

Department Construction
Name REHAU Web Design New Zealand
Phone 9272 2264
Email FHDesign.ANZ@rehau.com
Date 19/03/2019

Plumbcraft
Todd Bowmast
5 Waimana Rd
Takanini 2244

REHAU Hydronic System detailed design - Heating
Project: 19-101 46-48 Cryers Road

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

PROJECT NO.	19-101
PROJECT NAME	46-48 Cryers Road
INSTALLER	Plumbcraft
DATE	19/03/2019

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

	Parameter	Design Notes
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 40% 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	The Flow Temperature Mixer Unit requires a supply temperature from the heat source between 33°C and 70°C to be able to provide the required output.
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.
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

MANIFOLD VALVE SETTINGS - HYDRAULIC BALANCING



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	Project N°:	19-101					Project Name:	46-48 Cryers Road				Installer:	Plumbcraft			
2	Manifold M1 - Ground Floor													Date	19/03/2019	
3	Circuit Fluid Properties				Circuit Pipe Details				Flow and Return Pipe				RESULTS - Manifold			
4	Heating Temperature	23.0	°C	Manifold Stainless HKV-D				Length	30 m			Number of circuits: 4				
5	Cooling Temperature	NA	°C	Pipe RAUTHERM S 20				Flow/Ret pipe	RAUTITAN Pink 32			Total Length of circuits: 458 m				
6	Mean water temp	20.5	°C	Mixing Unit Details				Flow rate	701 l/h			Total Flow: 701 l/h				
7	% Ethylene Glycol	40.0	%					Type	External Flow Mixing Con			v	0.5 m/s			Pressure Loss @ Manifold: 15.5 kPa
8	viscosity	0.0031	Pa.s	Supply t	23.0 °C			ΔPfr	7.2 kPa			Total pressure including F/R: 22.7 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				ΔPpipe	Flow and Return Valves			Total Loss	Turn direction: Closed => Open							
13				v	v			ΔPFlow/Return valves, full open	ΔPtotal**							
14	Circuit Name	No.	m	l/min	l/s	m/s	Pa/m	Pa	Pa	Pa	Pa	Kv	Turns			
15												m³/h				
16	Circuit	M1.1	117	3.0	0.050	0.247	112	13,127	2,363	15,490	2,363	1.16	2 1/4			
17	Circuit	M1.2	114	2.9	0.048	0.241	107	12,237	2,244	14,481	3,254	0.97	1 1/4			
18	Circuit	M1.3	113	2.9	0.048	0.239	106	11,949	2,205	14,154	3,542	0.92	1 1/4			
19	Circuit	M1.4	114	2.9	0.048	0.241	107	12,237	2,244	14,481	3,254	0.97	1 1/4			
20	Circuit	M1.5														
21	Circuit	M1.6														
22	Circuit	M1.7														
23	Circuit	M1.8														
24	Circuit	M1.9														
25	Circuit	M1.10														
26	Circuit	M1.11														
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	11.7													CT ANZ / syd536		

This design and the associated date 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



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	Project N°:	19-101					Project Name:	46-48 Cryers Road				Installer:	Plumbcraft			
2	Manifold M2 - Ground Floor													Date	19/03/2019	
3	Circuit Fluid Properties				Circuit Pipe Details				Flow and Return Pipe				RESULTS - Manifold			
4	Heating Temperature	23.0	°C	Manifold Stainless HKV-D				Length	30 m			Number of circuits: 4				
5	Cooling Temperature	NA	°C	Pipe RAUTHERM S 20				Flow/Ret pipe	RAUTITAN Pink 32			Total Length of circuits: 458 m				
6	Mean water temp	20.5	°C	Mixing Unit Details				Flow rate	701	l/h		Total Flow: 701 l/h				
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9									%Fitting losses	20% (estimate)						
10	INPUT - Manifold							RESULTS - Floor Circuits								
11	<i>Note: ** pressure drop when valves fully open!</i>		Circuit length	Flow		Velocity	Head Loss	Head Losses			Balancing					
12			Σ	v	v			Δp _{pipe}	Δp _{Flow/Return valves, full open}	Total Loss	Turn direction:					
13	Circuit Name	No.	m	l/min	l/s	m/s	Pa/m	Pa	Pa	Pa	Pa	Kv	Turns			
14												m ³ /h				
15	Circuit	M2.1	117	3.0	0.050	0.247	112	13,127	2,363	15,490	2,363	1.16	2 1/4			
16	Circuit	M2.2	114	2.9	0.048	0.241	107	12,237	2,244	14,481	3,254	0.97	1 1/4			
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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°:	19-101					Project Name:	46-48 Cryers Road				Installer:	Plumbcraft			
2	Manifold M3 - Ground Floor													Date	19/03/2019	
3	Circuit Fluid Properties				Circuit Pipe Details				Flow and Return Pipe				RESULTS - Manifold			
4	Heating Temperature	23.0	°C	Manifold Stainless HKV-D				Length	30 m			Number of circuits: 4				
5	Cooling Temperature	NA	°C	Pipe RAUTHERM S 20				Flow/Ret pipe	RAUTITAN Pink 32			Total Length of circuits: 458 m				
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9								%Fitting losses	20% (estimate)							
10	INPUT - Manifold							RESULTS - Floor Circuits								
11	<i>Note: ** pressure drop when valves fully open!</i>		Circuit length	Flow		Velocity	Head Loss	Head Losses			Balancing					
12			Σ	v	v			Pipe	Flow and Return Valves	Total Loss	Turn direction:					
13							Δp _{pipe}	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	M3.1	117	3.0	0.050	0.247	112	13,127	2,363	15,490	2,363	1.16	2 1/4			
17	Circuit	M3.2	114	2.9	0.048	0.241	107	12,237	2,244	14,481	3,254	0.97	1 1/4			
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REHAU HYDRONIC SYSTEM

BILL OF MATERIAL - PROPOSED FINAL *



V.8.1

PROJECT NO. 19-101
 PROJECT NAME 46-48 Cryers Road
 INSTALLER Plumbcraft

Date 19/03/2019
 Department Construction

PROJECT OVERVIEW:

Project Type Commercial
 System in-slab
 Pipe RAUTHERM S 20
 Heat Source Solar with gas booster
 Total output Heating 10.9 kW
 Cooling Source None
 Total output Cooling 0 kW
 Covered Floor Area 550.8 m²
 Number of Zones 3
 Number of manifolds 3
 Number of circuits 12
 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 32 x 4.4 mm - 6m straight	Standard	136072-006	m	90	96
Floor Systems	RAUTHERM S	Pipe 20 x 2.0 mm - 400m coil	Standard	139800-400	m	1374	1600
Floor Systems	Stainless Manifold	Stainless Steel Manifold 4-port	Standard	208041-003	ea	3	3
Floor Systems	Stainless Manifold	Ball valve set 1"	Standard	208122-001	ea	3	3
Controls	Zone Controls	Actuator 24V for brass manifold / stainless steel manifold / NEA control	Standard	241293 or 217916	ea	12	Optional
Controls	Zone Controls	Actuator 230V for brass manifold / stainless steel manifold / ADR-UFH control	Standard	241283 or 217915	ea	12	Optional
Accessories	Manifold	Manifold Union for RAUTHERM S 20 x 2.0 mm	Standard	250617-001	ea	24	24
Accessories	Conduit	Conduit for RAUTITAN Pipe 20 mm (yellow)	Standard	180262-050	m	48	50
Accessories	RAUTITAN Fittings	Polymer Profile Bend Bkt 90 Deg 20 mm	Standard	297892-001	ea	24	24
Accessories	RAUTHERM S Fittings	No. 1 Straight Coupler 20 x 2.0 mm	Standard	250317-002	ea	4	4
Accessories	RAUTHERM S Fittings	Compression Sleeve 20 x 2.0 mm	Standard	250307-002	ea	8	8

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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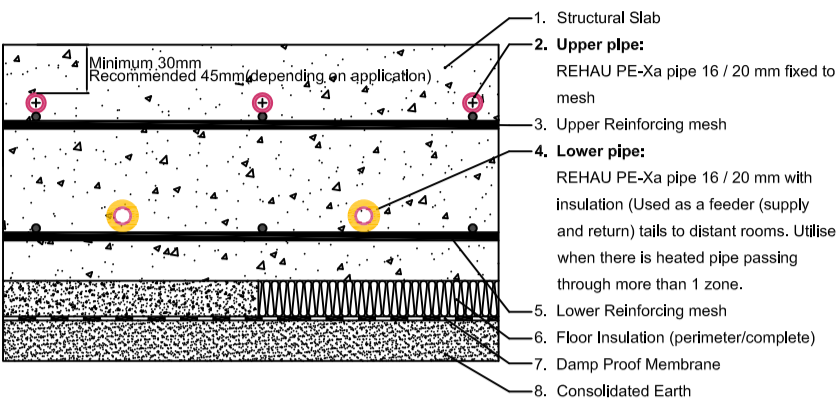
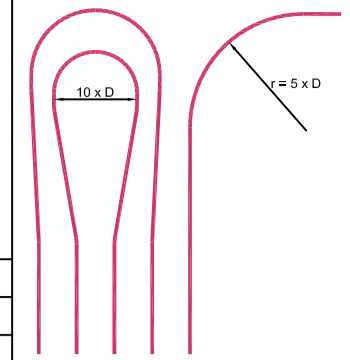
**This is an estimate only based on the information provided to us at the time of completing this proposal. The estimate assumes the building has sufficient thermal insulation to meet local building requirements, e.g. NZBC, BCA or BASIX, prior to the installation of the REHAU components. REHAU does not 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.

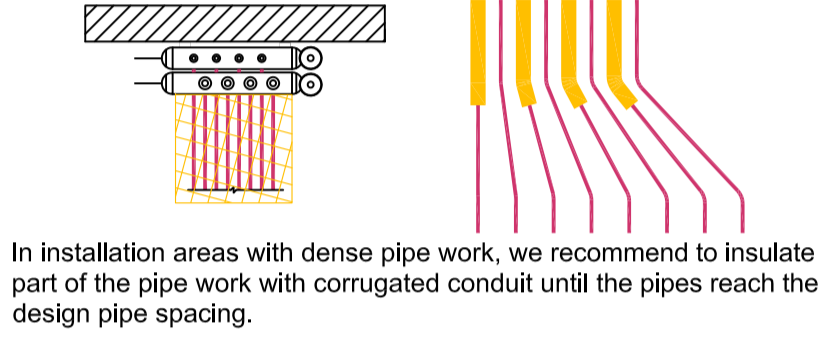
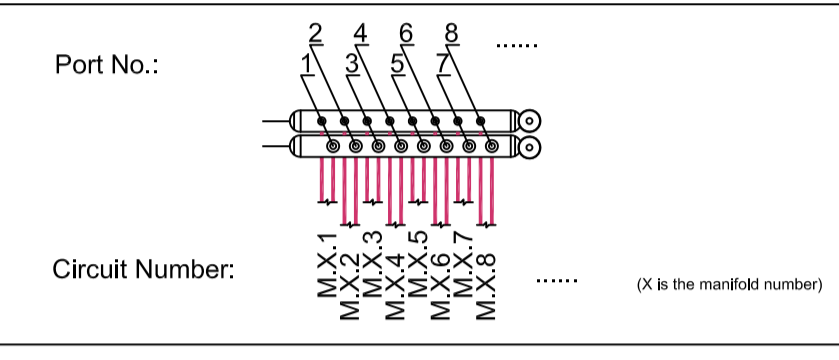
LAYING INSTRUCTIONS

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

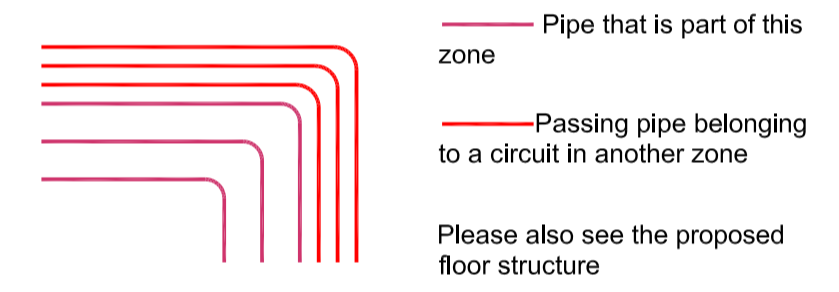
Ø 16 mm	min. 80 mm
Ø 20 mm	min. 100 mm
Ø 25 mm	min. 125 mm



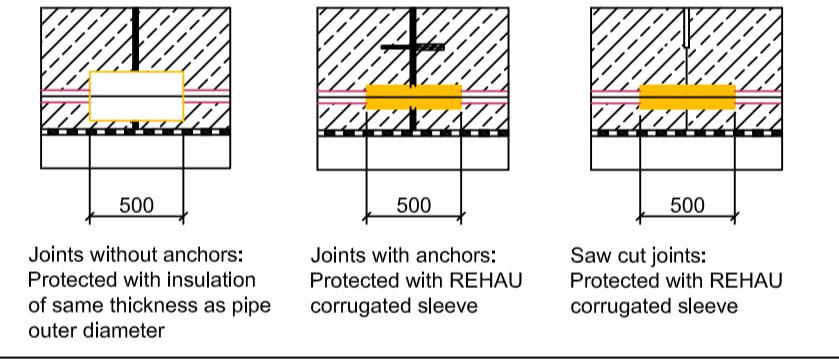
Typical Floor Structure: In-Slab
(general example only - not intended to satisfy the installation requirements for any particular project)



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



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



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 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

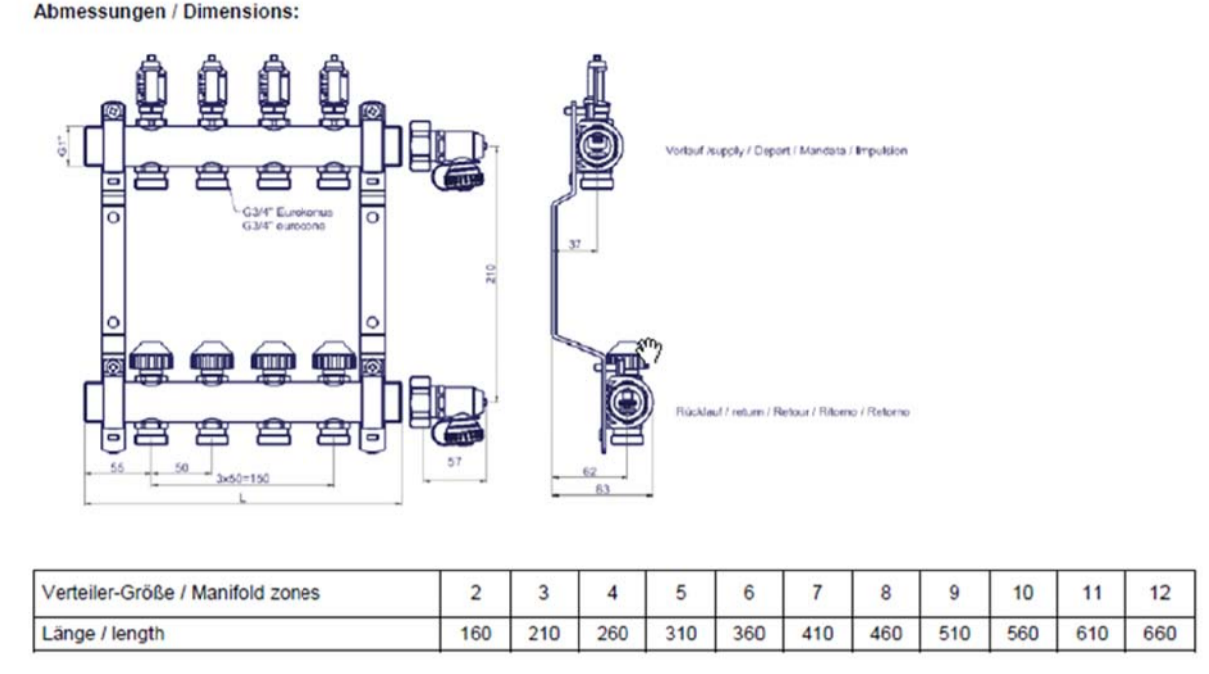
- In case of cement based screeds the initial warm-up must only be carried out after 21 days after laying (or as per manufacturer advice) to ensure the screed is correctly cured.
- In case of anhydride screeds the warm up can be carried out after 7 days
- The initial warm-up comprises the following two 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 locked 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				
Manifold type:	Circuits pipe:		Total Flow Rate:	Pressure Loss:
Stainless	RAUTHERM S 20x2.0		11.7 L/min	15.5 KPa
Circuit No.:	Pipe Spacing:	Total Length:	Flow Rate:	Turns open:
	(mm)	(m)	(L/min)	
M.1.1	400 mm	117	3.0	2-1/4
M.1.2	400 mm	114	2.9	1-1/4
M.1.3	400 mm	113	2.9	1-1/4
M.1.4	400 mm	114	2.9	1-1/4

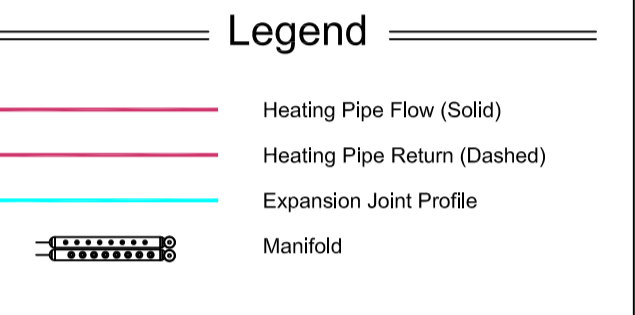


NOTE

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 any 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

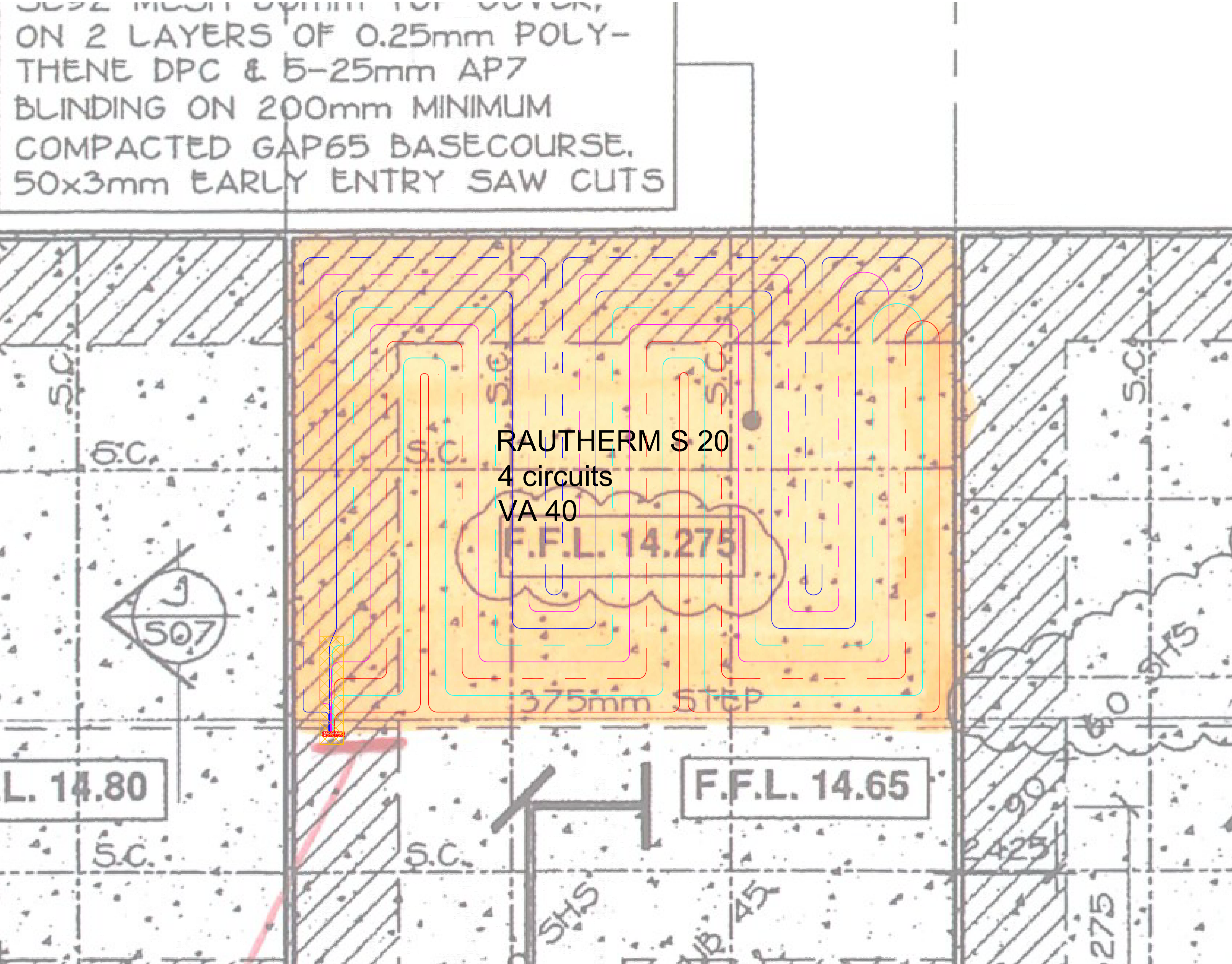


PROJECT TITLE

46-48 Cryers Road

DRAWING TITLE

UFH CIRCUIT LAYOUT



A	First Issue	19/03/19
No.	DESCRIPTION	DATE

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	19/03/19

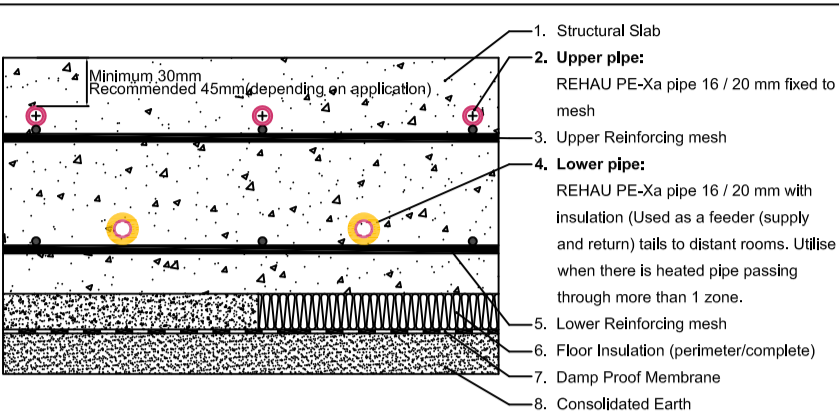
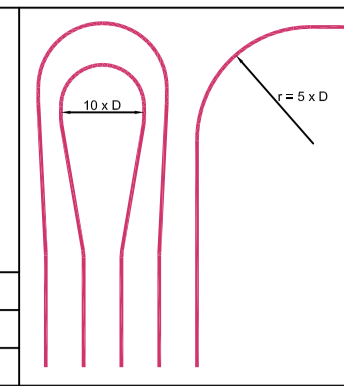
DRAWING No

RDC-ANZ-19-101

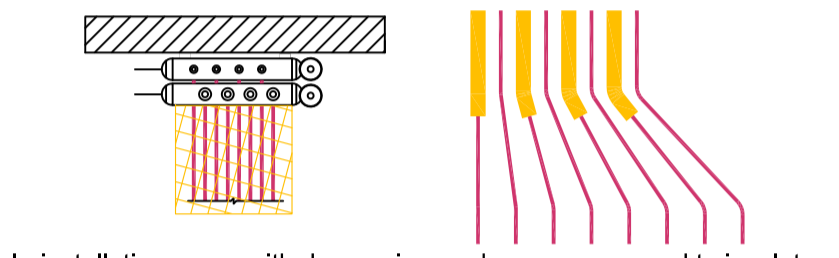
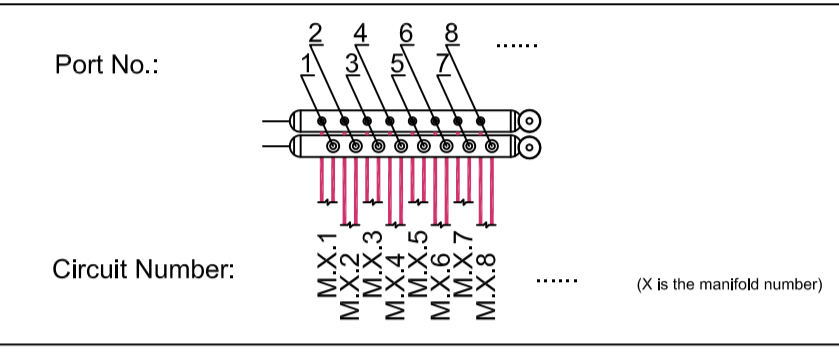
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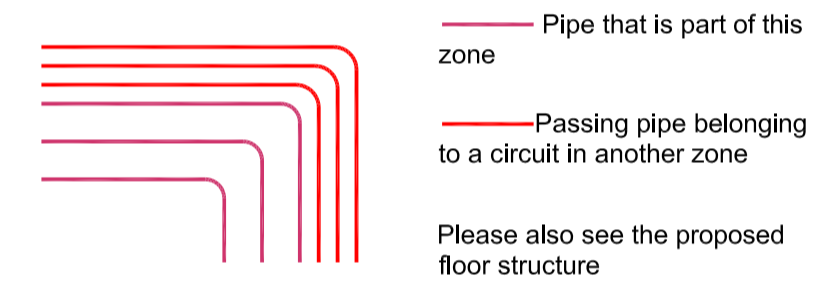


Typical Floor Structure: In-Slab
(general example only - not intended to satisfy the installation requirements for any particular project)

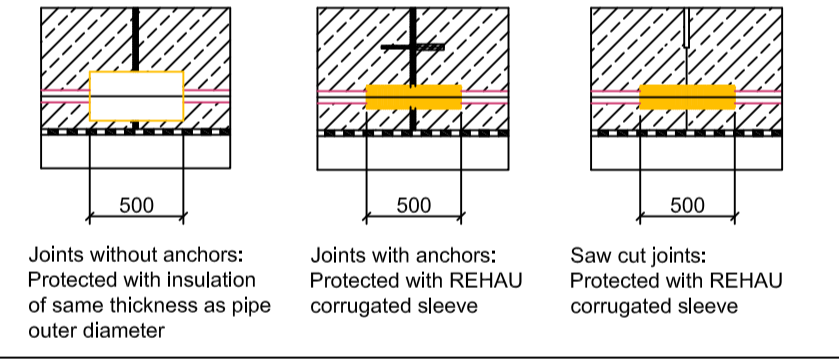


In installation areas with dense pipe work, we recommend to insulate part of the pipe work with corrugated conduit until the pipes reach the design pipe spacing.

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



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



1. PIPE LAYING INSTRUCTIONS

- Check that the passages indicated in the table are open, i.e. free from obstacles or other obstructions.
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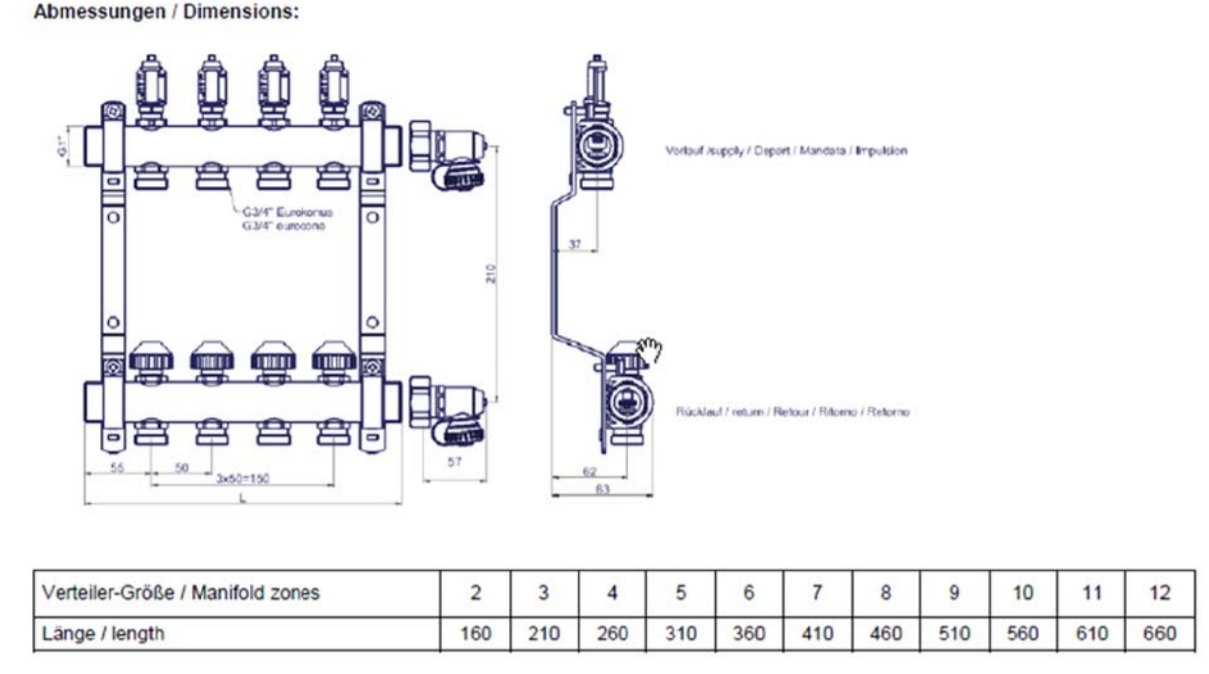
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- The initial warm-up comprises the following two stages:
Stage 1: operating the system for at least 3 days with a water temperature of 20°C to 25°C
Stage 2: increasing the water temperature to the max design temperature and maintaining it for a minimum 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.2					
Manifold type:		Circuits pipe:		Total Flow Rate:	Pressure Loss:
Stainless		RAUTHERM S 20x2.0		11.7 L/min	15.5 KPa
Circuit No.:	Pipe Spacing: (mm)	Total Length: (m)	Flow Rate: (L/min)	Turns open:	
M.2.1	400 mm	117	3.0	2-1/4	
M.2.2	400 mm	114	2.9	1-1/4	
M.2.3	400 mm	113	2.9	1-1/4	
M.2.4	400 mm	114	2.9	1-1/4	

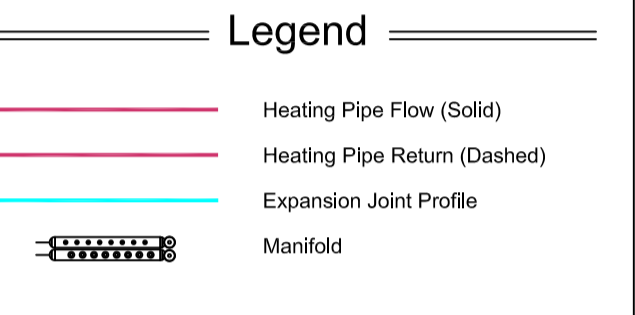


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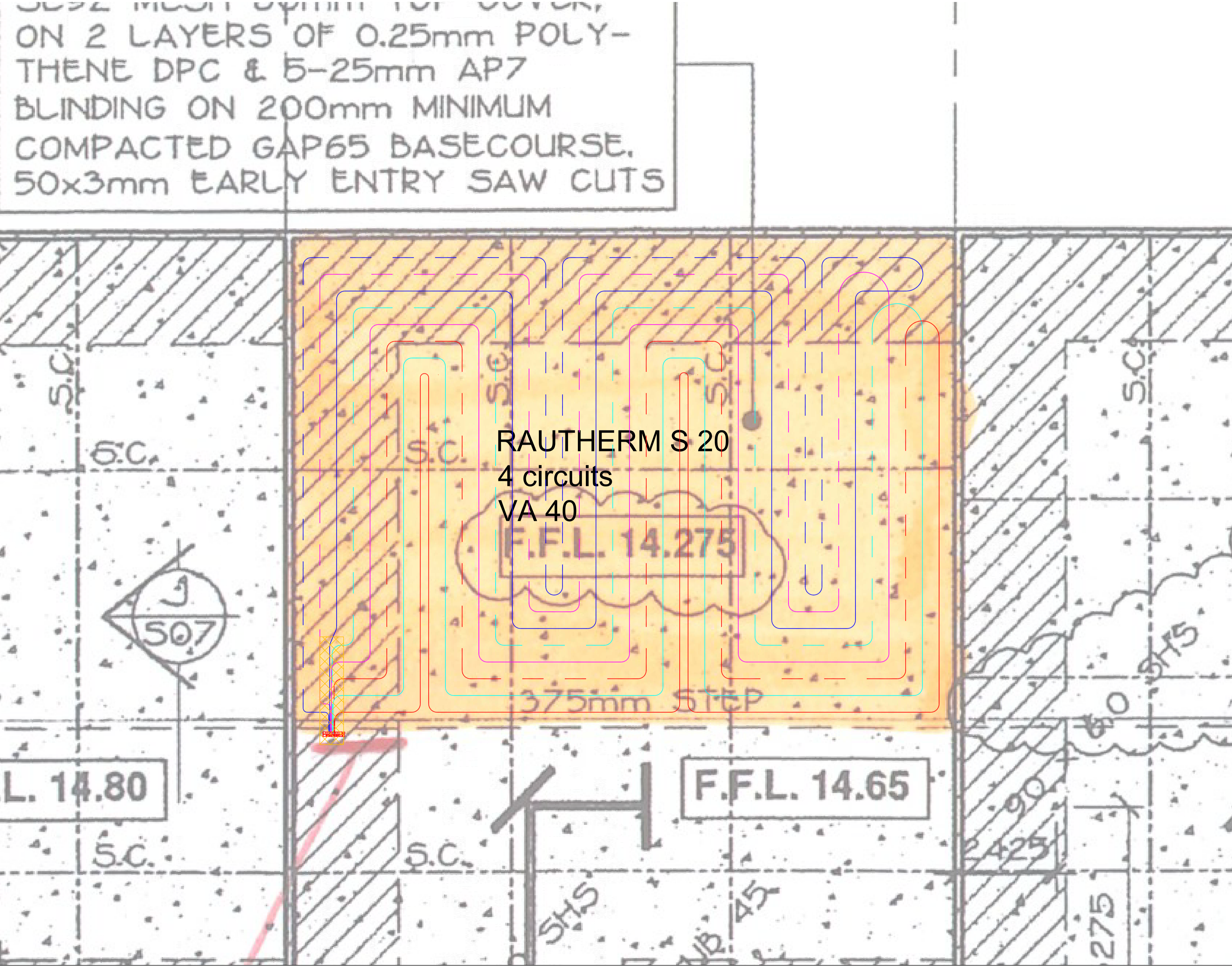


PROJECT TITLE

46-48 Cryers Road

DRAWING TITLE

UFH CIRCUIT LAYOUT



A	First Issue	19/03/19
No.	DESCRIPTION	DATE

ISSUES & REVISIONS

DRAWN BY	D.P.	SCALE	A1 1:50 A3 1:100
CHECKED BY	D.P.	SHEET NO.	P2
APPROVED BY	D.P.	DATE	19/03/19

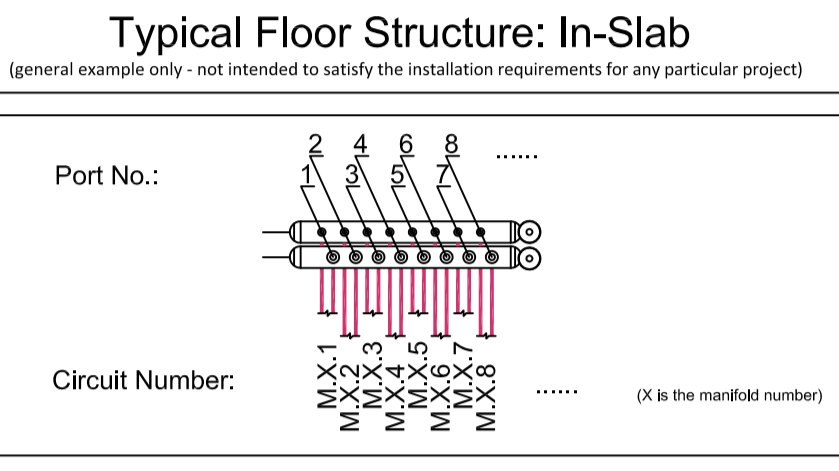
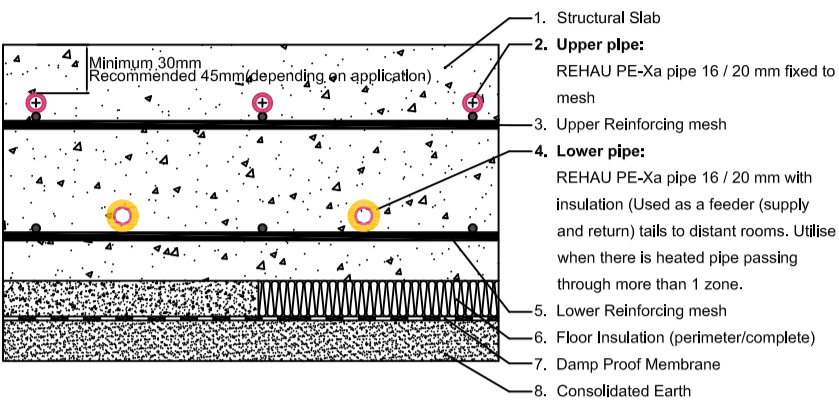
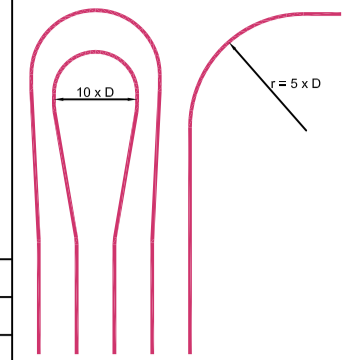
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RDC-ANZ-19-101

LAYING INSTRUCTIONS

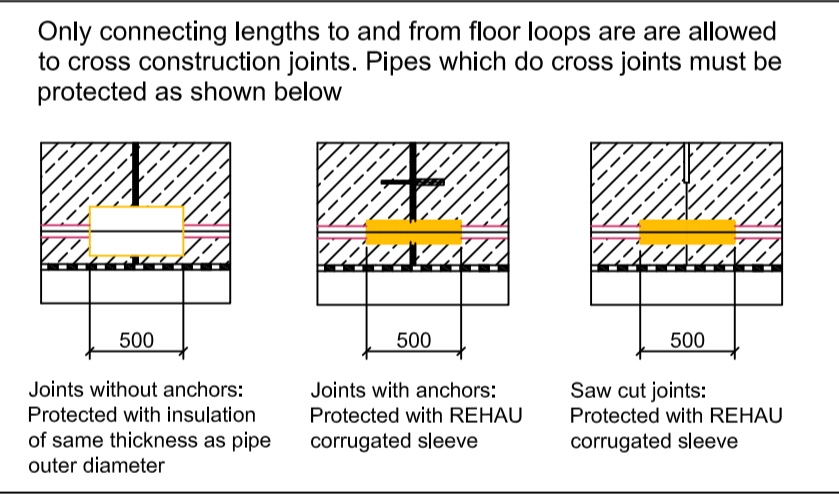
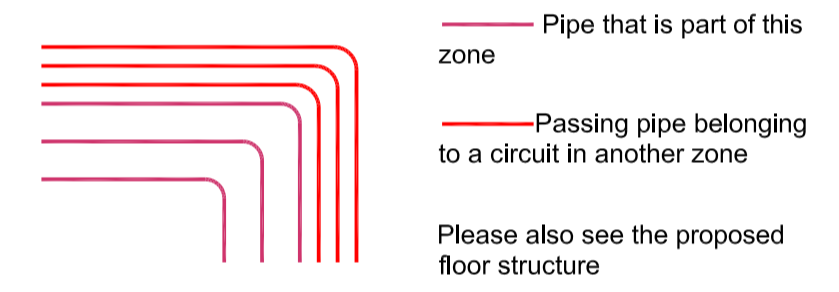
Regardless of the graph indicated in this document, the minimum radius of curvature of the piping shall not be less than 5 x diameter.

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



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 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

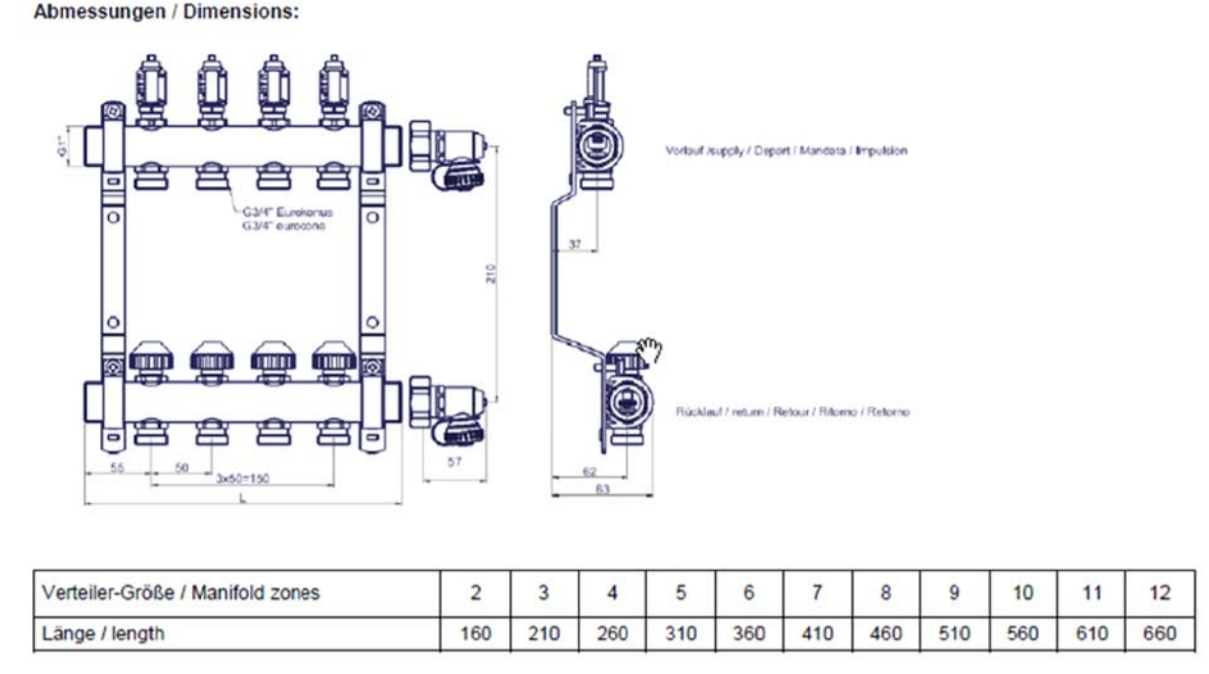
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- Repeat the same operation for all the other circuits.
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- Perform the hydraulic balancing of the circuits.
- Start-up and operate the plant.

Manifold No.: M.3				
Manifold type:	Circuits pipe:	Total Flow Rate:	Pressure Loss:	
Stainless	RAUTHERM S 20x2.0	11.7 L/min	15.5 KPa	
Circuit No.:	Pipe Spacing:	Total Length:	Flow Rate:	Turns open:
	(mm)	(m)	(L/min)	
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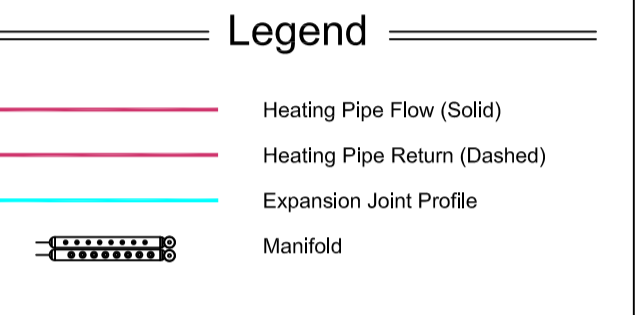


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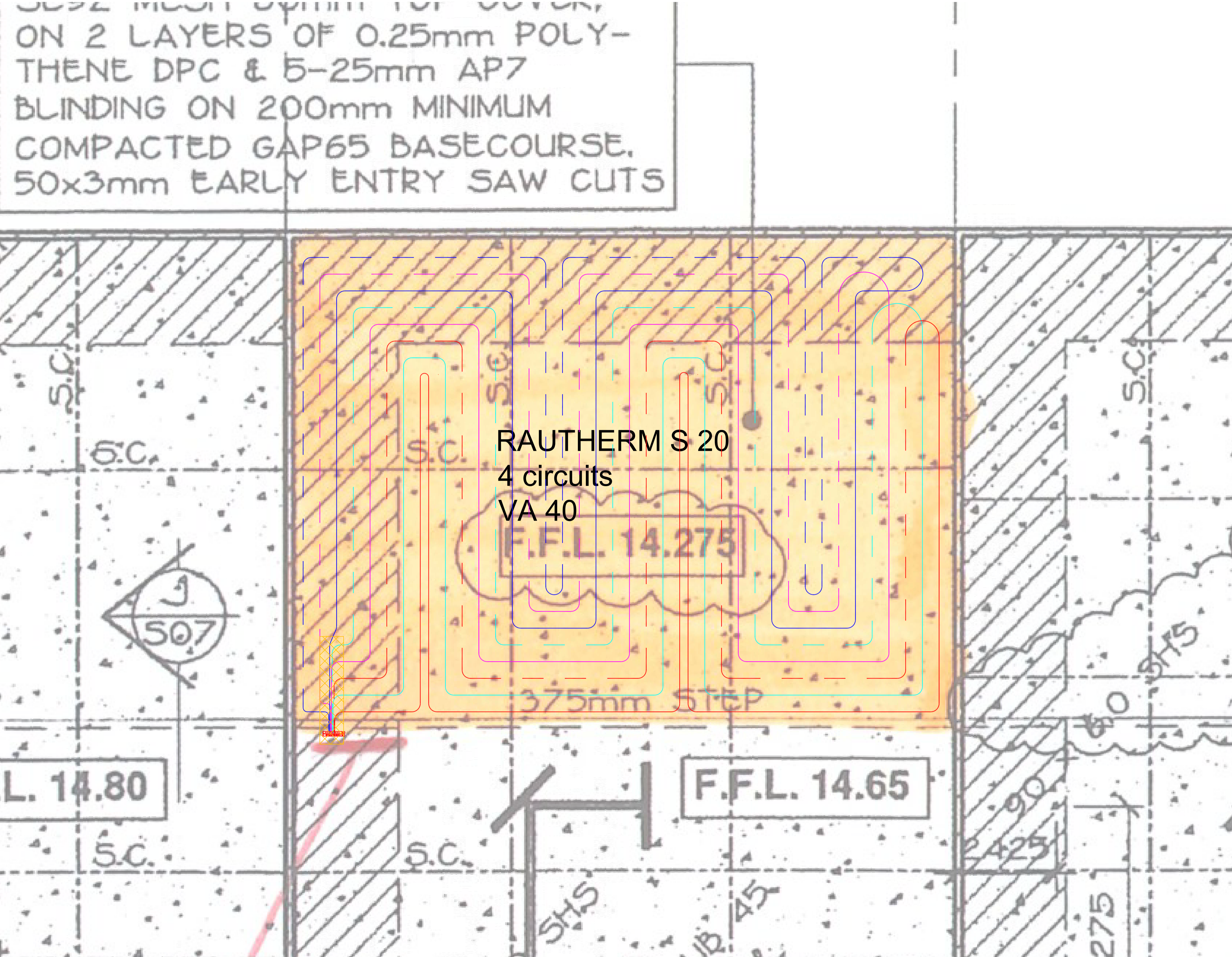


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