

TURBOJET 2000

SEWAGE TREATMENT PLANT SPECIFICATION & CONTRACT

Quotation Ref. No:

Date:

Contract Sum:

The Client:

Sewage treatment Plant Location:

Plant operation:

2.1 Construction

The sewage treatment plant is to be a Septech type Turbojet as described below and as shown and positioned on the drawings. The STP is to be as supplied by Septech Industries Australia Pty Ltd.

2.2 Design Parameters

Domestic Sewage will be collected from the dwelling and flow by gravity to the STP. The STP will serve:

NO TRADE WASTES of toxic or inorganic nature will be treated by this Plant.

Total Maximum Daily Flow to be treated by this plant: -	2000L
Total Maximum Daily Influent Suspended Solids: -	500mg/L
Total Maximum Daily Influent Biochemical Oxygen Demand	625g

Effluent from the STP will be disposed in accordance with the requirements of the Local Authority.

I/We the undersigned, agree to the terms and conditions of the specifications and drawings.

Signature:

2.3 Description of Plant

All wastewater is gravity fed into a Primary Sewage tank where the waste undergoes settlement and digestion during a retention period of approximately 48 hours. The settled wastewater then flows into the Turbojet Unit. This unit is divided into two distinct chambers – submerged contact aeration (SCA) tank and Humus Tank.

During regular time clock intervals, water and air is pumped into the SCA tank by means of strategically placed jets. The jets are positioned so as to cause a vigorous and turbulence of the tank contents. Effluent entering the SCA chamber is forced into a spiralling flow pattern. A biomass develops within the sludge particles tumbling through the tank. This biomass assimilates nutrients and Oxygen from the water leading to gradual reduction of impurities as the effluent passes through the tank. (Retention period of approximately 48 hours). The effluent and sludge particles then flow into the humus tank where the sludge particles settle to the floor of the tank and the effluent flows upwards through a plastic media block on which the biomass develops. (Retention period of approximately 36 hours). This biomass acts as a secondary biological contact interception and removal centre, further reducing the effluent B.O.D. before flowing into the contact sampling pit. Where it is further clarified and chlorinated (if necessary).

Settled humus tank sludge is automatically returned to the inlet of the SCA tank by means of a Vortex lift pump, which in turn is driven by the main SCA circulation pump. Effluent and sludge particles are also recirculated through the primary sewage tank by means of a 12mm diameter by-pass fed line from the Main SCA delivery pump. This has a threefold purpose.

1. Excess sludge is returned to the primary sewage tank for storage and digestion.
2. Clean effluent is recycled through the plant which tends to suppress the activities of micro-organisms which emit odours.
3. By regularly recycling effluent, the circulating biomass in the SCA tank is being fed with stored organics from the primary sewage tank. This keeps the micro-organisms at maximum population levels and reduces the problems of treatment plants not being used for extended periods eg: vacations. Consequently, untreated effluent is prevented from being discharged from the unit when persons return suddenly from extended periods of non-use.

2.4 Pump

240volt – 400 watt submersible pump (Refer to Pump Specifications for further details).

2.5 Pump Operation

The submersible pump shall be operated and monitored by the Septech electronic controller. Pump run time will depend on loading but run in accordance to EPA & Health Department Regulations. After 3 months this may be adjusted (increased or decreased) to obtain optimum treatment results.

2.6 Primary Sewage Tank

Provide one – 1.6 diameter x 2.3 long reinforced concrete sewage tank having an effective volume of 3200 litres. Inlet is to be 100mm diameter dropper, outlet of tank is to be 100mm diameter dropper to prevent short circuiting.

**** TOP OF TANK MUST BE LEVEL ****

2.7 Pumpwell (optional extra)

Only required where depth of sewer invert exceeds 610mm and/or the effluent pipe from the Turbo Jet Unit exceeds receiving means of disposal.

Note: Where a pumpwell is required, an alarm float switch **MUST** be installed.

2.8 Submerged Contact Aeration Tank

Provide one 1.6m diameter x 1.3m long reinforced concrete SCA tank having and effective volume of 1880 litres and a retention period of 20hours (average)

**** TOP OF TANK MUST BE LEVEL ****

2.9 Humus Settling Tank

Provide one – 1.6m dia x 1.0m long reinforced concrete Humus Tank having an effective volume of 1320litres. The tank shall meet the following conditions;

- a) Maximum surface overflow rate of 1,000 litres per square metre per hour.
- b) Minimum detention time of 4 hours at average daily flow
- c) Actual detention time of 14 hours.

2.10 Contact Stabilisation Block Media

15m² in aeration chamber and 15m² in Humus Tank.

2.11 Chlorine Contact Tank

Provide one- 1.1m x 0.7m x 2.1 metre deep reinforced Concrete Contact Tank having a working volume of 548 litres. The tank is to have a minimum detention time of 0.5 hour at peak hourly flow (PHF) of 667ltrs / hour. The actual contact detention time was calculated to be 49mins @ PHF. This extra 19mins ensures thorough chlorine dissipation & dilution, resulting in effective bacterial kill rate without excessive amounts of chlorine entering the environment. (Results confirmed through NATA testing under Australian Standard Conditions).

**** Tank Must be Installed PLUMB****

2.12 Chlorination Equipment

Disinfection by 76mm x 36mm x 30mm bio-guard chlorine product (STINGY STICKS). The required amount of chlorine product at maximum design flow rates over a 6 month period of treatment for effective disinfection (1mg/L Cl₂) is 811g (6.5 sticks). The Turbojet 2000 Chlorinator holds 1040g (8 sticks) of chlorine product.

2.13 Freeboard

Total freeboard in the Turbojet 2000 system is 1817L, exceeding EPA & Health Department Standards of 1000L.

2.14 Noise Pollution

Clause 17 of SEPP N-2 prescribes the noise limit for outdoor venues as 65 dB(A) when measured outdoors or 55 dB(A) when measured indoors. After testing Septech's Turbojet 2000 noise emissions from a 1m radius the results concluded to fall below 50 dB(A).

2.15 Materials and Construction

Precast concrete tanks to be built to AS1546.1 Small Septic Tanks.

All access covers to be capable of supporting a live load of 1200kg. On an area of 0.5m².

All metal components shall be of 304 or 316 stainless steel.

All plastic components to be of the grade equivalent of class 12PVC

All electrical motors to comply with AS1359 and AS1360.

All fittings and components will be manufactured of non-corrodible materials.

2.16 Electrical Control Panel & Alarm

Provide one- Septech Electronic Control Panel.

All electrical wiring to the STP location is to be supplied and installed to Australian Standards and to Septech specifications.

Control Panel to be wired as per Septech Installation Specifications.

2.17 Sewer Depth

This specification is based on a maximum sewer depth of 1080mm below ground level at the Treatment Plant.

Installation and Commissioning Notes

Septic Tank access manhole to ground level by means of precast concrete saddles and cover.

1. All compartments are to be left free of debris before commissioning of plant.
2. To avoid flotation = fill all compartments with water at time of installation.
3. TurboJet to be located level, this can be achieved by screening 7mm aggregate level and to the dimensions as shown on drawing – before commissioning unit.
4. Make sure all tank compartments are full of water before commissioning unit.
5. Clear excess excavated soil from around tank and ensure that the top of the concrete is 50mm above natural ground level to prevent entry of soil, debris and ground water.
6. Install 25mm diameter Class 12 PVC or steel protection conduit between Primary Sewage Tank and TurboJet Tank. Feed the 12mm diameter flexible recirculation

- conduit through the protection tube into the inlet of the Primary Sewage Tank, attach flexible conduit to the concrete roof of the tank with galv. Saddle clips. (Maximum distance between Primary Sewage Tank and the SCA tank to be 600mm).
7. Concrete access Saddles on the Turbojet are to be sealed with an approved product. Saddle to be located 50mm (min) above natural ground level. (not including lids).
 8. Top of Primary Sewage Tank and SCA tank MUST BE INSTALLED LEVEL.
 9. If an effluent pumpwell is to be installed after the STP in order to elevate effluent into an approved means of disposal, an alarm warning system MUST be installed to warn of any flood situation caused through an effluent pump failure.
 10. In applications where an effluent pumpwell is required due to depth exceeding 610mm below ground level and the TurboJet outlet is deeper than the receiving outfall drain or other means of disposal, the pumpwell MUST only be installed between the Primary Sewage Tank, with the SCA tank being elevated to a height whereby the effluent can be gravity fed into the receiving means of disposal. Installation of the pumpwell after the STP will automatically render the warranty null and void.

TERMS OF BUSINESS

Payment is required upon delivery of STP to the site. Failure to do so will result in the unit being returned to the factory and a further transport charge required if and when unit is re-delivered to the site. Payment to be made either in the form of bank cheque cash or EFTPOS.

NOTES

- a) The STP will be delivered and placed in the excavation provided that there is adequate access (minimum access dimensions: 4m wide x 6m high continuous to the STP area) for the crane truck to manoeuvre alongside the excavation.
- b) That the excavation is prepared prior to the delivery of the unit.
- c) That the crane truck can travel over a suitable ground surface without any hindrance to its movement (forward or reverse) or whether in the option of the driver that the truck will not become bogged.
- d) A time period of 30 minutes unloading is inclusive of quotation sum. Any delay longer than this stated period will result in an extra charge of \$85.00 per hour.

WARRANTY

The warranty will be automatically rendered void upon the following:

1. Any of the design parameter of the unit are exceeded.
2. The normal operation of the unit is interfered with by untrained personnel, causing part of parts of the STP to wear out prematurely.
3. Flotation of tanks occurring through de-sludging of tanks during wet weather or high ground water levels around the outside of tanks.

4. Large amounts of grease, oils or fats to accumulate within the STP consequently leading to stress and/or failure of the mechanical components to occurs.
5. Inadequate de-sludging of the unit as determined by Septech. EPA and Health Department require de-sludging of STP every 3 years.

If STP is installed by Septech, works will be guaranteed for a period of 12 months from delivery date against defects in workmanship, failure of any working part(s) on the proviso that correct weekly maintenance (see owners manual) is conducted

WARNING

Septech WILL NOT warranty any of the mechanical, electrical or pumping components on the STP due to the installation of an effluent pumping station after the STP (by others) and/or any works by others or natural occurrences which cause the plant to flood.

The STP MUST be kept in an operable state at all times during and after the warranty period, otherwise Septech WILL NOT be held responsible for poor effluent quality through owners negligence of the unit.

Note: - This STP is to be commissioned ONLY by the staff or representatives of Septech. Any attempt by other persons to commission this STP without Septech's authority, will render the Warranty on this STP null & void.

Warranty of this TurboJet STP will also null & void if upon inspection of the STP, it is found that the STP has been installed incorrectly according to the drawings and specifications which can lead to parts failure: ie, plant installed out of level or with an effluent pumping station.

REFERENCES:

Engineer Computation Conducted by

Matthew Diston
Bachelor Engineering – Environmental

Use of Reclaimed Waters

- Best Practise Environmental Management Series Publication 464.2 March 2003 EPA

Septic Tanks Code of Practise

- Best Practise Environmental Management Series Publication 891 March 2003 EPA

Code of Practise for Small Treatment Plants

- Best Practise Environmental Management Series Publication 500 June 1997 EPA


Public Health Engineering – Design in Metric WASTEWATER TREATMENT

- Ronald E. Bartlett 1971


Code of Practise – Septic Tanks. On-Site Domestic Wastewater Management.

- Best Practise Environmental Management Series Publication 451 March 1996 EPA

Turbojet 2000 Design Data Sheet

Hydraulic Loading Organic Loading Peak to average flow ratio	Calculated Design Data 2000 L/Day 675 g BOD / Day 8 from graph	
Turbojet 2000 Tank Dimensions		
Primary S.T.P. Tank		
Total Length of Primary STP	2275 mm	2.28 m
Dia Primary S.T.P.	1660 mm	1.66 m
Air Space in Primary STP (above water level)	300 mm	0.3 m
Primary S.T.P. Volume		3.45 m ³
Aerator + Humus Tank		
Total Length of Primary STP	2275 mm	2.28 m
Dia Primary S.T.P.	1660 mm	1.66 m
Wall thickness	80 mm	0.08 m
Inlet & Outlet Wall Thickness	100 mm	0.1 m
Air Space in Primary STP (above water level)	300 mm	0.3 m
Aerator Volume	1275 mm	1.93 m ³
Humus Volume	1000 mm	1.52 m ³
Total Volume		3.45 m ³
Contact Tank		
Total height of Clarifier	2085 mm	2.09 m
Length of Clarifier	1100 mm	1.10 m
Width of Clarifier	690 mm	0.69 m
Water Height in Clarifier	1100 mm	1.10 m
Usable Volume		0.55 m ³

Turbojet 2000 E.P.A. Requirement Calculations

	EPA & Health Department Requirement	Supplied
Primary Sewage Tank Peak Hourly Flow Primary Sewage Tank Retention Time Freeboard volume	 667 L/hr 2025 L 12 hr 333 L	 3448 L 41 hrs 572 L
Turbojet BOD Loading after Primary (25% reduction) Aeration Tank Volume Air requirement Disolved Oxygen Retention Time in Turbojet Freeboard volume	 506 g BOD remaining 2.03 m ³ >2.0 mg/l 4.0 hrs 333 L	 3.45 m ³ 4 - 9 mg/l* 41.4 hrs 572 L
Contact Tank Surface Area @ 1000L/m ² /hr Volume of clarifiers @ 0.5hr PHF Retention Time Freeboard volume of Contact Tank Total Freeboard volume Chlorine tablet dispensing requirements over 6 month period	 0.7 m ² 333 L 30.0 mins 333 L 1000 L 811 g (6 months)	 0.8 m ² 548 L (total) 49 minutes 672 L 1817 L 1040 g
Maximum daily BOD reduction to be removed Primary Sewage Tank Turbojet + Humus Tank Contact Tank Estimated BOD concentration left in effluent Maximum daily SS reduction to be removed Primary Sewage Tanks Turbojet + Humus Tank Contact Tank Estimated SS concentration left in effluent	 675 grams 25% reduction = 90% reduction = 25% reduction = 19.0 mg/L 500 mg SS / L 80% reduction = 20% reduction = 80% reduction = 16.0 mg/L	 506 grams remaining 51 grams remaining 38 grams remaining 100 mg SS / L remaining 80 mg SS / L remaining 16 mg SS / L remaining
* Results obtained under QAS testing 1546.3 - Moss Vale NSW		

Dimensions of **Septech Turbojet 2000** Chlorinator Computations



Length:	1100mm
Width:	690mm
Depth:	2085mm
Wall Thickness:	80mm
Water Level Height:	1100mm

Usable Volume of Chlorinator: (L x W x WLH)

$$= (1100 - 2 \times 80) \times (690 - 2 \times 80) \times 1100$$

$$= \frac{548020000\text{mm}^3}{1 \times 10^9\text{mm}^3} \times \frac{1 \text{ m}^3}{1 \text{ m}^3} \times \frac{1000 \text{ L}}{1 \text{ m}^3}$$

$$= \mathbf{548L}$$

Chlorine Dissipation Time @ PHF (667L/hr)

$$= \frac{548L}{667L/hr} \times \frac{60\text{mins}}{1hr}$$

$$= \mathbf{49.2mins}$$

Chlorine Dosing Requirement: (6 month period)

Max Hydraulic Loading:	2000L/day
Optimum Cl ₂ Concentration:	1.0mg/L
Stingy Stick Cl ₂ Concentration:	0.9kg Cl ₂ / kg
Kill rate Safety Factor	2

$$= \frac{2000 \text{ L}}{\text{Day}} \times \frac{1.0 \text{ mg}}{\text{L}} \times \frac{365 \text{ Days}}{2} \times \frac{1 \text{ kg}}{0.9\text{kg Cl}_2} \times \frac{1 \text{ g}}{1000 \text{ mg}} \times 2$$

$$= \mathbf{811g Cl_2 \text{ Tablets}}$$

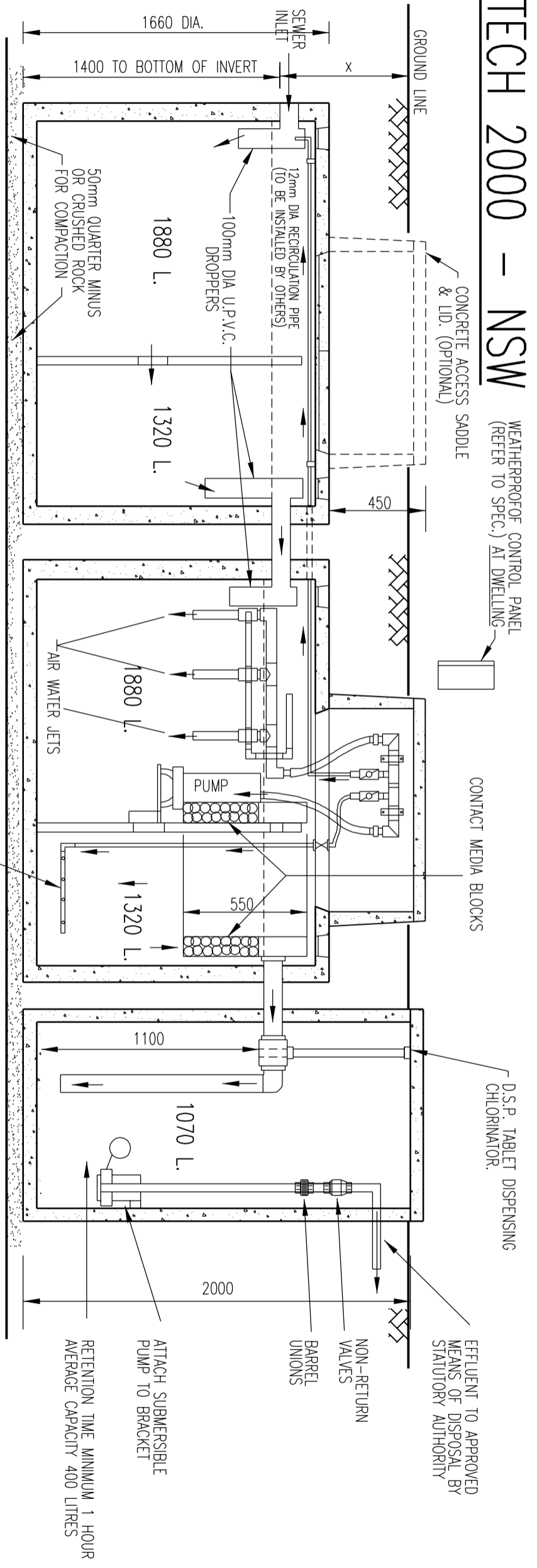
Appendix A

Engineer Computation Conducted by

Matthew Diston
Bachelor Engineering – Environmental

SEPTTECH 2000 - NSW

WEATHERPROOF CONTROL PANEL
(REFER TO SPEC.) AT DWELLING



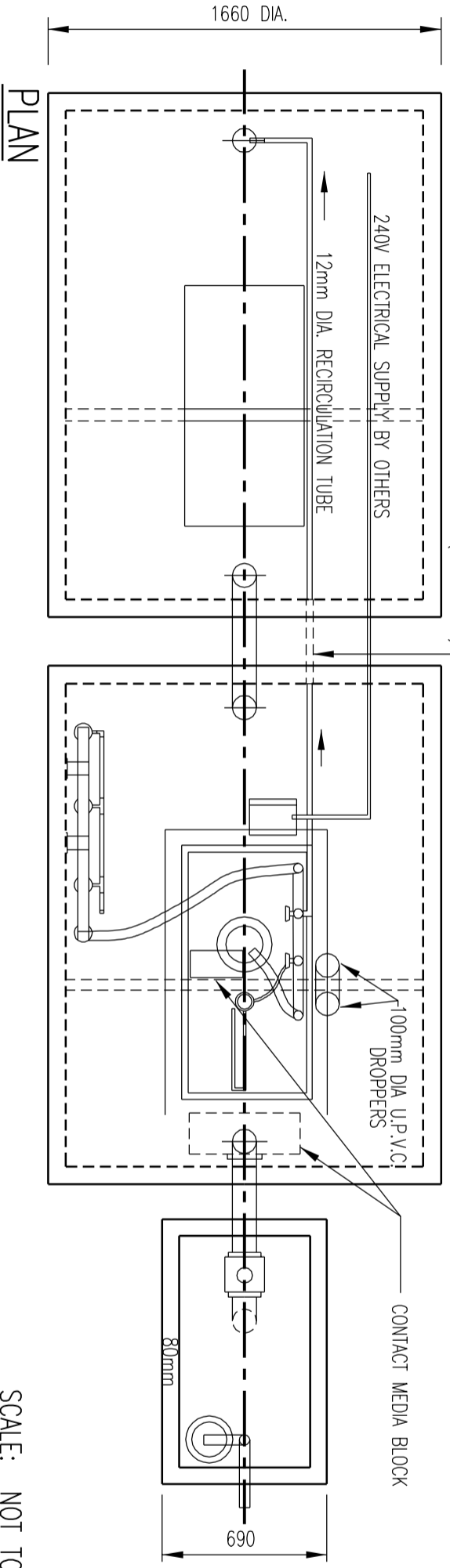
PRIMARY SEWAGE TANK
CAPACITY: 3200 LT

SUBMERGED CONTACT AERATION TANK
CAPACITY: 1880 LT

HUMUS TANK
CAPACITY: 1320 LT

CONTACT TANK
CAPACITY: 1070 LT

FLEXIBLE RECIRC. PIPE TO BE SLEAVED IN STEEL CONDUIT BETWEEN TANKS (BY OTHERS)



PLAN

SCALE: NOT TO SCALE

- NOTES**
1. REFER TO SPECIFICATIONS FOR FURTHER DETAILS OF S.I.P.
 2. TOP OF PRIMARY SEWAGE & S.C.A. TANKS TO BE INSTALLED LEVEL
 3. "X" - SEWAGE INVERT TO BE DETERMINED BY PLUMBER
 4. "Z" - EFFLUENT DRAIN TO BE 180mm LOWER THAN SEWER INVERT
 5. CONCRETE TANKS TO BE MANUFACTURED TO A.S.1546.3
 6. PATENT NO. 45342/89 APPLIES INFRINGEMENT WILL RESULT IN LEGAL ACTION
 7. MADE TO AUSTRALIAN STANDARD SPECIFICATION I.C. NO 714
 8. COMBINED WORKING CAPACITY OF 7470 LITRES
 9. PROVIDE MIN. 50mm FALL FROM OUTLET OF EACH TANK



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TITLE
STANDARD INSTALLATION ASSEMBLY "N.S.W."

TURBOJET 2000 DOMESTIC
SEWAGE TREATMENT PLANT
PLANT TO TREAT - 2000 LITRES PER DAY (MAX.)
500 GRAMS PER DAY B.O.D. (MAX)



DESIGNED

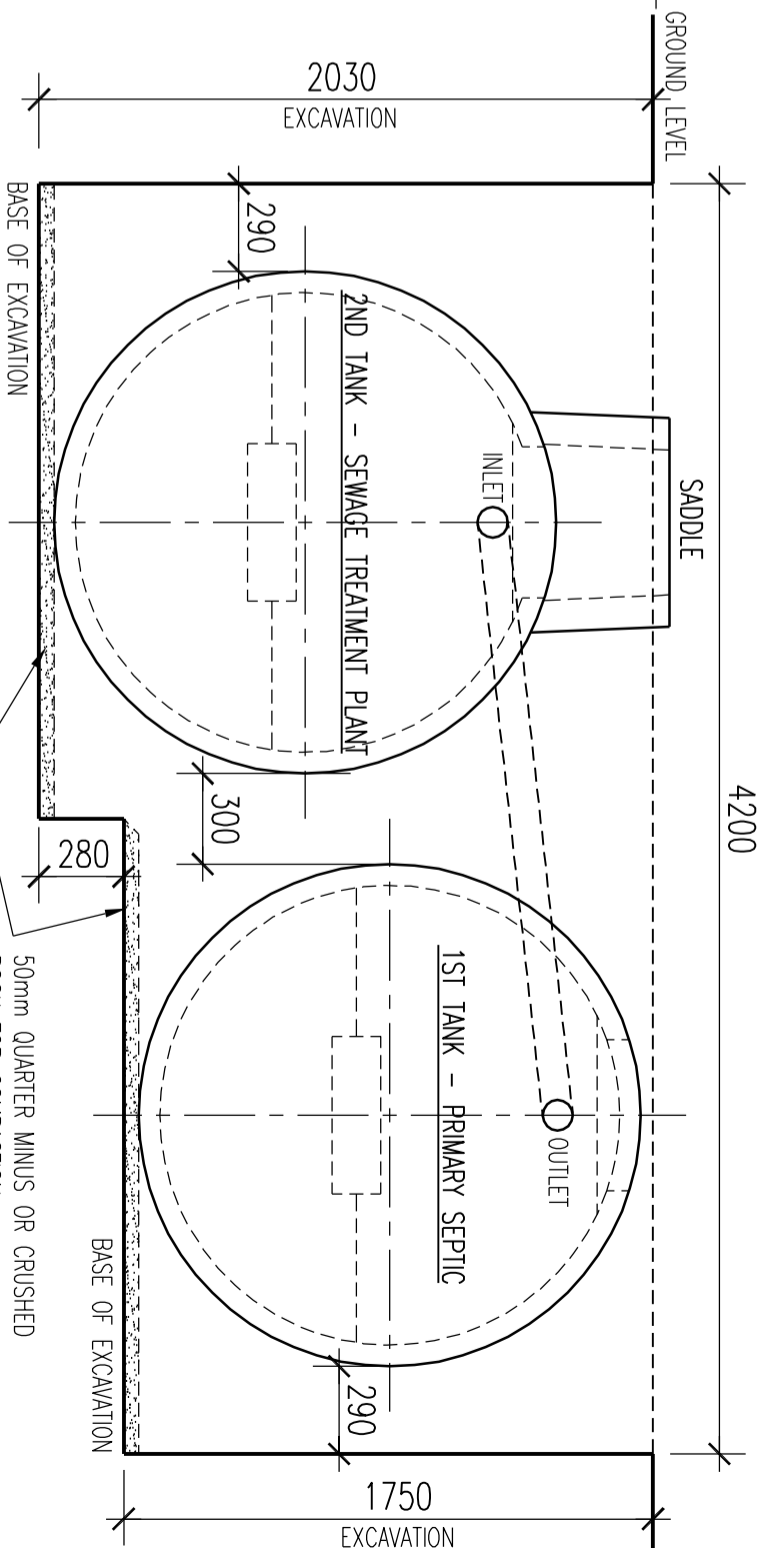
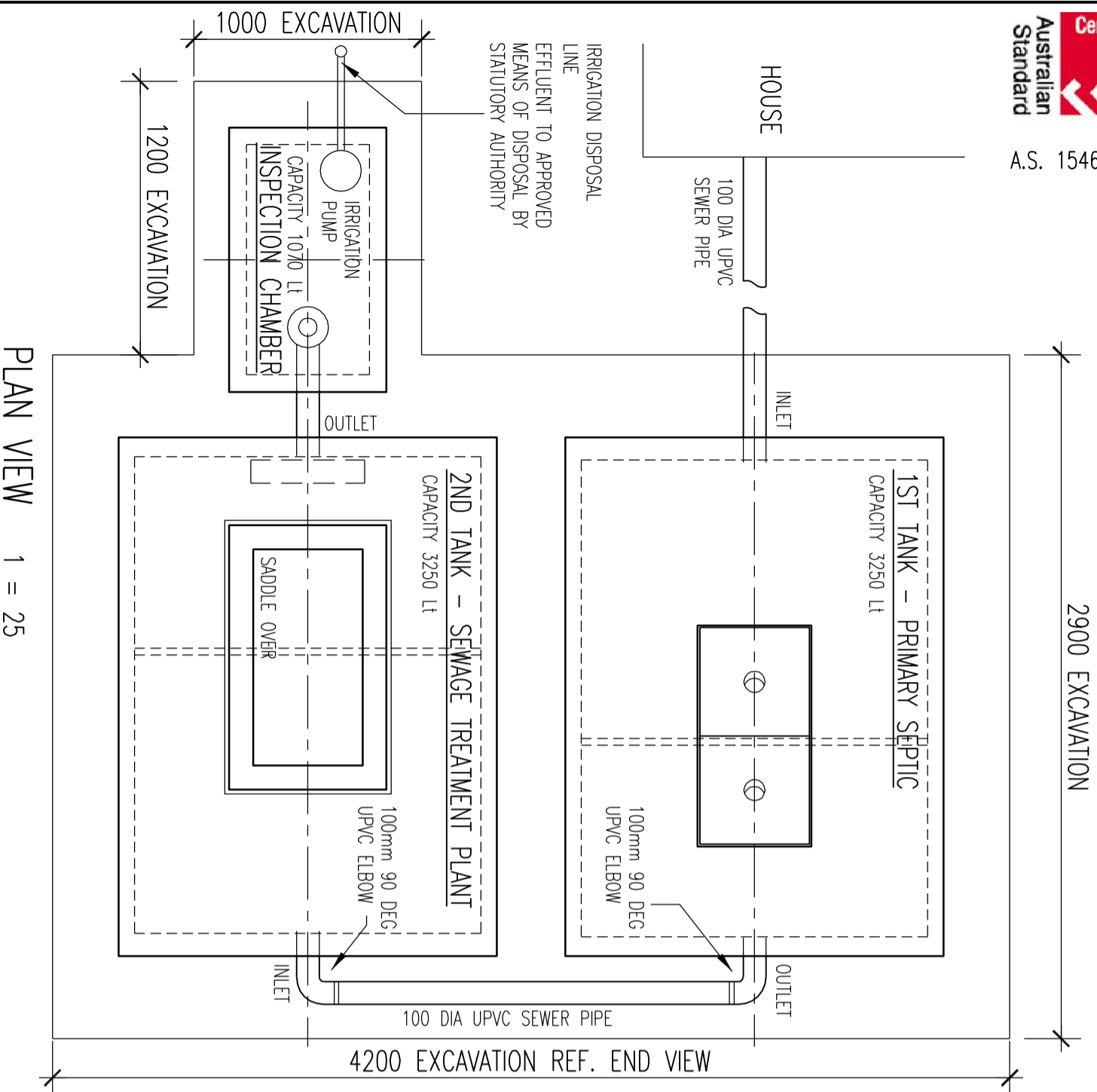
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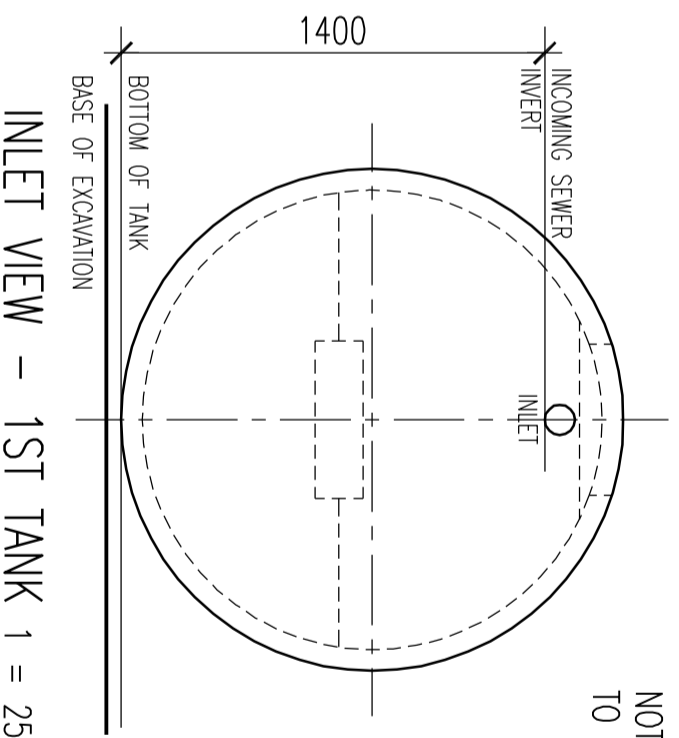
TURBO 2000/2

TURBOJET 2000



NOTE :- THESE DEPTHS GIVEN
 DEPENDS ON SEWER DEPTH

NOTE :- ALL SADDLES, PIPES AND CONDUITS
 TO BE SEALED WITH APPROVED METHOD



INLET VIEW - 1ST TANK 1 = 25

PLAN VIEW 1 = 25

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TITLE
 STANDARD SITE INSTALLATION FOR N.S.W.
 TURBOJET DOMESTIC SEWAGE
 TREATMENT PLANT WITH 1070 Lt INSPECTION CHAMBER



DESIGNED
CHECKED
APPROVED
DWG. No. TURBO 2000/2 (A)