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Textured concrete as an alternative cladding material instead of stone case of Amman

Dr Taiseer Al-Rawashdeh
Architecture Department, Al-Isra University
Dr Mahmood Soubeh
Architecture Department, Amman Al-Ahlyah University

Abstract
Many cladding materials can be found to cover facades, this study search about if the textured concrete can be an alternative cladding material to be used for facades instead of stone in Amman city with knowing that the textured concrete is an affordable material in Jordan and may offer the natural look of stone cladding.
Keywords: Textured concrete, stone cladding

Introduction

Cladding as we may also call it an exterior finishing system is done to protect the underlying structure as well as to provide a decorative finish.
There are many cladding materials that is used in facades and each is used according to the area that it is used in and its affordable materials, overall any cladding material must serve the same idea of providing a high protective covering system. And according to the nature of Jordan, stone been used in Amman's buildings since a long time ago as it's now used as a cladding material
At this research we aim to find if textured concrete can be an alternative cladding material to be used in Amman as it can be available and also can be as good as stone from the protecting side of view. We will study both stone cladding and textured concrete cladding and get in to expected results about if textured concrete can be used as an alternative cladding material for building the facades in Amman.
The main point of this study is to find out if the textured concrete can be an alternative solution as a cladding material used in construction of facades in buildings at Amman as an attempt to minimize cost and increase variety of materials used in facades of buildings in Amman.
This can be achieved through studying the existing situation in Jordan in terms of using stone which is the most common material used, and trying to find out if textured concrete can be an alternative that can be more efficient and has the same psychological and structural quality. Apart from the visual impact of concrete on the environment, the materials used in building construction affect the environmental role of buildings themselves.
Concrete has natural advantages that will be called upon even more in future, such thermal storage, durability, recyclability, and avoidance of environmental damaging chemicals. Governments are responding to changed community attitudes to increasingly mandate environmental responsibility. Concrete has to be positioned as the material of choice, with its positive attributes promoted.
The opportunity exists for all concerned with the manufacture, site processing and specification of concrete, to achieve a bright future for concrete wherever so desired. [1]

Stone Cladding

Stone cladding uses a thin layer of stone to cover a substrate such as concrete. It is generally preferred for its aesthetic appeal, durability, low maintenance and protective features. [3]
Limestone is the material used for cladding the facades in Amman city.
However, looking closely at the buildings, one begins to notice a variety of patterns formed by the stone blocks themselves and determined by their color, tool marks, size and arrangement. The limited flexibility, color and workability of limestone have contributed to a variety of wall patterns that reflect the individual style of the owner of a building, the architect, or both. These patterns often maintain a sense of austerity. [2].
Advantages: Stone cladding works well in the summer months since it does not trap heat, making it ideal for homes situated in warmer regions. It may require an additional insulation layer, however, to prevent heat loss in cooler weather.
Disadvantages: Stone cladding include the possibility of trapped moisture within the walls of the building and difficulty in its installation or replacement.

Stone cladding benefits

Installing stone cladding has numerous benefits, including:

- Fireproof
- Excellent thermal insulator
- Superior acoustic insulator
- Adds value to property. [4]

Quarries of Jordan

A variety of different stone formations can be found in Jordan that includes types such as limestone, granite, sandstone and basalt. Until now, limestone is the most quarried and used type of stone in Jordan. It is found in different parts of the country in a variety of color ranges: white, yellow, gray, brown and red. It is also exported to other countries in the region, either as a raw material or as a finished, cut and dressed product. [2]

As for the Jordanian quarries, nowadays limestone is being quarried in the areas of Maan, Ajlun, Irbid, al-Azraq, and the desert plains. See Fig (1).

The quarries of Maan, located in the southern part of Jordan, are famous for their white hard limestone, which is classified as a first grade stone, due to its hardness, purity and low porosity.

Ajlun, in the north of Jordan, has white limestone quarries of high strength, while the quarries of Irbid produce white and reddish colored limestone in addition to black volcanic rock. The desert stone is a white and reddish limestone that comes from the area of al-Azraq east of Amman, along the edge of the desert areas. Finally, the quarries found in the area of Salt near Amman produce soft limestone in white and yellow colors. [2].

Stone Surface Treatments

- By using a variety of tools in working the surface of stone, several different textures can be generated. Additionally, the exposed surface of the stone is sometimes intentionally left untreated or is treated by methods other than carving with conventional tools.

Stone construction in Jordan

The construction of a stone wall (coursed stone) makes little difference to its performance as a building element. The actual method of construction is likely to have been governed by local practices and availability of materials and by the era in which the building was constructed.

Traditionally, solid stone walls were constructed using lime mortar, and, if present, internal plastering, was also lime-based.

The lime mortar is both porous and flexible. Moisture is readily absorbed into the mortar during rainfall, and is able to evaporate away leaving the wall relatively dry. [3]

All stone used in stone masonry must satisfy requirements of strength, hardness, workability, durability and appearance. [4]

Textured Concrete Cladding

Textured Concrete cladding is cladding that can be fixed to the interior or exterior of a building. It is made from concrete that is pre-formed (using molds) into the desired panel shapes or into tiles. If no coloring agents are added, the concrete is a grey color, but with the addition of colorants many different colors can be achieved.

Stamped textured concrete walls are walls with a stamped texture. The stamping is done using the poured concrete technique, with the forms molding the concrete in the shapes of stones or masonry patterns instead of as smooth panels.

The resultant wall can look remarkably like stone or brick, which adds a natural rustic look to the wall you are constructing. This technique is less expensive and takes less time than building a stone or masonry wall. [5]

Textured concrete cladding benefits

There are several benefits to using textured concrete cladding. Firstly, **concrete is a more cost effective** option than natural stone as it is possible to create natural stone looks and finishes using the concrete. You can of course also have smooth, modern finishes in the color of your choice.

As well, you can have things as simple as false joints, right through to complicated leaf patterns pressed into the concrete during the molding stage. This makes **concrete cladding a surprisingly versatile choice**.

Concrete cladding is an extremely **strong form of cladding** and very **durable**. It is **low maintenance** and will require little in the way of maintenance (the occasional cleaning, or repainting if you have a painted concrete surface). **Concrete cladding stands up to the weather well**. You can affix the cladding to a timber backing, steel, or to brick walls, so it is equally suitable for new construction and existing construction alike.

Concrete itself is an **environmentally friendly material** and it is **recyclable** should you choose to remove the cladding from your building for any reason. It is **quick to install** and is great for insulating as **concrete has a high thermal mass**. You can also place other insulating materials behind the concrete in order to further improve its performance. Concrete can also provide you with **good sound insulation**.
Because the cladding is made from concrete, it is impervious to termites and other insects, will not rust, crack or warp, and it stands up well in the event of a fire. [6]

The factors contributing to a successful batch of concrete are

- Precise measurement of water content;
- Type, size, and amount of cement and aggregate;
- Type, size, and location of reinforcement within the concrete pour to compensate for the lack of tensile strength basic in concrete;
- Proper curing procedures during normal hot or cold weather conditions.[5]

Curing Procedures

1. Apply a membrane-curing compound—either by spraying or rolling on the surface immediately after the troweling process on slabs has ceased, or on walls, columns, beams, after the forms have been removed.
2. Curing by water in other than cold-weather conditions is acceptable, as long as it is continuous.
3. Waterproof paper, applied directly over the concrete surface after it has received a spray of water, is often effective.
4. Damp burlap, free of foreign substances that could leach out and stain the concrete, is also a proven curing procedure, as long as the burlap is kept moist.
5. Polyethylene sheets can be used as a blanket in much the same manner as waterproof paper, as long as its edges are lapped and sealed properly.
6. Damp sand or straw is also used on occasion, when nothing else is available. These materials must also be sprayed from time to time to maintain the moisture content. [5]

Color in textured Concrete Walling

An unlimited range of colors and textures can be provided on the surface of concrete. The method of achievement varies depending on whether the treatment is undertaken when the concrete is in the plastic or the hardened state, and whether walling is cast in site or in a precast factory. [6]
Color consistency is usually an important consideration in architectural concrete. Its achievement requires an understanding of the many factors that can influence the color.
These include the concrete constituents and their proportions, pigments, method and duration of curing, form oils, release agents, and the type and absorbency of the formwork. [6]

Comparison of stone cladding and textured concrete cladding, Table (1)

Comparison by	**Stone Cladding**	**Textured Concrete Cladding**
Manufacturing process	Cutting the stone from the mountains and then cutting it in quarries and form it then uses it in site.	Mixing sand withcoloredsand and adhesives all with white cement making a mixture in a powder form.
Implementation	• Construct: using mortar. • Cladding using mortar and Installation of stoneonacornersofmetal.	• Mixed with water in amounts manufacturer apply. • Implemented after a face of coarse plasterer and placed on layers.
Isolation	• Stone is astandalonewaterproof material and therangesdependingonthequalityoftheston e. • Polystyrene is placed as a thermalinsulation.	• Waterproof insulation materialintheouterlayers is applied. • Thermal insulation material isplacedinthefirstlayers.
Texture	According to the surface treatments applied.	• Soft • Rough • Mbzarh + glassstones
Cleaning	• Tossed sandy • Brush spool • Finallayerofthe seller	Final layer of the seller is applied it gives gloss and a layer of water insulating material is applied too.
Places ofUsage	Indoor, outdoor, flooringandwalls.	Indoor, outdoor, flooring, walls and ceilings.
Cost	According to: • Quality of the stone • Extraction areas • Finishing	According to: • Places that it is used in and colored typology that is used in • Texture • Number of layers
Permanence	More Permanence.	Less Permanence and needs servicing.

Table (1) - Comparison of stone cladding and textured concrete cladding

The textured concrete approved that it can be more efficient material to be used and it gives a modern view of the design that it is used with even from the cost side of view the textured concrete approved that it is a cheaper cladding material.
For sure the stone cladding got its own value but that does not make the textured concrete a useless cladding in Amman city.

Conclusion and recommendations

At the conclusion we will know that the whole study made us understand the differences between stone cladding and textured concrete cladding and not just about what the two cladding types just are but also we supposed to be knowing how does textured concrete approved being an alternative material to be used instead of stone in facades in Amman city.
Further studies about the textured concrete is recommended and the way it been used in new more modern ways and studies about the way that the textured concrete does effect specifically on the city and the people of Amman.

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