Department Construction
Name REHAU Web Design New Zealand
Phone 9272 2264
Email FHDesign.ANZ@rehau.com
Date 24/04/2017

WARMNZ
Todd Bowmast

REHAU Hydronic System detailed design - Heating

Project: 17-109 Dad's Pie Freezer - Refurbishment

Dear Todd,

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

V.7.8

PROJECT NO.	17-109
PROJECT NAME	Dad's Pie Freezer - Refurbishment
INSTALLER	WARMNZ
DATE	24/04/2017

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

	Parameter	Design Notes
System Details	Heat Source	Confirm if the supply temperature of 30ºC for the floor circuits in heating mode suits to your energy source. Refer to page 'Performance Overview'.
System Details	Pipe Diameter	Pipe size 20mm chosen due to the design parameters, which have taken into consideration the flow and pressure loss of the system.
System Details	Anti Freeze	The calculation is based on a ratio of 20% anti-freeze in water. It has been assumed the anti-freeze will be Ethylene Glycol with corrosion inhibitor.
System Details	Anti Freeze	When selecting anti-freeze make sure it includes corrosion inhibitors and is suitable for all metal materials used in the installation, ie. brass, steel etc. Anti-freeze with corrosion inhibitors must be maintained regularly in accordance with manufacturer's instruction.
Manifold Details	Flow Temperature Control Components	Assure the required design supply temperature and flow rate can be provided directly from the heat source as no Flow Temperature Mixer Unit was specified.
Manifold Details	Flow Temperature Control Components	A Flow Temperature Mixer Unit is recommended. Please advise if the REHAU Mixer Unit is required as this has not been included in the Bill of Materials.
Manifold Details	Flow Temperature Control Components	Further Control Components may be required for this application, check the Bill of Material and confirm the included control components suit your requirements.
Floor Structure	Floor Structure	The floor structure has been assumed since there was insufficient information provided. Refer to section "Floor Structure" on page "Performance Overview" for details.
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.

REHAU HYDRONIC SYSTEM

PERFORMANCE OVERVIEW - PROPOSED FINAL*

REHAU Unlimited Polymer Solutions

V.7.8

PROJECT NO.	17-109
PROJECT NAME	Dad's Pie Freezer - Refurbishment
INSTALLER	WARMNZ
DATE	24/04/2017
DESIGN BY	REHAU Design Team

PRELIMINARY DESIGN - NOT TO BE APPLIED WITHOUT CONFIRMATION FROM REHAU. REFER TO ADDITIONAL PLANNING NOTES IN EMAIL.

N/A

Floor layer:	L (mm)
N/A	

N/A

Floor layer	L (mm)
N/A	

Freezer (R=2.78 m².K/W)

Floor layer	L (mm)
Wear slab	130
Insulation 75mm	65
------ Pipe center ------	-----
Screed	10
Slab	150
Sand	2000

HYDRAULICS

Pipe type	RAUTHERM S 20	
Heating Flow temp	30	°C
Cooling Flow temp	NA	°C

PERFORMANCE SUMMARY

No. of zones	8	
No. of circuits	19	
Conditioned Area	539.8	m²

Room Parameters								Heating Performance									Cooling performance									
Room(s)	Zone	Area	Room Thermostat	Floor System	Floor type	Floor Covering	Pipe spacing	Temp above/ inside	Temp below/ outside	ΔT flow/ return	Area flow rate	Floor Surface Temp	Target Heat Output	Heat output up	Heat output down	Percent Covered	Total Slab Output	Temp above/ inside	Temp below/ outside	ΔT flow/ return	Area flow rate	Floor Surface Temp	Target Cooling Output	Cooling output up	Cooling output down	Percent Covered	Total Slab Output
		m²					mm	°C	°C	°C	L/min	°C	W/m²	W/m²	W/m²	%	W	°C	°C	°C	L/min	°C	W/m²	W/m²	W/m²	%	W
Freezer	1	427.3	None	Freezer	Slab on ground	None	300	-27.0		6.0	50.9	-25	23	26	22	111	20190										
Chiller	2	112.5	None	Freezer	Slab on ground	None	300	-27.0		6.0	13.4	-25	23	26	22	111	5316										
	2	539.8															25507										

** This design and the associated data have been prepared in accordance with the information provided by the requesting party. Please check if the parameter suits to your project. For minimum insulation requirements for the floor refer to the Building Code of Australia / New Zealand Building Code. When considering to use Tacker sheet, please check that the thermal and physical properties (eg. compressive stress) suit to your project. The advice is based on experience and the most recent know how but does not represent any obligation on our part.*

Explanatory Notes:

PIPE SPACING	Proposed pipe laying distance. Laying the pipes in a different spacing will influence the performance of the system.
TEMPERATURE ABOVE/INSIDE	Target temperature for the conditioned area above the slab (typically "Room Temperature").
TEMPERATURE BELOW/OUTSIDE	Temperature of the area below the slab (ie. ground temperature or room below).
ΔT FLOW/RETURN	Temperature difference between supply and return for the conditioned area.
NO. OF CIRCUITS	Number of circuits required to cover the conditioned area.
FLOOR SURFACE TEMPERATURE	Surface temperature of the finished floor.
TARGET HEAT/COOLING OUTPUT	Target Heat/Cooling output as per the information provided by the requesting party.
HEAT/COOLING OUTPUT UP	Heating/Cooling performance upwards in Watts per square meter.
HEAT/COOLING OUTPUT DOWN	Heating/Cooling performance downwards in Watts per square meter (in slab-on-ground constructions = "Downward losses")
PERCENT COVERED	Coverage of Target Heating/Cooling output in %
TOTAL SLAB OUTPUT	Output (upwards + downwards) of the conditioned slab in Watts.

REHAU HYDRONIC SYSTEM

MANIFOLD VALVE SETTINGS - HYDRAULIC BALANCING

Project Nº: 17-109 | Project Name: Dad's Pie Freezer - Refurbishment | Installer: WARMNZ

Manifold M1 - Ground Floor | Date 24/04/2017 | V.7.8

Circuit Fluid Properties			**Circuit Pipe Details**		**Flow and Return Pipe**			**R E S U L T S - Manifold**		
Heating Temperature	30.0	ºC	Manifold	Stainless HKV-D	Length	38	m	Number of circuits:	5	
Cooling Temperature	NA	ºC	Pipe	RAUTHERM S 20	Flow/Ret pipe	RAUTITAN Pink 40		Total Length of circuits:	606	m
Mean water temp	27.0	ºC	**Mixing Unit Details**		Flow rate	1299	l/h	Total Flow:	1299	l/h
% Ethylene Glycol	20.0	%	Type	None	v	0.5	m/s	Pressure Loss @ Manifold:	26.9	kPa
viscosity	0.0015	Pa.s	Supply t	30.0 ºC	ΔPf/r	7.4	kPa	Total pressure including F/R	34.2	kPa
					%Fitting losses	20%	(estimate)			

I N P U T - Manifold | **R E S U L T S - Floor Circuits**

Note: ** *pressure drop when valves fully open!*		Circuit length	Flow				Head Losses			Balancing		
							Pipe	Flow and Retun Valves	Total Loss	Turn direction:		
		Σ	v	v	Velocity	Head Loss	Δp_{pipe}	$\Delta p_{Flow/Return\ valves,\ full\ open}$	Δp_{total}**	**Closed => Open**		
Circuit Name	No.	m	l/min	l/s	m/s	Pa/m	Pa	Pa	Pa	Pa	Kv	Turns
											m³/h	
Circuit	M1.1	124	4.4	0.074	0.369	175	21,768	5,082	26,850	5,082	1.18	2 1/4
Circuit	M1.2	124	4.4	0.074	0.367	173	21,436	5,025	26,461	5,414	1.14	2
Circuit	M1.3	121	4.3	0.072	0.360	168	20,369	4,840	25,209	6,482	1.02	1 2/4
Circuit	M1.4	118	4.2	0.070	0.351	160	18,984	4,596	23,580	7,866	0.90	1 1/4
Circuit	M1.5	118	4.2	0.070	0.349	159	18,766	4,557	23,323	8,084	0.89	1
Circuit	M1.6											
Circuit	M1.7											
Circuit	M1.8											
Circuit	M1.9											
Circuit	M1.10											
Circuit	M1.11											
Circuit	M1.12											
Circuit	M1.13											
Circuit	M1.14											
Circuit	M1.15											
Circuit	M1.16											
Circuit	M1.17											

21.7

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This design and the associated date have been prepared in accordance with the information proveded be 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

MANIFOLD VALVE SETTINGS - HYDRAULIC BALANCING

REHAU
Unlimited Polymer Solutions

1	Project Nº:	17-109					Project Name:	Dad's Pie Freezer - Refurbishment			Installer:	WARMNZ			
2	**Manifold M2 -**	**Ground Floor**												Date	24/04/2017
3	**Circuit Fluid Properties**				**Circuit Pipe Details**			**Flow and Return Pipe**			**R E S U L T S - Manifold**				V.7.8
4	Heating Temperature	30.0	ºC		Manifold	Stainless HKV-D		Length	36	m	Number of circuits:	4			
5	Cooling Temperature	NA	ºC		Pipe	RAUTHERM S 20		Flow/Ret pipe	RAUTITAN Pink 40		Total Length of circuits:	476	m		
6	Mean water temp	27.0	ºC		**Mixing Unit Details**			Flow rate	1021	l/h	Total Flow:	1021	l/h		
7	% Ethylene Glycol	20.0	%		Type	None		v	0.4	m/s	Pressure Loss @ Manifold:	25.2	kPa		
8	viscosity	0.0015	Pa.s		Supply t	30.0	ºC	ΔPf/r	4.6	kPa	Total pressure including F/L	29.8	kPa		
9								%Fitting losses	20%	(estimate)					
10	**I N P U T - Manifold**							**R E S U L T S - Floor Circuits**							
11			Circuit	Flow				Head Losses				Balancing			
12	*Note:* ** *pressure drop when valves*		length					Pipe	Flow and Retun Valves	Total Loss		Turn direction:			
13	*fully open!*		Σ	v	v	Velocity	Head Loss	Δp_{pipe}	$\Delta p_{Flow/Return\ valves,\ full\ open}$	Δp_{total}**		**Closed => Open**			
14	Circuit Name	No.	m	l/min	l/s	m/s	Pa/m	Pa	Pa	Pa	Pa	Kv	Turns		
15												m³/h			
16	Circuit	M2.1	121	4.3	0.072	0.360	168	20,369	4,840	25,209	4,840	1.18	2 1/4		
17	Circuit	M2.2	121	4.3	0.072	0.357	166	20,005	4,776	24,782	5,203	1.13	2		
18	Circuit	M2.3	117	4.2	0.070	0.348	158	18,550	4,518	23,069	6,658	0.98	1 1/4		
19	Circuit	M2.4	117	4.2	0.070	0.346	157	18,293	4,472	22,766	6,915	0.95	1 1/4		
20	Circuit	M2.5													
21	Circuit	M2.6													
22	Circuit	M2.7													
23	Circuit	M2.8													
24	Circuit	M2.9													
25	Circuit	M2.10													
26	Circuit	M2.11													
27	Circuit	M2.12													
28	Circuit	M2.13													
29	Circuit	M2.14													
30	Circuit	M2.15													
31	Circuit	M2.16													
32	Circuit	M2.17													
33															
				17.0									CT ANZ / syd536		

This design and the associated data have been prepared in accordance with the information provided by the requesting party.
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REHAU HYDRONIC SYSTEM

MANIFOLD VALVE SETTINGS - HYDRAULIC BALANCING

REHAU
Unlimited Polymer Solutions

1	Project Nº:	17-109					Project Name:	Dad's Pie Freezer - Refurbishment			Installer:	WARMNZ			
2	**Manifold M3 -**	**Ground Floor**												Date	24/04/2017
3	**Circuit Fluid Properties**			**Circuit Pipe Details**			**Flow and Return Pipe**				**R E S U L T S - Manifold**				V.7.8
4	Heating Temperature	30.0	ºC	Manifold	Stainless HKV-D		Length	38	m		Number of circuits:	10			
5	Cooling Temperature	NA	ºC	Pipe	RAUTHERM S 20		Flow/Ret pipe	RAUTITAN Pink 40			Total Length of circuits:	859	m		
6	Mean water temp	27.0	ºC	**Mixing Unit Details**			Flow rate	1842	l/h		Total Flow:	1842	l/h		
7	% Ethylene Glycol	20.0	%	Type	None		v	0.8	m/s		Pressure Loss @ Manifold:	11.5	kPa		
8	viscosity	0.0015	Pa.s	Supply t	30.0	ºC	ΔPf/r	13.5	kPa		Total pressure including F/L	25.0	kPa		
9							%Fitting losses	20%	(estimate)						
10	**I N P U T - Manifold**						**R E S U L T S - Floor Circuits**								
11			Circuit length	Flow				Head Losses				Balancing			
12	*Note:* ** *pressure drop when valves*						Pipe	Flow and Retun Valves		Total Loss		Turn direction:			
13	*fully open!*		Σ	v	v	Velocity	Head Loss	Δp_{pipe}	$\Delta p_{Flow/Return\ valves,\ full\ open}$		Δp_{total}**	**Closed => Open**			
14	Circuit Name	No.	m	l/min	l/s	m/s	Pa/m	Pa	Pa		Pa	Pa	Kv	Turns	
15													m³/h		
16	Circuit	M3.1	89	3.2	0.053	0.265	99	8,838	2,619		11,457	2,619	1.18	2 1/4	
17	Circuit	M3.2	89	3.2	0.053	0.262	97	8,625	2,572		11,197	2,832	1.13	2	
18	Circuit	M3.3	86	3.1	0.051	0.255	93	8,030	2,440		10,470	3,427	1.00	1 2/4	
19	Circuit	M3.4	83	3.0	0.050	0.246	87	7,270	2,268		9,537	4,187	0.87	1	
20	Circuit	M3.5	82	2.9	0.049	0.244	86	7,081	2,224		9,306	4,376	0.84	1	
21	Circuit	M3.6	82	2.9	0.049	0.244	86	7,105	2,230		9,334	4,352	0.85	1	
22	Circuit	M3.7	83	3.0	0.049	0.246	87	7,246	2,262		9,508	4,211	0.87	1	
23	Circuit	M3.8	86	3.1	0.051	0.255	93	8,030	2,440		10,470	3,427	1.00	1 2/4	
24	Circuit	M3.9	88	3.2	0.053	0.262	97	8,598	2,566		11,165	2,859	1.12	2	
25	Circuit	M3.10	89	3.2	0.053	0.264	99	8,811	2,613		11,424	2,646	1.18	2 1/4	
26	Circuit	M3.11													
27	Circuit	M3.12													
28	Circuit	M3.13													
29	Circuit	M3.14													
30	Circuit	M3.15													
31	Circuit	M3.16													
32	Circuit	M3.17													
33				30.7											CT ANZ / syd536

This design and the associated data have been prepared in accordance with the information provided by the requesting party.
The advice is based on experience and the most recent know how but does not represent any obligation on our part.

REHAU HYDRONIC SYSTEM

BILL OF MATERIAL - PROPOSED FINAL*

V.7.8

PROJECT NO.	17-109	**Date**	24/04/2017
PROJECT NAME	Dad's Pie Freezer - Refurbishment	**Department**	Construction
INSTALLER	WARMNZ		

PROJECT OVERVIEW:

Project Type	Commercial
System	in-slab
Pipe	RAUTHERM S 20
Heat Source	tbd
Total output Heating	25.5 kW
Cooling Source	None
Total output Cooling	0 kW
Covered Floor Area	539.768 m²
Number of Zones	2
Number of manifolds	3
Number of circuits	19
Manifold type	Stainless HKV-D
Flow Temp. system	None

Further details see page "Performance Overview"

Category	Sub Category	Product Description	Availability	Article Number	Units	Est. Qty	Order Quantity
Floor Systems	RAUTITAN Pink	Pipe 40 x 5.5 mm - 6m straight	Standard	136082-006	m	112	120
Floor Systems	RAUTHERM S	Pipe 20 x 2.0 mm - 400m coil	Standard	139800-400	m	1940	2000
Floor Systems	Stainless Manifold	Stainless Steel Manifold 4-port	Standard	208041-003	ea	1	1
Floor Systems	Stainless Manifold	Stainless Steel Manifold 5-port	Standard	208051-003	ea	1	1
Floor Systems	Stainless Manifold	Stainless Steel Manifold 10-port	Standard	208101-003	ea	1	1
Floor Systems	Stainless Manifold	Ball valve set 1"	Standard	208122-001	ea	3	3
Accessories	Manifold	Manifold Union for RAUTHERM S 20 x 2.0 mm	Standard	250617-001	ea	38	38
Accessories	Conduit	Conduit for RAUTITAN Pipe 20 mm (yellow)	Standard	180262-050	m	76	100
Accessories	RAUTITAN Fittings	Polymer Profile Bend Bkt 90 Deg 20 mm	Standard	297892-001	ea	38	38
Accessories	RAUTHERM S Fittings	No. 1 Straight Coupler 20 x 2.0 mm	Standard	250317-002	ea	5	5
Accessories	RAUTHERM S Fittings	Compression Sleeve 20 x 2.0 mm	Standard	250307-002	ea	10	10

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.

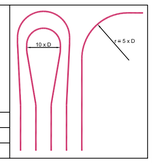
Category	Sub Category	Product Description	Availability	Article Number	Units	Est. Qty	Order Quantity

**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.*

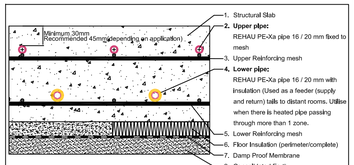
Our verbal and written advice relating to technical applications and this quote is based on experience and is to the best of our knowledge correct but is given without obligation.

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.



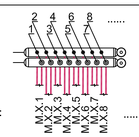
Ø 16 mm	min. 80 mm
Ø 20 mm	min. 100 mm
Ø 25 mm	min. 125 mm



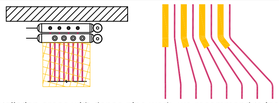
Typical Floor Structure: In-Slab

(general example only - not intended to satisfy the installation requirements for any particular project)

Port No.: 2 4 6 8 ..... / 1 3 5 7

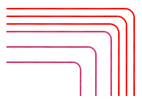


Circuit Number: M.X.1 M.X.2 M.X.3 M.X.4 M.X.5 M.X.6 M.X.7 M.X.8 ..... (X is the manifold number)



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.



Pipe that is part of this zone

Passing pipe belonging to a circuit in another zone

Please also see the proposed floor structure

Only connecting lengths to and from floor loops are are allowed to cross construction joints. Pipes which do cross joints must be protected as shown below

Joints without anchors: Protected with Insulation of same thickness as pipe outer diameter

Joints with anchors: Protected with REHAU corrugated sleeve

Saw cut joints: Protected with REHAU corrugated sleeve

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 deaerate 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 point 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.

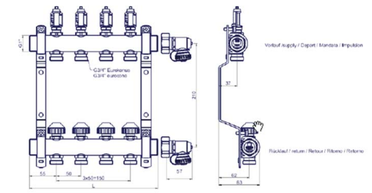
V-A1_24

Manifold No.: M.1				
Manifold type:	Circuits pipe:		Total Flow Rate:	Pressure Loss:
Stainless	RAUTHERM S 20x2.0		21.7 L/min	26.9KPa
Circuit No.:	Pipe Spacing: (mm)	Total Length: (m)	Flow Rate: (L/min)	Turns open:
M.1.1	300 mm	124	4.4	2-1/4
M.1.2	300 mm	124	4.4	2
M.1.3	300 mm	121	4.3	1-1/2
M.1.4	300 mm	118	4.2	1-1/4
M.1.5	300 mm	118	4.2	1

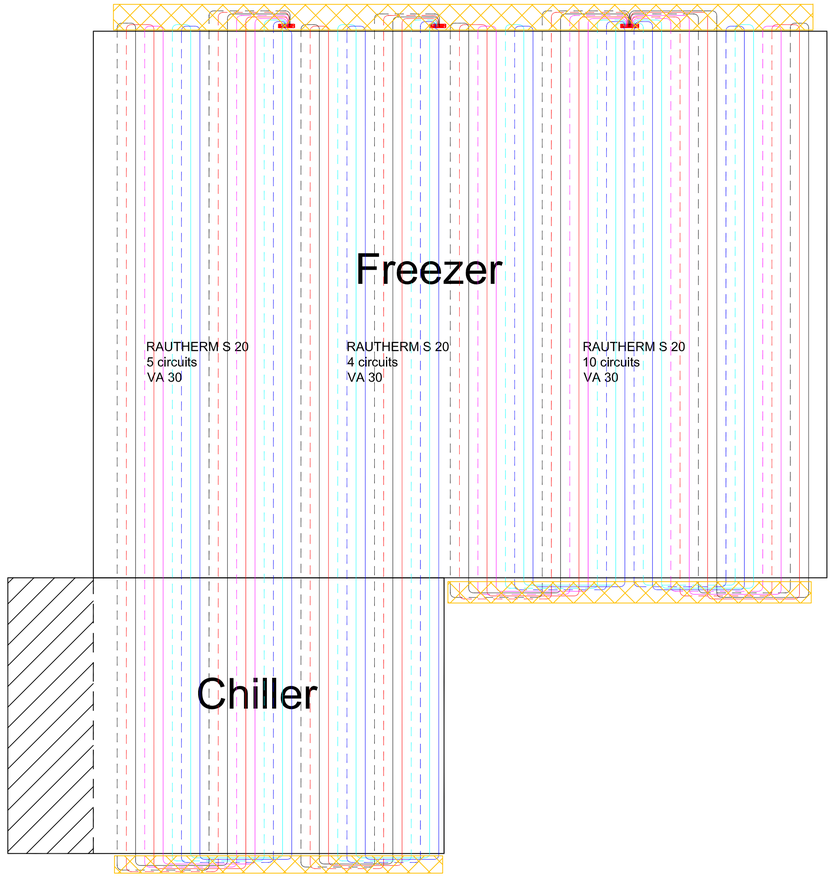
Manifold No.: M.2				
Manifold type:	Circuits pipe:		Total Flow Rate:	Pressure Loss:
Stainless	RAUTHERM S 20x2.0		17.0 L/min	25.2 KPa
Circuit No.:	Pipe Spacing: (mm)	Total Length: (m)	Flow Rate: (L/min)	Turns open:
M.2.1	300 mm	121	4.3	2-1/4
M.2.2	300 mm	121	4.3	2
M.2.3	300 mm	117	4.2	1-1/4
M.2.4	300 mm	117	4.2	1-1/4

Manifold No.: M.3				
Manifold type:	Circuits pipe:		Total Flow Rate:	Pressure Loss:
Stainless	RAUTHERM S 20x2.0		30.7 L/min	11.5 KPa
Circuit No.:	Pipe Spacing: (mm)	Total Length: (m)	Flow Rate: (L/min)	Turns open:
M.3.1	300 mm	89	3.2	2-1/4
M.3.2	300 mm	89	3.2	2
M.3.3	300 mm	86	3.1	1-1/2
M.3.4	300 mm	83	3.0	1
M.3.5	300 mm	82	2.9	1
M.3.6	300 mm	82	2.9	1
M.3.7	300 mm	83	3.0	1
M.3.8	300 mm	86	3.1	1-1/2
M.3.9	300 mm	88	3.2	2
M.3.10	300 mm	89	3.2	2-1/4

Abmessungen / Dimensions:



Verteiler-Größe / Manifold zones	2	3	4	5	6	7	8	9	10	11	12
Länge / length	160	210	260	310	360	410	460	510	560	610	660



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NOTE

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Legend

- Heating Pipe Flow (Solid)
- Heating Pipe Return (Dashed)
- Expansion Joint Profile
- Manifold

PROJECT TITLE

Dad's Pie Freezer - Refurbishment

DRAWING TITLE

UFH CIRCUIT LAYOUT

No.	DESCRIPTION	DATE
A	First Issue	24/04/17

ISSUES & REVISIONS

DRAWN BY: D.P
CHECKED BY: C.S
APPROVED BY: C.S
DATE: 24/04/17

SCALE: A1 1:50 A3 1:100

SHEET NO.: P1

DRAWING No

RDC-ANZ-17-109