



25th August 2021

The Planning Secretary
Department of Planning, Industry & Environment
320 Pitt Street
Sydney, NSW 2000

Attention: Megan Fu
Project: Nihon University Newcastle Campus - SSD 9787
Re: Conditions of Consent E21 and E22

Dear Megan,

Reference is made to SSD 9787 Conditions of Consent E21 and E22 in relation to the Stormwater Quality Management Plan and the Rainwater Harvesting requirements to the development.

A Storm Water Management Plan has been prepared to address the requirements of Conditions of Consent E21. The plan, as well as addressing the operation and maintenance requirements of the condition also addresses the harvesting and re-use of rainwater including operation and maintenance requirements. In accordance with Condition of Consent E22, please find attached a copy of the Stormwater Management Plan, the Rainwater Harvesting Plan and the Certification of the plans. A copy of the documentation has been forwarded to the Certifier.

Should you require further clarification on the Storm Water Management and Rainwater Harvesting Plan, please feel free to contact either Katherine Daunt or Edward Clode at dwp Australia Pty.

Yours sincerely,



Edward Clode
Design Director
Registered Architect – NSW ARBN 4100
Email: edward.c@dwp.com

File: 17-0347_A-d01-20_let
Encl.: Stormwater Management Plan 210825
Rainwater Harvesting plans,
Civil As-Built Certification

Copy: Certifier - Surescope Building Certifiers



Stormwater Quality Management Plan

Project Name: NIHON UNIVERSITY NEWCASTLE CAMPUS

Project Address.: 9 Church St, The Hill, NSW 2300

Distribution:

Scott O'Donahue

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Approved By / Date

Title

Sita Vasanthakumar – Design Manager

Revision Date	Nature of Revision	Authorised By		
		Name	Title	Date
07/06/21	DRAFT- For Review	SV	DM	07/06/21
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15/07/21	Final for Nihon Approval	SV	DM	15/07/21
25/08/21	Final for submission to Certifier	SV	DM	25/08/21

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1.0 Introduction

This Stormwater Quality Management Plan (SQMP) has been prepared by Built Pty Ltd on behalf of Nihon Daigaku Australia Newcastle Pty Ltd, in support of a State Significant Development Application (SSDA) submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The Application (referred to as SSDA 9787) seeks approval for the adaptive reuse of the State heritage listed former Newcastle Courthouse as an educational establishment with associated student accommodation.

1.1 Development Description

The Development is Nihon University Newcastle Campus and consists of the restoration and refurbishment of the retained and state heritage listed Newcastle Courthouse building and the construction of 2 x 4 storey buildings comprising student accommodation in the eastern building and teaching space/carpark in the western building and external pavement and landscape areas.

1.2 Development Location

The location of the Development is at Lot 1 DP1199904 - 9 Church Street, Newcastle, NSW 2300.



1.3 State Significant Development Conditions

Development Condition E21 states:

Prior to issue of an Occupation Certificate, an Operation and Maintenance Plan (OMP) is to be submitted to the satisfaction of the Certifier along with evidence of compliance with the OMP. The OMP must ensure the proposed stormwater quality measures remain effective and contain the following:

- (a) Maintenance schedule of all stormwater quality treatment devices that addresses Council's Technical Manual: Stormwater and Water Efficiency for Development (updated April 2019);*
- (b) Record and reporting details;*
- (c) Relevant contact information; and*
- (d) Work Health and Safety requirements*

1.4 Purpose

Built has been commissioned by Nihon University to prepare a Stormwater Quality Management Plan. This Stormwater Quality Management Plan (SQMP) presents the stormwater strategy for the site, system components and the maintenance of the stormwater quality treatment devices. The aim of the SQMP is to ensure the water quality both for re-use and discharge to public assets.

This SQMP has been prepared in accordance with City of Newcastle Technical Manual for Stormwater and Water Efficiency for Development (Updated April 2019) and Section 7.06 of the Newcastle Development Control Plan 2012.

2.0 Ownership and Contact

The Nihon University Newcastle Campus is owned by Nihon University Daigaku Newcastle Australia Pty Ltd. The building will be managed by

2.1 Building Management Team

Details of the Building Management Team during the are detailed below.

Name	Role	Contact Details

2.2 Approved Contractors

Nihon will engage specialist contractors to service and maintain the stormwater system in accordance with this manual. Details of specialist contractors are detailed below.

Name	Role	Contact Details
Murphy's Plumbing	Rainwater re-use system, pumps, siphonic drainage	Andrew Murphy 0418 495 136

3.0 Stormwater Quality Management Plan

3.1 Description of Stormwater System

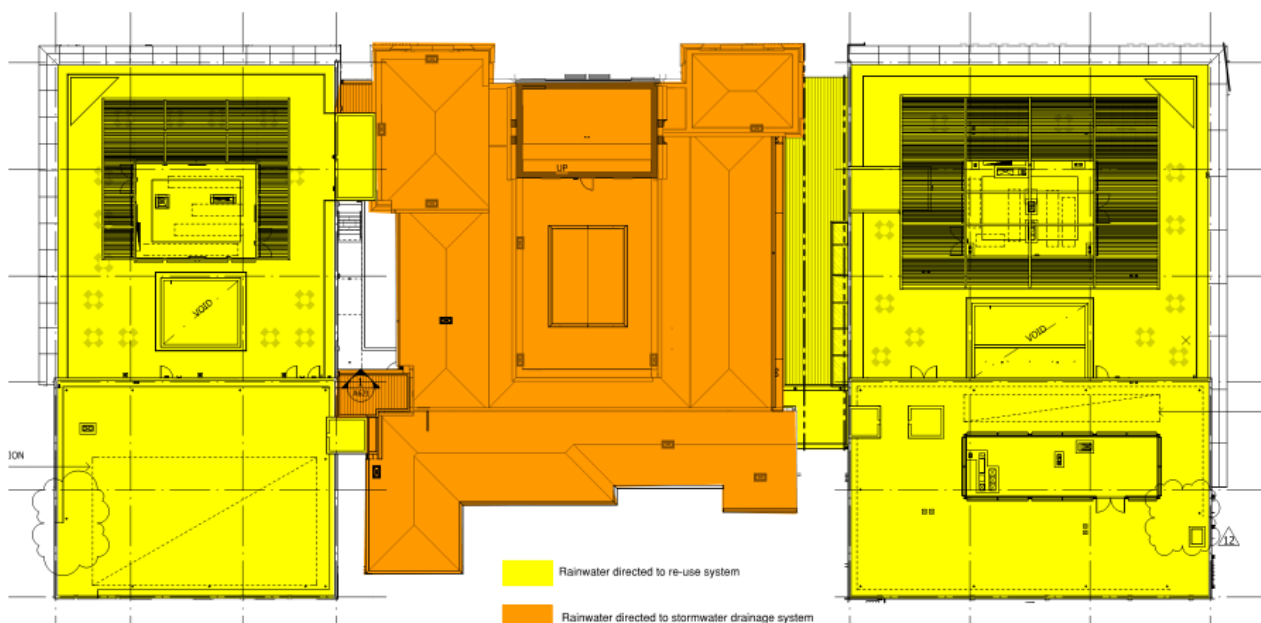
The stormwater management system was designed by Cardno (NSW/ ACT) and in response to the Planning Secretary's Environmental Assessment Requirements. Refer Appendix 1.0 for Stormwater Drainage design.

The building floor levels, with the exception of the L1 carpark and the existing Heritage Building, have been set at the RL's to protect buildings from water ingress from surface flows during large storm events. The proposed stormwater system for the site is made up of the following components:

3.1.1 Rainwater Reticulation

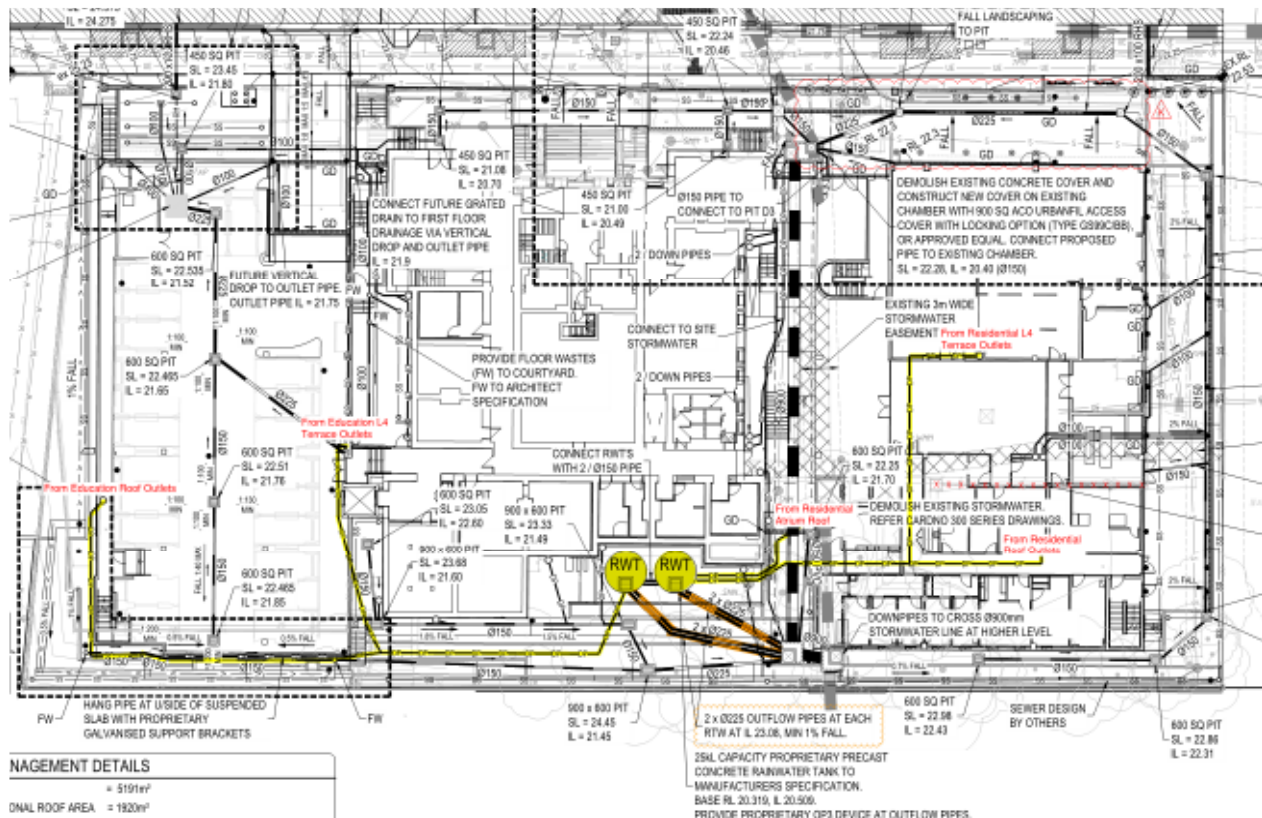
Rainwater is collected from the level 4 and level 5 roof outlets on the Residential and Education Buildings and atrium roof on Residential Building using the Gerberit Pluvia siphonic drainage system to a below ground drainage system and piped into the rainwater tanks. Refer Appendix 2.0 for Siphonic Drainage As-Built drawings. There are also overflows located on these roofs in the event that the siphonic drainage system is blocked, which discharge onto the external areas.

Rainwater from existing heritage roofs and new small link roofs between the Heritage Building and Education Building is directed to the external stormwater drainage system via existing box gutters, eaves gutters, downpipes, pits and pipes and into the stormwater culvert that runs to Church St. Rainwater cannot be collected from the Heritage roof for re-use due to the existing lead flashings on the roof.

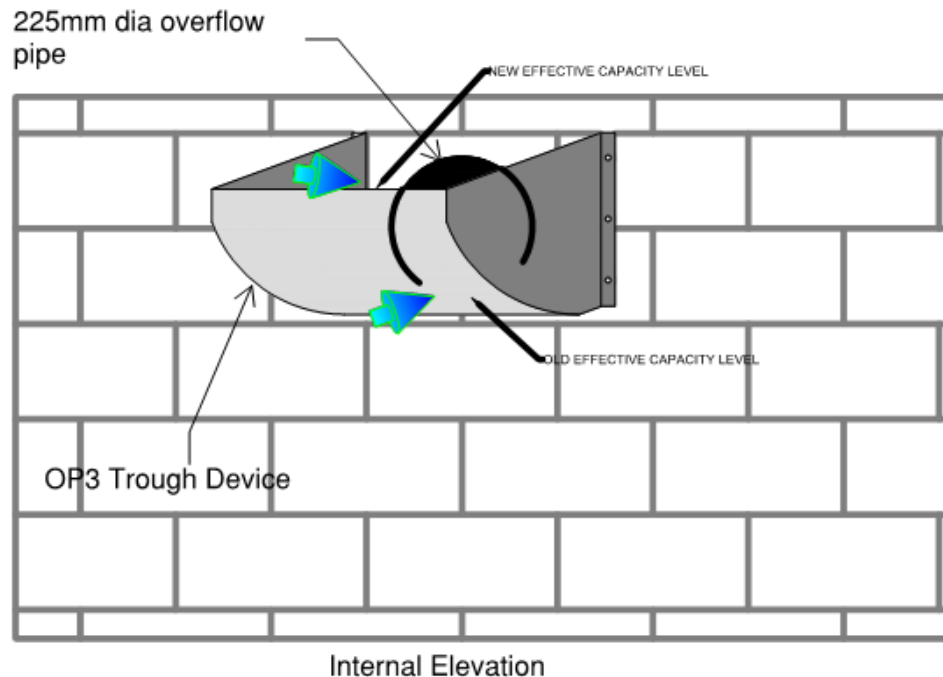


3.1.2 Rainwater Collection for Re-Use

The post-development impervious area compared to the pre-development totals has not increased. To meet the minimum requirements for stormwater, City of Newcastle requested that a retention/ reuse storage arrangement be used for the new roof areas only, at a rate of 25m³/1000m². The new roof area is 1920m², which equates to the requirement for a 48kL tank. To achieve this target, 2no. 25kL precast concrete tanks have been installed under the southern terrace slab behind the Heritage Building. Refer location plan below and tank shop drawings in Appendix 3.0.



The tanks are linked by 2x150mm diameter pipes located 150mm above the sludge level so that they fill and discharge at the same rate. To maximise the capacity of the tanks, they are fitted with a proprietary OP3 trough device at each overflow pipe.



Each tank has 2 x 225mm dia overflow pipes which connect into the stormwater pit at the south of the site.

3.1.3 Rainwater Re-Use Harvesting System

Rainwater collected for re-use is reticulated back through the buildings for use in the toilet cisterns, landscape irrigation and hose taps. Refer to the As-Built Hydraulic drawings in Appendix 4.0. Rainwater from the tanks is pumped to the rainwater harvesting system located in the south eastern corner of the carpark of L1 Education building and comprises of the following:

Submersible Pumps

2 no. stainless steel submersible pumps will be installed in one of the tanks. The pumps will be controlled by a VSD Pressure Control System to ensure that a constant pressure is maintained whilst minimising pump usage. The pumps will operate only when rainwater is in use. The system can be switched over to mains water manually, or it will automatically switch over to mains water if there is a fault with the pumps or if the tank is at 5% capacity.

Filters

Filters will be installed in series as follows:

1. Stainless steel bag filter acts as the initial particle filter
2. Backwash filter to remove fine particles from water
3. UV Disinfectant filter to kill bacteria in water. Filter comes with an audible and visual lamp alarm fail

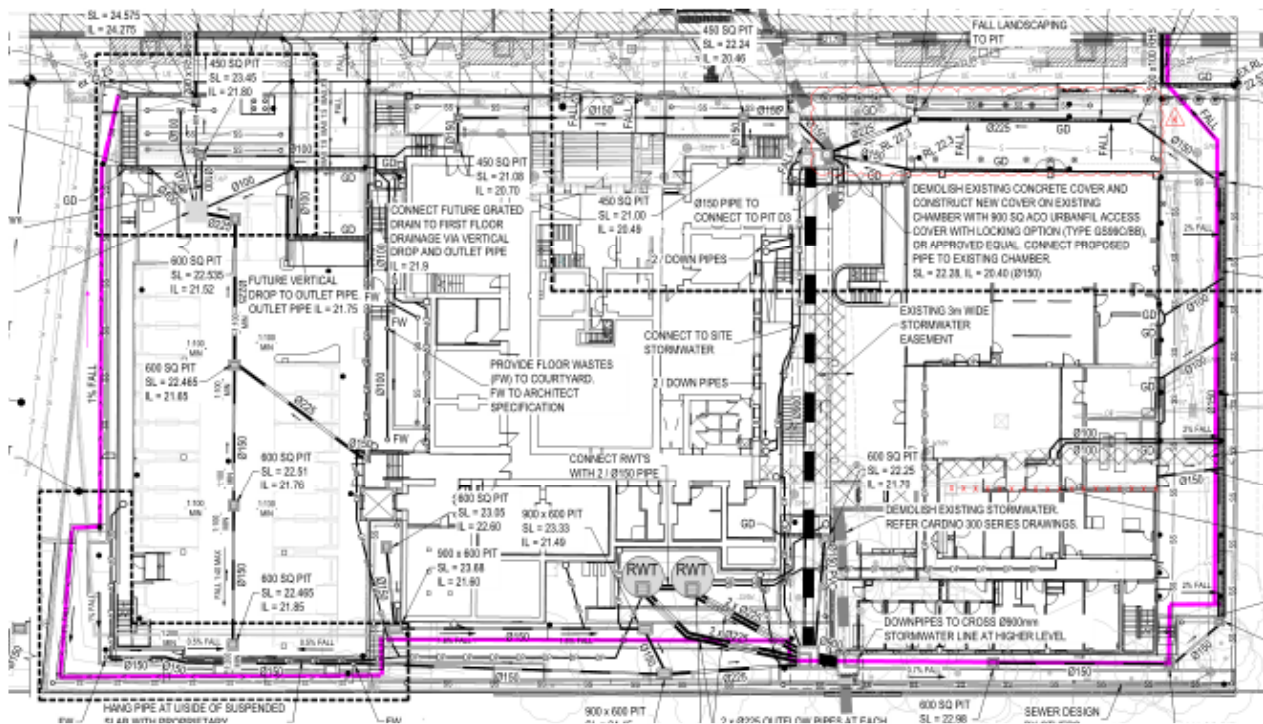
3.1.4 Rainwater Re-use Throughout Facility

Rainwater collected in the tanks will be pumped throughout the buildings to service the toilet cisterns, landscape irrigation and external hose taps. All external hose taps will be clearly signposted to show that the tap is non-potable water.

3.1.5 Surface Water Run-off

Surface water run-off from the external ground level areas is collected and reticulated as follows:

- Landscaped areas including planter beds and garden beds have subsoil drainage which connects into the in-ground stormwater drainage system at various intervals and flows into existing stormwater pits.
- External paved areas form part of the overland flow path with minimum crossfall of 0.5%, as highlighted on the drawing below. A series of pits and surface drains along the overland flow path are design to transport the water during normal rain events with the overland flow path only coming into effect in a 1 in 100-year rain event.



- As the carpark and area in front of the Education Building is below street level, surface water drains into the stormwater pits in the carpark and piped into a 1500x1500x2100 precast sump pit. There is a dual pump system inside the sump which pumps into a rising main and into a pit at street level

where it gravity drains into a kerb outlet. The pump controller has a visual and audible alarm during pump failure.

3.2 Maintenance of Stormwater System

Regular maintenance of all elements of the stormwater system is required to ensure water quality, both for re-use and discharge to public assets. The following guidelines are to be implemented during the operational life of the building:

- Maintenance of the stormwater system needs to be carried out by suitably qualified persons.
- Checks and maintenance must be performed periodically and recorded in writing.
- In addition to routine maintenance, the system should be checked after storms and high rainfall.
- Maintenance intervals are indicative only and are dependent on pollutant occurrence. This will need to be monitored by the maintenance team and adjusted accordingly to ensure that the stormwater quality measures remain effective.
- Stormwater system has been designed to account for the City of Newcastle Maintenance Requirements and Work Health and Safety Legislation.

3.2.1 Geberit Pluvia Siphonic Drainage System

Roof outlets are fitted with a leaf guard which filters out all larger debris. Roof outlets should be kept free from debris for a 500mm wide zone around them to prevent blocking of water ingress into the outlet. Inspection and cleaning should take place every 1-3 months. Roof outlets on the roof terraces are located under the raised decking system and can be accessed via the access panels at each outlet. The outlets themselves should be cleaned once a year to prevent build up as per the Geberit recommendations (Refer Appendix 05). The siphonic system is self-cleaning due to the high velocity of water flows through the pipes.

3.2.2 Rainwater Tanks

The rainwater tanks are a closed system and therefore the only accumulated debris will be from terraces and roofs transported through the siphonic drainage system. As recommended by Council's Technical Manual: Stormwater and Water Efficiency for Development, tanks should be inspected for sludge/sediment build up every 2-3 years and cleaned if build up is found.

Access into the rainwater tanks is via the pit lids and ladder located on the Heritage level 2 terrace to the south of the building. Access to the tanks will be by a suitably qualified person, trained in Confined Space work in accordance with AS2865 and WHS Legislation.

3.2.3 Rainwater Harvesting System

Rainwater pumps and filters should be checked and maintained every 3 months.

Pumps will require very little maintenance as they are self-lubricating, and the mechanical seal will be adjusted automatically. Pumps and control panel to be visually inspected, whilst running, for the following:

- operating pressures observed and recorded
- possible leakages
- possible motor overheat
- switch off time of motor when overloading
- frequency of starts and stops
- all control operation

UV Filter lamps and filter cartridges will need to be replaced every year to maintain maximum effectiveness. The quartz dome/ sleeve should be cleaned when the filter lamps are replaced.

The backwash filter is self-cleaning however it is recommended to clean with clean drinking water once a year. Backwashing intervals should be set to a higher frequency during the initial running period, as there may be an excess dirt in the system, however, can be changed to the recommended periods after a few weeks.

Bag filter housings to be kept clean to prevent contamination during bag change. Housings to be checked for any visible signs of corrosion or wear damage internally and externally. V-clam and T-bar thread should be lubricated. 'O' Rings should be inspected each time the filter housing is opened and replaced as required. Bag filters to be emptied, cleaned, inspected for wear and replaced as required.

Refer to Appendix 6.0 for maintenance manuals of rainwater pumps, control panels and filters.

3.2.4 Stormwater pits and grated drains

Stormwater pits and drains should be inspected every 3 months and cleaned out as required. The areas surrounding pits and drains, such as paths, driveways, garden beds etc should be regularly cleaned to prevent debris from entering the system.

Stormwater pits over 1.2m that are intended for access, have step irons installed to allow access into the pit. As with the tanks, access will be by a suitably qualified person, trained in Confined Space work in accordance with AS2865 and WHS Legislation.

3.2.5 Roofs, gutters, rainwater heads and overflows

Regular cleaning and maintenance regime to be established for roofs, box gutters, eaves gutters, rainwater heads and overflows to remove all debris to prevent it entering the stormwater system. It is recommended that these items be inspected and cleaned every 3 months.

Safe access to all maintainable high-level rainwater goods is provided via a series of ladder brackets, anchor points and fixed ladders. Maintenance should be carried out by suitably qualified people trained in working at heights in accordance with the WHS regulation.

3.3 Maintenance Schedule

Item	Location	Frequency	Procedure
Siphonic Drainage Outlets	Level 4 roof terrace and level 5 roof of Education and Residential buildings	Every 1-3 months	• Clean area around outlet. Remove outlet and clean inside as per Geberit's recommendations
Rainwater Tanks	Under level 2 southern terrace slab of Heritage Building. Access via pit lids on terrace.	Every 3 years	• Siphon sludge from bottom of tank for disposal
Pumps	Rainwater tank and carpark sump pit	Every 3 months	Visually inspect and test pumps while operating. Check for the following: • Pump working and operating pressures • Possible leakages • Possible motor overheat • Cleaning. Replacement of strainers • Switch off time of motor when overloading • Frequency of starts and stops • All control operation
Pump Control Panel	SE corner of carpark in undercroft area	Every 3 months	• Check and tighten all terminations. • Inspect and test control panel operation • Test telemetry/ alarm • Record voltage • Indicator lights
UV rainwater filters	SE corner of carpark in undercroft area	Every 12 months	• Replace UV lamp • Clean the quartz dome/ sleeve • Change filter cartridges • Replace 'O' ring seals • Reset timer • Lamps operational • Record run hours on lamp
Bag Filters	SE corner of carpark in undercroft area	Every 3 months As required	• Lubricate V-clamp and T-Bar thread • Inspect 'O' rings and replace as required • Check housing and keep clean and free from dirt • Inspect filter bags for wear and tear and replace as required
Backwash filter	SE corner of carpark in undercroft area	First few weeks Every 3 months Once a year	• Set backwash intervals at higher frequency • Monitor for faults • Clean the housing and transparent filter cover with clean drinking water
Pits and Surface Drains	External areas, planter beds, carpark,	Every 3 months	• Visual inspection and clean out of debris • Pipework condition

	driveway, door thresholds		Float switch operation and position
Roofs, gutters, rainwater heads and overflows	Heritage roof, Atrium roof, lift and stair overrun roofs, level 4 and 4 roofs	Every 3 months	Visual inspection of all areas and clean out debris

3.4 Maintenance Reporting

Maintenance reports to be prepared quarterly and will detail the results of:

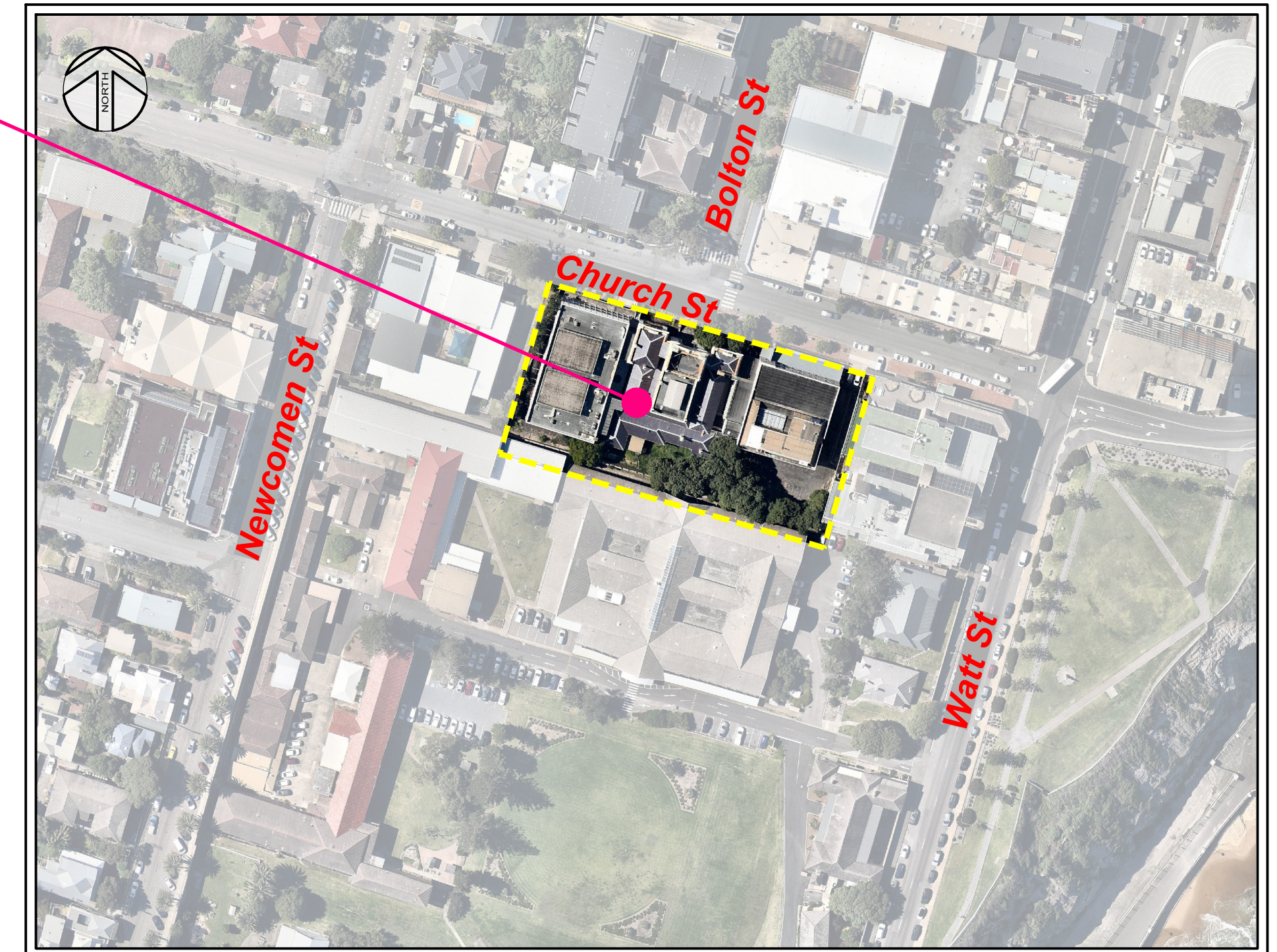
- Quarterly inspections
- Maintenance activities undertaken during the reporting period
- Inspection undertaken following a major rainfall event
- Service and Repairs during the reporting period

Refer Appendix 7.1 to 7.2 for examples of maintenance checklist and reporting

4.0 Appendices

Appendix 1.0 Stormwater Design prepared by Cardno

CIVIL ENGINEERING DRAWINGS COVER SHEET, DRAWING LIST & LOCALITY PLAN



LOCALITY PLAN
SCALE 1:1500

DRAWING LIST	
NUMBER	TITLE
81019007-CI-400	COVER SHEET, DRAWING LIST & LOCALITY PLAN
81019007-CI-405	CIVIL NOTES
81019007-CI-410	SITE PLAN
81019007-CI-415	STORMWATER MANAGEMENT PLAN
81019007-CI-416	OVERLAND FLOW PLAN
81019007-CI-420	SUBSOIL DRAINAGE PLAN
81019007-CI-450	DETAIL PLAN
81019007-CI-451	PUBLIC DOMAIN DETAIL PLAN AND SECTIONS
81019007-CI-470	PAVEMENT PLAN AND DETAILS
81019007-CI-480	EROSION AND SEDIMENT CONTROL PLAN
81019007-CI-491	SUBSTATION DETAILS

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Drawn LDB	Date APR 2020	FOR CONSTRUCTION			
Checked LDB	Date APR 2020				
Designed SCB	Date APR 2020	FOR CONSTRUCTION			
Verified SJB	Date APR 2020				
Approved		Datum	Register -	Scale 1:1500	Size A1
SJB	APR 2020	Drawing Number 81019007-CI-400			Revision B

- G.1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION AND WITH SUCH OTHER WRITTEN INSTRUCTIONS THAT SHALL BE ISSUED DURING THE COURSE OF CONSTRUCTION. ANY DISCREPANCY OR VARIATION SHALL BE REFERRED TO THE SUPERINTENDENT BEFORE PROCEEDING WITH THE WORK. IN CASE OF DISCREPANCY, ORDER OF PRECEDENCE IS DRAWINGS, NOTES THEN SPECIFICATION.
- G.2. ALL MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH THE CURRENT STANDARDS AUSTRALIA CODES AND WITH THE ORDINANCES OF THE RELEVANT AUTHORITIES. WORK IS TO BE CARRIED OUT IN A SAFE MANNER IN ACCORDANCE WITH APPLICABLE STATUTORY REGULATIONS, BY-LAWS OR RULES.
- G.3. ALL DIMENSIONS SHOWN SHALL BE VERIFIED BY THE CONTRACTOR ON SITE. ENGINEERS' DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS.
- G.4. DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING SHALL BE PROVIDED BY THE CONTRACTOR TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.
- G.5. UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES.
- G.6. DIVERSION OF WATER AND THE PROTECTION OF WORKS IS THE CONTRACTOR'S RESPONSIBILITY.
- G.7. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND SERVICES WITHIN THE SITE PRIOR TO COMMENCEMENT OF WORK.
- G.8. ALL DISTURBED AREAS SHALL BE STABILISED AS SOON AS REASONABLY PRACTICABLE. AREAS OF DISTURBANCE SHALL BE APPROVED BY THE SUPERINTENDENT.
- G.9. NO WORKS ARE TO BE UNDERTAKEN WITHIN PRIVATE PROPERTY WITHOUT WRITTEN PERMISSION OF THE AFFECTED LAND OWNER AND THE SUPERINTENDENT.
- G.10. ALL WORKS TO BE UNDERTAKEN IN ACCORDANCE WITH THE SPECIFICATIONS TO THE SATISFACTION OF THE SUPERINTENDENT.

- S.1. DETAILED SITE SURVEY UNDERTAKEN BY ADW JOHNSON REF 239815-DET-001-A, 10/09/18.
- S.2. ALL LEVELS ARE TO A.H.D.
- SU.3. ALL CHAINAGES AND LEVELS ARE IN METRES, AND DIMENSIONS IN MILLIMETRES.
- SU.4. ORIGIN OF LEVELS : REFER SURVEY DRAWING.
- SU.5. CONTRACTORS SHALL ARRANGE FOR THE WORKS TO BE SET OUT BY A REGISTERED SURVEYOR.

- SD.1. STORMWATER DRAINAGE SHALL BE GENERALLY IN ACCORDANCE WITH AS 3500.3.
- SD.2. PIPES UP TO AND INCLUDING 300mm DIA SHALL BE uPVC SN8 GRADE U.N.O. TO AS 1254.
- SD.3. PIPES OF 375mm DIA AND LARGER SHALL BE CONCRETE CLASS 2 TO AS4058, RUBBER RING JOINTED U.N.O. AND BE LAID AT A MINIMUM GRADE OF 0.5% U.N.O. BEDDING MATERIAL TO AS 3725.
- SD.4. MINIMUM COVER TO PIPES 300 mm GENERALLY & 450 mm IN CARPARK & ROADWAY AREAS. UNLESS NOTED.
- SD.5. BACKFILL TRENCHES WITH APPROVED FILL, SUCH AS SANDY LOAM, COMPACTED IN 200mm LAYERS TO 100% OF STANDARD DENSITY TO AS 1289 5.1.1.
- SD.6. ANY PIPES OVER 16% GRADE SHALL HAVE CONCRETE BULKHEADS AT ALL JOINTS.
- SD.7. PITS SHALL BE OF REINFORCED CONCRETE CONSTRUCTION OR AS DETAILED. GALVANISED, HINGED METAL GRATES AT LEVELS INDICATED. ALL PITS DEEPER THAN 1200mm TO HAVE STEP IRONS.
- SD.8. BUILD INTO UPSTREAM FACE OF ALL PITS A 3m PERFORATED SUBSOIL LINE - COVERED WITH FILTER FABRIC SOCK, FALLING TO PITS TO MATCH PIT INVERT.
- SD.9. SUBSOIL LINE PIPES AND FITTINGS SHALL BE PERFORATED PLASTIC TO AS 2439 PART 1. LAY PIPES ON FLOOR OF TRENCH GRADED 1% AND OVERLAY WITH FILTER MATERIAL EXTENDING TO WITHIN 200mm OF SURFACE. PROVIDE FILTER FABRIC OF PERMEABLE POLYPROPYLENE BETWEEN FILTER MATERIAL AND TOPSOIL.
- SD.10. ALL GRATES IN PAVEMENT TO BE CYCLE SAFE AND CLASS C TO AS 3996.

ES.1.	INSTALL TEMPORARY CONSTRUCTION VEHICLE EXIT.
ES.2.	INSTALL SILT FENCING, AND SAND BAGS IN ACCORDANCE WITH DETAILS AND LOCAL COUNCIL REQUIREMENTS.
ES.3.	STRIP VEGETATION FROM ALL CUT AREAS AND DISPOSE OFF SITE.
ES.4.	STRIP TOPSOIL FROM ALL CUT AREAS AND STOCKPILE ON SITE.
ES.5.	EXCAVATE ALL CUT AREAS AND PLACE COMPACTED FILL WHERE REQUIRED.
ES.6.	EXCAVATE, LAY AND BACKFILL DRAINAGE LINES. OPEN TRENCH LENGTHS ARE NOT TO EXCEED 25 METRES. DO NOT LEAVE TRENCHES OPEN OVER NIGHT.
ES.7.	CONSTRUCT DRAINAGE PITS AND INSTALL PIT PROTECTION MEASURES IN ACCORDANCE WITH DETAILS AND LOCAL COUNCIL STANDARDS.
ES.8.	AT THE COMPLETION OF ALL WORK, REMOVE EROSION CONTROL MEASURES, FOLLOWING SITE STABILISATION.

- BE.1. OVER FULL AREA OF EARTHWORKS, CLEAR VEGETATION, RUBBISH, SLABS ETC. AND STRIP TOPSOIL, AVERAGE 200mm THICK. REMOVE FROM SITE EXCEPT TOP SOIL FOR RE-USE.
- BE.2. EXCAVATE THE EXPOSED SOIL TO THE FINISHED SUB-GRADE LEVEL. DISCARD ANY EXPOSED MATERIAL WITHIN THE CATEGORY DESCRIBED IN NOTE BE1.
- BE.3. CUT AND FILL OVER THE SITE TO LEVELS REQUIRED.
- BE.4. IN AREAS OF CUT OR IN EXISTING GROUND, PRIOR TO ANY FILLING, PROOF ROLL THE EXPOSED SURFACE IN ACCORDANCE WITH CLAUSE 5.4 OF AS3798 ENSURING THAT ADJACENT STRUCTURES ARE NOT DAMAGED DURING WORKS.
- BE.5. EXCAVATE AND REMOVE ANY SOFT SPOTS ENCOUNTERED DURING PROOF ROLLING AND REPLACE WITH APPROVED FILL COMPACTED IN LAYERS. THE WHOLE OF THE EXPOSED SUBGRADE AND FILL SHALL BE COMPACTED TO 100% STANDARD MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT $\pm$ 2%. THE COSTS OF TESTING AND RE-TESTING ARE TO BE ALLOWED FOR BY THE BUILDER.
- BE.6. ON SITE FILLING AREAS. CONTRACTOR SHALL TAKE LEVELS OF EXISTING SURFACE AFTER STRIPPING TOPSOIL AND PRIOR TO COMMENCING FILL OPERATIONS.
- BE.7. ROCK - WHERE HARD ROCK IS EXPOSED IN THE EXCAVATED SUB-GRADE, THIS WILL BE INSPECTED AND A DECISION MADE ON THE LEVEL TO WHICH EXCAVATION IS TAKEN.
- BE.8. FILL IN 250mm MAXIMUM (LOOSE THICKNESS) LAYERS TO UNDERSIDE OF BASECOURSE USING THE EXCAVATED MATERIAL AND COMPACTED TO 100% STANDARD (AS 1289 5.1.1) MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT $\pm$ 2%. SHOULD THERE BE INSUFFICIENT MATERIAL FROM SITE EXCAVATIONS IMPORT AS NECESSARY CLEAN GRANULAR FILL TO APPROVAL.
- BE.9. BATTERS TO BE AS SHOWN, OR MAXIMUM 1V : 3H
- BE.10. ALL CONDUITS AND MAINS SHALL BE LAID PRIOR TO LAYING FINAL PAVEMENT.
- BE.11. ALL BATTERS AND FOOTWAYS ADJACENT TO ROADS SHALL BE TOPSOILED WITH 150mm APPROVED LOAM AND SEEDED UNLESS OTHERWISE SPECIFIED.

TW.1. EXISTING TUNNEL WITHIN SITE IS TO BE PARTIALLY DEMOLISHED. POSSIBLE CONSTRUCTION STAGING INDICATED BELOW. CONTRACTOR TO CONFIRM TO SUIT THEIR NOMINATED CONSTRUCTION STAGING

- PROP WALLS INTERNALLY NEAR UNDERSIDE OF ROOF SLAB.
- CONSTRUCT BLOCKWORK WALLS AT EXTENT OF PROPOSED PARTIAL DEMOLITION, INCLUDING WEEP HOLES AT LOW SIDE OF TUNNEL AT BOTTOM OF WALL.
- DEMOLISH NOMINATED EXTENTS OF WALLS AND ROOF SLAB. DISPOSE OFF SITE.
- PLACE AND COMPACT CONTROLLED BACKFILL BETWEEN TUNNEL WALLS.
- REMOVE WALL PROPS WHEN CONTROLLED BACKFILL IS NOMINALLY -600mm BELOW TOP OF WALL LEVEL.
- COMPLETE CONTROLLED BACKFILL.

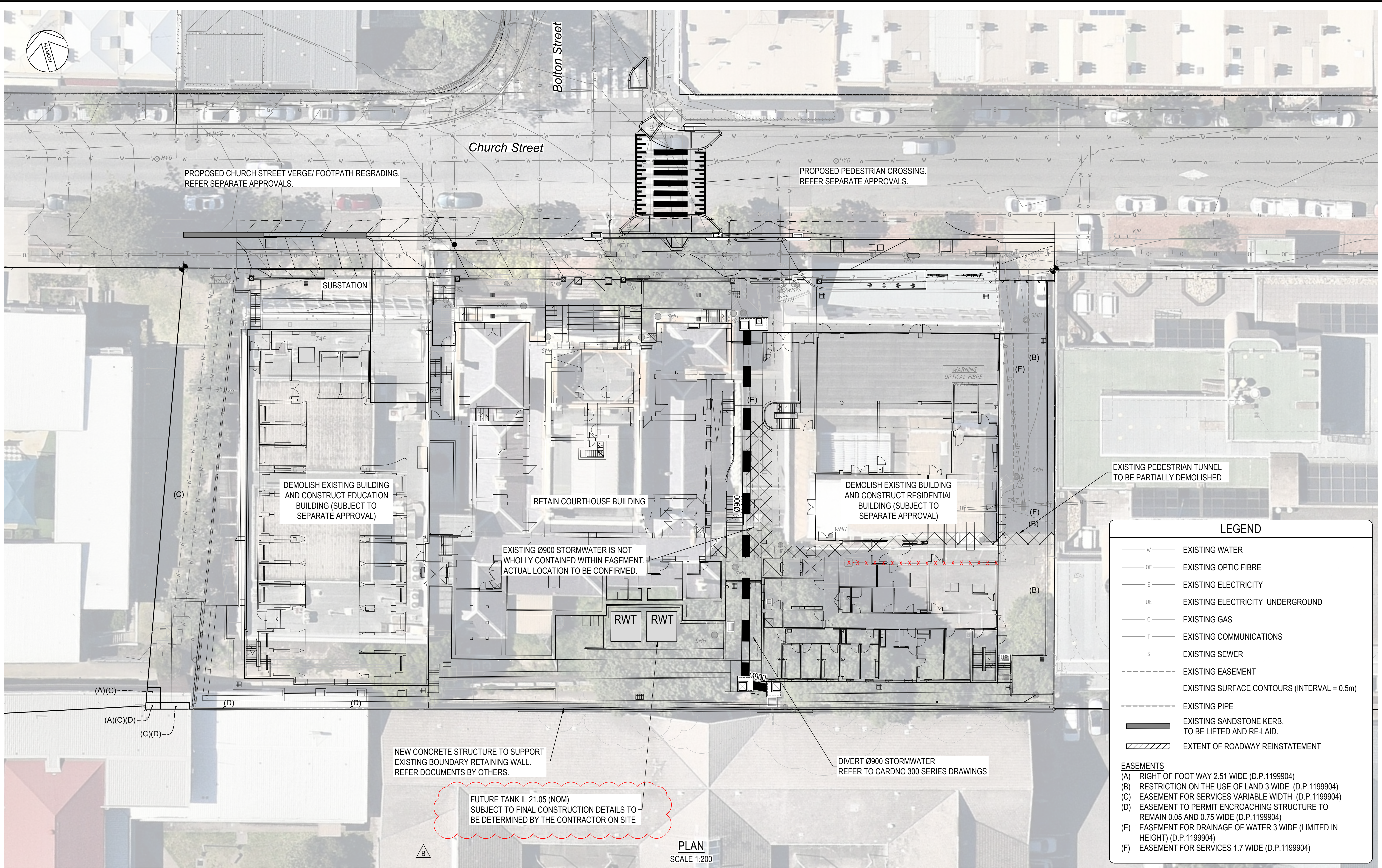
C	29/05/20	RE-ISSUED FOR CONSTRUCTION	TH	SJB	SJB
B	24/04/20	RE-ISSUED FOR CONSTRUCTION	SJB	SJB	SJB
A	14/02/20	ISSUED FOR CONSTRUCTION	JK	SGB	SGB
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SJB	APR 2020

Client	AZUSA SEKKEI
Project	NIHON UNIVERSITY AUSTRALIA NEWCASTLE CAMPUS PROJECT 9 CHURCH STREET, NEWCASTLE
Title	CIVIL NOTES



Rev.	Date	Description	Des.	Verif.	Appd.
B	24/04/20	RE-ISSUED FOR CONSTRUCTION	SJB	SJB	SJB
A	14/02/20	ISSUED FOR CONSTRUCTION	JK	SGB	SGB



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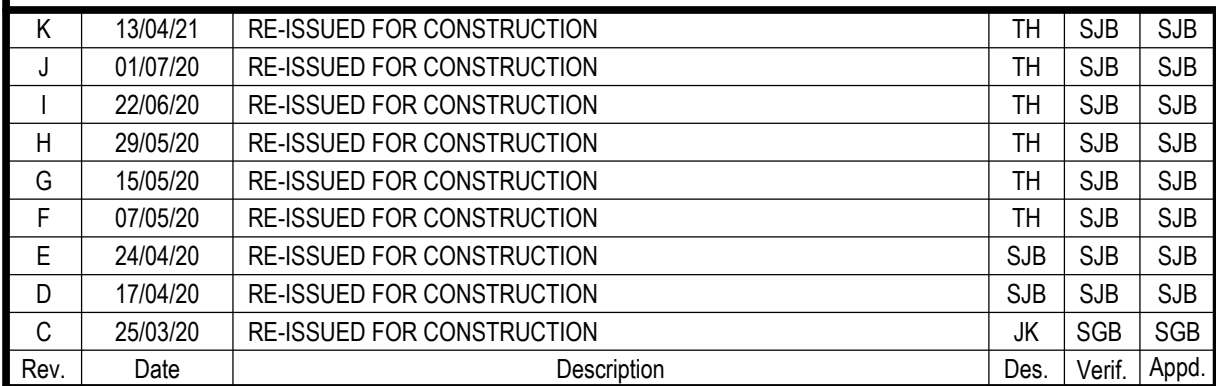
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Shaping the Future

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Gosford, NSW 2250
Tel: 02 4323 2558 Fax: 02 4324 3251
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Drawn	LDB	Date	APR 2020
Checked	LDB	Date	APR 2020
Designed	SGB	Date	APR 2020
Verified	SJB	Date	APR 2020
Approved		Date	
	SJB	Date	APR 2020

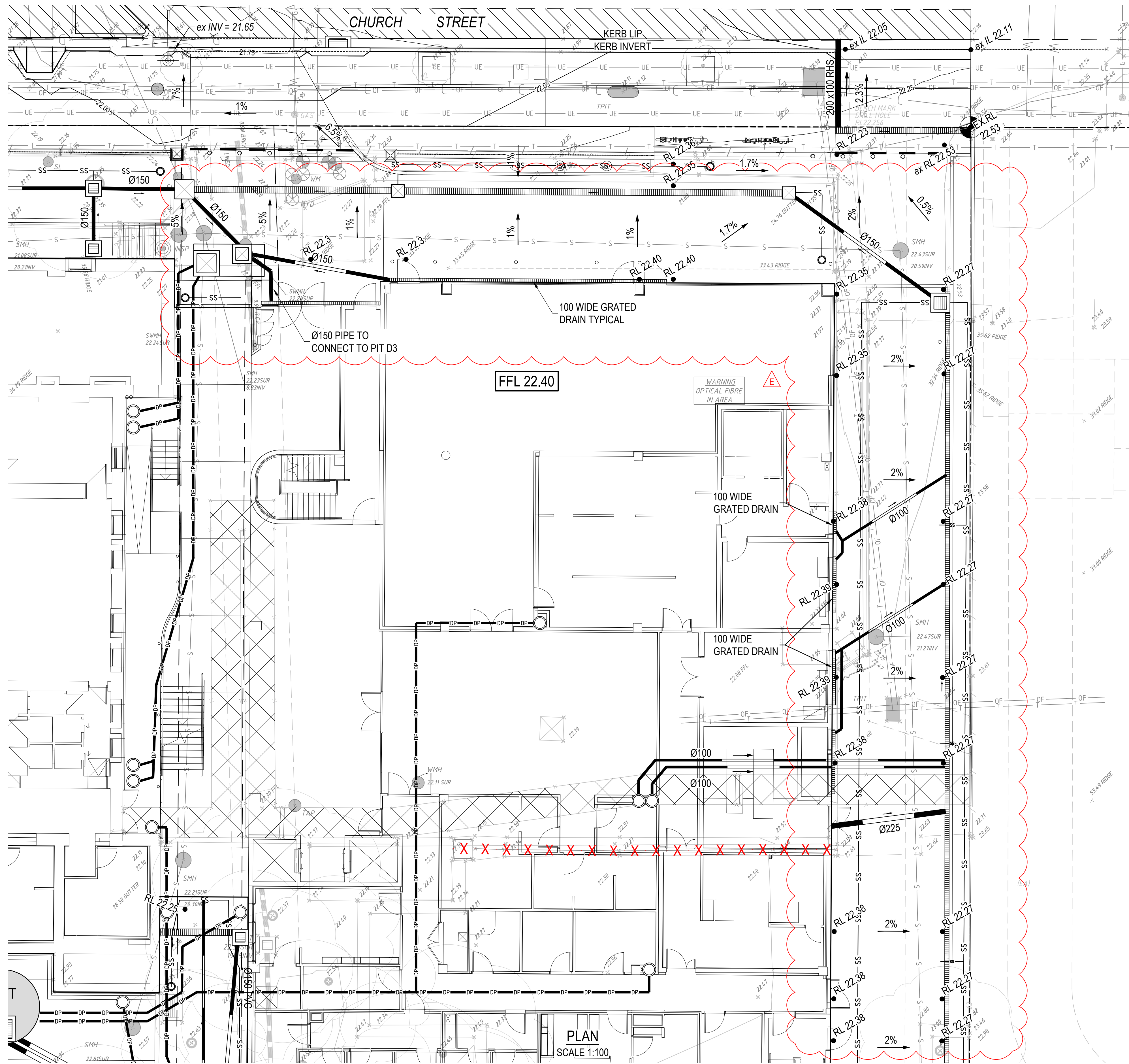
Client	AZUSA SEKKEI
Project	NIHON UNIVERSITY AUSTRALIA NEWCASTLE CAMPUS PROJECT 9 CHURCH STREET, NEWCASTLE
Title	SITE PLAN

Status	FOR CONSTRUCTION
Datum	AHD
Register	-
Scale	1:200
Size	A1
Drawing Number	81019007-CI-410
Revision	B



Drawn LDB	Date APR 2020
Checked TH	Date APR 2020
Designed SGB	Date APR 2020
Verified SJB	Date APR 2020
Approved	Date
SJB	- APR 2020

Datum AHD	Register -	Scale 1:200	Size A1
Drawing Number 81019007-CI-415			Revision K



E	22/06/20	RE-ISSUED FOR CONSTRUCTION			
D	29/05/20	RE-ISSUED FOR CONSTRUCTION	TH	SJB	SJB
C	07/05/20	RE-ISSUED FOR CONSTRUCTION	TH	SJB	SJB
B	24/04/20	RE-ISSUED FOR CONSTRUCTION	SJB	SJB	SJB
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Rev.	Date	Description	Des.	Verif.	Appd.



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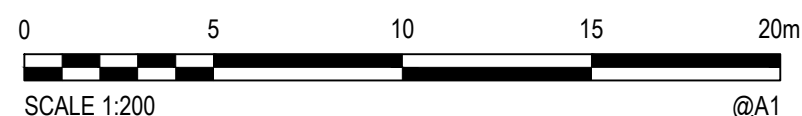
Drawn LDB	Date APR 2020
Checked LDB	Date APR 2020
Designed SGB	Date APR 2020
Verified SJB	Date APR 2020
Approved	Date
SJB	APR 2020

Client	AZUSA SEKKEI
Project	NIHON UNIVERSITY AUSTRALIA NEWCASTLE CAMPUS PROJECT 9 CHURCH STREET, NEWCASTLE
Title	OVERLAND FLOW PLAN

Status				FOR CONSTRUCTION			
Datum		Register		Scale		Size	
AHD		-		1:50		A1	
Drawing Number							Revision
81019007-CI-416							E



D	29/05/20	RE-ISSUED FOR CONSTRUCTION	TH	SJB	SJB
C	15/05/20	RE-ISSUED FOR CONSTRUCTION	TH	SJB	SJB
B	24/04/20	RE-ISSUED FOR CONSTRUCTION	SJB	SJB	SJB
A	14/02/20	ISSUED FOR CONSTRUCTION	JK	SGB	SGB
Rev.	Date	Description	Des.	Verif.	Appd.



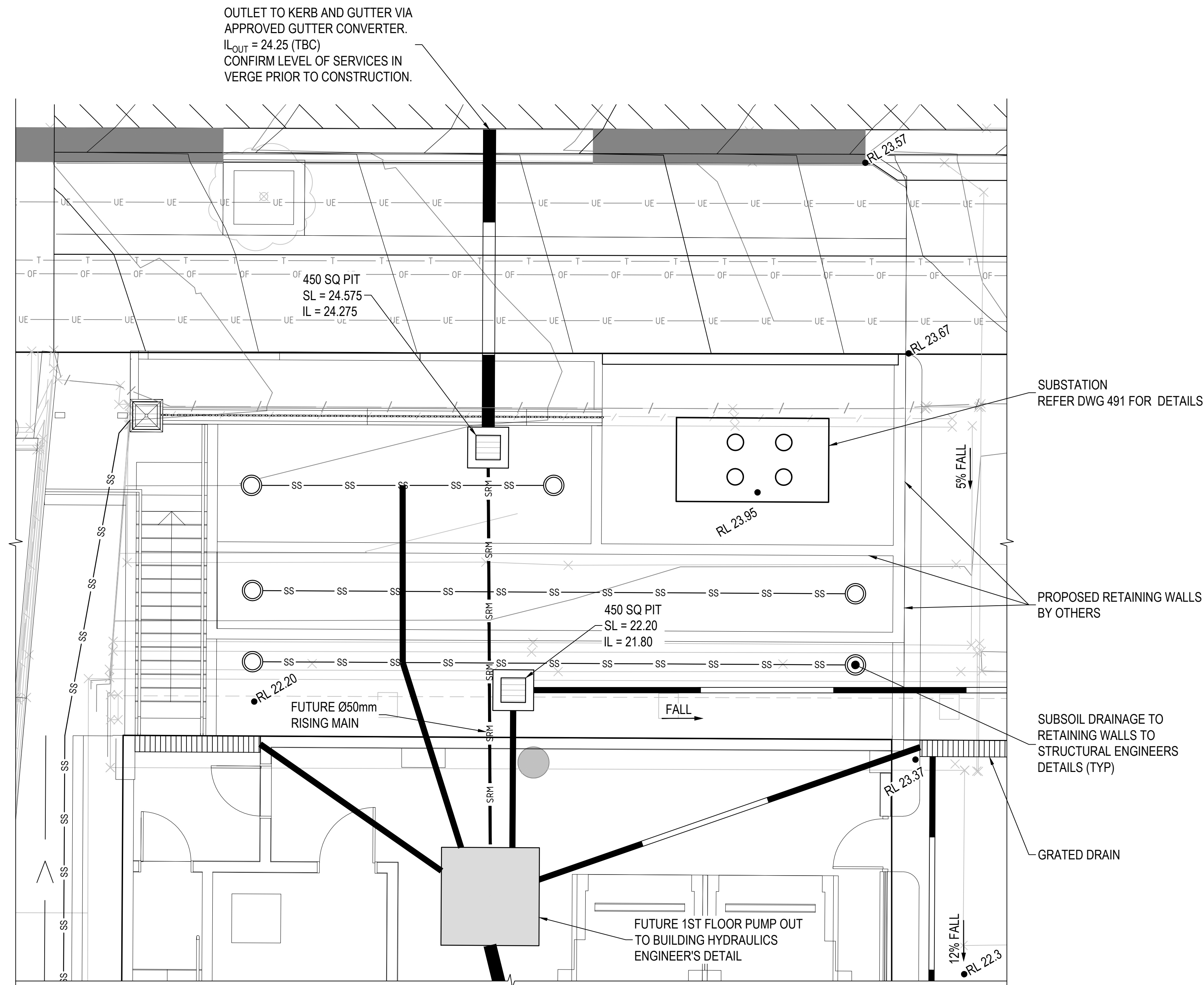
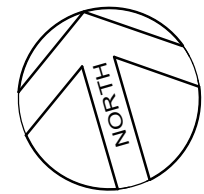
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Drawn LDB	Date APR 2020
Checked LDB	Date APR 2020
Designed SGB	Date APR 2020
Verified SJB	Date APR 2020
Approved	Date
SJB	APR 2020

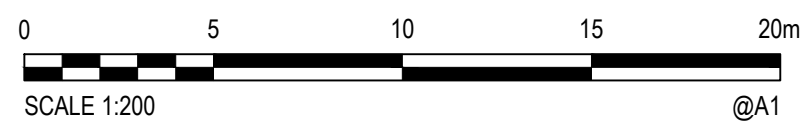
Client	AZUSA SEKKEI
Project	NIHON UNIVERSITY AUSTRALIA NEWCASTLE CAMPUS PROJECT 9 CHURCH STREET, NEWCASTLE
Title	STORMWATER DESIGN SUBSOIL DRAINAGE PLAN

Status					FOR CONSTRUCTION	
Datum		Register	Scale	Size		
AHD		-	1:200	A1		
Drawing Number					Revision	
81019007-CI-420					D	



NORTH WEST CORNER DETAIL PLAN

SCALE 1:50



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Drawn	LDB	Date	APR 2020
Checked	LDB	Date	APR 2020
Designed	SGB	Date	APR 2020
Verified	SJB	Date	APR 2020
Approved		Date	-
	SJB	Date	APR 2020

Client	AZUSA SEKKEI		
Project	NIHON UNIVERSITY AUSTRALIA NEWCASTLE CAMPUS PROJECT 9 CHURCH STREET, NEWCASTLE		
Title	DETAIL PLAN		

Status	FOR CONSTRUCTION			
Datum	Register	Scale	Size	
AHD	-	1:50	A1	
Drawing Number				Revision
81019007-CI-450				C

Appendix 2.0 Geberit As-Built Drawings

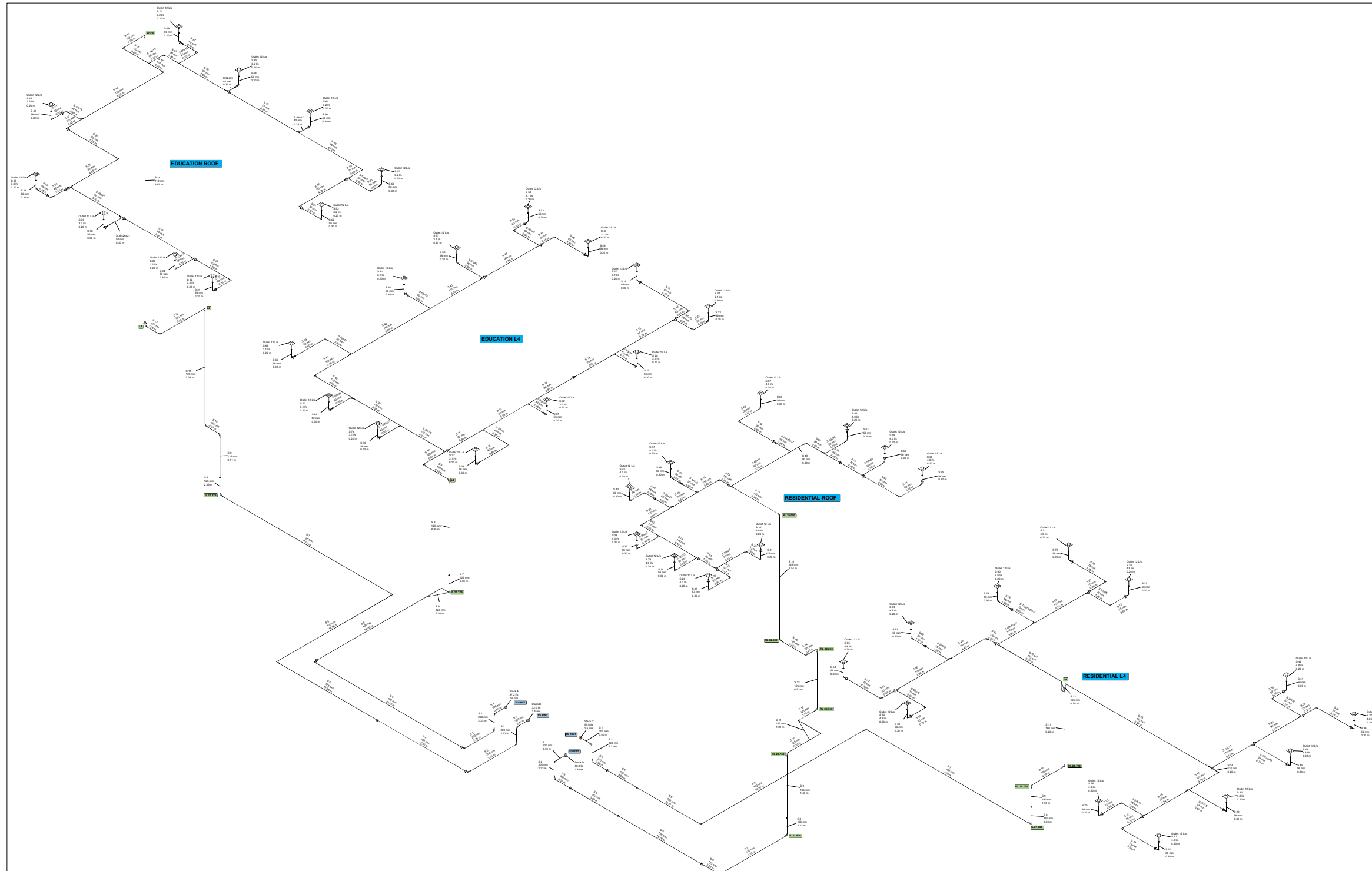
Roof outlet legend
 CRACK type
 Section (S)
 Volumetric flow rate (V)
 Length of outlet pipe

Transfer point legend
 Stack designation
 Volumetric flow rate (V)
 Flow velocity (v)

Pipe legend
 Reinforced pipe (RFRP)
 Section (S)
 Outside diameter (d)
 Length (L)

Product range legend
 Gasket PG

Symbol legend
 Roof outlet
 Transfer point
 Bend 2x45°
 Reducer



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Any infringement of this copyright may result in legal action.

Project no.: P2020007	Project: Nihon University 9 Church Street Newcastle 2300		
 GEBERIT	Description: Designed to specified flow rates		
	Subproject: Roof drainage systems - 18/01/21		
Person responsible: Eranda D.	Street: 8a, 6-8 Byfield street		
Telephone: 02 9889 7866	Postal code: 2113		
support.engineer@geberit.com	City: Macquarie Park	Created: 11/02/2020	Changed: 18/01/2021

Appendix 3.0 Australian Tanks Shop Drawings

THESE DRAWINGS AND PLANS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL STAMPED AS APPROVED BY RELEVANT AUTHORITY. ALL WORKS ARE TO BE CONSTRUCTED TO THE SATISFACTION OF RELEVANT AUTHORITIES. THE CONTRACTOR IS RESPONSIBLE FOR ORGANISING NECESSARY PERMITS, AUTHORITIES AND SUBSEQUENT INSPECTIONS AS REQUIRED BY RELEVANT AUTHORITIES.



ACCESS OPENINGS
600Ø ROUND OR
900Ø ROUND OR
600x600 SQUARE OR
900x600 RECTANGULAR OR
900x900 SQUARE

Notes
For holding liquids or contents other than water, applicable tank coatings must be applied as per product technical data sheets. Not meeting the correct specifications and application requirements will void the Australian Tanks 10 Year Warranty.

Disclaimer
This plan is for diagram purposes only, and is not intended to be used for manufacture or construction purposes.

50MPa Concrete
Due to the high compressive strength and durability requirements necessary for heavy duty construction, Australian Tanks uses 50Mpa strength concrete in all products manufactured.

Profile

Australian Tanks specialise in quality heavy-duty precast concrete tanks and civil infrastructure products. We offer innovative and dynamic water and waste water solutions in the Civil, Commercial, Defence, Mining, and Residential markets. All Australian Tanks precast concrete products carry a 10 Year Warranty with 50 Year design life.

TANK & LID WEIGHT = 16.54 TONNE

ACCESS OPENINGS —————
600Ø ROUND OR
900Ø ROUND OR
600x600 SQUARE OR
900x600 RECTANGULAR OR
900x900 SQUARE

- WALLS, BASE LID & RISER:
- 50MPa CONCRETE AT 28 DAYS WITH FIBRECON MP47-MACRO POLY
- REINFORCEMENT SPECIFICATION AS PER ENGINEERING PLANS
- EXPOSURE CLASSIFICATION = "B2"

EXTERNAL EYE ANCHORS

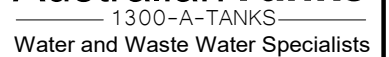
– 220 x 55mm BEVEL FOR VERTICAL LOADING
REFER DETAIL 1

DETAIL 1
1 : 10

Australian Tanks products are rated with a "B2" classification, in accordance with Australian Standards AS3735 (Concrete Structures for retaining liquids). Base and walls to be coated with suitable waterproofing agent in accordance with manufacturer's specification for environments more severe than exposure classification "B2".

All tanks have a calculated resistance against flotation from watertable levels up to the underside of lid once backfilled and covered with either soil or pavement. Refer to specific information for each tank for required depths of cover.

25kL		Volumes & Specifications	Cutouts:
External Dimensions	3475mm L x 3365mm H (lid on)		
Internal Dimensions	Ø3305mm (Top) x Ø3265mm (Base) x 2990mm H (no lid)		Nil
Tank Walls	Wall Thickness = 85mm (Top) x 105mm (Base) Base Chamfer = 220mm x 55mm		
Lid Height	200mm	Lid Rebate = 15mm	
Base Thickness	190mm	600 x 600 lid opening add 72 L	Nil
Rebate Volume	128 L	600 x 900 lid opening add 108 L	
Tank Volume (no lid)	25,257 L	900 x 900 lid opening add 162 L	
Tank Volume (with lid)	25,128 L	Dia. 600 lid opening add 56 L	
		Dia. 900 lid opening add 127 L	



This concrete tank has been designed to support vehicle loads up to and including a single axle load of 9.0t, tandem axle load of 16.5t and a tri-axle load of 20.0t operating at low speeds based on the Queensland Department of Transport and Main Roads regulation mass limits.

This corresponds to supporting a 4 Axle Twin Steer Rigid Truck (Garbage Truck) up to a GVM = 27.5t and Common 3 Axle Rigid Truck up to GVM = 23.0t.



Model

ATQ-25KL-TS
ROUND TANK

Version:	0.05
----------	------

Date: 25/11/19

Scale: As indicated @ A3.

Drawn: DTA

Checked:	DTA
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RPEQ:	DTA
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Drawing:

ATQ-25KL-TS-01

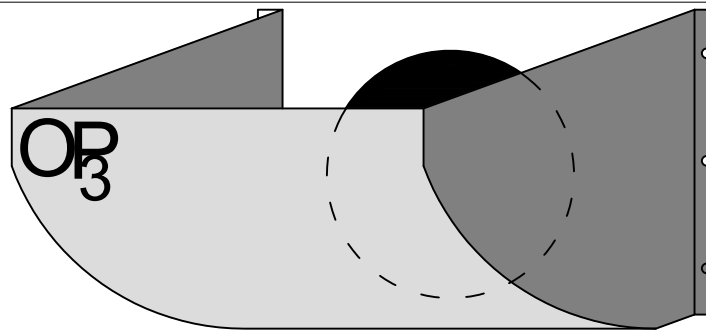
TYPICAL 25KL TANK PLANS & SECTIONS



MAX CAPACITY
to suit up to 375 outlet pipe
www.op3australia.com.au

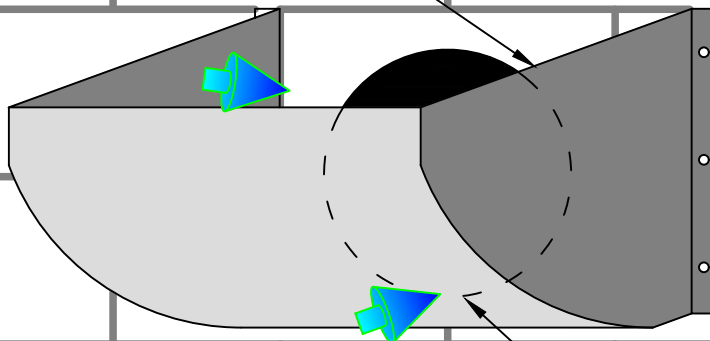
email scott@op3.com.au mob 0431 755 938

Scale No	Orig Drg Size Revision	Date	Drawing

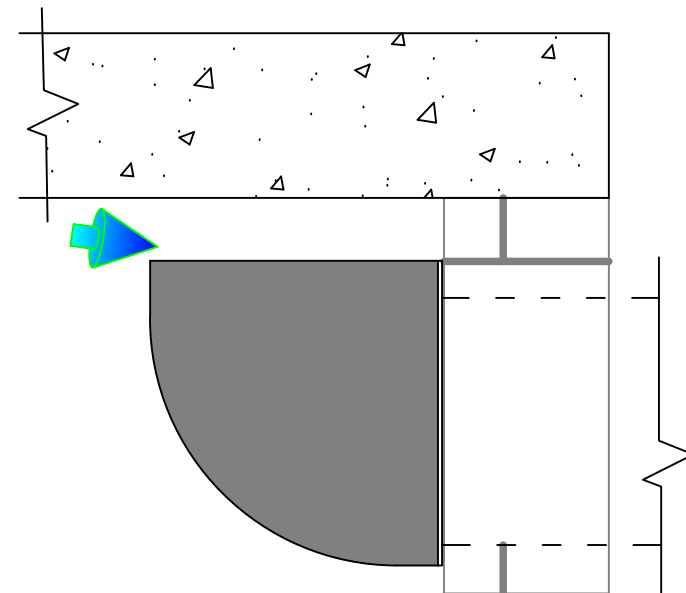


MAX CAPACITY BY OP3
AUSTRALIA OR APPROVED
EQUIVALENT

NEW EFFECTIVE CAPACITY LEVEL



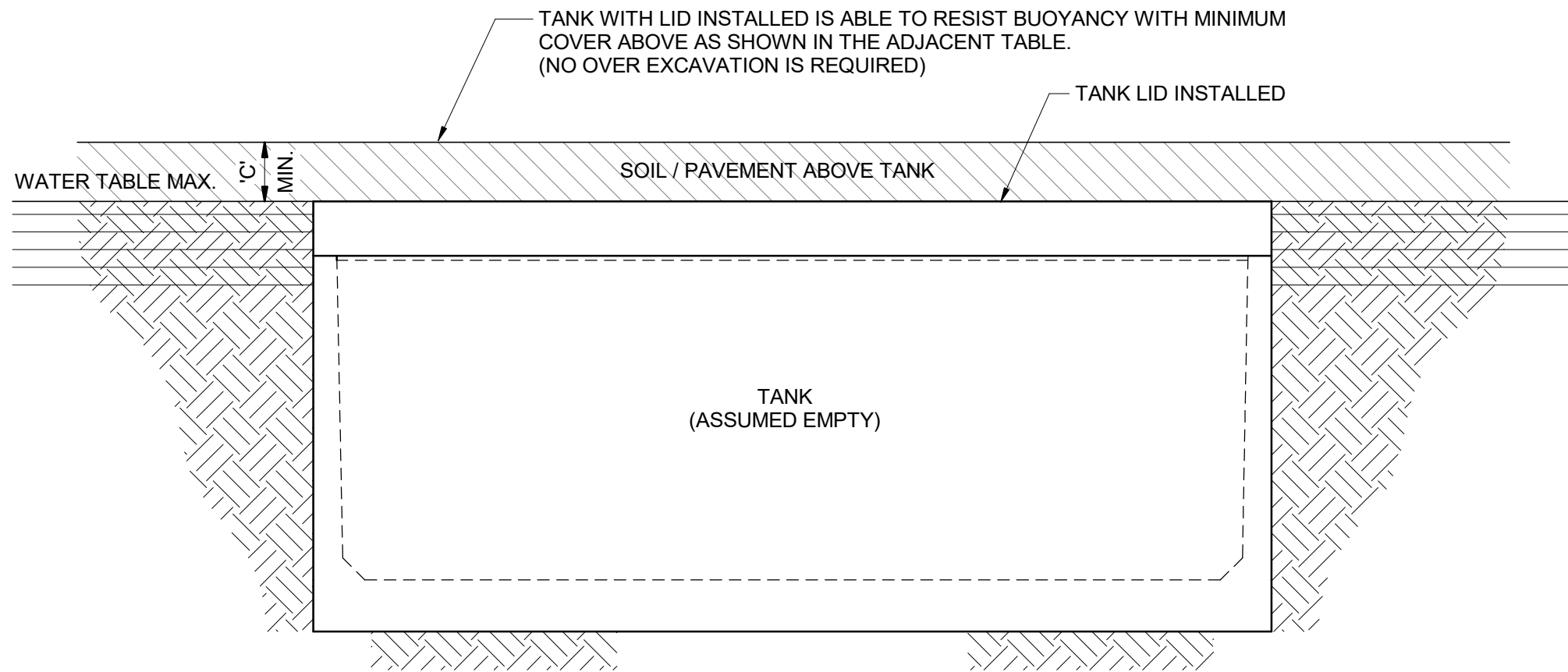
OLD EFFECTIVE CAPACITY LEVEL



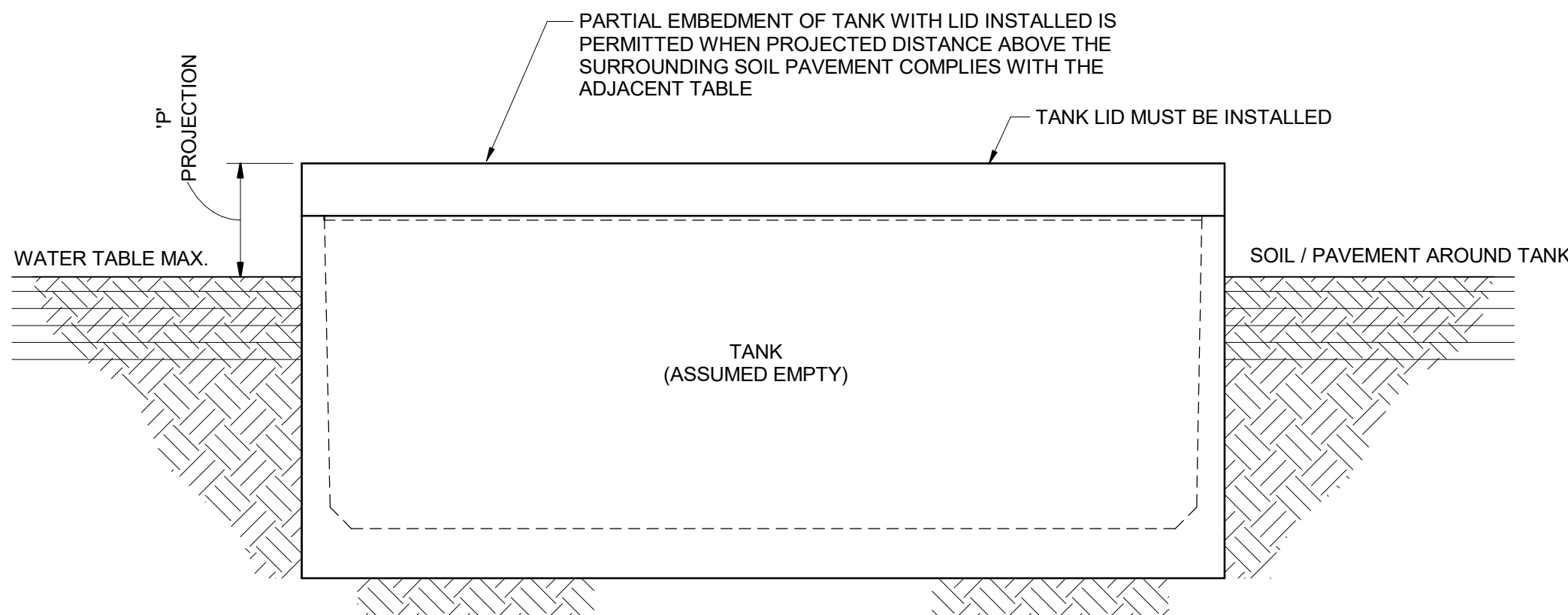
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email scott@op3.com.au

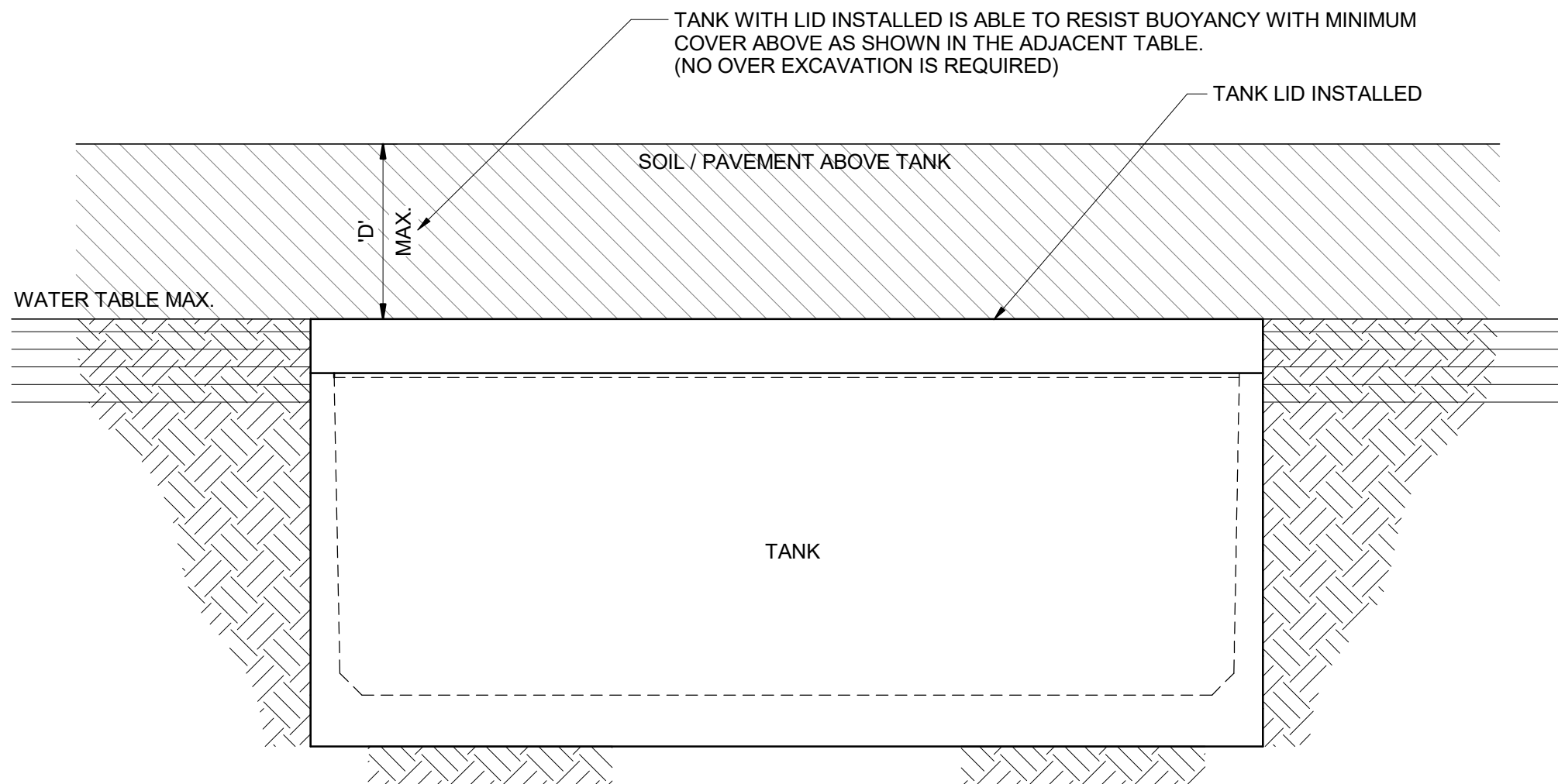
mob 0431 755 938



ANTI-FLOTATION REQUIREMENTS WHEN TANK IS FULLY BURIED



ANTI-FLOTATION REQUIREMENTS WHEN TANK IS PARTIALLY BURIED



MAXIMUM COVER ABOVE LID

MINIMUM COVER TO ACHIEVE ANTI-FLOTATION

TANK SIZE	'C' min. (mm)
3.0 kL ROUND - (2kL GREASE ARRESTOR)	0
5.0 kL ROUND	0
5.8 kL SQUARE - (3,4,5kL GREASE ARRESTORS)	300
7.0 kL RECTANGULAR	180
10.0 kL ROUND - (6kL GREASE ARRESTOR)	150
12.0 kL RECTANGULAR	320
15.0 kL ROUND - (8, 10kL GREASE ARRESTORS)	0
20.0 kL ROUND	200
25.0 kL ROUND - (10, 16kL GREASE ARRESTORS)	350

FLOTATION FACTOR OF SAFETY = 1.10
ASSUMED BULK DENSITY OF OVERBURDEN $\gamma = 15 \text{ kN/m}^3$.
REFER TO ON-SITE GEOTECHNICAL ADVICE AS TO WHETHER WATER TABLE IS PRESENT AND ANTI-FLOTATION CHECKS ARE REQUIRED.

MINIMUM PROJECTION TO ACHIEVE ANTI-FLOTATION

TANK SIZE	'P' min. (mm)
3.0 kL ROUND - (2kL GREASE ARRESTOR)	0
5.0 kL ROUND	0
5.8 kL SQUARE - (3,4,5kL GREASE ARRESTORS)	350
7.0 kL RECTANGULAR	100
10.0 kL ROUND - (6kL GREASE ARRESTOR)	0
12.0 kL RECTANGULAR	750
15.0 kL ROUND - (8, 10kL GREASE ARRESTORS)	100
20.0 kL ROUND	550
25.0 kL ROUND - (10, 16kL GREASE ARRESTORS)	900

WHEN 'P' = 0, TANK CAN BE PARTIALLY BURIED TO ANY DEPTH AS THE BUOYANCY FORCE NEVER OVERCOMES THE TANK SELF WEIGHT WITH A FACTOR OF SAFETY OF 1.10.
REFER TO ON-SITE GEOTECHNICAL ADVICE AS TO WHETHER WATER TABLE IS PRESENT AND ANTI-FLOTATION CHECKS ARE REQUIRED.

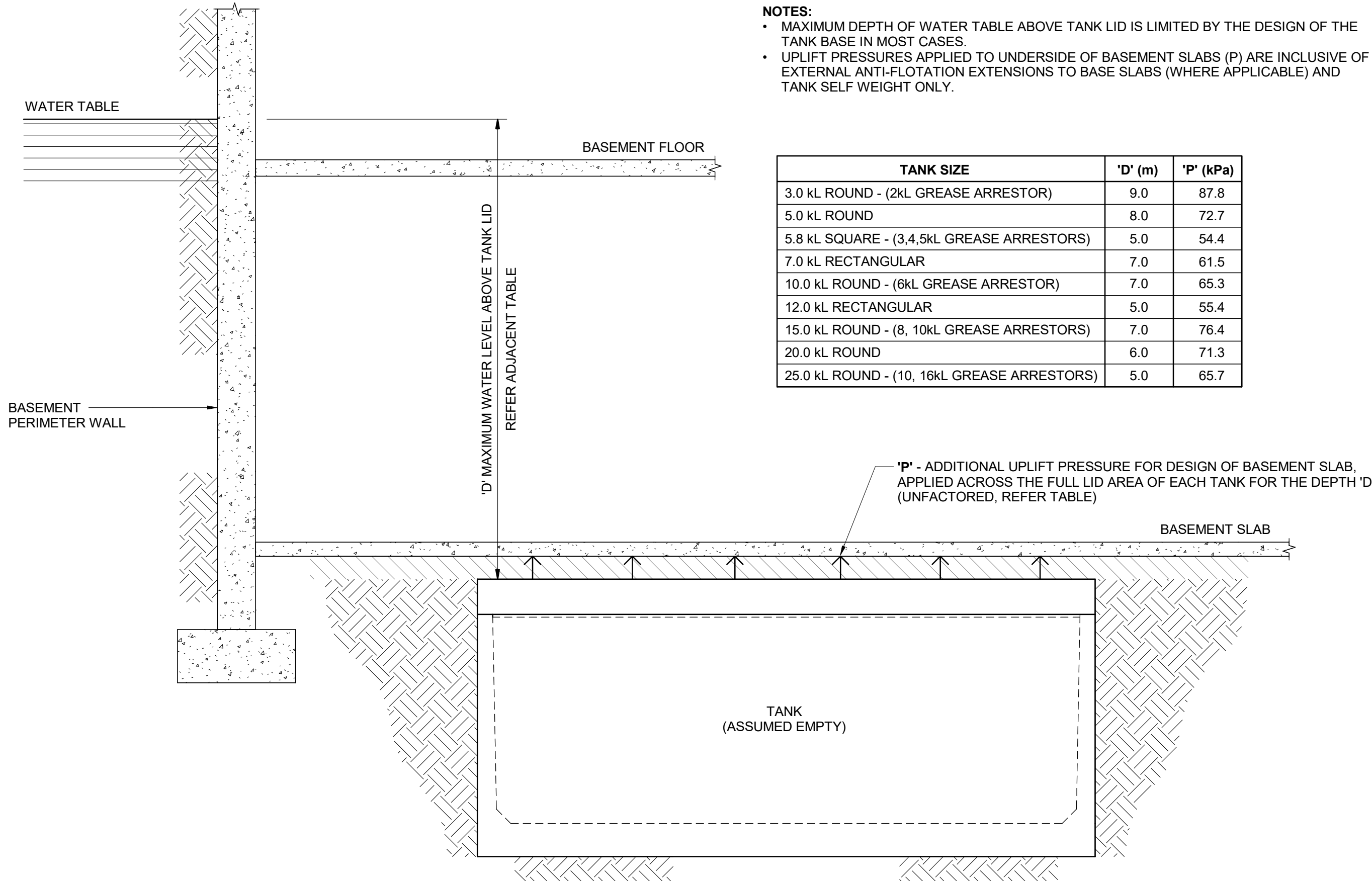
MAXIMUM DEPTH OF FILL/PAVEMENT ABOVE TANK LID

TANK SIZE	'D' max. (mm)
3.0 kL ROUND - (2kL GREASE ARRESTOR)	3000
5.0 kL ROUND	2000
5.8 kL SQUARE - (3,4,5kL GREASE ARRESTORS)	2000
7.0 kL RECTANGULAR	2000
10.0 kL ROUND - (6kL GREASE ARRESTOR)	2000
12.0 kL RECTANGULAR	2000
15.0 kL ROUND - (8, 10kL GREASE ARRESTORS)	2000
20.0 kL ROUND	2000
25.0 kL ROUND - (10, 16kL GREASE ARRESTORS)	2000

MAXIMUM DEPTH OF COVER ABOVE TANK HAS BEEN ASSESSED FOR ALL DESIGN VEHICLE TYPES LISTED ON DRAWING 1355-G-EN-03. REFER NOTES ON THIS DRAWING FOR INFORMATION RELATED TO BRIDGE CODE STYLE LOADING (eg. SM1600 LOADS).

GREATER DEPTHS OF COVER ABOVE LIDS MAY BE ACHIEVED WITH RESTRICTIONS TO VEHICULAR TRAFFIC OR ALTERNATIVE LID DESIGNS - REFER ENGINEER.

ASSUMED BULK DENSITY OF OVERBURDEN $\gamma = 18 \text{ kN/m}^3$.



BASEMENT HYDROSTATIC LOADING REQUIREMENTS

SCALE 1 : 20

- NOTES:
- MAXIMUM DEPTH OF WATER TABLE ABOVE TANK LID IS LIMITED BY THE DESIGN OF THE TANK BASE IN MOST CASES.
 - UPLIFT PRESSURES APPLIED TO UNDERSIDE OF BASEMENT SLABS (P) ARE INCLUSIVE OF EXTERNAL ANTI-FLOTATION EXTENSIONS TO BASE SLABS (WHERE APPLICABLE) AND TANK SELF WEIGHT ONLY.

TANK SIZE	'D' (m)	'P' (kPa)
3.0 kL ROUND - (2kL GREASE ARRESTOR)	9.0	87.8
5.0 kL ROUND	8.0	72.7
5.8 kL SQUARE - (3,4,5kL GREASE ARRESTORS)	5.0	54.4
7.0 kL RECTANGULAR	7.0	61.5
10.0 kL ROUND - (6kL GREASE ARRESTOR)	7.0	65.3
12.0 kL RECTANGULAR	5.0	55.4
15.0 kL ROUND - (8, 10kL GREASE ARRESTORS)	7.0	76.4
20.0 kL ROUND	6.0	71.3
25.0 kL ROUND - (10, 16kL GREASE ARRESTORS)	5.0	65.7

Issue	Description	Issued By	Date
0.3	ISSUED FOR CONSTRUCTION	DTA	03/02/20
0.2	FOR REVIEW	DTA	04/11/19
0.1	PRELIMINARY ISSUE	DTA	10/10/19

H Scale 1 : 20
V Scale 1 : 20



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STRUCTURAL
ENGINEERING

M / 0422 189 353
E / dean.anderson@dtastuct.com.au
W / www.dtastruct.com.au

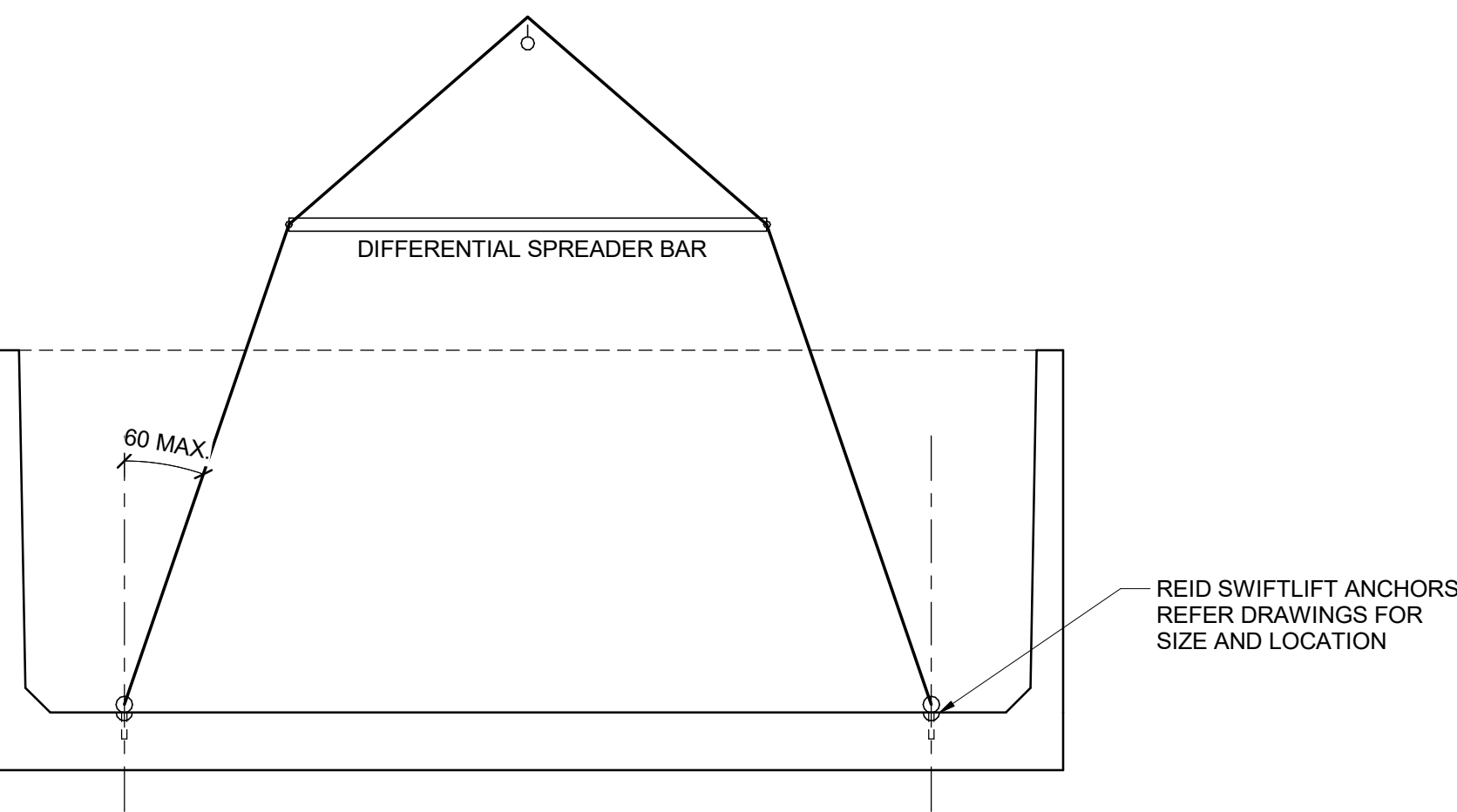
AustralianTanks
1300-A-TANKS
Water and Waste Water Specialists

Model
TANK INSTALLATION NOTES &
SPECIFICATIONS

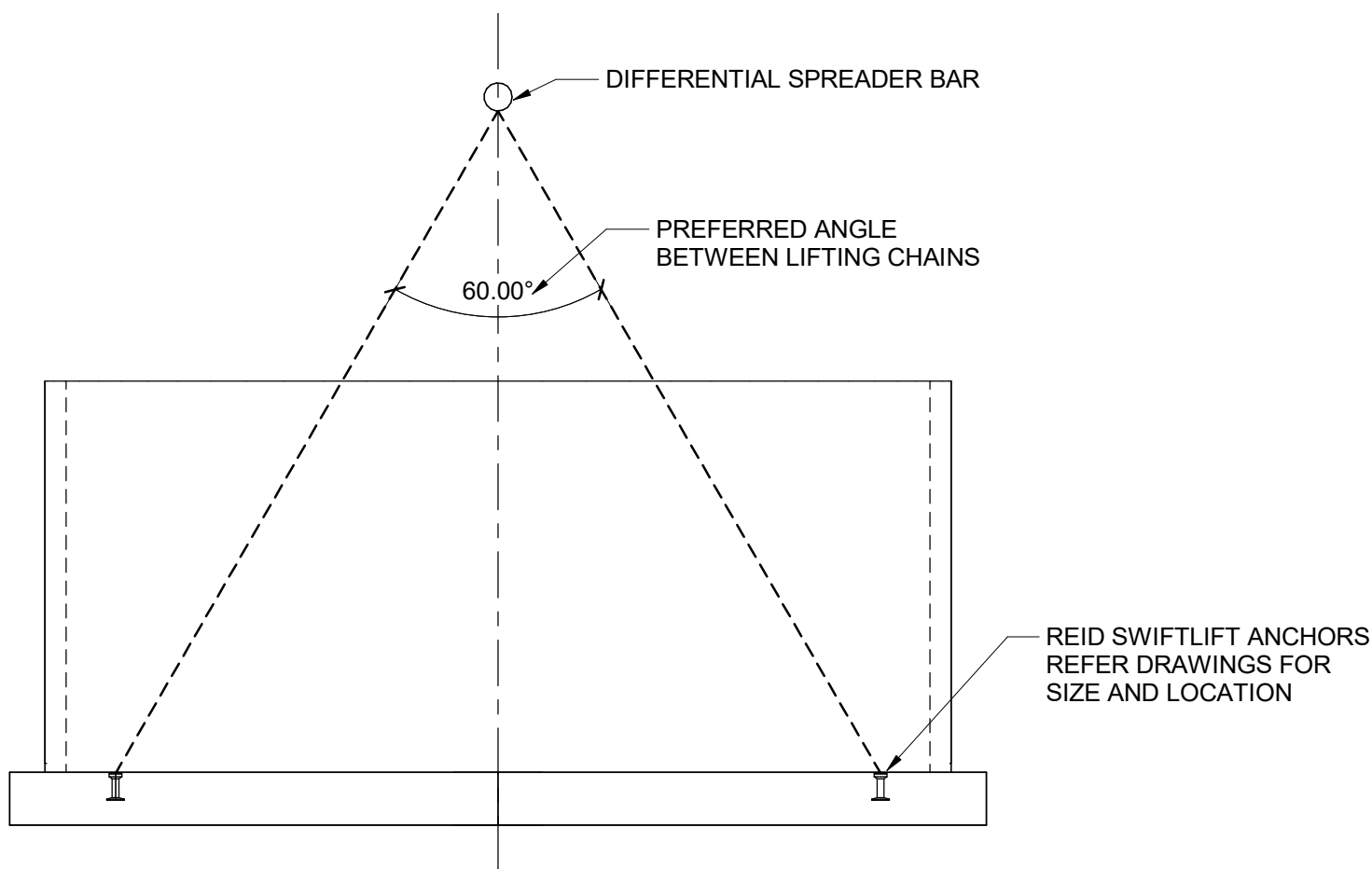
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Checked:	DTA		
RPEQ:	Dean Anderson (RPEQ 21536)		
Drawing Title:			
BOUYANCY & COVER HEIGHTS		Drawing Number:	Rev:
		1355-G-EN-01	0.

LIFTING NOTES

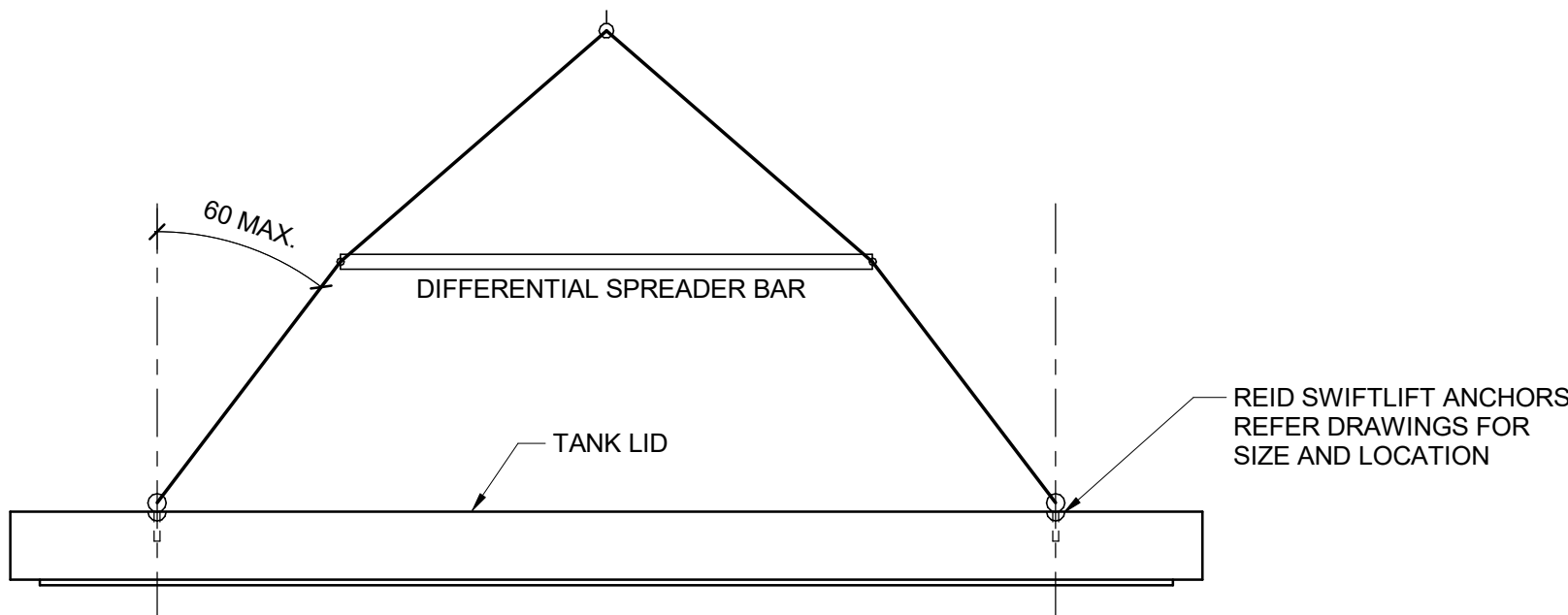
1. INSTALLATION OF CAST-IN ANCHORS AND LIFTING PROCEDURES TO BE IN ACCORDANCE WITH "PSA FOOT AND EYE ANCHORS" SPECIFICATIONS AND CERTIFICATION FOR MULTIPLE LIFTS. ANCHORS AND SURROUNDING CONCRETE SHOULD BE INSPECTED PRIOR TO EACH USE. DAMAGED ANCHORS SHALL NOT BE USED (CONTACT MANUFACTURER FOR ADVICE IF REQUIRED).
2. CONCRETE STRENGTH OF PRECAST ELEMENTS TO BE F'C = 30MPa MINIMUM AT TIME OF LIFTING.
3. ALL LIFTING MUST BE CARRIED OUT USING A CRANE AT NORMAL HOIST SPEEDS WITH A MAXIMUM SLING ANGLE OF 60 DEGREES. TANKS MAY BE CARRIED BY SLOW MOVING MOBILE CRANES OVER LEVEL TERRAIN.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE GENERAL NOTES ON 1355-G-EN-04.
5. ENSURE THAT ALL LIFTING INSERTS ARE INSTALLED IN THE CORRECT POSITION PRIOR TO LIFTING.
6. DAMAGED LIFTING ANCHORS TO BE IMMEDIATELY GROUTED OVER TO PREVENT FURTHER USE.
7. ENSURE ALL REINFORCEMENT BARS ARE INSTALLED AS PER THE MANUFACTURER'S REQUIREMENTS TO EYE ANCHORS.
8. THE FOLLOWING NOTES ARE A GUIDE ONLY. LIFTING PROCEDURES TO BE THE RESPONSIBILITY OF THE CONTRACTOR PERFORMING THE WORKS.



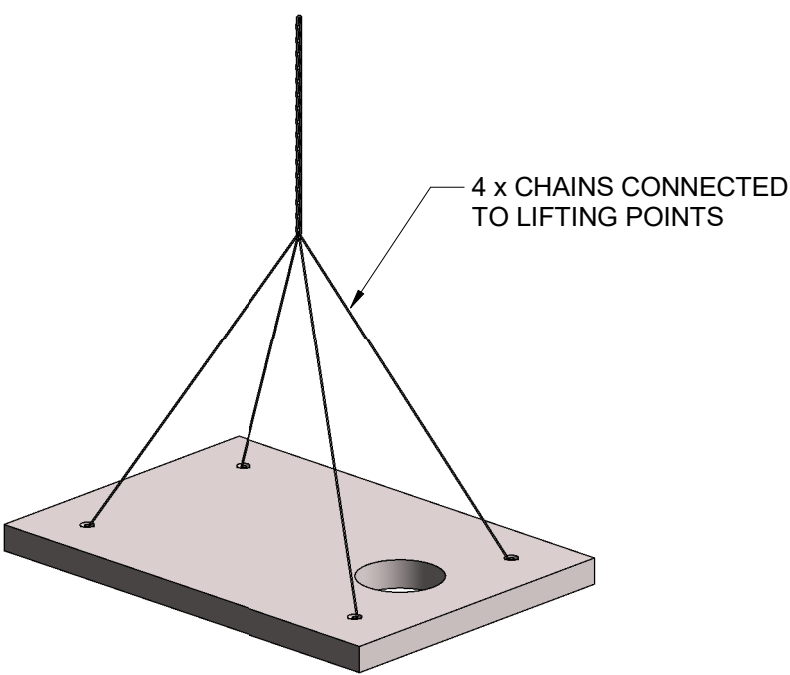
RECTANGULAR TANK - INTERNAL LIFTING POINTS



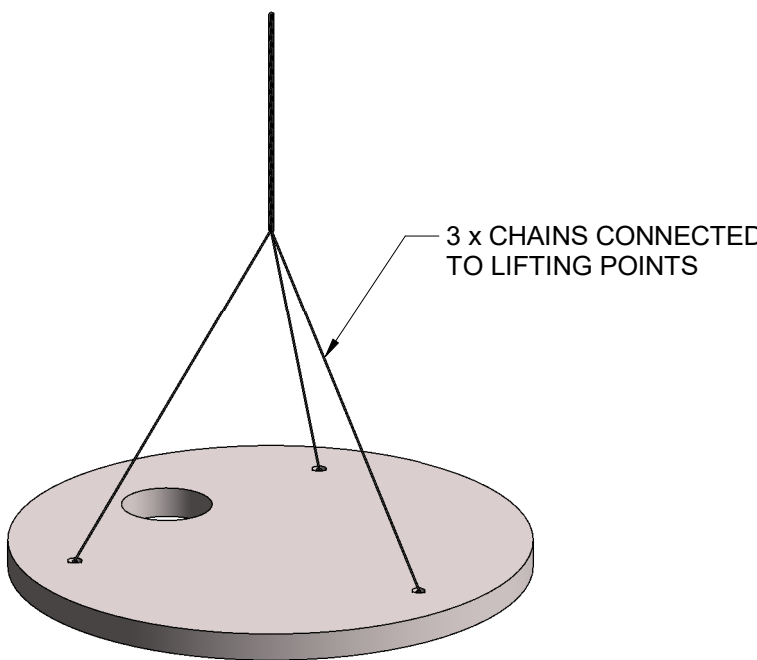
ROUND TANK - INTERNAL LIFTING POINTS



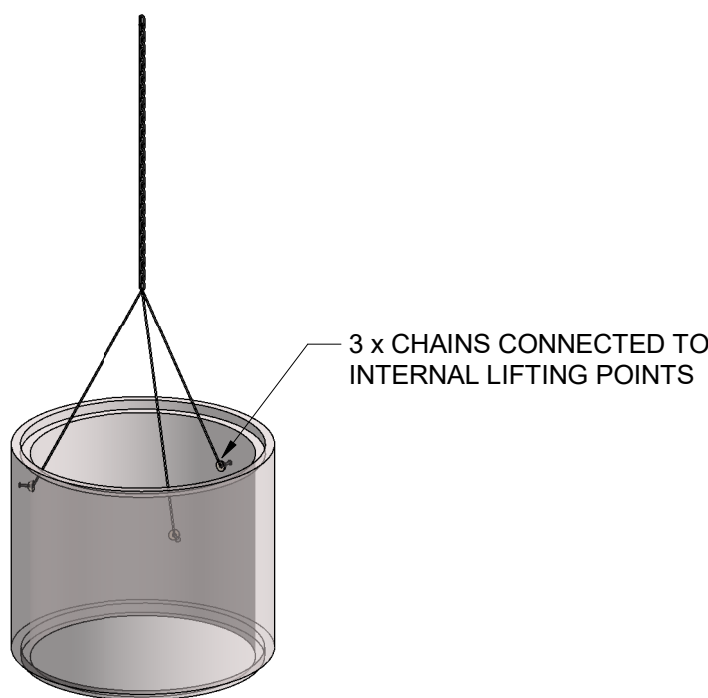
TANK LID - LIFTING POINTS



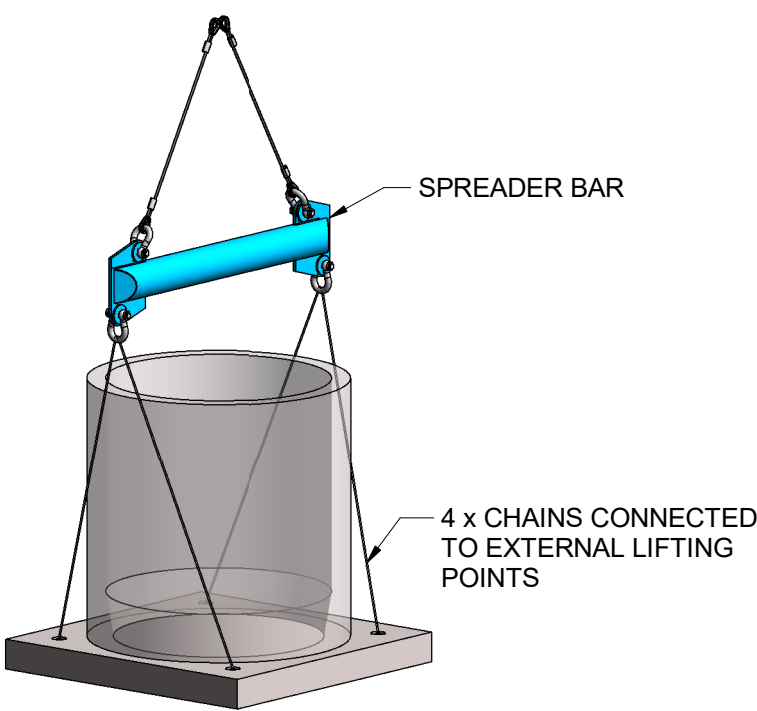
SQUARE/RECTANGULAR TANK LID LIFTING DIAGRAM



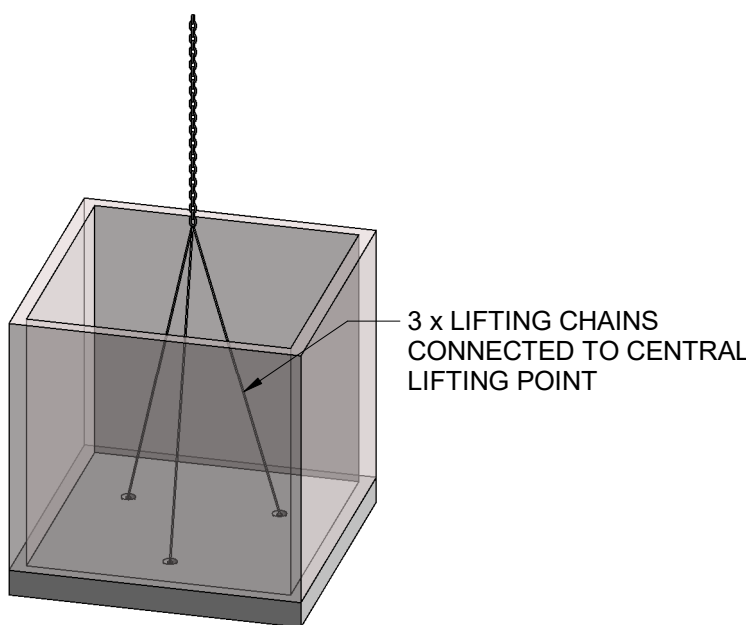
ROUND TANK LID LIFTING DIAGRAM



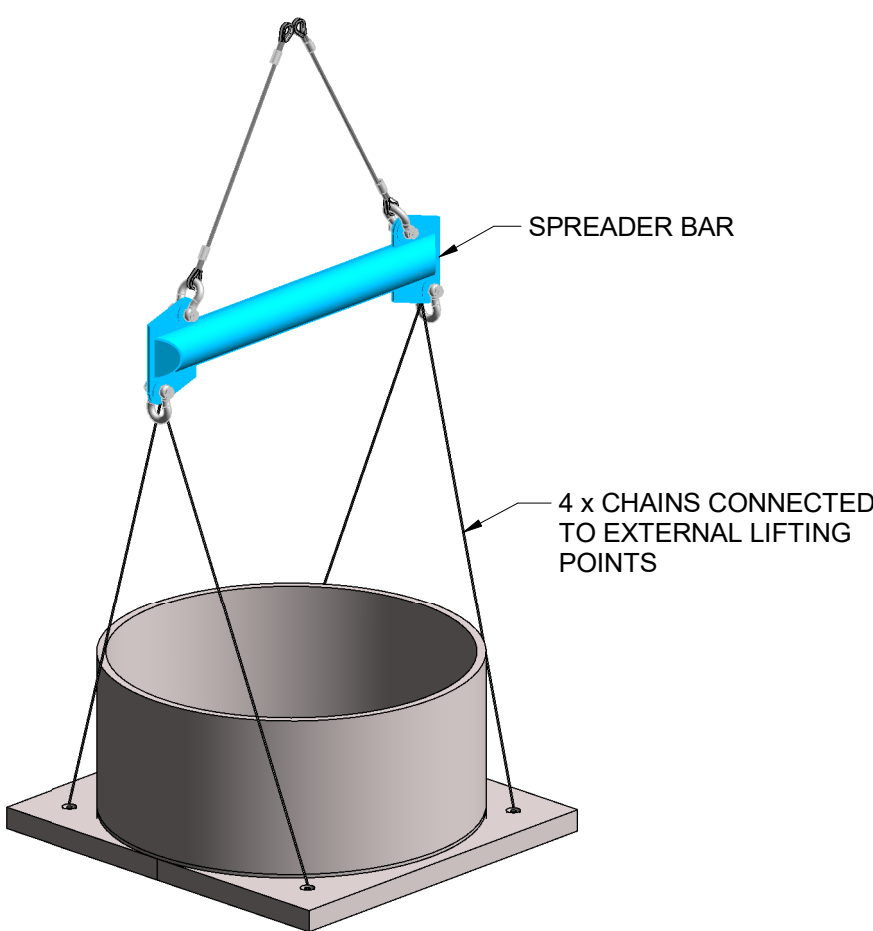
1500Ø RING LIFTING DIAGRAM



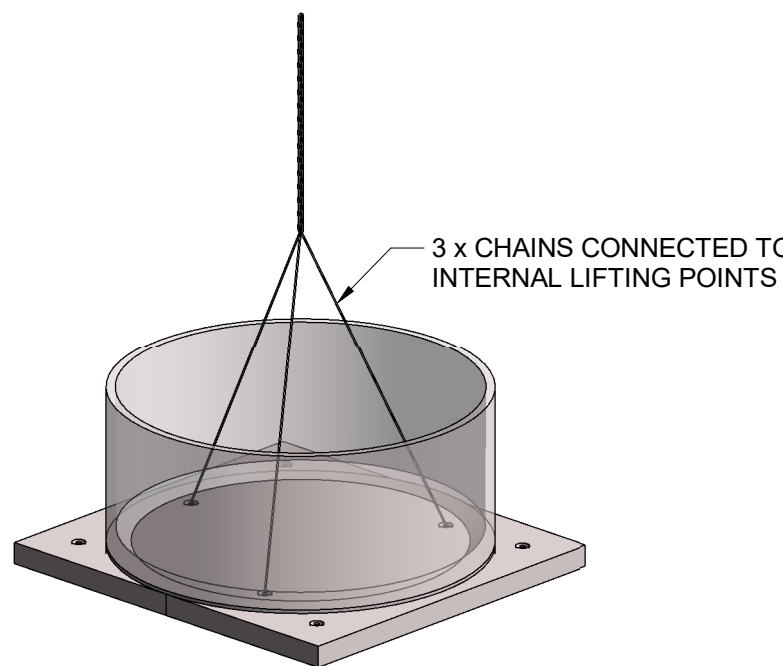
3kL TANK LIFTING DIAGRAM



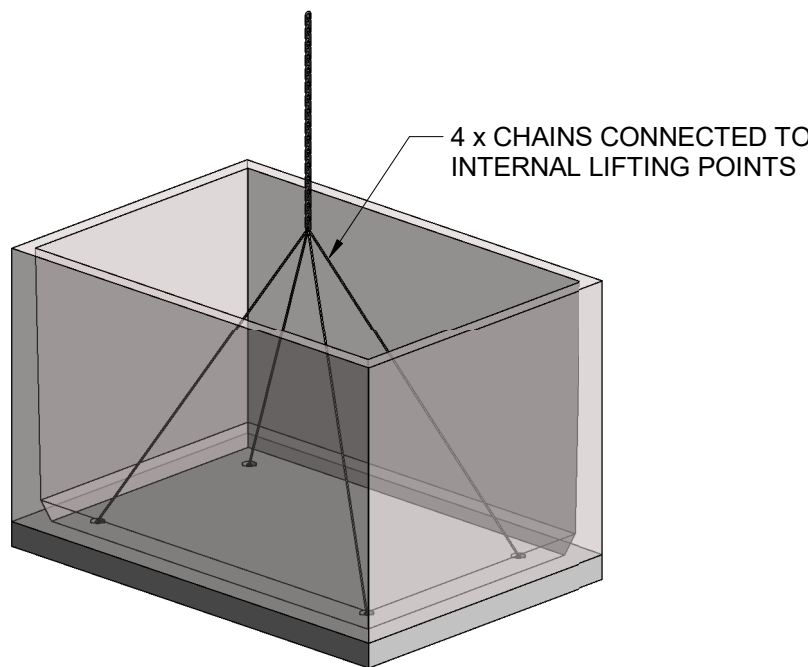
5.8kL TANK LIFTING DIAGRAM



5, 10, 15, 20, 25kL TANK LIFTING DIAGRAM (EXTERNAL POINTS)

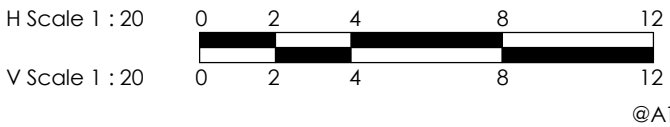


5, 10, 15, 20, 25kL TANK LIFTING DIAGRAM (INTERNAL POINTS)



7, 12kL TANK LIFTING DIAGRAM (INTERNAL POINTS)

0.2	ISSUED FOR CONSTRUCTION	DTA	03/02/20
0.1	FOR REVIEW	DTA	04/11/19
Issue	Description	Issued By	Date



DTA
STRUCTURAL
ENGINEERING

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E / dean.anderson@dtastuct.com.au
W / www.dtastruct.com.au

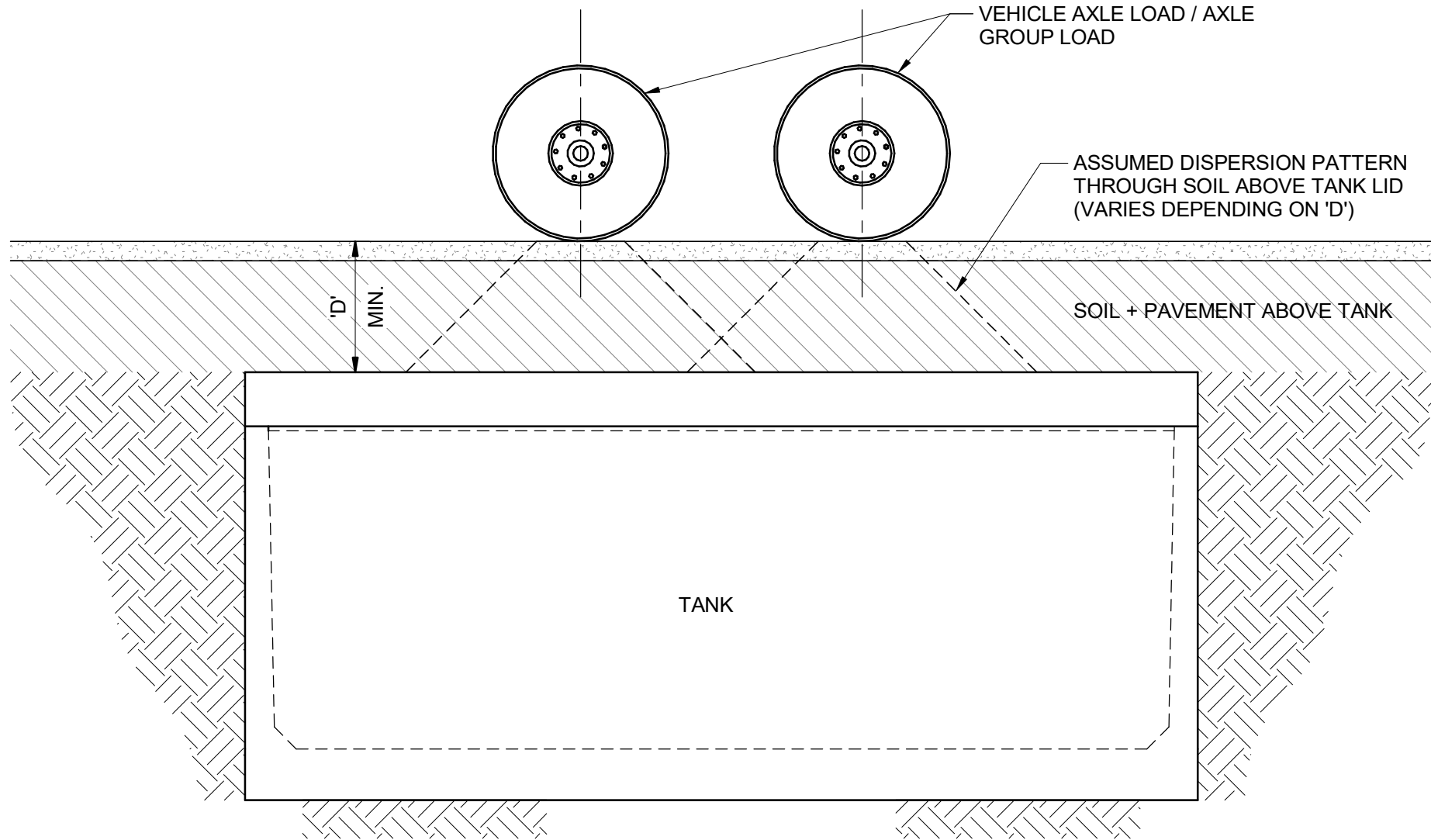


Model
TANK INSTALLATION NOTES & SPECIFICATIONS

APPROVED FOR CONSTRUCTION		
Scale:	1 : 20 @ A1	Sheet Size: A1
Drawn:	DTA	THE DESIGNS AND PLANS REPRESENTED ON THIS DRAWING ARE NOT TO BE REPRODUCED IN WHOLE OR PART WITHOUT CONSENT OF DTA STRUCTURAL ENGINEERING PTY LTD. ALL DIMENSIONS TO BE VERIFIED ON SITE. REPORT ANY DISCREPANCIES TO THE ENGINEER. DO NOT SCALE OFF DRAWINGS.
Checked:	DTA	
RPEQ:	Dean Anderson (RPEQ 21536)	
Drawing Title:		
GENERIC LIFTING DETAILS		
Drawing Number:		Rev:
1355-G-EN-02		0.2

VEHICLE LOADING CONSIDERATIONS

1. TANK HAS BEEN DESIGNED FOR BELOW GROUND USE IN CONTROLLED TRAFFIC CONDITIONS FOR THE AXLE LIMITS SHOWN IN THE TABLE BELOW.
2. ALL HEAVY VEHICLE LOADS ARE ASSUMED TO BE WITHIN THE GROSS VEHICLE MASS (GVM) AND AXLE MASS LIMITS PRESCRIBED BY THE QUEENSLAND DEPARTMENT OF TRANSPORT AND MAIN ROADS (SEE TABLE BELOW).
3. IT IS THE CLIENT'S RESPONSIBILITY TO ENSURE THAT THE VEHICLE LOAD LIMITS ARE NOT EXCEEDED, THROUGH CLEAR SIGNAGE OR OTHER MEANS.
4. WHERE IT CANNOT BE GUARANTEED THAT THE AXLE LOAD LIMITS SHOWN IN THE TABLE BELOW WILL NOT BE EXCEEDED, TANKS MUST BE DESIGNED FOR SM1600 LOADS TO AS5100 (SPECIFICALLY W80). SM1600 IS DERIVED FROM THE BRIDGE CODE (AS5100.2) AND DESCRIBES A SERIES OF LOADS THAT REPRESENTS DIFFERENT DESIGN CASES SUCH AS A STATIONARY WHEEL (W80), A SINGLE AXLE GROUP (A160), A MOVING TRAFFIC LOAD (M1600) AND A STATIONARY TRAFFIC LOAD (S1600). WHEN THE TANK LID IS SPECIFIED FOR COMPLIANCE WITH LOAD CASES DERIVED FROM THE BRIDGE CODE (eg. W80), IT IS IMPORTANT TO KNOW THAT THE LOAD FACTORS FOR ULTIMATE LIMIT STATE DESIGN MUST BE INCREASED IN ACCORANCE WITH AS5100 (1.8 AS OPPOSED TO 1.5). THIS WILL POTENTIALLY RESULT IN THE REQUIREMENT FOR ADDITIONAL LID REINFORCEMENT OR THICKENING OF THE LID.
5. REFER TO ENGINEER FOR QUERIES RELATED TO VEHICLE LOADING OR SPECIFIC QUERIES RELATED TO COMPLIANCE WITH AS5100.
6. WHEEL LOADS ARE ASSUMED TO BE DISPERSED THROUGH A MINIMUM SOIL COVER DEPTH "D" (SEE ADJACENT TABLE).
7. REFER TO MINIMUM AND MAXIMUM SOIL COVER DEPTHS SHOWN IN THE TABLES ON DRAWING 1355-G-EN-01 AS REQUIRED FOR ANTI-BUOYANCY
8. WHERE SOIL DEPTH ABOVE TANK NEEDS TO BE SHALLOWER THAN SHOWN IN THE TABLE BELOW, SEEK ENGINEER'S ADVICE ABOUT ALTERNATE LID DESIGNS.
9. WHERE THE TANK IS TO BE INSTALLED BENEATH A BASEMENT SLAB, THE HYDROSTATIC PRESSURES ON THE TANK MUST BE CONSIDERED. CONTACT AUSTRALIAN TANKS (ATQ) FOR ADVICE. FURTHER ADVICE IS GIVEN ON DRAWING 1355-G-EN-01.
10. ALL TANK LIDS ARE DESIGNED TO SUPPORT CLASS D RATED ACCESS COVERS AND GRATES. THIS CORRESPONDS TO A NOMINAL WHEEL LOAD OF 8,000kg (W80), SERVICEABILITY DESIGN LOAD OF 140kN AND AN ULTIMATE LIMIT STATE DESIGN LOAD OF 210kN.
11. VEHICLE LOADS APPLIED TO ACCESS COVERS ARE ASSUMED TO BE DIRECTLY BE SUPPORTED BY THE CONCRETE RISER ELEMENTS. AUSTRALIAN TANK RISERS ARE DESIGNED TO SUPPORT THE ACCESS COVER LOADS MENTIONED IN NOTE 10. RISER ELEMENTS ARE IN TURN SUPPORTED DIRECTLY BY TANK LIDS.
12. ENSURE LID IS FULLY INSTALLLATED PRIOR TO COMMENCING BACKFILLING WORKS. ENSURE THAT EQUIPMENT AND PLANT USED IN BACKFILLING IS ADEQUATELY REVIEWED AS TO NOT OVERLOAD THE WALLS OR LID OF THE TANK.

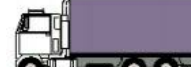


NOTE:
SIZE AND SHAPE OF DISTRIBUTION RECTANGLE ONTO LID CALCULATED IN ACCORDANCE WITH AS5100.2 - 7.12 "DISTRIBUTION PATTERN OF TRAFFIC LOADS THROUGH FILL"

MINIMUM SOIL/PAVEMENT DEPTH ABOVE TANK

TANK SIZE	'D' min. (mm)
3.0 kL ROUND - (2kL GREASE ARRESTOR)	300
5.0 kL ROUND	300
5.8 kL SQUARE - (3,4.5kL GREASE ARRESTORS)	300
7.0 kL RECTANGULAR	300
10.0 kL ROUND - (6kL GREASE ARRESTOR)	300
12.0 kL RECTANGULAR	300
15.0 kL ROUND - (8, 10kL GREASE ARRESTORS)	300
20.0 kL ROUND	300
25.0 kL ROUND - (10, 16kL GREASE ARRESTORS)	300

VEHICLE AXLE LOADS USED IN DESIGN

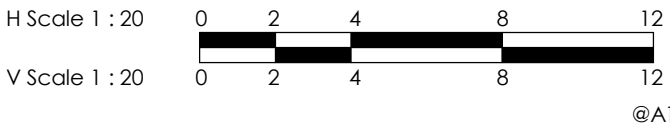
VEHICLE TYPE	STEER AXLE LOAD (t)	SOLID AXLE LOAD (t)	TANDEM AXLE LOAD (t)	TRI-AXLE LOAD (t)
2 x AXLE RIGID TRUCK 	6.0	9.0	-	-
3 x AXLE RIGID TRUCK 	6.0	-	16.5	-
4 x AXLE RIGID TWIN STEER 	11.0	-	16.5	-
6 x AXLE SEMI-TRAILER 	6.0	-	16.5	20.0

NOTES:

- AXLE MASS LIMITS HAVE BEEN DERIVED FROM THE QUEENSLAND DEPARTMENT OF TRANSPORT AND MAIN ROADS (TMR) DOCUMENT TITLED 'AXLE MASS LIMITS IN QUEENSLAND COMPARISON TABLE'.
- AXLE MASS LIMITS ARE IN ACCORDANCE WITH 'REGULATION' LIMITS. FOR HIGHER AXLE LIMITS, SUCH AS THOSE LISTED AS 'HML' OR 'NHVAS', SEE ENGINEER FOR INFORMATION.

APPROVED FOR CONSTRUCTION

0.2	ISSUED FOR CONSTRUCTION	DTA	03/02/20
0.1	FOR REVIEW	DTA	04/11/19
Issue	Description	Issued By	Date



DTA
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Model
TANK INSTALLATION NOTES &
SPECIFICATIONS

Scale:	1 : 20 @ A1.	Sheet Size:	A1
Drawn:	DTA	THE DESIGNS AND PLANS REPRESENTED ON THIS DRAWING ARE NOT TO BE REPRODUCED IN WHOLE OR PART WITHOUT CONSENT OF DTA STRUCTURAL ENGINEERING PTY LTD. ALL DIMENSIONS TO BE VERIFIED ON SITE. REPORT ANY DISCREPANCIES TO THE ENGINEER. DO NOT SCALE OFF DRAWINGS.	
Checked:	DTA		
RPEQ:	Dean Anderson (RPEQ 21536)		
Drawing Title:			
VEHICLE LOADING		Drawing Number:	Rev:
		1355-G-EN-03	0.2

1. READ STRUCTURAL DRAWINGS IN CONJUNCTION WITH OTHER CONSULTANTS' DRAWINGS, SPECIFICATIONS AND OTHER WRITTEN INSTRUCTIONS. REFER ALL DISCREPANCIES TO THE ENGINEER.
2. VERIFY ALL DIMENSIONS RELEVANT TO THE MANUFACTURE OF TANKS AND SETTING OUT ON AND OFF SITE WORK BEFORE CONSTRUCTION AND/OR FABRICATION IS COMPLETED.
3. DO NOT SCALE THE DRAWINGS UNLESS NOTED OTHERWISE.
4. MAINTAIN ALL STRUCTURES INCLUDING NEIGHBOURING STRUCTURES IN A STABLE CONDITION DURING CONSTRUCTION.
5. COMPLY WITH THE RELEVANT CURRENT AUSTRALIAN STANDARD CODES AND THE LOCAL STATUTORY AUTHORITIES REGULATIONS EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS. COMPLY WITH THE REQUIREMENTS OF THE WORKPLACE HEALTH AND SAFETY ACT (QLD).
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
7. NO RESPONSIBILITY IS TAKEN FOR THE INTERACTION OF TANKS WITH EXISTING INFRASTRUCTURE AND SERVICES. THE INSTALLING CONTRACTOR IS TO ENSURE THAT THE TANKS DO NOT DAMAGE OR APPLY LOAD TO EXISTING SERVICES.
8. ALL PROPRIETARY ITEMS MUST BE INSTALLED STRICTLY IN ACCORDANCE WITH MANUFACTURERS REQUIREMENTS.
9. HANDRAILS AND FIXINGS SHALL BE DESIGNED AND INSTALLED TO RESIST LOADS TO AS1170 WITH STRUCTURAL ENGINEERING CERTIFICATION SUPPLIED BY THE MANUFACTURER.
10. INTERIOR OF PRECAST TANK TO BE LINED USING APPROVED WATERPROOFING AGENT ACCORDING TO PRECAST MANUFACTURERS SPECIFICATION (IF REQUIRED).
11. CONSTRUCTION DRAWINGS MUST BE READ IN CONJUNCTION WITH THE CONSTRUCTION NOTES AND DETAILS ON THE STANDARD DRAWINGS FOR EACH VARIANT.
12. THE DESIGN REPRESENTED ON THE STRUCTURAL DRAWINGS FOR EAC PRODUCT IS NOT VALID UNLESS PERIODIC INSPECTIONS BY THE CERTIFYING PARTY IS CARRIED OUT TO ENSURE THAT TANKS ARE BUILT IN ACCORDANCE WITH THE REQUIREMENTS SET OUT IN THESE DRAWINGS.

1. THE STRUCTURAL COMPONENTS DETAILED ON THESE DRAWINGS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE RELEVANT STANDARDS AUSTRALIA CODES AND THE BUILDING CODE OF AUSTRALIA.
2. TANKS HAVE BEEN DESIGNED IN ACCORDANCE WITH THE PORTLAND CEMENT ASSOCIATION MANUALS 'CIRCULAR CONCRETE TANKS' AND 'RECTANGULAR CONCRETE TANKS' AND ALSO IN ACCORDANCE WITH AS3600 'CONCRETE STRUCTURES CODE' AND AS3735 'LIQUID RETAINING STRUCTURES' CODE.
3. TANKS HAVE BEEN DESIGNED FOR BELOW GROUND ENVIRONMENTS WITH NON-AGGRESSIVE AND NON-SALINE SOILS. FOR OTHER CONDITIONS CONTACT ENGINEER FOR ADVICE.
4. TANKS HAVE BEEN DESIGNED FOR ABOVE-GROUND USE IN SUB-TROPICAL REGIONS WHERE THE OUTSIDE TEMPERATURE CAN BE EXPECTED TO REACH A MAXIMUM OF 30 DEGREES CELSIUS HIGHER THAN THE INTERNAL TANK TEMPERATURE ONLY.
NOTE: TANK EXTERIOR SHALL NOT BE PAINTED WITH DARK COLOURS.
5. TANK IS APPROVED FOR DOMESTIC SEWAGE APPLICATIONS WHERE THE CONTENTS WILL NOT BE DISTURBED (eg. DUE TO DROPS), WHERE ADEQUATE VENTILATION HAS BEEN PROVIDED TO PREVENT THE BUILD UP OF GASEOUS HYDROGEN SULPHIDE WITHIN THE TANK AND WHERE APPROPRIATE COATINGS ARE USED INTERNALLY.
6. TANKS HAVE BEEN DESIGNED TO WITHSTAND VEHICLE LOADING. THE TERM 'RESTRICTED TRAFFIC' REFERS TO CONTROLLED TRAFFIC CONDITIONS WHERE THE HEAVIEST VEHICLE SUPPORTED AS ASSUMED TO BE WITHIN THE TANK DESIGN IS A LIGHT GVW (M) AND A MAXIMUM MASS DESCRIBED BY THE QUEENSLAND DEPARTMENT OF TRANSPORT MAIN ROADS. CURRENT TANK DESIGN IS BASED ON THE AXLE MASS LIMITS SHOWN IN THE TANK ON DRAWING 1355-G-EN-03.
7. REFER TO TANK ON DRAWING 1355-G-EN-01 FOR MINIMUM SOIL/PAVEMENT COVER OVER TANKS FOR ANTI-FLOTATION. WHETHER ANTI-FLOTATION REQUIREMENTS APPLY TO THE SPECIFIC TANK APPLICATION SHOULD BE CONFIRMED BY THE CLIENT AND A LICENSED ENGINEER.
8. WHEN LOADS ARE ASSUMED TO BE DISPERSED THROUGH MINIMUM SOIL/PAVEMENT DEPTHS AS SHOWN ON THE TABLE AND NOTES ON 1355-G-EN-03.
9. REFER TO TANK ON DRAWING 1355-G-EN-01 FOR MAXIMUM SOIL/PAVEMENT DEPTH ABOVE TANKS.
10. NO SURCHARGE LOADS SHALL BE PERMITTED WITHIN A DISTANCE EQUAL TO THE HORIZONTAL SPREAD OF THE TANK UNTIL THE LID HAS BEEN INSTALLED.
11. WHERE THE TANK IS TO BE INSTALLED BENEATH A BASEMENT SLAB, THE HYDROSTATIC PRESSURES ON THE TANK MUST BE CONSIDERED. CONTACT AUSTRALIAN TANKS (ATQ) FOR ADVICE. FURTHER ADVICE IS GIVEN ON DRAWING 1355-G-EN-01.

1. ALL CHEMICAL ANCHORS SHALL BE RAMSET "CHEMSET REO 502" EPOXY SERIES OR HILTI "HIT - RE 500 INJECTION ADHESIVE" OR POWERS "POWER - FAST PRO EPOXY INJECTION SYSTEM" OR APPROVED EQUIVALENT. ALL PREPARATION AND APPLICATION SHALL BE IN STRICT ACCORDANCE WITH MANUFACTURERS SPECIFICATION.

1. CORE HOLES IN WALLS SHALL COMPLY WITH THE REQUIREMENTS SPECIFIED ON ENGINEERING DRAWINGS FOR EACH TANK TYPE.
2. CUT BARS SHALL BE PRIMED WITH ZINGA "ZINGASPRAY" WITH A DRY FILM THICKNESS OF 120µm IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

1. REFER TO SPECIFIC DETAILS ON DRAWING 1355-G-EN-02.

1. POLYMER FIBRE-REINFORCED CONCRETE WALLS ARE SEPARATELY CERTIFIED BY FIBRECON QLD PTY LTD.
2. FIBRE DOSAGE SHOWN ON THE STRUCTURAL DRAWINGS IS SPECIFIED BY FIBRECON.
3. REFER TO FIBRECON FOR ANY TEST CERTIFICATES OR OTHER REPORTS PERTAINING TO THE MECHANICAL PROPERTIES OF THE FIBRES.

1. COMPLY WITH AS3600 CONCRETE STRUCTURES.
2. DESIGN AND CONSTRUCT FORMWORK IN ACCORDANCE WITH AS3610.1.
3. PROVIDE QUALITY OF FINISHES OF FORMED SURFACES IN ACCORDANCE WITH AS3610.1 AND AS FOLLOWS ON DRAWINGS:
 - a. EXPOSED SURFACES: CLASS 3
 - b. CONCEALED SURFACES: CLASS 4
 - c. IN CONTACT WITH GROUND: CLASS 5
4. THE LISTED SIZE OF CONCRETE ELEMENTS DO NOT INCLUDE THICKNESS OF APPLIED FINISHES. PROVIDE CHAMFERS, FILLETS REGLETS AND DRIP EDGES AS SHOWN ON THE STRUCTURAL DRAWINGS.
5. DO NOT MAKE ANY PENETRATIONS OR CHASES OR EMBED ANY ITEMS OTHER THAN THOSE SHOWN IN THE STRUCTURAL DRAWINGS WITHOUT APPROVAL OF THE ENGINEER.
6. FORM CONSTRUCTION JOINTS ONLY WHERE APPROVED BY THE ENGINEER.
7. REINFORCEMENT SYMBOLS:
 - a. "S" DENOTES GRADE 250S HOT ROLLED DEFORMED BAR TO AS 4671
 - b. "R" DENOTES GRADE 250R HOT ROLLED PLAIN BAR TO AS4671
 - c. "W" DENOTES HARD-DRAWN PLAIN WIRE TO AS 4671
 - d. "RF" & "L" DENOTES HARD-DRAWN RIBBED WIRE FABRIC TO AS 4671
 - e. "N" DENOTES GRADE 500N HOT ROLLED DEFORMED BAR TO AS 4671
 - f. THE NUMBER FOLLOWING THE BAR SYMBOL IS THE BAR DIAMETER IN mm.
8. MINIMUM COVER (mm) TO ALL REINFORCEMENT INCLUDING FITMENTS SHALL BE AS FOLLOWS, U.N.O.:

ELEMENT	COVER (mm)
TANK BASES WITH EXPOSURE CLASS 'B2'	35
TANK LIDS	35

9. MINIMUM REINFORCEMENT LAP LENGTHS:

REINFORCING LAP SCHEDULE							
BAR Ø	FOOTING LAP		BEAM LAP		SLAB LAP	WALL LAP	COLUMN LAP
	BOTTOM	TOP	BOTTOM	TOP			
N12	500	650	500	650	500	500	500
N16	750	1000	750	1000	750	750	750
N20	1000	1250	1000	1250	1000	1000	1000
N24	1250	1600	1250	1600	1250	1250	1250
N28	1500	1950	1500	1950	1500	1500	1500
N32	1800	2300	1800	2300	1800	1800	1800
N36	2100	2700	2100	2700	2100	2100	2100
N40	2450	3150	2450	3150	2450	2450	2450

10. SUPPORT REINFORCEMENT IN ITS CORRECT POSITION DURING CONCRETING BY APPROVED BAR CHAIRS, SPACERS OR SUPPORT BARS SUITABLE FOR THE EXPOSURE CONDITIONS.
11. DO NOT WELD OR SITE BEND REINFORCEMENT UNLESS SHOWN IN THE DRAWINGS OR OTHERWISE SPECIFIED BY THE ENGINEER.
12. LAID REINFORCEMENT MESH BY ONE COMPLETE MESH.
13. REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND IS NOT NECESSARILY SHOWN IN TRUE PROJECTION.
14. SAMPLE TEST AND ASSESS CONCRETE COMPLIANCE IN ACCORDANCE WITH PROJECT ASSESSMENT OF STRENGTH GRADE TO SECTION 19.1.6 AS3600-2009.
15. THE CONCRETE SHALL BE COMPACTED USING HIGH FREQUENCY VIBRATORS.
16. CURING OF ALL CONCRETE SURFACES SHALL COMMENCE IMMEDIATELY AFTER SURFACES ARE FINISHED BY THE APPLICATION OF ALIPHATIC ALCOHOL AFTER EACH FINISHING OPERATION WHILE WATER SHEEN IS STILL EVIDENT THEN AS SPECIFIED AND SHALL CONTINUE FOR A MINIMUM OF 7 DAYS. CURING METHOD SHALL BE EITHER: CHEMICAL AD MIXTURES SHALL NOT BE USED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
17. CEMENT SHALL BE TYPE NORMAL CLASS PORTLAND CEMENT UNLESS NOTED OTHERWISE.
18. MAXIMUM 56 DAY SHRINKAGE STRAIN WHEN TESTED IN ACCORDANCE WITH AS1012. WATER/CEMENT RATIO SHALL BE A MAXIMUM OF 0.46.
19. MAXIMUM FLYASH CONTENT TO BE 10% MEASURED BY WEIGHT OF CEMENTITIOUS MATERIAL.
20. ALL SLAB SEALANTS SHALL BE SIKAFLEX PRO 2HP POLYURETHANE JOINT SEALANT OR APPROVED EQUIVALENT. SEALANT MUST BE APPLIED STRICTLY TO MANUFACTURERS SPECIFICATIONS WITH REGARD TO JOINT CONFIGURATION, SURFACE PREPARATION, PRIMING, DEBONDING, APPLICATION AND CLEANING.
21. ALL CHEMICAL ANCHORS SHALL BE RAMSET CHEMSET INJECTION 800 SERIES OR HILTI HIT-RE 500 INJECTION ADHESIVE OR APPROVED EQUIVALENT. ALL PREPARATION AND APPLICATION SHALL BE IN STRICT ACCORDANCE WITH THE MANUFACTURERS SPECIFICATION.

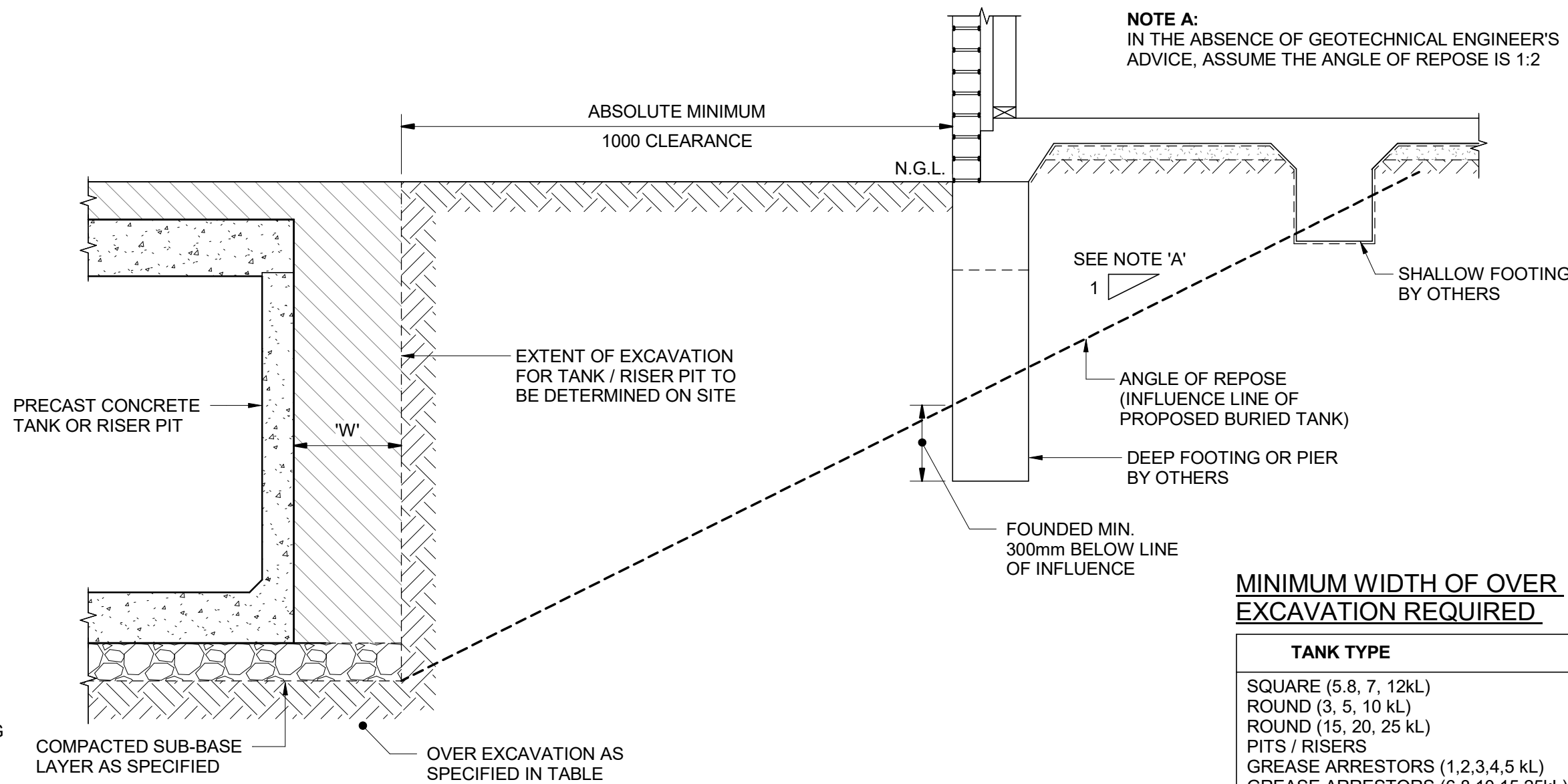
TANK BASE MUST BE FOUNDED ON NATURAL MATERIAL WITH ALLOWABLE BEARING CAPACITY OF 150kPa MIN.

DEPTH OF SOIL COVER (mm)	BASE LAYER THICKNESS (mm) *
<1000	100
1000 - 1500	150
1501 - 2000	200

* FOR FOUNDING TANK ON NATURAL GROUND WITH 150 kPa ALLOWABLE BEARING CAPACITY. ALTERNATIVELY WHERE ALLOWABLE BEARING CAPACITY = 175 kPa, A 100mm THICK BASE LAYER IS ADEQUATE UP TO 2000mm SOIL COVER.

1. THE BASE SLAB IS NOT TO BE FOUND ON A CUT/FILL PLATFORM. BASE SLAB IS TO BE WHOLLY FOUNDED IN EITHER CUT OR FILL. A LEVELLING LAYER / COMPACTED SUB BASE TO ABOVE MENTIONED DEPTHS TO BE PROVIDED.
2. SUBSTRATE TO BE OF COMPACTED SAND / ROAD BASE AT THE BASE OF THE EXCAVATION WITH A MINIMUM CB40 FOR TANKS SUBJECT TO VEHICLE LOADS, OR CB15 OTHERWISE.
3. GEOTECHNICAL INVESTIGATION REPORT SPECIFYING THE SITE SOIL CLASSIFICATION AND ALLOWABLE BEARING CAPACITY MUST BE PROVIDED TO AUSTRALIAN TANKS TO BE SUBMITTED WITH THIS TENDER.
4. WHERE MAXIMUM BEARING CAPACITY SPECIFIED CAN NOT BE ACHIEVED AT TANK BASE LEVEL CONTACT AUSTRALIAN TANKS ENGINEERS FOR SPECIFIC FOUNDATION DESIGN.

1. LEVEL 1 SUPERVISION AND TESTING OF FILLING MUST BE UNDERTAKEN WHERE FILLING IS TO SUPPORT BUILDINGS OR PAVEMENTS. THE FILL MATERIAL SHALL BE COMPACTED IN LAYERS NOT MORE THAN 200mm THICK. EACH LAYER SHALL BE COMPACTED TO AT LEAST 98% OF THE MAXIMUM DRY DENSITY AS DEFINED BY THE STANDARD COMPACTION TEST AS1289.
2. WHEN BACKFILLING AROUND AND ADJACENT TO WALLS FOR AREAS NOT DIRECTLY SUBJECT TO AND OUTSIDE THE ZONE OF INFLUENCE FROM VEHICULAR TRAFFIC. UNCONTROLLED FILL COMPRISED OF CLEAN WELL GRADED MATERIAL FREE OF ANY ORGANIC MATTER MAY BE USED AS AN ALTERNATIVE AT THE CLIENT'S DISCRETION.
3. AUSTRALIAN STANDARDS SUGGEST A SANDY GRANULAR COMPACTABLE, OR SELF-COMPACTING MATERIAL.
4. DRAINAGE GRAVEL OR SIMILAR MATERIAL IS PERMITTED SO LONG AS SUITABLE CALCULATIONS HAVE BEEN CARRIED OUT TO CHECK THE REDUCED SHEAR STRENGTH REQUIRED IS SUITABLE FOR ANTI-FLOATATION REQUIREMENTS. (SEEK ENGINEER'S ADVICE).
5. BACKFILLING VARIATIONS IN HEIGHT BETWEEN ON OPPOSITE SIDES OF A WALL SHALL NOT EXCEED 500mm.
6. VIBRATORY TYPE COMPACTION OF BACKFILL AND OVERBURDEN MATERIAL NOT PERMITTED. SEEK AUSTRALIAN TANK ENGINEER'S ADVICE FOR REQUIREMENTS.
7. ENSURE TANK LID IS FULLY INSTALLED AND SEALED PRIOR TO SURCHARGING WALLS OR LID DURING BACKFILL PROCEDURE.



MINIMUM WIDTH OF OVER EXCAVATION REQUIRED

TANK TYPE	WIDTH 'W'
SQUARE (5.8, 7, 12kL)	250
ROUND (3, 5, 10 kL)	250
ROUND (15, 20, 25 kL)	300
PITS / RISERS	150
GREASE ARRESTORS (1.2,3,4,5 kL)	250
GREASE ARRESTORS (6,8,10,15,25kL)	250

NOTE:
PROJECT ENGINEER MUST APPROVE PROPOSED
TANK / RISER PIT LOCATION AND EXCAVATION

1. AS REQUIRED UNDER SECTION 28 OF THE OCCUPATIONAL HEALTH AND SAFETY ACT 2004, **DTA STRUCTURAL ENGINEERING HAS UNDERTAKEN A SAFETY IN DESIGN (SID) ASSESSMENT FOR THIS PROJECT AND, AS DESIGNERS, WE ARE TO PROVIDE WRITTEN COMMUNICATION TO OUR CLIENT THAT SPECIFIES THE HAZARDS OF OUR DESIGN, AS WE ARE REASONABLY AWARE THAT:**
 - A. CREATE A RISK TO THE HEALTH OR SAFETY OF PERSONS WHO ARE INVOLVED IN THE CONSTRUCTION, OPERATION, MAINTENANCE AND DECOMMISSIONING OF THE PROJECT; AND
 - B. THAT ARE SPECIFIC TO THE PROJECT.
2. THE SCOPE OF THE FOLLOWING SID ASSESSMENT IS LIMITED TO THE HAZARDS THAT WE REASONABLY FORSEE AT THE TIME OF DESIGN AND THAT COULD RESULT FROM DESIGN ASPECTS OF THE PROJECT THAT WE ARE RESPONSIBLE FOR.
3. THIS ASSESSMENT DOES NOT SEEK TO IDENTIFY ALL CONSTRUCTION SIZE HAZARDS COMMONLY ENCOUNTERED WITH PROJECTS OF THIS NATURE, FOR WHICH THE IDENTIFICATION AND MANAGEMENT REMAINS THE RESPONSIBILITY OF THE CONTRACTOR.
4. OUR ASSESSMENT ASSUMES ANY WORK UNDERTAKEN IN THE PROJECT UNDER THE CONTRACTOR WILL BE CARRIED OUT BY SUITABLY QUALIFIED PERSONNEL WITH APPROPRIATE EXPERIENCE AND COMPETENCE TO UNDERTAKE SUCH TASKS.
5. ANY ADDITIONAL HAZARDS OR RISKS THAT MAY ARISE DURING THE PROJECT LIFE NOT COVERED IN THIS REPORT SHOULD BE BROUGHT TO THE ATTENTION OF **AUSTRALIAN TANKS** FOR REVIEW AND DIRECTION ON RESOLUTION.
6. THE SID PROCESS INVOLVED THE FOLLOWING STEPS:
 - A. HAZARD IDENTIFICATION
 - B. CONSEQUENCE ASSESSMENT
 - C. RISK RATING
 - D. IDENTIFICATION OF CONTROL MEASURES TO MITIGATE RISK
 - E. INCORPORATION OF CONTROL MEASURES INTO DESIGN
 - F. RISK RE-RATING OF HAZARDS
- REFER TO THE FOLLOWING RISK RATING REGISTER
7. THE CLIENT MUST PROVIDE A COPY OF THIS ASSESSMENT TO THE PRINCIPAL CONTRACTORS TENDERING ON THIS PROJECT, MAINTENANCE PERSONNEL AND BUILDING USERS.

ABNORMAL AND DESIGN RELATED RISKS											TREATMENT							
Item	Project Phase & Element		Hazard	Location / Description	Risk	Residual Risk Manager	Date Reviewed	Severity	Likelihood	Risk Rating	Treatment Options		Severity	Likelihood	Residual Risk	Adopted Treatment	Reason	By Whom
F1	FABRICATION	Collapse of formwork during erection and concrete placement	Fabrication facility	Refer hazard	Australian Tanks	4/1/19	Medium	Low	Low	Ensure erected formwork is adequately secured, stabilised and fastened together. Ensure formwork complies with AS3610.	Medium	Low	Low	Refer treatment options	Most effective / appropriate	Australian Tanks		
F2		Falling into open formwork entrapment	Fabrication facility	Refer hazard	Australian Tanks	4/1/19	High	Low	Medium	Cover and fence off all foundation excavations prior to reinf / concrete installation	High	Low	Medium	Refer treatment options	Most effective / appropriate	Australian Tanks		
F3		FABRICATION	Craneage of precast elements	Fabrication facility	Refer hazard	Australian Tanks	4/1/19	High	Low	Medium	Ensure all elements have achieved the required concrete strength prior to lifting from formwork. Ensure all safety measures are undertaken when using cranes or other lifting devices to move precast elements.	High	Low	Medium	Refer treatment options	Most effective / appropriate	Australian Tanks	
I1	INSTALLATION	Construction loads exceeding capacity of in situ ground	Construction equipment / sloping ground	Refer hazard	Installation Contractor	4/1/19	Medium	Low	Medium	When using construction equipment ensure that surrounding ground is suitable to carry construction equipment / site conditions are suitable	High	Low	Medium	Refer treatment options	Most effective / appropriate	Installation Contractor		
I2		INSTALLATION	Neighbour's lots boundary conditions (retaining walls / neighbour's pool / council easements etc)	Within excavation	Refer hazard	Installation Contractor	4/1/19	Medium	Low	Low	Refer to local council for any boundary conditions with regard to exclusion from construction. Review neighbouring lots conditions as required.	Low	Low	Low	Refer treatment options	Most effective / appropriate	Installation Contractor	
I3		INSTALLATION	Craneage of precast tanks and lids into place	Within excavation	Refer hazard	Installation Contractor	4/1/19	High	Medium	High	Install and maintain pool fencing compliant with local authority requirements. Supervise pool swimmers at all times	High	Low	Medium	Refer treatment options	Most effective / appropriate	Installation Contractor	
M1	MAINTENANCE	Falling into tank	Tank entrance	Refer hazard	Tank owner / maintenance contractor	4/1/19	Medium	Low	Low	Erecting fall protection devices at manhole location.	Low	Low	Low	Refer treatment options	Most effective / appropriate	Tank owner / maintenance contractor		
M2		MAINTENANCE	Entrapment	Inside tank	Refer hazard	Tank owner / maintenance contractor	4/1/19	Medium	Low	Low	Ensure all elements have achieved the required concrete strength prior to lifting from formwork. Ensure all safety measures are undertaken when using cranes or other lifting devices to move precast elements.	Low	Low	Low	Refer treatment options	Most effective / appropriate	Tank owner / maintenance contractor	
M3		MAINTENANCE	Drowning	Inside tank	Refer hazard	Tank owner / maintenance contractor	4/1/19	Medium	Low	Low	Do not enter tank with water inside.	Low	Low	Low	Refer treatment options	Most effective / appropriate	Tank owner / maintenance contractor	
D1	REFURBISHMENT	Risks as per abnormal and maintenance style activities (M1-M3)																
R1	DEMOLITION	NO ABNORMAL AND/ OR DESIGN RELATED HAZARDS IDENTIFIED																

[illegible]

	High Fatality Major illness Long term disability	Medium Injury/illness causing Short term disability	Low Minor injury/illness
High Certain/nearly certain	H	H	M
Medium Reasonably likely	H	M	L
Low Seldom	M	L	L

3 x 3 Risk Assessment Matrix

0.2	ISSUED FOR CONSTRUCTION	DTA	03/02/20
0.1	FOR REVIEW	DTA	04/11/19
Issue	Description	Issued By	Date

H Scale 1 : 20

V Scale 1 : 20

0 2 4 8 12

0 2 4 8 12

@A

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Australian Tanks
1300-A-TANKS
Water and Waste Water Specialists

TANK INSTALLATION NOTES & SPECIFICATIONS

Scale:	As Indicated @ A1	Sheet Size:	A1
Drawn:	DTA	THE DESIGNS AND PLANS REPRESENTED ON THIS DRAWING ARE NOT TO BE REPRODUCED IN WHOLE OR PART WITHOUT CONSENT OF DTA STRUCTURAL ENGINEERING PTY LTD. ALL DIMENSIONS TO BE VERIFIED ON SITE. REPORT ANY DISCREPANCIES TO THE ENGINEER. DO NOT SCALE OFF DRAWINGS.	
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RPEQ:	Dean Anderson (RPEQ 21536)		
Drawing Title:			
GENERIC ENGINEERING NOTES		Drawing Number:	Rev:
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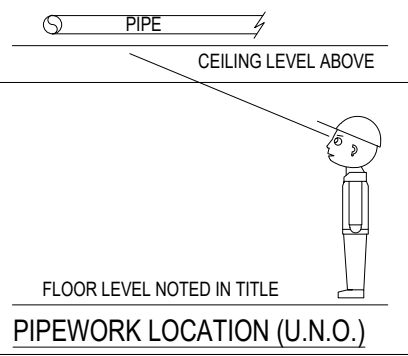
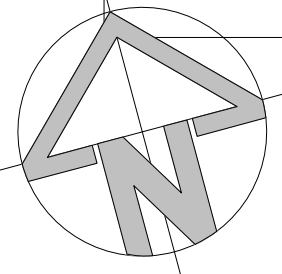
Appendix 4.0 Hydraulics As-Built Drawings

40mm RAINWATER HARVESTING CONTROL SYSTEM (240 VOLT)
INCORPORATING AUTOMATIC MAINS BACKUP WITH A SUBMERSIBLE PUMP FITTED WITH A FLOAT SWITCH AND A 20mm JUDO FILTER ON THE SUPPLY PIPE FROM THE RAINWATER PUMP OUTLET

HUNTER PUMPS VARIABLE RAINSAVER SET
COMPLETE WITH INTERCONNECTING WIRING BETWEEN PUMPS, CONTROL PANEL AND PRESSURE TRANSDUCER WITH A MAINS BYPASS VIA FLOAT SWITCH AND SOLENOID VALVE.

- STAINLESS STEEL BAG FILTER (MODEL SLB-SS SERIES)
- AUTOMATIC BACKWASH FILTER MODEL (JS4 SERIES) 32mm
- ULTRAVIOLET DISINFECTOR FILTER MODEL (UV-HE 8 SERIES) C/W AUDIBLE AND VISUAL ALARM FAILS.

REV	DATE	AMENDMENT
A	12/08/21	WORK AS EXECUTED



ARCHITECT:
DWP

CLIENT:
NIHON UNIVERSITY

PROJECT:
NIHON UNIVERSITY, NEWCASTLE CAMPUS
9 CHURCH STREET, NEWCASTLE
EDUCATION - LEVEL 1 - HYDRAULIC SERVICES

Drawn
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Design
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Approved
A G M

FOR CONSTRUCTION

Scale
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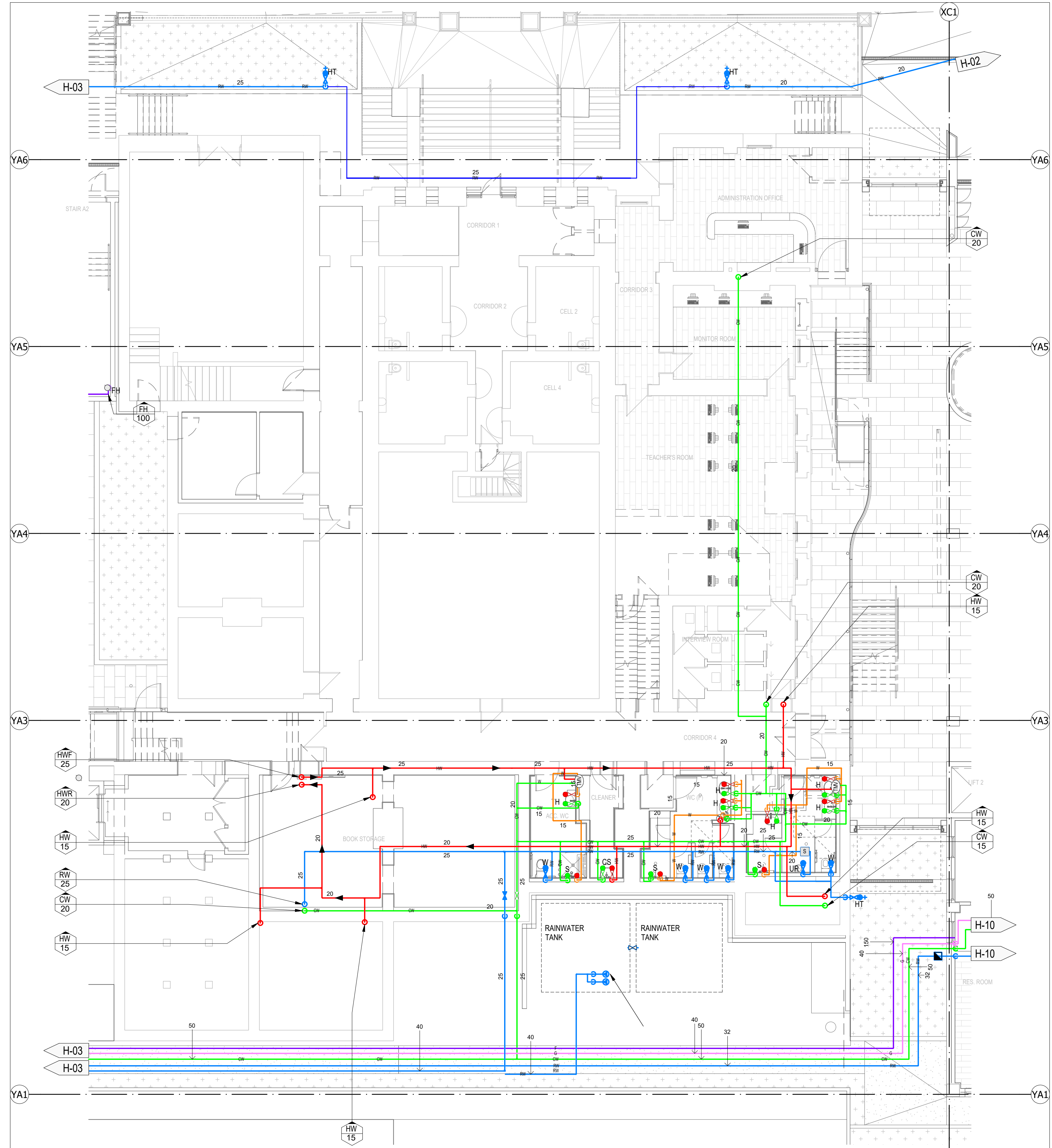
Job NO.
18571

DRG. No.
MP- WAE-H-03

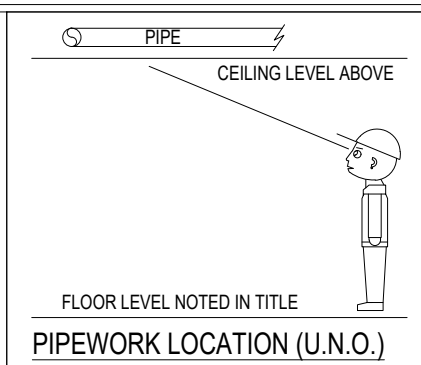
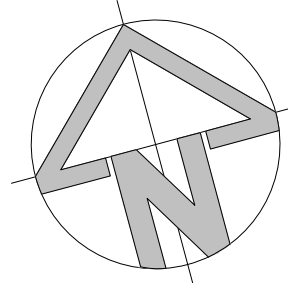
Size
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No. in SET

Revision
A

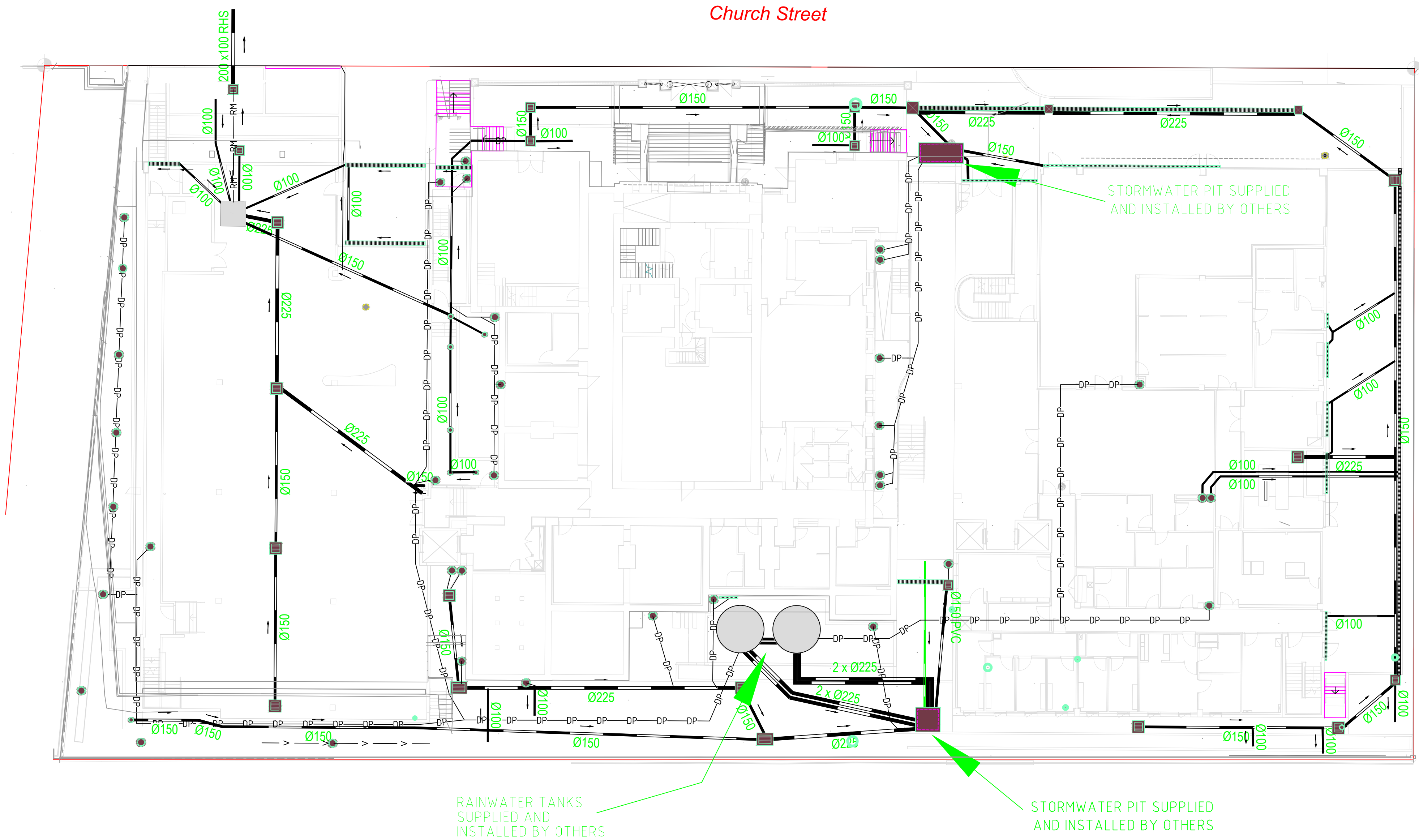
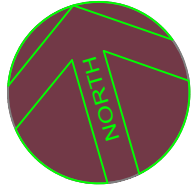


REV	DATE	WORK AS EXECUTED AMENDMENT
A	23/08/21	WORK AS EXECUTED



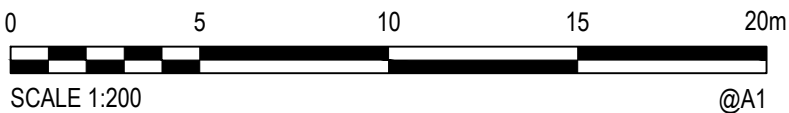
ARCHITECT:	DWP
CLIENT:	NIHON UNIVERSITY
PROJECT:	NIHON UNIVERSITY, NEWCASTLE CAMPUS 9 CHURCH STREET, NEWCASTLE COURT HOUSE - LEVEL 1 - HYDRAULIC SERVICES

Drawn	WORK AS EXECUTED	Size	A1
Design	Scale 1 : 100	Job NO. 18571	No. In SET
Approved	DRG. No. MP-WAE-H-07	Revision	A



LEGEND			
	PROPOSED STORMWATER PIT		EXISTING PIPE
	PROPOSED STORMWATER PIPE AND SIZE		EXISTING WATER
	PROPOSED DOWNPIPE REFER HYDRAULIC ENGINEERS DOCUMENTATION		EXISTING OPTIC FIBRE
	PROPOSED Ø100 SUBSOIL PIPE AND CLEAN OUT		EXISTING ELECTRICITY
	PROPOSED GRATED DRAIN		EXISTING ELECTRICITY UNDERGROUND
	PROPOSED SWALE DRAIN		EXISTING GAS
	EXISTING DOWNPIPE LOCATION (APPROX.)		EXISTING COMMUNICATIONS
			EXISTING SEWER
			EXISTING SURFACE CONTOURS (INTERVAL = 0.5m)

Rev.	Date	Description	Des.	Verif.	Appd.
A	10/08/21	WAE	AGM	AGM	AGM





Cardno
Shaping the Future

OFFICE-LINE1
OFFICE-LINE2
OFFICE-LINE3
OFFICE-LINE4
OFFICE-LINE5

CDD_ANZ_OFFICE

Drawn	AGM	Date	AUG 2021
Checked	AGM	Date	AUG 2021
Designed	AGM	Date	AUG 2021
Verified	AGM	Date	AUG 2021
Approved	AGM	Date	AUG 2021

Client	AZUSA SEKKEI		
Project	NIHON UNIVERSITY AUSTRALIA NEWCASTLE CAMPUS PROJECT 9 CHURCH STREET, NEWCASTLE		
Title	STORMWATER MANAGEMENT PLAN		

Status			
WEA			
Datum	Register	Scale	Size
AHD	-	1:200	A1
Drawing Number			Revision
MP-WEA-CI-415			A

Appendix 5.0 Geberit Maintenance Guide

5 Maintenance

5.1 General maintenance notes

The building owner must check and maintain the Geberit Pluvia roof drainage system. Geberit recommends using skilled persons to plan and carry out this work.

Checks and maintenance must be performed periodically or as required and recorded in writing.

Control and maintenance work make it possible to recognize and correct signs of wear and damage early on. This extends the service life of the roof drainage system. Furthermore, the ageing behaviour of the roof structure can be evaluated and a modernisation can be planned in the long term.

After storms, the roof drainage system must be checked by the building owner or a skilled person.

Regular maintenance of the flat roof, the drainage gutter and the sumps ensures continuously safe and optimum roof drainage.

5.1.1 Regular maintenance work

The Geberit Pluvia siphonic roof drainage system is low maintenance.

- A 500 mm wide zone must be kept free from vegetation around the Geberit Pluvia outlet (e.g. with a gravel bed). Contamination, e.g. by leaves or growth must be periodically removed to prevent humus formation or blockage.
- The cleaning must be performed regularly according to the respective environmental influences and also includes flat roof, drainage gutter as well as emergency overflows.
- Contamination and blockage of the pipelines of critical roof structures must be prevented by periodically cleaning the pipes.

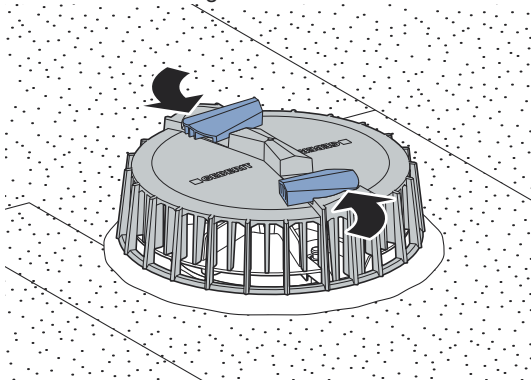
5.2 Maintenance intervals and cleaning of Geberit Pluvia outlets

Maintenance work on the outlet depends on the respective environmental conditions. It is therefore not possible to define exact maintenance intervals.

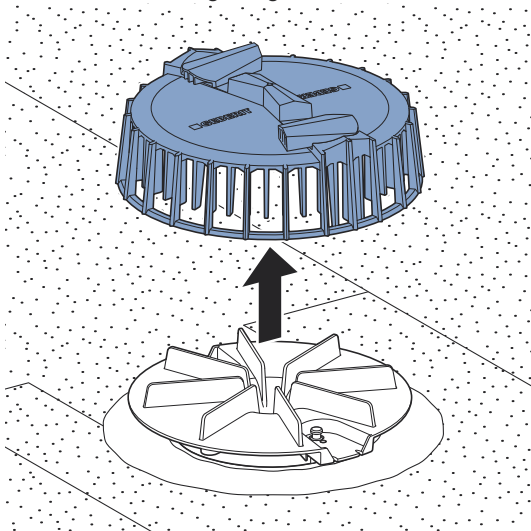
Maintenance work	Maintenance interval
Remove foreign bodies such as dirt, leaves or roof growth.	Select maintenance intervals so that obstruction of the sump is prevented.
Clean the outlet and function disc.	Select maintenance intervals so that obstruction of the outlet is prevented; however, at least once per year.

5.2.1 Cleaning the Geberit Pluvia 12 l and 25 l outlet

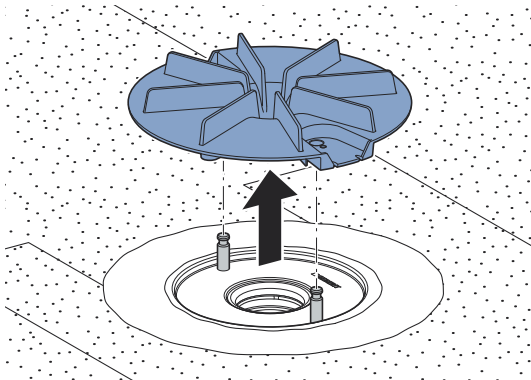
- 1** Unlock both rotating lock bars.



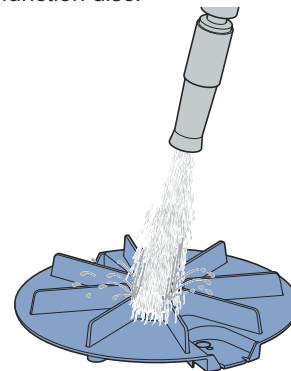
- 2** Remove the outlet grating.



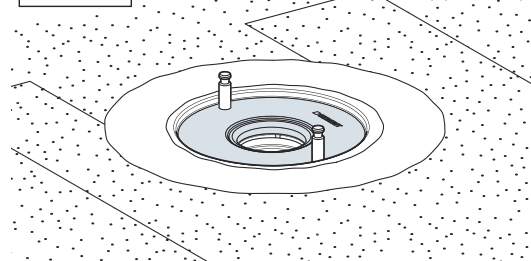
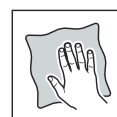
- 3** Remove the function disc.



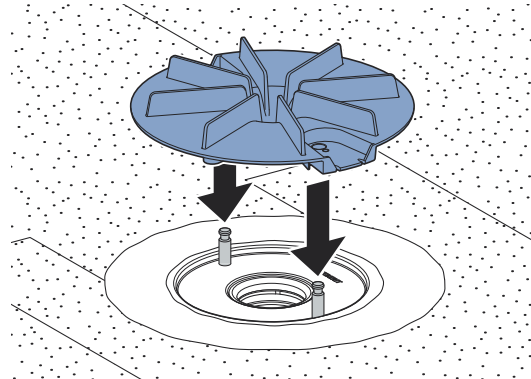
- 4** Clean the function disc.



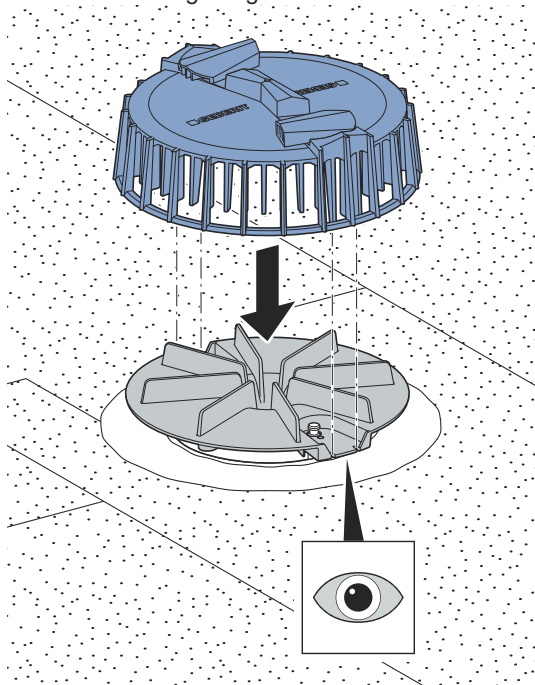
- 5** Clean the entire outlet area.



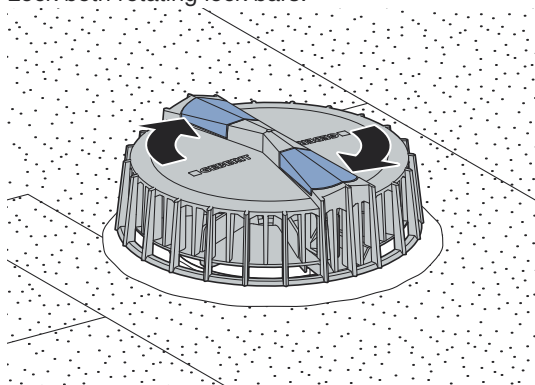
- 6** Mount the function disc.



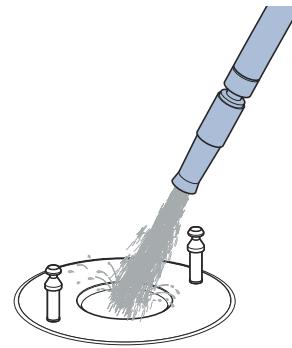
7 Mount the outlet grating.



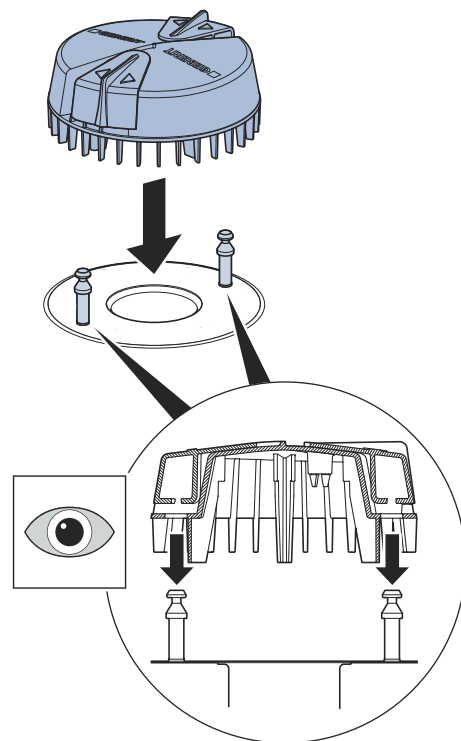
8 Lock both rotating lock bars.



2 Clean the outlet grating and outlet area.

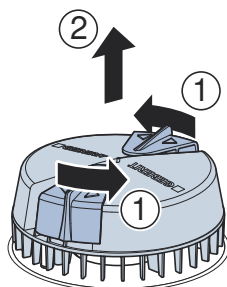


3 Place the outlet grating on the pins.

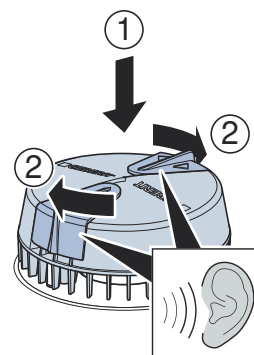


5.2.2 Cleaning the Geberit Pluvia 19 l outlet

1 Open both rotary latching sliders and remove the outlet grating.

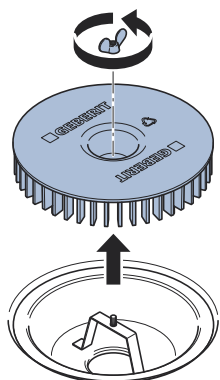


4 Mount the outlet grating and close both rotary latching sliders.

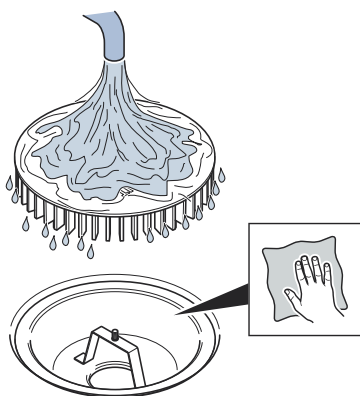


5.2.3 Cleaning the Geberit Pluvia 45 l, 60 l and 100 l outlet

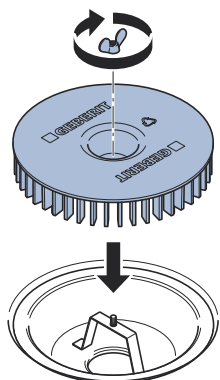
- 1** Remove the wing bolt.



- 2** Clean the outlet grating and outlet area.



- 3** Mount the outlet grating and fasten the wing bolt.



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www.geberit.com.au/pluvia

Appendix 6.0 Rainwater Harvesting System Manuals



EQUIPMENT MANUAL

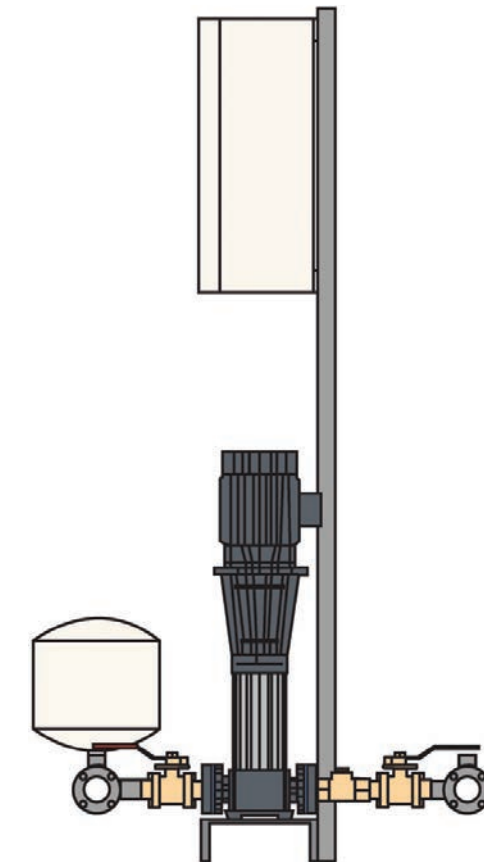
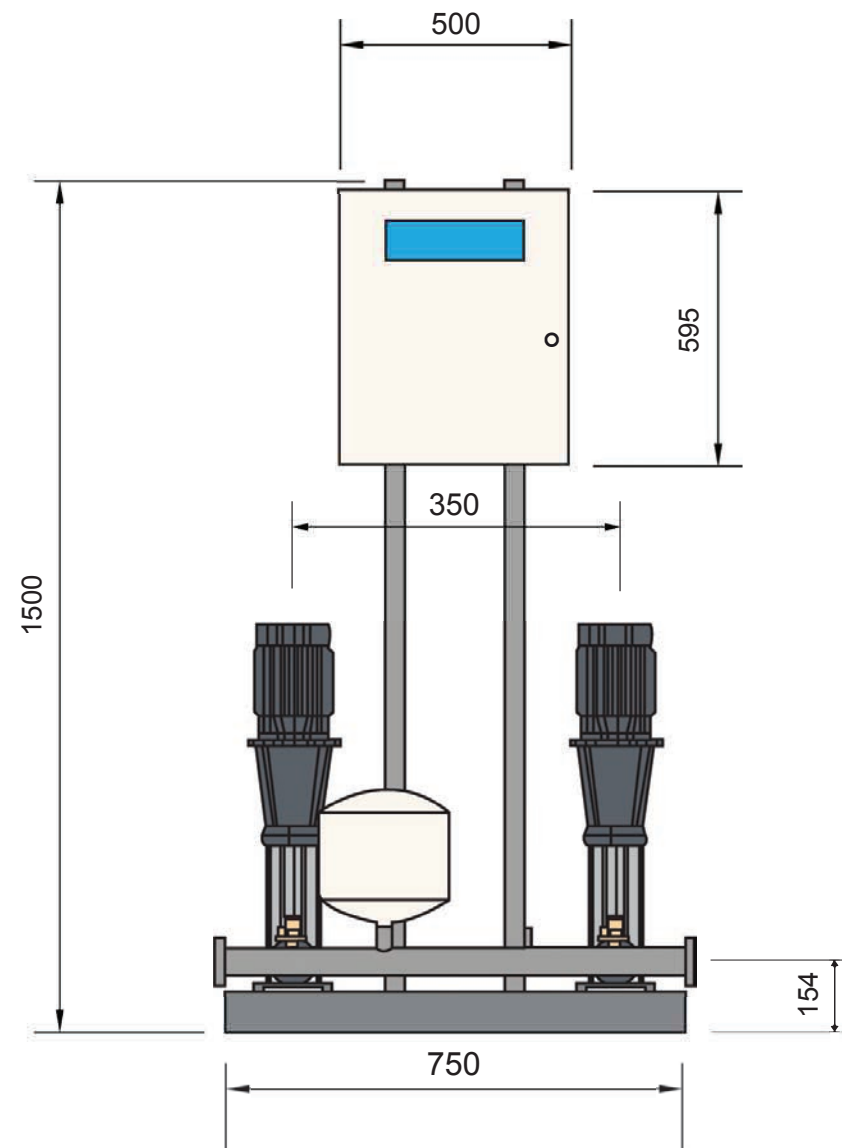
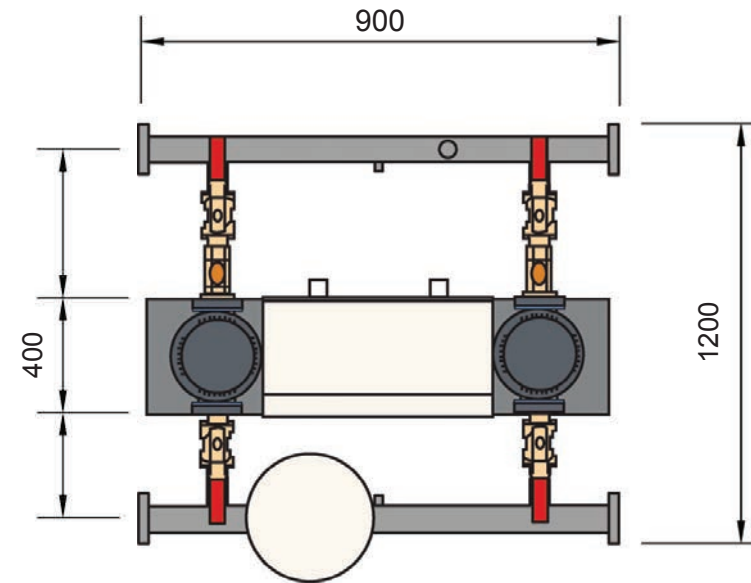
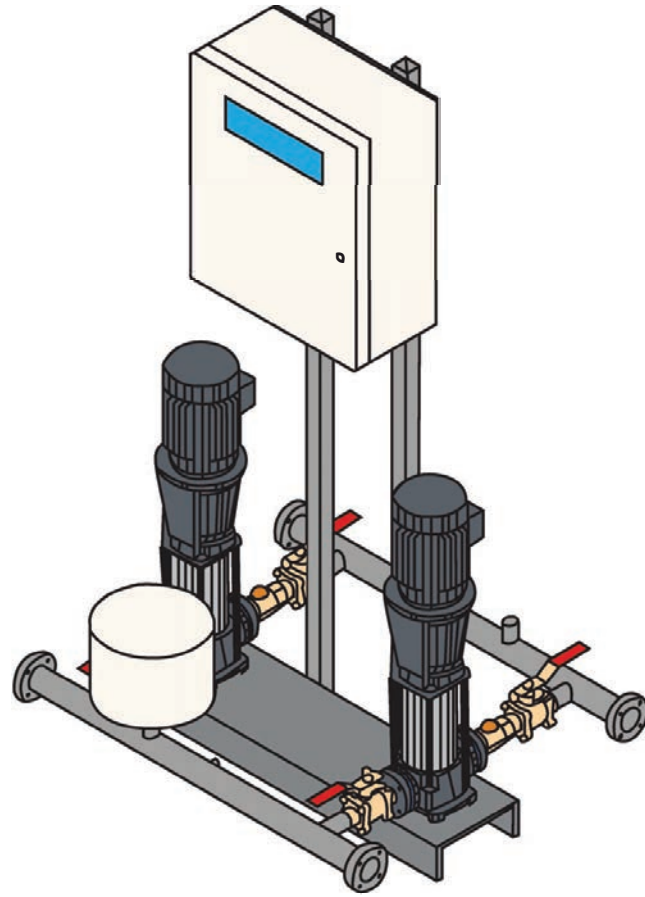


DUAL VARIABLE SPEED NON-POTABLE COLD WATER PUMPSET



TABLE OF CONTENTS

4	SECTION 1 - PUMPS
18	SECTION 2 - CONTROL PANEL
49	SECTION 3 - WARRANTY



SECTION 1 - PUMPS

Read this manual carefully before installing or starting the pump.

1. APPLICATIONS & CONDITIONS

CDL and CDLF pumps are non-self-priming vertical multistage centrifugal pumps. They are efficient and lightweight with low noise and a compact structure.

1.1 APPLICATIONS

- Pumped Liquids: These pumps can handle low viscosity, neutral and non-explosive liquids, free of solid particles or fibres. The liquid must not attack the pump materials chemically.
- Boiler water supply and condensing systems.
- Water treatment and filtration systems.
- Food and beverage industry.
- Pressure boosting systems.
- Irrigation.
- Liquid conveying, circulation and boosting.
- Hot and cold water.

1.2 OPERATING CONDITIONS

- Liquid temperature: Normal temperature type $-15^{\circ}\text{C} \sim +70^{\circ}\text{C}$.
Hot Water type $-15^{\circ}\text{C} \sim +120^{\circ}\text{C}$.
- Flow range: $0.4 \sim 180\text{m}^3/\text{h}$.
- Liquid pH range: pH 5~9.
- Max. ambient temperature: $+40^{\circ}\text{C}$.
- Max. altitude: 1000m.
- Min inlet pressure: Refer to CDL/CDLF catalogue.

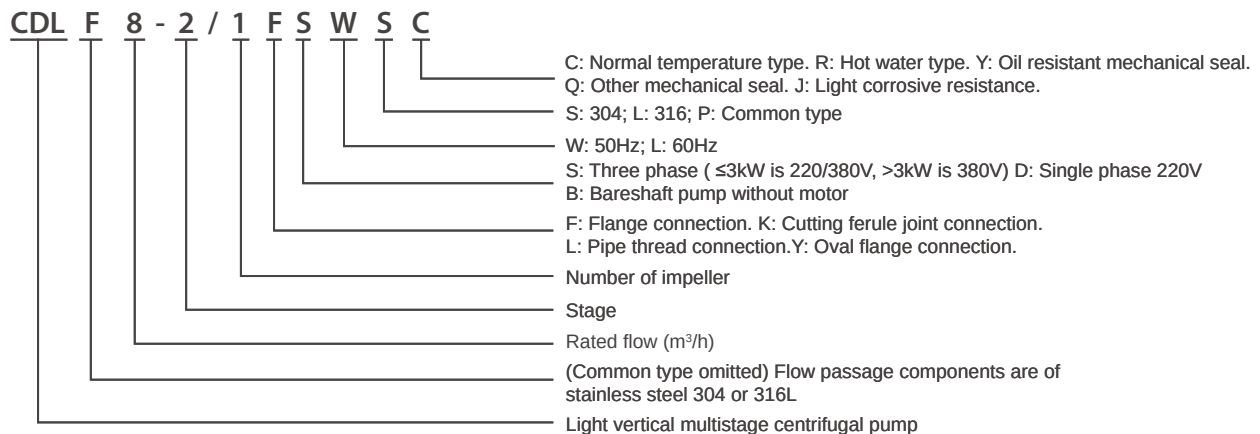


CAUTION

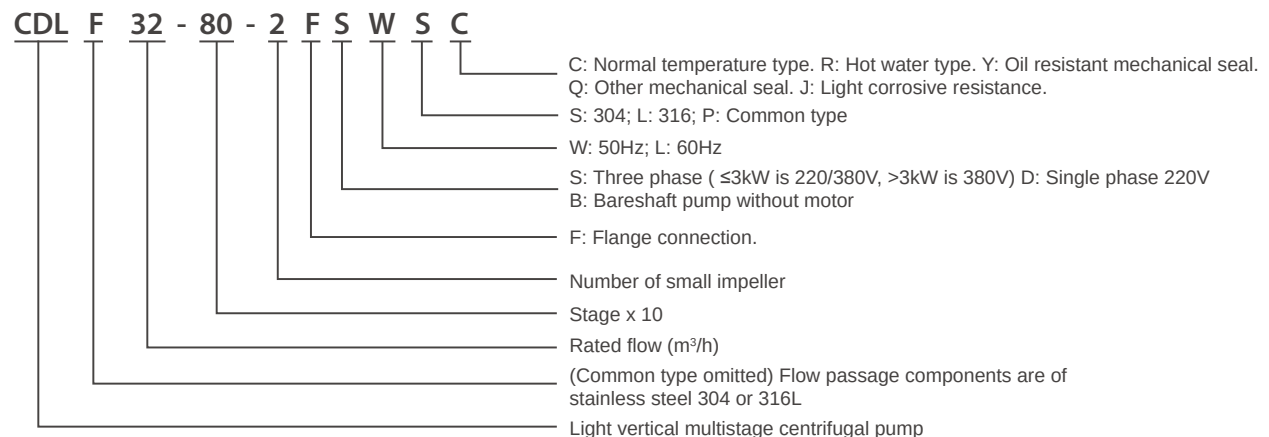
- When pumping liquids with a density and/or viscosity higher than that of water, use motors with correspondingly higher outputs, if required.

2. DEFINITION OF MODEL

2.1 CDL/CDLF 1, 2, 3, 4, 8, 16, 20

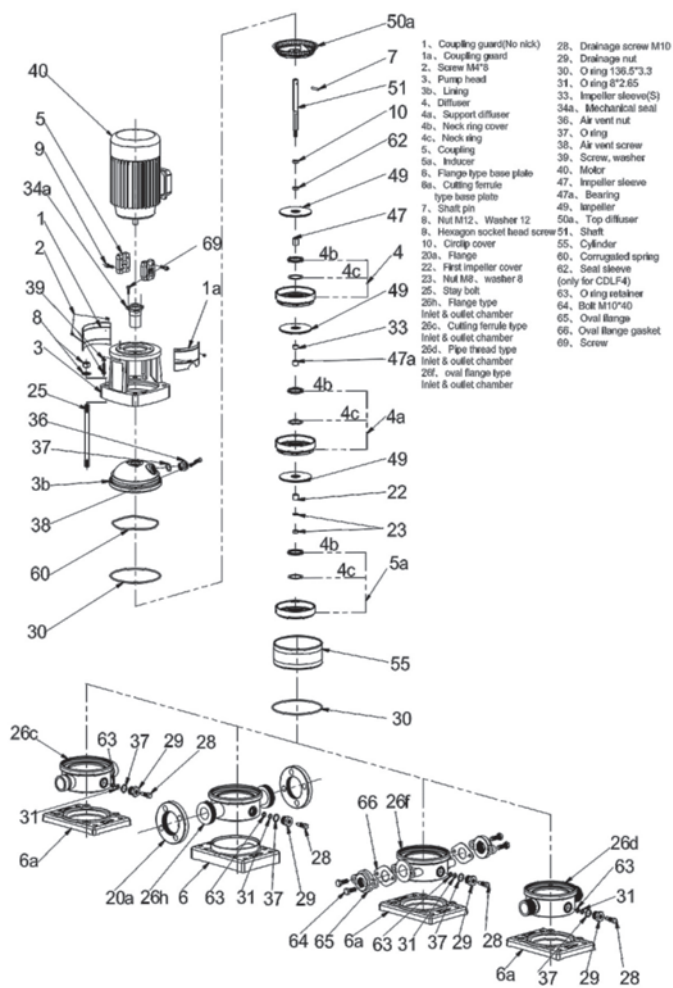


2.2 CDL/CDLF 32, 42, 65, 85, 120, 150

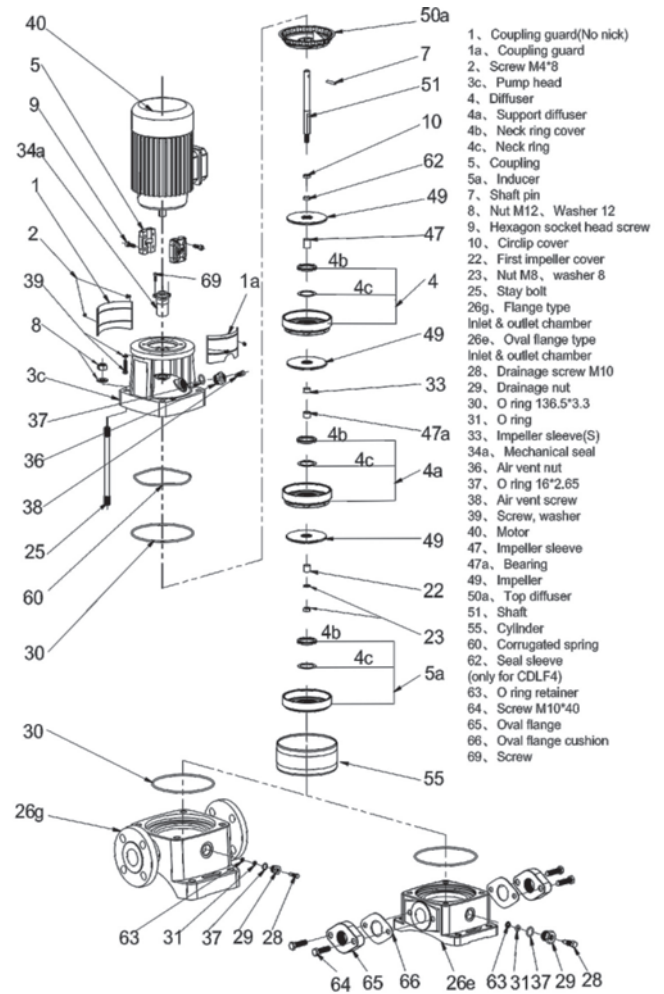


3. STRUCTURE

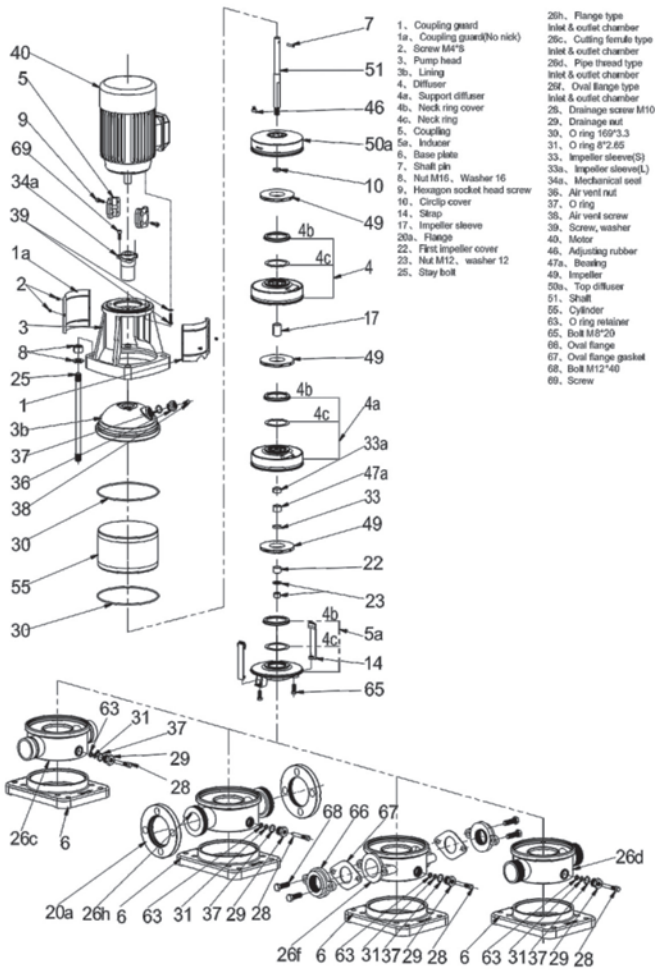
- The CDL/CDLF model is composed of a motor, pump head, diffuser, impeller, cylinder, inlet/outlet chamber, pump shaft and mechanical seal etc.
- The key parts of the pump, diffuser, impeller, cylinder and shaft are made of stainless steel. The pump head and inlet/outlet chamber is made of cast iron for the CDL series, while for the CDLF series, they are made of stainless steel.
- The mechanical seal is a single face seal made of cemented carbides/carbon. The support part of the diffuser is made of tungsten carbide.
- Normally the pipes are connected by round flanges, although different connection types are available on demand.



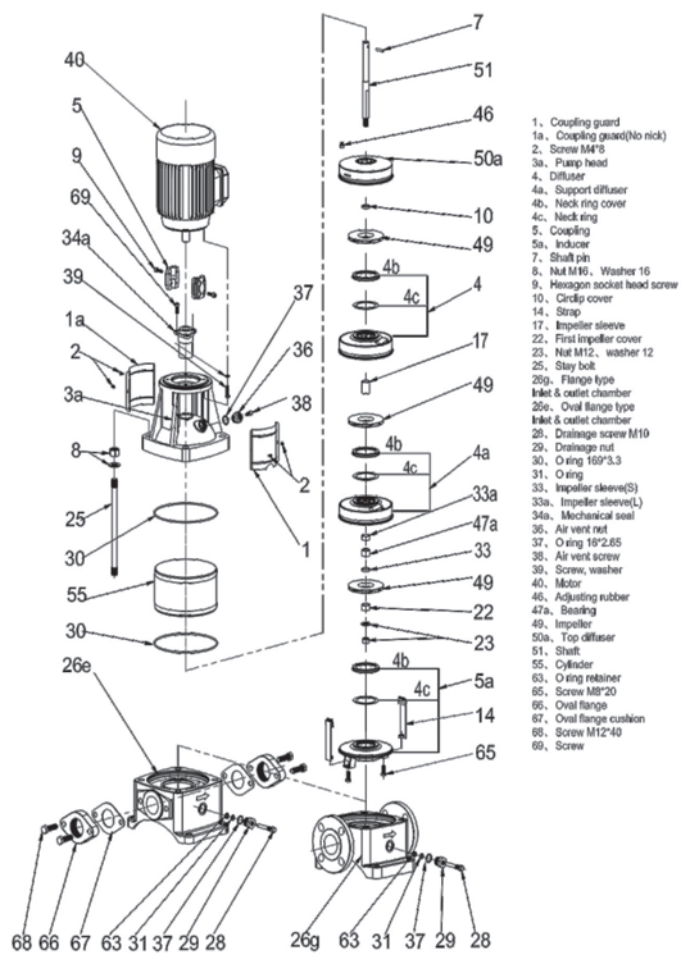
CDLF 1, 2, 3, 4 Pump Structure



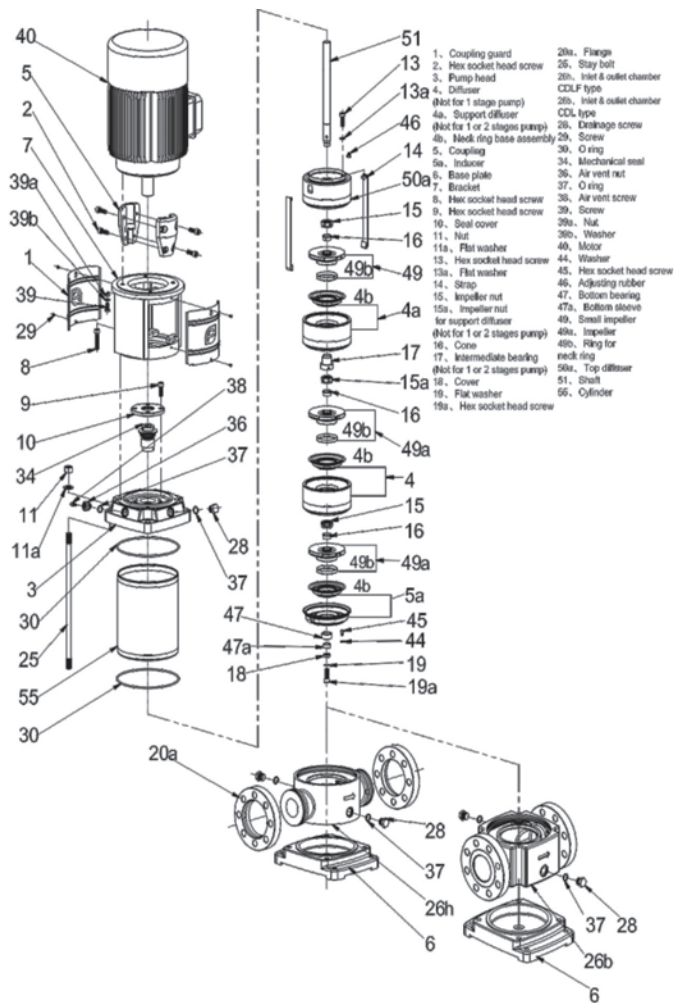
CDL 1, 2, 3, 4 Pump Structure



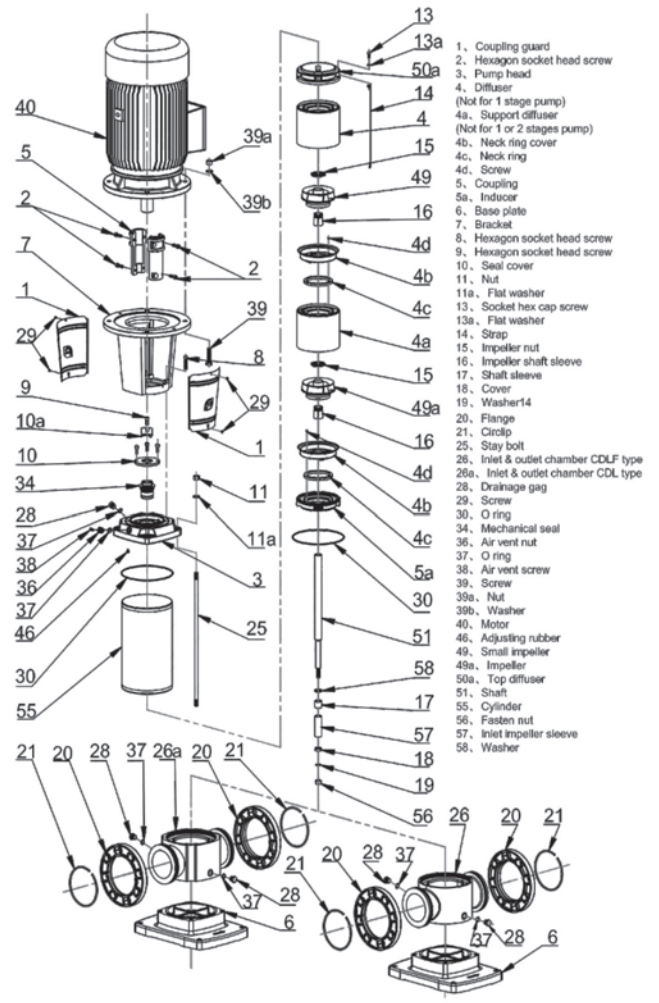
CDLF 8, 12, 16, 20 Pump Structure



CDL 8, 12, 16, 20 Pump Structure



CDL/CDLF 32, 42, 65, 85 Pump Structure



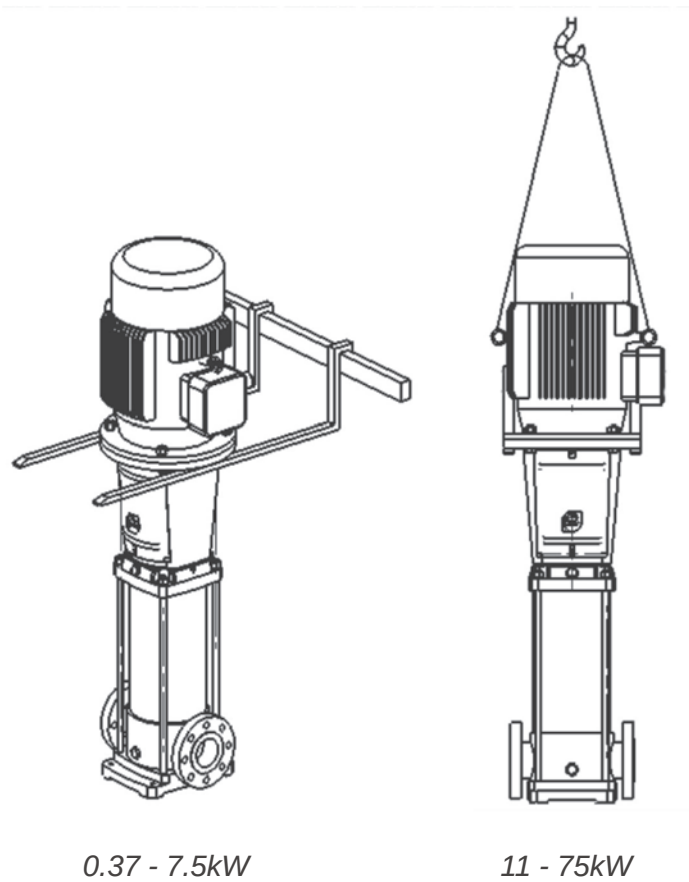
CDL/CDLF 120, 150 Pump Structure

4. INSTALLATION & CONNECTION

4.1 HANDLING

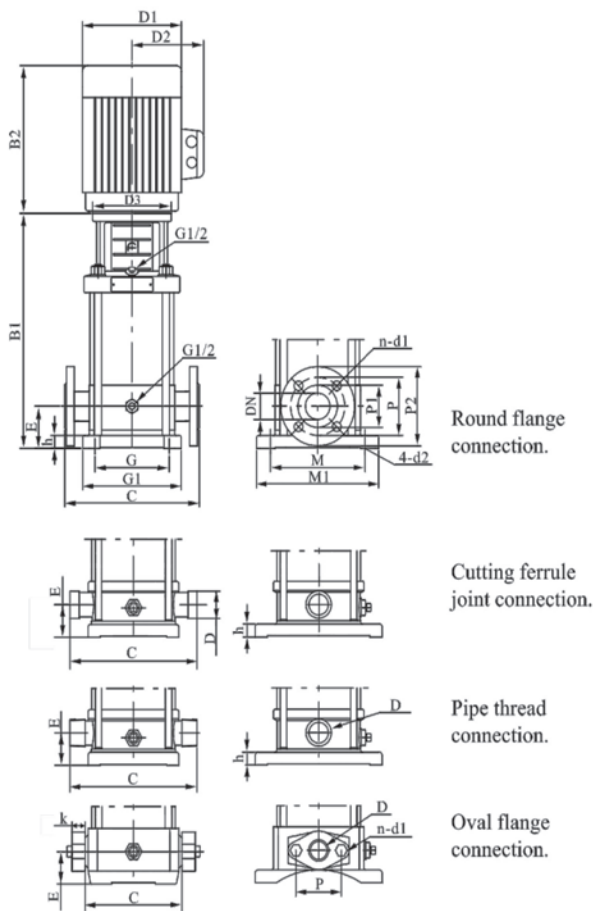
When lifting the entire pump with motor, follow these instructions:

- Pumps with motor sizes 0.37 - 7.5kW - Lift the pump in the motor flange with straps.
- Pumps with motor sizes 11 - 75kW - Lift the pump by means of motor eyebolts.



4.2 PUMP INSTALLATION

Pump size and dimensions can be found on the data sheets for each model.
An installation sketch is below.



Size		Model													
		1	2	3	4	8	12	16	20	32	42	65	85	120	150
Round flange connecting	DN	25			32	40			50	65	80	100		125	
	P1		60				80			107	120	150		175	
	P		85		100	110		125		145	160	180		220	
	P2		115		140	145		160		185	200	220		270	
	n-d1	4-φ 14			4-φ 18					8-φ 18				8-φ 28	
	C	250				280		300		320		365	380	380	
	E	75				80		90		105		140		180	
	h	32				25		35		30		45		40	
Cutting ferrule joining connection	Nominal pressure	PN25								PN 25-40	PN 16-25		PN16	PN 25-40	
	D	42				60									
	C	210				260									
	E	50				80		90							
Pipe thread connection	h	20				25		35							
	D	ZG 1¼				ZG2									
	C	210				260									
	E	50				80		90							
Oval flange connection	h	20				25		35							
	P	75				100									
	n-d1	2-M 10 x 40				2-M 12 x 45									
	k	22													
	G	100				130				170	190	199		275	
	G1	150				199				225	245	255		340	
Footer size	M	180				215				240	266	280		380	
	M1	210				247				298	330	348		472	
	d2	13								14				18	

The pump should be sited in a well ventilated and frost-free position. The distance between pump - motor and other objects should be at least 150mm, in order to cool the motor by fan with enough air.

- To reduce the head loss of the inlet to be as little as possible, the inlet pipe should be as short as possible.
- Ensure the check valve is installed in the pipeline system before the pump installation. If the pump is used for boiler water supply, a check valve must be installed in the piping between the pump and boiler.

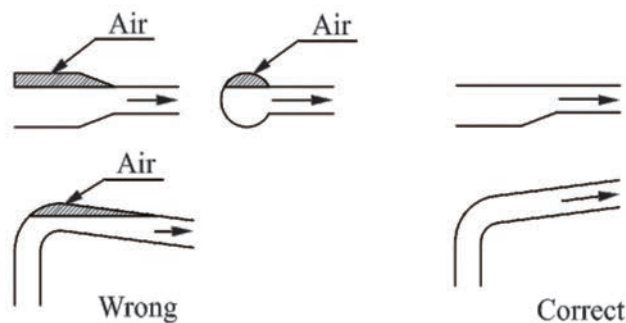
- The pump should be installed in a cement base or other similar base with suitable height. It can also be installed in fixed grounds or brackets on the wall. Ensure the weight of the pipe system does not rest on the pump to prevent the pump from damage.



CAUTION

- When installing the pumpset, the motor should not be hung upside down.
- Arrow on the inlet and outlet chamber shows the direction of the flow of liquid through the pump. Check whether the liquid can flow easily before starting the pump.
- Before pump installation, the inlet pipe line should be cleaned. If there are impurities in the pipe it is necessary to install a strainer at 0.5-1m in front of the pump inlet (particularly recommended for pumps with flow less than 8m³/h).

The air locks must be avoided when installing the inlet pipeline.



- If the outlet globe valve might be closed (or the flow is decreased to zero), a bypass should be installed in the outlet pipeline to ensure adequate lubrication and cooling water to pass the pump.

4.3 ELECTRICAL CONNECTION

- Electrical connections should be carried out by an authorised electrician.
- To ensure the motor is suitable for the power supply, cables of the motor must be connected to a power supply according to the fig. on the terminal box, and the motor nameplate.
- Motor should be connected with a fast and effective motor starter, to ensure the motor will not be damaged by lack of phase, unstable voltage or overload. The motor must be earthed reliably.



CAUTION

- Before taking apart the terminal box cover or dismantling the pump, make sure the power supply is switched off.



WARNING *Electrical connection and safety devices*

- The pump units should be connected to the power supply by the appropriately rated power cables according to the motor ratings.
- The pump units should always be equipped with safety devices as required in the standards.
- The power supply to the pump unit must be equipped with the following electrical safety devices with appropriate ratings:
 - Emergency switch.
 - Circuit breaker (as a supply disconnecting (isolating) device as well as an overcurrent protective device).
 - Motor overload protection.

The following table is for suggestion:

380V (50Hz/60Hz)

No.	Power Input (kW)	Cable Connection	Input Current (A)	Cable Spec (mm ²)	Circuit Breaker (A)	Thermal Protector (A)
1	0.37	Y	1	0.75	5	1.2
2	0.55	Y	1.4	0.75	5	1.7
3	0.75	Y	1.8	0.75	5	2.2
4	1.1	Y	2.6	1	5	3.1
6	1.5	Y	3.5	1	10	4.2
8	2.2	Y	4.9	1.5	10	5.9
11	3	Y	6.3	1.5	10	7.6
13	4	Δ	8.2	2.5	20	9.8
15	5.5	Δ	11	2.5	20	13.2
16	7.5	Δ	15	4	20	18.0
17	11	Δ	21	4	25	25.2
18	15	Δ	29	6	32	34.8
19	18.5	Δ	35	10	40	42.0
20	22	Δ	41	16	60	49.2
21	30	Δ	55	16	60	66.0
22	37	Δ	68	25	80	81.6
23	45	Λ	82	35	100	98.4
25	55	Λ	100	70	160	120.0
26	75	Λ	134	70	160	160.8
27	90	Λ	160	90	200	192.0

- The acoustic noise emission is around 85dB (A).



CAUTION

- Before opening the terminal box, please shut off power supply to prevent power shock.
- Ensure pump is stopped prior to opening coupling guards.
- When installing the pump, please fix foundation bolts vertically to prevent the pump from falling.
- Please fill grease for the pump as required. For motor power less than 5.5kW, no grease fill is required. For motor power greater than or equal to 5.5kW, please fill grease every 5000 running hours.

5. START-UP, OPERATION & MAINTENANCE



CAUTION

- Read the label on the cylinder carefully prior to start up.

1. Do not start the pump until it has been fully filled with water or liquid.

- Fill water in pump in inverse pouring system.
- Close the pump outlet valve, release the air vent screw on the pump head and open the inlet valve slowly until stable water flows from the air vent screw. Then fasten the screw and open the check valve completely in the inlet pipeline.
- In open system, fill the water in the pump when the liquid surface is lower than the pump.
Please note: A check valve will be installed in the inlet pipe.
- Close the pump outlet valve, release the air vent screw and fill the liquid in the pump through the air vent screw hole until the pump and inlet pipeline are fully filled with water. Fasten the air vent screw again.



CAUTION

- Do not start the pump until it has been fully filled with liquid and air vented. Be careful of the direction of the air vent screw hole. Ensure flowing water will not injure persons, pump or parts.

2. Check the rotary direction.

- Switch on the power supply and view the rotary direction by observing the motor fan. The arrow on the pump head indicates the correct direction of rotation. From the motor-end, the pump should run counter-clockwise.

3. Prior to pump start-up.

- Check whether foundation bolt is fastened.
- Check whether pump is fully filled with water.
- Check whether the power supply voltage is correct.
- Check whether the pump turns correctly.
- Ensure all pipe lines are connected tightly and are supplying water normally.
- Ensure valves in the inlet pipe line are completely open and the outlet valve is opened slowly after pump start-up.
- If pressure meter is installed, check operational pressure.
- Check all controls for normal operation. If the pump is controlled via pressure switch, check and adjust the starting and stopping pressures. Check the full load current to ensure it does not surpass the max. current.

4. Frequency of pump starts.

- The pump should not be started too frequently. It is suggested the pump will not start more than 100 times per hour if the motor power is less than or equal to 4kW. In instances where the

motor power is greater than 4kW, the pump will not start more than 20 times per hour. If the pump starts and stops too frequently, the control device should also be checked and adjusted. It is also necessary in this instance to check the installation of the pump.

It is suggested that while the pump is running, flow should be controlled at 0.5-1.3 times rated flow.

5. Pumps that are installed according to this installation manual will work effectively and require little maintenance.

- The mechanical seal will be adjusted automatically. The moving part and stationary part is lubricated and cooled by the transferring liquid. When replacing the mechanical seal, the user must not disassemble the motor for power larger than 7.5kW.
- The pump bearing is lubricated by the transferring liquid.

6. Frost Protecting

- The pumps can be used with anti-frozen measures for water. If the pump is installed in an easily frozen place, suitable antifreeze should be added to the transferring liquid to prevent the pump being damaged. If antifreeze is not used, the pump will be stopped if frozen. Pumps which are not in use should be drained.

7. The following should be regularly checked:

- Pumps working and operating pressures.
- Possible leakages.
- Possible motor overheat.
- Cleaning/replacement of all strainers.
- Switch off time of motor when overloading.
- Frequency of starts and stops.
- All control operation.

If a malfunction is found, check the system according to the Fault finding and solutions chart.

8. Pump to be cleaned and stored appropriately when not in use for long periods of time.

- The pump should protected from damage and corruption in storage.

6. ASSEMBLY AND DISASSEMBLY

6.1 CDL/CDLF 1, 2, 3, 4

- Put circlip cover on the shaft and fit the sleeve, impeller, impeller sleeve, diffuser and support diffuser.
- Continue the assembly order until the last impeller is fitted, then fit the impeller cover, washer and nut.
- Pay attention to the position of the support diffuser - for pumps with lesser stages, the last one is the support diffuser. For pumps with more stages, the support diffuser should be even and put on the support sleeve and bearing with the support diffuser.
- Place the inducer on the inlet and outlet chamber and fit the finished parts as above on the inducer.
- Fit the O-Ring on the inlet and outlet chamber and put on the cylinder and top diffuser.
- Put the pump head, installed with O-Ring, lining and corrugated spring, on the cylinder. Screw the four nuts of the stay bolts on the base plate. Tighten each nut symmetrically in turn.
- Fit the mechanical seal and tighten it, then install the motor and coupling, screw the bolts in (not tightly) and press the coupling and shaft down to the direction of the base plate. Lift it around 1mm in the reverse direction and tighten the screws. Please note that the space between the two couplings should be equal.
- Tighten fixing bolts in the mechanical seal and rotate the coupling to ensure the shaft can rotate freely and not be choked.
- Reversing this process will disassemble the pump.

6.2 CDL/CDLF 8, 12, 16, 20

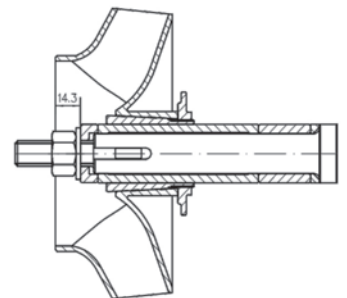
- Put the circlip cover on the shaft and fit the sleeve, impeller, impeller sleeve, diffuser, support diffuser, bearing and support sleeve.
- Continue the assembly order until the last impeller is fitted and then install the impeller cover, washer and tighten the nuts.
- Place the inlet and outlet chamber on the base plate and put the O-Ring, clamp plate and inducer on the inlet/outlet chamber, and put the finished parts on the inducer. Put the top diffuser on top, and tighten the nuts. Lastly, put on the cylinder.
- Put the pump head, installed with O-Ring, lining and adjusting rubber, on the cylinder and then tighten the four stay bolts symmetrically in turn.
- Fit the mechanical seal and tighten, then install the motor and coupling, screw the bolts in (not tightly) and press the coupling and shaft down to the direction of the base plate. Lift around 1mm in the reverse direction and tighten the screws. Please note that the space between the two couplings should be equal.
- Tighten fixing bolts in the mechanical seal and rotate the coupling to ensure the shaft can rotate freely and not be choked.
- Reversing this process will disassemble the pump.

6.3 CDL/CDLF 32, 42, 65, 85

- Put the inlet and outlet chamber on the base plate, fit the flanges on the inlet and outlet chamber on two sides and fit the inducer.
- Put the first impeller on the shaft, tighten the nuts and put the impeller on the neck ring base of the inducer. Then attach the diffuser, impeller and support diffuser, until the top diffuser and fix all with straps.
- Shaft parts: Fit the bottom sleeve, cover and washer on the shaft and tighten the bolts then fit the bottom bearing on the inlet/outlet chamber and fit the washer.
- Then put the shaft parts on the inlet/outlet chamber, fit the O-Ring, lubricate the O-Ring and put on the cylinder.
- Fit stay bolts on the base plate and fit the O-Ring, adjusting rubber and air vent gag on the pump head. Put the pump head on the stay bolts, add the washer and tighten all the nuts.
- Fit the mechanical seal on the pump head, fit the seal cover and tighten the bolts as well as the bolts in the seal.
- Lift the shaft and insert adjusting slice.
- Fit the bracket and motor on pump head.
- Finally, fit the coupling, tighten the bolts, and take out the adjusting slice. Rotate the coupling to ensure the shaft can rotate freely and not be choked.
- Reversing this process can disassemble the pump.

6.4 CDL/CDLF 120, 150

- Put the inlet and outlet chamber on the base plate, fit the flanges on the inlet and outlet chamber on two sides and fit the inducer.
- Fit washer (PN58), shaft sleeve (PN17), inlet impeller sleeve (PN57), cover (PN18), washer, and fasten the nut.
- Fit impeller shaft sleeve (PN16) and impeller, then fasten impeller nut (PN15), ensuring the size is 14.3 as shown.
- Put shaft parts on the inducer, fit the support diffuser, impeller sleeve and impeller, then fasten the impeller nut and fit the diffuser, impeller etc. until the last diffuser.
- Fit the top diffuser, using straps to fasten all diffusers.
- Fit the O-Ring on the inlet/outlet chamber, lubricate them and put on cylinder.
- Fit stay bolts on the base plate, and the O-Ring on the pump head, adjusting the rubber, air vent screw etc. Then put the pump head on the stay bolts, fit the washer and fasten the nut.
- Fit the mechanical seal on the pump head, then fit the seal cover and tighten the bolts as well as the bolts in the seal.
- Lift the shaft and insert the adjusting slice.
- Fit the bracket and motor on the pump head.
- Finally fit the coupling, tighten the bolts and take out the adjusting slice. Rotate the coupling to ensure the shaft can rotate freely and not be choked and loose.
- Reverse this process to disassemble the pump.



7. FAULT FINDING AND SOLUTIONS CHART



CAUTION

- Before removing the terminal box cover and before any removal/dismantling of the pump, make sure that the power supply has been switched off.

Fault	Cause	Solution
Motor does not run when started.	a) Power supply failure.	a) Check power supply.
	b) Fuses are blown.	b) Replace fuses.
	c) Motor is overloaded.	c) Check system.
	d) Main contacts of starter are not connected well or the coil is defective.	d) Replace motor starter.
	e) Control circuit is defective.	e) Check control circuit.
	f) Motor is defective.	f) Repair.
Overload device of motor starter trips out immediately when power supply is switched on.	a) Fuses are blown.	a) Replace fuses.
	b) Contacts of overload device are faulty.	b) Check motor starter.
	c) Cable connection is loose or faulty.	c) Check cables and power supply.
	d) Motor winding is defective.	d) Replace motor.*
	e) Pump mechanically blocked.	e) Check and repair pump.*
Overload device trips out occasionally.	a) The setting of overload is too low.	a) Reset overload setting.
	b) Periodic power supply faults.	b) Check power supply.
	c) Low voltage at peak times.	c) Add regulator.
Motor starter has not tripped out but the pump does not run.	a) Contacts of starter are not contacted well or the coil is faulty.	a) Change motor starter.
	b) Control circuits are defective.	b) Check control circuit.
Pumped water does not flow constantly.	a) Suction pipe is too small.	a) Enlarge inlet pipeline.
	b) There is not sufficient water in pump water inlet.	b) Improve system and increase incoming water.
	c) Liquid level is low.	c) Try to lift liquid level.
	d) Pump inlet pressure is too low compared with water temperature, pipeline loss and flow.	d) Improve system and try to increase inlet pressure.
	e) Suction pipe is partly blocked by impurities.	e) Check and clear impurities.
Pump runs but gives no water.	a) Suction pipe is blocked by impurities.	a) Check and clean suction pipe.
	b) Foot valve or check valve is closed.	b) Check and repair foot valve or check valve.
	c) Leakage in suction pipe.	c) Check and repair suction pipe.
	d) There is air in suction pipe or pump.	d) Refill liquid, release air.
Pump runs backwards when switched off.	a) Leakage in suction pipe.	a) Check suction pipe.
	b) Foot valve or check valve is defective.	b) Check and repair foot valve or check valve.
	c) Foot valve is blocked in opened or partly opened position.	c) Check and repair foot valve.
	d) There is air in suction pipe.	d) Check and repair suction pipe and release air.
Abnormal vibration or noise from pump.	a) Leakage in suction pipe.	a) Check and repair suction pipe.
	b) Suction pipe is too small or is partly blocked by impurities.	b) Enlarge or check suction pipe.
	c) There is air in suction pipe or pump.	c) Refill liquid to the pump and vent air.
	d) The comparison of delivery head of device with delivery head of pump is very low.	d) Improve system or choose another pump model.
	e) Pump mechanically blocked.	e) Check and repair pump.*

* In these cases, the user shall not disassemble the pump by themselves.

SECTION 2 - CONTROL PANEL

Matelec ME21 VSD Pressure Control System

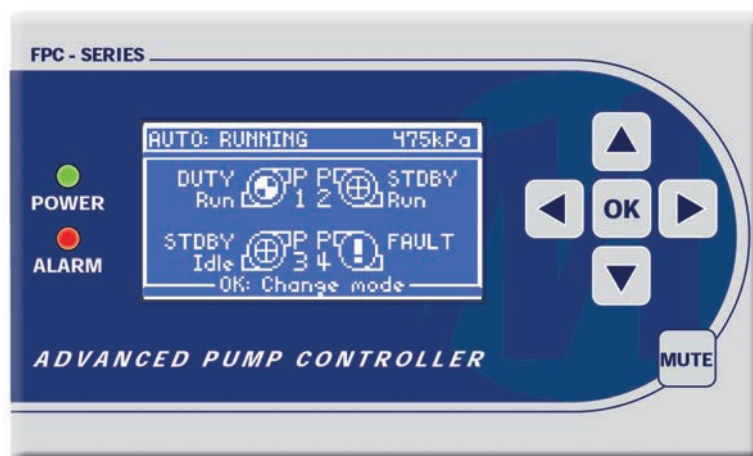
This manual outlines the specifications and operational description of the ME21 VSD Pressure Control System. The control algorithms are particularly complex and rely on a large number of operator specified parameters. Throughout this document any parameter that is able to be varied will be indicated using *italics*. Section 9 contains a full list of all parameters.

1. APPLICATION BRIEF

Pressure pumping is a common application whereby the system attempts to maintain a constant pressure for delivery of water through installations such as plumbing in a large building. Although off the shelf controllers such as the APC6 are able to offer pressure pumping modes, they are restricted to on-off control of the pumps - a technique which is simply unsuitable for medium to large sized applications. For optimal efficiency and pump wear a variable speed multi-pump system is required.

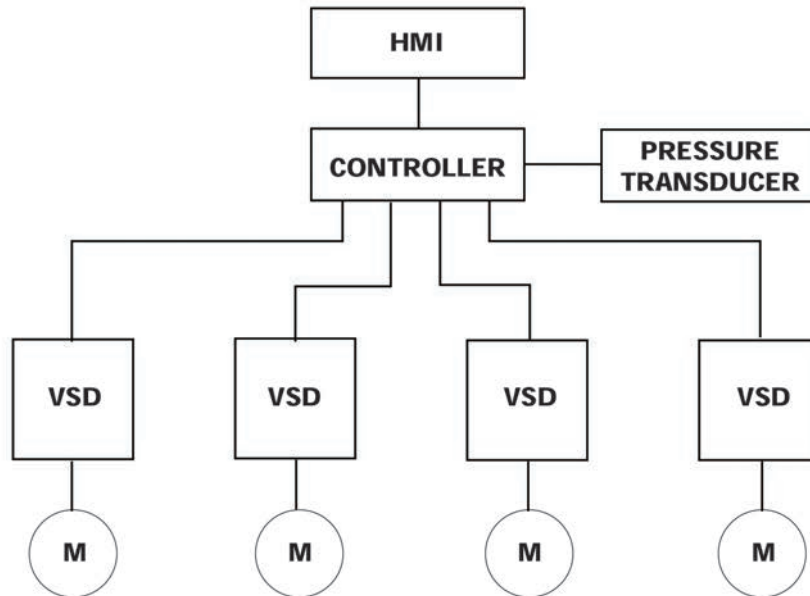
Controlling the speed of 3-phase pumps is electrically not a simple task, therefore an electronic Variable Speed Drive (VSD) is used. There are different configurations available such as using a single VSD to drive motors via arrays of contactors, however the most robust and reliable system uses a single VSD for each pump in the system.

The ME21 Pressure Control System is a smart control solution to the variable speed multi-pump pressure control application. Through the use of existing and new Matelec electronic hardware it provides a reliable, flexible and economical system to interface with VSDs for the control of up to four pumps. A complex PID control algorithm determines which and how many pumps will run based on the set pressure operating point and pressure feedback signal.



2. OVERALL SOLUTION

Electrically the system is composed of three main components: the controller, VSDs and Human Machine Interface (HMI). The following diagram depicts the basic layout:



In order to minimise the amount of hardware development required, the system uses the recently completed ME16 HMI hardware running a custom firmware version to support this application. With the VSDs being off the shelf items, the only other piece of hardware required is the controller, which itself is not overly expensive.

Many options for interfacing with the VSDs were assessed before deciding on a final solution.

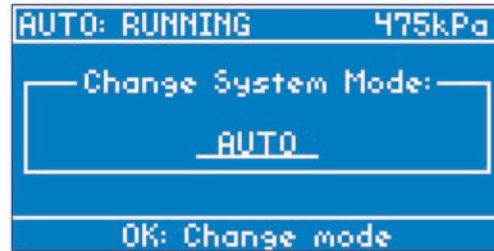
Communication with each VSD is achieved using five signals:

1. 0-10V speed reference (common to all VSDs in the system).
2. VSD reset discrete output (common to all VSDs in the system).
3. VSD enable discrete output (to VSD).
4. VSD healthy discrete input (from VSD, opens on VSD fault).
5. VSD running discrete input (from VSD, indicates that speed is greater than 0).

It is therefore the responsibility of the controller to manage each of the VSDs and determine the desired speed reference voltage.

3. OPERATIONAL MODES

The system will have three primary modes of operation, outlined as follows:



1. Off Mode

The controller is disabled and will not activate any of the pumps. All alarm conditions are still valid.

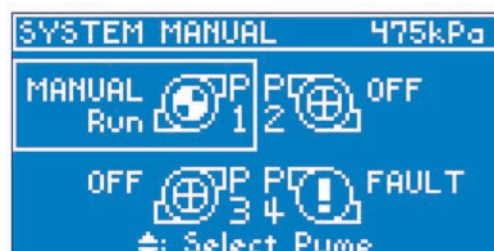
2. Auto Mode

When the system is set to Auto, each of the four pumps will operate independently in order to maintain the system pressure at its set point. Additionally a number of fault conditions will be monitored and alarms triggered if these conditions are met.



3. Manual Mode

With the system in protected manual mode, one selected pump at a time will operate on a manual speed reference, ignoring the PID pressure control algorithms. Each pump will be able to be individually selected to run in manual mode. Despite this manual control of the pumps and speed, all pump protection algorithms will still be applicable and a faulty pump will still not run. Manual mode ignores the run enable input.



Based on the pump mode, operational state and parameter settings each of the four pumps will operate independently in one of eight states:

Pump State	Applicable Modes	Description
Off	Off	Pump will not run.
Disabled	All	Pump is disabled by parameter settings and won't run.
Fault	All	The VSD for this pump has indicated a fault and has been shut down.
Manual Run	Manual	Pump has been set to run in manual mode.
Standby Idle	Auto	Pump is not running but available to run if demand requires.
Standby Run	Auto	To meet demand this pump has been started in addition to the duty pump.
Duty Run	Auto	Pump is the primary operating pump used to maintain the system pressure about the setpoint. If it is unable to keep up with demand then a standby pump will be started in addition to this pump.
Duty Sleep	Auto	This pump is the primary pump operating but has been shut off due to no demand.

4. OPERATION

The multi-pump aspect of the system is more than just redundancy, as each of the pumps is brought in and out of operation as the demands of the system vary. A PID algorithm is used to control the pump(s) speed to achieve a constant pressure in the system, as defined by the *setpoint*.

Since the system can operate with 1 to 4 pumps, each pump is treated in a relatively isolated manner. As part of the system setup the operator will specify how many pumps the system will be operating with. Additionally, individual pumps can be disabled (such as if the pump has been temporarily removed for servicing).

The following operational descriptions are valid only when the system mode is set to Auto.

4.1 BASE OPERATION

During periods of normal demand the duty pump will be the only pump operating as the pressure is maintained about the pressure *setpoint*. The internal PID function will vary the pump speed based on the pressure feedback signal in relation to the *setpoint*.

4.2 NUMBER OF PUMPS

Although this system is designed to operate with up to four pumps, it will also work just as well using a single pump. The number of pumps in use by the system is specified using the *[number_of_pumps]* parameter. The number of pumps displayed on the HMI's main screen automatically adjusts to this parameter but note that logged data and other settings for all pumps will always be available through the logged data and parameter menus (this is to prevent the HMI from becoming extraneously complex).

Additionally, each pump has an individual *[pump_x_enable]* parameter. Setting this parameter to 0 (disable) will prevent that pump from being used in both auto and manual modes. This is useful if, for example, a pump has been removed for servicing.

4.3 PID CONTROL

The controller incorporates a complete digital PID control system which is used to regulate the speed reference signal based on the setpoint and feedback pressure signal. In addition to adjustment of the setpoint, both the Proportional, Integral and Derivative components on the algorithms can be varied.

The standard PID algorithm for a control application such as this is the standard positional form:

$$\begin{aligned} speed(t) &= K_p e(t) + \frac{K_p}{T_i} \int_0^t e(\tau) d\tau + K_p T_d \frac{de(t)}{dt} \\ &= K_p \left(e(t) + \frac{1}{T_i} \int_0^t e(\tau) d\tau + T_d \frac{de(t)}{dt} \right) \end{aligned}$$

Where $e(t) = \text{setpoint}(t) - \text{feedback}(t)$

$$T_i = \frac{K_p}{K_i} \text{ and } T_d = \frac{K_d}{K_p}$$

The standard form PID algorithm allows the proportional gain to become independent of the integral and derivative gains, and instead the integral and derivative components are specified as times.

For optimal performance however the algorithm that has been implemented is standard positional form with *derivative on measurement*, which eliminates derivative kick caused by a change in setpoint:

$$speed(t) = K_p \left(e(t) + \frac{1}{T_i} \int_0^t e(\tau) d\tau + T_d \frac{d\text{feedback}(t)}{dt} \right)$$

The proportional gain has a range of 0.1 to 100, in 0.1 increments.

The integral time has a range of 0 to 100 in 0.1 increments.

The derivative time has a range of 0 to 100 in 0.1 increments.

Other PID improvement techniques have been implemented, such as integral windup prevention, output saturation and bumpless auto/manual/auto transition.

The *[minimum_speed]* parameter can be used to specify a minimum speed at which the duty pump will operate during PID control.

4.4 PID REVERSE

The standard PID configuration is valid only for installations where pressure pumping is required, so that a decrease in pressure results in an increase in speed (and vice versa). There are however applications such as fluid level control where the system must pump water out of a well to maintain a consistent level. In this case the PID is required to perform the opposite action: increase the pump speed as the level increases.

The PID_reverse parameter allows such applications to be fulfilled by simply inverting the PID operation. Note that in practice the PID algorithm simply inverts the Kp parameter and results in a PID calculation of:

$$speed(t) = -K_p \left(e(t) + \frac{1}{T_i} \int_0^t e(\tau) d\tau + T_d \frac{dfeedback(t)}{dt} \right)$$

4.5 PUMP STAGING/DESTAGING

In normal conditions the duty pump will be the only pump running as the system pressure is maintained at the *[setpoint]*. If the duty pump is unable to keep up with demand and the following condition occurs for *[stage_destage_delay]* seconds then a standby pump will be brought online (*staged*) to increase the flow:

1. The pump speed exceeds *[standby_start_threshold]* and
2. The feedback pressure is less than *[setpoint] - [stage_min_error]*.

If this still does not provide enough flow then the process can repeat until all standby idle pumps are running.

Conversely if (the speed drops below *[standby stop threshold]* and feedback pressure is greater than *[setpoint] + [destage_min_error]*) for *[stage_destage_delay]* seconds then a standby pump will be switched off (destaged) repeatedly until it is again only the duty pump operating.

The method that the controller uses to select a standby pump to stage depends on the *[share_mode]* setting:

Stage Mode	Description
Sequential	Pumps are staged sequentially starting from pump 1 (1-2-3-4, with 4 cycling back to 1). If a pump is disabled or faulty, it is skipped.
Timeshare	The pump with the lowest run time that is not faulty or disabled, is staged.

Note that all pumps use the same speed reference, so if more than one pump is running they will all be operating at the same speed.

4.6 STAGE/DESTAGE BYPASS

When a pump is staged the speed reference will already be at a relatively high speed as this is what triggers the pump stage process. In some circumstances depending on the PID settings, bringing on the second pump with this high speed reference could cause an undesirable overshoot in the system pressure. Therefore better performance can be achieved if the PID algorithm is bypassed and the pump speeds are controlled directly. Setting the *[stage_bypass_en]* parameter causes the following procedure when a pump is staged:

1. Set speed reference to *[stage_bypass_speed]*.
2. Activate the pump to be staged.
3. Wait *[bypass_delay]* seconds.
4. Return speed reference to PID output.

A similar procedure is valid when destaging if the *[destage_bypass_en]* parameter is set:

1. Deactivate the pump to be destaged.
2. Set speed reference to *[destage_bypass_speed]*.
3. Wait *[bypass_delay]* seconds.
4. Return speed reference to PID output.

4.7 PUMP DUTY AND DUTY CHANGE

At any time only one pump can be the duty pump. This pump will react to most of the pressure variations around the setpoint and standby pumps will only be brought online if necessary. A pump can only be the duty pump if it has no current associated faults. If a fault occurs with a duty pump then duty will immediately be switched to another available pump.

Change of duty can also be universally configured with the *[Duty_change_mode]* parameter to one of two options: time based or time + sleep based:

Duty Change Mode	Description
Time Based	While the duty pump is running (i.e. is not in duty sleep mode), a timer will be running. When this timer reaches <i>[duty_change_period]</i> minutes, then duty will immediately transfer to the next available pump.
Time + Sleep Based	In addition to time based duty change, duty will transfer to the next available pump each time the system wakes up from sleep.

Duty is shared between the pumps based on the *[share_mode]* settings outlined above.

4.8 BUMPLESS TRANSFER

When duty changes in time mode it's likely that the duty pump will be running when the change occurs. Bumpless transfer ensures that the transition of duty from one pump to another causes no pressure dips or spikes. This operates as follows when change of duty is triggered:

1. The new duty pump is enabled and begins to run.
2. If the new duty pump was already running (i.e. was in standby run) then the old duty pump is switched off immediately and no further action takes place.

3. Otherwise if the new duty pump was off then the system will wait *[bumpless_transfer_delay]* seconds before switching off the old standby pump.

4.9 SLEEP

During a period of decreased demand, all standby pumps will be idle and the duty pump speed will approach zero. A no demand situation occurs when speed drops below *[no_demand_speed]* threshold and no standby pumps are active.

When the No Demand condition is detected for *[no_demand_sleep_delay]* seconds the duty pump will enter the Duty Sleep state and shut down.

If the *[sleep_boost_en]* parameter is set then prior to entering sleep the sleep boost algorithm will activate. This will run the pump at *[sleep_boost_speed]* for *[sleep_boost_period]* seconds before shutting down the pump, boosting the pressure locked in the system to avoid excessive cycling due to slow leaks.

Once the system is in sleep the pumps will continue to run at the speed set by the *[minimum_speed]* parameter. If this parameter is zero then in addition to setting the speed reference to zero all of the pump run signals will be deactivated during sleep.

The system will exit Duty Sleep and continue normal running once it detects that the feedback pressure has dropped below *[wakeup_pressure_level]* for *[wakeup_delay]* seconds.

4.10 PIPE FILL

Upon entering a running state (either on initial power up or wakeup from sleep) it's possible that there is minimal or no fluid present in the downstream piping. In order to avoid the effects of the resultant PID feedback error the Pipe Fill function can be enabled.

If the Pipe Fill algorithm is enabled and the system pressure is below *[pipe_fill_threshold]* then the PID will be overridden. The pump will be run at *[pipe_fill_speed]* until the pressure increases above *[pipe_fill_threshold]*, at which point standard PID control and system operation will be restored.

The pipe fill algorithm also includes a failure timeout: if the pipe fill function runs for more than *[pipe_fill_fall_timeout]* then a pipe fill fail fault is flagged and the system is locked.



4.11 SETPOINT RAMP

Whenever the system enters a running state (either on initial power up or wakeup from sleep) it's likely that the system pressure will be below the setpoint pressure. In order to avoid the effects of a large feedback error on the PID algorithm, the setpoint ramp function can be enabled via the *[setpoint_ramp_en]* parameter.

The setpoint ramp algorithm will override the actual setpoint during this startup period with a virtual setpoint. This virtual setpoint is then gradually increased at *[setpoint_ramp_rate]* until virtual setpoint equals the actual setpoint. At this point control reverts back to the actual setpoint.

[setpoint_ramp_rate] is the time in 100ms increments between which the virtual setpoint is increased by 0.1mA increments.

Note that if both pipe fill and setpoint ramp are enabled and the pipe fill conditions are met then the pipe fill will take priority.

4.12 JACKING PUMP

A single output is provided to control a small external jacking pump. This jacking pump output turns on while the system is enabled, in auto mode, and no other pumps are running. Once another pump has been running for 10 seconds the *jacking pump output* will be switched off.

4.13 RAIN/MAINS WATER INTEGRATION

In order for the VSD pressure control system to work in a rain/mains water installation, there are two I/Os providing rain/mains integration. The *mains water on* input when open will disable the controller, allowing the installation to operate on mains water without the pumps running.

The *force mains water* output will close if any of these three conditions occurs:

1. The operator has set the *[force_mains_water]* parameter.
2. A fault has caused a fault lockout condition, so no pumps are running.
3. There are no enabled, non-faulty pumps available to run.
4. The *mains water on* input is activated.

If the *mains water on* input has activated the *force mains water* output will close for 5 seconds every 60 seconds, in order to allow the Rain/Mains Controller Card to activate rain water and enable the pumps to run.



4.14 STATIC LEAD PUMP

Some applications have only low average flow but high peak flows. In these cases the installation will pair a smaller lead pump with up to three larger pumps that only come into play during these peak periods. The controller is able to support such configurations using static lead pump mode.

If *[static_lead_pump_en]* is set then pump number 1 will always be selected as the duty pump. If however pump 1 is disabled or flagged as faulty then the system will select another pump to use as the duty pump to ensure uninterrupted operation.

4.15 PUMP LIMITING

The *[pump_limit]* parameter specifies the maximum number of pumps that can operate simultaneously (the default is 4: all pumps). Duty change functionality still works as usual (i.e. after duty change timeout or a pump/drive fault). Pump limiting also functions in manual mode so that no more than the specified number of pumps can be operated manually.

4.16 SPEED MINIMISE

In some circumstances the PID algorithm itself does not cover all situations optimally - particularly when using pumps that reach a speed where they are "slipping" (so that an increase in speed does not increase the outlet pressure). In this case the "speed minimise" function can be enabled. This will minimise the speed required to maintain a specific pressure, as follows:

[Speed_minimise_en] enables the speed minimise function. If pressure remains within +/- 12kPa of the setpoint the speed does not vary by more than +/- 1Hz for the period of time set by *[speed_minimise_delay]*, the system will enter speed minimise mode.

Once in speed minimise mode, the system is no longer operating via PID and instead the speed begins ramping down. Every *[speed_minimise_rate]* seconds the speed will be reduced by 0.5Hz. If at any time the pressure drops more than 12kPa below the set point the system will immediately switch back to normal running and PID control.

If there is more than one pump running during speed minimise mode, the system will still destage it once the pump speed drops below the destage threshold. The system will then have to satisfy the minimum speed entry conditions for *[speed_minimise_delay]* before speed minimise resumes. Similarly the system will still go to sleep if no demand conditions are met.

5. FAULT PROTECTION ALGORITHMS

In order to protect both individual pumps and the pressure system as a whole, there are several protection mechanisms in use by the controller.

5.1 FAULT INDICATION FROM VSDS

Each VSD has a discrete output to indicate the "health" of the drive, which deactivates in the case that the drive detects a fault with itself or the pump. Upon loss of this "healthy" signal the controller will immediately recognise a pump fault and trigger the corresponding **Pump Fault** alarm. If the pump was the system duty pump then duty will immediately change. This fault will auto reset once the drive has restored its "healthy" signal.



5.2 HIGH PRESSURE SWITCH PROTECTION

If the *[high_pressure_input_en]* parameter is enabled then the controller must have a normally closed (open on high pressure) high pressure switch connected. If the input is opened for *[high_pressure_input_delay]* period then a **High Pressure Fault** is flagged and the entire system will shut down. This fault can only be manually reset.

5.3 FEEDBACK HIGH PRESSURE PROTECTION

If *[FB_high_pressure_en]* is enabled then the controller uses the feedback pressure sensor to monitor for high pressure conditions. If the feedback pressure exceeds *[FB_high_pressure_level]* for *[FB_high_pressure_delay]* seconds then a Feedback High Pressure Fault is flagged and the entire system will be shut down. If *[FB_high_pressure_reset]* is enabled then the fault will reset once the fault condition abates (however the alarm will remain active until manually reset).

5.4 LOW PRESSURE PROTECTION

If *[low_pressure_protect_en]* is set the feedback pressure sensor will be used to determine a condition such as a pipe break which will prevent the system from reaching the pressure setpoint. If the pump speed is greater than *[low_pressure_speed]* and the feedback pressure is below *[low_pressure_level]* for *[low_pressure_delay]* seconds then the entire system will be shut down and a **Minimum Pressure Fault** flagged. This fault can only be manually reset.

The minimum pressure protect algorithm is ignored during a pipe fill operation.

5.5 LOW LEVEL LOCKOUT

If `[low_level_lockout_en]` is set then the controller will monitor the Low Level discrete input. If this input opens for longer than `[low_level_lockout_delay]` seconds then the system will shut down and a **Low Level Fault** flagged. If `[low_level_lockout_reset]` is enabled then the fault will reset once the Low Level input closes again (however the alarm will remain active until manually reset).

5.6 PUMP CYCLE PROTECTION

If the system has a faulty non-return valve or similar fault where the system can fail to maintain pressure then much energy can be wasted due to continual pump cycling. If `[cycle_protect_en]` is set then each time the system exits sleep within `[cycle_min_sleep_time]` seconds of entering sleep a cycle counter is incremented. If this counter exceeds `[cycle_count_threshold]` within a continuous 1 hour period then **Pump Cycle Fault** is flagged. If `[cycle_chutdown_en]` is set then the entire system will shut down. This fault can only be manually reset.

5.7 4-20 MA FEEDBACK LOSS

If the system is in auto mode and `[feedback_loss_fault_en]` is set then if the 4-20mA pressure feedback signal drops below 4mA for `[feedback_loss_delay]` seconds the system is immediately shut down and a **4-20mA Feedback Loss Fault** flagged. This fault can only be manually reset.

5.8 PIPE FILL FAIL

If the pipe fill function runs for `[pipe_fill_fail_timeout]` period then a **Pipe Fill Fail** fault will be flagged and the system locked out.

5.9 LOSS OF RUNNING SIGNAL

Unless using the "Econo Drive Configuration", each pump returns a discrete "pump running" signal whenever the drive is operating the pump at a speed greater than zero. These signals are used to confirm that a pump is running when required and also trigger the pump run timers. If an installation error or bad connection causes any of these connections to fail the system will compensate as follows.

If a pump is being signalled to run but no pump run signal is received for 10 seconds then a **Pump Fault** will be triggered for that VSD. If the pump was a duty pump then a duty change will occur, otherwise if the pump is a standby running pump it will simply be switched over to another available pump.

6. CONTROLLER HARDWARE SPECIFICATIONS

The aim of this controller was to create a piece of hardware generic enough to suit not only this application, but through the use of customised firmware, support a wide range of future projects. It is effectively a small, custom PLC.

6.1 SUPPLY VOLTAGE

A 24VDC supply for the system is optimal, providing maximum compatibility with other industrial control electronics. An internal switchmode power supply provides regulation to 12VDC and 5VDC for the microcontroller and associated internal electronics.

6.2 I/O

The pressure feedback is taken using a 4-20mA pressure transducer which is referenced to a pressure setpoint set by the operator via the HMI. A PID algorithm regulates the pump speed using the set point and feedback inputs and sends the result to VSDs as a 0-10VDC analogue signal.

ANALOG		
Pressure:	12.8mA	550kPa
Speed:	8.6V	43.0Hz
Setpoint:	500kPa	
Press OK to edit setpoint		

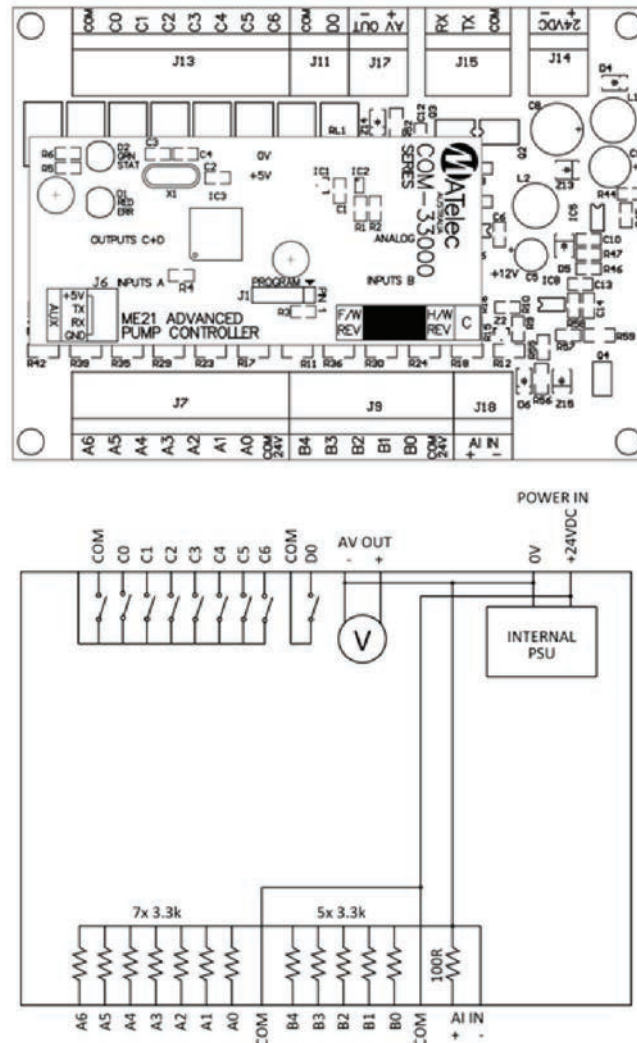
All operator control including pump auto/off/manual is done using our ME16 HMI running custom firmware, which connects via a dedicated, optically isolated serial port.

The following table lists all I/O signals and their functions:

I/O Name	Signal Name	Description
A0	Pump 1 Healthy	Input from VSD open when VSD detects a fault with Pump 1.
A1	Pump 1 Running	Input from VSD closed when pump 1 is running.
A2	Pump 2 Healthy	Input from VSD open when VSD detects a fault with Pump 2.
A3	Pump 2 Running	Input from VSD closed when Pump 2 is running.
A4	Pump 3 Healthy	Input from VSD open when VSD detects a fault with Pump 3.
A5	Pump 3 Running	Input from VSD closed when Pump 3 is running.
A6	Pump 4 Healthy	Input from VSD open when VSD detects a fault with Pump 4.
B0	Pump 4 Running	Input from VSD closed when Pump 4 is running.
B1	High Pressure	Input open on high pressure condition.
B2	Low Level	Input open on low level condition.
B3	System Enable	Input closed to allow system to run.
B4	Mains Water On	Input open disables system and displays "Mains Water On" if Rain/Mains operation is enabled.
C0	Pump 1 Run	Output to VSD closes to run Pump 1.
C1	Pump 2 Run	Output to VSD closes to run Pump 2.
C2	Pump 3 Run	Output to VSD closes to run Pump 3.
C3	Pump 4 Run	Output to VSD closes to run Pump 4.
C4	VSD Reset	Output to VSD pulses closed to reset VSD faults.
C5	System Fault	Output closes when any fault is active.
C6	Jacking Pump	Output closes to enable Jacking Pump.
D0	Force Mains Water	Output opens when the system must change to mains water.
AI IN	Feedback In	4-20mA pressure transducer input.
AV OUT	Speed Out	0-10V speed reference output.

IO STATES				
IN:	A0: ○	A1: ●	A2: ●	A3: ○
	A4: ○	A5: ○	A6: ○	B0: ●
	B1: ○	B2: ○	B3: ○	B4: ○
OUT:	C0: ●	C1: ○	C2: ○	C3: ●
	C4: ●	C5: ○	C6: ○	D0: ○

Figure 1 shows the layout of the controller and the corresponding internal electrical details relating to the I/O connections. Note that HMI serial interface is not depicted as it is a dedicated, optically isolated interface.



6.3 DISCRETE OUTPUTS

All discrete outputs are provided in the form of a single relay with contacts rated to 1A at 24VAC. They are not suitable to switch 240VAC loads. Each discrete output block features a common connection to each of the relays in that block.

6.4 DISCRETE INPUTS

The discrete inputs each feature a ruggedised design with extensive voltage suppression, *but no optical isolation*. Input impedance is 3.3k Ω with a sampling rate of 100Hz. Each discrete input connector block includes a common connection which is internally connected to the 24V supply.

6.5 ANALOGUE INPUT

The 4-20mA analogue input features extensive voltage surge and spike suppression to aid robustness of the controller. Since it is designed for a current loop the analogue input impedance is 100Ω, sampling at 100Hz with a Nyquist filter at 50Hz limiting the maximum input frequency to 50Hz.

In addition to its surge protection, the analogue input also features a simple current limiting circuit which prevents burning out the sense resistor in the case of a short circuit. During normal operation the current limiting circuit will be switched off and not have any impact on the input current. If the input current exceeds the threshold (in the range of 30-40mA) then the current limiter will activate and maintain the current level at the threshold.

Note that this current limiting function is intended to protect the device from temporary fault conditions only. In the case of a short to +24V the current limiting transistor will be dissipating a significant amount of power in the form of heat - if this is maintained for an extended period, damage to the analogue input circuitry can occur.

For feedback and display purposes the analogue input signal range is 0.25-.5mA. Any current above this range will simply be displayed as 25.5mA.

6.6 ANALOGUE OUTPUT

The 0-10V analogue output also features extensive voltage surge and spike suppression. The 0-10V output is rated for a maximum output current of 20mA with an output impedance of 47Ω. Refresh rate is 100Hz with filtering to 50Hz to minimise DAC step noise.

6.7 TERMINATION TYPES

All inputs and outputs use 5.08mm pitch pluggable terminals with the inputs and outputs in banks. Each bank has a single common for all connections in that bank.

6.8 ENCLOSURE

The controller uses the APC6 DIN rail and screw mounting ABS enclosures.

6.9 TELEMETRY

The HMI design already includes hardware (and related software) for a Modbus interface, and it is through this that any telemetry equipment can be connected. This provides a remote system with all necessary data regarding the operation state of the pressure controller system.

7. MODBUS COMMUNICATIONS

Modbus is a serial communications protocol originally designed for use in PLCs. Simple and robust, it has since become one of the de facto standard communications protocols in the industry, and it is now amongst the most commonly available means of connecting industrial electronic and control devices. Through it's connected ME16 HMI, the ME21 supports Modbus communications as described here.

There are several different variations of the Modbus standard based around the transmission mode and data encoding technique. The protocol supported by the ME16 is Modbus RTU, which is a binary format sent over a serial link. The ME16 is configured as a Modbus slave and responds to commands sent to it from the Modbus master.

7.1 MODBUS SETTINGS

In order to reduce unnecessary complexity, the system will comply only with the BASIC Modbus implementation class but with some additional features, as detailed in the following table. All settings have a default which is valid until the operator changes them via the configuration menu.

Setting	Implemented	Default
Address	Configurable from 1 to 247	1
Baud Rate	9600, 19200	19200
Parity	Even, Odd, None	Even



7.2 MODBUS PHYSICAL CONNECTION

The ME16 provides a three pin pluggable terminal for connection of the three RS-485 connections required for the Modbus interface; A, B and GND. As with the other ME16 connections the wiring information is printed on the rear label of the unit.

7.3 MODBUS POLL AND TIMEOUT SETTINGS

The poll rate is how often the Modbus master requests information from the slave. Since the processor on the ME16 must also operate the user interface and continually operate the communication link with the connected controller, it is only able to cope with a limited number of Modbus transactions per second. The recommended maximum poll period of 500ms (2 polls per second), however a period of 1 second is preferred. Periods as low as 250ms can be achieved but

there can be no guarantee as to the ME16's ability to respond at this rate (particularly with write commands).

Certain Modbus operations require the ME16 to initiate further communications with the attached controller and this can take significantly more time than other operations for the controller to respond. For this reason a timeout period of no less than 1000ms should be used. If the Modbus connection is being used for monitoring only (rather than monitoring and control) then the timeout can be reduced to 500ms.

7.4 MODBUS DIAGNOSTICS

The *System Information* screen on the HMI can be used to diagnose the Modbus communication channel. Whenever a Modbus packet is received the "Modbus Diag" line will momentarily report "Modbus Diag: Data Rx" for 500ms. This will prove that the physical RS-485 connection is functional.

If the received packet caused a modbus exception to be generated then it will also be temporarily reported as follows:

Parity Error:	"Parity Error"
Baud Rate/Serial Port Error:	"UART Error"
Function Not Supported:	"Bad Function"
Illegal Data Address:	"Data Bad Addr"
Illegal Data Value:	"Bad Data Val"
Slave Device Failure:	"Slave Failure"

The error message is displayed for 20 seconds after the event occurs.

7.5 MODBUS SUPPORTED FUNCTION CODES

The Modbus protocol used function codes to perform actions such as reading and writing the different physical data types. Only a portion of the full range of function codes is used, as outlined in the following table:

Function Code	Description	Valid Address Range
01	Read coils	1 to 2016
03	Read holding registers	1 to 126
06	Write single register	1 to 105
16	Write multiple registers	1 to 105

7.6 ADDRESS REFERENCE

The following table lists all valid Modbus coil and register addresses for the ME21 and the data contained within:

Value	Register Address	First Coil Address	Data Range	Data Type
ID_number [0]	1	1	48-255	ASCII
ID_number [1]	2	17	48-255	ASCII
ID_number [2]	3	33	48-255	ASCII
ID_number [3]	4	49	48-255	ASCII
ID_number [4]	5	65	48-255	ASCII
ID_number [5]	6	81	48-255	ASCII
ID_number [6]	7	97	48-255	ASCII
ID_number [7]	8	113	48-255	ASCII
Number_of_pumps	9	129	1-4	Number
Pump_1_enable	10	145	0-1	Number
Pump_2_enable	11	161	0-1	Number
Pump_3_enable	12	177	0-1	Number
Pump_4_enable	13	193	0-1	Number
Setpoint_ramp_en	14	209	0-1	Number
Setpoint_ramp_rate	15	225	0-65535	Number
Pipe_fill_en	16	241	0-1	Number
Pipe_fill_threshold	17	257	40-200	Current x 10
Pipe_fill_speed	18	273	0-100	Voltage x 10
Pipe_fill_fail_timeout	19	289	0-65535	Minutes
Share_mode	20	305	0: sequential 1: timeshate	Number
Duty_change_mode	21	321	0: time based 1: time + sleep	Number
Duty_change_period	22	337	0-65535	Minutes
Bumpless_transfer_delay	23	353	0-65535	Seconds
Stage_destage_delay	24	369	0-65535	Seconds
Stage_threshold	25	385	0-100	Voltage x 10
Stage_min_error	26	401	40-200	Current x 10
Stage_bypass_en	27	417	0-1	Number
Stage_bypass_speed	28	433	0-100	Voltage x 10
Destage_threshold	29	449	0-100	Voltage x 10
Destage_min_error	30	465	4-20.0	Current x 10
Destage_bypass_en	31	481	0-1	Number
Destage_bypass_speed	32	497	0-100	Voltage x 10
Bypass_delay	33	513	0-65535	Seconds
Minimum_speed	34	529	0-100	Voltage x 10
No_demand_speed	35	545	0-100	Voltage x 10
No_demand_sleep_delay	36	561	0-65535	Seconds
Sleep_boost_en	37	577	0-1	Number

Value	Register Address	First Coil Address	Data Range	Data Type
Sleep_boost_speed	38	593	0-100	Voltage x 10
Sleep_boost_period	39	609	0-65535	Seconds
Wakeup_pressure_level	40	625	40-200	Current x 10
Wakeup_delay	41	641	0-65535	Seconds
High_pressure_input_en	42	657	0-1	Number
High_pressure_input_delay	43	673	0-65535	Seconds
FB_high_pressure_en	44	689	0-1	Number
FB_high_pressure_level	45	705	40-200	Current x 10
FB_high_pressure_delay	46	721	0-65535	Seconds
FB_high_pressure_reset	47	737	0-1	Number
Low_pressure_protect_en	48	753	0-1	Number
Low_pressure_protect_speed	49	769	0-100	Voltage x 10
Low_pressure_protect_level	50	785	40-200	Current x 10
Low_pressure_protect_delay	51	801	0-65535	Seconds
Low_level_lockout_en	52	817	01	Number
Low_level_lockout_delay	53	833	0-65535	Seconds
Low_level_lockout_reset	54	849	0-1	Number
Cycle_protect_en	55	865	0-1	Number
Cycle_count_threshold	56	881	0-65535	Number
Cycle_min_sleep_time	57	897	0-65535	Seconds
Cycle_shutdown_enable	58	913	0-1	Number
Feedback_loss_fault_en	59	929	0-1	Number
PID_proportion	60	945	0-100	Number x 10
PID_integral	61	961	0-100	Number x 10
PID_derivative	62	977	0-100	Number x 10
Setpoint	63	993	40-200	Current x 10
PID_reverse	64	1009	0-1	Number
Force_mains_water	65	1025	0-1	Number
Static_lead_pump_en	66	1041	0-1	Number
Rain_mains_en	67	1057	0-1	Number
Sleep_speed	68	1073	0-100	Voltage x 10
Pump_limit	69	1089	1-4	Number
Speed_minimise_en	70	1105	0-1	Number
Speed_minimise_delay	71	1121	0-65535	Seconds
Speed_minimise_rate	72	1137	0-65535	Seconds
Pump_1_start_count	73	1153	0-65535	Number
Pump_2_start_count	74	1169	0-65535	Number
Pump_3_start_count	75	1185	0-65535	Number
Pump_4_start_count	76	1201	0-65535	Number
Pump_1_run_hours	77	1217	0-65535	Hours
Pump_2_run_hours	78	1233	0-65535	Hours
Pump_3_run_hours	79	1249	0-65535	Hours
Pump_4_run_hours	80	1265	0-65535	Hours

Value	Register Address	First Coil Address	Data Range	Data Type
Pump_1_fault_count	81	1281	0-65535	Number
Pump_2_fault_count	82	1297	0-65535	Number
Pump_3_fault_count	83	1313	0-65535	Number
Pump_4_fault_count	84	1329	0-65535	Number
Power_cycle_count	85	1345	0-65535	Number
Sleep_count	86	1361	0-65535	Number
High_pressure_count	87	1377	0-65535	Number
Low_pressure_count	88	1393	0-65535	Number
Low_level_lockout_count	89	1409	0-65535	Number
Cycle_protect_count	90	1425	0-65535	Number
Feedback_loss_count	91	1441	0-65535	Number
Pipe_fill_fail_count	92	1457	0-65535	Number
Spare	93	1473	-	-
Spare	94	1489	-	-
Spare	95	1505	-	-
Spare	96	1521	-	-
System_mode	97	1537	0: Off 1: Auto 2: Manual	Number
Fault reset	98	1553	0-1	Number
Pump_1_man_run	99	1569	0-1	Number
Pump_2_man_run	100	1585	0-1	Number
Pump_3_man_run	101	1601	0-1	Number
Pump_4_man_run	102	1617	0-1	Number
Manual_speed	103	1633	0-100	Voltage x 10
Spare	104	1649	-	-
System_state	105	1665	0: Off 1: Manual 2: Startup 3: Pipe Fill 4: Running 5: Staging 6: Destaging 7: Changing Duty 8: Sleep Boost 9: Sleep 10: Ramp Up 11: Fault Lockout 12: Disabled 13: Mains Water Mode	Number

Value	Register Address	First Coil Address	Data Range	Data Type
Pump_1_state Pump_2_state Pump_3_state Pump_4_state	106 107 108 109	1681 1697 1713 1729	0: Off 1: Disabled 2: Standby Idle 3: Standby Run 4: Duty Sleep 5: Duty Run 6: Manual Run 7: Fault	Number
Input_states	110	1745	-	Binary States
Output_states	111	1761	-	Binary States
Analogue_in	112	1777	0-200	Current x 10
Analogue_out	113	1793	0-100	Voltage x 10
Alarm_states	114	1809	-	Binary States
Fault_lockout_states	115	1825	-	Binary States
Virtual_setpoint	116	1841	0-200	Current x 10
Firmware_rev[0]	117	1857	48-255	ASCII
Firmware_rev[1]	118	1873	14-255	ASCII
Firmware_rev[2]	119	1889	48-255	ASCII
Firmware_rev[3]	120	1905	48-255	ASCII
Spare	121	1921	-	-
Spare	122	1937	-	-
Spare	123	1953	-	-
Spare	124	1969	-	-
Spare	125	1985	-	-
Spare	126	2001	-	-



DATA TABLE	
ID_number[0]	0 (48)
ID_number[1]	0 (48)
ID_number[2]	0 (48)

7.7 DATA TYPES

Number

Number values are numeric values in the range specified.

Current

Current values represent any parameter relating to the analogue input. Current is used here as it represents the base format of the analogue input. Because Modbus only supports integer values, the numeric value in these registers represents the measured current multiplied by ten. To convert between the register value and other units please use the following table:

Units	Convert from Register Value	Convert to Register Value
Actual Current (mA)	$\frac{\text{register_value}}{10}$	$\text{actual_current} \times 10$
Pressure (kPa)	$\frac{(\text{register_value} - 40) \times \text{sensor_range}}{160}$	$\frac{\text{pressure} \times 160}{\text{sensor_range}} + 40$
Level (m)	$\frac{(\text{register_value} - 40) \times \text{sensor_range}}{160}$	$\frac{\text{level} \times 160}{\text{sensor_range}} + 40$
Temperature (°C)	$\frac{(\text{register_value} - 40) \times \text{sensor_range}}{160}$	$\frac{\text{temperature} \times 160}{\text{sensor_range}} + 40$

Voltage

Voltage values represent parameters relating to the analogue output and pump speed. Voltage is used here because it is the narrative unit of the analogue output. Because Modbus only supports integer values, the numeric value in these registers represents the measured voltage multiplied by ten. To convert between the register value and other units please use the following table:

Units	Convert from Register Value	Convert to Register Value
Actual Voltage (V)	$\frac{\text{register_value}}{10}$	$\text{actual_value} \times 10$
Speed (Hz)	$\frac{\text{register_value}}{2}$	$\text{speed} \times 2$

ASCII

These registers contain the ASCII code for characters used in the unit's ID number (or serial number). These ASCII values have a range of 48 to 255 (0x30 to 0xff), however note that the HMI can only display ASCII characters in the range of 48 to 126 (0x30 to 0x7e). The following ASCII table shows these characters:

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL	(null)	32	20	040	Space	64	40	100	64	64	96	60	140	96	96
1	1	001	SOH	(start of heading)	33	21	041	!	65	41	101	65	65	97	61	141	97	97
2	2	002	STX	(start of text)	34	22	042	"	66	42	102	66	66	98	62	142	98	98
3	3	003	ETX	(end of text)	35	23	043	#	67	43	103	67	67	99	63	143	99	99
4	4	004	END	(end of transmission)	36	24	044	\$	68	44	104	68	68	100	64	144	100	100
5	5	005	ENQ	(enquiry)	37	25	045	%	69	45	105	69	69	101	65	145	101	101
6	6	006	ACK	(acknowledge)	38	26	046	&	70	46	106	70	70	102	66	146	102	102
7	7	007	BEL	(bell)	39	27	047	'	71	47	107	71	71	103	67	147	103	103
8	8	010	BS	(backspace)	40	28	050	(	72	48	110	72	72	104	68	150	104	104
9	9	011	TAB	(horizontal tab)	41	29	051	)	73	49	111	73	73	105	69	151	105	105
10	A	012	LF	(NL line feed, new line)	42	2A	052	*	74	4A	112	74	74	106	6A	152	106	106
11	B	013	VT	(vertical tab)	43	2B	053	+	75	4B	113	75	75	107	6B	153	107	107
12	C	014	FF	(NP form feed, new page)	44	2C	054	,	76	4C	114	76	76	108	6C	154	108	108
13	D	015	CR	(carriage return)	45	2D	055	-	77	4D	115	77	77	109	6D	155	109	109
14	E	016	SO	(shift out)	46	2E	056	.	78	4E	116	78	78	110	6E	156	110	110
15	F	017	SI	(shift in)	47	2F	057	/	79	4F	117	79	79	111	6F	157	111	111
16	10	020	DLE	(data link escape)	48	30	060	0	80	50	120	80	80	112	70	160	112	112
17	11	021	DC1	(device control 1)	49	31	061	1	81	51	121	81	81	113	71	161	113	113
18	12	022	DC2	(device control 2)	50	32	062	2	82	52	122	82	82	114	72	162	114	114
19	13	023	DC3	(device control 3)	51	33	063	3	83	53	123	83	83	115	73	163	115	115
20	14	024	DC4	(device control 4)	52	34	064	4	84	54	124	84	84	116	74	164	116	116
21	15	025	NAK	(negative acknowledge)	53	35	065	5	85	55	125	85	85	117	75	165	117	117
22	16	026	SYN	(synchronous idle)	54	36	066	6	86	56	126	86	86	118	76	166	118	118
23	17	027	ETB	(end of trans. block)	55	37	067	7	87	57	127	87	87	119	77	167	119	119
24	18	030	CAN	(cancel)	56	38	070	8	88	58	130	88	88	120	78	170	120	120
25	19	031	EM	(end of medium)	57	39	071	9	89	59	131	89	89	121	79	171	121	121
26	1A	032	SUB	(substitute)	58	3A	072	:	90	5A	132	90	90	122	7A	172	122	122
27	1B	033	ESC	(escape)	59	3B	073	;	91	5B	133	91	91	123	7B	173	123	123
28	1C	034	FS	(file separator)	60	3C	074	<	92	5C	134	92	92	124	7C	174	124	124
29	1D	035	GS	(group separator)	61	3D	075	=	93	5D	135	93	93	125	7D	175	125	125
30	1E	036	RS	(record separator)	62	3E	076	>	94	5E	136	94	94	126	7E	176	126	126
31	1F	037	US	(unit separator)	63	3F	077	?	95	5F	137	95	95	127	7F	177	127	127

Source: www.LookupTables.com

Binary States

Input states, output states, alarm states and fault lockout states have information in binary form as shown in the following table. Each of the individual addresses can be accessed as a coil (using the specified coil address) or as an individual bit of that register (bit 0 is the least significant bit, on the right).

Register Bit	Coil Address	Input State
0	1745	A0
1	1746	A1
2	1747	A2
3	1748	A3
4	1749	A4
5	1750	A5
6	1751	A6
7	1752	B0
8	1753	B1
9	1754	B2
10	1755	B3
11	1756	B4
12-15	-	Unused

Register Bit	Coil Address	Output State
0	1761	C0
1	1762	C1
2	1763	C2
3	1764	C3
4	1765	C4
5	1766	C5
6	1765	C6
7	1768	D0
8-15	-	Unused

Register Bit	Coil Address	Alarm State
0	1809	Pump 1 fault
1	1810	Pump 2 fault
2	1811	Pump 3 fault
3	1812	Pump 4 fault
4	1813	High pressure fault
5	1814	Feedback high pressure fault
6	1815	Low pressure fault
7	1816	Low level fault
8	1817	Pump cycle fault
9	1818	Feedback loss fault
10	1819	Bad data load upon powerup
11	1820	Pipe fill fail
12-15	-	Unused

Register Bit	Coil Address	Fault Lockout State
0	1825	High pressure
1	1826	Feedback high pressure
2	1827	Low pressure
3	1828	Low level
4	1829	Pump cycle
5	1830	Feedback loss
6	1831	Pipe fill fail
7-15	-	Unused

8. PARAMETERS

As outlined throughout this document, the system uses many various parameters in operation:

Parameter	Description	Data Range	Units	Default
Number_of_pumps	Number of pumps connected to the system	1-4	-	4
Pump_1_enable	Enable use of Pump 1	0-1	-	1
Pump_2_enable	Enable use of Pump 2	0-1	-	1
Pump_3_enable	Enable use of Pump 3	0-1	-	1
Pump_4_enable	Enable use of Pump 4	0-1	-	1
Setpoint_ramp_en	Enable setpoint ramp function	0-1	-	1
Setpoint_ramp_rate	Delay x100ms between increments of the virtual setpoint in setpoint ramp mode	0-65535	-	1
Pipe_fill_en	Enable pipe fill function	0-1	-	1
Pipe_fill_threshold	Pipe fill activation pressure	4-20.0	mA	7.9
Pipe_fill_speed	Pumps are run at this speed during pipe fill	0-50.0	Hz	32
Pipe_fill_fail_threshold	If the pipe fill function runs for this amount of time a pipe fill fail fault is flagged and the system locked out	0-655.5	Minutes	10
Share_mode	Determines how duty and standby pumps are selected	0: sequential 1: timeshare	-	timeshare
Duty_change_mode	Determines how change of duty is triggered	0: time based 1: time + sleep	-	Time based
Duty_change_period	Duty is changed after the duty pump has run for this period of time	0-65535	Minutes	60
Bumpless_transfer_delay	Time for which the previous duty pump continues to run during change of duty	0-65535	Seconds	60
Stage_destage_delay	Once a stage/destage condition is met it must be maintained for this period until it activates	0-65535	Seconds	50
Stage_threshold	During normal operation if the pump speed rises above this level a standby pump will be started	0-50	Hz	50
Stage_min_error	The feedback pressure must be at least this amount lower than the setpoint for staging to initiate	4-20.0	mA	4.1
Stage_bypass_en	Enable stage PID bypass	0-1	-	1
Stage_bypass_speed	Pump speed during staging PID bypass operation	0-50	Hz	38
Destage_threshold	During normal operation if the pump drops below this level a standby pump will be stopped	0-50	Hz	34
Destate_min_error	The feedback pressure must be at least this amount greater than the setpoint for destaging to initiate	4-20.0	mA	4.1
Destage_bypass_en	Enable destage bypass	0-1	-	1
Destage_bypass_speed	Pump speed during destaging PID bypass operation	0-100	Hz	40
Bypass_delay	Period of stage/destage PID bypass	0-65535	Seconds	5
Minimum_speed	Minimum speed at which the pumps will be run during automatic PID control	0-50	Hz	25
No_demand_speed	Speed below which system is deemed to be in a no demand situation and must go to sleep	0-50	Hz	31
no_demand_sleep_delay	If the pump speed is below no_demand_speed for this period of time the system will enter sleep	0-65535	Seconds	10

Parameter	Description	Data Range	Units	Default
Sleep_boost_en	Enable sleep boost function	0-1	-	1
Sleep_boost_speed	Speed during sleep boost function	0-50	Hz	35
Sleep_boost_period	Time for which system provides sleep boost	0-65535	Seconds	3
Wakeup_pressure_level	Pressure setpoint below which the system wakes up	4-20.0	mA	11.2
Wakeup_delay	Wakeup activation delay	0-65535	Seconds	0x02
High_pressure_input_en	Enable high pressure input fault	0-1	-	0
High_pressure_input_delay	High pressure alarm activation delay	0-65535	Seconds	3
FB_high_pressure_en	Enable feedback high pressure fault	0-1	-	1
FB_high_pressure_level	Feedback high pressure fault activation level	4-20.0	mA	16.8
FB_high_pressure_delay	Feedback high pressure alarm activation delay	0-65535	Seconds	3
FB_high_pressure_reset	Enable auto-reset of feedback high pressure fault	0-1	-	1
Low_pressure_protect_en	Enable minimum pressure fault function	0-1	-	1
Low_pressure_speed	Pump must be greater than this speed for minimum pressure protection to trigger	0-50	Hz	31
Low_pressure_level	Minimum pressure protect fault pressure	4-20.0	mA	8
Low_pressure_delay	Minimum pressure protect alarm activation delay	0-65535	Seconds	10
Low_level_lockout_en	Enable low level lockout alarm	0-1	-	0
Low_level_lockout_delay	Low level lockout alarm delay	0-65535	Seconds	5
Low_level_lockout_reset	Enable auto reset of low level lockout fault	0-1	-	10
Cycle_protect_en	Enable pump cycle protect fault	0-1	-	0
Cycle_count_threshold	Enable pump cycle protect fault	0-65535	-	1
Cycle_min_sleep_time	If in sleep for less than this amount of time the cycle fault counter will increment	0-65535	Seconds	10
Cycle_shutdown_enable	Enable shutdown on pump cycle fault	0-1	-	20
Feedback_loss_fault_en	Enable feedback loss fault	0-1	-	0
PID_proportion	PID proportional gain	0-100	-	12
PID_integral	PID integral time	0-100	-	0
PID_derivative	PID derivative time	0-100	-	0
Setpoint	Operating setpoint	4-20.0	mA	0
PID_reverse	Reverse PID action (i.e. for pump out applications)	0-1	-	0
Force_mains_water	Forces on the mains water output	0-1	-	0
Static_lean_pump_en	Pump 1 is always used as the lead pump (duty does not change)	0-1	-	4
Rains_mean_en	Enable rain-mains operation for system	0-1	-	
Sleep_speed	Speed at which the pumps are operated during sleep	0-50	Hz	
Pump_limit	Maximum number of pumps that can run simultaneously	1-4	-	
Speed_minimise_en	Enable pump stop attempts when pressure and speed are stable	0-1	-	0
Speed_minimise_delay	Pressure and speed must be stable for this amount of time for pump stop to activate	0-65535	Seconds	12
Speed_minimise_rate	Rate at which speed is reduced - sets number of seconds between 0.5Hz steps down	0-65535	Seconds	2

PARAMETERS 	
Number_of_pumps	4
Pump_1_enable	1
Pump_2_enable	1

Although each of the parameters can be individually modified, some parameters are related to each other. In order to prevent undefined operation, these dependent settings must be valid not just in the range of the parameter, but also relative to any related parameters.

The following table lists those parameters with dependencies, and the parameters to which they are related:

Parameter	Dependencies
Stage_threshold	Greater than <i>destage_threshold</i>
Destage_threshold	Less than <i>stage_threshold</i> Greater than <i>no_demand</i> speed
Minimum_speed	Less than <i>no_demand_speed</i>
No_demand_speed	Less than <i>destage_threshold</i> Greater than <i>minimum_speed</i>
Low_pressure_speed	Greater than <i>minimum_speed</i>
Setpoint	Greater than <i>minimum_speed</i>
Low_pressure_level	Less than <i>setpoint</i> Greater than <i>pipe_fill_threshold</i>
Pipe_fill_threshold	Less than <i>low_pressure_level</i>

If an attempt is made to write a parameter value that does not meet these dependencies, then the parameter will be set to the closest valid value. The write will appear successful but the parameter will then change to the valid value rather than the written value.

9. LOGGED DATA

To provide feedback regarding the system the following parameters will be logged.
All logged data has a maximum value of 0xffff (if this value is reached, the parameter will not be incremented any further).

Parameter	Description
Pump_1_starts	Number of times Pump 1 had started
Pump_2_starts	Number of times Pump 2 has started
Pump_3_starts	Number of times Pump 3 has started
Pump_4_starts	Number of times Pump 4 has started
Pump_1_fault_count	Number of times Pump 1 has flagged a fault
Pump_2_fault_count	Number of times Pump 2 has flagged a fault
Pump_3_fault_count	Number of times Pump 3 has flagged a fault
Pump_4_fault_count	Number of times Pump 4 has flagged a fault
Pump_1_run_hours	Number of hours Pump 1 has been running for
Pump_2_run_hours	Number of hours Pump 2 has been running for
Pump_3_run_hours	Number of hours Pump 3 has been running for
Pump_4_run_hours	Number of hours Pump 4 has been running for
Power_cycle_count	Number of times controller has been powered up
Sleep_count	Number of times system has entered sleep mode
High_pressure_count	Number of times a high pressure fault has been activated
Low_pressure_count	Number of times a minimum pressure fault has been activated
Low_level_lockout_count	Number of times a low level lockout has occurred
Cycle_protect_count	Number of times a pump cycling protect has activated
Feedback_loss_count	Number of times a feedback loss fault has activated
Pipe_fill_fail_count	Number of times a pipe fill failure has occurred

LOGGED DATA 	
Pump_1_start_count	12
Pump_2_start_count	3
Pump_3_start_count	3



10. STATUS INFORMATION

Separate to logged data and function parameters, the following lists information reporting purely system information:

Parameter	Description
System_state	Current operational state of the system
Pump_1_state	Operational state of Pump 1
Pump_2_state	Operational state of Pump 2
Pump_3_state	Operational state of Pump 3
Pump_4_state	Operational state of Pump 4
Input_states	Each bit depicts the state of one of the discrete inputs
Output_states	Each bit depicts the state of one of the discrete outputs
Analogue_in	Analogue input level (feedback pressure)
Analogue_out	Analogue output level (speed)
Alarm_states	Each bit depicts the state of an alarm
Fault_lockout_states	Each bit depicts the state of a fault lockout
Virtual_setpoint	Setpoint used by the controller during setpoint ramp operation
Firmware_rev	4-Characters representing the controllers' firmware revision



SECTION 3 - WARRANTY

Items manufactured, supplied and maintained by Hunter Pumps Sales & Service (ABN 40518050187) “*Hunter Pumps*” are warranted to be free from defects in material and workmanship for 12 calendar months from the time they originally depart Hunter Pumps factory. Hunter Pumps liability under this warranty, statutory or otherwise, is limited to replacement or repair of the defective part or parts. Such repair or replacement shall be at the absolute discretion of Hunter Pumps. All parts or items subject to a claim under this warranty shall be delivered to and collected from Hunter Pumps factory or an alternative address designated by Hunter Pumps.

Exclusions:

- a, any item not subject of a maintenance agreement with and maintained by Hunter Pumps
- b, replacement or repair of any perishable or consumable parts or materials
- c, costs of collection from or delivery to Hunter Pumps of the parts claimed.
- d, any part or any item on which a repair or alteration has been attempted or made without Hunter Pumps express permission in writing, unless such repair or alteration has been made by Hunter Pumps.
- e, any parts supplied or manufactured by manufacturers other than Hunter Pumps forming part of the item supplied or manufactured by Hunter Pumps, shall be subject to the terms and conditions and warranties of their respective manufacturers, no warranty is offered by Hunter Pumps on those parts.
- f, parts used inappropriately, misused or used out of manufacturers specification.
- g, parts which have failed or been damaged as a result of cavitation, erosion, chemical reaction, electrolytic action, or foreign body.
- h, parts which have not been maintained in accordance with their manufacturers recommendations.
- i, parts damaged as a result of ionizing radiation or force majeure.
- j, fair wear and tear.

Items or parts provided by Hunter Pumps under this warranty that repair or replace a defective item shall inherit the balance of outstanding warranty period of the original item.

In no event shall Hunter Pumps be liable for any costs or consequential damages or contingent liabilities arising out of the failure of or defect in any part or item manufactured or supplied or maintained by Hunter Pumps.

No express, implied or statutory warranty, other than herein set forth is made.

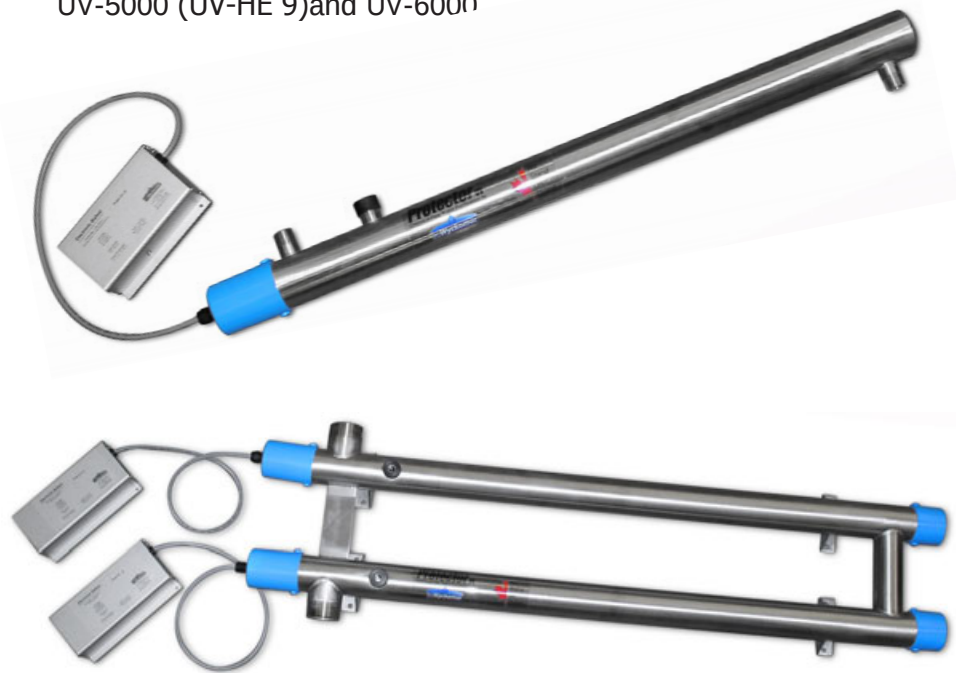


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Installation and Maintenance Manual

Models:

UV-1, UV-250,
UV-700 (UV-HE 6), UV-1200,
UV-1500 (UV-HE 7),
UV-3000 (UV-HE 8),
UV-5000 (UV-HE 9) and UV-6000





UV Purification Systems

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UV Purification Systems

Introduction

How Ultraviolet Water Purification Works

Ultraviolet (UV) Purifiers utilize the proven principle of ultraviolet light radiation to eliminate or reduce unacceptable levels of microorganisms in water and other liquids. Ultraviolet light energy destroys bacteria, viruses, fungi, spores, algae and other such contaminants, which are pathogenic to humans, animals and plants.

Ultraviolet purification is a completely natural, non-chemical, environmentally safe technique, which adds nothing to, and removes nothing from the water (such as trace minerals).

Factors Affecting UV Purification

The UV Purifier is guaranteed to eliminate microbiological contamination only if the physical qualities of the influent water supply are as follows:

Turbidity (Suspended Solids): Turbidity must be < 1.0 NTU at the time of disinfection. There must be a 5-micron or less sediment prefiltration system installed before the UV system.

TDS (Total Dissolved Solids): Should not exceed approximately 500 ppm.

Total Hardness (Sum of Calcium & Magnesium): Must be < 10 gpg (grains per gallon) of hardness, otherwise pretreatment is required.

Tannins & Colour: Must be < 2.0 ppm, or pretreatment is required.

Iron: Must be < 0.3 ppm.

Manganese: Must be < 0.05 ppm.

If your water quality parameters do not meet these criteria, please contact the manufacturer for pretreatment recommendations.



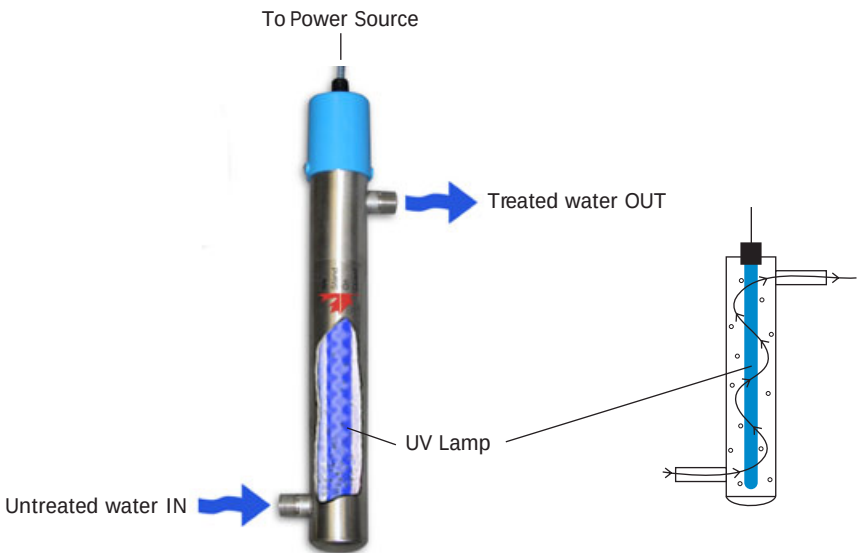
UV Purification Systems

Introduction

How Your Wyckomar UV Water Purifier Works

Untreated water enters the lower portion of the purification chamber and flows through the unit in an upward circular path. The spiraling movement assures the maximum irradiation of the fluid and helps prevent larger particles from blocking the treatment of microorganisms. The purification chamber contains the ultra-violet light-producing lamp. In operation, the lamp emits a bluish glow, which is visible in the view port window on the side of some units. **WARNING: DO NOT LOOK AT THE UV LIGHT DIRECTLY.** Looking through the view port is safe, since the glass disc in the view port filters out the UV rays. On systems equipped with a UV monitor, do not look at the UV light through the view port, as the quartz disc that is used in this case does not filter out the UV rays.

If your unit does not have a view port, operation of the UV light is confirmed by a green LED indicator lamp on the ballast. As long as the appropriate indicators are glowing, the unit is working properly. An alarm will sound when the UV lamp is not functioning. When the alarm is sounding, the lamp must be replaced for the unit to operate properly. The alarm sounds also when the ballast is damaged for any reason (e.g. from moisture buildup inside, or from having received a power spike or lightning strike).





UV Purification Systems

Setting Up

Safety Precautions

**Please READ and FOLLOW all safety precautions.
SAVE these instructions.**

Never expose your eyes directly to UV light.

This UV system is designed for indoor use only. Do not use this UV system where it may be exposed to the elements. Protect the unit from freezing at all times.

ELECTRICAL SHOCK HAZARD

This UV system is installed near water. Please take all necessary precautions. Other than where noted in this manual, **DO NOT** attempt to repair parts yourself, but contact the manufacturer or authorized dealer for repair service.

The electronic ballast in this system can get damaged from voltage and/or frequency deviations, caused by power outages or lightning strikes. Only connect this UV system to a properly grounded outlet. A GFCI circuit is recommended. It should not be plugged into the same circuit as a water pump, since the on/off cycle of the pump can cause voltage spikes in the line.

It is highly recommended, especially in rural areas, to install **a quality voltage regulator or surge suppressor, rated at > 3600 Joules** at the power input to the ballast.

In older homes, the installation of plastic water treatment devices such as filter housings may interrupt the water pipe's electrical continuity to ground. This can lead to pinhole leaking due to electrolysis or stray current corrosion. For prevention, the piping has to be properly bonded and grounded. Contact a professional plumber for information.

Ensure installation is in compliance with all local laws, regulations and codes.

DO NOT operate the UV system if the power cord, plug or any electrical component appears to be damaged or if the unit has been dropped or damaged in any way. Inspect the UV system after installation, and carefully check for leaks. **DO NOT** plug in the system if there is water on any part(s) that are not intended to be wet.

This system is to be used **ONLY** for its intended use of potable water disinfection. **DO NOT** use attachments that are not approved by the manufacturer, as this may cause problems with the UV system.



UV Purification Systems

Setting Up

Important Considerations

Wyckomar purifiers are installed either at the main water supply line or at point of use. In some installations, particularly where plumbing is old, the water may become re-contaminated in the pipes between the purifier and the faucet. Be sure to follow instructions under “Disinfecting Your Water System” on Page 9

Wyckomar purifiers are designed to be installed vertically and work best when mounted in this position. However, in cases with space restrictions, the unit may be mounted horizontally (see Installation Diagrams on Page 6).

Important: Clearance to the side or above the unit for lamp exchanges should be equal to the length of the purifier.

Caution: The ballast and all electrical connections must be mounted and installed above water lines to prevent the possibility of electric shock in the case of a water leak. A grounded electrical outlet is required (GFCI is preferred).

The manufacturer’s warranty is only applicable when prefiltered water is used. Prefilters (to 5 micron) remove sediment particles that can reduce the effectiveness of the UV lamp or potentially damage the unit.

If a water softener, iron removal system or other treatment device is installed or planned for, your purifier should be located closest to the faucet.

Install your Wyckomar purifier indoors in a protected area. The temperature should not fall below 4 °C (40 °F). Avoid conditions with high humidity to prevent condensation on the purification chamber. Ideal temperature conditions range from 9 °C to 29 °C.

Use Teflon tape (T-tape) liberally on all pipe connections (3 turns around the fitting). Do not use any other sealants other than food grade pipe dope.

Use food-grade silicon or plumber’s grease on O-rings. DO NOT use oil-based products.

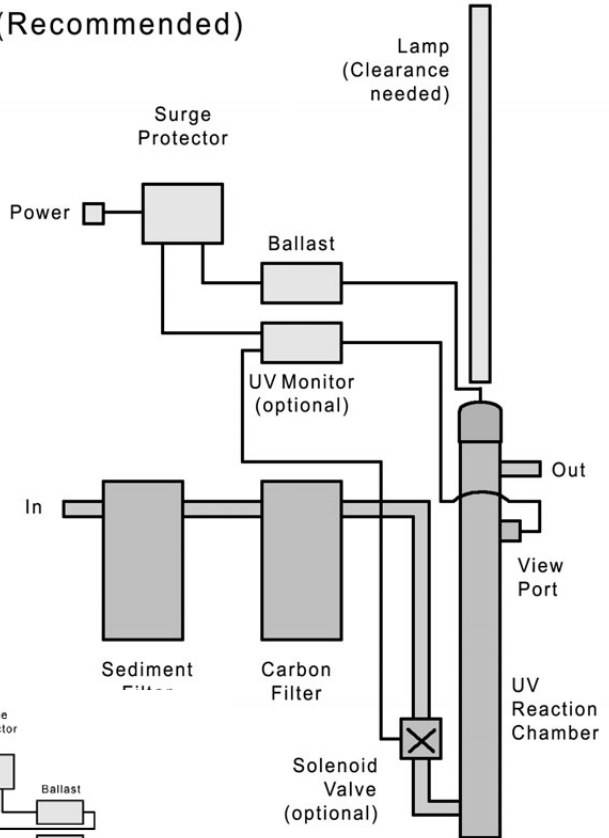
UV Purification Systems

Setting Up

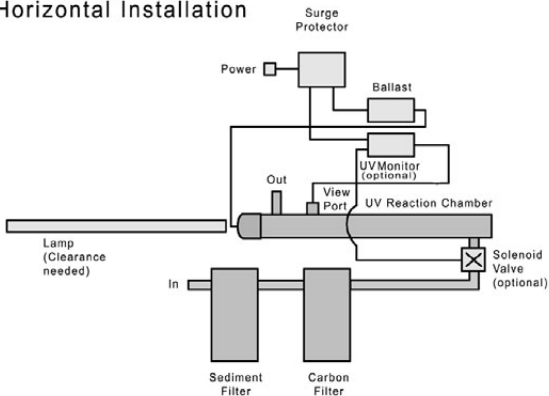
Installation Diagrams

Wyckomar systems can be installed vertical or horizontal. Refer to these schematic drawings for typical position of components. Ensure that there is adequate clearance at the lamp end of the unit in order to safely remove the UV lamp from the chamber. Space required for clearance is at least the length of the UV chamber.

Vertical Installation (Recommended)



Horizontal Installation





UV Purification Systems

Setting Up

Installation

Carefully select the location for the UV system and any related components. Note the direction of water flow in the supply line to which the unit is being connected.

Refer to the appropriate exploded view diagram for your unit and check to see that you have all the necessary fittings.

Parts List: 4 screws 1 quartz dome or sleeve, 1 or 2 O-rings
1 alcohol wipe 1 Allen key wrench
1 UV lamp w/ O-rings on each end

Turn off the main water supply valve. Fasten unit to wall, using the mounting clips ("pipe hangers") and screws provided. Press the UV chamber into the clips for a secure hold.

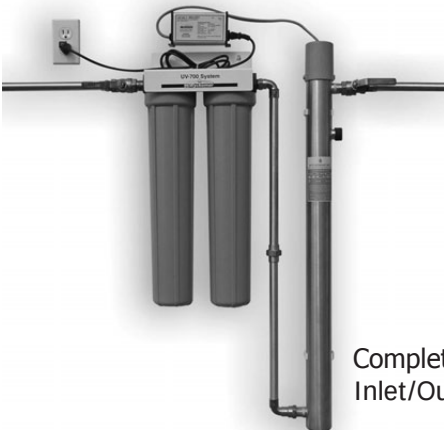
Install new plumbing, making sure the In and Out ports on the filter set point in the direction of water flow. Installation of bypass and valves is recommended.



Install filter set



Install UV unit



After installation of the plumbing is complete, install electrical components (surge suppressor and ballast, monitor if present) ABOVE the water line.

Complete installation with pre-filter set and UV. Inlet/Outlet shutoff valves are recommended.



UV Purification Systems

Setting Up

Installation and Start Up Operation

Take the plastic cap off the unit and remove the black nut from the end of the unit. Remove quartz sleeve/dome from packaging, being careful not to loose the spring inside the dome. You may wish to lubricate o-ring with food-grade silicon or plumber's grease (do NOT use oil based products such as Vaseline) and roll it over both ends of the sleeve or the open end of the dome. Avoid fingerprints on the sleeve/dome, wipe with alcohol.

Gently slide the sleeve/dome into the unit. For domed systems (UV-1, UV-250, UV-700 and UV-1200), the dome will center itself inside the bottom of the reaction chamber. For sleeved systems (UV-1500, UV-3000, UV-5000 and UV-6000), the sleeve(s) will protrude out of the reaction chamber at the bottom end, hold in place with hand or foot.

Thread on the compression nut(s). The O-ring will set itself into the beveled seal of the bushing on the reaction chamber. **Hand tighten** the nut(s) (do NOT use tools). In sleeved systems, install the lower plastic cap and gently tighten the set screws with the Allen key supplied. This will keep the lamp from sliding through.

Insert the UV lamp, it will center itself in the spring inside the dome in domed systems, or stop at the lower plastic cap in sleeved systems. Connect the white 4-pin electrical connector. Replace the top plastic cap and gently tighten setscrews. Unit is now ready to be turned on.

Open main water valve **slowly**. As water fills into the filter set, press the red button on top of the first filter housing (pressure relief valve) to release air. Hold until water starts to escape and then release. Continue with next filter. Open valves on either side of purifier **slowly** and check for leaks (bypass valve should remain closed). Turn on any faucet to release air in the system, wait for a steady stream of water, then turn off faucet.

Plug the power cable from the ballast into an appropriate power source outlet (**a power surge suppressor rated at > 3600 Joules is strongly recommended**). Wait for the lamp to come on (up to 30 sec) and inspect the ballast and viewport, if present.

Now that system is operating properly, any incoming water is disinfected. Any exisiting pathogens downstream of the system, if present, are not affected. Therefore, **it is mandatory to disinfected the plumbing system downstream from the unit after installation** according to the instructions on Page 9.



UV Purification Systems

Setting Up / Maintenance

Disinfecting Your Water System

In any UV system, disinfection takes place inside the UV chamber and there is no residual disinfection agent remaining in the water stream. Pathogens that may still be present in the plumbing system downstream of the UV unit will not be affected by the disinfection process. For this reason, it is **CRITICAL** that the plumbing system is disinfected after initial installation to prevent possible re-contamination of the water on it's way to the taps.

The following steps must be taken to accomplish this important task.

- 1** Turn off the water supply to the UV unit and make sure that the by-pass valve is closed if equipped. Turn on the UV unit.
- 2** Remove the filter bowls from the filter housing head and remove the filter cartridges.
- 3** Fill one filter bowl one-half full with chlorine bleach and screw the bowls (without cartridges) back onto the filter housing head.
- 4** Turn on the water supply, check for leaks.
- 5** Turn on every tap in the water system of the building both inside and outside, one-by-one. Run the water at each tap until the smell of chlorine is evident. Let the system sit idle for 60 minutes.
- 6** While the UV lamp remains on, open all taps in the water system to flush out the chlorine - approximately 5 minutes.
- 7** When all chlorine is flushed from the system, and while the UV lamp remains on, shut off the water supply and reinstall the filter cartridges in the filter housings.
- 8** Turn on the water supply, check for leaks. Test water for contaminants.

WARNING

This simple procedure must be performed after installation of the UV system, and whenever the UV system is shut down or inoperative for any reason whatsoever.



UV Purification Systems

Maintenance

Ultraviolet Lamp Replacement

The UV lamp located in the purification chamber will operate effectively for approximately 1 year (9000 hours) under normal conditions. The lamp will still light after that period, but maximum UV light penetration may fall below the prescribed safety level.

Important:

It is required that the lamp be changed every 12 months after installation regardless of apparent condition of the lamp. **For warranty purpose use only original manufacturer replacement parts.**



Caution! Do not look directly at the UV.

- 1** Unplug the purifier from the electrical outlet. Note: It is not necessary to turn off the water supply. Do not use water.
- 2** With the Allen key provided, loosen the two set screws that secure the top cap containing the electrical cord. Remove the cap and carefully set aside (it is attached to the ground wire).
- 3** Remove the lamp connector located at the cord end of the lamp by gently wiggling and pulling away from the lamp.
- 4** Carefully slide the UV lamp out of the quartz dome/sleeve and discard appropriately.
- 5** Insert the replacement lamp into the quartz dome/sleeve. Hold lamp at ceramic ends. Do not touch the lamp with your hands - fingerprints will prevent the system from working properly. If the lamp is touched, clean with an alcohol wipe.
- 6** Gently push the lamp connector against the pins at the end of the new lamp.
- 7** Make sure that all electrical components are dry before replacing the top cap. Secure the cap with the setscrews.
- 8** Plug in the power cord. The lamp should be operating at this time. To confirm that your new lamp is working correctly, check your model's light indicator on the ballast and, if present, check the view port.



UV Purification Systems

Maintenance

Cleaning/Replacing the Quartz Dome or Sleeve

Important:

If water turbidity is a problem, it is advisable to clean the quartz dome/sleeve each time when replacing the lamp.

- 1 Turn off the water supply and open a faucet to depressurize the plumbing system. Unplug the purifier from the electrical outlet. Press the pressure-relief button on one of the filter housings. Horizontal mounted systems need to be drained by removing filter bowls. Have a bucket on hand.
- 2 With the Allen key provided, loosen the two set screws that secure the top cap containing the electrical cord. Remove the cap and carefully set aside (it is attached to the chamber with the ground wire).
- 3 Remove the white lamp pin connector from lamp end. Remove the UV lamp carefully from the UV unit.
- 4 Loosen and remove the sealing compression nut. Caution: Quartz dome/sleeve may be stuck to the O-ring inside the retaining nut.
- 5 Carefully remove the quartz dome/sleeve from the UV chamber.
- 6 Wipe the quartz dome/sleeve with nonabrasive cleaner (e.g. CLR or Limeaway) and with an alcohol wipe being careful not to touch the dome/sleeve with your fingers. You may choose to lubricate the O-ring with food-grade silicon or plumber's grease (do not use oil based products, such as Vaseline). Slide the O-ring onto the dome/sleeve.
- 7 Using a clean cloth to hold the end of the replacement quartz dome/sleeve, guide it gently into the UV chamber and screw the sealing compression nut down until snug to secure seal. Hand-tight only, DO NOT USE TOOLS!
- 8 Insert the replacement lamp into the quartz dome/sleeve. Gently push the lamp pin connector against the pins at the end of the lamp.
- 9 Complete the reassembly of the UV purifier. Make sure that all electrical parts are dry before replacing the top cap and securing it with the setscrews.
- 10 Plug in the ballast, turn on the water supply and check for leaks.



UV Purification Systems

Maintenance

Changing Filter Cartridges

Filter cartridges have to be changed on a frequent basis to ensure proper operation of the system. A pressure drop detected at the tap is an indication that the sediment filter cartridges is at capacity, and a re-occurrence of unwanted taste or odour is an indication that the carbon cartridge (if present) is exhausted.

Follow these steps to change out filter cartridges in your system.

- 1** Turn off the water supply. If isolation valves are installed at the unit, close them both.
- 2** Depress pressure release button to relieve pressure in filter housing. Unscrew housing with plastic wrench. Note: When opening filter housing, it is common for the O-ring/gasket to lift out of the housing and stick to cap.
- 3** Remove used cartridge and discard. Rinse out housing and fill approximately 1/3 full of water. Add about 2 to 3 teaspoons of bleach and scrub thoroughly with brush or sponge. Rinse thoroughly.
- 4** Remove O-ring/gasket from sump and wipe groove and O-ring/gasket clean. You may choose to lubricate O-ring/gasket with a coating of food grade silicon grease. Place O-ring/gasket back in place and press O-ring/gasket down into the groove with fingers (or place on rim of sump). Note: Make sure O-ring/gasket is seated level to maintain proper seal. If O-ring/gasket appears damaged, replace at this time.
- 5** Insert a new cartridge into the sump making sure that it slips down over the sump standpipe.
- 6** Screw the sump onto the cap and handtighten. Make sure that the cartridge slips over the cap standpipe.
- 7** Open shutoffs at the UV system (if present), open a faucet to depressurize the plumbing system, then turn on the water supply slowly to allow filter housing(s) to fill with water.
- 8** Depress the pressure release button (if present) to release trapped air from the filter housings.
- 9** Check for leaks before leaving installation. Filter sump may be gently tightened with plastic filter wrench if leaks occur. **DO NOT OVERTIGHTEN!**



UV Purification Systems

Maintenance

Filter Maintenance and Troubleshooting

Important:

Do not use filter with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the unit.

An activated carbon cartridge (Taste/Odour) may contain a small amount of carbon fines (very fine black powder). A new cartridge should be flushed with sufficient water after installation to remove the fines before using the water.

Each time that you use water from your filtered water tap for drinking or cooking purposes, it is recommended that you run the tap for at least 10 seconds prior to using the water. This is important if the water tap is not used daily.

Replacement filter cartridges have a limited service life. Changes in taste, colour and flow of the water being filtered are signals that replacement of the cartridge is imminent or may soon be necessary.

CAUTION: The filter must be protected against freezing. Failure to do so may result in cracking of the filter and water leakage.

CAUTION: All filtration systems contain other parts that have a limited service life. Exhaustion of the service life of those parts often cannot be easily detected. Commonly, it is only after leakage has been observed or water damage has occurred that one is made aware that the service life has been exhausted.

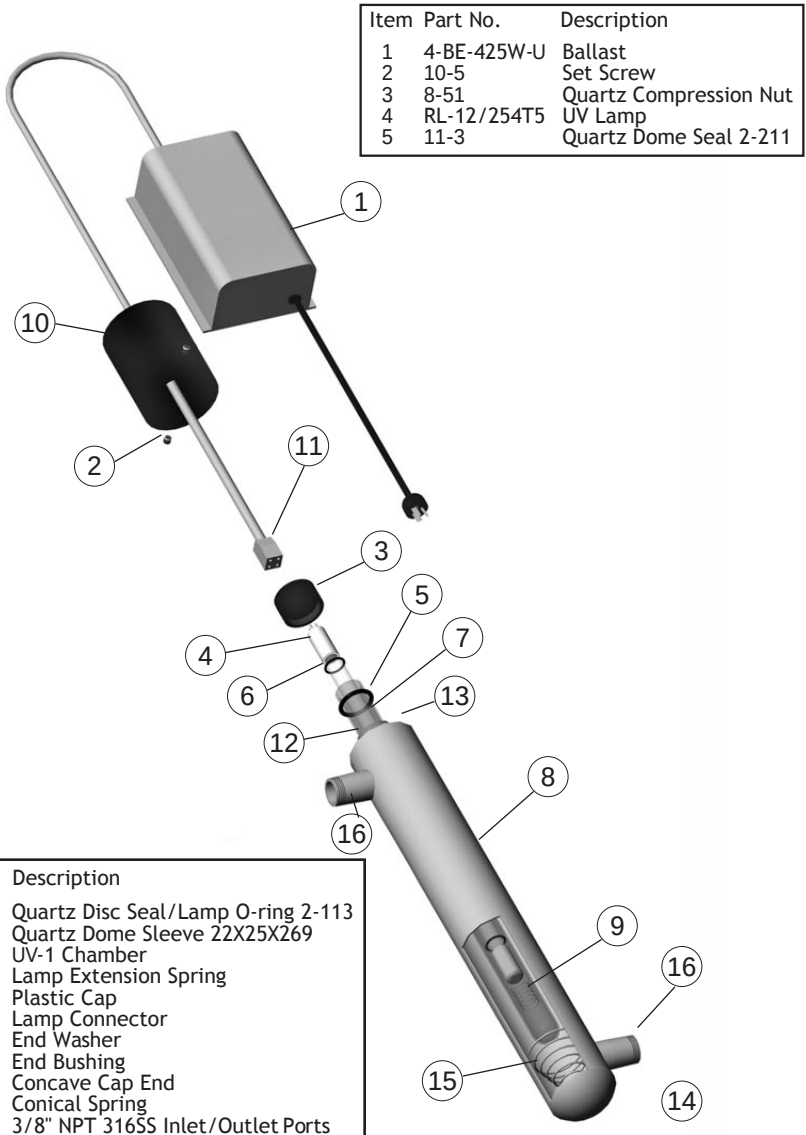
IMPORTANT NOTICE: To prevent costly repairs or possible water damage, we recommend that the bowl or sump of all plastic housings be replaced periodically: at least every 5 years for clear sumps, and every 10 years for opaque sumps.

UV Purification Systems

UV-1

Technical Info

Exploded Diagram & Parts List

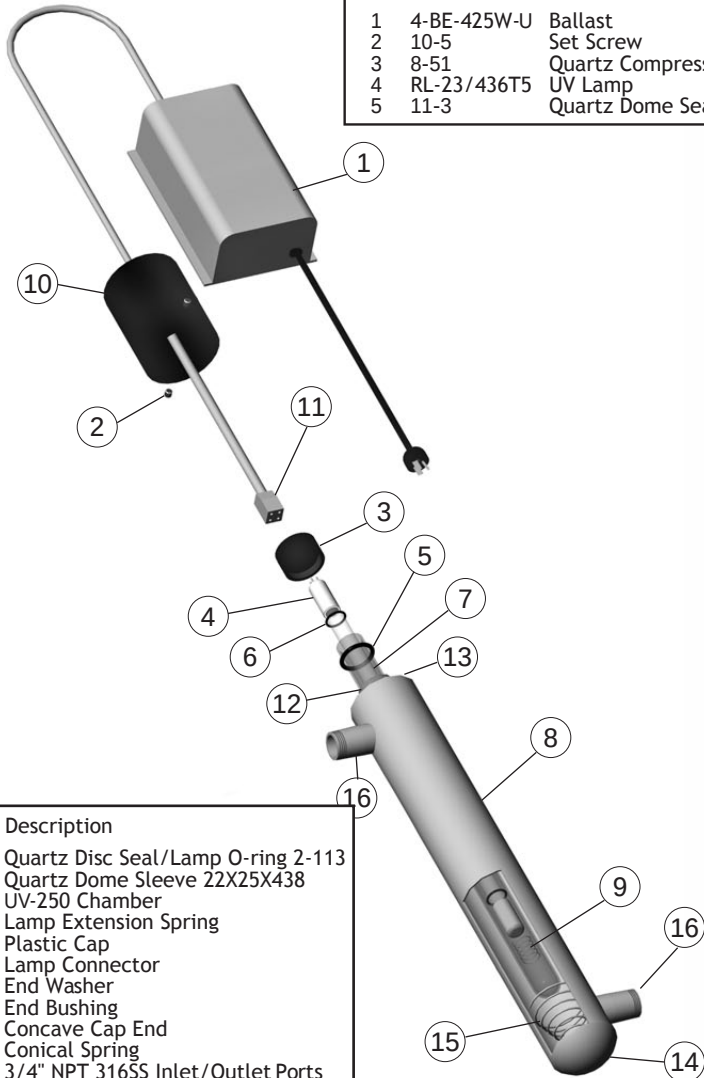


UV Purification Systems

UV-250

Technical Info

Exploded Diagram & Parts List





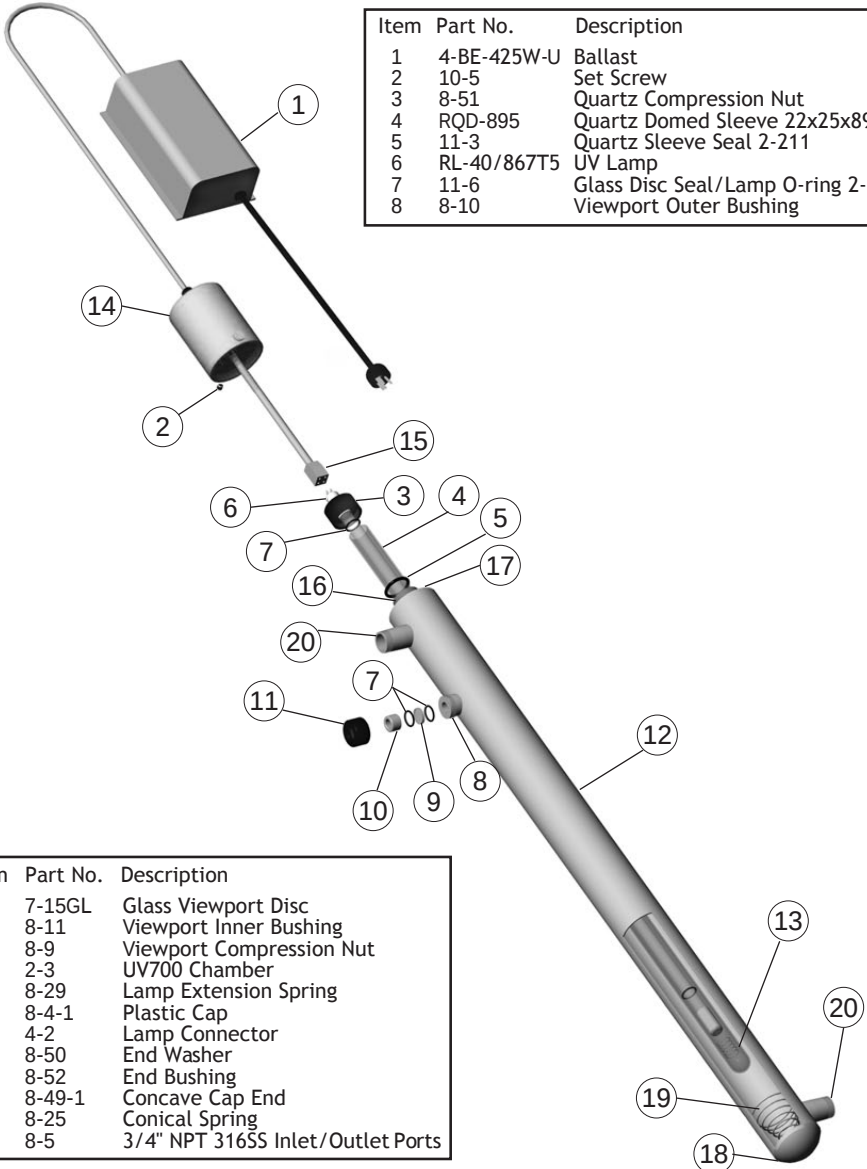
UV Purification Systems

UV-700

Technical Info

Exploded Diagram & Parts List

Item	Part No.	Description
1	4-BE-425W-U	Ballast
2	10-5	Set Screw
3	8-51	Quartz Compression Nut
4	RQD-895	Quartz Domed Sleeve 22x25x895
5	11-3	Quartz Sleeve Seal 2-211
6	RL-40/867T5	UV Lamp
7	11-6	Glass Disc Seal/Lamp O-ring 2-113
8	8-10	Viewport Outer Bushing



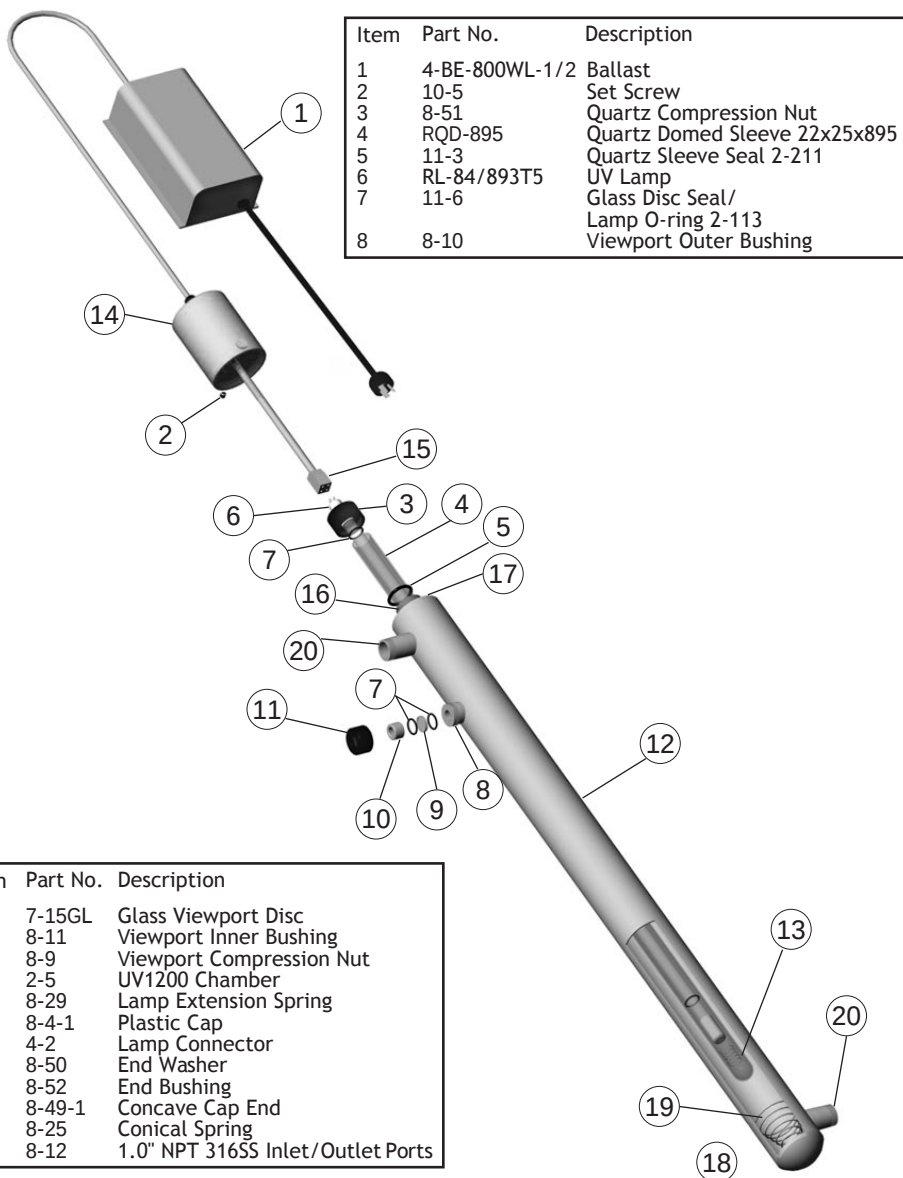
Item	Part No.	Description
9	7-15GL	Glass Viewport Disc
10	8-11	Viewport Inner Bushing
11	8-9	Viewport Compression Nut
12	2-3	UV700 Chamber
13	8-29	Lamp Extension Spring
14	8-4-1	Plastic Cap
15	4-2	Lamp Connector
16	8-50	End Washer
17	8-52	End Bushing
18	8-49-1	Concave Cap End
19	8-25	Conical Spring
20	8-5	3/4" NPT 316SS Inlet/Outlet Ports

UV Purification Systems

UV-1200

Technical Info

Exploded Diagram & Parts List



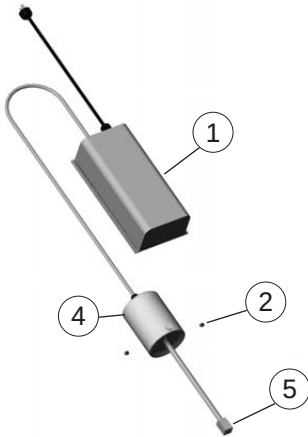


UV Purification Systems

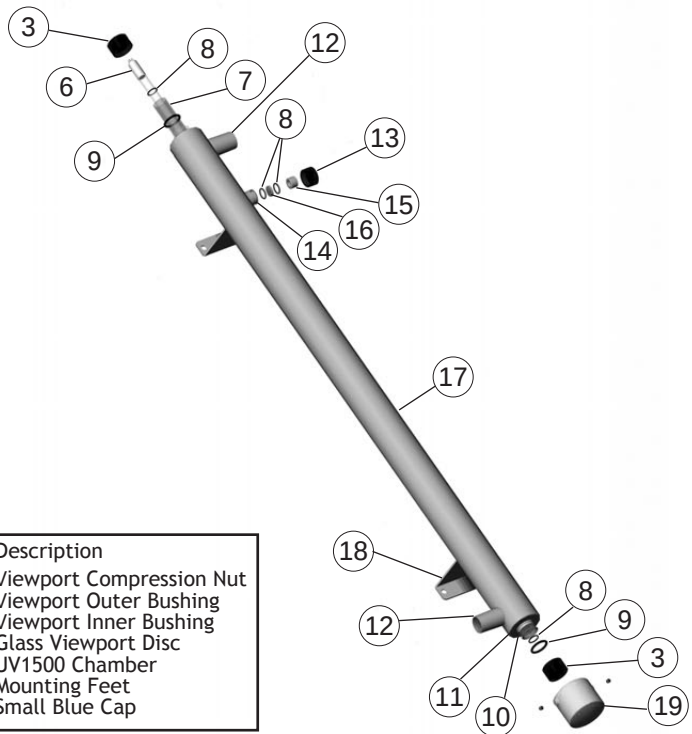
UV-1500

Technical Info

Exploded Diagram & Parts List



Item	Part No.	Description
1	4-BE-800WL-1/2	Ballast
2	10-5	Set Screw
3	8-53	Quartz Compression Nut
4	8-4-1	Large Blue Cap
5	4-2	Lamp Connector
6	RL-110/1197T5	UV Lamp
7	RQS-1181	Quartz Open Sleeve 22x25x1181
8	11-6	Glass Disc Seal/ Lamp O-ring 2-113
9	11-3	Quartz Sleeve Seal 2-211
10	8-52	End Bushing
11	8-50	End Washer
12	8-12	1.0" NPT 316SS Inlet/Outlet Ports



Item	Part No.	Description
13	8-9	Viewport Compression Nut
14	8-10	Viewport Outer Bushing
15	8-11	Viewport Inner Bushing
16	7-15GL	Glass Viewport Disc
17	2-4	UV1500 Chamber
18	5-2	Mounting Feet
19	8-4	Small Blue Cap



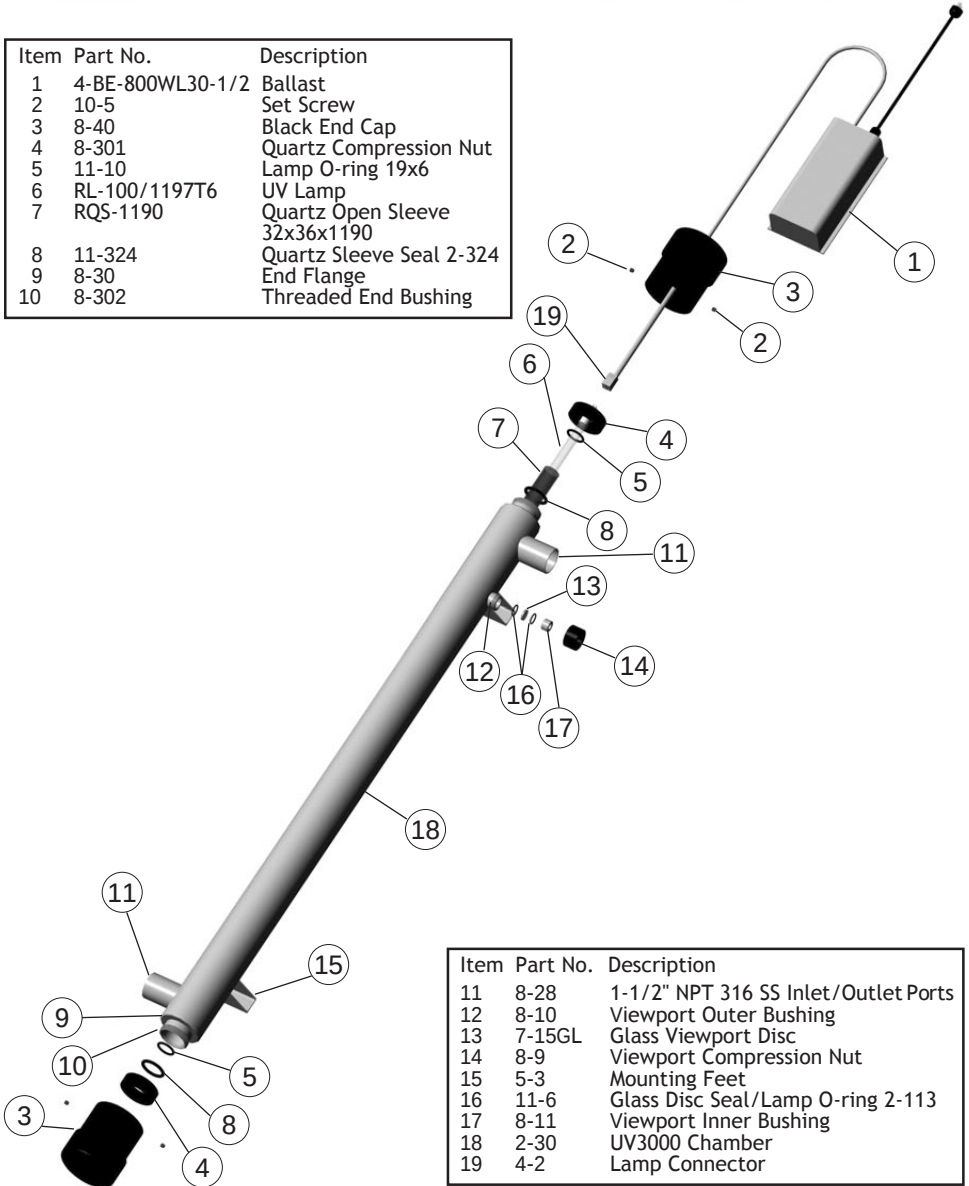
UV Purification Systems

UV-3000

Technical Info

Exploded Diagram & Parts List

Item	Part No.	Description
1	4-BE-800WL30-1/2	Ballast
2	10-5	Set Screw
3	8-40	Black End Cap
4	8-301	Quartz Compression Nut
5	11-10	Lamp O-ring 19x6
6	RL-100/1197T6	UV Lamp
7	RQS-1190	Quartz Open Sleeve 32x36x1190
8	11-324	Quartz Sleeve Seal 2-324
9	8-30	End Flange
10	8-302	Threaded End Bushing



Item	Part No.	Description
11	8-28	1-1/2" NPT 316 SS Inlet/Outlet Ports
12	8-10	Viewpoint Outer Bushing
13	7-15GL	Glass Viewport Disc
14	8-9	Viewpoint Compression Nut
15	5-3	Mounting Feet
16	11-6	Glass Disc Seal/Lamp O-ring 2-113
17	8-11	Viewpoint Inner Bushing
18	2-30	UV3000 Chamber
19	4-2	Lamp Connector

UV Purification Systems

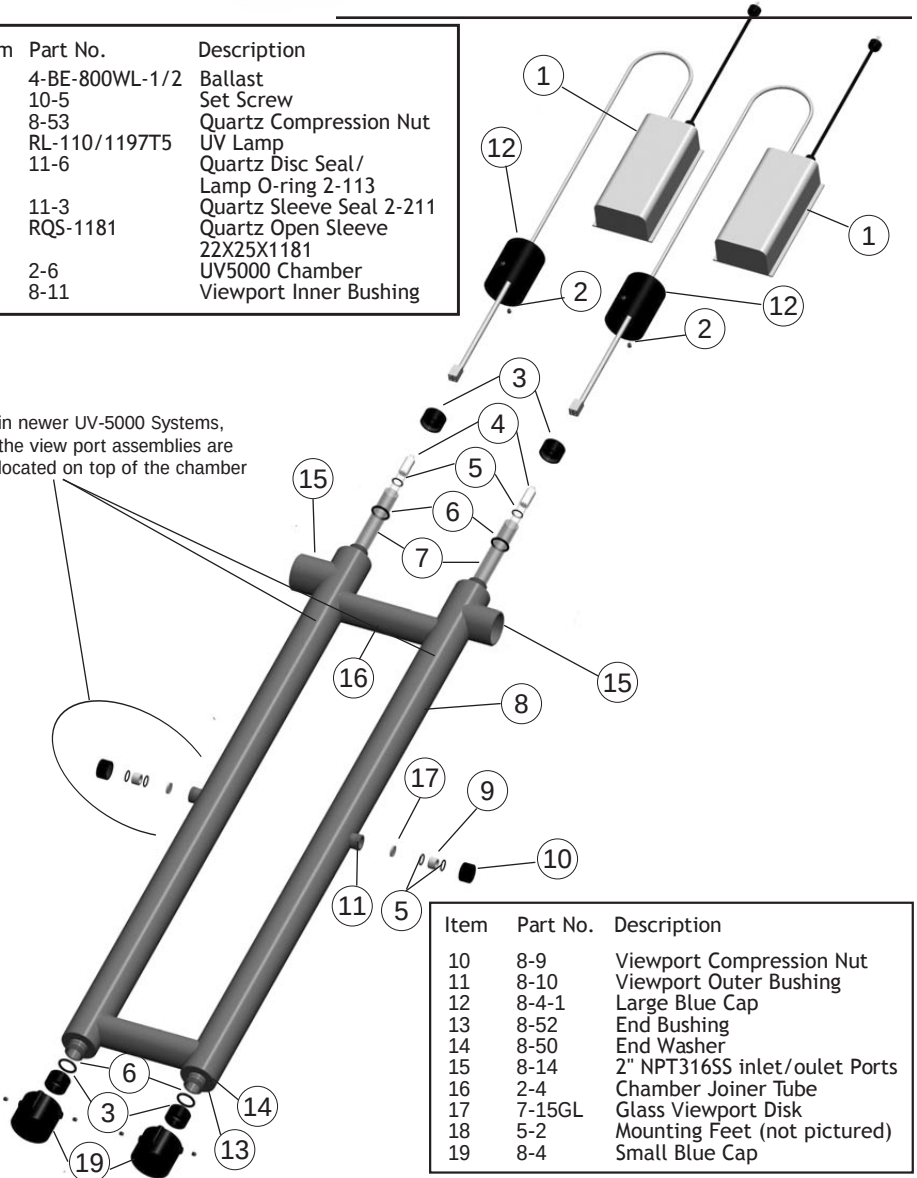
UV-5000

Technical Info

Exploded Diagram & Parts List

Item	Part No.	Description
1	4-BE-800WL-1/2	Ballast
2	10-5	Set Screw
3	8-53	Quartz Compression Nut
4	RL-110/1197T5	UV Lamp
5	11-6	Quartz Disc Seal/ Lamp O-ring 2-113
6	11-3	Quartz Sleeve Seal 2-211
7	RQS-1181	Quartz Open Sleeve 22X25X1181
8	2-6	UV5000 Chamber
9	8-11	Viewport Inner Bushing

in newer UV-5000 Systems,
the view port assemblies are
located on top of the chamber



Item	Part No.	Description
10	8-9	Viewport Compression Nut
11	8-10	Viewport Outer Bushing
12	8-4-1	Large Blue Cap
13	8-52	End Bushing
14	8-50	End Washer
15	8-14	2" NPT316SS inlet/outlet Ports
16	2-4	Chamber Joiner Tube
17	7-15GL	Glass Viewport Disk
18	5-2	Mounting Feet (not pictured)
19	8-4	Small Blue Cap

UV Purification Systems

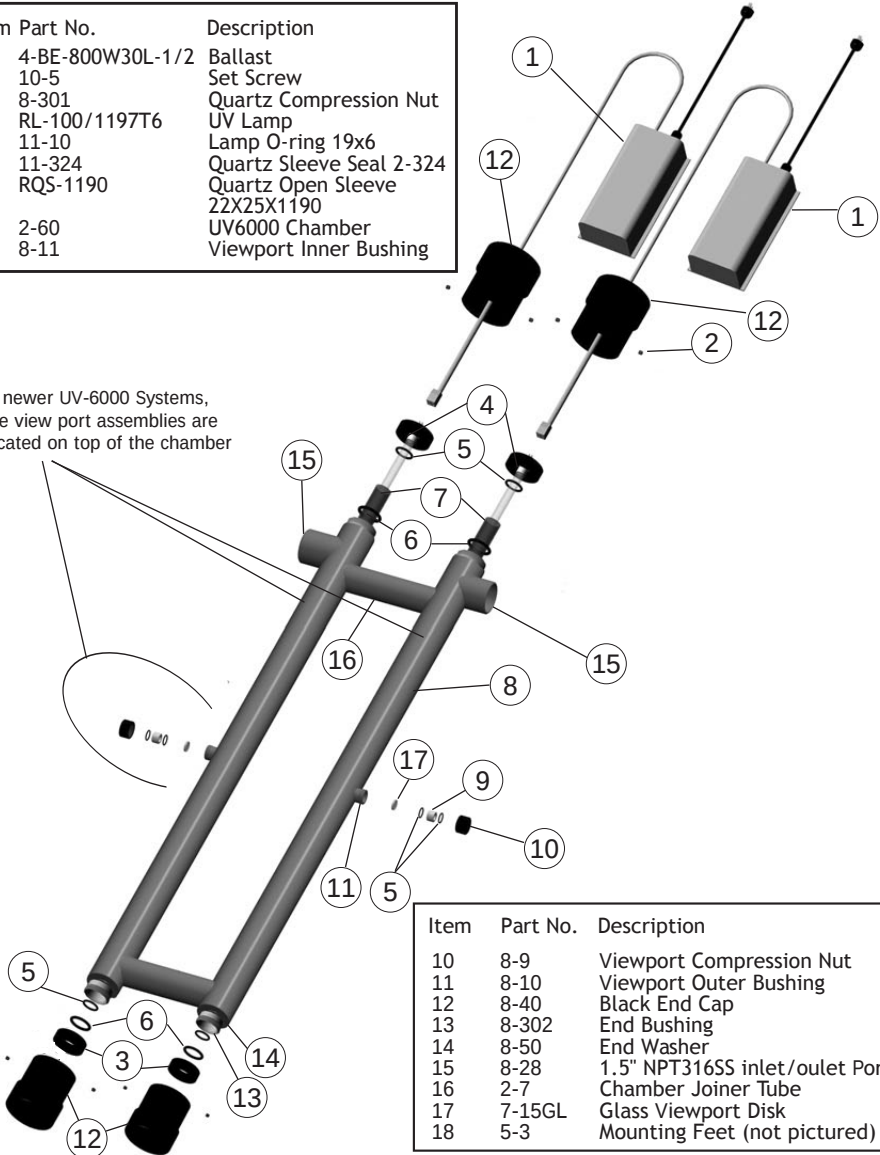
UV-6000

Technical Info

Exploded Diagram & Parts List

Item	Part No.	Description
1	4-BE-800W30L-1/2	Ballast
2	10-5	Set Screw
3	8-301	Quartz Compression Nut
4	RL-100/1197T6	UV Lamp
5	11-10	Lamp O-ring 19x6
6	11-324	Quartz Sleeve Seal 2-324
7	RQS-1190	Quartz Open Sleeve 22X25X1190
8	2-60	UV6000 Chamber
9	8-11	Viewport Inner Bushing

in newer UV-6000 Systems,
the view port assemblies are
located on top of the chamber



Item	Part No.	Description
10	8-9	Viewport Compression Nut
11	8-10	Viewport Outer Bushing
12	8-40	Black End Cap
13	8-302	End Bushing
14	8-50	End Washer
15	8-28	1.5" NPT316SS inlet/outlet Ports
16	2-7	Chamber Joiner Tube
17	7-15GL	Glass Viewport Disk
18	5-3	Mounting Feet (not pictured)



UV Purification Systems

Maintenance

Troubleshooting Guide

Trouble	Cause	Solution
UV Lamp will not light	Input voltage below or above 120/240 volts	Install a voltage regulator
	Line cord disconnected or outlet defective	Check or replace
	Breaker/fuse has blown	Check or replace
	Defective UV Lamp	Replace
	Defective Lamp Ballast	Check that indicator light is on Check output voltage Check that white lamp end connector is secure on lamp pins
Leak at quartz sleeve	Defective or cracked O-ring O-ring not seated properly Quartz fracture	Lubricate or replace O-ring Replace O-ring Replace quartz sleeve

If problem persists, call Wyckomar Inc. for technical assistance.
1.800.419.5162 or 519.822.1886 email sales@wyckomaruv.com



UV Purification Systems

Accessories

Filter Sets and Cartridges

Filter Sets are available in standard 10" and 20" configurations, in SlimLine and BigBlue sizes. For commercial applications with higher flow rates, stainless steel filter housings are available. We HIGHLY recommend a 5 micron sediment and a carbon filter be installed ahead of the UV unit in order to ensure proper UV operation. Commercial grade filter systems for higher flow rates are also available

Sediment and carbon filter cartridges are available from Wyckomar. Other types of filter cartridges for the removal of various contaminants are also available (arsenic, fluoride, etc). Minerals and dissolved solids have an effect on the clarity of the water and therefore on the efficacy of the UV disinfection process. If elevated levels of these contaminants are present, additional equipment may be needed to reduce/remove them from the water. Please refer to the Section "Factors affecting UV Purification" on Page 2.

Be sure to replace filter cartridges on a regular basis to ensure proper operation of your UV disinfection system.



UV Purification Systems

Accessories

UV Monitoring System

A Wyckomar UV Monitor (available separately) measures true UV intensity at 254 nm, which is the effective germicidal wavelength for UV treatment of drinking water. It continuously monitors lamp output inside the reaction chamber through a sensor in the viewport, regardless of whether or not water is flowing through the system. UV intensity is constantly displayed in real-time on the meter face on the monitor device. If the UV intensity emitted by the lamp drops below the alarm set-point (70% of new lamp UV output), the audible alarm will sound. An optional solenoid valve may be connected to the monitor to stop the water flow.

The UV Monitor is available with volt-free contacts for remote signaling of operation, and also with 4-20mA output for remote operation logging (see Page 25).

Installation instructions are supplied with the UV Monitor.





UV Purification Systems

Accessories

Remote Output and Operation Logging

An electronic ballast and a monitor can be equipped with volt-free contacts to allow remote signalling of the operation. This allows to incorporate the UV system into the work-flow of a large water treatment system that is centrally operated through a BMS (building management system).

A UV Monitor with 4-20 mA output for remote operation logging in a PLC is also available.



UV Monitor with 4-20 mA Output



UV Monitor Wet/Dry Contacts Extension

UV Purification Systems

Accessories

Purge Valve, Hour Meter

Thermo-Sensitive Purge Valve

During times of no-flow, some UV systems will warm up, as there is no cool water flowing through the chamber to cool the lamp. This is normal.

Increased temperature of the water means reduced UV output, as hot lamps do not produce as much germicidal output as cool lamps do. This may result in the UV system going into alarm state, if it is equipped with a UV Monitor.

The solution to this problem is to install a thermo-sensitive purge valve at the out port of the UV system. It will automatically open and drain water from the chamber, to allow cool water to replace it and maintain high UV output of the lamp. No power is required.



Purge Valve



Installation on the Out Port with a T-Fitting

Hour Meter

The electronic ballast of any Wyckomar UV system can be equipped with an optional resettable hour meter, displaying the total run time of the lamp. This is convenient for ensuring that the lamp is not used after the germicidal output has decreased to less than 70% of the output of a new lamp (after 9000 hours of operation).



Ballast with Hour Meter Installed



SECTION 3 - WARRANTY

Items manufactured, supplied and maintained by Aqua Energy Group (ABN 70614426827) are warranted to be free from defects in material and workmanship for 12 calendar months from the time they originally depart Aqua Energy Group's factory. Aqua Energy Group's liability under this warranty, statutory or otherwise, is limited to replacement or repair of the defective part or parts. Such repair or replacement shall be at the absolute discretion of Aqua Energy Group. All parts or items subject to a claim under this warranty shall be delivered to and collected from Aqua Energy Group's factory or an alternative address designated by Aqua Energy Group.

Exclusions:

- a, any item not subject of a maintenance agreement with and maintained by Aqua Energy Group
- b, replacement or repair of any perishable or consumable parts or materials
- c, costs of collection from or delivery to Aqua Energy Group of the parts claimed.
- d, any part or any item on which a repair or alteration has been attempted or made without Aqua Energy Group express permission in writing, unless such repair or alteration has been made by Aqua Energy Group.
- e, any parts supplied or manufactured by manufacturers other than Aqua Energy Group forming part of the item supplied or manufactured by Aqua Energy Group, shall be subject to the terms and conditions and warranties of their respective manufacturers, no warranty is offered by Aqua Energy Group on those parts.
- f, parts used inappropriately, misused or used out of manufacturers specification.
- g, parts which have failed or been damaged as a result of cavitation, erosion, chemical reaction, electrolytic action, or foreign body.
- h, parts which have not been maintained in accordance with their manufacturers
- i, recommendations.
- j, parts damaged as a result of ionizing radiation or force majeure.
- fair wear and tear.

Items or parts provided by Aqua Energy Group under this warranty that repair or replace a defective item shall inherit the balance of outstanding warranty period of the original item.

In no event shall Aqua Energy Group be liable for any costs or consequential damages or contingent liabilities arising out of the failure of or defect in any part or item manufactured or supplied or maintained by Aqua Energy Group.

No express, implied or statutory warranty, other than herein set forth is made.



Head Office: 21 Kalinya Close, Cameron Park NSW 2285
Queensland Office: 2/35 Millenium Place, Tingalpa QLD 4173
02 4958 7555 | sales@hunterpumps.com
www.hunterpumps.com

Installation and Operating Instructions JUDO SPEEDYMAT- LongLife

Backwash Protective Filter $\frac{3}{4}$ " – 2"

Valid for: EU countries and Switzerland

Language: English

Attention:

Carefully read through the installation and operating instructions and safety information before installing and putting the unit into service.

These must always be issued to the owner/user.

Extended warranty period if a service agreement is concluded!

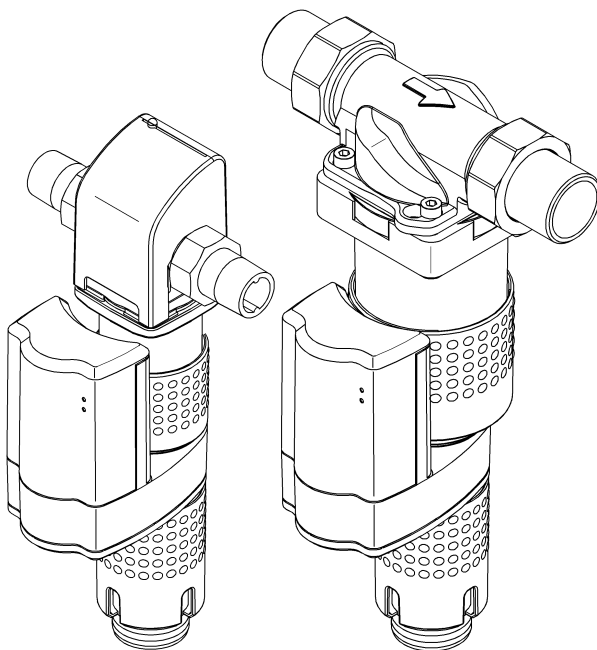


Fig: JSY-LF-A $\frac{3}{4}$ " – 1 $\frac{1}{4}$ "

Fig: JSY-LF-A 1 $\frac{1}{2}$ " – 2"



**HP HUNTER
PUMPS**

Enquiries, orders, customer support

Phone: 02 4958 7555

internet: <http://www.hunterpumps.com>

e-mail: sales@hunterpumps.com

Address

21 Kalinya Close

CAMERON PARK NSW 2285

Dear Customer,

We would like to thank you for your confidence in us, which you have shown by purchasing this device. The product you have purchased is a filter developed using state of the art technology.

This filter is suitable for use in cold drinking water up to a maximum ambient temperature of 30°C (86°F).

It removes coarse and fine-grained particles larger or equal in size to the filter screen (strainer) mesh from the filter through screen filtration.

Particles smaller than the screen mesh size used, turbidities (i.e. substances that make the water turbid) and substances dissolved in the water cannot be filtered out of the water.

Each unit is thoroughly checked before delivery. Should difficulties nevertheless occur, please contact the responsible customer service. See back page.



EC Conformity Declaration

Document-no. 128/04.05

Manufacturer: JUDO Wasseraufbereitung GmbH

Address: Hohreuschstr. 39 - 41
71364 Winnenden

**Product Description: Automatic Backwash-Protective Filter
JUDO SPEEDYMAT-LongLife ¾" - 2"**

- EC-Directive: Electromagnetic Compatibility (EMC) 89/336/EC
- Harmonized Standard: Electromagnetic Compatibility, Generic Standards EN 61000-6-2
for Radiated Interference and Interference Immunity. EN 61000-6-3

The observance of all points of the EMC requirements (EC conformity) for the use of the device in household / commercial areas and industrial areas is hereby confirmed in each above mentioned detail.

- Harmonized Standard: Safety of power transformers, power supply units and similar. EN 61558-2-6

Issuer: JUDO Wasseraufbereitung GmbH

Place and Date: Winnenden, 13th April, 2005

Legally binding
signature:

JUDO Wasseraufbereitung GmbH

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Enclosure: Consultation Voucher**1. About this Instruction Manual**

(see chapter "Safety information and dangers due to non-compliance")

The instruction manual must be permanently available at the place in which the filter is used.

This instruction manual is intended to make it easier to familiarize yourself with the filter and its possible intended uses.

The instruction manual contains important information in order to safely, properly and economically run the filter.

It contains fundamental information, which must be observed during installation, operation and maintenance. Observance of this information helps to avoid dangers, reduce repair costs and increase the reliability and service life of the filter.

The instruction manual must be read and used by each person entrusted with carrying out work on the filter, for example:

- **Installation**
- **Operation**
- **Maintenance** (servicing, inspection, repair)

Installation and maintenance may only be carried out by personnel authorized by the manufacturer, who are capable of fulfilling the instructions given in the installation and operating instructions and the country-specific regulations.

Apart from the instruction manual and the legally binding accident prevention provisions applicable in the country and place of use, the recognized technical regulations for safe and proper work must also be observed.

Therefore, this instruction manual must always be read by the fitter and responsible skilled personnel/owner or operator before

installation, putting into service and maintenance.

Not only the general safety notes given in the chapter “Intended Use” are to be observed, but also the special safety notes inserted under the other main items.

1.1 Symbols used

The safety notes contained in this instruction manual are labelled with the following symbols:



ATTENTION

Notes on existing dangers



Warning, electrical voltage.



Torques specified by the manufacturer.



Tips for use and other information.

Notes directly attached to the filter, e.g.

- Direction of flow (see Fig.1)
- Rating plate
- Cleaning information

must always be observed and kept in a fully legible condition.

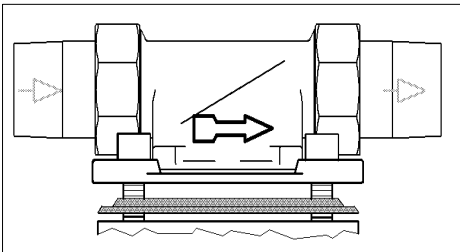


Fig. 1: Built-in rotary flange

1.2 Safety information and dangers due to non-compliance

In detail, failure to observe the general danger symbols can result, for example, in the following risks:

- Failure of important functions of the filter.
- Danger to persons due to electrical and mechanical effects.
- Danger to persons and the environment due to leaks.

Refrain from any unsafe working methods.

Failure to comply with this instruction manual and the safety information can not only result in dangers for people but can also harm the environment and the unit.

1.3 Units used

In derogation of the International System of Units (SI = System International), the following units are used:

Units	Conversion
°F	°F = 9/5°C + 32
bar	1 bar = 10 ⁵ Pa = 0.1 N/mm ²
¾"	DN 20
1"	DN 25
1¼"	DN 32
1½"	DN 40
2"	DN 50

2. Intended Use

The installation and operation of the filter is subject to the following existing national regulations.

In addition to the operating instructions and the obliging regulations concerning accident prevention that exist in the country of operation and the location of use, the established technical regulations concerning safe and professional work, should also be observed.

The water which is to be treated should fulfil the requirements stipulated by European drinking water directives!

It is absolutely essential that the manufacturer / supplier will be consulted prior to any operation of the device using water of a different quality, respectively with water that contains additives.

This filter is designed for use with cold drinking water with a maximum water and environmental temperature of 30°C (86°F).

The filter has been developed and manufactured using state of the art technology and the established safety regulations in Germany.

The filter may only be operated in accordance with the manufacturer's specifications. Any other operation or operation beyond the specified use, is not in accordance with the manufacturer's specifications.

Additional dangers may result in the event of the device not being operated in accordance with the manufacturer's specifications and non-observance of the danger symbols or safety instructions. The manufacturer / supplier cannot be made liable for any damages caused by these additional dangers. The operator is responsible for these risks.

The use of the device in accordance with the customer's specifications includes the observance of the operating instructions.

The manufacturer / supplier should be consulted prior to any operation of the filter other than in the operational areas stated in these operating instructions.

The filter may only be operated in a technically faultless condition, in accordance with the manufacturer's specifications and the stated safety and danger relevant instructions and under observance of the operating instructions!

Any functional defects are to be removed immediately!

2.1 Water Pressure

The water pressure should be between 1.5 bar and 10 bar.

The water pressure must not exceed 1.5 bar as otherwise the backwashing can be impaired! If the filter is not backwashed regularly a pressure loss can result and this can impair the filter function.



ATTENTION

(see chapter “Safety information and dangers due to non-compliance”)

In the event of **water pressure above 10 bar**, the pressure reduction valve should be fitted **in front** of the filter (see Fig.2). If the operating pressure is above 10 bar, this may result in defects during operation.

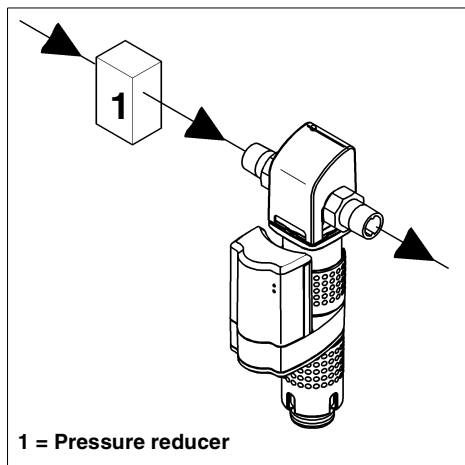


Fig. 2: Pressure reducer upstream of the unit



The installation of a pressure reduction valve is recommended for **water pressures between 5 bar and 10 bar**.

2.2 Notes on special dangers

2.2.1 Electrical equipment / installations



There must not be any electrical cables and devices underneath or in the immediate vicinity of the filter!

Electrical wiring and devices may not be situated under or in the direct vicinity of the filter.

Electrical devices / equipment that are not splash-water proof and are situated in the direct vicinity of the filter may be damaged by water leaking from the filter caused as a result of the device not being operated in accordance with the manufacturer's specifications.

In addition this may also result short circuits if these electrical devices / equipment being connected to the electrical power supply. In the event of such cases persons are at risk and may sustain electrical shocks. Therefore any electrical devices / equipment situated in the direct vicinity should be splash-water proof, respectively comply with the statutory requirements for wet areas (IP44).

2.2.2 Isolated outpost



Only extra-low voltage may be used for the remote transmission of the fault message by means of the isolated output!

Switched voltage.....maximum 24 V

Current..... maximum 1 A

(see chapter “Connecting an isolated fault message”)

3. Product Information

3.1 Intended purpose

This filter is suitable for use in cold drinking water up to a water temperature of maximum 30°C (86°F).



(see chapter “Safety information and dangers due to non-compliance”)

Please refer to the chapter on “Intended Use” for use restrictions.

This filter removes coarse and fine-grained particles from the water which are larger than or equal in size to the mesh size of the filter.



Particles smaller than the supplied mesh size and impurities causing turbidity cannot be filtered out of the water.

3.2 Test marks

DIN-DVGW mark



Fig. 3: Test marks

The units conform to the technical regulations for drinking water installations in accordance with DIN 1988. They are tested by the DVGW (Deutsche Vereinigung des Gas- und Wasserfaches e.V. technical –scientific association for the gas and water industries) in accordance with the requirements of DIN 19632 pressure stage PN 16 for mechanical filters for use in drinking water and are entitled to bear the DIN-DVGW mark (see Fig. 2).

3.3 Materials used

The materials used are resistant to the physical, chemical, and corrosive loads to be expected in the drinking water and fulfil the requirements specified in DIN 19632 (“Mechanical filters in drinking water installations”). All materials are hygienically and physiologically safe. Plastics (KTW recommendations) and metallic materials fulfil the requirements of the BgVV (German Federal Institute for Consumer Health Protection and Veterinary Medicine).

4. Installation

4.1 General



(see chapter “Safety information and dangers due to non-compliance”)

The unit may only be installed by skilled personnel.

The chapter “Intended Use” must always be observed!

The pipes must be able to safely support the filter.

Otherwise mechanical damage or fractures/bursts can occur in the pipes. This can result in major water damage. People close to the filter are exposed to a health risk due to the large quantities of water released. Therefore, if necessary, the pipes must be additionally fixed or supported.

For convenient operation and maintenance it is absolutely necessary to ensure the given spacings (see chapter “Discharging the backwashing water”).

A space of at least 200 mm should be maintained above and below the filter. These distances are necessary to be able to properly carry out the backwashing (see chapter “Backwashing”).

(see chapter “Modifications / changes / spare parts”)

4.1.1 Requirements for the place of installation

The room where the unit is installed must be dry and frost free!

Unauthorised persons must not have access to the filter!



(see chapter “Safety information and dangers due to non-compliance”)

- The ambient temperature must not exceed 30°C (86°F)! At higher temperatures or direct sun radiation the material can be damaged and the filter hood can even break.
- In order to be able to safely discharge the wastewater in operation and in case of any defects that occur in the system, precise compliance with the details given in the “Installation” chapter is necessary! If the wastewater (backwashing) cannot be safely and completely discharged, the house and installations can be damaged by water.
- A shut-off valve must be installed upstream of the filter! This enables the water supply to the filter to be interrupted during installation, servicing/maintenance, repairs and in case of malfunctions. Floods and serious water damage to house installations can therefore be avoided.
- The unit can be installed in all standard drinking water pipes.
- It is not permitted to install the filter **upstream of** the water meter!
- A socket outlet with earthing contact, for the automatic filter's power supply unit, is required above the filter with a continuous power supply at a maximum distance of 1.5 m.

4.1.2 Installed position



(see chapter “Safety information and dangers due to non-compliance”)

Always install the filter in a vertical position ($\pm 5^\circ$)!

Failure to observe this can cause uncontrolled backwashing water to escape and can result in damage caused by water.

4.1.3 Mounting the built-in rotary flange

Install using the supplied built-in rotary flange. The built-in rotary flange is used as a connecting element between the pipe and the filter.

It is suitable for both horizontal and vertical pipes.

The built-in rotary flange must be installed in the direction of flow. This is marked by a cast in arrow.

Failure to comply with this means the filter cannot work.



(see chapter “Safety information and dangers due to non-compliance”)

The flange surface of the built-in rotary flange must be in a vertical position! The built-in rotary flange must be fitted so that mechanical stresses cannot occur! Otherwise mechanical damage can result in the built-in rotary flange. Otherwise mechanical damage can result, the pipe may burst or the built-in rotary flange can break. This can result in major water damage.

In this case, people close to the filter are exposed to a health risk due to the large quantities of water.

Therefore, during installation, ensure that no large forces act on the pipe, built-in rotary flange and filter.

4.1.4 Installing the filter



Select the torque (approx. 4 Nm) so that the gasket closes and the filter is not damaged or strained!

The filter is connected using the supplied built-in rotary flange. It consists of the built-in rotary flange, profiled flange seal, union nut, sleeve and flat seal (see chapter “Spare parts”).

Undo the built-in rotary flange union nuts and fit to the pipe with the sleeve.

Note the installed dimensions!

Position the filter with pre-fitted built-in rotary flange between the sleeves, insert the flat seals and screw using the union nut.

The cast in arrow of the built-in rotary flange must match the direction of flow of the water.

**ATTENTION**

(see chapter “Safety information and dangers due to non-compliance”)

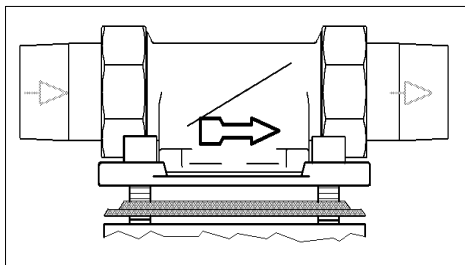


Fig. 4: Built-in rotary flange

The section of the profiled flange gasket must point towards the built-in rotary flange. Failure to observe this can lead to leaks and water escaping. This can in turn cause water damage to the house and its installations (see Fig. 4).

4.2 Discharging the backwashing water

**ATTENTION**

(see chapter “Safety information and dangers due to non-compliance”)

An adequately dimensioned wastewater connection (e.g. floor drain) to DIN 1986 must be available for the backwashing water.

The dimensioning depends on the local circumstances (e.g. wastewater pipe gradient, number of pipe bends, length of the wastewater pipe, etc.). The dimensioning must at least allow all the wastewater to be discharged at the same time.



Ensure that the wastewater connection functions before plugging the power supply unit into the socket.

If it is not possible to provide a wastewater connection directly beneath the filter, the flushing water can be fed several metres to the next wastewater connection, either through a hose or a pipe to be fitted to the flushing water valve. This pipe must have the same dimension as the flushing water valve.

In all options, a free discharge must be ensured in accordance with EN 1717.

4.2.1 Backwashing water discharge options

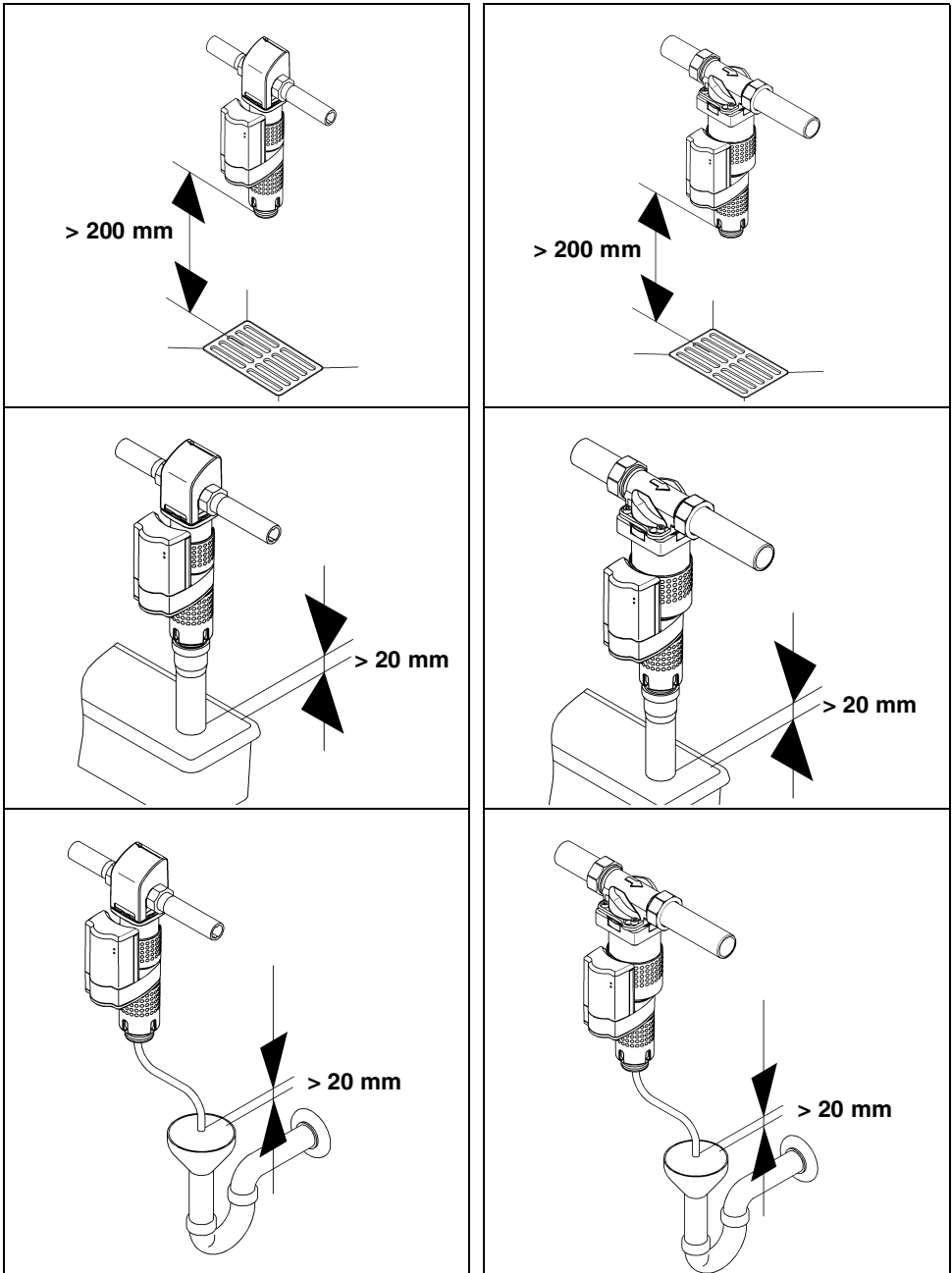
JSY-LF-A $\frac{3}{4}$ " – $1\frac{1}{4}$ "**JSY-LF-A $1\frac{1}{2}$ " – 2"**

Fig. 5: Backwashing water discharge options

5. Operation



ATTENTION

(see chapter "Safety information and dangers due to non-compliance")

Always observe the chapter "Intended Use"!

5.1 Commissioning

Before starting up (initial putting into service or startup after maintenance work), **fill** the filter with water and **vent**!

- To this end, after installation the filter station is filled with water by opening the upstream shut-off valve.
- The filter is now at the same pressure as the water system.
- The enclosed air must then be immediately removed from the filter station in order to avoid damage to the installation caused by pressure surges- The filter station is vented by means of backwashing (see chapter "Discharging the backwashing water").
- After backwashing and venting the filter station is ready for use.
- Check the default time control values set in the factory and adjust if necessary.

5.2 Indicator lights

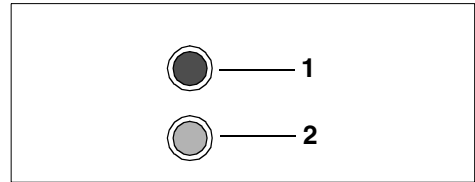


Fig. 6: Indicator lights

1	Operation - green indicator light filter is ready for use.
2	Fault - red indicator light A fault exists (see chapter "Faults").

5.3 Set time controls

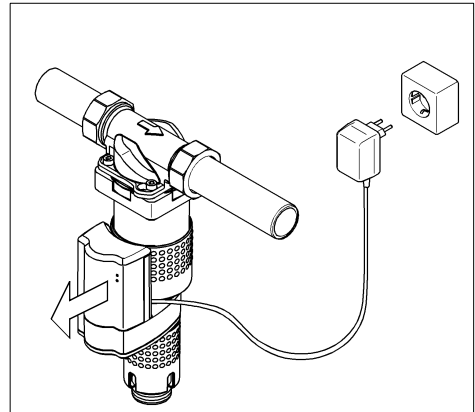


Fig. 7: Mains power interruption E.g.JSY-LF-A 2"



Disconnect the power supply unit from the socket!

- Remove the automatic controls cover by pressing on the side and pulling.

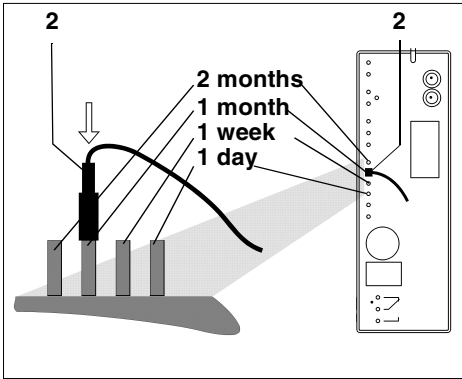


Fig. 8: Set time controls

- Select the required time interval for the time-controlled automatic backwashing process at the control electronics of the automatic controls- Select the required time interval by reconnecting the short cable strand (2). A cleaning interval of 1 month is preset in the factory. The selectable time intervals are written on the side of the control electronics. To change the time interval, pull off the cable lug (2) and push it onto the pin of the new time interval selected.

Selectable time intervals

2 months

1 month

1 week

1 day

- Replace the hood of the automatic controls, it audibly clicks into position.

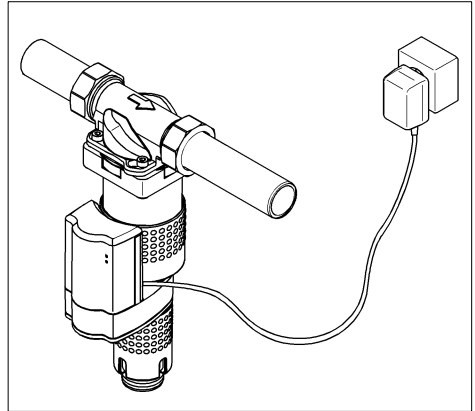


Fig. 9: Mains power interruption E.g. JSY-LF-A 2"



Ensure that the wastewater connection functions before plugging the power supply unit into the socket.



ATTENTION



(see chapter "Safety information and dangers due to non-compliance")

Backwashing starts immediately!

After the backwashing process the filter station is ready for use again.

Selecting the backwashing intervals

Application cases	Backwashing intervals ¹⁾
Doctor's practices, laboratories, photo labs	1 day, 1 week
filter installations in private and commercial buildings	1 month, 2 month
Well water	1 day, 1 week
Industrial sector air conditioning systems	1 day, 1 week

1) Depending on the amount of dirt arising

5.4 Functional description

Water flows through the built-in rotary flange (1) into the filter. A coarse filter (JSY-LF-A 1½" – 2") prevents large dirt particles from getting into the fine filter. These large dirt particles cannot be removed by the backwashing equipment. The water flows through the fine filter from the outside inwards. The filtered dirt is retained by the fine filter screen. The adhering dirt is visible through the transparent filter cover (3). The filtered water then leaves the filter via the built-in rotary flange (1).

The automatic controls (2) automatically start the backwashing. The handwheel (4) therefore then only has a free discharge function.

The cleaning process is started:

- By plugging the power supply unit into the plug
- Automatically through the control electronics depending on the cleaning interval selected (days, weeks, months).
- Manually by briefly disconnecting the mains supply (remove the plug and then plug it back into the socket).

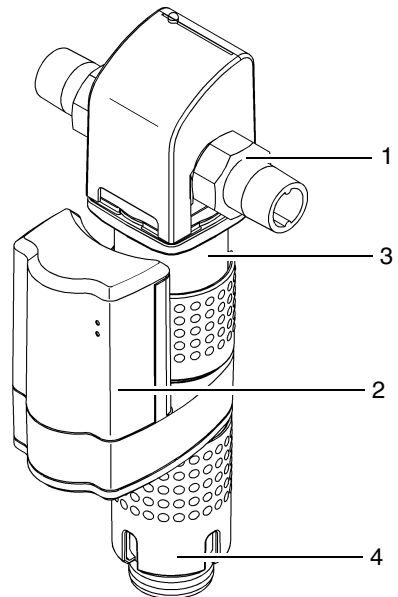
5.5 Backwashing

The filter must be backwashed (=cleaned) at the specified cycles in order to remove the filtered dirt from the fine filter screen.

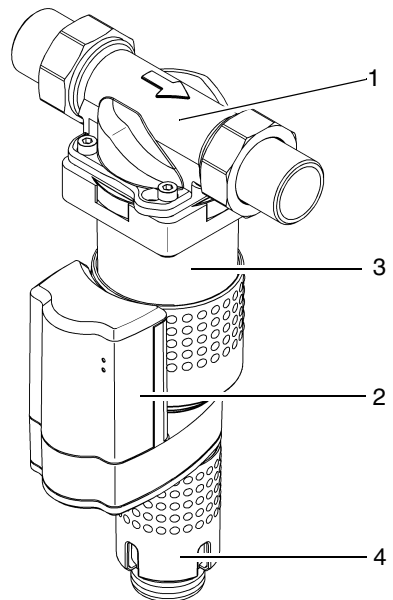
During the backwashing process three suction pipes rotate around the screen. At the same time a patented ceramic flushing valve on the underside of the filter station opens so that the backwashing water can flow out. The treated water flows from the inside outwards through the screen into the suction pipe, taking the adhering particles with it.

The fine filter screen is cleaned. At the same time the inside of the transparent filter cover is cleaned together with the wiper lips of the suction pipe.

JSY-LF-A¾" – 1¼"



JSY-LF-A1½" – 2"



- 1 Built-in rotary flange
- 2 Automatic controls
- 3 Filter bell
- 4 Handwheel for free discharge

Fig. 10: Functional description



All sizes of filter are backwashed with treated water. The supply of treated water to the filter station is maintained throughout the backwashing process. Dirty water cannot get into the clean water side during backwashing.

After approx 40 seconds the ceramic flushing valve closes again and the backwashing process is completed.

This backwashing process can be repeated if necessary.



Both the degree of soiling and the cleaning process can be observed from the outside.

If the mains power supply fails during the backwashing process the backwashing is still completed due to the fitted battery.

5.5.1 Backwashing interval



ATTENTION



(see chapter “Safety information and dangers due to non-compliance”)

Unauthorised persons must not operate the filter! Persons who operate the filter must observe the operating instructions. Failure to observe these instructions can result in damage to property and personal injuries.



ATTENTION



(see chapter “Safety information and dangers due to non-compliance”)

The smaller the mesh size of the screen insert the more frequently backwashing is required!

From experience, increased dirt is deposited during the initial running period. In this case the unit will have to be flushed more frequently than normal.

Set a temporary shorter time interval!

Failure to flush in good time can cause damage to the screen. Large quantities of filtered particles can deform the screen. As a result, proper function of the filter is no longer ensured. In addition, large quantities of dirt can cause mechanical damage to the backwashing function.

5.6 Modifications / changes / spare parts



ATTENTION



(see chapter “Safety information and dangers due to non-compliance”)

Only original spare parts are to be used!

Independent modifications and changes are prohibited for safety reasons! These can impair the function of the filter, lead to lead and in extreme cases can cause the filter to burst.

The test marks imprinted on the unit are only valid if original spare parts are used.

Changing the battery:

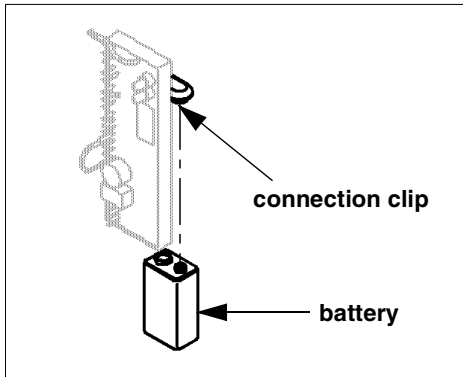


Fig. 11: Changing the battery



Only use 9V alkali block batteries; see battery labelling.

A patented switching technique prevents the battery from discharging while the filter's flushing valve is closed. As a result the battery has a service life lasting several years. A required battery change is indicated by simultaneous flashing of the red and green LEDs.

- Disconnect the power supply unit from the plug.
- Remove the automatic controls by pressing on the side and pulling off.
- Release the battery from the connection clip of the connection lead behind the electric circuit.
- Replace the battery and insert in the connection clip.
- Insert the power supply unit into the plug.
- The electric circuit immediately performs a battery test. If successful, cleaning is started automatically.
- Used batteries are to be returned to a distributor or to one of the returning facilities, established to this purpose by the public recycling entities.

5.6.1 Connecting an isolated fault message

The isolated output of the electric circuit can be used for remote transfer of the filter fault messages. Not the maximum switching current and switching voltage (see chapter "Isolated output").

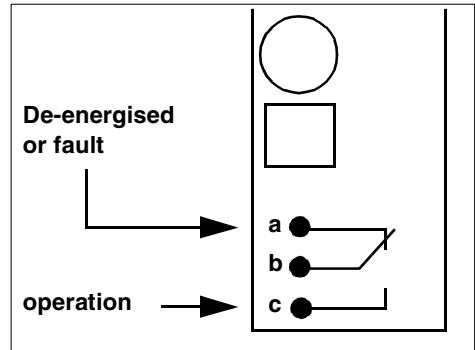


Fig. 12: Relay contact assignment

Connect relay as:	Contacts
Make contacts	a and b
Break contacts	b and c

In this figure Fig. 12) the contacts of the isolated relay are labelled in their de-energised condition.

The relay can be connected as a break contact or as a make contact. If the filter power supply unit is plugged in the relay changes its switched condition. If a fault message occurs the relay switches to the de-energised condition shown in the diagram.

5.6.2 Servicing / Repair

Before carrying out any work on the filter, which extends beyond pure operational control, the filter must be depressurised! Failure to observe this can lead to an uncontrolled escape of water and therefore lead to water damage in the building. Strictly comply with the instructions given in the "Installation" and "Maintenance" chapters.

5.7 Stoppages



ATTENTION



(see chapter "Safety information and dangers due to non-compliance")

If a filter has to be removed from the flange or unscrewed, the chapter "Intended use" must always be observed!

- Protect the flange surfaces from damage! Damaged flanged surfaces cannot close tight. As a result, escaping water can damage the building and installations.
- Ensure that no dirt can get into the filter! This dirt can get into contact with and be discharged into the drinking water when the filter is switched back on. The health of people who drink dirty water is at risk.
- Store the filter in frost-free conditions! Frost can cause any water contained in the filter voids to freeze and thus cause mechanical damage to the filter so that it leaks at operating pressure or can burst. Leaking water can cause major damage to the building. In addition, people near the filter can be injured by breaking off filter parts.
- When restarting the filter, follow the instructions for a new filter.

6. Faults

In order to ensure unit safety and leak tightness, only approved persons may open the units and replace parts subject to water pressure.

Help with faults:

Fault	Cause	Remedy
Leaks in the filter!	Filter cover has been exposed to high temperatures or solvents.	Inform the fitter or nearest customer service centre. (The filter cover must be replaced immediately.)
Filter cover becomes turbid!		
Hairline cracks on the filter hood!		
Backwashing water continues running!	Ceramic flushing valve not fully closed.	Carry out backwashing. – Remove mains plug from the socket. – Wait until all indicator lights have gone out. – Push mains plug back into the socket. Fault reoccurs:
	Dirt in the ceramic flushing valve.	
Water flow rate falls!	Screen is blocked.	
Red indicator light is lit!	Fault in the automatic controls.	
Red indicator light is lit and acoustic signal sounding! Backwashing water is possibly escaping!	Ceramic flushing valve is not fully closed. Possibly dirt in the ceramic flushing valve.	Inform the fitter or nearest customer service centre.
Simultaneous flashing of the red and green indicator lights! (No backwashing triggered!)	Battery is dead, is missing or wrong type of battery.	Disconnect the mains plug, insert new 9V alkali batteries, re-connect the mains plug.
Downstream pressure slowly rises when no water flowing!	Impermissible increase in pressure due to service water heating	Check the safety valve of the hot water boiler. Inform the fitter or nearest customer service centre.
	Wear in the pressure reducer cartridge.	

7. Maintenance



(see chapter "Safety information and dangers due to non-compliance")

Always observe the chapter "Intended Use"!

7.1 Cleaning



(see chapter "Safety information and dangers due to non-compliance")

Only use clear, clean drinking water to clean the housing and transparent filter cover.

Domestic all-purpose cleaners and glass cleaners can contain up to 25% solvents or alcohol (spirits).

These substances can chemically attack the plastic parts, which can lead to brittleness or even fractures.

Such cleaners must therefore not be used.

8. Warranty and Services

In order to comply with the legal warranty claim, according to DIN 1988, Part 8, it is necessary that the "... backwashing takes place at least every 2 months, after operating conditions exist ...".

Regular servicing is indispensable in order to continue to achieve a successful process for many years after the unit is put into service. In the building services sector this is covered by DIN 1988, Part 8.

A servicing agreement is the best way to ensure a good operating function beyond the warranty period.

Wherever possible, the regular servicing work and supply with consumables and wearing materials, etc. should be carried out by the specialist trade or the factory's customer service department.

9. Data Sheet

9.1 Type

JUDO SPEEDYMAT-LongLife
Backwash Protective Filter

Abbreviated name: JSY-LF-A

9.2 Models

Model	Order No.
JSY-LF-A ¾"	8070517
JSY-LF-A 1"	8070572
JSY-LF-A 1¼"	8070573
JSY-LF-A 1½"	8070566
JSY-LF-A 2"	8070567

9.3 Technical specifications

The following applies for all the models of the device:

- The filters are supplied with a stainless steel screen with a mesh size of 0.1 mm as a standard.
- Pressure loss when clean (after backwashing): 0.2 bar at the water flow rate (nominal flow rate) given in the table.
- Maximum ambient temperature and water temperature: 30°C (86°F)
- **The water to be filtered must conform to the European Drinking Water Regulations!**
- Threaded connection to DIN 2999.

Nominal Pressure

Model	Operating Pressure	Nominal Pressure
JSY-LF-A ¾" – 2"	1.5 – 10 bar	PN 16

The nominal pressure denotes the pressure class, according to which the filter must fulfil the requirements to DIN 19632. The maximum operating pressure is lower, in order to ensure the optimum function of the filter.

Weight

Model	Weight
JSY-LF-A ¾"	2.5 kg
JSY-LF-A 1"	2.6 kg
JSY-LF-A 1¼"	3.0 kg
JSY-LF-A 1½"	5.9 kg
JSY-LF-A 2"	6.4 kg

Water flow rate

Model	Water flow rate up to	Pressure loss after backwashing
JSY-LF-A ¾"	3.3 m³/h	0.2 bar
JSY-LF-A 1"	4.5 m³/h	0.2 bar
JSY-LF-A 1¼"	5.5 m³/h	0.2 bar
JSY-LF-A 1½"	13.0 m³/h	0.2 bar
JSY-LF-A 2"	17.0 m³/h	0.2 bar

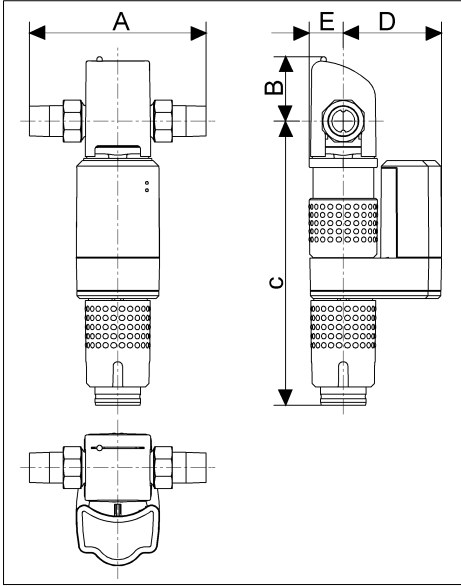
Back-flush Volume Stream

Model	Back-flush Volume Stream
JSY-LF-A ¾"	0.3 l/s
JSY-LF-A 1"	0.3 l/s
JSY-LF-A 1¼"	0.3 l/s
JSY-LF-A 1½"	0.3 l/s
JSY-LF-A 2"	0.3 l/s

The backwashing volumetric flow given applies to 2-3 bar mains pressure and for a completely opened flushing water valve.

The backwashing process takes 40 seconds.

9.4 Installed dimensions JSY-LF-A $\frac{3}{4}$ " - $1\frac{1}{4}$ "

Fig. 13: Installed dimensions JSY-LF-A $\frac{3}{4}$ " - $1\frac{1}{4}$ "

Model	A	B	C	D	E
JSY-LF-A $\frac{3}{4}$ "	180	82	306	108	38
JSY-LF-A 1"	195	75	313	108	38
JSY-LF-A $1\frac{1}{4}$ "	230	71	317	108	38

All dimensions in [mm](see Fig.13)

A = Fitting length

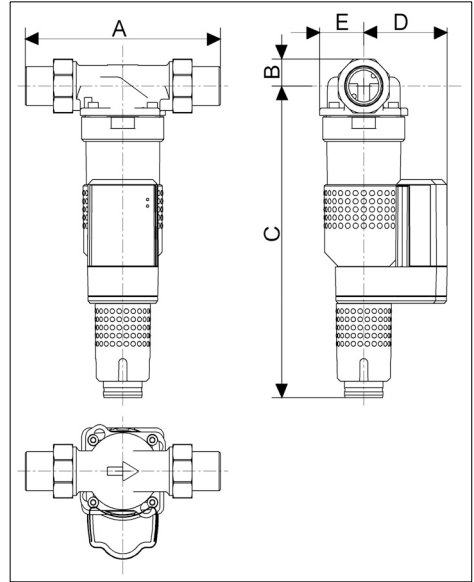
B = unit width

C = Height above pipe centre

D = Height below pipe centre

E = Depth to pipe centre

9.5 Installed dimensions JSY-LF-A $1\frac{1}{2}$ " - 2"

Fig. 14: Installed dimensions JSY-LF-A $1\frac{1}{2}$ " - 2"

Model	A	B	C	D	E
JSY-LF-A $1\frac{1}{2}$ "	252	35	385	108	57
JSY-LF-A 2"	280	43	395	108	57

All dimensions in [mm](see Fig.14)

A = Fitting length

B = unit width

C = Height above pipe centre

D = Height below pipe centre

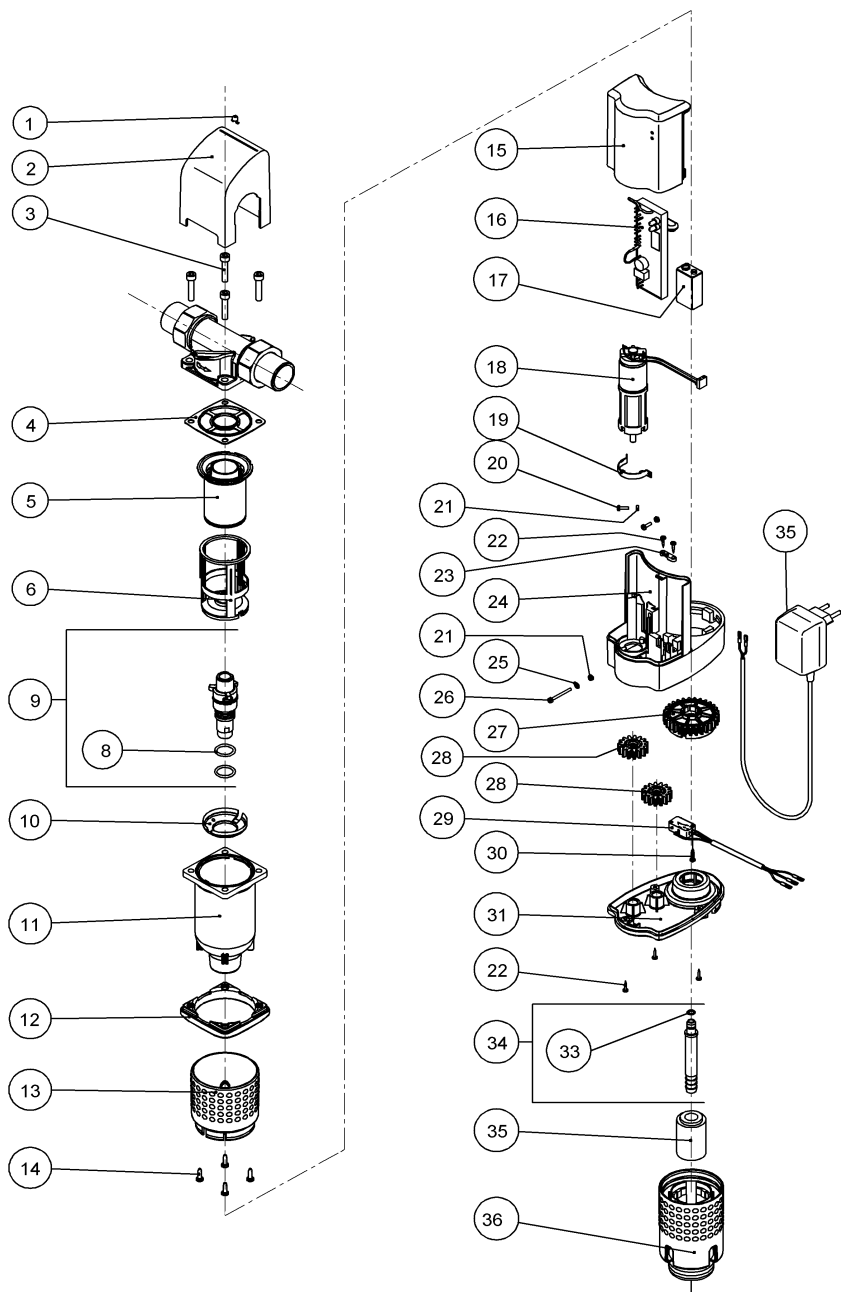
E = Depth to pipe centre

9.6 Scope of supply

- Pre-installed Backwash Protective Filter
- Installation and Operating Instructions
- Built-in rotary flange JQE ¾", 1" or 1¼" with bayonet fixture and screw connection (JSY-LF-A ¾" – 1¼")
- Built-in rotary flange JQE 1½" or 2" with bayonet fixture and screw connection (JSY-LF-A 1½" – 2")

10. Spare parts

10.1 JSY-LF-A $\frac{3}{4}$ " – $1\frac{1}{4}$ "



List of Spare Parts JSY-LF-A ¾" – 1¼"

Pos.	Designation (Recommended average replacement interval for wearable parts [*])	Piece(s)	Order No.	VE ¹⁾ /Piece
1	Display button	1	1120424	2
2	Cover of flange JSY-LF-A ¾"	1	2070217	13
2	Cover of flange JSY-LF-A 1"	1	2070219	13
2	Cover of flange JSY-LF-A 1 ¼"	1	2070250	13
3	Cylinder screw M6 x 30	4	1650209	2
4	Profile flange seal	** 1	1200218	5
5	Strainer	**** 1	2070302	70
6	Flushing valve	**** 1	1120534	12
8	O-ring 18 x 2.5	**** 2	1200291	2
9	Pre-fitted flushing valve	**** 1	2170179	75
10	Suction pipe base	1	1120533	7
11	Filter bell	1	1120536	135
12	Flange	1	1420013	20
13	Cover filter bell	1	1120541	31
14	Lens metal screw 3.9 x 13	4	1650289	1
15	Motor cover	1	2170224	22
16	Switch	1	2170193	353
17	Battery 9V Typ Alkaline	** 1	1500261	18
18	Engine	1	2170209	260
19	Latch fastener	1	1400098	4
20	Cylinder screw M3 x 10	1	1650144	1
21	Hexagon nut M3	3	1609169	1
22	Lens metal screw 2.9 x 13	1	1609172	1
23	Strain relieving bracket	1	1609114	2
24	Mechanism housing	1	1120554	29
25	Disc A 3.2	1	1607243	1
26	Cylinder screw M3 x 30	1	1609166	1
27	Flushing valve toothed wheel	1	1120498	12
28	Motor pinion	2	1120496	6
29	Cam-operated switch	1	2170202	16
30	Lens metal screw 2.9 x 16	1	1650173	1
31	Gearing cover	1	1120551	14
32	Power pack	1	2170208	82
33	O-ring 6.07 x 1.3	1	1200137	2
34	Pre-fitted hose connector	1	2170222	16
35	Union nut	1	1440151	14
36	Handweel	1	1120461	36

1) VE = Unit of Billing

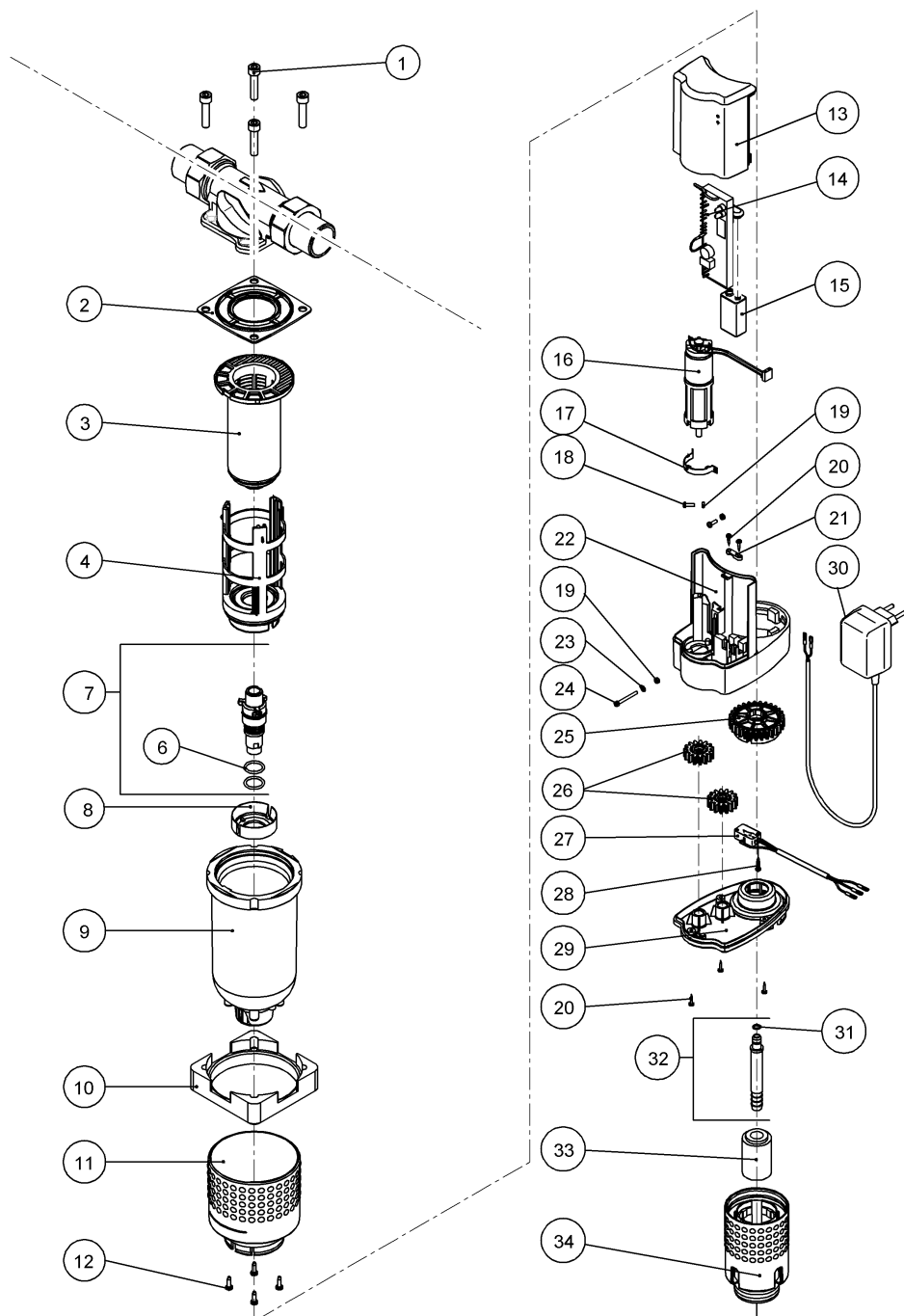
Replacement interval

** = 2 years

**** = 4 years

Extended warranty period if a maintenance agreement is concluded!

10.2 JSY-LF-A 1½" – 2"



List of Spare Parts JSY-LF-A 1½" – 2"

Pos.	Designation (Recommended average replacement interval for wearable parts [*])	Piece(s)	Order No.	VE ¹⁾ /Piece
1	Cylinder screw M8x35	4	1650107	2
2	Profile flange seal	1	1200230	9
3	Strainer	1	2070304	168
4	Flushing valve	1	2170178	78
6	O-ring 18 x 2.5	2	1200291	2
7	Pre-fitted flushing valve	1	2170179	75
8	Suction pipe base	1	1120464	6
9	Filter bell	1	1120459	212
10	Flange	1	1430099	41
11	Cover filter bell JSY-LF-A 1½"	1	2170236	39
11	Cover filter bell JSY-LF-A 2"	1	2170239	39
12	Lens metal screw 3.9 x 13	4	1650289	1
13	Motor cover	1	2170224	22
14	Switch	1	2170193	353
15	Battery 9V Typ Alkaline	1	1500261	18
16	Engine	1	2170209	260
17	Latch fastener	1	1400098	4
18	Cylinder screw M3 x 10	1	1650144	1
19	Hexagon nut M3	3	1609169	1
20	Lens metal screw 2.9 x 13	1	1609172	1
21	Strain relieving bracket	1	1609114	2
22	Mechanism housing	1	1120554	29
23	Disc A 3.2	1	1607243	1
24	Cylinder screw M3 x 30	1	1609166	1
25	Flushing valve toothed wheel	1	1120498	12
26	Motor pinion	2	1120496	6
27	Cam-operated switch	1	2170202	16
28	Lens metal screw 2.9 x 16	1	1650173	1
29	Gearing cover	1	1120551	14
30	Power pack	1	2170208	82
31	O-ring 6.07 x 1.3	1	1200137	2
32	Pre-fitted hose connector	1	2170222	16
33	Union nut	1	1440151	14
34	Handwheel	1	1120461	36

1) VE = Unit of Billing

Replacement interval

** = 2 years

**** = 4 years

Extended warranty period if a maintenance agreement is concluded!



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SLB-SS-02 Series SLB-SS-04 Series SLB-SS-100 Series

Installation and Operating Instructions

SKAN bag filter housings

Attention

Carefully read through the installation and operating instructions and safety information before installing and putting the unit into service. These must always be issued to the owner/user.



SKAN

Dear Customer,

We would like to thank you for your confidence in us, which you have shown by purchasing this device. The product you have purchased is a filter developed using state of the art technology.

This housing is suitable, at the operating parameters stated, for all liquids classified as Group 2. This fluid group is as defined in the European Pressure Equipment Directive 97/12/EC.

Queries, orders, customer support

Southland Filtration
Freecall: 1800 656 771
Email: filtration@southlandind.com.au

Design data

Working Temperature	110°C
Maximum Working Pressure	Liquid 10 Bar g

Connections

Inlet	the higher of the 2 larger connections
Outlet	the lower of the 2 larger connections
Vent	located in the lid of the housing
Drain	located in the bottom

Symbols used

The safety notes contained in this instruction manual are labelled with the following symbols:

ATTENTION



Notes on existing dangers

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1. Installation

1.1 Vent

Fit the blanking cap/plug (supplied) or the vent and gauge kit as appropriate, to the lid. Seal with the aid of PTFE tape or and appropriate sealant, as required.

1.2 Inlet/Outlet

Connect the inlet and outlet pipework to the housing connections.

For threaded connections use PTFE tape or an appropriate sealant as a seal.

For flanged connections use a suitable gasket, and for dairy connections use the correct sealing ring.

1.3 Before Operating



ATTENTION



It is important that the pipe work to and from the filter is adequately supported.



ATTENTION



Before operating we recommend that the filter is flushed thoroughly.



ATTENTION



Important safety notes

Please read before using this housing

1. Never attempt to open the housing whilst it is under pressure.

2. Never operate the housing outside the permitted operating parameters as stated (i.e. over pressure, under vacuum, over or under temperature).
3. Housing using Vee clamps should not be used in cyclic pressure or shock load environments, or where highly viscous fluids could solidify the closure seal.
4. For safety, it is recommended that a pressure relief device is installed in the system to prevent over-pressurisation.
5. Never use the housing for liquids other than those it is rated for, and ensure that the housing and seal materials are compatible with the process fluid.
6. Care must be taken to protect operators from hot surfaces if the housing is being run at high temperatures.
7. Failure of the filter housing could result from misuse - please ensure that these installation, operating and maintenance procedures are strictly adhered to.

The following factors have not been considered in the design of this housing, as they are either negligible or not considered appropriate for this product, unless specifically stated:

1. Static pressure/head
2. Traffic, wind and earthquake loading
3. Decomposition effects of unstable fluids
4. Creep, fatigue and corrosion allowances
5. External fire

2. Operation

2.1 Opening the filter housing

**ATTENTION**

Always ensure the that the system is not under pressure before opening the housing.

For the Bolted closure filter housing - if the filter has been in service, refer to the instructions given in **2.6 Removing the filter from service.**

Otherwise, unscrew the clamp bolts with a suitable spanner.

Swing the clamps clear of the cover.

Remove the lid and O-ring, and store them in a safe place where they cannot get dirty or damaged.

Remove the basket compression plate.

2.2 Fitting the Perforated basket

The housing is supplied with a perforated bag support basket.

There is an inner gasket fitted under the basket.

Check the O-ring groove and inner gasket for any damage, and place inner gasket in the groove.

Place the basket into position, ensuring that the inner gasket does not become dislodged.

2.3 Fitting the filter bags

Push the bag into the basket that is situated in the housing and check that the filter bag ring is fitted flush to the basket flare.

Position the bag compression plate onto the top of the bag ring, with the large plate fitting against the bag in the basket lip.

This will compress the bag and basket against the inner gasket

2.4 Closing the filter housing

For the Bolted closure filter housing - check the housing top ring and groove, the O-ring and lid for any dirt or damage.

Clean away any foreign objects and replace defective parts as necessary.

Place the O-ring into the groove at the top of the housing.

Position the lid evenly over the housing, ensuring the seal is not disturbed.

Swing the screw clamps up into position ensuring that the clamp locates correctly in the grooves on both the lid and housing top ring.

Screw the clamps down evenly.

Before tightening ensure the lid is set squarely on the housing top ring.

Finally nip down the screw clamps with a spanner in a diagonal basis across the filter housing.

DO NOT over tighten.

2.5 Putting the filter into Service

Ensure the inlet and outlet valves are shut.

Ensure that the drain valves (if fitted) are closed or the drain plugs are fitted.

Open the vent valve or plug.

Gradually, open the inlet valve on the

upstream side of the filter housing whilst ensuring that the down stream valve remains closed.

As the housing fills, air will be expelled from the vent.

When all the air has been expelled, fluid will begin to flow from the vent.

For safety reasons, it is important to ensure that vent and drain connections are secure and that released fluid is disposed of to an appropriate drain or container.

Appropriate measures should be taken if the liquid is hazardous.

Close the vent valve or plug, then slowly open the outlet valve.



The filter is now in service and no attempt should be made to open the cover.

Regular venting of the housing, by opening the vent to permit any trapped air to vent to atmosphere, will maintain the operating efficiency of the filter.



For safety reasons, it is important to ensure that venting is ONLY performed via a valve, which is opened with extreme care and that released fluid is disposed of to an appropriate drain or container.

Appropriate measures should be taken if the liquid is hazardous.

The filter can be operated until the increase in the pressure differential across the filter bag reaches approximately 1.5Bar (25psi), at this point the bag should be replaced.

2.6 Removing the filter from Service

Close the outlet valve.

Close the inlet valve.



The filter housing will still be under pressure at this point.

Before opening the filter housing, the pressure must be relieved. This can be done either by carefully opening the vent valve or plug or the drain valve or plug, whichever is most appropriate.

Before opening the closure, open both the dirty drain and clean drain valves or plugs to allow all of the fluid to drain out of the housing. The vent must be open to allow the housing to drain properly.

If the fluid is hazardous, appropriate measures should be taken before opening the closure.



For safety reasons it is important to ensure that vent and drain connections (such as any valves or hoses) are secure and that released fluid is disposed of to an appropriate drain or container.

3. Maintenance

3.1 General

The filter housing will require very little maintenance.

The outer surface should be kept clean and free from dirt. This will prevent contamination of the filter during bag change.

The V clamp should be maintained as follows: A small amount of a suitable lubricant should be used on the sliding surfaces of the clamp.

The 'T' bar thread **must** be periodically greased. We recommend the use of a molybdenum based grease which will adhere to the thread. Binding of the thread could occur if they are not lubricated regularly.

Inspect the 'O'-rings each time the filter housing is opened and replace as required.

The housing must be checked for any visible signs of corrosion or wear damage internally and externally on a routine basis.

Internal examination should be carried out via the housing closure.

3.2 Replacing the filter bag

Open the filter housing according to the instructions given in the section **2.1 Opening the filter housing**.

The new filter bags should be installed according to the instructions described under **2.3 Fitting the Filter Bags**.

3.3 Filter bag disposal

The spent filter bags should be disposed of in a responsible manner. The filter itself can be disposed of by incineration or as land-fill by an authorized contractor; however, it is important for the user to check how the contaminant contained in the filter should be disposed of.

4. Other

4.1 Filter Bags

CODE	MICRON RATING	BOX QTY
Polyester needlefelt bags for SLB-SS-02		
S10101501	1um	25
S10101502	5um	25
S10101503	10um	25
S10101504	20um	25
S10101505	50um	25
S10101506	100um	25
Nylon monofilament bags for SLB-SS-02		
S10200501	100um	25
S10200502	150um	25
S10200503	250um	25
S10200504	400um	25
S10200505	600um	25
S10200506	1000um	25
S10200507	1700um	25
Polyester needlefelt bags for SLB-SS-04		
S10201001	1um	25
S10201002	5um	25
S10201003	10um	25
S10201004	20um	25
S10201005	50um	25
S10201006	100um	25
Polyester needlefelt bags for SLB-SS-100		
S10100501	1um	25
S10100502	5um	25
S10100503	10um	25
S10100504	20um	25
S10100505	50um	25
S10100506	100um	25

4.2 Accessories

CODE	DESCRIPTION
S05900001	Filter pressure differential alerting device

4.3 Spare Parts

CODE	DESCRIPTION
S05101508	Lid seal O-ring: SLB-SS-02
S05101509	Basket seal O-ring: SLB-SS-02
S05102003	Lid seal O-ring: SLB-SS-04
S05102004	Basket seal O-ring: SLB-SS-04
S05102503	Lid seal O-ring: SLB-SS-100
S05102504	Basket seal O-ring: SLB-SS-100

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Appendix 7.1 Maintenance Checklist and Reporting for Stormwater Quality System

Nihon University Newcastle Campus
Maintenance Checklist for Stormwater Quality System

Date: **Company:**

Name: **Signature:**

Item #	Description	Location	Task	Frequency	Action Taken	Comments
1	Siphonic Drainage Outlets	Residential and Education Level 4 Terrace and Roofs	Refer Geberit Maintenance Checklist	Monthly		
2	Grated Drains and Floor Drains	Education Level 2 Terrace	Clean around outlets and drains. Lift grate, inspect and clean debris	Quarterly		
		Residential Level 2 Terrace	Clean around outlets and drains. Lift grate, inspect and clean debris	Quarterly		
		Heritage Roofs	Clean around outlets and drains. Lift grate, inspect and clean debris	Quarterly		
		Residential External Building Perimeter	Clean around outlets and drains. Lift grate, inspect and clean debris	Quarterly		
		Residential Driveways	Clean around outlets and drains. Lift grate, inspect and clean debris	Quarterly		
		Education Level 2 Southern Path	Clean around outlets and drains. Lift grate, inspect and clean debris	Quarterly		
3	Rainwater Pumps	Carpark- undercroft area	Refer Hunter Pumps maintenance report	Quarterly		
4	Pump Control Panel	Carpark- undercroft area	Refer Hunter Pumps maintenance report	Quarterly		
5	Bag Filters	Carpark- undercroft area	Refer Hunter Pumps maintenance report	Quarterly		
6	UV Rainwater Filters	Carpark- undercroft area	Refer Hunter Pumps maintenance report	Annually		
7	Backwash Filter	Carpark- undercroft area	Monitor for faults	Quarterly		
			Wash filter with clean drinking water	Annually		
			Clean the housing and transparent filter cover with clean drinking water	Annually		
8	Stormwater Pits and Surface Drains	External paths and planter beds	Visually inspect and clean out debris	Quarterly		
9	Roofs, gutters, rainwater heads and overflows	All roofs	Visually inspect and clean out debris	Quarterly		

Appendix 7.2 Maintenance Checklist for Geberit Pluvia Siphonic Drainage

Geberit Pluvia	Checklist for Pluvia commissioning / care and maintenance Pluvia calculation no.		
	☐ Commissioning		☐ Care and maintenance
Company:	Name: Address:		Tel.: Date: Signature:
Building address:			
Roof structure:	☐ Flat roof		☐ Sawteeth roof / Gutters
	☐ Intensive green roofing	☐ Extensive green roofing	☐ Gravel / Bitumen roof
Commissioning:	☐ The roof surface has been cleaned. (It is particularly important that no packaging or insulation materials remain on the roof area.)		
	☐ All roof drainage pipes have been flushed		
	☐ Pluvia outlet grating and function disc have been correctly mounted		
	Check the fixations. ☐ Check (visual) completed to ensure pipe fixation design is correct and that the right quantity has been used		
	☐ Pluvia emergency overflow ☐ Conventional emergency overflow		Check has been carried out to ensure the arrangement of the emergency overflows is correct and complete
	☐ Visual check has been carried out to ensure tightness		
Care and maintenance:	☐ Vegetation within a circumference of 50 cm has been cleared from around roof outlets.		
	☐ Contamination such as leaves or growth has been removed.		
	If there is a risk of silting up or the roof structures concerned are critical, the pipelines should be cleaned regularly. ☐ Pipelines have been cleaned.		

Appendix 7.3 Maintenance Checklist for Rainwater Pumps and Filters

PRESSURE SYSTEM MAINTENANCE REPORT

CLIENT:	DATE:
SITE ADDRESS:	
ORDER NO:	CONTACT:
MODEL:	PUMP MODEL:
CONTROL PANEL TYPE:	

<u>PUMP:</u>	
Grinder / Cutter Wear:	☐
Oil Level / Condition:	☐
Pump 1. Amp Draw:	☐
Pump 2. Amp Draw:	☐
<u>PIT:</u>	
Pipework Condition:	☐
Level of Sludge:	☐
Float Switch Operation:	☐
Float Switch Position:	☐
<u>CONTROL PANEL:</u>	
Pump Operation Manual:	☐
Pump Operation Auto:	☐
Pump Start Alteration:	☐
Indicator Lights:	☐
Alarm Operation:	☐

MATERIALS USED:

COMMENTS:

SERVICED BY:	START TIME:	ARRIVAL TIME:
--------------	-------------	---------------



UV STERILIZER SERVICE REPORT

SITE ADDRESS:

SITE:

SITE CONTACT:

CLIENT:

PHONE NUMBER:

SERVICE DATE:

TYPE OF SERVICE:

TECHNICIAN:

GENERAL OBSERVATIONS:

EQUIPMENT:

Equipment details:

☐

Change lamp(s):

☐

Change quartz thimble:

☐

Replace 'O' ring seal(s):

☐

Clean thimble(s):

☐

Reset Timer(s):

☐

Change ballast(s):

☐

External visual inspection:

☐

Lamp(s) operational:

☐

System left online:

☐

Active alarms:

☐

Run hours on lamp: _____

☐

COMMENTS:

TECHNICIANS SIGNATURE:

CUSTOMERS SIGNATURE:



BAG OR CARTRIDGE FILTER SERVICE REPORT

SITE ADDRESS:

SITE:

SITE CONTACT:

CLIENT:

PHONE NUMBER:

SERVICE DATE:

TYPE OF SERVICE:

TECHNICIAN:

GENERAL OBSERVATIONS:

EQUIPMENT:

List equipment:

☐

Replace filter(s)/bag(s):

☐

Internal visual inspection:

☐

External visual inspection:

☐

Replace 'O' ring seal(s):

☐

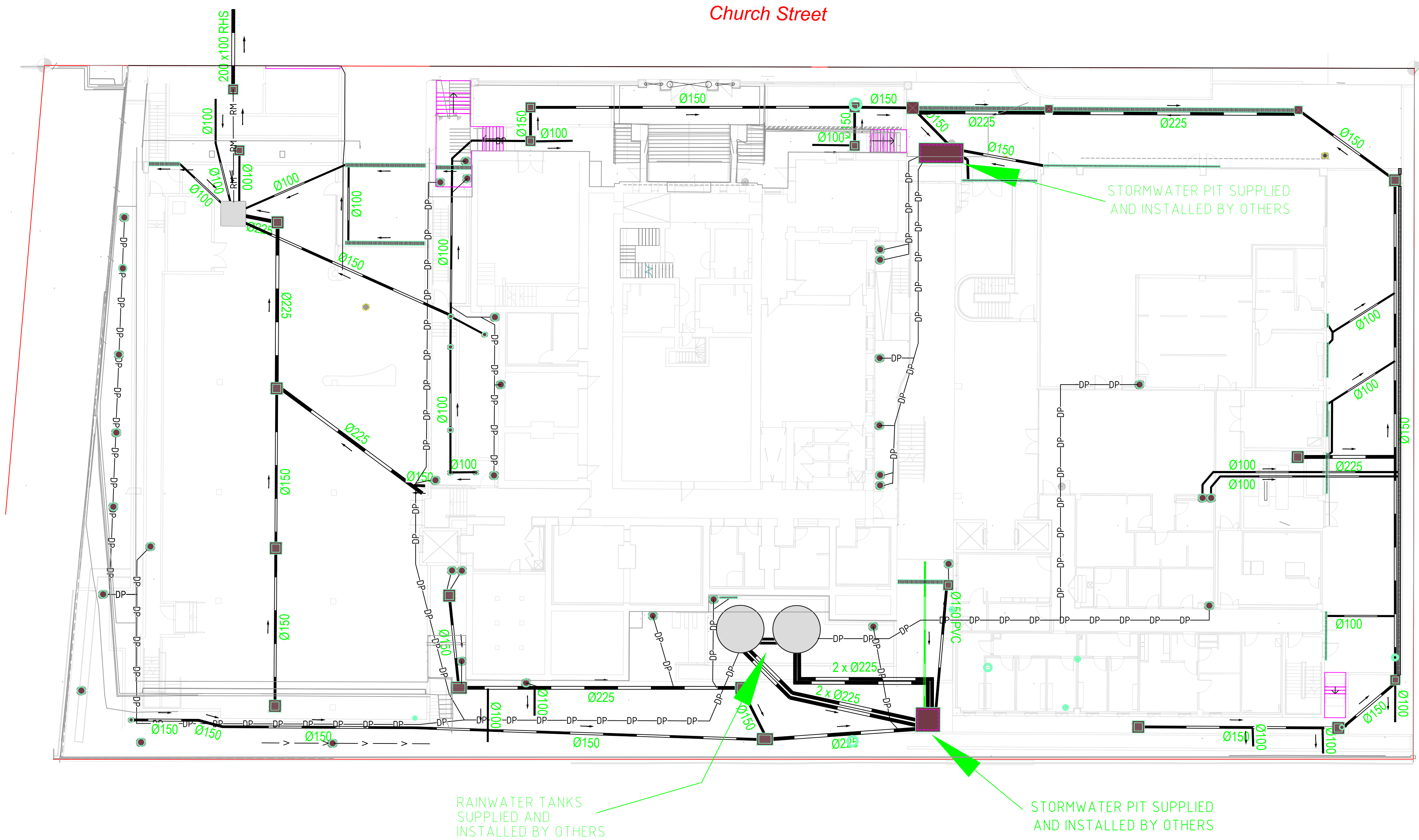
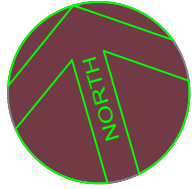
Plant left online:

☐

COMMENTS:

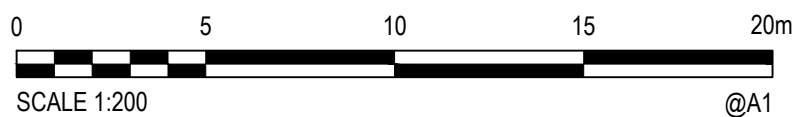
TECHNICIANS SIGNATURE:

CUSTOMERS SIGNATURE:



LEGEND			
	PROPOSED STORMWATER PIT		EXISTING PIPE
	PROPOSED STORMWATER PIPE AND SIZE		EXISTING WATER
	PROPOSED DOWNPIPE REFER HYDRAULIC ENGINEERS DOCUMENTATION		EXISTING OPTIC FIBRE
	PROPOSED Ø100 SUBSOIL PIPE AND CLEAN OUT		EXISTING ELECTRICITY
	PROPOSED GRATED DRAIN		EXISTING ELECTRICITY UNDERGROUND
	PROPOSED SWALE DRAIN		EXISTING GAS
	EXISTING DOWNPIPE LOCATION (APPROX.)		EXISTING COMMUNICATIONS
			EXISTING SEWER
			EXISTING SURFACE CONTOURS (INTERVAL = 0.5m)

Rev.	Date	Description	Des.	Verif.	Appd.
A	10/08/21	WAE	AGM	AGM	AGM



**Cardno**
Shaping the Future

OFFICE-LINE1
OFFICE-LINE2
OFFICE-LINE3
OFFICE-LINE4
OFFICE-LINE5

CDD_ANZ_OFFICE

Drawn	AGM	Date	AUG 2021
Checked	AGM	Date	AUG 2021
Designed	AGM	Date	AUG 2021
Verified	AGM	Date	AUG 2021
Approved	AGM	Date	AUG 2021

Client	AZUSA SEKKEI		
Project	NIHON UNIVERSITY AUSTRALIA NEWCASTLE CAMPUS PROJECT 9 CHURCH STREET, NEWCASTLE		
Title	STORMWATER MANAGEMENT PLAN		

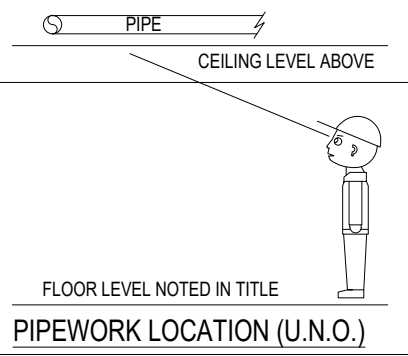
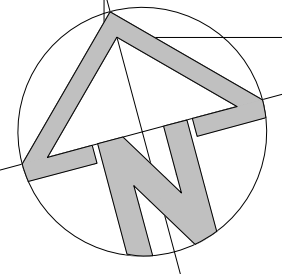
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WEA			
Datum	AHD	Register	-
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Drawing Number	MP-WEA-CI-415		Revision
		A	

40mm RAINWATER HARVESTING CONTROL
SYSTEM (240 VOLT)
INCORPORATING AUTOMATIC MAINS BACKUP WITH A SUBMERSIBLE
PUMP FITTED WITH A FLOAT SWITCH AND A 20mm JUDO FILTER ON
THE SUPPLY PIPE FROM THE RAINWATER PUMP OUTLET

HUNTER PUMPS VARIABLE RAINSAVER SET
COMPLETE WITH INTERCONNECTING WIRING BETWEEN PUMPS,
CONTROL PANEL AND PRESSURE TRANSDUCER WITH A MAINS
BYPASS VIA FLOAT SWITCH AND SOLENOID VALVE.

- STAINLESS STEEL BAG FILTER (MODEL SLB-SS SERIES)
- AUTOMATIC BACKWASH FILTER MODEL (JS4 SERIES) 32mm
- ULTRAVIOLET DISINFECTOR FILTER MODEL (UV-HE 8 SERIES) C/W
AUDIBLE AND VISUAL ALARM FAILS.

REV	DATE	AMENDMENT
A	12/08/21	WORK AS EXECUTED



ARCHITECT:
DWP

CLIENT:
NIHON UNIVERSITY

PROJECT:
NIHON UNIVERSITY, NEWCASTLE CAMPUS
9 CHURCH STREET, NEWCASTLE
EDUCATION - LEVEL 1 - HYDRAULIC SERVICES

Drawn
A G M

Design
A G M

Approved
A G M

FOR CONSTRUCTION

Scale
1 : 100

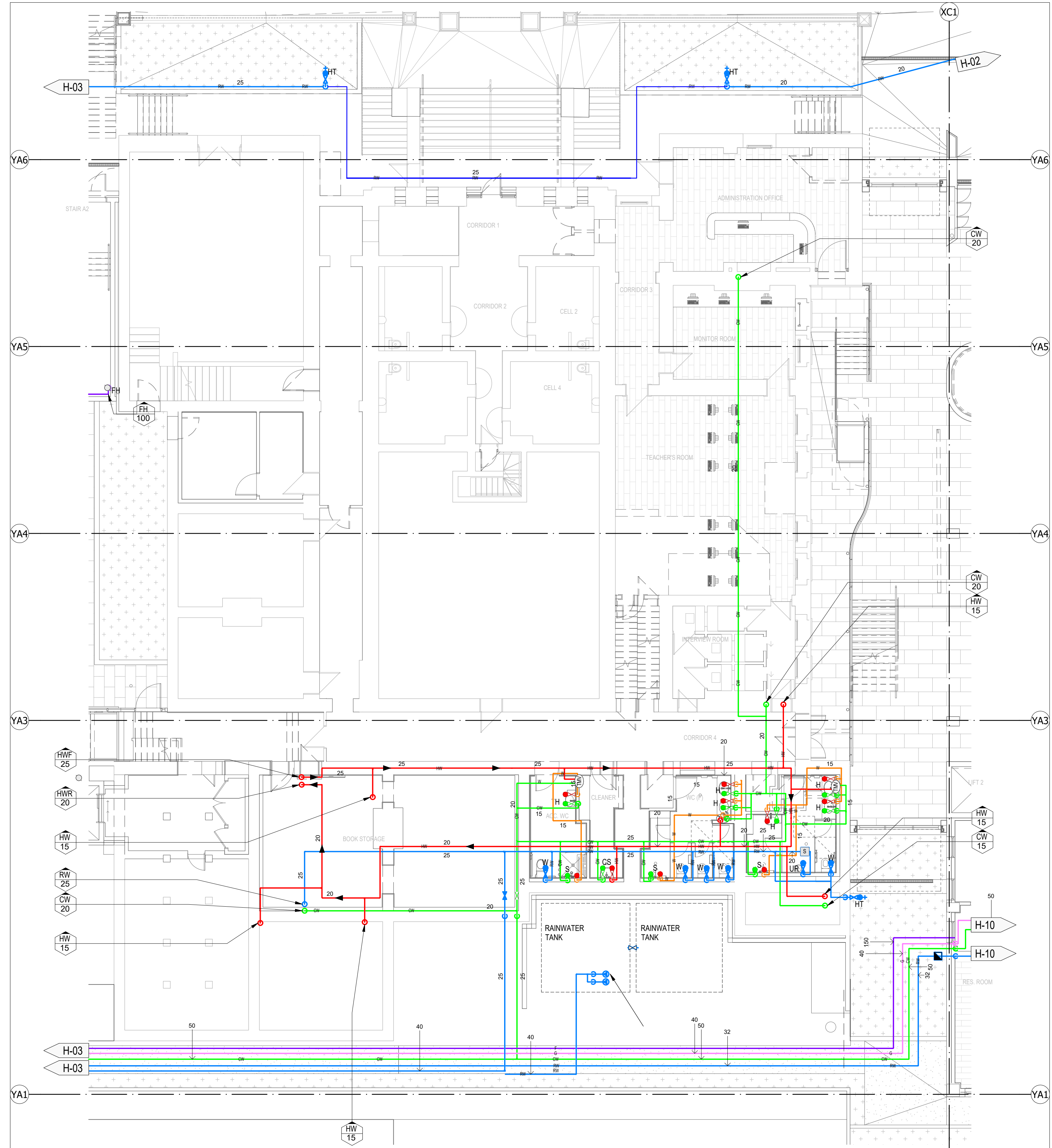
Job NO.
18571

DRG. No.
MP- WAE-H-03

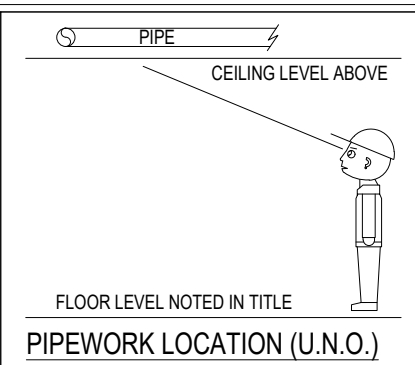
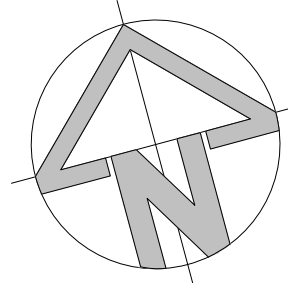
Size
A1

No. in SET

Revision
A



REV	DATE	WORK AS EXECUTED AMENDMENT
A	23/08/21	WORK AS EXECUTED



ARCHITECT:	DWP
CLIENT:	NIHON UNIVERSITY
PROJECT:	NIHON UNIVERSITY, NEWCASTLE CAMPUS 9 CHURCH STREET, NEWCASTLE COURT HOUSE - LEVEL 1 - HYDRAULIC SERVICES

Drawn	WORK AS EXECUTED	Size	A1
Design	Scale 1 : 100	Job NO. 18571	No. In SET
Approved	DRG. No. MP-WAE-H-07	Revision	A

Our Ref: 81019007:TH
Contact: Olivia Ryan

25 August 2021

BUILT Pty Ltd
L1, 155-157 Lambton Rd
Broadmeadow NSW 2292

Attention: Olivia Ryan

Cardno (NSW/ACT) Pty Ltd
ABN 95 001 145 035

Level 3, Suite 34
207 Albany Street North
Gosford NSW 2250
same as physical address

Phone +61 2 4323 2558
Fax +61 2 4324 3251

www.cardno.com

Dear Madam,

**NIHON UNIVERSITY CAMPUS
AS-BUILT CIVIL CERTIFICATION**

Cardno confirm that we have reviewed the following provided information:

1. Stormwater Quality Management Plan (*dated 25/08/2021, by Built Pty Ltd*);
and
2. Rain Water Harvesting As-Built Plans (*MP-WAE-CI-415, dated Aug 2021, by Murphy Plumbing*)

Concerning the rainwater harvesting and quality systems installed at the above site.

It is the opinion of Cardno that the Stormwater Quality Management Plan (Operation and Maintenance Plan) provided meets the requirements of item E21 of the SSD-9787 Consent Conditions.

Furthermore, the installed Rainwater Harvesting System has been confirmed as meeting the intent of the design by the Hydraulic Design Engineer (*McCullum PFCA*) and therefore has our endorsement as Civil Engineers for the project as meeting the requirements of Consent item E22.

Yours sincerely,



Trent Halvorsen
Senior Engineer
for Cardno
Direct Line: +61 2 4940 5521
Email: trent.halvorsen@cardno.com.au

cc: dwp