SARIEDDINE ENGINEERING

RESIDENTIAL VILLA
UNDERFLOOR HEATING DESIGN

Project Portfolio Report

PROJECT DATA	
Location	Mount Lebanon, Lebanon
Altitude	Approx. 1,300 m above sea level
System	Hydronic Underfloor Heating (UFH)
Discipline	Mechanical / HVAC
Prepared by	Sarieddine Engineering
Design basis	EN 1264 / ASHRAE 2025 Fundamentals

Portfolio edition - client identity and exact project address intentionally omitted.

1. Project Overview

Sarieddine Engineering developed the Ground Floor hydronic underfloor heating system for a residential villa in Mount Lebanon at approximately 1,300 m elevation. The work included winter heating-load assessment, room zoning, active heated-area coordination, UFH pipe-spacing selection, manifold positioning, detailed circuit routing and verification of actual CAD-measured circuit lengths.

2. Key Design Criteria

Parameter	Adopted Design Basis
Outdoor winter design temperature	-3°C (project mountain design assumption)
Living areas	21°C
Guest bedroom	20°C
Service / circulation spaces	18°C
Toilets	24°C
UFH pipe	16 x 2 mm
Maximum circuit-length target	100 m including supply and return tails
Typical pipe spacing	100 / 150 / 200 mm according to zone load
Floor finish	20 mm marble

3. UFH Floor Build-Up

Layer	Specification
Floor finish	20 mm marble
Adhesive	Approx. 5 mm flexible marble adhesive
Heating screed	70 mm reinforced cement/sand screed
UFH pipe	16 x 2 mm
Separation layer	0.20 mm PE foil
Thermal insulation	50 mm high-compressive-strength rigid insulation
Perimeter strip	8-10 mm edge insulation
Structure	Reinforced concrete slab

Approximate slab-to-finished-floor build-up: 145 mm.

4. Design Development

The Ground Floor winter heating load used for UFH design is approximately 20.54 kW before design allowance. A 10% design allowance gives an emitter design basis of approximately 22.59 kW. Fixed kitchen cabinets, islands, sanitary fixtures and permanently covered areas are excluded from active heated floor area.

Low-load service spaces were rationalized to avoid unnecessary short circuits. The Pantry, Store and Janitor have no dedicated UFH circuits. COR 1 is heated by transit pipework serving the Main Kitchen, while the Maid Toilet is incorporated into the Maid Room circuit arrangement.

5. Ground Floor Manifold Schedule

Tag	Location	Manifold Size	Active / Spare
GF-M-01	Dining Room	5-way	5 active
GF-M-02	G. Bedroom	6-way	6 active
GF-M-03	Corridor	8-way	8 active
GF-M-04	COR 1	4-way	4 active
GF-M-05	Main Entrance	9-way	8 active + 1 spare

Total available ways: 32. Current measured active circuits: 31.

6. Actual CAD-Measured Circuit Lengths

Manifold	Port	Actual Length	QA/QC
GF-M-01	P01	77 m	Accepted
GF-M-01	P02	77 m	Accepted
GF-M-01	P03	99 m	Accepted - upper target
GF-M-01	P04	99 m	Accepted - upper target
GF-M-01	P05	99 m	Accepted - upper target
GF-M-02	P01	98 m	Accepted - upper target
GF-M-02	P02	98 m	Accepted - upper target
GF-M-02	P03	90 m	Accepted
GF-M-02	P04	63 m	Accepted
GF-M-02	P05	67 m	Accepted
GF-M-02	P06	20 m	Accepted short zone circuit
GF-M-03	P01	67 m	Accepted
GF-M-03	P02	68 m	Accepted
GF-M-03	P03	91 m	Accepted
GF-M-03	P04	79 m	Accepted
GF-M-03	P05	84 m	Accepted
GF-M-03	P06	50 m	Accepted
GF-M-03	P07	76 m	Accepted
GF-M-03	P08	95 m	Accepted
GF-M-04	P01	97 m	Accepted
GF-M-04	P02	77 m	Accepted
GF-M-04	P03	37 m	Accepted short zone circuit
GF-M-04	P04	37 m	Accepted short zone circuit
GF-M-05	P01	80 m	Accepted
GF-M-05	P02	80 m	Accepted
GF-M-05	P03	95 m	Accepted
GF-M-05	P04	85 m	Accepted
GF-M-05	P05	57 m	Accepted
GF-M-05	P06	48 m	Accepted
GF-M-05	P07	80 m	Accepted
GF-M-05	P08	49 m	Accepted
GF-M-05	P09	-	SPARE / CAPPED

Total measured active circuit length: 2,319 m. Longest measured circuit: 99 m. No active circuit exceeds the 100 m project target.

7. Hydraulic / Installation Requirements

Each circuit shall be individually balanced at the manifold flowmeter to its scheduled design flow.

Short circuits serving small discrete rooms are retained where geometrically appropriate; unnecessary pipe shall not be added only to equalize circuit lengths.

Manifolds shall include isolation valves, flowmeters, return control/balancing valves, air vent and drain/fill provisions.

Circuits shall be pressure-tested before screed placement and maintained under test pressure during screeding in accordance with the selected pipe/manifold manufacturer's instructions.

8. Ground Floor UFH Drawing

Portfolio drawing preview - manifold locations, circuit routing and coordinated room layout.

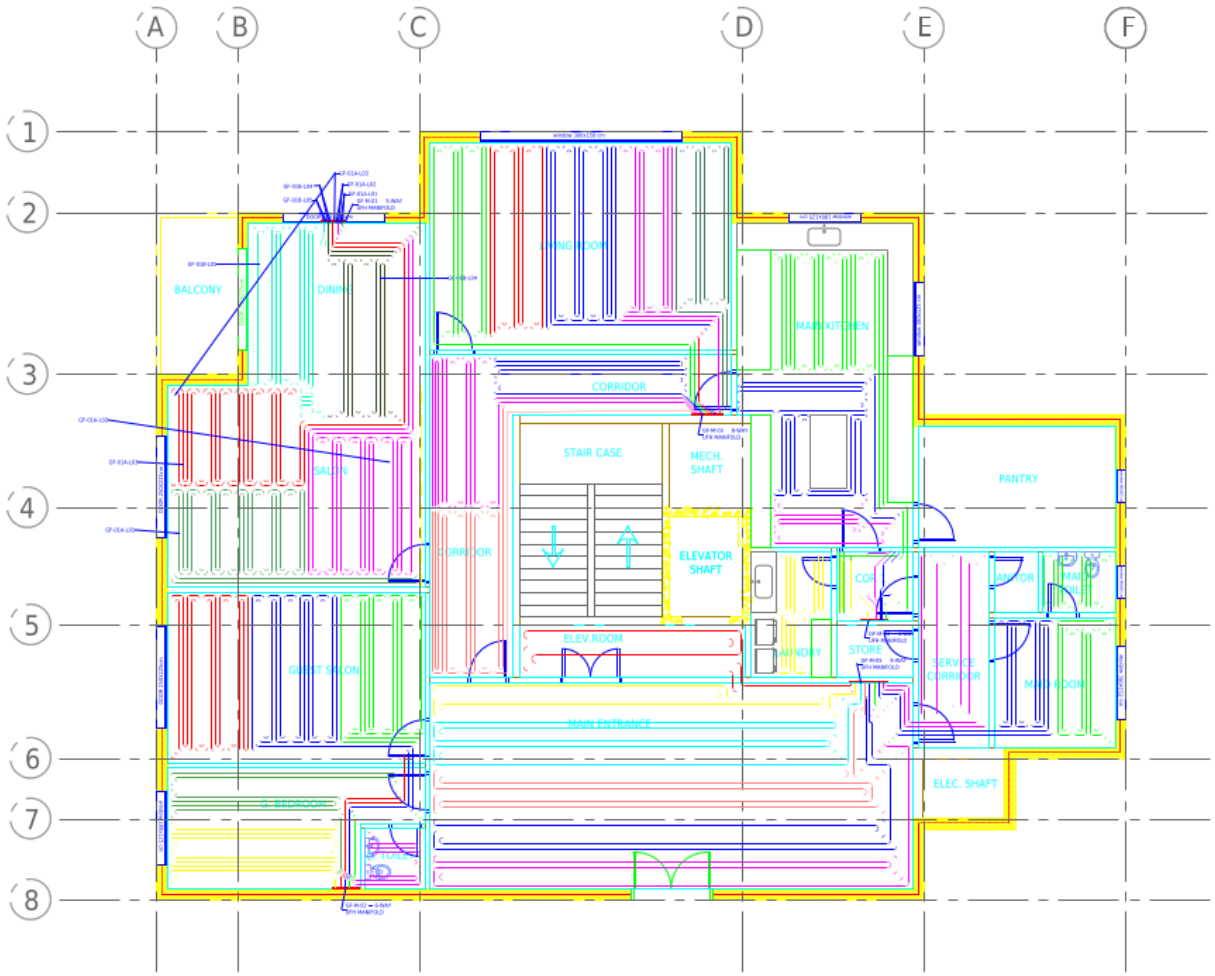


Figure 1. Ground Floor Underfloor Heating Layout

9. Drawing QA/QC Notes

Five manifold locations are clearly identified on the current DXF.

Salon and Dining circuit tags are shown on the drawing; remaining circuits should be tagged consistently before issuing the drawing as a contractor construction sheet.

For the website portfolio image, the drawing can be published as a design presentation even while detailed port-to-loop hydraulic tags remain in the engineering schedule.

GF-M-05 Port 09 is reserved as spare/capped unless required by final coordination.

10. Website Project Profile

Website Field	Final Text
Project title	Residential Villa - Underfloor Heating Design
Company	Sarieddine Engineering
Location	Mount Lebanon, Lebanon
Altitude	Approx. 1,300 m above sea level
Category	HVAC Design / Underfloor Heating
Scope	Heating-load assessment, UFH zoning, manifold layout, circuit routing, pipe-length verification and hydraulic design basis
System	Hydronic UFH - 16 x 2 mm pipe
Highlights	5 manifolds / 31 active circuits / 2,319 m measured UFH pipe / 99 m longest circuit

Website Description

Sarieddine Engineering completed the hydronic underfloor heating design for a residential villa in Mount Lebanon at approximately 1,300 m above sea level. The design included winter heating-load assessment, room-by-room UFH zoning, active floor-area coordination, pipe-spacing selection, manifold positioning, detailed circuit routing and verification of actual CAD-measured loop lengths. The Ground Floor system uses 16 x 2 mm UFH pipe distributed through five manifolds, with 31 active circuits and approximately 2,319 m of measured circuit pipework. The longest measured circuit is 99 m, remaining within the project's 100 m circuit-length target. The layout was developed to provide practical installation routing, effective zoning and a clear basis for hydraulic balancing and commissioning.

Recommended Website Image Caption

Ground Floor hydronic underfloor heating layout showing coordinated circuit routing and manifold distribution.