

File Ref: AC18315 – 07 – R1

28 July 2020

Mr M. Flewellen
Resene Construction Systems
5 Venture Place
CHRISTCHURCH 8024

Email: mark.flewellen@reseneconstruction.co.nz

Dear Mark

Re: Resene Insulated Façade Systems – Acoustic Insulation Appraisal

Acoustic Engineering Services Ltd has been engaged to provide acoustic engineering advice with regard to the acoustic performance of two Resene Insulated Façade Systems.

We have modelled the façade systems to assess the acoustic performance and have provided our opinion of the performance relative to other typical façade systems.

This assessment could be used to determine how these systems compare to other façade elements, in relation to the reverse sensitivity requirements which many authorities include (such as District Councils, the NZTA, Kiwi Rail and the like). These reverse sensitivity requirements typically require residential and other noise sensitive buildings to be acoustically insulated to protect occupants from high-noise environments such as high traffic roads, railways, port noise, airport and helipad noise, industrial noise, entertainment precinct, central city or commercial activities.

Please find our analysis below.

1.0 RESENE INSULATED FAÇADE SYSTEMS

We have based our analysis on the modelling software Insul (Version 9.0.22) and the following façade build-ups:

Resene Insulated Facade System – XTherm Blue - XPS

- 5 – 10 mm Resene Rockcote Plaster System / 50mm Extruded Polystyrene (35kg/m³) / 20 mm polystyrene cavity batten / Building wrap (surface mass 0.11 kg/m²) / 90 x 45 mm timber studs at 600 mm spacing with fibrous insulation to the cavity / 10 mm Standard Gib plasterboard

Resene Insulated Facade System – EPS

- 5 – 10 mm Resene Rockcote Plaster System / 50mm Expanded Polystyrene (24kg/m³) / 20 mm polystyrene cavity batten / Building wrap (surface mass 0.11 kg/m²) / 90 x 45 mm timber studs at 600 mm spacing with fibrous insulation to the cavity / 10 mm Standard Gib plasterboard

The modelled system is shown in figure 1.1 below.

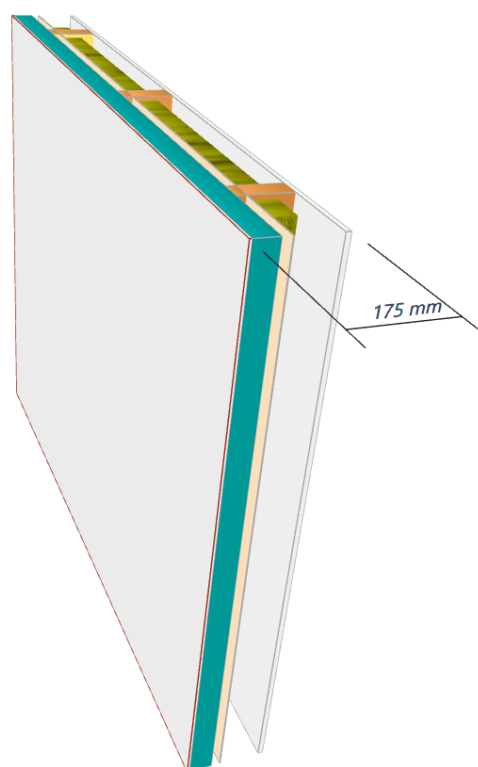


Figure 1.1 – Resene Insulated Façade Systems with Rockcote Plaster

2.0 MODELLED TRANSMISSION LOSS

Based on the systems described above, the acoustic performance of each system with a 10 kg/m² plaster layer (approximately 10 mm), with a 5 kg/m² (approximately 5 mm) plaster layer and un-plastered, is shown below in table 2.1. There are a number of acoustic metrics that can be used to summarise the level of sound insulation provided by a construction. We have presented the STC and R_w as these are most commonly used in New Zealand.

The R_w and STC are similar parameters and represent the reduction in noise levels that can be expected between spaces for typical indoor noise sources such as human speech. The C_{tr} adaption can be combined with the R_w to provide an indication of the likely system performance when faced with sources containing elevated low-frequency noise levels (such as urban road traffic).

Table 2.1 – Insulated façade system performance

System	Plaster	STC	R_w	$R_w + C_{tr}$
XTherm Blue - XPS	10 kg/m ²	44	43	35
	5 kg/m ²	39	38	30
	No plaster	28	28	22
EPS	10 kg/m ²	41	42	30
	5 kg/m ²	38	38	29
	No plaster	26	26	21

We note that these systems have not been laboratory tested. We expect that the system performance, if tested in the laboratory, would not exactly correspond to the modelled performance.

This analysis indicates that there is an imperceptible difference in acoustic performance between the two systems and that the most important element is the Resene Rockcote plaster system.

3.0 DISTRICT PLAN INSULATION REQUIREMENTS

Many District Plans in New Zealand require the façade of a building to achieve a certain level of acoustic insulation to protect sensitive activities from various sources such as traffic noise, airport noise, entertainment noise and the like. While the specific requirements differ between Districts, the requirements typically involve either constructing buildings using defined acceptable solutions, designing the building façades to provide a stated level of performance, or achieve a maximum permitted internal noise level.

Façade reduction and internal noise level requirements take into account the performance of the entire building envelope (walls, glazing, doors and roof) and the shape and size of the room to be considered – so the façade will only be one element of any room that needs to be considered. As an example, we have considered a room with one external façade and with the following specifications:

- Size: External wall 10 m², room volume 50 m³
- Roof: Standard gable with 0.4 mm profiled metal, fibrous insulation and 13 mm Standard Gib plasterboard suspended on a resilient system
- Façade: Resene Rockcote Plaster System (5 – 10 mm) / 50mm **XPS or EPS** / 20 mm polystyrene cavity batten / Building wrap (surface mass 0.11 kg/m²) / 90 x 45 mm timber studs at 600 mm spacing with fibrous insulation to the cavity / 10 mm Standard Gib plasterboard
- Glazing: 6 mm float glass / 12 mm airgap / 6 mm float glass (maximum 50 % wall area or 5 m²)
- Internal surface finishes: Carpet flooring, plasterboard and glazed walls

The external envelope of this room would achieve a traffic noise reduction of 27 – 29 dB. As outlined above the façade reduction depends on the entire building envelope. In this case upgrades would be required to the façade system to achieve a traffic noise reduction of 30 dB (a common façade reduction requirement). This would be achieved by increasing the thickness of the internal plasterboard lining. For example, 13 mm Standard Gib plasterboard lining is required to provide a 30 dB noise reduction for the XPS system with 10 mm plaster for the particular room arrangement described above. Specialist acoustic advice would be required to ensure compliance for other room arrangements.

The example room above would have an internal noise level of 40 dB L_{Aeq} when the external traffic noise level was 64 - 67 dB L_{Aeq} for the plastered XPS or EPS systems. In some Districts this would comply with the sound insulation requirements, without further upgrades.

4.0 COMPARISON WITH COMMON FAÇADE CONSTRUCTIONS

We have also compared the above Resene façade systems to other common façades in NZ. Based on the following build-up the STC, R_w and R_w + C_{tr} ratings for some common façade constructions are shown in table 4.1 below.

- Façade element / 20 mm timber or polystyrene cavity batten / Building wrap (surface mass 0.11 kg/m²) / 90 x 45 mm timber studs at 600 mm spacing with fibrous insulation to the cavity / 10 mm Standard Gib plasterboard

Table 4.1 – STC, R_w and $R_w + C_{tr}$ ratings

Façade element	STC	R_w	$R_w + C_{tr}$
50 mm Resene Integra façade (with 5kg/m ² plaster)	50	50	41
9 mm fibre cement sheet	45	44	34
XPS with 10 kg/m ² plaster	44	43	35
EPS with 10 kg/m ² plaster	41	42	30
17 mm plywood	41	40	31
XPS with 5 kg/m ² plaster	39	38	30
20 mm Cedar shiplap	39	38	30
0.6 mm profiled metal	38	39	29
EPS with 5 kg/m ² plaster	38	38	29

This indicates that the XPS and EPS systems are expected to provide similar acoustic insulation to other lightweight systems such as timber and profiled metal facades. Higher acoustic insulation can be achieved by including a thicker plaster layer.

Please do not hesitate to contact us to discuss further as required.

Kind Regards,



Rewa Satory
BE (Mech). MASNZ
Acoustic Engineer
Acoustic Engineering Services