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Date 25/01/2018

Plumbcraft
Sean Stephens
5 Waimana Rd
Takanini 2244

REHAU Hydronic System detailed design - Heating
Project: 17-3690 WARMNZ - GJG SHOWHOME POKENO

Dear Sean,

We have pleasure in submitting our detailed design documents for your above mentioned project. This design and the associated data have been prepared according to the information, diagrams and/or drawings provided. Please check and confirm all parameters and results prior to using them.

By utilising our design service and the results you recognise the current REHAU Terms and Conditions of Sale, which are available on request or at www.rehau.com/LZB.

In case this design requires amendments, please send an email with all required changes to FHDesign.ANZ@rehau.com

Additional charges may apply for design changes or required corrections not caused by us.

We thank you for your interest in the REHAU Hydronic System detailed design and look forward to the application of our products.

Please do not hesitate to contact us if you require any further clarification or assistance.

Kind regards

REHAU Web Design New Zealand
REHAU Pty Ltd

Attachments: Performance overview (proposed final)
 Hydraulic Balancing Data for each manifold
 Bill Of Material (proposed final)
 Circuit layout as CAD drawing

REHAU HYDRONIC SYSTEM DESIGN NOTES

PROJECT NO.	17-3690
PROJECT NAME	WARMNZ - GJG SHOWHOME POKENO
INSTALLER	Plumbcraft
DATE	25/01/2018

These design notes shall provide guidance on obviously conflicting parameters. Please read them carefully.

	Parameter	Design Notes
Manifold Details	Flow Temperature Control Components	The Flow Temperature Mixer Unit requires a supply temperature from the heat source between 58°C and 70°C to be able to provide the required output.
Floor Structure	Insulation	As per the NZBC, the insulation requirements must be assessed according to Clause H1 and any other relevant standards.
Control Details	Zone Control	Further Control Components may be required for this application, check the Bill of Material and confirm the included control components suit your requirements.
Performance Details	Required Output	The target output (heat load/cooling load) reflects the information provided by the requesting party. REHAU has not verified if it covers the load requirements of the building or of particular areas of the building. We recommend to verify the load requirements by conducting a heat load / cooling load calculation.
Performance Details	Required Output	The target heat load as specified by the requesting party can't be achieved in some areas. Please verify the required heat load for these areas and if an additional heat source may be required. Refer to page "Performance Overview" for details.

REHAU HYDRONIC SYSTEM

MANIFOLD VALVE SETTINGS - HYDRAULIC BALANCING



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	Project N°:	17-3690					Project Name:	WARMNZ - GJG SHOWHOME POKENO			Installer:	Plumbcraft				
2	Manifold M1 - Ground Floor													Date	25/01/2018	
3	Circuit Fluid Properties				Circuit Pipe Details				Flow and Return Pipe			RESULTS - Manifold				
4	Heating Temperature	48.0	°C	Manifold Stainless HKV-D				Length	10 m		Number of circuits: 11					
5	Cooling Temperature	NA	°C	Pipe RAUTITAN pink 16				Flow/Ret pipe	RAUTITAN Pink 25		Total Length of circuits: 677 m					
6	Mean water temp	43.8	°C	Mixing Unit Details				Flow rate	1298 l/h		Total Flow: 1298 l/h					
7	% Ethylene Glycol	None	%					Type	External Flow Mixing Con		v	1.4 m/s		Pressure Loss @ Manifold: 18.8 kPa		
8	viscosity	0.0006	Pa.s	Supply t	48.0 °C		ΔPf/r	15.2 kPa		Total pressure including F/R 34.0 kPa						
9								%Fitting losses	20% (estimate)							
10	INPUT - Manifold							RESULTS - Floor Circuits								
11	<i>Note: ** pressure drop when valves fully open!</i>		Circuit length Σ	Flow		Velocity	Head Loss	Head Losses			Balancing					
12				Δp _{pipe}	Flow and Return Valves			Total Loss	Turn direction:							
13			v	v			Δp _{Flow/Return valves, full open}	Δp _{total} **		Closed => Open						
14	Circuit Name	No.	m	l/min	l/s	m/s	Pa/m	Pa	Pa	Pa	Pa	Kv	Turns			
15												m ³ /h				
16	Circuit	M1.1	46	1.7	0.028	0.268	117	5,396	716	6,113	13,400	0.28	1/4			
17	Circuit	M1.2	54	2.0	0.033	0.313	152	8,218	974	9,192	10,578	0.37	1/4			
18	Circuit	M1.3	55	2.0	0.033	0.316	155	8,470	996	9,466	10,326	0.37	1/4			
19	Circuit	M1.4	53	1.9	0.032	0.307	147	7,808	939	8,747	10,988	0.35	1/4			
20	Circuit	M1.5	26	1.4	0.023	0.216	80	2,099	464	2,563	16,698	0.20	1/4			
21	Circuit	M1.6	62	2.3	0.038	0.356	191	11,733	1,264	12,997	7,063	0.51	2/4			
22	Circuit	M1.7	71	2.6	0.043	0.409	243	17,131	1,666	18,796	1,666	1.20	2 2/4			
23	Circuit	M1.8	101	1.4	0.023	0.220	83	8,331	481	8,813	10,465	0.26	1/4			
24	Circuit	M1.9	109	1.5	0.025	0.237	94	10,237	560	10,797	8,559	0.31	1/4			
25	Circuit	M1.10	52	2.5	0.042	0.395	229	11,889	1,558	13,448	6,907	0.57	2/4			
26	Circuit	M1.11	50	2.4	0.040	0.377	211	10,444	1,418	11,862	8,352	0.50	2/4			
27	Circuit	M1.12														
28	Circuit	M1.13														
29	Circuit	M1.14														
30	Circuit	M1.15														
31	Circuit	M1.16														
32	Circuit	M1.17														
33	21.6															

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This design and the associated date have been prepared in accordance with the information provided by the requesting party.

The advice is based on experience and the most recent know but does not represent any obligation on our part.

REHAU HYDRONIC SYSTEM

BILL OF MATERIAL - PROPOSED FINAL *



V.7.9

PROJECT NO. 17-3690
 PROJECT NAME WARMNZ - GJG SHOWHOME POKENO
 INSTALLER Plumbcraft

Date 25/01/2018
 Department Construction

PROJECT OVERVIEW:

Project Type Residential
 System in-slab
 Pipe RAUTITAN pink 16
 Heat Source Heat pump
 Total output Heating 11.5 kW
 Cooling Source None
 Total output Cooling 0 kW
 Covered Floor Area 131.3 m²
 Number of Zones 7
 Number of manifolds 1
 Number of circuits 11
 Manifold type Stainless HKV-D
 Flow Temp. system External Flow Mixing Control

Further details see page "Performance Overview"

Category	Sub Category	Product Description	Availability	Article Number	Units	Est. Qty	Order Quantity
Floor Systems	RAUTITAN Pink	Pipe 16 x 2.2 mm - 200m coil	Standard	136042-200	m	677	800
Floor Systems	RAUTITAN Pink	Pipe 25 x 3.5 mm - 6m straight	Standard	136062-006	m	10	12
Floor Systems	Stainless Manifold	Stainless Steel Manifold 12-port	Standard	208121-003	ea	1	1
Floor Systems	Stainless Manifold	Ball valve set 1"	Standard	208122-001	ea	1	1
Controls	Zone Controls	Actuator 24V for polymer manifold / NEA control	Standard	240131 or 217916	ea	11	Optional
Controls	Zone Controls	Actuator 230V for polymer manifold / ADR-UFH control	Standard	240011 or 217915	ea	11	Optional
Accessories	Manifold	Manifold Union 16 x 2.0mm, 16 x 2.2 mm	Standard	266352-003	ea	22	22
Accessories	Conduit	Conduit for RAUTITAN Pipe 16 mm (yellow)	Standard	180252-050	m	66	100
Accessories	RAUTITAN PX Fittings	No. 1 Straight Coupler 16 mm	Standard	160011-001	ea	4	4
Accessories	RAUTITAN PX Fittings	Compression Sleeve 16 mm	Standard	160001-001	ea	8	8
Accessories	RAUTITAN Fittings	Polymer Profile Bend Bkt 90 Deg 16 mm	Standard	297891-001	ea	22	22

Further Hydronic Components that may be required*:

- Suitably sized energy source(s)
- Suitably sized supply and return pipe work from the energy source to the manifold(s)
- An external pump (check the internal energy source pump curve)
- Suitably sized expansion vessel
- Safety Valves and Isolating Valves
- Air Bleeding Valve
- Other

The above are only suggestions from REHAU and a proper design considering the whole hydraulic system is required to determine if the above material estimation will be sufficient to condition the space adequately.

Category	Sub Category	Product Description	Availability	Article Number	Units	Est. Qty	Order Quantity
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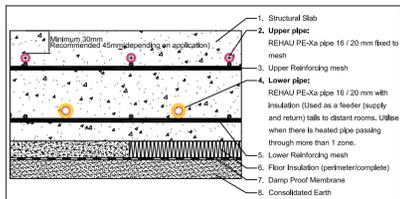
**This is an estimate only based on the information provided to us at the time of completing this proposal. The estimate assumes the building has sufficient thermal insulation to meet local building requirements, e.g. NZBC, BCA or BASIX, prior to the installation of the REHAU components. REHAU does not accept any liability for omissions of hydronic components, installation tools and accessories, or for any discrepancy in terms of quantity of materials (overestimate or underestimate) compared to the actual requirements. This material list terminates at the UFH manifold and may not include all components required to condition the space adequately. The amount and sizes for each article may change during the final design.*

Our verbal and written advice relating to technical applications and this quote is based on experience and is to the best of our knowledge correct but is given without obligation.

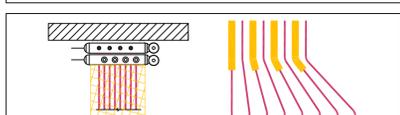
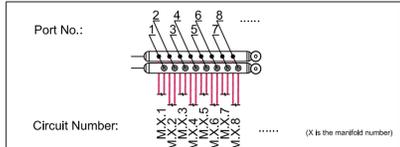
LAYING INSTRUCTIONS

Regardless of the graph indicated in this document, the minimum radius of curvature of the piping shall not be less than 5 x diameter.

Ø 16 mm	min. 80 mm
Ø 20 mm	min. 100 mm
Ø 25 mm	min. 125 mm

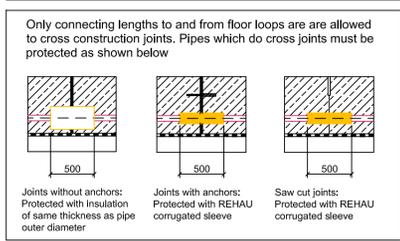
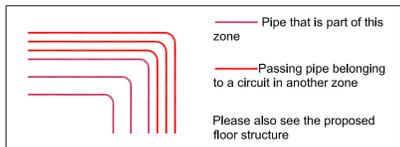


Typical Floor Structure: In-Slab
(general example only - not intended to satisfy the installation requirements for any particular project)



In installation areas with dense pipe work, we recommend to insulate part of the pipe work with corrugated conduit until the pipes reach the design pipe spacing.

Note: Depending on the structural load a minimum distance between the pipes needs to be considered, refer to a structural engineer for further advice.



1. PIPE LAYING INSTRUCTIONS

- Check that the passages indicated in the table are open, i.e. free from obstacles or other obstructions.
- Check that the thickness of the available floor conforms to the drawing.
- In the areas near the manifolds, where the circuits' delivery and return pipes are concentrated, it is recommended to insulate the pipes alternating, so as to prevent any excessive heat emission, and subsequently any uneven floor temperature.
- The expansion joints must be installed in the positions and according to the instructions specified. For screed / topping slab applications a single bay is not recommended to exceed either 40 m² or a maximum side length of 8m.

2. PRESSURE TESTING

Once the plant piping has been laid, it is necessary to proceed with the hydraulic testing as follows.

PRESSURE TEST WITH WATER

- Close ball valves at circuit and visually check all connections
- Fill and flush all heating circuits individually one after another and degaerate system
- Apply test pressure: minimum 4 bar (400kPa), maximum 6 bar (600 kPa)
- Reapply pressure after 2 hours, as the pressure may drop due to expansion of the pipe
- Test time 3 hours. The pressure test has been passed if water does not exit from any joint of the pipeline and the test pressure has not dropped more than 0.1 bar (10kPa) per hour.

Warning:
A pressure drop may occur based on any temperature variations.
The pressure is likely to change by approx. 1 bar in case of differences of +/- 10°C.

PRESSURE TEST WITH AIR

- Contact REHAU for further advice on pressure testing with air.

On completion of the pressure test the pipe circuits can be covered with concrete/screed. Keep the system under operating pressure during pouring of the screed to detect any leaks straight away.

Warning:
Don't leave any water in the system when there is a risk of sub-zero conditions!

3. INITIAL WARM-UP

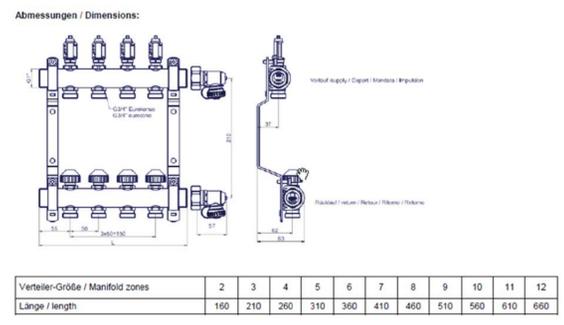
- In case of cement based screeds the initial warm-up must only be carried out after 21 days after laying (or as per manufacturer advice) to ensure the screed is correctly cured.
- In case of anhydride screeds the warm up can be carried out after 7 days
- The initial warm-up comprises the following two stages:
Stage 1: operating the system for at least 3 days with a water temperature of 20°C to 25°C
Stage 2: increasing the water temperature to the max design temperature and maintaining it for a minimum of 4 days
- It is recommended to document and record this test

NOTE: The initial warm-up must NEVER be used to accelerate the drying / curing of the concrete / screed mix.

4. PLANT START-UP

- Let the air out of the plant, and carefully fill circuit by circuit.
- Install a drain pipe on the hose adapter and, after closing all circuits, fill a single circuit at a time, by opening the related lockshield valve.
- Repeat the same operation for all the other circuits.
- Set the regulation curve of the heating/cooling control station.
- Perform the hydraulic balancing of the circuits.
- Start-up and operate the plant.

Manifold No.: M.1		Circuits pipe:		Total Flow Rate:	Pressure Loss:
Manifold type:		Stainless	RAUTITAN pink 16x2.2	21.6 L/min	18.8 KPa
Circuit No.:	Pipe Spacing: (mm)	Total Length: (m)	Flow Rate: (L/min)	Turns open:	
M.1.1	200 mm	46	1.7	1/4	
M.1.2	200 mm	54	2.0	1/4	
M.1.3	200 mm	55	2.0	1/4	
M.1.4	200 mm	53	1.9	1/4	
M.1.5	200 mm	26	1.4	1/4	
M.1.6	200 mm	62	2.3	1/2	
M.1.7	200 mm	71	2.6	2-1/2	
M.1.8	200 mm	101	1.4	1/4	
M.1.9	200 mm	109	1.5	1/4	
M.1.10	200 mm	52	2.5	1/2	
M.1.11	200 mm	50	2.4	1/2	

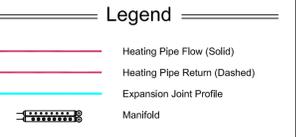
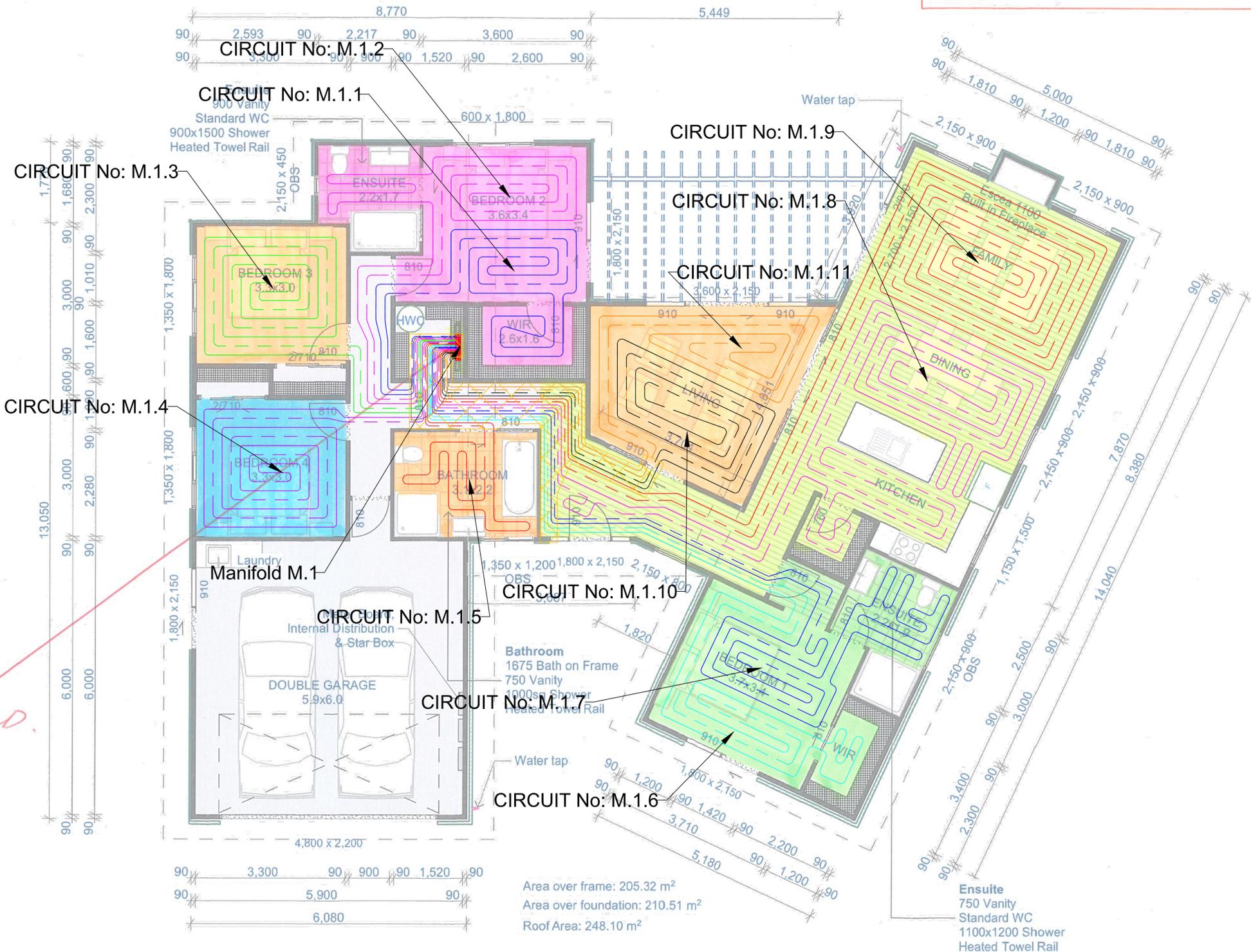


NOTE

IMPORTANT

This technical information is provided only for general quotation purposes and is based in part on information you provided. No representations, warranties, or guarantees are made regarding the suitability of REHAU technical information to meet code requirements for a particular project, nor regarding the accuracy of the costing of any project based upon this information.

This technical information is not intended to be used as final drawings or specifications and is provided only as an aid in architect's/engineer/installer's development of the final specification and is not intended as a substitute for sound architectural/engineering/installation judgment. The architect/engineer/installer shall be responsible to convert this technical information into a final specification that meets the functional and aesthetic needs of its client, as well as complying with all applicable codes and local climate conditions. Unless otherwise specified in this agreement, the standard REHAU Terms and Conditions of Sale shall apply and are available on request or at www.rehau.com.au. © 2016 REHAU



PROJECT TITLE

WARMNZ - GJG SHOWHOME POKENO

DRAWING TITLE

UFH CIRCUIT LAYOUT

No.	DESCRIPTION	DATE
A	First Issue	25/01/18

ISSUES & REVISIONS	
DRAWN BY D.P	SCALE A1 1:50 A3 1:100
CHECKED BY D.P	SHEET NO. P1
APPROVED BY D.P	
DATE 25/01/18	

DRAWING No: **RDC-ANZ-18-3690**