		
Inputs	**Parameter**	**Source**	**Type**
	CtrlRem	N/A	
	Flt	XC-G21(1/2/3/4)1.AlmFlt OR YC-G21(1/2/3/4)0.AlmFlt OR LDIC-G21(1/2/3/4)0.CtrlErr	Link
	RdyIn	See below	Link
	Run	YC-G21(1/2/3/4)0_Scour_Sequence_Running	Link
	Intlk	LI-G2011.AlmHi OR LAH-G2021.Alm	Link
	RunAuto	KQI-G21(1/2/3/4)0_Scour.CtrlHi	Link
Alarms	N/A		

The Screen SCR-G21(1/2/3/4) Channel Scour ready conditions (YC-G21(1/2/3/4)0_Scour.RdyIn) are as follows (AND):

- Channel inlet gate ready (XK-G21(1/2/3/4)1.Rdy)
- Equipment ready (YC-G21(1/2/3/4)0.Rdy)
- Unit running (YC-G21(1/2/3/4)9.Running)
- Scour level controller with no errors LDIC-G21(1/2/3/4)0.CtrlErr
- Only one unit is required by raw sewage plant flows (NOT YC-G2100_RunLag.Out)
- Other channel inlet gates closed:
    - For YC-G2110_Scour, (XK-G2121.FbkOut < 4% TBDC) AND (XK-G2131.FbkOut < 4% TBDC) AND (XK-G2141.FbkOut < 4% TBDC)
    - For YC-G2120_Scour, Similar to YC-G2110_Scour with SCR-G211, SCR-G213 and SCR-G214 channel inlet gates
    - For YC-G2130_Scour, Similar to YC-G2110_Scour with SCR-G211, SCR-G212 and SCR-G214 channel inlet gates
    - For YC-G2140_Scour, Similar to YC-G2110_Scour with SCR-G211, SCR-G212 and SCR-G213 channel inlet gates
- Other units not running:
    - For YC-G2110_Scour, NOT (YC-G2129.Running OR YC-G2139.Running OR YC-G2149.Running)
    - For YC-G2120_Scour, NOT (YC-G2119.Running OR YC-G2139.Running OR YC-G2149.Running)
    - For YC-G2130_Scour, NOT (YC-G2119.Running OR YC-G2129.Running OR YC-G2149.Running)
    - For YC-G2140_Scour, NOT (YC-G2119.Running OR YC-G2129.Running OR YC-G2139.Running)

3.2.3.2. YC-G21(1/2/3/4)0_Scour_Sequence / Screen Channel Scour Sequence



3.2.3.3. LDIC-G21(1/2/3/4)0 / Channel Scour Level Differential Controller

While scouring, the level differential is generated by modulating the screen influent gate.

Table 3.2-8 LDIC-G21(1/2/3/4)0 / Channel Scour Level Differential Controller

Instance	LDIC-G21(1/2/3/4)0		
Class	PID_Controller		
Inputs	Parameter	Source	Type
	PV	(LI-G2011.Out - LI-G21(1/2/3/4)3-1.Out) * 1000 (meters to millimetres assumed)	I/O
	Auto_SP	LDIC-G2100_ScourLD_Setting	Link
	Min_CV	4% TBDC	Const
	Tracking	XK-G21(1/2/3/4)1.NotRdy OR NOT YC-G21(1/2/3/4)0_Scour_LD_Req	Link
	TrackingCV	XK-G21(1/2/3/4)1.CV	Link
	DisDevAlmDB	LDIC-G21(1/2/3/4)0.CtrlTr	Link
	DevBand	TBDC	Const
	ReverseAct	0 (Direct)	Const
Alarms	N/A		

Notes:

FIC-D3013 is direct acting. As level differential increases, XK-G21(1/2/3/4)1 % open increases.

3.2.4 Screen Hot Washing

P&ID Drawing: PPID-G201, PPID-G202 & PPID-G508

The ability to periodically wash the screens with hot water is provided to remove accumulated fats and grease from the perforated plates. An electric hot water heater provides hot water storage to hot wash one screen at a time. Motorized three-way valves on the wash water supply piping to each screen control the source of wash water, either cold for normal screen operation or hot for hot washing.

A retentive timer accumulates the run enable time for each screen (KQI-G21(1/2/3/4)5). If the accumulator exceeds the hot washing due “Screen Hot Wash Repeat Cycle Time” (KQI-G2105_HotWashCycle_Setting) a screen hot washing cycle will be initiated if no other screen is being hot washed and the elapsed time since any screen has hot washed (as measured by retentive timer KQI-G5331) exceeds the “Hot Water Recovery Time” (KQI-G5331_RecovTime_Setting).

KQI-G2105_HotWashCycle_Setting and KQI-G5331_RecovTime_Setting are real numbers in hours that can be modified by an operator with security level M or higher. The operator HMI settings should be range checked before being used.

Table 3.2-9 KQI-G21(1/2/3/4)5 / Screen SCR-G21(1/2/3/4) Run Enable Accumulated Time For Hot Wash [Hrs] (Operator Resettable)

Instance	KQI-G21(1/2/3/4)5		
Class	AccumulatorIAC		
Inputs	Parameter	Source	Type
	PV_In	If(YC- G21(1/2/3/4)5.RunEnb,1,0)	Link
	TimeFactor	3600 (Accumulates hours)	Const
	UnitConv	1	Const
	CtrlHiSP	KQI-G2105_HotWashCycle_Setting	Link
	AccumRstEnable	1 (Operator reset enabled)	Const
	ExtRst	Falling edge of YC-G21(1/2/3/4)5	Link
Alarms	N/A		

Table 3.2-10 KQI-G5331 / TK-G533 Hot Water Heater Elapsed Time Since Last Use [Hrs] (Operator Resettable)

Instance	KQI-G5331		
Class	AccumulatorIAC		
Inputs	Parameter	Source	Type
	PV_In	1	Link
	TimeFactor	3600 (Accumulates hours)	Const
	UnitConv	1	Const
	CtrlLoSP	KQI-G5331_RecovTime_Setting	Link
	AccumRstEnable	1 (Operator reset enabled)	Const
	ExtRst	(XC-G5341.ConfPos2 OR XC-G5342.ConfPos2 OR XC-G5343.ConfPos2 OR XC-G5344.ConfPos2) for more than 60 sec (TBDC)	Link
Alarms	N/A		

3.2.5 Sluice Water Pumps

P&ID Drawing: PPID-G204

There are two sluice water pumps (P-G221, P-G222), one duty and one standby. The pump discharge header is equipped with a pressure transmitter (PIT-G2201) to detect duty pump failure (on low pressure) and pipe blockage (on high pressure).

In the event of pump low discharge pressure while the lead pump is running, the lead pump stops and the lag pump starts. When the pumps are in auto, only one pump at a time is allowed to run.

Table 3.2-11 YC-G2209 Sluice Water Pump Duty Selector – P-G221 / P-G222

Instance	YC-G2209		
Class	DutyDS		
Inputs	Parameter	Source	Type
	Eqmt1_Fail	YC-G2210.Fail	Link
	Eqmt1_Rdy	YC- G2210.Rdy	Link
	Eqmt1_Running	YC- G2210.Running	Link
	Eqmt1_Auto	YC- G2210.CtrlAuto	Link
	Eqmt2_Fail	YC- G2220.Fail	Link
	Eqmt2_Rdy	YC- G2220.Rdy	Link
	Eqmt2_Running	YC- G2220.Running	Link
	Eqmt2_Auto	YC- G2220.CtrlAuto	Link
	RunReq	NOT LAH-G2302.Alm	Link
Alarms	(1) – Emergency / Call Out Priority		

3.2.6 Disposal Bins

P&ID Drawing: PPID-G203

There are two disposal bins (TK G233, TK G234) that receive dewatered grit from the grit classifiers and compacted and dewatered screenings from the screenings washer/compactors. Each bin serves one washer/compactor (WCP G231, WCP G232, respectively) and one grit classifier (GRP G341, GRP G342, respectively). Each bin is positioned on a weigh scale (WE/WIT G2331, WE/WIT G2341) to monitor the total weight of the bin and the grit and screenings. When a bin is full it is picked up by the hauler and taken to a landfill for emptying.

An infrared sensor (ZS G2332, ZS G2342) at each weigh scale detects the presence or absence of a disposal bin on the weigh scale. These sensors are also used to aid the hauler in pushing the bin into proper position on the scale.

The operator selects either local or remote mode (HL-G2300.Out is True in Remote) at the local control panel (LCP-G230) for disposal bin duty assignment. At least one disposal bin should be active at all times, the only exception is when disposal bin equipment stop (HA-G2300-2) ispressed.

3.2.6.1. Disposal Bin Selection In Remote Mode

In remote mode, bin duty assignment is done automatically by the PCS. Normally only one bin is Active; however, both bins can be assigned Active in emergency situations.

Table 3.2-12 YC-G2300_BinSel / Remote Disposal Bin Selection (Off for TK-G233 / On for TK-G234)

Instance	YC-G2300_BinSel		
Class	OnOffSel		
Inputs	**Parameter**	**Source**	**Type**
	SelOffText	"TK-G233 Disposal Bin Remote Selection"	Const
	SelOnText	"TK-G234 Disposal Bin Remote Selection"	Const
	SelOffNotPerm	NOT YL-G2332.Out OR WI-G2331.AlmHi	Link
	SelOnNotPerm	NOT YL-G2342.Out OR WI-G2341.AlmHi	Link
	IntlkOn	See logic below	Link
	IntlkOff	See logic below	Link

Note: Interlocks have priority over permissives.

The PCS will automatically change the bin selection in local mode to follow the latest local activated bin. In remote mode the PCS automatically changes the bin selection when:

- The selected bin becomes full and the other bin is ready
- The washer/compactor or gates associated with the selected bin becomes not ready or gates not in position after 2 minutes of being selected
- The grit classifier or gates associated with the selected bin becomes not ready or valves are not in position after 2 minutes of being selected

Table 3.2-13 YC-G2330_BinSysFail / TK-G233 Disposal Bin System Selected and Equipment not Ready or Valves or Gates Not In Position

Instance	YC-G2330_BinSysFail		
Class	DiscreteIA		
Inputs	Parameter	Source	Type
	In	((NOT YC-G2300_BinSel.SelOut) On delay of 2 minutes) AND NOT (YC-G2310.Rdy AND XC-G2311.ConfOpn AND YC-G3410.Rdy AND (XC-G3414.Rdy OR XC-G3414.ConfOpn) AND XC-G3411.ConfOpn AND XC-G3412.ConfOpn AND XC-G3413.ConfOpn)	Link
Alarms	Alm(1 - TBDC) – Emergency / Call Out Priority		

Table 3.2-14 YC-G2340_BinSysFail / TK-G234 Disposal Bin System Selected and Equipment not Ready or Valves or Gates Not In Position

Instance	YC-G2340_BinSysFail		
Class	DiscreteIA		
Inputs	Parameter	Source	Type
	In	((YC-G2300_BinSel.SelOut) On delay of 2 minutes) AND	Link

		NOT (YC-G2320.Rdy AND XC-G2321.ConfOpn AND YC-G3420.Rdy AND (XC-G3424.Rdy OR XC-G3424.ConfOpn) AND XC-G3421.ConfOpn AND XC-G3422.ConfOpn AND XC-G3423.ConfOpn)	
Alarms	Alm(1 - TBDC) – Emergency / Call Out Priority		

```
If HL-G2300.Out Then
    If WI-G2331.AlmHi AND YL-G2342.Out AND NOT WI-G2341.AlmHi OR
        NOT (YC-G2310.Rdy AND (XC-G2311.Rdy OR XC-G2311.ConfOpn)) OR
        NOT (YC-G3410.Rdy AND (XC-G3414.Rdy OR XC-G3414.ConfOpn) AND (XC-
            G3411.Rdy OR XC-G3411.ConfOpn) AND (XC-G3412.Rdy OR XC-
            G3412.ConfOpn) AND (XC-G3413.Rdy OR XC-G3413.ConfOpn)) OR
        YC-G2330_BinSysFail.Out
        Then
        Set YC-G2300_BinSel_SetOn    // Remote bin selection to TK-G234
    Endif
    If WI-G2341.AlmHi AND YL-G2332.Out AND NOT WI-G2331.AlmHi OR
        NOT (YC-G2320.Rdy AND (XC-G2321.Rdy OR XC-G232.ConfOpn)) OR
        NOT (YC-G3420.Rdy AND (XC-G3424.Rdy OR XC-G3424.ConfOpn) AND (XC-
            G3421.Rdy OR XC-G3421.ConfOpn) AND (XC-G3422.Rdy OR XC-
            G3422.ConfOpn) AND (XC-G3433.Rdy OR XC-G3433.ConfOpn)) OR
        YC-G2340_BinSysFail.Out
        Then
        Set YC-G2300_BinSel_SetOff    // Remote bin selection to TK-G233
    Endif
Endif

Change bin selection if required
If YC-G2300_BinSel_SetOn AND YC-G2300_BinSel_SetOff Then
    //Leave at least one interlock on and switch each pass
    YC-G2300_BinSel.IntlkOn := NOT YC-G2300_BinSel.IntlkOn
    YC-G2300_BinSel.IntlkOff := NOT YC-G2300_BinSel.IntlkOn
Else
    YC-G2300_BinSel.IntlkOn := YC-G2300_BinSel_SetOn
    YC-G2300_BinSel.IntlkOff := YC-G2300_BinSel_SetOff
Endif
```

3.2.6.2. Disposal Bin Activation In Remote Mode

The bin selection is used to activate the bin and, after a successful bin system activation (includes associated washer/compactor, classifier equipment and gates), is used to deactivate the previous bin.

```
If HL-G2300.Out Then
    If (XC-G2311.ConfOpn OR YC-G2330.CmdOn) AND LAHH-G2315.Alm OR
            (XC-G2321.ConfOpn OR YC-G2340.CmdOn) AND LAHH-G2325.Alm Then
            // High Level in Washer Compactor, Set Both Bins Active
        Set YC-G2330.OnAuto
        Set YC-G2340.OnAuto
    Else
        If NOT YC-G2300_BinSel.SelOut Then
            Set YC-G2330.OnAuto
            //Reset TK-G234 bin activation if TK-G233 bin system was activated successfully
            If YC-G2310.Rdy AND XC-G2311.ConfOpn AND YC-G3410.Rdy AND XC-G3414.Rdy
                    AND XC-G3411.Rdy AND XC-G3412.ConfOpn AND XC-G3413.ConfOpn Then
                Reset YC-G2340.OnAuto
            Endif
        Else
            Set YC-G2340.OnAuto
            //Reset TK-G233 bin activation if TK-G234 bin system was activated successfully
            If YC-G2320.Rdy AND XC-G2321.ConfOpn AND YC-G3420.Rdy AND XC-G3424.Rdy
                    AND XC-G3421.Rdy AND XC-G3422.ConfOpn AND XC-G3423.ConfOpn Then
                Reset YC-G2340.OnAuto
            Endif
        Endif
    Endif
EndIf
```

Table 3.2-15 YC-G2330_BinSysNotReady / TK-G234 Bin is Full and TK-G233 Disposal Bin Not In Position or Full

Instance	YC-G2330_BinSysNotReady		
Class	DiscreteIA		
Inputs	Parameter	Source	Type
	In	WI-G2341.AlmHi AND YC-G2300_BinSel.SelOut AND (WI-G2331.AlmHi OR NOT YL-G2332.Out)	Link
Alarms	Alm(1- TBDC) – Emergency / Call Out Priority		

Table 3.2-16 YC-G2340_BinSysNotReady / TK-G233 Bin is Full and TK-G234 Disposal Bin Not In Position or Full

Instance	YC-G2340_BinSysNotReady		
Class	DiscreteIA		
Inputs	Parameter	Source	Type
	In	WI-G2331.AlmHi AND NOT YC-G2300_BinSel.SelOut AND (WI-G2341.AlmHi OR NOT YL-G2342.Out)	Link
Alarms	Alm(1-TBDC) – Emergency / Call Out Priority		

3.2.6.3. Disposal Bin Activation In Local Mode

In local mode, bin duty assignment is done manually by the operator at the local control panel. In local mode there is no automatic checking of the bin status and no automatic switchover of the bins when they are full. Bin duty assignment should normally be in remote mode. Local mode should only be used for testing and maintenance purposes and emergency situations.

In Local mode (NOT HL-G2300.Out) the bin activation is toggled by the operator. A bin can be toggled off only after the one is on:

```
If  NOT HL-G2300.Out AND rising edger of (HL-G2304.Out On Delay of .5 seconds (TBDC)) Then
            //Toggle Bin TK-G233 Active status
      If YC-G2330.CmdOn AND YC-G2340.CmdOn Then
            Reset YC-G2330.OnAuto
      Else
            Set YC-G2330.OnAuto
            Set YC-G2300_BinSel_SetOff    // Change remote bin selection for bumpless transfer
      Endif
EndIf
If  NOT HL-G2300.Out AND rising edger of (HL-G2305.Out On Delay of .5 seconds (TBDC)) Then
            //Toggle Bin TK-G234 Active status
      If YC-G2340.CmdOn AND YC-G2330.CmdOn Then
            Reset YC-G2340.OnAuto
      Else
            Set YC-G2340.OnAuto
            Set YC-G2300_BinSel_SetOn    // Change remote bin selection for bumpless transfer
      Endif
EndIf
```

3.2.6.4. Disposal Bin Active Light

The disposal bin active light (YC-G230(4/5).OnAuto) has the following states:

- Off if the bin is not active (NOT YC-G23(3/4)0.CmdOn),
- Steady on when
  - the light test is pushbutton is pressed (HL-G2300-3.Out) or
  - the bin is active , the associated washer/compactors and grit classifier are ready with their corresponding gates and valves open (YC-G23(3/4)0.CmdOn AND YC-G23(1/2)0.Rdy AND XC-G23(1/2)1.ConfOpn AND YC-G34(1/2)0.Rdy AND XC-G34(1/2)4.Rdy AND XC-G34(1/2)1.ConfOpn AND XC-G34(1/2)2.ConfOpn AND XC-G34(1/2)3.ConfOpn)
- Blinking if the bin is active but the associated washer/compactors or grit classifier are not ready or any of the corresponding gates and valves are not open (YC-G23(3/4)0.CmdOn AND NOT(YC-G23(1/2)0.Rdy AND XC-G23(1/2)1.ConfOpn AND YC-G34(1/2)0.Rdy AND XC-G34(1/2)4.Rdy AND XC-G34(1/2)1.ConfOpn AND XC-G34(1/2)2.ConfOpn AND XC-G34(1/2)3.ConfOpn))

3.2.6.5. Ready for Hauler

When a full bin becomes inactive a message will be sent message to haulers for bin pickup. The operator can manually select a bin that is not full as ready for hauler pick up. The alarm notification system will escalate the message if the bin pick up message is not acknowledged by the hauler.

Table 3.2-17 YC-G2306_PickUpSel / Disposal Bin TK-G233 Ready For Pick Up

Instance	YC-G2306_PickUpSel		
Class	OnOffSel		
Inputs	**Parameter**	**Source**	**Type**
	SelOffText	“TK-G233 Disposal Bin Not Ready For Pick Up”	Const
	SelOnText	“TK-G233 Disposal Bin Ready For Pick Up”	Const
	SelOnNotPerm	YC-G2300_BinSel.SelOut	Link
	IntlkOn	Rising edge of ((NOT YC-G2330.CmdOn AND WI-G2331.AlmHi) for more than 2 minute)	Link
	IntlkOff	Rising edge of ZL-G2332	Link

Send message via alarm notification system to Hauler to pick up Disposal Bin TK-G233 on YC-G2306_PickUpSel.SelOut.

Table 3.2-18 YC-G2307_PickUpSel / Disposal Bin TK-G234 Ready For Pick Up

Instance	YC-G2307_PickUpSel		
Class	OnOffSel		
Inputs	**Parameter**	**Source**	**Type**
	SelOffText	"TK-G234 Disposal Bin Not Ready For Pick Up"	Const
	SelOnText	"TK-G234 Disposal Bin Ready For Pick Up"	Const
	SelOnNotPerm	NOT YC-G2300_BinSel.SelOut	Link
	IntlkOn	Rising edge of ((NOT YC-G2340.CmdOn AND WI-G2341.AlmHi) for more than 2 minute)	Link
	IntlkOff	Rising edge of ZL-G2342	Link

Send message via alarm notification system to Hauler to pick up Disposal Bin TK-G234 on YC-G230_PickUpSel.SelOut.

3.2.7 Screen Washers / Compactors

Screenings are discharged from the sluice to two washer/compactors (WCP G231, WCP G232). Each washer/compactor is equipped with a hopper to receive the screenings and carrier water, a constant speed motor-driven auger to compact and dewater the screenings, a wash water connection to remove organic material from the screenings, and a discharge tube to facilitate compaction and dewatering of the screenings. The compacted and dewatered screenings from each washer/compactor are discharged to the associated disposal bin (TK G233, TK G234, respectively). The drainage water, organic material, wash water, and sluice carrier water return by gravity to the screens influent channel. Under normal operating conditions only one washer/compactor is in operation at a time and operation alternates back and forth between the two washer/compactors depending on which disposal bin is active.

The raw screenings and carrier water are discharged from the sluice into the inlet hopper located above the opening to the auger housing. The carrier water passes through a screen below the auger, while the screenings are retained by the screen and transported by the auger into a compaction zone where they are compressed and dewatered. Wash water is used to remove organic material from the screenings.

In remote, the washer/compactor is enabled and associated sluice gates are commanded to open if its corresponding disposal bin active.

3.3 G3 – Grit

3.3.1 TK-G321&2 Grit Slurry pumps

P&ID Drawing: PPID-G302

There are three grit slurry pumps, two normal duty (P G323, P G325) and one common standby (P G324). Each normal duty pump is dedicated to the associated grit tank (TK G321, TK G322, respectively). The standby pump can serve as backup to either duty pump.

Table 3.3-1 YC-G3241 TK-G321&2 Grit Slurry pumps Duty/Standby/Duty Selector – P-G323 / P-G324 / P-G325

Instance	YC-G3241		
Class	DutyDSD		
Inputs	Parameter	Source	Type
	Eqmt1_Fail	YC-G3230.Fail	Link
	Eqmt1_Rdy	YC-G3230.Rdy	Link
	Eqmt1_PathA_RunRdy	XC-G3411.CnfOpn OR XC-G3421.CnfOpn	Link
	Eqmt1_Running	YC-G3230.Running	Link
	Eqmt1_Auto	YC-G3230.CtrlAuto	Link
	Eqmt2_Fail	YC-G3240.Fail	Link
	Eqmt2_Rdy	YC-G3240.Rdy	Link
	Eqmt2_PathA_Rdy	(XC-G3236.CnfOpn OR XC-G3236.Rdy) AND (XC-G3237.CnfOpn OR XC-G3237.Rdy) AND XC-G3256.CnfCls AND XC-G3257.CnfCls AND (XC-G3411.CnfOpn OR XC-G3421.CnfOpn)	Link
	Eqmt2_PathA_RunRdy	XC-G3236.CnfOpn AND XC-G3237.CnfOpn AND XC-G3256.CnfCls AND XC-G3257.CnfCls AND (XC-G3411.CnfOpn OR XC-G3421.CnfOpn)	Link
	Eqmt2_PathB_Rdy	(XC-G3256.CnfOpn OR XC-G3256.Rdy) AND (XC-G3257.CnfOpn OR XC-G3257.Rdy) AND XC-G3236.CnfCls AND XC-G3237.CnfCls AND (XC-G3412.CnfOpn OR XC-G3422.CnfOpn)	Link
	Eqmt2_PathB_RunRdy	XC-G3256.CnfOpn AND XC-G3257.CnfOpn AND XC-G3236.CnfCls AND XC-G3237.CnfCls AND (XC-G3412.CnfOpn OR XC-G3422.CnfOpn)	Link
	Eqmt2_Running	YC-G3240.Running	Link
	Eqmt2_Auto	YC-G3240.CtrlAuto	Link
	Eqmt3_Fail	YC-G3250.Fail	Link
	Eqmt3_Rdy	YC-G3250.Rdy	Link
	Eqmt3_PathB_RunRdy	XC-G3412.CnfOpn OR XC-G3422.CnfOpn	Link
	Eqmt3_Running	YC-G3250.Running	Link
	Eqmt3_Auto	YC-G3250.CtrlAuto	Link
	RunReqPathA	NOT HL-G3212.ConfCls	Link
	RunReqPathB	NOT HL-G3222.ConfCls	Link
Alarms	(2) – Medium Priority		

3.3.2 TK-G331&2 Grit Tanks

P&ID Drawing: PPID-G303 & PPID-G301

TK-G331&2 grit tanks are not always in operation. In Auto mode, operation of the grit tanks depends on the plant influent flow rate. Once in operation, the flow to TK-G321&2 grit tanks is maintained by redirecting some of the flow to TK-G331&2 grit tanks. The flow to TK-G321&2 is controlled indirectly by maintaining the screens effluent channel level.

3.3.2.1. Grit tanks auto start conditions

In Auto mode, TK-G331&2 will be in operation when the plant influent flow exceeds 220 ML/d "Flow Rate to Start Grit Tanks 3 & 4" (YC-G3300_FlowRun_Setting setpoint by operator) for greater than TBDC minutes "Wait Time to Start Grit Tanks 3 & 4" (YC-G3300_FlowRunDly_Setting setting by operator), as measured using flow meters on the influent pump discharge pipes.

TK-G331&2 Grit Tanks are stopped when the plant influent flow is below TBDC ML/d "Flow Rate to Stop Grit Tanks 3 & 4" (YC-G3300_FlowStop_Setting setting by operator) for more than TBDC minutes "Wait Time to Stop Grit Tanks 3 & 4" (YC-G3300_FlowStopDly_Setting setting by operator).

YC-G3300_FlowRunDly_Setting [minutes], YC-G3300_FlowStopDly_Setting [minutes], YC-G3300_FlowRun_Setting [ML/d] and YC-G3300_FlowStop_Setting [ML/d] are real numbers that can be modified by the operator with security level M or higher. The values should be checked so that YC-G3300_FlowRun_Setting > YC-G3300_FlowStop_Setting. The operator HMI setpoints should be range checked before being used.

Table 3.3-2 FIC-G3300 Plant Influent Flow TK-G331&2 Grit Tanks Control

Instance	FIC-G3300		
Class	AnalogIAC		
Inputs	Parameter	Source	Type
	PV	FI-G1100	Link
	CtrlHiSP	YC-G3300_ FlowRun_Setting	Link
	CtrlLoSP	YC-G3300_ FlowStop_Setting	Link
	CtrlHiDly	YC-G3300_FlowRunDly_Setting * 60 000 [ms/minutes]	Link
	CtrlLoDly	YC-G3300_FlowStopDly_Setting * 60 000 [ms/minutes]	Link
Alarms	N/A		

3.3.2.2. LIC-G3201 / Screens effluent channel level control

The PCS records the current level in the screens effluent channel LIC-G3201.Out in YC-G3300_ChannelLvlSP when the plant influent flow reaches YC-G3300_CtrlHiSP (rising edge).

If the plant influent flow is less than YC-G3300_CtrlHiSP, YC-G3300_ChannelLvlSP is updated with the screens effluent channel high alarm level setting (LIC-G3201.AlmHiLmt) when a high level alarm (LI-G3201.AlmHi) is detected (rising edge) before starting the TK-G331&2 Grit Tank Sequence.

For the case where the system is operated in manual, YC-G3300_ChannelLvlSP is updated to the current level in the screens effluent channel LIC-G3201.Out when the system is commanded to run (YC-G3300.CmdRun rising edge) in manual (YC-G3300.CtrlAuto is False).

YC-G3300_ChannelLvlSP should be range limited to LIC-G3201.AlmHiLmt.

YC-G3300_ChannelLvlSP is not updated while TK-G331&2 Grit Tanks are commanded to run (YC-G3300.CmdRun is True).

Table 3.3-3 LIC-G3201 / Screens Effluent Channel Level Control

Instance	LIC-G3201		
Class	PID_Controller		
Inputs	Parameter	Source	Type
	PV	LIT-G3201	I/O
	Auto_SP	YC-G3300_ChannelLvlSP	Link
	Tracking	LK-G3201.NotRdy OR NOT YC-G3300_LC_En OR LIC-G320.AlmErr	Link
	TrackingCV	LK-G3201.CV	Link
	ReverseAct	0 (Direct)	Const
Alarms	Hi(1) & Err(1)		

Notes:

Refer to PCN Alarm, Range and Settings List for operator setting ranges. Alarm priority as per as per default class definition or as shown between parentheses.

LIC-G3201 is direct acting. As channel level increases, LV-G3201 opening increases.

Table 3.3-4 LK-G3201 / LK-G3201 Grit Tanks Influent Flow Split Gate

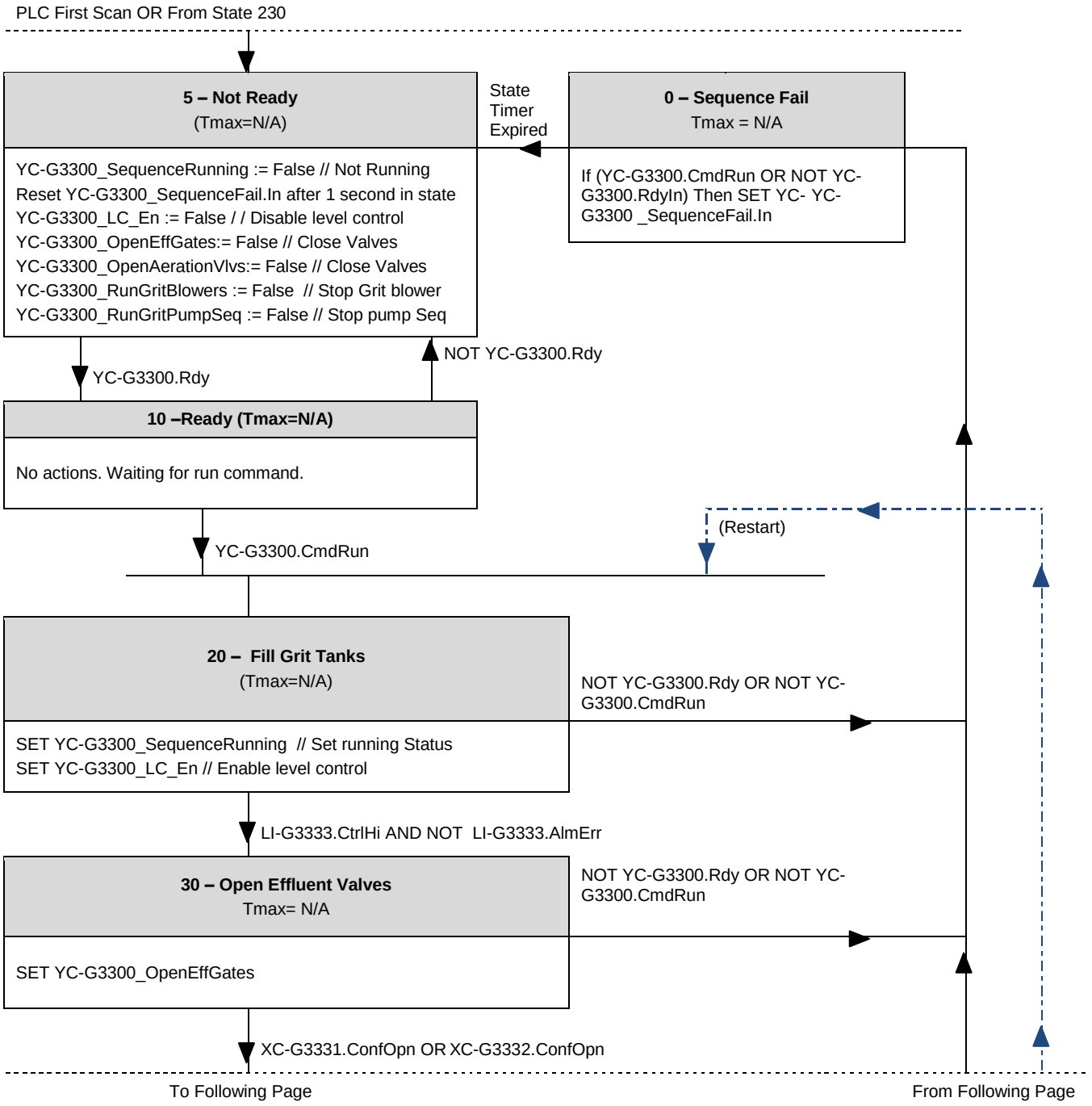
Instance	LK-G3201		
Class	AnalogCS		
Inputs	Parameter	Source	Type
	CV_In	If(YC-G3300_LC_En,If(LIC-G3201.AlmErr,100%,LIC-G3201.CV),0%)	Link
	CtrlRem	LV-G3201.Rem	I/O
	Fbk	LV-G3201.Z	I/O
	Flt	LV-G3201.Flt	I/O
	Intlk	N/A	-
Outputs	Parameter	Destination	Type
	CV	LV-G3201.CmdZ	I/O
Alarms	(1) – Emergency / Call Out Priority		

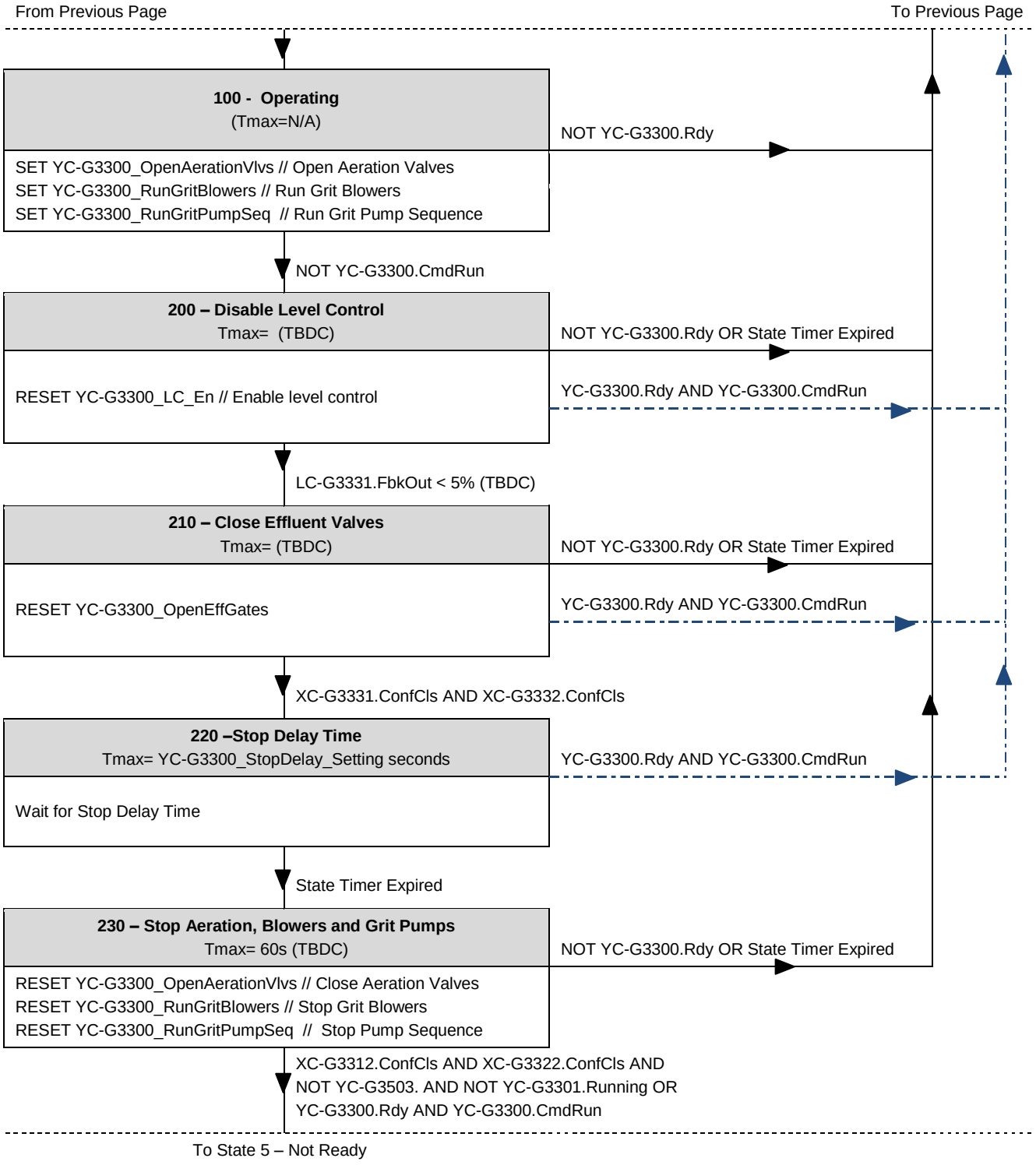
3.3.2.3. Grit tanks Start / Stop

Table 3.3-5 YC-G3300 / TK-G331&2 Grit Tank Sequence Control Station

Instance	YC-G3300		
Class	DiscreteCS		
Inputs	Parameter	Source	Type
	CtrlRem	N/A	Link
	Flt	YC-G3300_SequenceFail	Link
	RdyIn	LK-G3201.Rdy AND (HL-G3311.ConfOpn OR HL-G3321.ConfOpn)	Link
	Run	YC-G3300_SequenceRunning	Link
	RunAuto	(FIC-G3300.CtrlHi OR YC-G3300.Running) AND NOT FIC-G3300.CtrlLo OR LI-G3201.AlmHi	Link
	WarningIn	(LIC-G3201.AlmErr for more than 10 seconds) OR NOT (XC-G3331.Rdy OR XC-G3331.ConfOpn OR XC-G3332.Rdy OR XC-G3332.ConfOpn) OR NOT (XC-G3312.Rdy OR XC-G3312.ConfOpn) OR NOT (XC-G3322.Rdy OR XC-G3322.ConfOpn) OR NOT (YC-G3503.EqmtRdy OR YC-G3503.EqmtRunning) OR NOT(YC-G3301.Rdy OR YC-G3301.Running) OR (LI-G3333.AlmErr for more than 10 seconds) OR NOT (XC-G3331.Rdy OR XC-G3331.ConfOpn OR XC-G3332.Rdy OR XC-G3332.ConfOpn)	Link
Alarms	(1) – Emergency / Call Out Priority		

3.3.2.4. YC-G3300_Sequence / TK-G331&2 Grit Tank Sequence




From Previous Page
To Previous Page
100 - Operating
(Tmax=N/A)
SET YC-G3300_OpenAerationVlvs // Open Aeration Valves
SET YC-G3300_RunGritBlowers // Run Grit Blowers
SET YC-G3300_RunGritPumpSeq // Run Grit Pump Sequence
NOT YC-G3300.Rdy
NOT YC-G3300.CmdRun
200 – Disable Level Control
Tmax= (TBDC)
RESET YC-G3300_LC_En // Enable level control
NOT YC-G3300.Rdy OR State Timer Expired
YC-G3300.Rdy AND YC-G3300.CmdRun
LC-G3331.FbkOut < 5% (TBDC)
210 – Close Effluent Valves
Tmax= (TBDC)
RESET YC-G3300_OpenEffGates
NOT YC-G3300.Rdy OR State Timer Expired
YC-G3300.Rdy AND YC-G3300.CmdRun
XC-G3331.ConfCls AND XC-G3332.ConfCls
220 –Stop Delay Time
Tmax= YC-G3300_StopDelay_Setting seconds
Wait for Stop Delay Time
YC-G3300.Rdy AND YC-G3300.CmdRun
State Timer Expired
230 – Stop Aeration, Blowers and Grit Pumps
Tmax= 60s (TBDC)
RESET YC-G3300_OpenAerationVlvs // Close Aeration Valves
RESET YC-G3300_RunGritBlowers // Stop Grit Blowers
RESET YC-G3300_RunGritPumpSeq // Stop Pump Sequence
NOT YC-G3300.Rdy OR State Timer Expired
XC-G3312.ConfCls AND XC-G3322.ConfCls AND
NOT YC-G3503. AND NOT YC-G3301.Running OR
YC-G3300.Rdy AND YC-G3300.CmdRun
To State 5 – Not Ready

Notes:

The Effluent Channel is considered full when “Grit Tanks 3 & 4 Effluent Channel Full Level” LI-G3333_EffChanFull_Setting is reached (LI-G3333.CtrlHi).

YC-G3300_StopDelay_Setting is the “Grit Tanks 3 & 4 Stop Delay Time” in seconds. YC-G3300_StopDelay is can be modified by the operator with security level M or higher.

Table 3.3-6 YC- YC-G3300 _SequenceFail / TK-G331&2 Grit Tank Sequence Fail

Instance	YC-G3300_SequenceFail		
Class	DiscreteIA		
Inputs	Parameter	Source	Type
	In	See YC-G3300_Sequence above	Link
	ExtRst	YC-G3300.RstDevAlms	Link
Alarms	Alm(3) - Low Priority		

Note: Alarm text to include name and description of the failed sequence state

3.3.3 TK-G331&2 Grit Slurry pumps

P&ID Drawing: PPID-G304

When in service, Grit is periodically pumped from the grit tank. There are two grit slurry pumps (P-G335, P-G336), one duty and one standby for both tanks. XV-G3313 and XV-G3323 are used to remove grit from TK-G331 and TK-G332 respectively. The grit is removed from each tank sequentially, the operator can select how long grit will be removed from each thank (YC-G3301_TK33(1/2)_PumpGritTime) and how long to wait to till the next cycle (YC-G3301_PumpGritDly).

YC-G3301_TK33(1/2)_PumpGritTime [2] are modifiable by the operator with security level M or higher. The operator HMI setting should be range checked (0 to 100 minutes) before being used.

YC-G3301_PumpGritDly [3] are modifiable by the operator with security level M or higher. The operator HMI setting should be range checked (0 to 500 minutes) before being used.

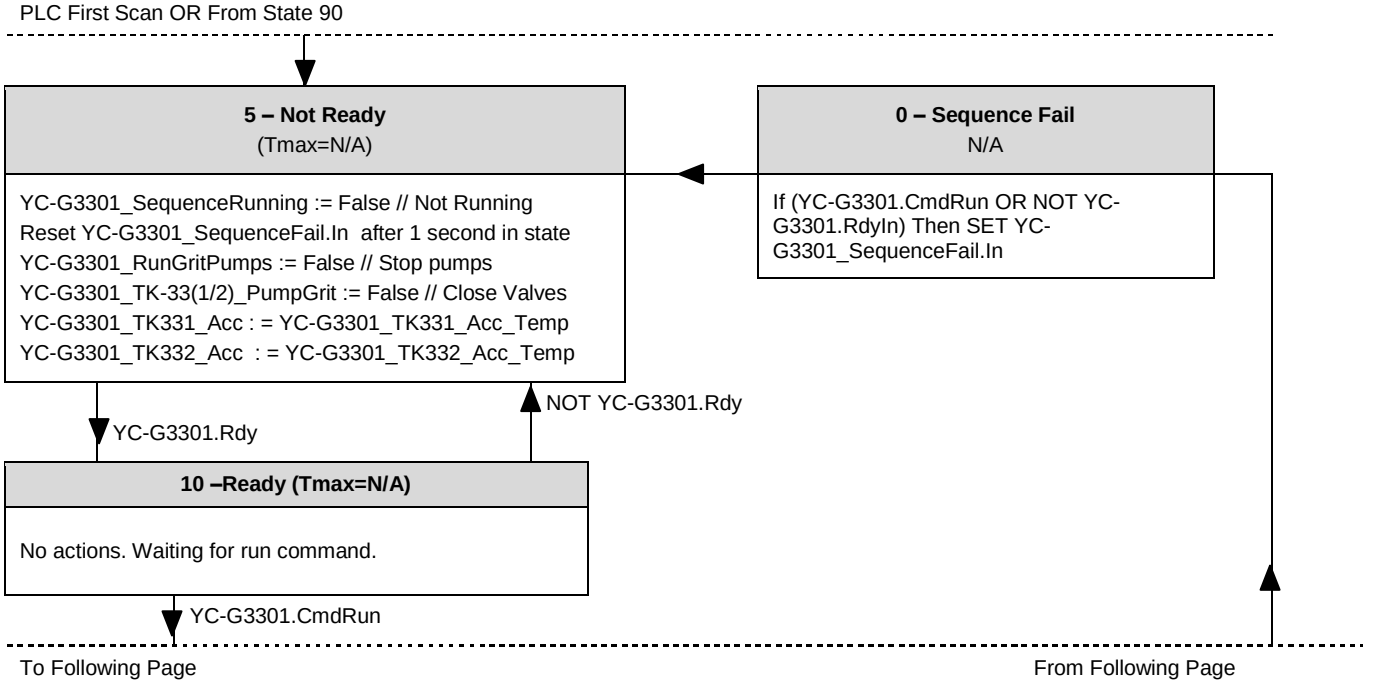
Table 3.3-7 YC-G3301 / TK-G331&2 Grit Slurry Pumping Sequence Control Station

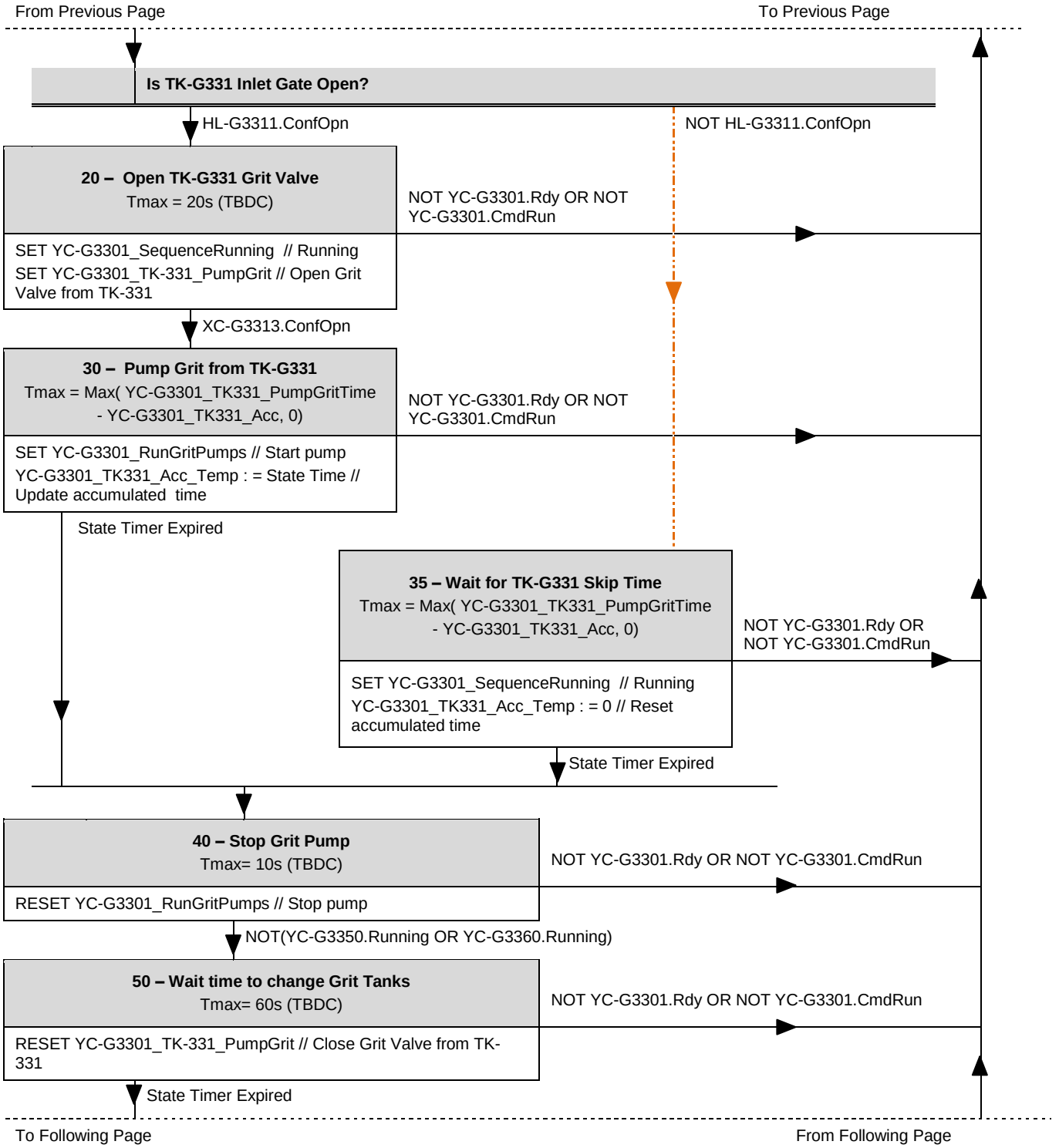
Instance	YC-G3301		
Class	DiscreteCS		
Inputs	Parameter	Source	Type
	CtrlRem	N/A	Link
	Flt	YC-G3302.AlmEqmtNotAvail OR YC-G3301_SequenceFail	Link
	PathNotRunRdyIn	NOT (XC-G3331.ConfOpn OR XC-G3332.ConfOpn)	Link
	PathFltAutoRst	True	Const

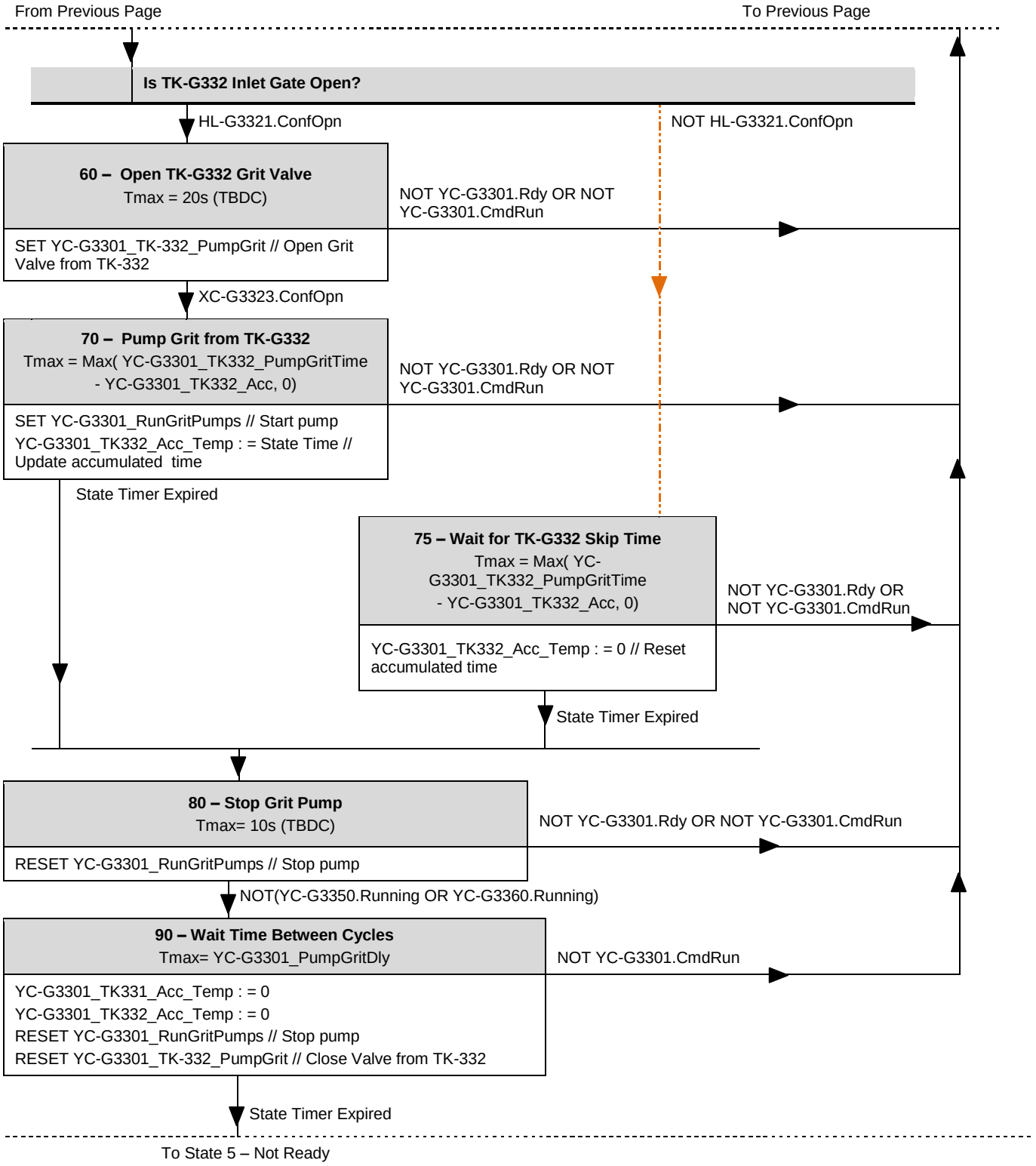
[2] 30 minutes initial value as per existing DCS logic.
[3] 1 minute initial value as per existing DCS logic.

	RdyIn	(HL-G3311.ConfOpn AND XC-G3313.Rdy AND (XC-G3323.Rdy OR XC-G3323.ConfCls) OR HL-G3321.ConfOpn AND XC-G3323.Rdy AND (XC-G3313.Rdy OR XC-G3313.ConfCls)) AND YC-G3302.Rdy AND (XC-3413.ConfOpn OR XC-3423.ConfOpn)	Link
	Run	YC-G3301_SequenceRunning	Link
	RunAuto	YC-G3300_RunGritPumpSeq	Link
	WarningIn	HL-G3311.ConfOpn AND NOT (XC-G3313.Rdy OR XC-G3313.ConfOpn) OR HL-G3321.ConfOpn AND NOT (XC-G3323.Rdy OR XC-G3323.ConfOpn)	Link
Alarms	(2) – Medium Priority		

3.3.3.1. YC-G3301_Sequence / TK-G331&2 Grit Slurry Pumping Sequence




From Previous Page
To Previous Page
Is TK-G331 Inlet Gate Open?
HL-G3311.ConfOpn
NOT HL-G3311.ConfOpn
20 – Open TK-G331 Grit Valve
Tmax = 20s (TBDC)
NOT YC-G3301.Rdy OR NOT YC-G3301.CmdRun
SET YC-G3301_SequenceRunning // Running
SET YC-G3301_TK-331_PumpGrit // Open Grit Valve from TK-331
XC-G3313.ConfOpn
30 – Pump Grit from TK-G331
Tmax = Max(YC-G3301_TK331_PumpGritTime - YC-G3301_TK331_Acc, 0)
NOT YC-G3301.Rdy OR NOT YC-G3301.CmdRun
SET YC-G3301_RunGritPumps // Start pump
YC-G3301_TK331_Acc_Temp : = State Time // Update accumulated time
State Timer Expired
35 – Wait for TK-G331 Skip Time
Tmax = Max(YC-G3301_TK331_PumpGritTime - YC-G3301_TK331_Acc, 0)
NOT YC-G3301.Rdy OR NOT YC-G3301.CmdRun
SET YC-G3301_SequenceRunning // Running
YC-G3301_TK331_Acc_Temp : = 0 // Reset accumulated time
State Timer Expired
40 – Stop Grit Pump
Tmax= 10s (TBDC)
NOT YC-G3301.Rdy OR NOT YC-G3301.CmdRun
RESET YC-G3301_RunGritPumps // Stop pump
NOT(YC-G3350.Running OR YC-G3360.Running)
50 – Wait time to change Grit Tanks
Tmax= 60s (TBDC)
NOT YC-G3301.Rdy OR NOT YC-G3301.CmdRun
RESET YC-G3301_TK-331_PumpGrit // Close Grit Valve from TK-331
State Timer Expired
To Following Page
From Following Page


From Previous Page
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Is TK-G332 Inlet Gate Open?
HL-G3321.ConfOpn
NOT HL-G3321.ConfOpn
60 – Open TK-G332 Grit Valve
Tmax = 20s (TBDC)
NOT YC-G3301.Rdy OR NOT YC-G3301.CmdRun
SET YC-G3301_TK-332_PumpGrit // Open Grit Valve from TK-332
XC-G3323.ConfOpn
70 – Pump Grit from TK-G332
Tmax = Max(YC-G3301_TK332_PumpGritTime - YC-G3301_TK332_Acc, 0)
NOT YC-G3301.Rdy OR NOT YC-G3301.CmdRun
SET YC-G3301_RunGritPumps // Start pump
YC-G3301_TK332_Acc_Temp : = State Time // Update accumulated time
State Timer Expired
75 – Wait for TK-G332 Skip Time
Tmax = Max(YC-G3301_TK332_PumpGritTime - YC-G3301_TK332_Acc, 0)
NOT YC-G3301.Rdy OR NOT YC-G3301.CmdRun
YC-G3301_TK332_Acc_Temp : = 0 // Reset accumulated time
State Timer Expired
80 – Stop Grit Pump
Tmax= 10s (TBDC)
NOT YC-G3301.Rdy OR NOT YC-G3301.CmdRun
RESET YC-G3301_RunGritPumps // Stop pump
NOT(YC-G3350.Running OR YC-G3360.Running)
90 – Wait Time Between Cycles
Tmax= YC-G3301_PumpGritDly
NOT YC-G3301.CmdRun
YC-G3301_TK331_Acc_Temp : = 0
YC-G3301_TK332_Acc_Temp : = 0
RESET YC-G3301_RunGritPumps // Stop pump
RESET YC-G3301_TK-332_PumpGrit // Close Valve from TK-332
State Timer Expired
To State 5 – Not Ready

Notes:
YC-G3301_TK331_Acc_Temp and YC-G3301_TK332_Acc_Temp retain the last state timer running value for cases where the cycle is stopped for short period of time. Reset YC-G3301_TK331_Acc_Temp and YC-G3301_TK332_Acc_Temp if the sequence does not run (NOT YC-G3301_SequenceRunning) for more that 1 hour (TBDC).

Table 3.3-8 YC-G3301_SequenceFail / TK-G331&2 Grit Slurry Pumping Sequence Fail

Instance	YC-G3301_SequenceFail		
Class	DiscreteIA		
Inputs	Parameter	Source	Type
	In	See YC-G3301_Sequence above	Link
	ExtRst	YC-G3301.RstDevAlms	Link
Alarms	Alm(3) - Low Priority		

Note: Alarm text to include name and description of the failed sequence state

Table 3.3-9 YC-G3302 TK-G331&2 Grit Slurry Pump Duty Selector – P-G335 / P-G336

Instance	YC-G3302		
Class	DutyDS		
Inputs	Parameter	Source	Type
	Eqmt1_Fail	YC-G3350.Fail	Link
	Eqmt1_Rdy	YC- G3350.Rdy	Link
	Eqmt1_Running	YC- G3350.Running	Link
	Eqmt1_Auto	YC- G3350.CtrlAuto	Link
	Eqmt2_Fail	YC- G3360.Fail	Link
	Eqmt2_Rdy	YC- G3360.Rdy	Link
	Eqmt2_Running	YC- G3360.Running	Link
	Eqmt2_Auto	YC- G3360.CtrlAuto	Link
	RunReq	YC-G3301_RunGritPumps	Link
Alarms	(1 - TBDC) – Emergency / Call Out Priority		

3.3.4 Grit Classifier

P&ID Drawing: PPID-G305

Grit slurry pumped from the grit tanks is received by two grit classifiers (GRP-G341, GRP-G342). Each classifier consists of a settling tank equipped with a motor driven screw conveyor and three cyclones. The three cyclones on grit classifier GRP-G341 (CYC-G341 1, CYC-G341 2, CYC-G341 3) receive grit slurry from Grit Tank 1, Grit Tank 2, and Grit Tanks 3 & 4, respectively. Similarly, the three cyclones on grit classifier GRP-G342 (CYC-G342 1, CYC-G342 2, CYC-G342 3) also receive grit slurry from Grit Tank 1, Grit Tank 2, and Grit Tanks 3 & 4, respectively. The washed and dewatered grit from each grit classifier is discharged to the associated disposal bin

(TK-G233, TK-G234, respectively). The separated water and organics are returned to the screens effluent channel. Each grit classifier is sized to handle the combined grit slurry from all grit sources simultaneously under peak loading conditions. Under normal operating conditions only one grit classifier is in operation at a time and operation alternates back and forth between the two grit classifiers depending on which disposal bin is active.

The settling tank provides a quiescent pool where the grit particles undergo final separation and washing. The settled grit is transferred along an inclined trough by a screw conveyor and lifted above the water level for further dewatering and washing before being discharged to the disposal bins. Water and organic material is discharged over a weir and returned to the screens effluent channel. The weir elevation can be manually adjusted by the operator to achieve the optimal liquid depth in the settling tank, producing grit with a minimal amount of organics. Each grit classifier has a wash water supply line equipped with a motorized valve (XV G3414, XV G3424) to wash organic material from the grit before it is discharged to the disposal bin. Each classifier is also equipped with a motion detector (XE G3415, XE G3425) to confirm rotation of the screw conveyor and a cable actuated safety switch (HSS G3416, HSS G3426) to manually shut off the screw conveyor in an emergency.

There are three separate grit slurry lines feeding the grit classifiers, one from Grit Tank 1 (TK G321), another from Grit Tank 2 (TK G322), and a common one from Grit Tanks 3 & 4 (TK G331, TK G332). Routing of these flow streams to the two grit classifiers is controlled by six motorized grit slurry inlet valves, two for each grit slurry line (XV G3411 and XV G3421, XV G3412 and XV G3422, XV G3413 and XV G3423, respectively).

Normally, the grit classifiers run intermittently according to the “Grit Classifier On Time” (YC-G3400_GRP_OnTime_Setting) and “Grit Classifier Off Time” (YC-G3400_GRP_OffTime_Setting) specified by the operator at the plant HMI. To prevent overloading of the auger drive at high plant influent flows when grit loading is likely to be highest, the classifiers will automatically switch to continuous operation when the plant influent flow rate is above the “Flow Rate for Continuous Grit Classifier Operation” (YC-G3400_GRP_FlowRateCont_Setting [ML/d]) specified by the operator.

YC-G3400_GRP_OnTime_Setting, YC-G3400_GRP_OffTime_Setting and YC-G3400_GRP_FlowRateCont_Setting are real numbers than can be modified by an operator with security level M or higher.

The wash water valve is open whenever the associated grit classifier is running.

A grit classifier system consist of a grit classifier equipment (GRP-G34(1/2)) with its corresponding grit classifier auger low speed detection and wash water valve. The grit classifier system control station enables/disables the operation of the grit classifier as per grit classifier on time and grit classifier off time or continuous operations depending on influent flow.

Table 3.3-10 YC-G34(1/2)9 / Grit Classifier GRP-G34(1/2) System Control Station

Instance	YC-G34(1/2)9		
Class	DiscreteCS_RunEnb		
Inputs	**Parameter**	**Source**	**Type**
	CtrlRem	N/A	
	Flt	YC-G34(1/2)0.Fail OR SAL-G34(1/2)5.Alm OR XC-G34(1/2)4.Fail OR XA-G34(1/2)4.Alm	Link
	RdyIn	YC-G34(1/2)0.Rdy AND NOT SAL-G34(1/2)5.Alm AND (XC-G34(1/2)4.Rdy OR XC-G34(1/2)4.ConfOpn)	Link
	Run	YC-G34(1/2)0.Running AND XC-G34(1/2)4.ConfOpn	Link
	Intlk	HA-G34(1/2)0.Alm OR HA-G2300-2.Alm	
	RunEnbAuto	YC-G23(3/4)0.CmdOn	Link
Alarms	N/A		

Grit Classifier Equipment Run Request is defined as follows:

```
If YC-G23(3/4)0.CmdOn Then
        If (FI-G1100.Out > YC-G3400_GRP_FlowRateCont_Setting) for more than YC-
                G3400_GRP_OffTime_Setting Then
                Set YC-G3400_GRP_FlowRateCont_Run
        EndIf
        If (YC-G3400_GRP_FlowRateCont_Run AND (FI-G1100.Out < YC-
                G3400_GRP_FlowRateCont_Setting)) for more than YC-G3400_GRP_OnTime_Setting Then
                Reset YC-G3400_GRP_FlowRateCont_Run
        EndIf
        If YC-G3400_GRP_FlowRateCont_Run Then
                YC-G34(1/2)0_RunReq := True
        Else
                 YC-G34(1/2)0_RunReq  is on for YC-G3400_GRP_OnTime_Setting and off for YC-
                        G3400_GRP_OffTime_Setting
        EndIf
Else
        YC-G34(1/2)0_RunReq := False
        Reset YC-G3400_GRP_FlowRateCont_Run
EndIf
```

3.3.5 TK-G331 & TK-G332 Grit Blowers

P&ID Drawing: PPID-G306

Grit Tanks TK-G331 & TK-G332 utilize process air released through a submerged diffuser to create a rolling flow pattern within the tank that enhances grit separation while maintaining organic material in suspension. Air is supplied to the grit tanks by two grit blowers (B-G353, B-G354), one duty and one standby.

Table 3.3-11 YC-G3503 TK-G331&2 Grit Blowers Duty Selector – B-G353 / B-G354

Instance	YC-G3503		
Class	DutyDS		
Inputs	Parameter	Source	Type
	Eqmt1_Fail	YC-G3530.Fail	Link
	Eqmt1_Rdy	YC- G3530.Rdy	Link
	Eqmt1_Running	YC- G3530.Running	Link
	Eqmt1_Auto	YC- G3530.CtrlAuto	Link
	Eqmt2_Fail	YC- G3540.Fail	Link
	Eqmt2_Rdy	YC- G3540.Rdy	Link
	Eqmt2_Running	YC- G3540.Running	Link
	Eqmt2_Auto	YC- G3540.CtrlAuto	Link
	RunReq	YC-G3300_RunGritBlowers	Link
Alarms	(1 - TBDC) – Emergency / Call Out Priority		

3.3.6 Channel Aeration Blowers

P&ID Drawing: PPID-G307

The wastewater channels within the headworks facility are aerated to help maintain sand and grit in suspension and minimize settling. Air is supplied continuously to the channels by two channel aeration blowers (B G351, B G352), one duty and one standby.

Table 3.3-12 YC-G3502 Channel Aeration Blowers Duty Selector – B-G351 / B-G352

Instance	YC-G3502		
Class	DutyDS		
Inputs	Parameter	Source	Type
	Eqmt1_Fail	YC-G3510.Fail	Link
	Eqmt1_Rdy	YC- G3510.Rdy	Link
	Eqmt1_Running	YC- G3510.Running	Link
	Eqmt1_Auto	YC- G3510.CtrlAuto	Link
	Eqmt2_Fail	YC- G3520.Fail	Link
	Eqmt2_Rdy	YC- G3520.Rdy	Link
	Eqmt2_Running	YC- G3520.Running	Link
	Eqmt2_Auto	YC- G3520.CtrlAuto	Link
	RunReq	True	Link

Alarms	(1 - TBDC) – Emergency / Call Out Priority

Note: Initial maximum duty cycle length to be determined during commissioning.