

HUT PROCUREMENT MANUAL

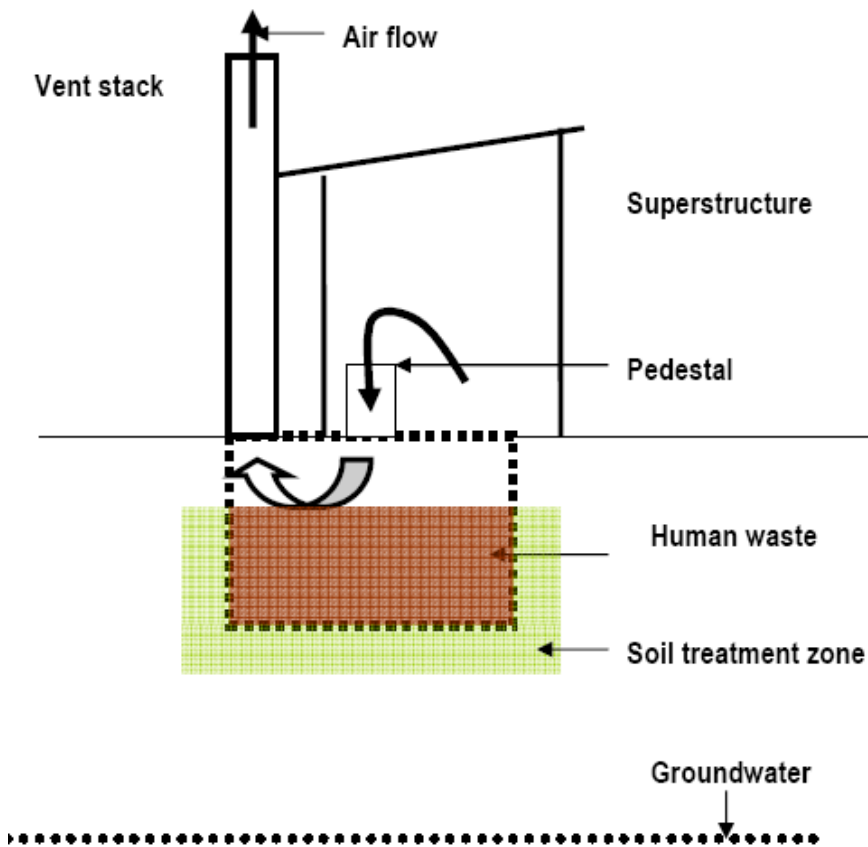
PART F

TOILETS AND GREY WATER

FOR BACKCOUNTRY HUTS

QD code VC1414

March 2009 Version 4.0



Department of Conservation
Te Papa Atawhai

CONTENTS

PAGE

Section F1 Ventilation Improved Pit Toilet.....	1
1.1 Purpose.....	1
1.2 Regional Plans	1
1.3 Interpretation	1
1.4 Number of toilets	2
1.5 Location and Orientation of Toilet	2
1.6 Distance from Water.....	4
1.7 Design Factors	4
1.8 Verification Method.....	7
1.9 Standard Solutions.....	7

Appendix F1 Ventilation Improved Pit Toilet Drawings

Section F2 Grey Water treatment and disposal.....	1
2.1 Purpose.....	1
2.2 Regional Plans	1
2.3 Interpretation.....	1
2.4 Requirement	1
2.5 Sinks	1
2.6 Discharge pipework and drains.....	2
2.7 Grey water treatment and disposal	2
2.8 Verification method.....	5
2.9 Standard Solutions.....	5

Appendix F2 Greywater on-site systems Drawings

Section F1 Ventilation Improved Pit Toilet

1.1 Purpose

This part of the manual provides acceptable solutions and verification methods for Ventilation Improved Pit (VIP) Toilets.

1.2 Regional Plans

The discharges to the environment from a VIP toilet shall comply with the relevant regional plan. The rules in the relevant regional plan shall be checked as part of the planning process. Where the prescribed acceptable solutions cannot be located and detailed so as to comply with the relevant rules, a discharge permit shall be obtained as part of the planning process.

1.3 Interpretation

A ventilation improved pit (VIP) toilet comprises:

- a excavation in the ground over which a small building is sited
- a small building that is specifically design for enhanced passive ventilation (as illustrated in figure 1).

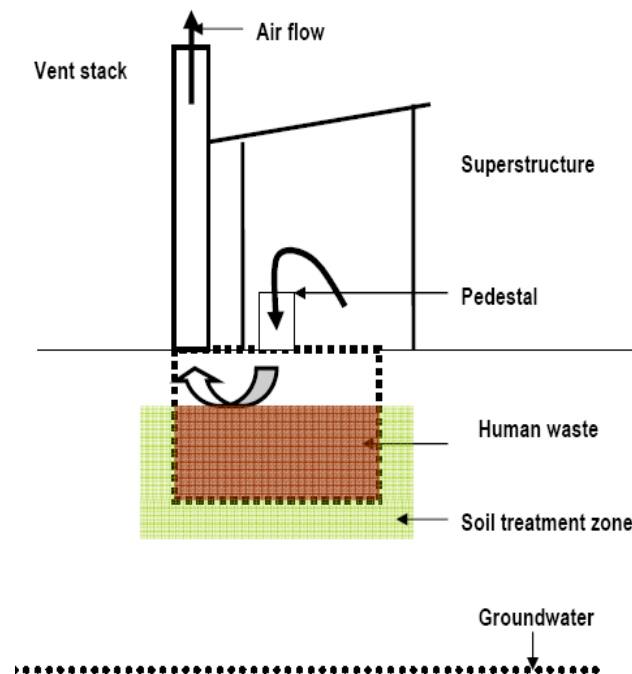


Figure 1: VIP Toilet Schematic

1.4 Number of toilets

The number of toilets shall be provided in accordance with Table 1.1.

Table 1.1: Number of Toilets

Sleeping capacity ⁽¹⁾	No of VIP Toilets
Up to 20	1
21 to 36	2
37 to 48	3
Above 48	4

Notes

1. Calculated sleeping capacity includes staff hut sleeping capacity as the backcountry hut toilet is used by staff.

1.5 Location and Orientation of Toilet

- i) A VIP toilet shall be located:
 - at least 3 metres and not more than 100 metres from a backcountry hut,
 - downwind of the hut under the prevailing wind conditions.
- ii) A VIP toilet shall be located either –
 - 6 metres away from trees, or
 - the trees within a 6 metre-radius shall be pruned to eliminate limbs less than 4 metres above ground level.

Within the 6m zone any vegetation shall be trimmed or cut so that it does not exceed 2m in height, and is a minimum of 2m from the cubicle.

- iii) A VIP toilet shall be orientated so that the cubicle vent faces the prevailing wind.

Comment: When locating the toilet, to enhance the performance of the toilet, consideration should also be given to:

- *taking maximum advantage of the wind flow and the sun's energy*
 - *selecting a location that is not a hollow, on the lee side of a ridge, immediately adjacent to dense bush, or beneath an overhang.*
 - *Where a door vent does not face the wind, locating the vent in the relevant wall.*
- iv) Where two or more toilets are required the cubicles shall be located on the site so that –
 - No cubicle vents are obstructed from the prevailing wind, and
 - The pit vent stacks are offset to the prevailing wind by at least 1m.

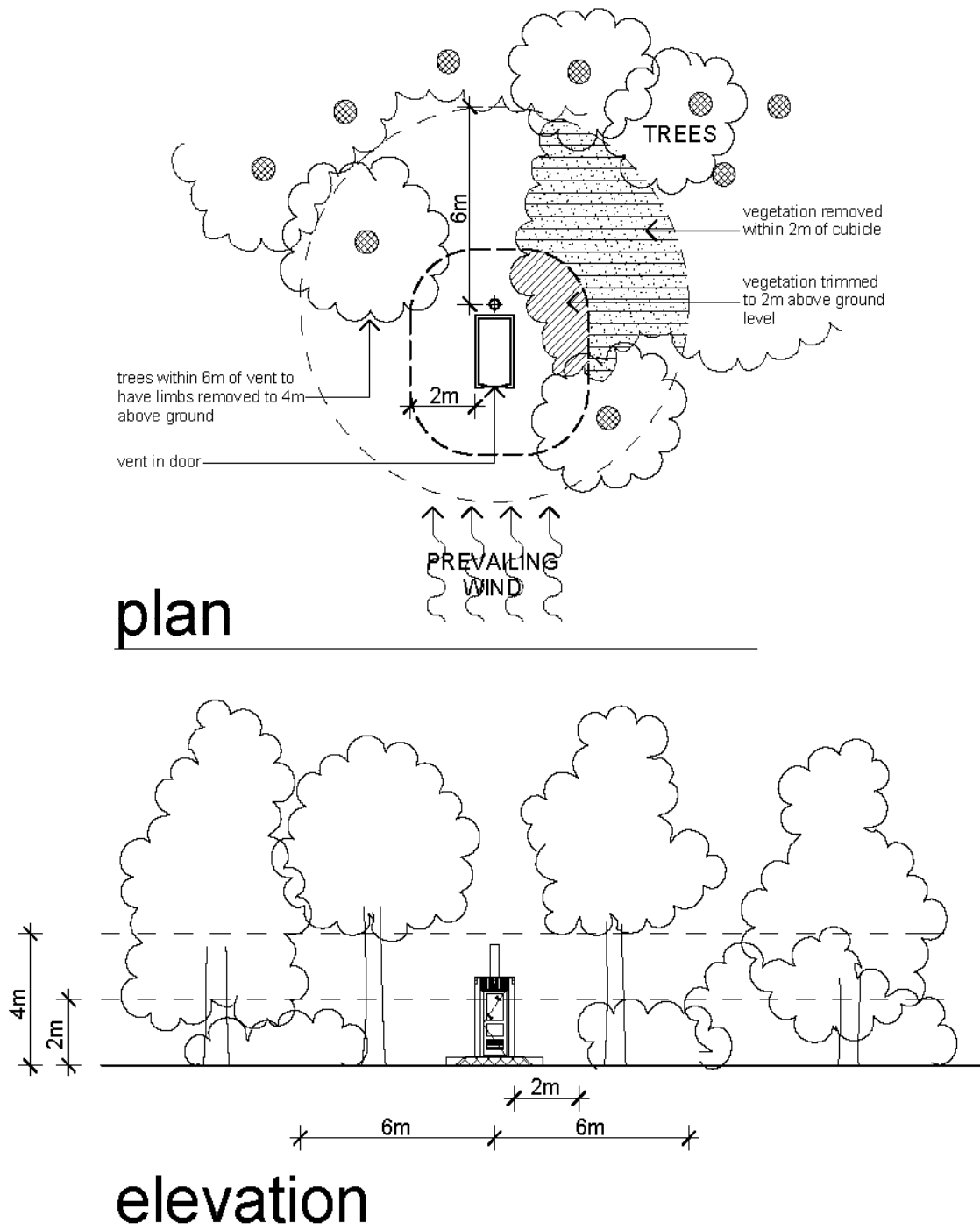


Figure 2: VIP Toilet vegetation clearances

1.6 Distance from Water

1.6.1 Distance from Surface Water

A VIP toilet shall be located at the minimum distance from surface water given in the relevant regional plan.

Comment: Surface water includes a stream, lake, tarn, or the Coastal Marine area.

1.6.2 Distance from Ground Water

- i) Except in gravels, scoria and fractured rock, the base of a VIP toilet pit shall be located at least 0.6 metres above maximum groundwater level or the distance given in the relevant regional plan, whichever is the greater.
- ii) Where located in gravels, scoria and fractured rock, the base of a pit toilet shall be 6 metres above groundwater or the sides of the pit shall be lined and the base shall be covered to a depth of 600 mm with sand or local soil.

Comment: Guidance on soil types is given in AS/NZS 1547: 2000 On-site domestic wastewater management.

1.7 Design Factors

1.7.1 Pit Capacity

- i) The minimum size of a pit shall be in accordance with Table 1.2..
Comment: These storage volumes are likely to provide for overnight visitors (depending on climate and soil conditions) for a period of 3 years.
- ii) The minimum depth of cover soil over a completed pit shall be the greater of 500 mm or the minimum depth given in the relevant regional plan.

Table 1.2: Pit Sizing

Sleeping capacity	Pit size		
	Length	Width	depth ⁽¹⁾⁽²⁾
2 – 6	1.35m	0.7m	0.9m
		0.9m	0.9m
10 – 12	1.35m	0.7m	1.1m
		0.9m	0.95m
20	1.5m	1.0m	1.3m

Notes

1. These depths include the allowance of 500mm cover soil.
2. A minimum depth of 900mm is required to avoid 'piling' below and blockage of the toilet dropper.

- iii) If a greater capacity is desired to prolong the life of the pit, then the pit may be dug deeper at the rate of 0.06m³ volume per 100 additional hut users per year (i.e. an additional 100 bednights per year) , or any proportion thereof. This equates to deepening the pit by 50mm.
- iv) An earlier pit may be dug out and reused a minimum of six years after use had ceased and the pit has been covered. Excavated material shall be placed somewhere away from regular use where vegetation can grow and cover it.

Comment: For a pit of the size noted this allows adequate time for the decomposition of all material that could be considered harmful to health and a resulting rich soil. Generally, well within this six year period after being covered, the waste in a pit will stabilise and be pathogen-free.

Whenever a pit has been filled and covered, its location should be logged with pit dimensions and a finder diagram. This will assist when the next new pit has to be dug. Also, the location where any excavated pit material has been placed should be logged with deposition dimensions and a finder diagram

1.7.2 Pit Stability

- i) Pits shall not be excavated deeper than 1.5 m without observing Department of Labour requirements.
- ii) Where excavated in firm soils, such as clay, silt loams or tightly bound gravels, pit walls are not required to be supported.
- iii) Where excavated in loose soils, such as sand or friable loam, the full height of the pit wall shall be supported with untreated timber
- iv) When a new pit is being excavated, the distance between the new pit and the filled pit should at least the depth of the new pit. For example, if the base of the filled pit is 1.5 metres below ground level, the edge of new pit should be at least 1.5 m away from the filled pit.
- v) To avoid pressure on the back or front wall of the pit, where the front or back edge of the platform is within 900mm of the pit wall the relevant edge bearers of the cubicle platform shall be doubled and extend 900mm beyond the edge of the platform.

1.7.3 Ventilation

- i) The pit shall be ventilated by a vent stack that:
 - has a minimum diameter of 300mm
 - extends to a minimum height of 1m above the highest point of the cubicle roof
 - shall remain uncovered and unscreened at the top.

- does not protrude below floor framing level
Comment: This is necessary to enable venting of all gases from the pit
 - Is coloured black
Comment: A ventilator is not required to be fitted to the top of the vent to induce adequate ventilation. There is a risk that in some conditions a ventilator may inhibit ventilation. There is no evidence that ventilators add over all to performance.
- ii) The cubicle shall be ventilated by a single vent that:
- faces the prevailing wind
 - Is located no more than 500mm above the cubicle floor level, and
 - Has a total area of 72,000 mm² minimum if unscreened or 90,000mm² if screened to prevent insect entry.
- iii) The cubicle ventilation requirement may be met by either:
- a 200mm high vent full width between stiles in door, or
 - a 300 x 300mm vent in either door or wall with insect mesh (no smaller than 5mm x 5mm aperture), or
 - the door being undercut by 90mm.

1.7.4 Lighting and Insulation

- i) Natural lighting shall be provided and shall be adequate for the visitor to see comfortably but not directed in a way that the waste can be seen down the toilet dropper.
- ii) Skylights shall not be used.
- iii) Windows, if provided, may be located in either the wall or door. Windows shall be non-opening and, if located in the wall, the window shall face either west or south.
- iv) The roof of the cubicle shall be insulated to a minimum R value of R1.8, with any lighting located in the walls or door and non-opening.
- Comment :Insulation is required to maintain a lower temperature inside the cubicle so that a reverse airflow (i.e. airflow from the pit into the cubicle) is not induced. Windows are required to be non-opening so that the stack effect is optimised between the entry point of air into the cubicle and the exit point of the air at the top of the vent.*

1.7.5 Cubicle construction

- i) Interior floor and toilet seat surfaces shall be easily cleaned, and moisture-resistant.
- ii) The floor surfaces requirement may be met by:
 - H3 CCA ply flooring that has been finished with a moisture-cured polyurethane or a decking-grade oil, and
 - No lip or raised threshold at the door.
- iii) The toilet seat shall be a proprietary seat with lid, and may be fitted to either a pedestal or bench, with the dropper into the pit being a minimum of 300mm diameter.

Comment: The toilet seat shall have a gap between seat and lid to enable a free flow of air onto the pit.

- iv) The toilet pedestal or bench surfaces requirement may be met by:
 - a proprietary pedestal of any impervious material
 - a bench constructed of H3 ply that has been finished with a moisture-cured polyurethane or a decking-grade oil.

1.8 Verification Method

A design method to avoid the likelihood of foul air and gases accumulating within or entering into buildings, may be verified as satisfying the relevant Performances of NZBC G13 if the method complies with In-Depth Design and Maintenance for Vault Toilets, B. Cook, Forest Service, US Department of Agriculture 1991.

1.9 Standard Solutions

Appendix F1 contains standard solutions for VIP toilets.

As required for differing sleeping capacities, these drawings shall be altered to show the correct pit size in accordance with Table 1.2.

Appendix F1 Ventilation Improved Pit Toilet Drawings

- Current Drawing Register
- Amendment Register
- Base drawings

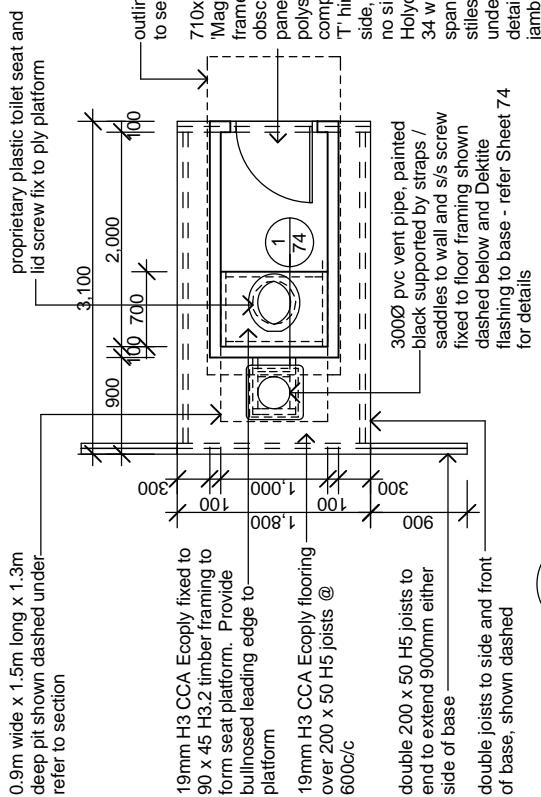
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CURRENT DRAWING REGISTER

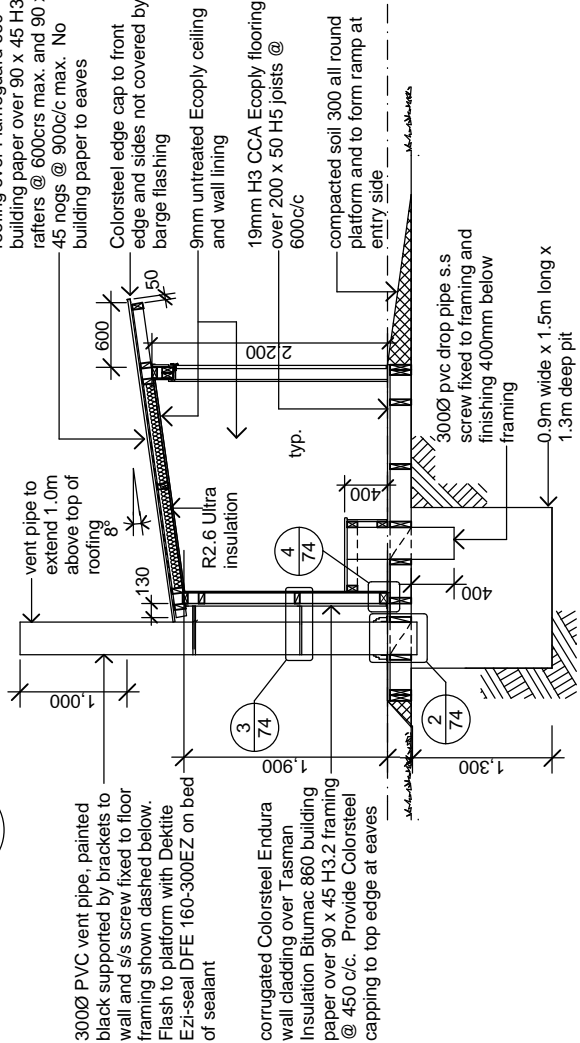
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71	Standard Pit Toilet – Colorsteel cubicle for 20 bunk huts	4.0	March 2009
72	Standard Pit Toilet – Norski cubicle	4.0	March 2009
73	Standard Pit Toilet – Colorsteel cubicle for 2 – 12 bunk huts.	4.0	March 2009
74	Standard Pit Toilet details	4.0	March 2009

AMENDMENT REGISTER

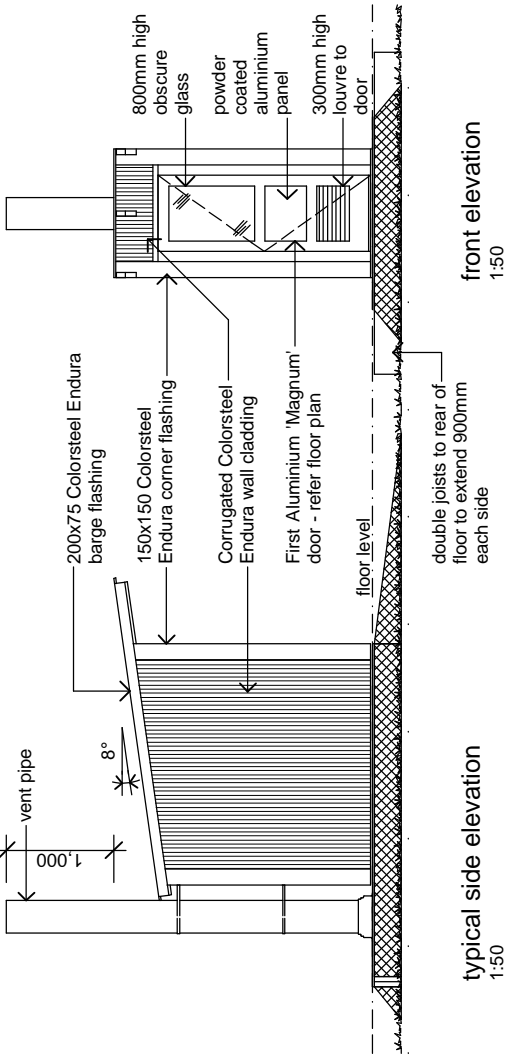
Amendment date	Amendment details (section, page number, block)	Version	Signature of copyholder and date



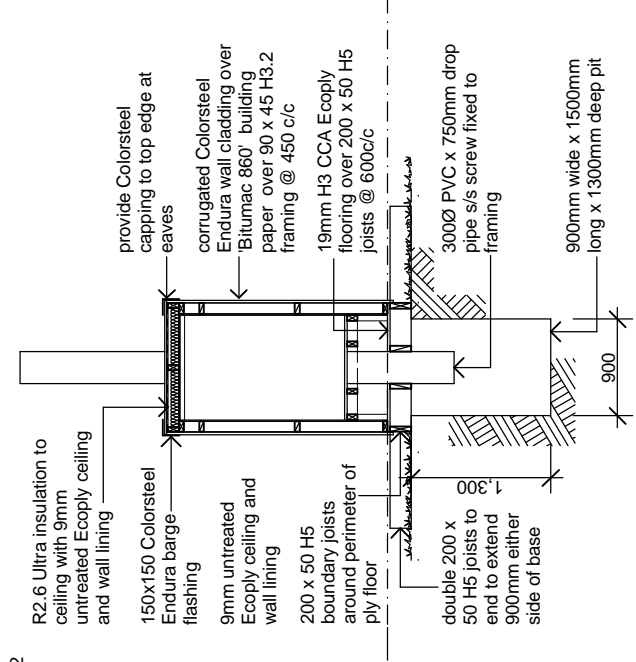
standard pit toilet plan
1:50



A Section
1:50



typical side elevation
1:50



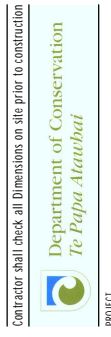
B Section
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4.0	First Issue	Mar 09	-
	REV NO	DESCRIPTION	DATE
		Drawing Issue and Amendments	DWN CKD
		V4.0 Toilets Appendix F1	

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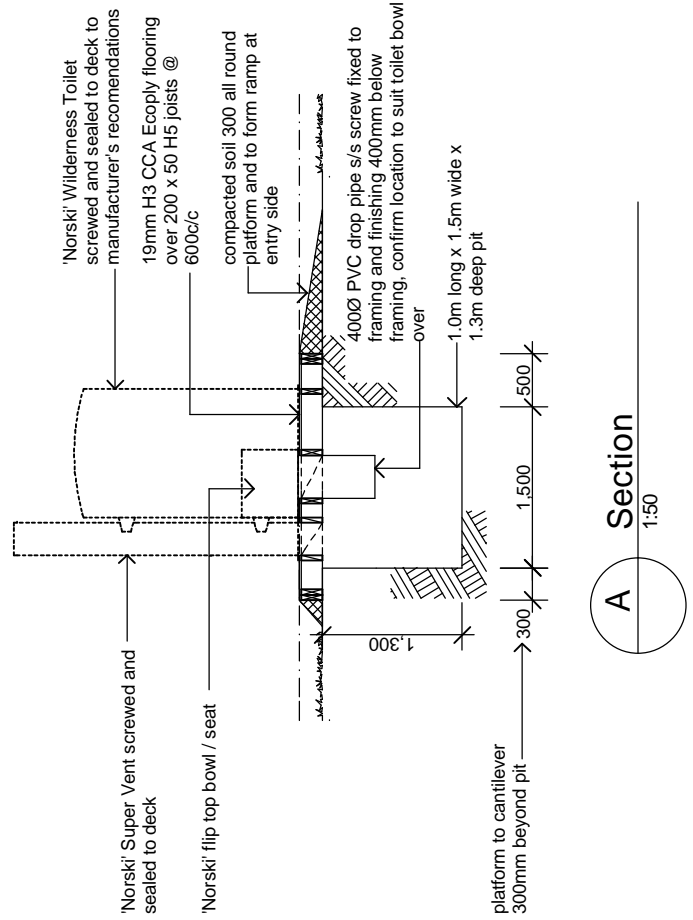
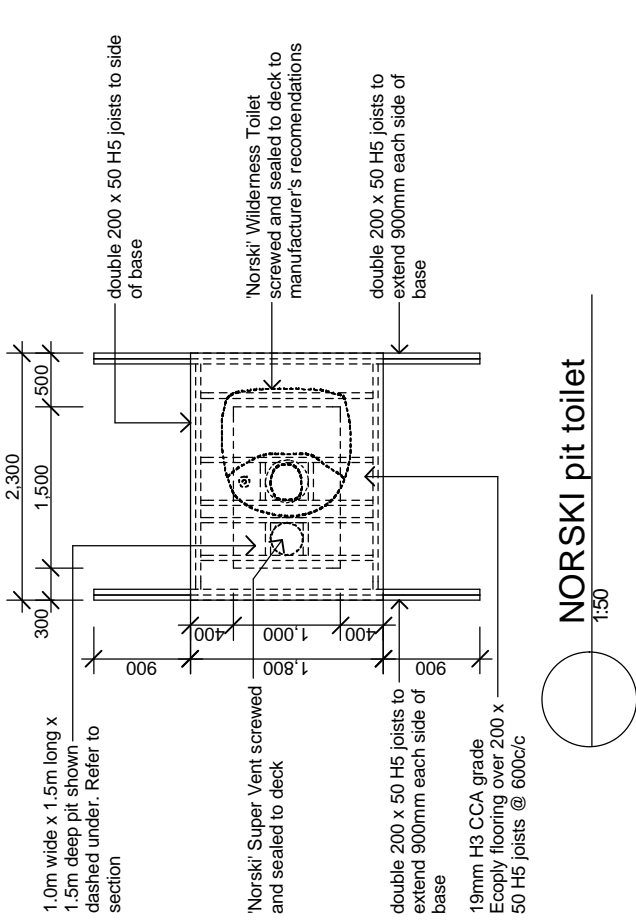
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Contractor shall check all Dimensions on site prior to construction



HUT DESIGN MANUAL TOILETS

CLIENT	DEPARTMENT OF CONSERVATION
SHEET COMMENTS	SCALES
standard pit toilet - colorsteel cubicle	1:50
DESIGN	DRAWN
RP	GR
CHECKED	RP
DATE	March 2009
PROJECT NO.	xyz
SHEET NO.	71
REV NO.	



4.0	First Issue	Mar 09	-
	REV NO DESCRIPTION	DATE	DWN CKO
Drawing Issue and Amendments			
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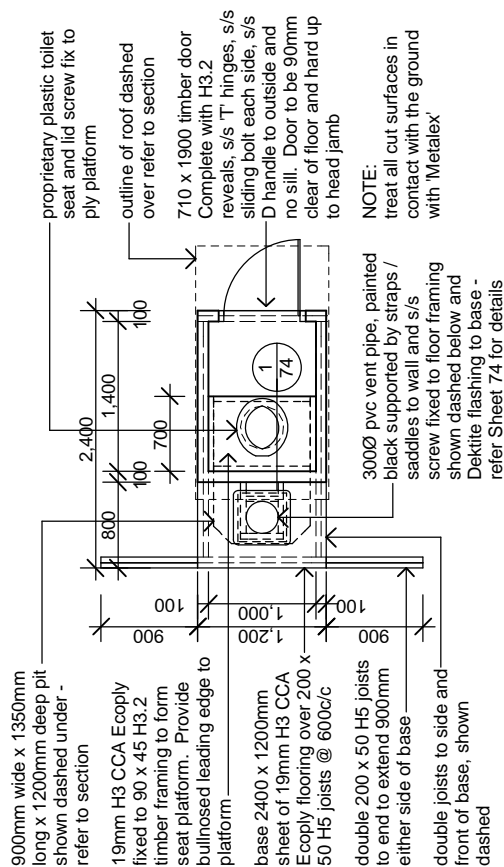
PROJECT

**HUT DESIGN MANUAL
TOILETS**

CLIENT DEPARTMENT OF CONSERVATION

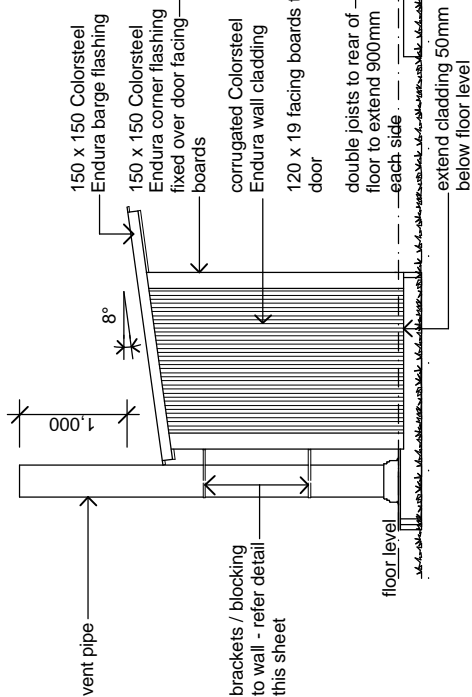
SHEET CONTENTS
NORSKI pit toilet

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DATE	March 2009			72

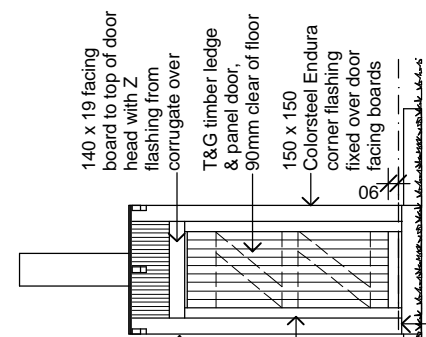


standard pit toilet plan 1:50

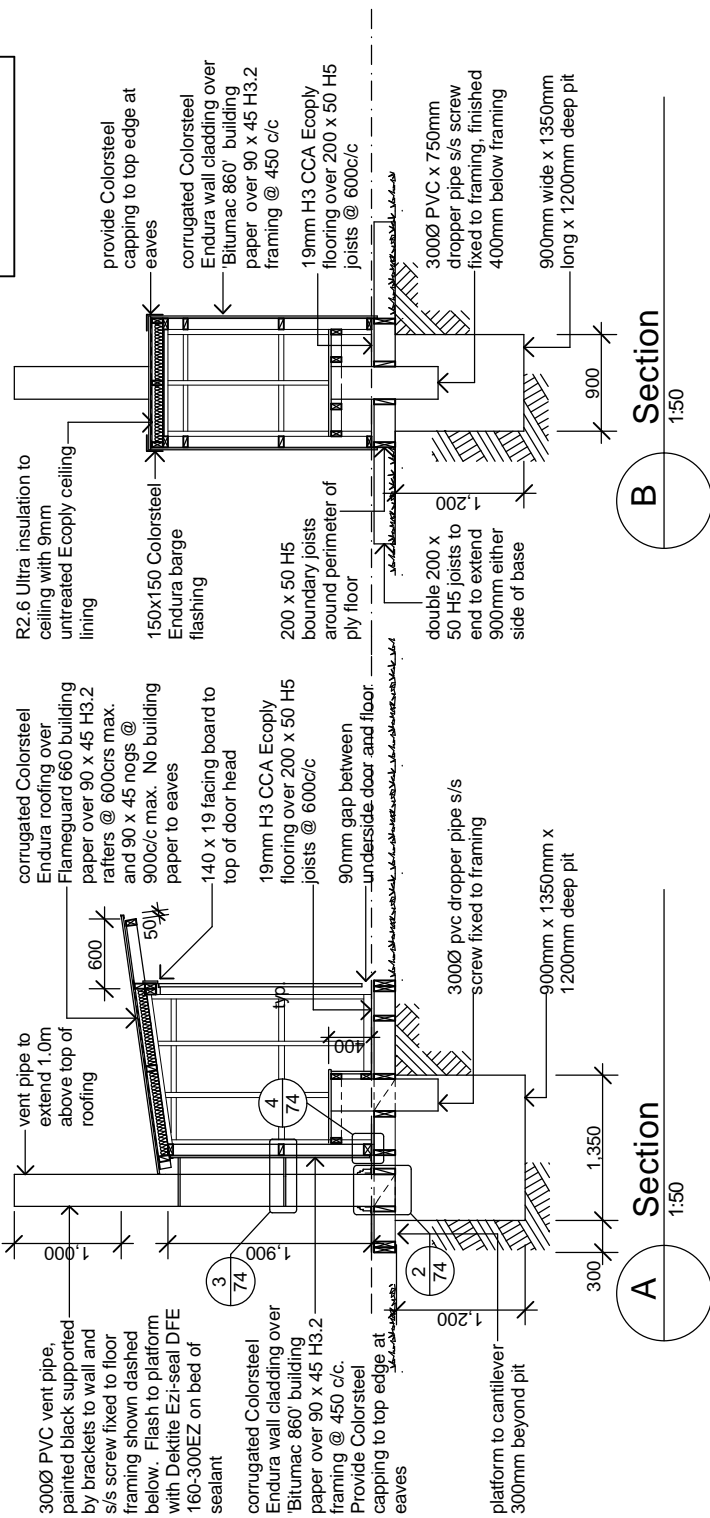
typical side elevation 1:50



front elevation 1:50



NOTE: Refer to Table 1.2 of Section F1 and adjust pit dimensions to suit



A Section 1:50

B Section 1:50

4.0	First Issue	Mar 09	
	REV NO	DESCRIPTION	DATE
		Drawing Issue and Amendments	DWN CKO
		V4.0 Toilets Appendix F1	

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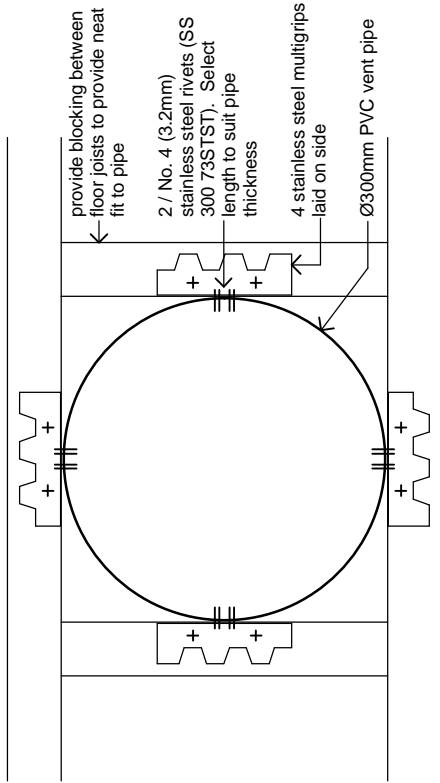
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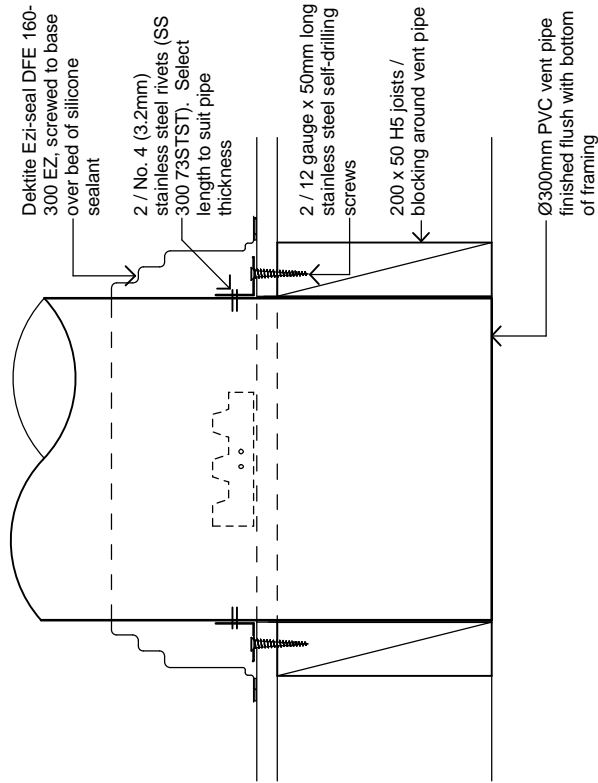
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HUT DESIGN MANUAL
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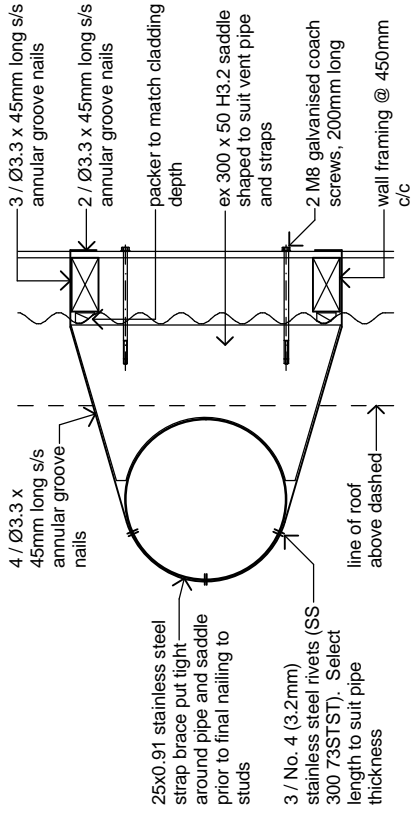
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SHEET COMMENTS	SCALES
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DESIGN	DRAWN
RP	GR
CHECKED	PROJECT NO.
DATE	xyz
March 2009	73



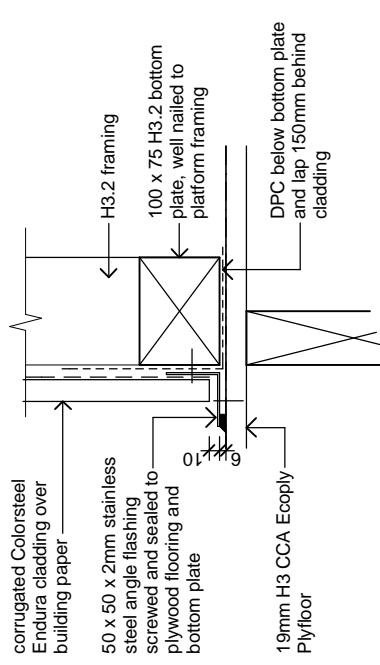
2 vent pipe plan
1:5



1 vent pipe section
1:5



3 saddle detail
1:10



4 wall base detail
1:5

REV NO	DESCRIPTION	DATE	BY	CHKD
4.0	First Issue	Mar 09		
Drawing Issue and Amendments				
V4.0 Toilets Appendix F1				



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HUT DESIGN MANUAL
TOILETS

CLIENT		DEPARTMENT OF CONSERVATION	
SHEET CONTENTS		SCALES	
standard pit toilet details		1:10, 1:5	
DESIGN	DRAWN	CHECKED	PROJECT NO.
RP	GR	RP	
DATE	March 2009		xyz
			74

Section F2 Grey Water treatment and disposal

2.1 Purpose

This part of the manual provides acceptable solutions and verification methods for Grey water treatment and disposal for huts with a sleeping capacity of up to and including 20 persons. For huts with greater sleeping capacities specific design shall occur.

2.2 Regional Plans

The discharges to the environment from a grey water treatment and disposal system shall comply with the relevant regional plan. The rules in the relevant regional plan shall be checked as part of the planning process. Where the prescribed acceptable solutions cannot be located and detailed so as to comply with the relevant rules, a discharge permit shall be obtained as part of the planning process.

2.3 Interpretation

Grey water is wastewater that is discharged from a sink or basin at a hut.

A grey water system comprises:

- discharge pipework from the sink or basin to a gully trap
- a gully trap and drain from the gully trap to a greywater treatment and disposal system
- greywater treatment and disposal system.

2.4 Requirement

Where sinks or basins are provided at a backcountry hut then a greywater system shall be required. For the purposes of this part 'sink' shall be taken to include 'basins'.

2.5 Sinks

- i) Sinks are not required at backcountry huts for building code compliance purposes. If sinks are provided, they shall be provided in accordance with this part of the hut manual.
- ii) DOC has service standards addressing different levels of provision for different visitor groups. The Service Standards currently require sinks for both food rinsing/dish washing and hand washing at 'Great Walk' huts, 'Serviced' huts and high-use (more than 1000 bed nights per annum) 'Serviced-Alpine' huts. For these huts, sinks shall be provided in accordance with Table 2.1.

Table 2.1: Number of Sinks

Sleeping capacity	No of Sinks	
	Food rinsing/dish washing ⁽¹⁾	Hand-washing ⁽²⁾
1-12 people	1	1 ⁽³⁾
13 to 20 people	1	1
21 to 36 people	2	1
37 to 48 people	3	2
Above 48 people	4	3
staff huts	not required ⁽⁴⁾	not required ⁽⁴⁾

Notes

1. Food rinsing/dish washing sinks may be located either inside or outside the hut.
2. Hand washing sinks shall be located outside the hut or associated with the toilets.
3. For serviced huts with a sleeping capacity of 12 or less the sink may be replaced with a tap only.
4. Staff hut sleeping capacity is included in the backcountry hut sleeping capacity as the backcountry hut sink is used by staff.

2.6 Discharge pipework and drains

- i) External sinks shall not have a trap on the waste pipe, but the waste pipe shall discharge over a gully trap to isolate the soakage pit or septic tank.

Otherwise, discharge pipework from the sink to the gully trap shall be installed to comply with the requirements of Acceptable Solution G13/AS1.

- ii) Gully traps and drains shall be installed to comply with the requirements of Acceptable Solution G13/AS2

2.7 Grey water treatment and disposal

2.7.1 Interpretation

The greywater treatment and disposal system (greywater on-site system) shall comprise:

- a septic tank (except as provided for under 2.7.4 below) and
- a soil soakage facility of either
 - a soakage pit (as provided for under 2.7.5 below) or
 - a soil soakage bed or trench (as provided for under 2.7.6 below).

2.7.2 Location of Greywater On-site System

- i) The septic tank shall be located at least 6 metres and the soil soakage facility shall be located at least 12m from a backcountry hut.

- ii) The soakage facility shall be sited so as to minimise surface water runoff infiltration into the pit. This includes not siting a soakage facility in a gully or depression.

Comment: If required, further guidance on siting soil soakage facilities is given in AS/NZS 1547: 2000 On-site domestic wastewater management.

2.7.3 Distance from Water

- i) Distance from Surface Water

The soil soakage facility shall be located the distance given in the relevant regional plan from surface water.

Comment: Surface water includes a stream, lake, tarn or the Coastal Marine area.

- ii) Distance from Ground Water

Except in gravels, scoria and fractured rock, the base of a soil soakage facility shall be located at least of 0.6 metres above maximum groundwater level or the distance given in the relevant regional plan, whichever is the greater.

Where located in gravels, scoria or fractured rock, the soil soakage facility shall be a soakage bed or trench constructed as a controlled discharge soil soakage facility.

Comment: Guidance on soil types is given in AS/NZS 1547: 2000 On-site domestic wastewater management.

2.7.4 Soil Categories

- i) The soil categories shall be those identified in AS/NZS 1547: 2000 On-site domestic wastewater management, as follows:

Table 2.2: Soil categories

Soil category	Soil texture
1	Gravels and sands
2	Sandy loams
3	Loams
4	Clay loams

2.7.5 Septic Tank

- i) The septic tank shall comply with AS/NZS 1546.1: 2008 Onsite domestic wastewater treatment units. Part 1: Septic tanks.

- ii) The septic tank shall be fitted with a proprietary effluent filter that meets the requirements of AS/NZS 1546.1: 2008
- iii) For huts with a sleeping capacity of 6 or less a septic tank may be omitted provided that:
 - the soakage pit is sited in soil category 1 or 2 soils, and
 - the soakage pit dimensions are those in the 7 to 12 bunk sleeping capacity category of table 2.4
- iv) The capacity of the septic tank (i.e. the volume below the outlet level) shall be selected from Table 2.3.

Table 2.3: Greywater Septic Tank Capacity

Sleeping Capacity	Average daily flow at maximum occupancy (litres)	Septic tank Effective Volume (litres)						
		Overnight visitors per year ⁽¹⁾						
		100	200	400	600	800	1000	2000
Up to 4	80	200	200	200	N/A	N/A	N/A	N/A
5 or 6	120	200	200	200	230	N/A	N/A	N/A
7 to 10	200	220	240	280	310	350	400	N/A
11 or 12	240	260	280	320	350	390	500	N/A
13 to 20	400	420	440	480	510	550	600	1,000

Notes

1. Most huts of these sizes will be visited on the weekend only, or over holiday periods. It is unlikely that overnight visitor numbers per year would exceed 50 times the hut sleeping capacity (e.g. for a 10 bunk hut it is unlikely that more than 500 people would use the hut each year. Visitor numbers greater than 100 times capacity (e.g. 1,000 per annum for a 10 bunk hut) indicate overcrowding, or a very different pattern of use requiring specific design.
2. 200 litres is a practical minimum size to accommodate the filter, to allow settlement to occur and to minimise the risk of filter clogging.

2.7.6 Soakage Pit

- i) Soakage pits may be suitable for:
 - Huts with 20 bunks or less in soil category 1
 - Huts with 12 bunks or less in soil category 2
 - Huts with 10 bunks or less in soil category 3.

Soakage pits shall not be used in soil category 4, 5 and 6 soils. Specialist advice shall be sought.

Comment: Guidance on soil types is given in AS/NZS 1547: 2000 On-site domestic wastewater management.

- ii) Soakage pits shall be sized in accordance with the dimensions given in Table 2.4.

Table 2.4: Dimensions of Soakage pit

Sleeping Capacity	Soakage Pit Dimensions (Diameter (mm) x height (mm)) For Soil Categories		
	Category 1	Category 2	Category 3
Up to 4	750 x 750	1,000 x 1,000	1,500 x 1,200
5 or 6	1,000 x 1,000	1,500 x 1,200	2,000 x 1,200
7 to 12	1,500 x 1,200	2,000 x 1,200	Not applicable
13 to 20	2,400 x 1,200	Not applicable	Not applicable

- iii) The soil covering a soakage pit shall be mounded so as to shed rainfall and surface water runoff from upslope of the soakage pit.

2.7.7 Soakage Bed

- i) Soakage beds or soakage trenches may be suitable for huts in soil categories 1, 2, 3 and 4. Soakage beds or soakage shall not be used in soil category 5 and 6 soils. Specialist advice shall be sought.
- ii) The minimum invert area of soil soakage beds or trenches shall be as given in Table 2.5.

Table 2.5: Dimensions of Soakage bed or trench

Sleeping Capacity	Beds or trenches area (m) For Soil Categories			
	Category 1	Category 2	Category 3	Category 4
Up to 4	2	3	5	15
5 or 6	3	5	8	24
7 to 12	7	10	16	48
13 to 20	11	16	27	80

2.8 Verification method

A design method for facilities for the storage, treatment and disposal of foul water, may be verified as satisfying the relevant performance criteria of NZBC G13 if the method complies with AS/NZS 1547: 2000.

2.9 Standard Solutions

Appendix F2 contains standard solutions for Grey water on-site systems.

As required for differing sleeping capacities, these drawings shall be altered to show the correct septic tank capacities in accordance with Table 2.3 and soakage pit capacities in accordance with Table 2.4.

Appendix F2 Greywater on-site systems Drawings

- Current Drawing Register
- Amendment Register
- Base drawings

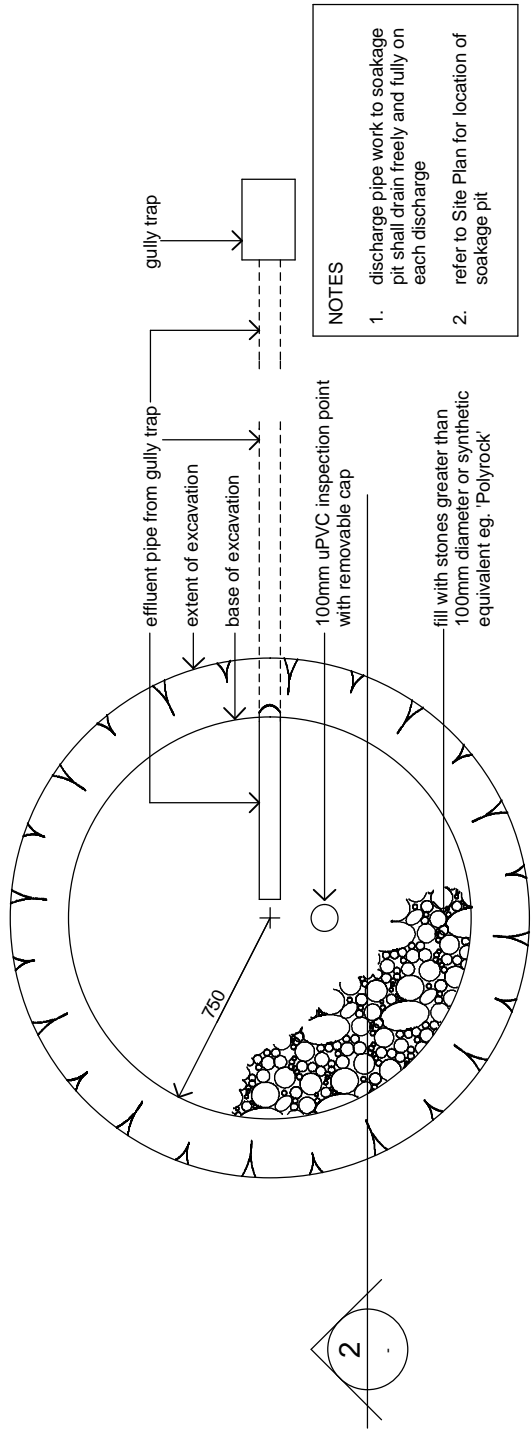
ALL DRAWINGS ARE A4 REDUCTIONS OF A3 ORIGINALS AND THEREFORE ARE NOT TO SCALE. DO NOT MEASURE OFF THESE DRAWINGS OR USE FOR CONSTRUCTION.

CURRENT DRAWING REGISTER

Sheet	Title	Version	Date issued
55	Soakage Pit	4.0	March 2009
56	Septic tank and Soakage Pit	4.0	March 2009

AMENDMENT REGISTER

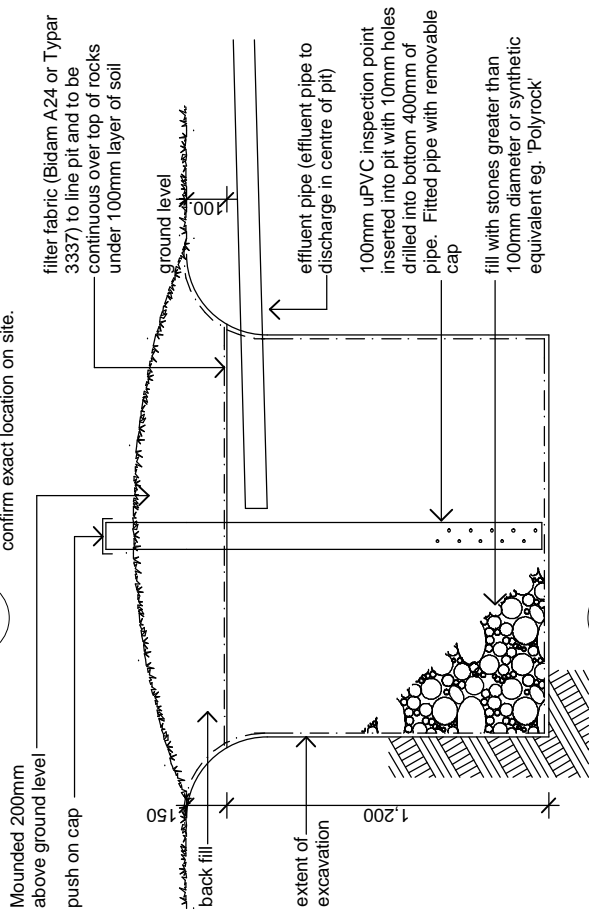
Amendment date	Amendment details (section, page number, block)	Version	Signature of copyholder and date



NOTES

1. discharge pipe work to soakage pit shall drain freely and fully on each discharge
2. refer to Site Plan for location of soakage pit

1 plan of soakage pit
1:20
confirm exact location on site.



2 section
1:20

REV NO	DESCRIPTION	DATE	DWN	CKD
4.0	First Issue	Mar 09	-	-
Drawing Issue and Amendments				
Val 0 Grey Water Appendix F2				

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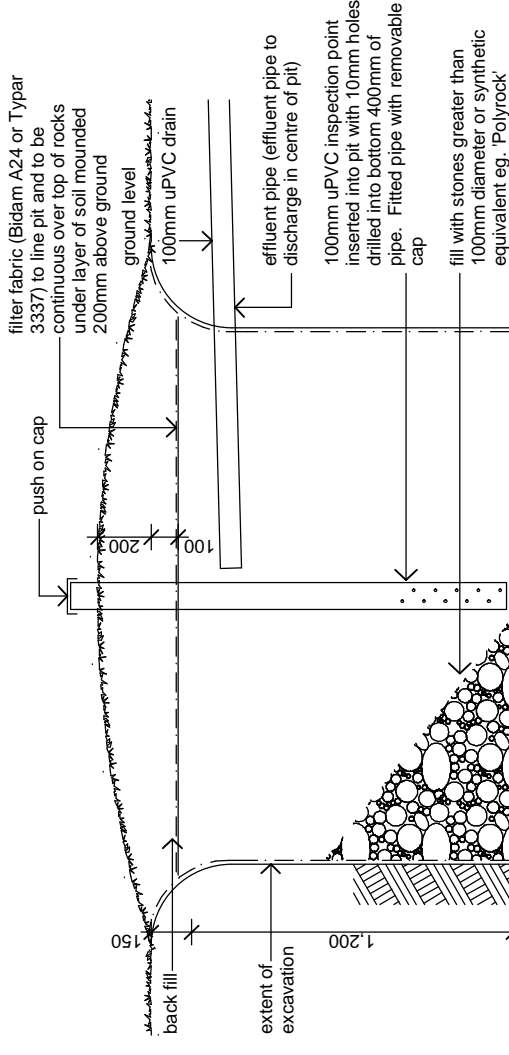
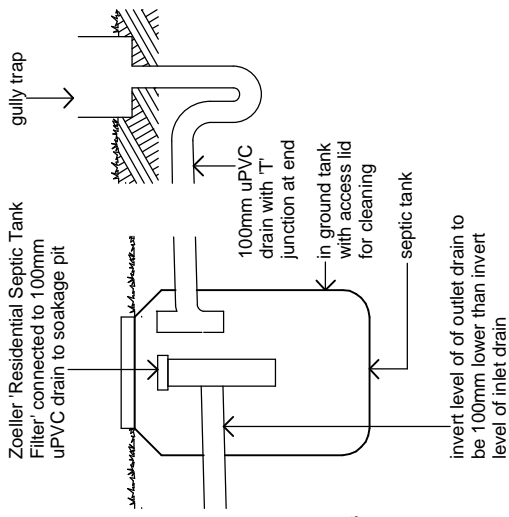
Contractor shall check all Dimensions on site prior to construction



PROJECT
HUT DESIGN MANUAL
GREY WATER

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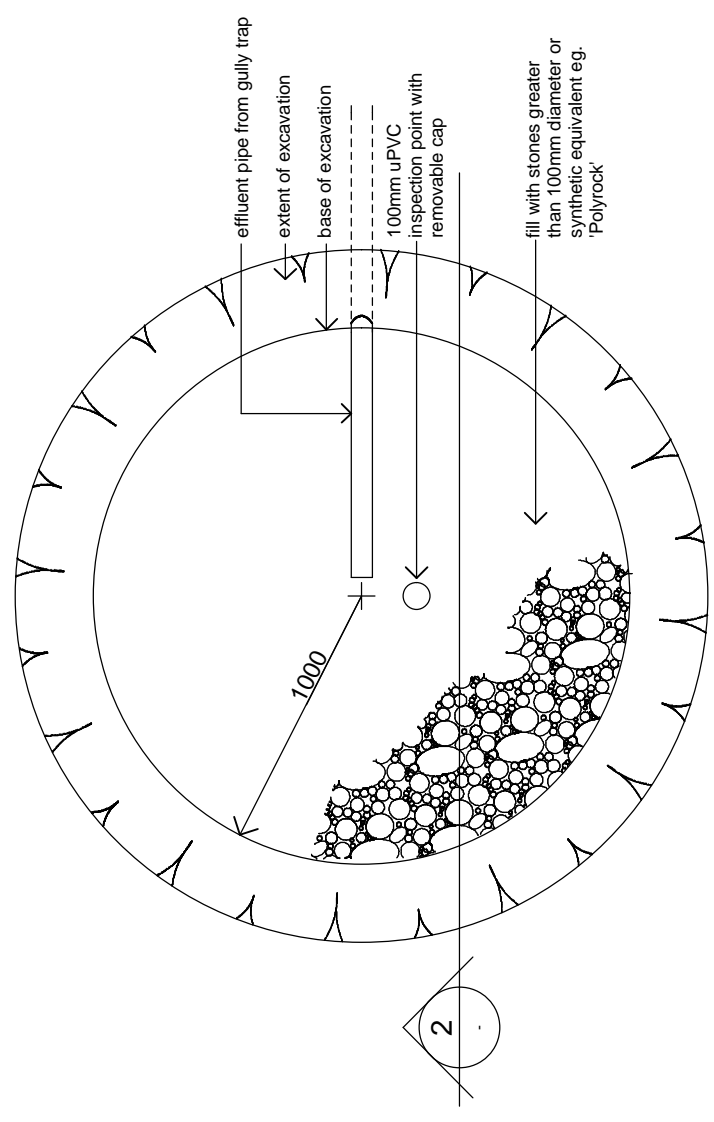
SHEET CONTENTS		SCALES
soakage pit		1:20
DESIGN	CHECKED	@ A3 SHEET SIZE
RP	GR	SHT No.
	RP	REV No.
DATE	March 2009	55



2 section 1:20

NOTES

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1 plan of soakage pit 1:20 confirm exact location on site.

4.0	First Issue	Mar 09	-
	REV NO	DESCRIPTION	DATE
		Drawing Issue and Amendments	DWN CKO
		Valo Grey Water Appendix F2	

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SHEET CONTENTS
scales
1:20
septic tank & soakage pit

DESIGN	DRAWN	CHECKED	PROJECT NO.	REV. NO.
RP	GR	RP	xyz	56
DATE	March 2009			