

# Stone Cladding with Aluminum Honeycomb

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# Alliances



# Overview

- ▶ Value Engineering on Stone
- ▶ Analysis of activities on Processing of Stone
- ▶ Analysis of suitability of Stone to Projects
- ▶ Stone Cladding on Honeycomb
- ▶ Conclusion



# Value Engineering Analysis

## - Job Plan

- ▶ Preparation
  - ▶ Information
- }
- Information Gathering
- 
- ▶ Analysis
  - ▶ Creation
- }
- Alternative Generation
- 
- ▶ Evaluation
  - ▶ Development
- }
- Evaluation
- 
- ▶ Presentation
  - ▶ Follow up
- }
- Presentation

# Information Gathering

- ▶ This asks what the requirements are for the object. Function analysis, an important technique in value engineering, is usually done in this initial stage. It tries to determine what function or performance characteristics are important. It asks questions like; What does the object do? What must it do? What should it do? What could it do? What must it not do?

# Alternative Generation (creation)

- ▶ In this stage, the value engineers ask; What are the various alternative ways of meeting requirements? What else will perform the desired function?

# Evaluation

- ▶ In this stage, all the alternatives are assessed by evaluating how well they meet the required functions and how great will the cost savings be

# Presentation

- ▶ In the final stage, the best alternative will be chosen and presented to the client for final decision

# Cost Comparison

Value comparison between all option  
DATA FOR STONE WORK - 40MM THICK actual status

S.No	DESCRIPTION	UNIT	QUANTITY	Rate/aed	Amount
<b>1</b>	<b>MATERIAL</b>				
1/a	Panna Fragola granite CUT TO SIZE	m2	30,000	600	18,000,000
1/b	G.Veneziano CUT TO SIZE	m2	3,000	600	1,800,000
	<b>TOTAL MATERIAL COST</b>		<b>33,000</b>		<b>19,800,000</b>
<b>2</b>	<b>ADDITIONAL FINISHING</b>				
2/a	/slot/rake/groove	lm	LS	-	2,400,000
2/b	/slot/rake/groove	lm	LS	-	2,000,000
	<b>TOTAL ADDITIONAL FINISHING</b>				<b>4,400,000</b>
<b>3</b>	<b>PREINSTALLATION</b>				
3/a	Unloading of stone	m2	33,000	5.00	165,000.00
3/b	Finishing of stone	m2	33,000	5.00	165,000.00
3/c	Drylay	m2	33,000	10.00	330,000.00
	<b>TOTAL PREINSTALLATION</b>				<b>660,000.00</b>
<b>4</b>	<b>INSTALLATION</b>				
4/a	installation labour	M2	33,000	170.00	5,610,000
	<b>TOTAL INSTALLATION LABOUR</b>				<b>5,610,000</b>
<b>5</b>	<b>METAL FRAME AND ACCESSORY SS</b>				
5/a	Hot Deep galvanize frame	m2	33,000	175.00	5,775,000
5/b	Accessory SS 316	m2	33,000	125.00	4,125,000
	<b>TOTAL METAL FRAME AND ACCESSORY</b>				<b>9,900,000.00</b>
<b>6</b>	<b>WHATERPROOFING /INSULATION</b>				
6/a	Bitumin	m2	33,000.00	40.00	1,320,000.00
6/b	thermal insulation 5 cm	m2	33,000.00	55.00	1,815,000.00
6/c	Joint grout	ls			500,000.00
	<b>TOTAL WHATER PROOFING INSULATION</b>				<b>3,635,000.00</b>
<b>7</b>	<b>SCAFFOLDING</b>				
7/a	up to 6 Floor level				1,500,000.00
7/b	Mast climber				4,800,000.00
	<b>TOTAL SCAFFOLDING</b>				<b>6,300,000.00</b>
<b>8</b>	<b>PM / CONSTR? QC/QS</b>				
8/a	PROJECM MANAGEMENT STONE	mht	60000	12	720,000.00
8/b	Engineering Calculation				-
8/c	independent Inspector		33,000.00	10	330,000.00
8/d	Site supervision QC	mht	30000	12	360,000.00
	<b>TOTAL PM /QS/QC</b>				<b>1,410,000.00</b>
	<b>TOTAL VALUE OF WORK</b>				<b>51,055,000.00</b>

NDS

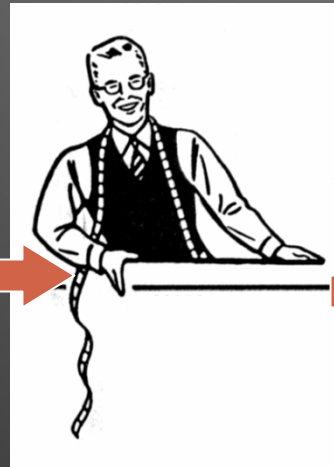
Value comparison between all option  
DATA FOR STONE WORK - 10 MM + honeycomb

S.No	DESCRIPTION	UNIT	QUANTITY	Rate/aed	Amount
<b>1</b>	<b>MATERIAL</b>				
1/a	panna fragola CUT TO SIZE	m2	30,000	300	9,000,000
1/b	G.Veneziano CUT TO SIZE	m2	3,000	300	900,000
	<b>TOTAL MATERIAL COST</b>		<b>33,000</b>		<b>9,900,000</b>
<b>2</b>	<b>ADDITIONAL FINISHING</b>				
2/a	HONEY COMB PANEL	MQ	33,000	400.00	13,200,000
2/b	G.Veneziano/slot/rake/groove	lm	LS	-	-
	<b>TOTAL ADDITIONAL FINISHING</b>				<b>13,200,000</b>
<b>3</b>	<b>PREINSTALLATION</b>				
3/a	Unloading of stone	m2	33,000	3.00	99,000.00
3/b	Finishing of stone	m2	33,000	-	-
3/c	Drylay	m2	33,000	3.00	99,000.00
	<b>TOTAL PREINSTALLATION</b>				<b>198,000.00</b>
<b>4</b>	<b>INSTALLATION</b>				
4/a	installation labour	M2	33,000	95.00	3,135,000
	<b>TOTAL INSTALLATION LABOUR</b>				<b>3,135,000</b>
<b>5</b>	<b>METAL FRAME AND ACCESSORY SS</b>				
5/a	ALLUMINIUM ANGLE	m2	33,000	105.00	3,465,000
5/b	Accessory SS 316	m2	33,000	25.00	825,000
	<b>TOTAL METAL FRAME AND ACCESSORY</b>				<b>4,290,000.00</b>
<b>6</b>	<b>WHATERPROOFING /INSULATION</b>				
6/a	Bitumin	m2	33,000.00	40.00	1,320,000.00
6/b	thermal insulation 5 cm	m2	33,000.00	55.00	1,815,000.00
6/c	Joint grout	ls			500,000.00
	<b>TOTAL WHATER PROOFING INSULATION</b>				<b>3,635,000.00</b>
<b>7</b>	<b>SCAFFOLDING</b>				
7/a	up to 6 Floor level				1,000,000.00
7/b	Mast climber				960,000.00
	<b>TOTAL SCAFFOLDING</b>				<b>1,960,000.00</b>
<b>8</b>	<b>PM / CONSTR? QC/QS</b>				
8/a	PROJECM MANAGEMENT STONE	mht	50000	8	400,000.00
8/b	Engineering Calculation			50,000	50,000.00
8/c	independent Inspector		33,000.00	10	330,000.00
8/d	Site supervision QC	mht	30000	12	360,000.00
	<b>TOTAL PM /QS/QC</b>				<b>1,140,000.00</b>
	<b>TOTAL VALUE OF WORK</b>				<b>37,260,000.00</b>

# Misconception Approach



Project



Designer

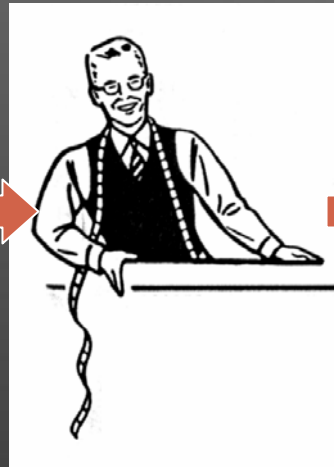


Material

# Value Engineering Approach



Material

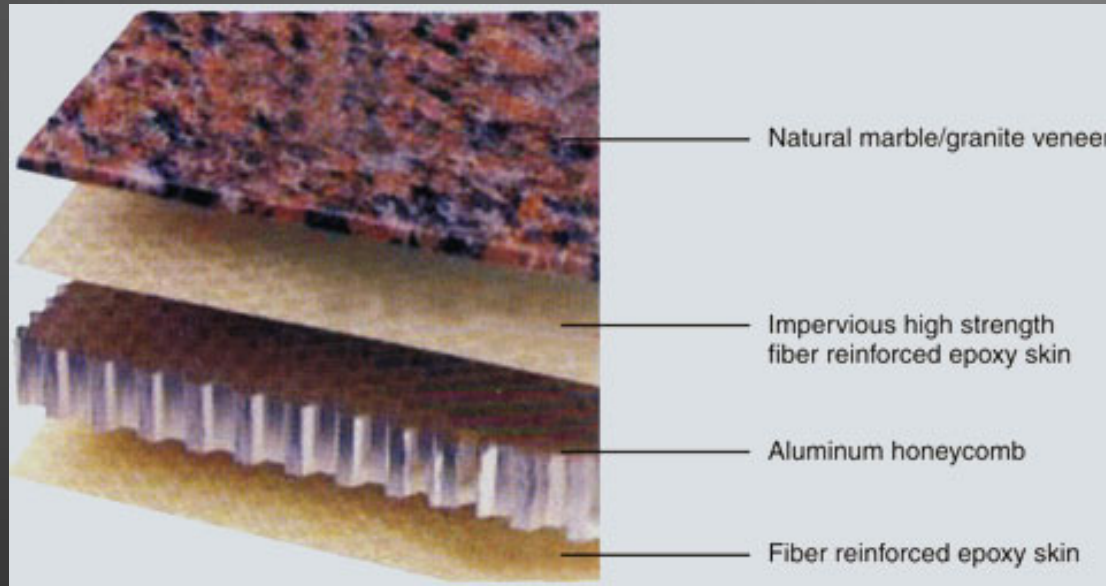


Designer



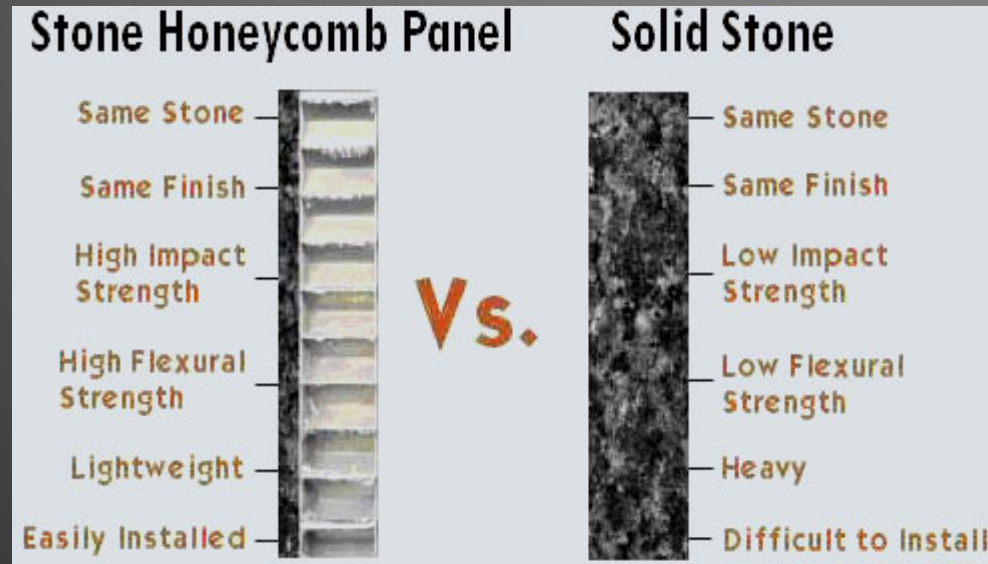
Project

# Stone Honeycomb



- ▶ Stone Honeycomb Panels are composite wall panels made up of a thin natural stone veneer reinforced with an aluminum honeycomb backing. The stone veneer can be almost any stone including granite, marble, limestone, slate and sandstone.

# Honeycomb vs. Solid stone



- ▶ Tough, durable stone + honeycomb panels offer fantastic impact resistance and flexural strength provided by patented manufacturing process. They can resist up to 60 times more impact than solid 3 cm thick granite.
- ▶ Stone + Honeycomb Panel is impervious to water penetration, even with open structured stones such as Travertine, Indiana limestone and French limestone. The fiber-reinforced epoxy skin directly behind the stone provides a waterproof barrier.

# Technical Properties

Temperature Strength	0.08
coefficient of expansion (per 100°C change) (mm/m)	1.2
Fire Behaviour (French NF P92-501)	Class M1 (CSTB)
Tensile strength (Mpa or N/mm <sup>2</sup> )	220
0.2%proof stress (Mpa or N/mm <sup>2</sup> )	130
Elongation 50,A	8%
Modulus of Elasticity (N/mm <sup>2</sup> )	7000
Yield Point or section modulus (cm <sup>2</sup> /m)	14
Sound insulation (dB)	22

Total Thickness	10mm
Cell Size	¼"
Top Sheet Thickness	1mm
Bottom Sheet Thickness	1mm
Tolerances (length, width & squareness):	( ±1.6 mm)
Weight (kg/m <sup>2</sup> )	4

Available Thicknesses	4 mm to 150 mm
Max. Width	1500 mm
Max. Length	5000 mm
Standard Size	1220 x 2440 mm

# Performance Evaluation

The matrix shown below summarizes the quality performance anticipated from two options. It is based on the quality of work anticipated of the two options as result of its panel processing system.

<b>Performance Comparison Matrix</b>		
<b>Criteria</b>	<b>Option 1 40 mm thick</b>	<b>Option 2 Alu Honeycomb</b>
<i>Material Selection</i>	1	2
<i>Panel Fabrication</i>	2	1
<i>Shipping &amp; Handling</i>	1	2
<i>Installation</i>	1	2
<i>Constructability</i>	1	2
<i>Safety during installation</i>	1	2
<b>Total Score</b>	<b>7</b>	<b>11</b>

**Good = 1**

**Excellent= 2**

As shown above, option 2 outscored option 1 and consequently the overall finishing product of option 2 is anticipated to be of higher quality than option 1.

# Specifications and Illustrations

Example made of black granite of thickness of 2 mm applied on Honeycomb panel of thickness of 5 mm.



Example made of two slabs  
of lightweight marble of sq.m. 3  
each one;



cm 250 x 122 x 2,  
cm 300 x 100 x 2.  
Weight kg 57,71 each.  
Lifted by hand!  
The laying in work  
will turn out easy,  
fast and so cheap.



With the application of the Honeycomb, from every single slab of stone material of the thickness of 2 cm, the double of sq.m. of surface original thanks to the split of the slab itself is obtained

Pregious materials  
with natural  
drawings they allow  
the formation of  
open stains  
perfectly symmetric



Slab made of  
arabesque marble  
lightened on  
Honeycomb.  
Thickness of  
the marble 5 mm.  
Honeycomb 13 mm  
thickness.

From 15 raw slabs  
of marble of cm  
250 x 122 x 2  
we have obtained  
30 panels of marble  
lightened of the same  
dimensions  
cm 250 x 122 x 0,5  
marble thickness  
+ 1,3 Honeycomb thickness





The Honeycomb panel is a structural composite panel in established like that bee nest:

the said outside coverings "skins" are constituted by a double fabric of bidirectional glass of the total weight of 600 Gr/sq.m. which the stone material is applied on in the minimum thickness of 2 mm. The thickness of 5 mm is the standard.





Said "skins" are soaked with special resins. The Core of the panel is constituted by a bee nest slab in aluminium.



The members of the Honeycomb panel are gathered and subsequently joined through a trial to high temperature.



The principal properties of the honeycomb panel are:

- 1\_ Raised resistance to the efforts of cut and flection;
- 2\_ Excellent stabilities;
- 3\_ Excellent resistance to the compression;
- 4\_ Flatness;
- 5\_ Lightness;
- 6\_ Resistance to the atmospheric agents;
- 7\_ Resistance to the temperature difference from  $-40^{\circ}$  to  $+90^{\circ}$

The reaction tests to the fire, according to the method CSE RF 3/77 and CSE RF 2/75 A to they make turn out the honeycomb panel in 1 CLASS. The thermoplastic film we use involves superior values of Peeling until 5 times as regards the normal thermosetting resin. Minimum 100 Newtons value (Resistance to the Peeling according to the EN 2243/3 rule). Such he tries it has been made also after a series of cycles of accelerated ageing which has not involved any deterioration of the characteristics of the panel. The honeycomb panel exposed to many ageing methods, does not show signs of reduction, of adhesion and resistance (certified n° 85086 of the Jordan Institute of Rimini - Italy) .



5 mm thickness of stone applied  
on 15 mm thickness of Honeycomb,  
for a 20 mm thickness total, weight  
18,92 kg/sq.m..

