

Heat insulated fabrication GRC panel

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Abstract

This study is about Desostone facade exterior cladding GFRC panel. This panel gives opportunity to obtain light weight cast concrete panel and heat insulation layer at the same time with the same color and texture variety of GFRC. First of all, the scope of the invention has explained and physical and also heat insulation properties installation process and finished project with the product are included to the study.

INTRODUCTION

For all kind of building facade claddings for aesthetic purpose and heat insulation is a very import need. For obtaining regular temperature inside the building the heat conductivity can only be obtained with heat, sound design and also correct heat insulation sound isolation materials.

DESOSTONE is designed to change these disadvantages to an advantage. Desostone is a lightweight heat insulated GRC panel, cladding including both insulation and decorative layers. It can be used in every kind of projects such as shopping malls, schools, hospitals, office buildings and residences. Because of having a lightweight structure, it also provides statically advantage to the construction. This is the main purpose for the design process of the product. The installation process provides a fast and practical way for the exterior facade cladding. Two layers (heat insulation, decorative cladding) has been obtained with one installation process.

Desostone is obtained with 8 -10 mm GFRC shell 50 mm rock wool, aluminium frame and aluminium anchorages and it is installed with aluminum fixing units mechanically.

SCOPE

After the heat insulation layer cladding, the decorative cladding comes as a second layer on facade and increases the thickness of the facade claddings total thickness. The decorative cladding also increases the facade load and the building gains extra static loads by this way. Cladding the heat insulation layer and the decorative cladding layer separately increases the initial costs and time plan for the facade. By this way desostone is designed:

- a. To create a facade covering both supplies heat, sound and humidity insulation and used for decorative purpose.
- b. To create a façade covering that gives opportunity to insulate decorative look and also water sound and vapor insulation.
- c. To decrease the facade covering system thickness between the wall and the facade shell.
- d. To prevent the internal usage of the steel construction in facade coverings.
- e. To prevent usage of vertical steel tubes on facade on application process.
- f. To decrease the static loads coming from extra steel structure.
- g. To prevent extra workmanship costs for heat insulation.

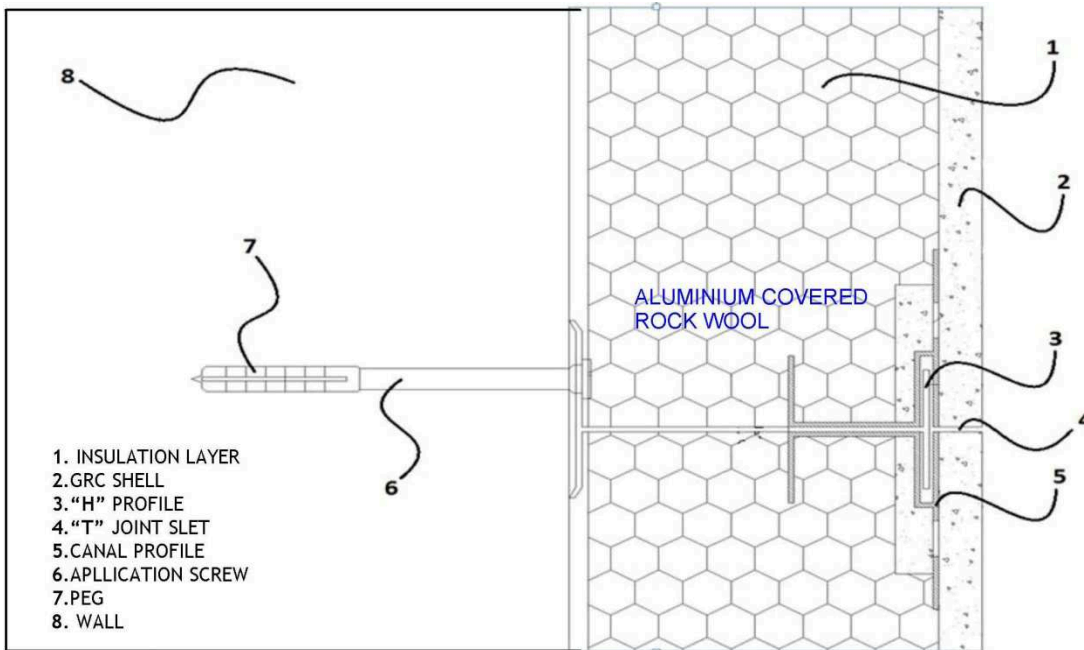


Figure1. Panel section

PHYSICAL PROPERTIES

Test	GRC - GFRC
Compressive Strength	f_c : 30-55 N/mm ²
Tensile Strength	f_{ct} : 4-10 N/mm ²
Modulus of Rupture	LOP: 7-9 N/mm ²
Flexural Strength	MOR: 10-20 N/mm ²
Expansion Limit	ϵ_u : 0,5-4 %
Modulus of Elasticity	E: 10-13 kN/mm ²
Density	1,8 - 2 kg/dm ³
Expansion	T: 1.0 - 15 X 10 ⁻⁵
Heat Conductivity	0,8 - 1,2 W/mk
Fire Resistance	(DIN 4102) A1
Shrinkage Value	ϵ_{cs} : 1.0 – 2.0mm/m
Water Absorption	3-15 %
Vapor Diffusion	μ : 50 – 200

CHARACTERISTIC PROPERTIES

Fire Standard	A1
Horizontal Surface	$\pm 1 - 1.5$ mm
Vertical Surface	± 1.5 mm
Thickness	10mm ± 1 mm
Length	20-120mm ± 1 mm

HEAT INSULATION LAYER

5 cm Rockwool used in the insulating layer is complies with A1 class (DIN 4102)

Fire Standard	A1 sınıfı (DIN 4102)
Heat Conductivity	$\lambda = 0.036 \text{ W/mK}$
Density	110 kg/m^3
Melting Point	$\geq 1000 \text{ }^\circ\text{C}$
Quality Certification	DIN EN ISO 2001

INSTALLATION

STEP 1

On facade wall (brick or concrete curtain) a steel frame has been installed.

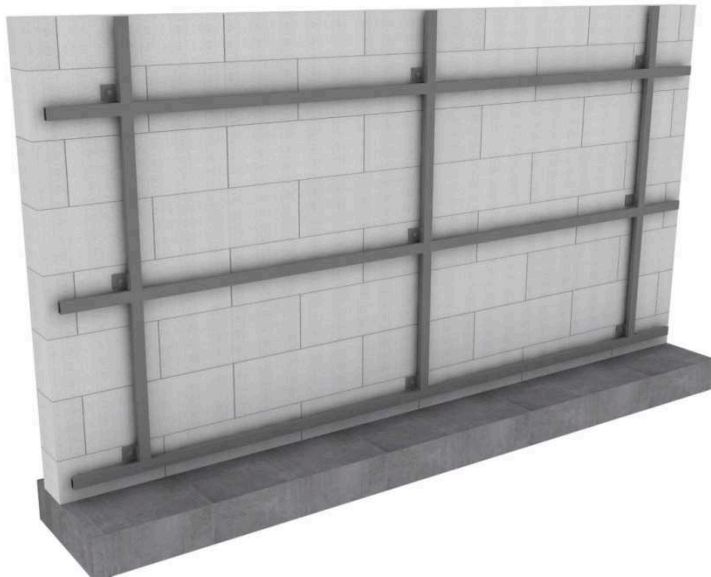


Figure 2. Application Step 1

STEP 2

First aluminum U channel has been screwed on the steel frame.



Figure 3. Application Step 2

STEP 3

The panel is replaced by using the panel frame canal. For the upper part of the panel to obtain a regular joint a T profile is replaced on the upper part of the panel.

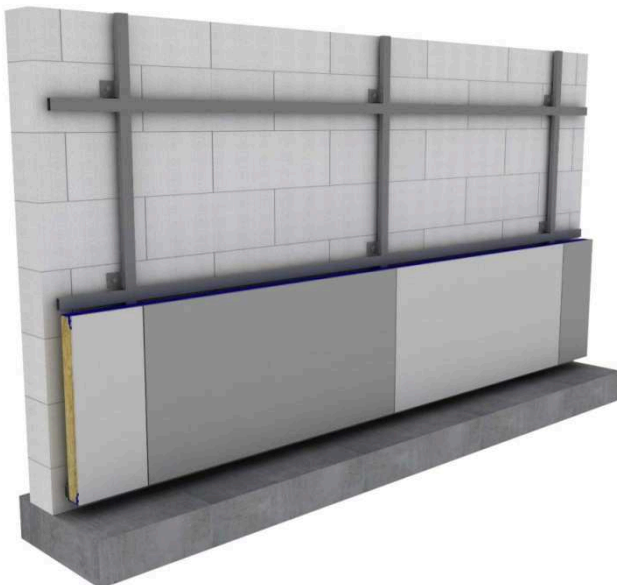


Figure 4. Application Step 3

STEP 4

On the upper part of the first panel line an H profile is replaced on the panel's own frame. After this process the H profile is fixed by screwing it on the steel frame.

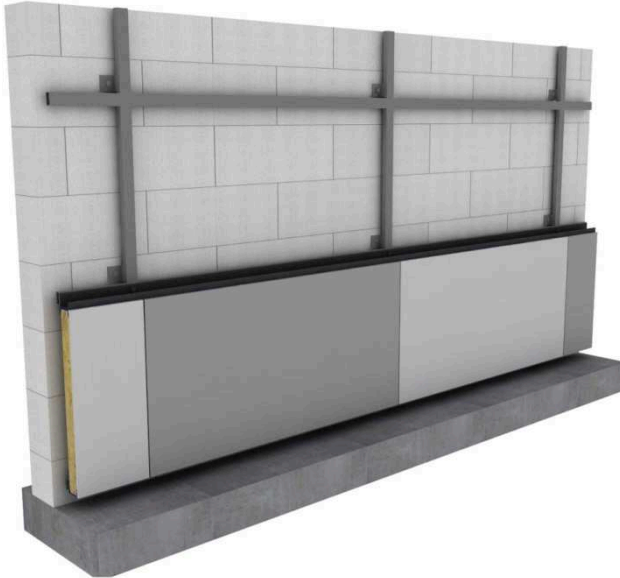


Figure 5. Application Step 4

STEP 5

After the H profile installation, the second line of the panel is replaced on the H profile and T profile is replaced on the second joint.

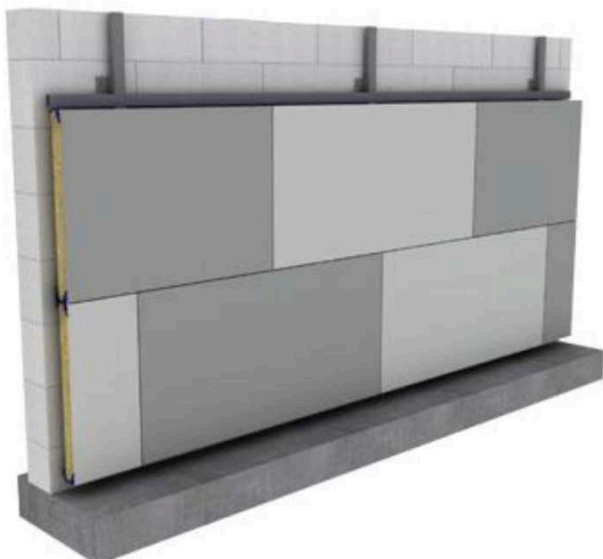


Figure 6. Application Step 5

STEP 6

The finish panel is fixed with a L profile after it is replaced on the H profile.

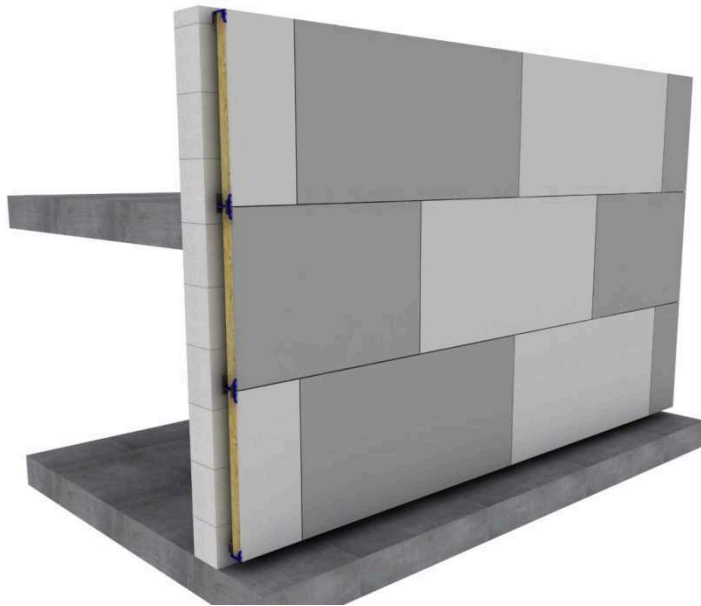


Figure 7. Application Step 6

STEP 7

In case of the finish panel is on the parapet the coping detail can be finished even with aluminum, titanium, GRC, or even natural stone.

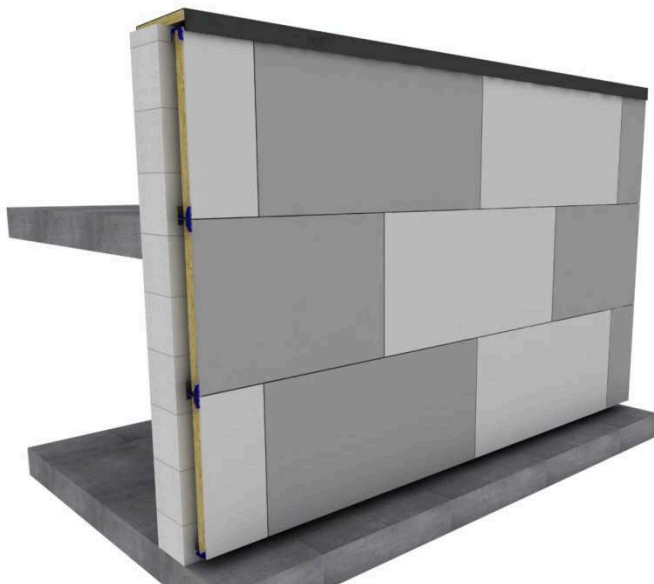


Figure 8. Application Step 7

Corner Details

In corner detail the corner unit can be designed in 2 ways first is typical corner detail with special Desostone corner unit and the second is also can be designed with special aluminum corner profile. You can also see the horizontal joint detail.



Figure 9. Corner detail

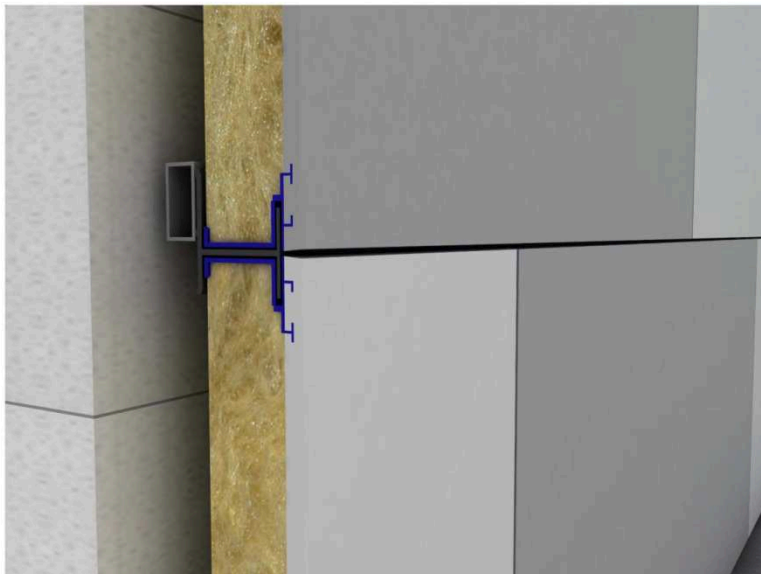


Figure 10. Horizontal detail

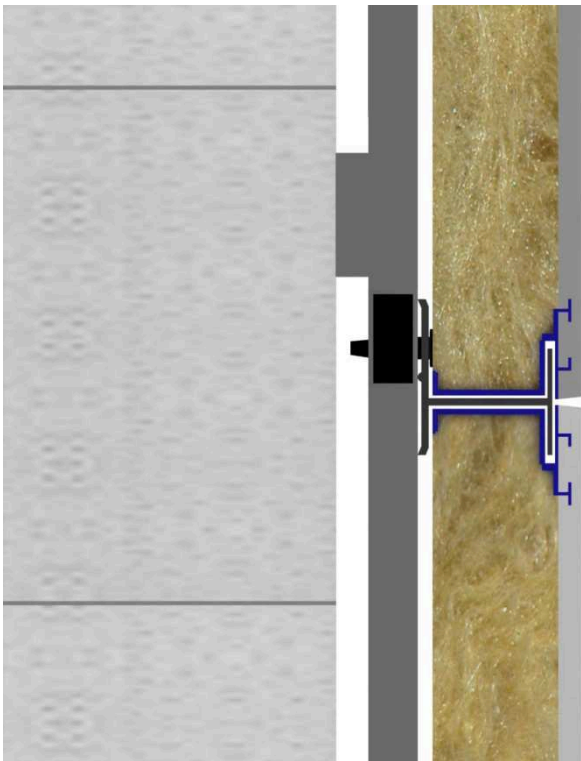


Figure 11. Horizontal section

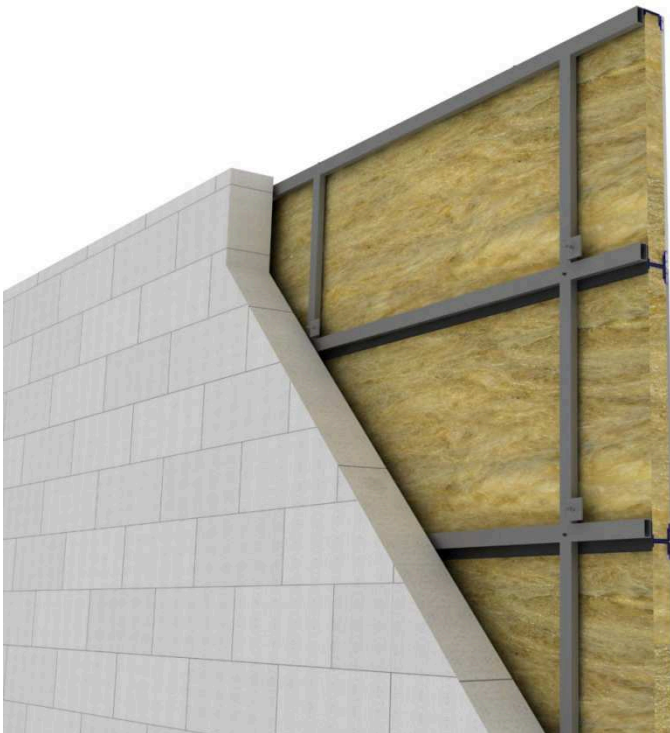


Figure 12. Back view

PROJECTS

Turkey football federation

The Project total amount is , in which the panels were used vertically. The used panel sizes are 60X120cm - 45X120cm, 60x60cm and 45x45cm. The vertical alignment disorders were corrected and improved by applying steel grids to the facade. Due to the curved facade of the Management Building of the construction, the building has been constructed with only using 45x120cm panels. The Desostone panels used in this project are combined with 2 different tones of the grey color, smooth and rough surface texture.

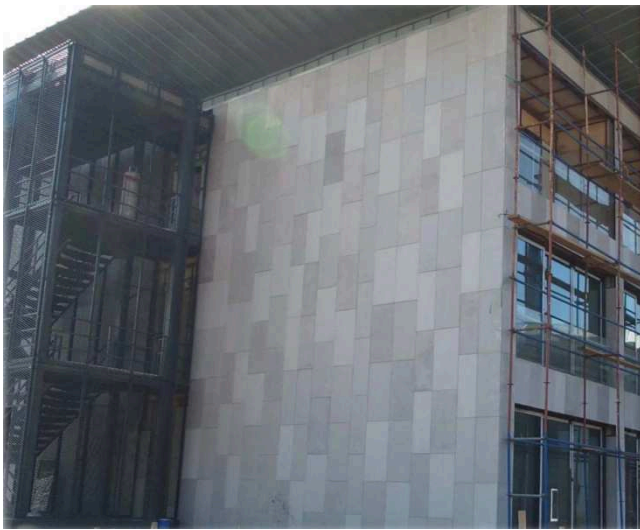


Figure 13. Project: Turkey Football Federation



Figure 14. Project: Turkey Football Federation

Duhok American University

The Desostone applied in this Project is . Due to the lack of horizontal and vertical alignments of the surface, where the application was done, the facade was brought to its vertical alignment by using steel cages. 60 x120cm panels were used throughout the Project. Based on the requests, the production was made in sandstone color. Special geometrical corners and triangular forms in the main entrance have been produced in special dimensions.



Figure 15. Duhok American University