SGEL6000 Independent Project

2020-2021

DOUBLE MARKING SHEET AND COMBINED STUDENT FEEDBACK

Assessment 4 of 4

Presentation 2: Project Design, Implementation and Evaluation

Agreed mark

61

Link to presentation: https://youtu.be/4iAt5-3ptOk
Link to Questions: https://youtu.be/Dm585HHOdC4

Student Name: Carl Jones **Student Number** 1910607

Generic Assessment Criteria	Marks available	Ist Marker (RD)	2nd Marker (MH)	Agreed Mark
1. Engagement with Literature Skills.				
Section 3: Use of technical literature in final design solution: Good evidence presented, reference made to standards. However, further investigation could have forearmed you about the issues with the PID controller Most sources were company documentation	5	3	3	3
Total	5	3	3	3
2. Knowledge and Understanding Skills				
Section 1: Introduction: Briefly presented outline the aims and objectives of the project Project was introduced as an upgrade to a sewage treatment works due to a local housing development. Aims and objectives were listed and explained.	5	3	4	3
Section 2: FDS: Briefly presented but additions were mentioned in questioning where customer has paid extra. FDS was explained, including the need to build and install several panels, installation of flow meters and installation of control cables.	5	3	4	4
Section 3: Advanced knowledge and critical understanding demonstrated in the design of the project: There is very good evidence of knowledge and critical understanding except in the PID controller. Design of the panels was carried on AutoCAD, the pump controller used a Pulsar Ultimate and cables were designed using Trimble Amtech software.	10	7	7	7
All sections: Response to questioning: Good answers given showed a full understanding of the system produced. Questions were generally well answered, a bit vague on some wider issues.	10	7	7	7
Total	30	20	22	21
3. Cognitive and Intellectual Skills				
Section 5: Testing and analysis of result: An explanation of testing was presented but no results given.	10	4	5	5

Testing was limited to the PID flow meter which was currently on-going and involves consultation with the manufacturer.				
Section 6: Critical evaluation of the project outcomes and comparison with the FDS: Good evaluation of all aspects of the project outcomes. Holdups were identified due to Brexit and Covid, wasn't clear how much of the FDS has been satisfied.	10	6	5	5
Section 8: Overall conclusions and recommendations: Present condition of the project concluded with future work to do. Budget was met with probable profit of £26K, issues with the customer not accepting the Pulsar Ultimate controller may result in a design change.	10	6	6	6
Total	30	16	16	16
4. Practical Application Skills				
Section 3: Formulation of innovative and creative design solution to the project problem: The design sowed a good level of innovation and creativity using standard methods within the restrictions imposed by the customer. A range of software was used and the design solution is suitable for the needs to the industry.	5	3	4	3
Section 4: Deployment method, use of material, tools, equipment and techniques in the construction of the project: Excellent and professional methods employed. Photos of the finished panels and the site installation were shown.	5	4	4	4
Section 4: Quality of the final product or system: High quality final build quality though there was an issue with the operation of the controller as identified. Photos of the final installation along with the flow meters were shown.	5	3	4	3
Section 5: Use of test equipment and presentation of results of the project: Some explanation given of testing (limited by electrical supply on site and not being able functionally test in the workshop) but no evidence presented. Although photos of the final installation were shown there was only a brief mention of testing in the presentation. This included testing of the PID flow meter (which failed)	5	1	1	1
Section 7: Management techniques and planning, comparison with initial plan: Good evidence of management techniques and comparison with original plan. Microsoft Project was used to manage the project, some consideration for project slippage was given due to hold ups in the supply of materials.	5	4	3	4
Total	25	15	16	15
5. Transferable Skills for Life and Professional Practice				
All sections: Quality of the presentation slides: Good quality though some slides contained too much information Most slides were legible, spreadsheets and Gantt charts being an exception.	5	3	3	3
All sections: Quality of the delivery style: Good style but there were many pauses. Slightly nervous, but presentation was delivered with reasonable confidence.	5	3	3	3
Total	10	6	6	6

Grand Total	**100**	**60**	**63**	**61**

1910607 - project presentation 2

by Carl Jones

FILE	17677_CARL_JONES_1910607_-_PROJECT_PRESENTATION_2_179209_1366737738.PPTX (9.32M)		
TIME SUBMITTED	21-MAY-2021 10:16PM (UTC+0100)	WORD COUNT	1021
SUBMISSION ID	154376200	CHARACTER COUNT	5259

Course: BSc (Hons) Electrical and Electronic Engineering
Module: SGEL6000 Independent Project
Presentation 2: **Project Design, Implementation and evaluation**
Name: Carl Jones
University Number: 1910607
Date Submitted: **21/05**/2021

Title: Waste Water treatment works upgrade

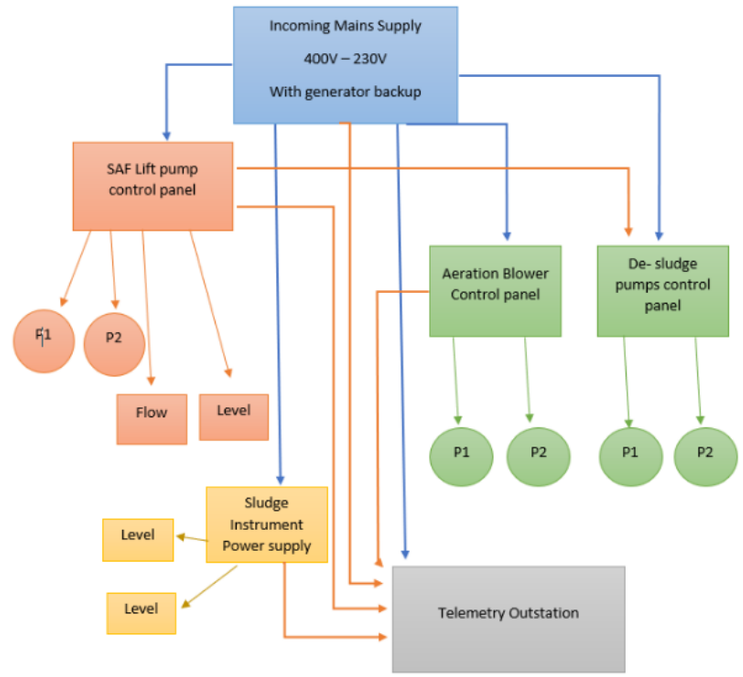
Introduction to Project

- The aim of the project is to upgrade a sewage treatment works due to local housing development.
- Project aims and objectives
  - Implement the project plan, monitor and update timelines
  - Track costs for materials and labour
  - Implement the design process to produce construction drawings
  - Implement the construction phase for both workshop builds and onsite installation.
  - Develop a Risk assessment & Method statement for installation
  - Testing of solution
  - Evaluate the project outcome.

Function Design Specification (FDS)

The design and installation is slit into areas.

- Design, build and install a mains/generator feeder panel
- Design, build and install the SAF lift pump control panel
- Installation of flowmeter and level switches
- Design and installation of power and control cables for the entire process plant.



Design

Using AutoCad electrical to create Electrical designs and Schematic

<u>Mains/Generator panel</u>

- Changeover isolator from Mains to backup generator
- Easy plug connections for generator supply
- Phase failure Alarm signal to telemetry

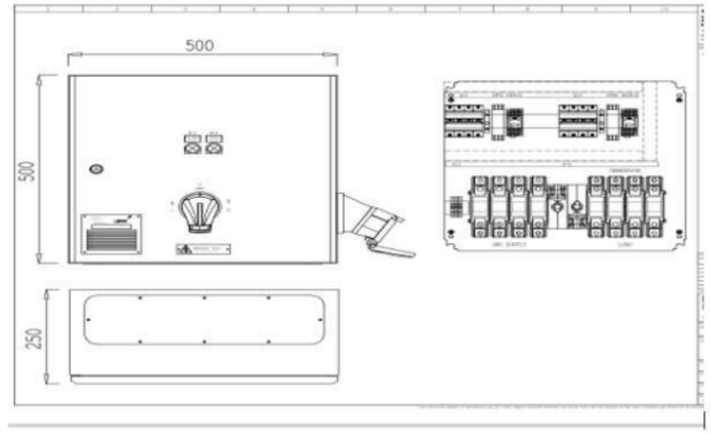
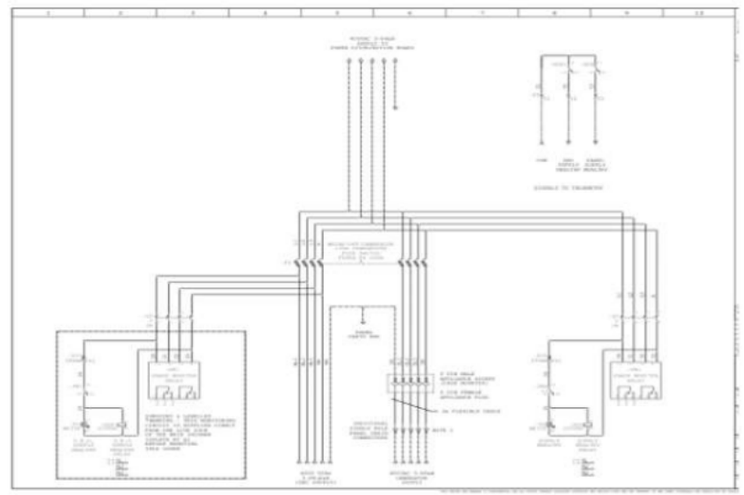


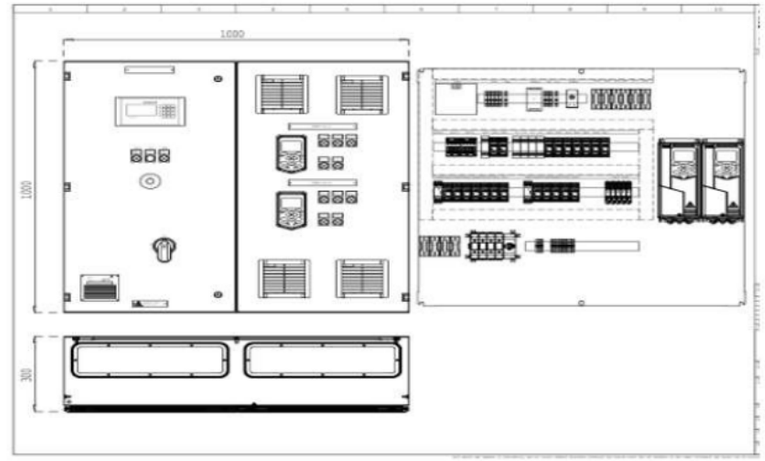
Figure 3-Main income panel Layout drawing

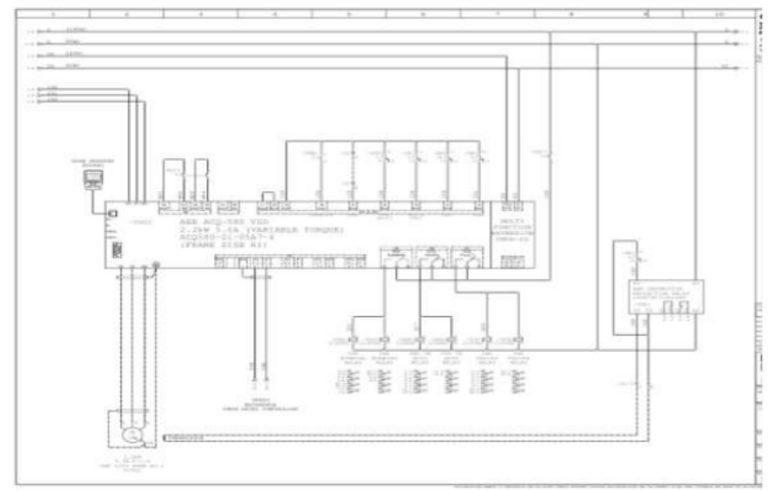


Design (cont..)

SAF pumping station LCP

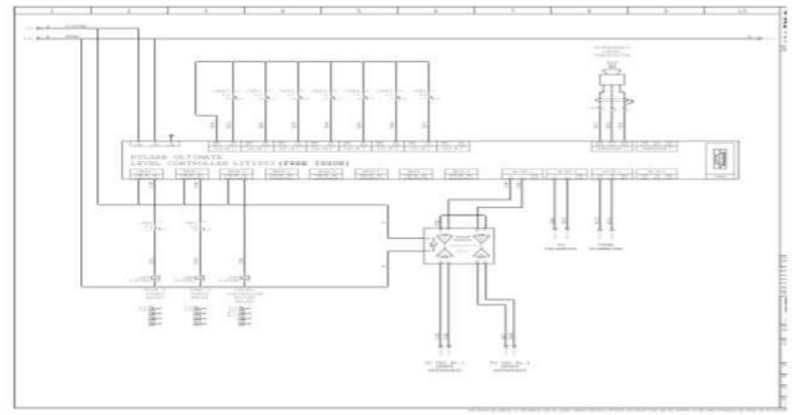
- VSD pump control duty/assist
- Hand/ Auto selection
- Emergency stop
- Level and flow control for speed variation of the pump motors
- Backup start if level sensor fails

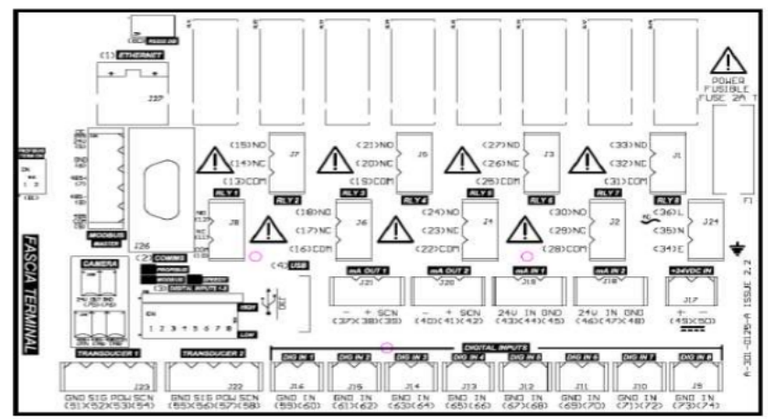




Design (Cont..)

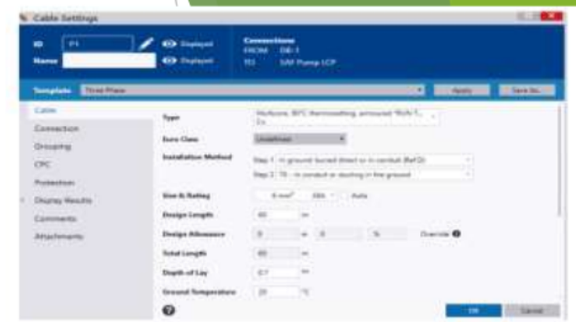
- Pulsar ultimate design.
- Connection diagram had to be sourced from the manual

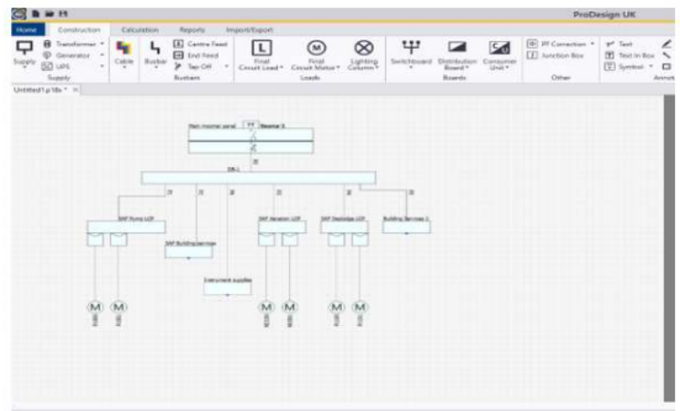




Design - Power cable

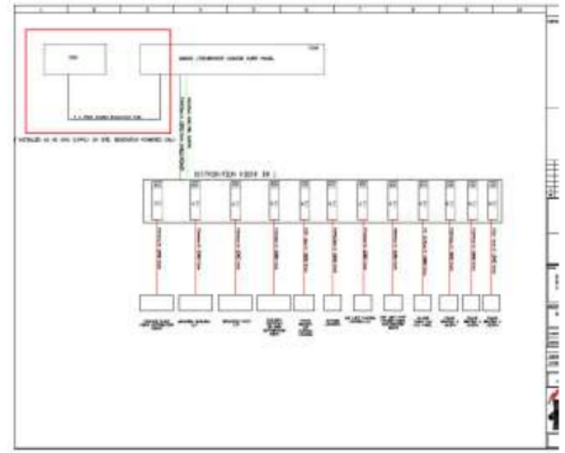
- Sizes of cable to be installed are calculated using Trimble Amtech software
- This is calculated off load values and cable lengths
- A single line diagram is then drawn out on the software and all relevant values are entered for calculations to be carried out and a report generated

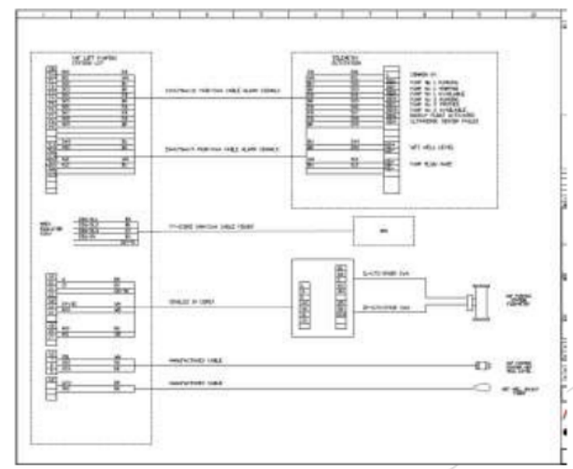




Design- Single line diagrams & termination schedules

- Single line diagrams where produced for all cables to be installed
- Termination schedules were produced for ease of connection on site





Construction

- Build of SAF control panel in workshop

Site Installation

- Before being able to carry out an installation on site a Full risk assessment and method statement had to be issued

Operation	Personnel at Risk	Hazard	P	S	R	Risk	Control Measures	P	S	R	Residual Risk
Site construction Traffic	• Site Operatives • Plant operatives • Engineers	• Physical injury to individuals •	3	5	15	Med	• Stay within fenced pedestrian marked areas. • Where passing working machinery, make sure driver/ banks man acknowledges you and your intentions to pass and says it's safe to do so. • PPE must be worn at all times.	2	5	10	Med
Testing of Electrical Systems.	• Site Operatives • Engineers • Localised Contractors.	• Electricity • Sudden movement of plant or equipment. • Noise	4	4	16	High	• Check installation and equipment for serviceability by competent electrician. • Check approved engineering drawings and schedules are in place before commencing. • Use only approved and calibrated test equipment. • Use only approved GS38 leads. • Wear appropriate Personal Protective Equipment, such as gloves, eye protection, hearing protection, and head and foot protection. • Check local procedures and safe systems of work before commencing. • Confirm local Isolations and Permit to Work before commencing. • Testing only to be carried out by competent electricians. • Inform plant operators, controls rooms or operations of work content prior to commencing. • Inform localised contractors of hazards involved. • Barrier off work area and display warning signs where practicable. • If while onsite a better or safer means of testing is available then this could be evaluated with the aid of point of work booklet.	2	4	8	Med

25

10.0 Emergency Procedures

10.1 Emergency procedures will be explained in Morgan Sindall site induction and will be followed as the primary method.
10.2 There will be at least one site personnel from Hornbill with 3 day first aid on site at all times.

11.0 Tools and equipment:

11.1 Tools and equipment that will be used throughout the job are all listed below.
- General electrically insulated hand tools in good condition.
- 24v Milwaukee drill.
- 24v Milwaukee grinder.
- 24v Milwaukee cold cutting circular saw.
- Single man work podiums, portable scaffold.
- Electrical testing kit.

11.2 All will be checked daily before use.
11.3 Site personnel will be trained and competent to use equipment
11.4 All calibration and training certificates will be in date and supplied.
11.5 All personnel using powered hand tools will follow the attached risk assessment to reduce HAVS.
11.6 Hand Arm Vibration assessment has been carried out for the tools with the manufactures data sheets. Assessment attached.
11.7 Hearing protection to be worn with certain tools as instructed in attached risk assessment.

Site Installation

- SAF Panel was installed in a kiosk on site
- All cables were installed as the single line diagram

Site testing and commisioning

- Do to a few hold ups caused by circumstances out of my control full powered up testing has not been completed to date.
- To power the site up at the moment there is a temporary generator, this is mainly to keep the anti condensation heaters on for all the electrical equipment.
- Tests carried out to date.
- Electrical test of power cable, produce NICEIC test certificate
- End to end testing of control cables
- Setup the instrumentation, drives with out running any pumps and process
- Generated Alarms signals and tested at telemetry outstation

Site testing and commisioning

- Niceic certification is a statutory document which has to be issue as proof that the electrical installation is safe and complies with BS7671 wiring regs.
- This must be issued before switching on any Electrical supply.

PART 11 : SCHEDULE OF CIRCUIT DETAILS AND TEST RESULTS

Circuits/equipment vulnerable to damage when testing: 1L1,1L2,1L3,2L1,2L2,2L3,3L1,3L2,3L3,6L1,5L2,5L3,6L2

CODES for Type of wiring: (A) Thermoplastic non-twisted / sheathed cables (B) Thermoplastic cables in metallic conduit (C) Thermoplastic cables in non-metallic conduit (D) Thermoplastic cables in metallic trunking (E) Thermoplastic cables in non-metallic trunking (F) Thermoplastic / SWA cables (G) Thermosetting / SWA cables (H) Mineral insulated cables (O) other - state: N/A

Circuit number	Circuit description	Type of wiring (see Codes)	Reference Method (BS 7671)	Number of points served	Circuit conductor csa: Live (mm²)	Circuit conductor csa: cpc (mm²)	Max. disconnection time (BS 7671) (s)	Protective device: BS (EN)	Protective device: Type	Protective device: Rating (A)	Protective device: Short-circuit capacity (kA)	RCD: Operating current ($I_{\Delta n}$) (mA)	RCD: Measured operating time (ms)	Circuit impedances (Ω): Ring final circuits only (measured end to end): (Live) r_1	(Neutral) r_n	(cpc) r_2	All circuits (complete at least one column): $(R_1 + R_2)$	R_2	Insulation resistance: Live / Live (MΩ)	Live / Earth (MΩ)	Test voltage DC (V)	Polarity (✓)	Max. measured earth fault loop impedance Z_s (Ω)	RCD operating time (ms)	Test buttons: RCD (✓)	AFDD (✓)
1L1	DB4-Jacopa kiosk	F	D	1	4	4	0.4	60898	B	32	10	N/A	1.37	N/A	N/A	N/A	0.28	0.14	200	200	1000	✓	0.29	N/A	N/A	N/A
1L2	DB4-Jacopa kiosk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1L3	DB4-Jacopa kiosk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2L1	PST-Jacopa kiosk	F	D	1	4	4	0.4	60898	B	32	10	N/A	1.37	N/A	N/A	N/A	0.29	0.15	200	200	1000	✓	0.29	N/A	N/A	N/A
2L2	PST-Jacopa kiosk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2L3	PST-Jacopa kiosk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3L1	SAF-Jacopa kiosk	F	D	1	4	4	0.4	60898	B	32	10	N/A	1.37	N/A	N/A	N/A	0.29	0.15	200	200	1000	✓	0.29	N/A	N/A	N/A
3L2	SAF-Jacopa kiosk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3L3	SAF-Jacopa kiosk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4L1	DB2-WPD kiosk	A	B	1	4	4	0.4	60898	B	16	6	N/A	2.73	N/A	N/A	N/A	0.01	0.01	200	200	500	✓	0.07	N/A	N/A	N/A
4L2	Trace heating 1-wet well	F	D	1	4	4	0.4	61009	B	20	6	30	2.19	N/A	N/A	N/A	0.19	0.09	1000	1000	500	✓	0.15	28	✓	N/A
4L3	External lighting floodlights	F	D	6	1.5	1.5	0.4	60898	B	10	6	N/A	6.13	N/A	N/A	N/A	2.5	1.25	1000	1000	500	✓	0.14	N/A	N/A	N/A
5L1	3ph Control Panel-pump kiosk	F	D	1	4	4	0.4	60898	B	32	6	N/A	1.37	N/A	N/A	N/A	0.02	0.01	1000	1000	1000	✓	0.16	N/A	N/A	N/A
5L2	3ph Control Panel-pump kiosk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5L3	3ph Control Panel-pump kiosk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6L1	DB3-pump kiosk	F	D	1	4	4	0.4	60898	B	32	6	N/A	1.37	N/A	N/A	N/A	0.18	0.09	200	200	1000	✓	0.25	N/A	N/A	N/A
6L2	Level controller power supply	F	D	1	2.5	2.5	0.4	60898	B	10	6	N/A	4.37	N/A	N/A	N/A	0.76	N/A	1000	1000	500	✓	0.61	N/A	N/A	N/A
6L3	Trace heating 2 -Jacopa	F	D	1	4	4	0.4	61009	B	20	10	30	2.19	N/A	N/A	N/A	0.7	N/A	1000	1000	1000	✓	0.76	28	✓	N/A

DISTRIBUTION BOARD (DB) DETAILS (to be completed in every case)
DB designation: DB1
Location of DB: WPD Kiosk

TESTED BY
Name (capitals): RICHARD SIMON
Signature:
Position: Electrical inspector
Date: 07/05/2021

TO BE COMPLETED ONLY IF THE DB IS NOT CONNECTED DIRECTLY TO THE ORIGIN OF THE INSTALLATION
Supply to DB is from: (DB1) Nominal voltage: (400) V No. of phases: (3)
Overcurrent protection device for the distribution circuit Type: (BS EN 60947-3) Rating: (100) A
Associated RCD (if any) Type: (BS EN N/A) No. of poles: (N/A) $I_{\Delta n}$ (N/A) mA Operating time (N/A) ms
Characteristics at this DB Confirmation of supply polarity: (✓) Phase sequence confirmed (where appropriate): (✓) Z_s (0.06) Ω I_{pf} (6.6) kA

TEST INSTRUMENTS (enter serial number against each instrument used)
Multi-function: (2758095)
Continuity: (N/A)
Insulation resistance: (N/A)
Earth fault loop impedance: (N/A)
Earth electrode resistance: (N/A)
RCD: (N/A)

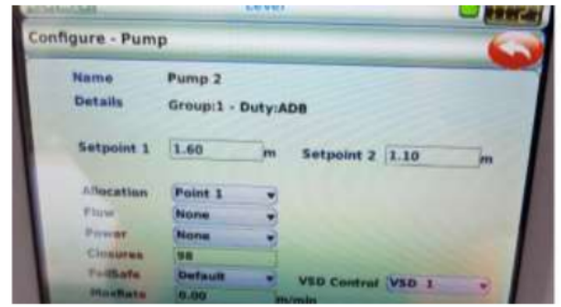
This certificate is based on the model forms shown in Appendix 6 of BS 7671 Enter a (✓) or value in the respective fields, as appropriate. * Where figure is not taken from BS 7671, state source: (N/A)
Published by Certsure LLP Certsure LLP operates the NICEIC & ELECSA brands © Copyright Certsure LLP (July 2018)
Page 6 of 14

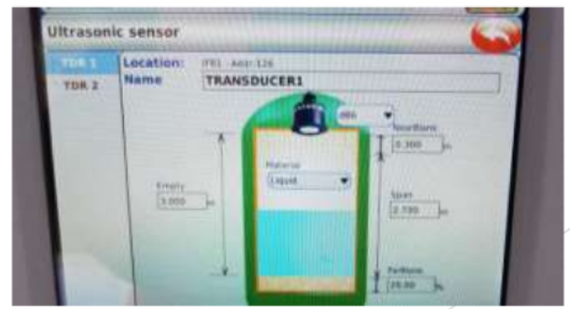
Original

Site testing and commisioning

Setting up the Pulsar ultimate controller

- It has a very user friendly setup display screen
- The ultrasonic sensor levels were entered. These have to be measure from the wet well
- Empty distance is from face to floor
- Span distance is emply – blanking range
- Blanking range is the distance that the ultrasonic will go out of range
- The analogue level is scaled between floor and span, 0 – 2.700mtrs





Site testing and commisioning

VSD Programming

- Using the keypad on the front of the panel, all required settings was entered in to the VSD.
- Motor setting were taken from the name plates and entered for KW rating, FLC, rpm, pf.

Site testing and commisioning

Sludge tank sensors

- Level in the sludge tank is measured with a hydrostatic pressure sensor, the is a 4 -20mA loop powered device.
- There are two sensors on the tank for redundance in case of failure
- The device is setup using the buttons and a simple menu, problem with this is the instrument is reading % and the requirement is mtrs. After looking through the manual advance settings can only be changed using HART connection which means buying a special siemens HART modem to connect to the laptop.

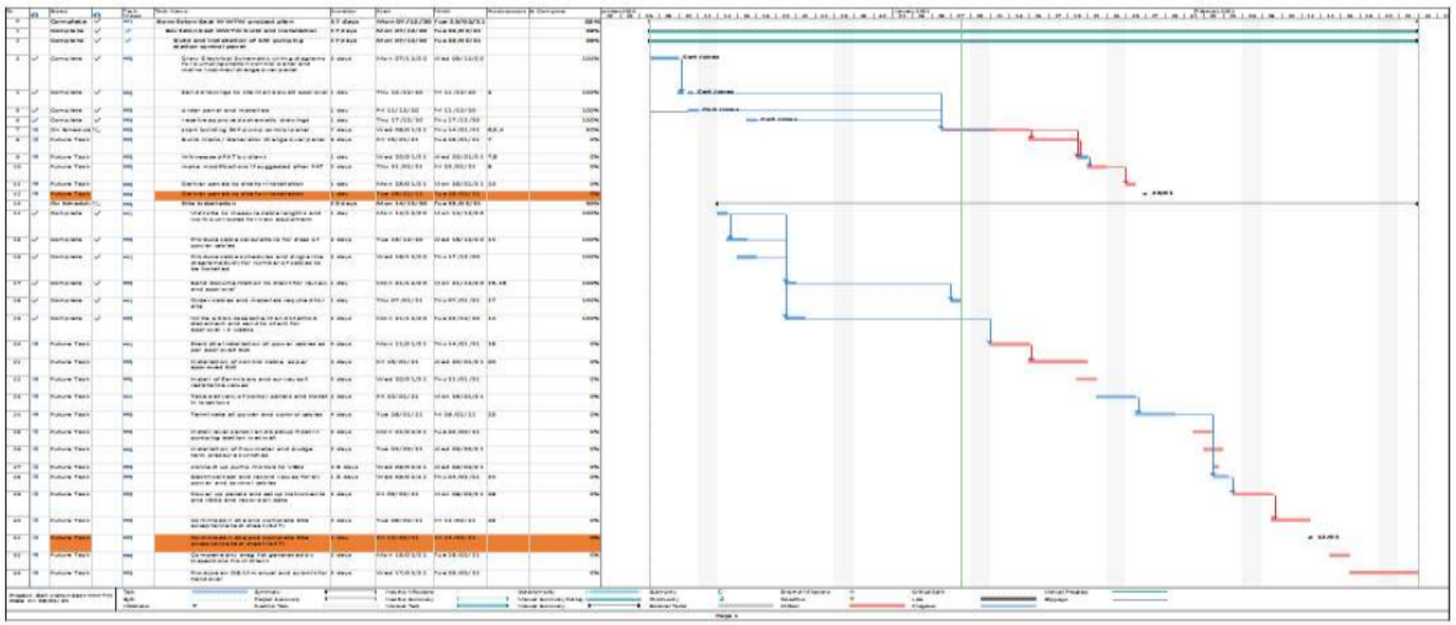
Site testing and commisioning

Alarm signals

- A start has been made in testing the Alarm signal back
- Digital inputs are being forced on in the control panels to create a change instate on the display from green to red.
- Analogue values for the flow and wet well are display but range not fully tested for accuracy.

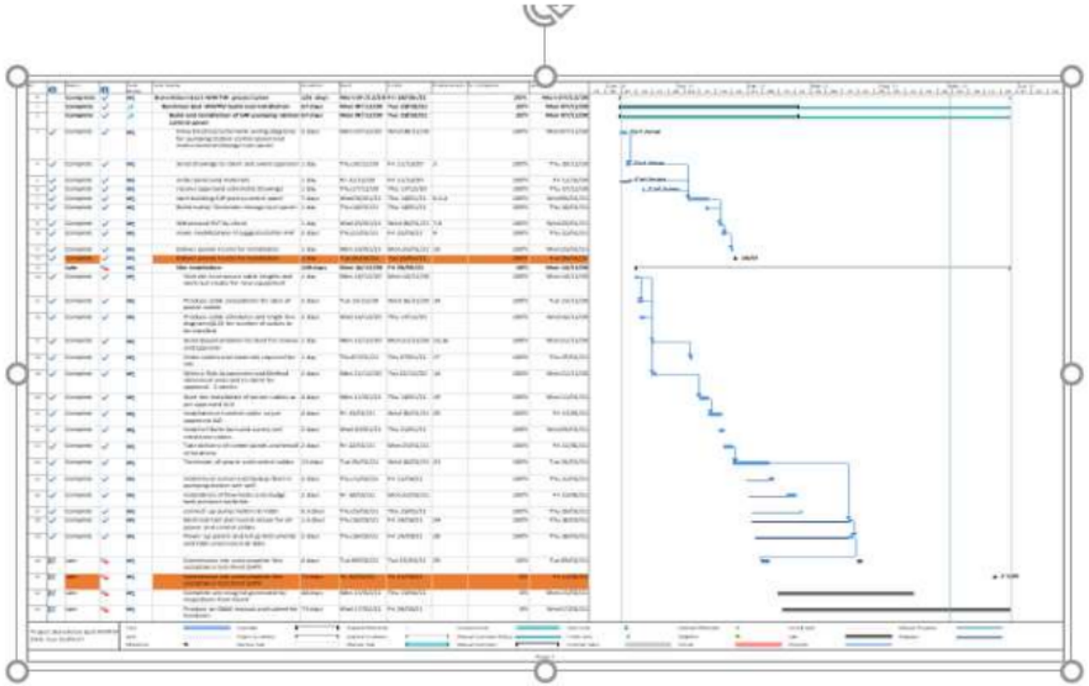
Project Programme
Original

- Microsoft Project was used to create a working programme.



Project Programme to date

- Microsoft Project was used to create a working programme.



Project Costs

The cost to date for the project is £ 33,248.21. there maybe some outstanding supplier costs which have not filtered through but as it stands the project will make profit for the company of approx. £26,000.00

All cost for labour hours and material were tracked to make sure that it didn`t go over the predicted budget.

Project Conclusions

- Today the project hasn`t been finished.
- Testing is still on going.
- Project is about 85% complete at this stage
- At the moment with delays the project is still going to make a 30% profit for the company
- Design variations were added to the project due to specification requirements by the water industry which had been missed by the client. All variations were quoted and agreed before commencing work.
- A trail run of the PID control for varying the speed of the pump from level and flow has worked yet from the Pulsar Ultimate controller. This controller was push into the design by the client and they had said it had been used on another site. I looked into this and it seems that the concept of using flow and level to drive the analogue output had never been tested. At the moment I am communicating with Pulsar engineers who are testing the internal software of the device.
- If the pulsar ultimate fails to meet the specification it may mean re-designing the panel and installing a PLC which was discussed at the design stages but turned down as a cost saving exercise by the client.

1910607 - project presentation 2

GRADEMARK REPORT

FINAL GRADE

61 /100

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

PAGE 15

PAGE 16

PAGE 17

PAGE 18

PAGE 19

PAGE 20

PAGE 21

GRADING FORM: NEW CSG-RUBRIC

CARL JONES	61

1. ENGAGEMENT WITH LITERATURE

Section 3: Use of technical literature in final design solution: Good evidence presented, reference made to standards. However, further investigation could have forearmed you about the issues with the PID controller Most sources were company documentation 3/5

3

2. KNOWLEDGE AND UNDERSTANDING

Section 1: Introduction: Briefly presented outline the aims and objectives of the project Project was introduced as an upgrade to a sewage treatment works due to a local housing development. Aims and objectives were listed and explained. Section 2: FDS: Briefly presented but additions were mentioned in questioning where customer has paid extra. FDS was explained, including the need to build and install several panels, installation of flow meters and installation of control cables. Section 3: Advanced knowledge and critical understanding demonstrated in the design of the project: There is very good evidence of knowledge and critical understanding except in the PID controller. Design of the panels was carried on AutoCAD, the pump controller used a Pulsar Ultimate and cables were designed using Trimble Amtech software. All sections: Response to questioning: Good answers given showed a full understanding of the system produced. 21/30

21

3. COGNITIVE AND INTELLECTUAL

Section 5: Testing and analysis of result: An explanation of testing was presented but no results given. Testing was limited to the PID flow meter which was currently on-going and involves consultation with the manufacturer. Section 6: Critical evaluation of the project outcomes and comparison with the FDS: Good evaluation of all aspects of the project outcomes. Holdups were identified due to Brexit and Covid, wasn't clear how much of the FDS has been satisfied. Section 8: Overall conclusions and recommendations: Present condition of the project concluded with future work to do. Budget was met with probable profit of £26K, issues with the customer not accepting the Pulsar Ultimate controller may result in a design change. 16/30

16

4. PRACTICAL APPLICATION

Section 3: Formulation of innovative and creative design solution to the project problem: The design sowed a good level of innovation and creativity using standard methods within the restrictions imposed by the customer. A range of software was used and the design solution is suitable for the needs to the industry. Excellent and professional methods employed. Photos of the finished panels and the site installation were shown. High quality final build quality though there was an issue with the operation of the controller as identified. Photos of the final installation along with the flow meters were shown. Some explanation given of testing (limited by electrical supply on site and not being able functionally test in the workshop) but no evidence presented. Although photos of the final installation were shown there was only a brief mention of testing in the presentation. This included testing of the PID flow meter (which failed) Good evidence of management techniques 15/25

15

5. TRANSFERABLE SKILLS

All sections: Quality of the presentation slides: Good quality though some slides contained too much information Most slides were legible, spreadsheets and Gantt charts being an exception. All sections: Quality of the delivery style: Good style but there were many pauses. Slightly nervous, but presentation was delivered with reasonable confidence. 6/10

6