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Construction Management Option



Murur Mixed Use Complex
Ajman, United Arab Emirates

Proposal

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Project Team:

Owner: Ajman Traffic Department
A/E: AJ Design
G/C: Ali Moosa & Sons Contracting
HVAC: AMS Contracting-MEP Division
Super-Structure Designer: Freysinnet
Landscaping Works: Lea

The Buildings:

The project has a shopping mall and 2 towers
The residential tower is 20 floors + penthouse
The office tower is 26 floors
The shopping mall is 3 floors
Total parking spaces are 1,357 spaces
3 Basement Parking + 2 upper level parking

The Project:

History: The Site was previously occupied by Ajman Traffic Department, and this is where the name comes from, since Murur means Traffic.

Size: 2,300,000 Square Feet

Delivery: Design-Bid-Build

Cost: 600 million AED = 164.4 million USD

Structural and MEP Systems:

Structure: Reinforced Concrete Building, 280 mm slabs, columns range from 300 mm to 1600 mm

Foundation: 2000 mm thick R.C.C. raft on friction pile foundation

MEP Systems: Power delivered by FEWA at 240/415V, 3 phase, 4 wires, 50 Hz.
Chilled water HVAC system



A. Executive Summary:

This proposal discusses the three analyses that will be researched as a part of the final thesis report on the Murur Mixed-use Complex. The topics are about photovoltaic panels, louvers used for solar shading, and prefabrication of the interior work on the project.

Analysis 1: Photovoltaic Panels

Energy is a major issue that affects all industries including the construction industry. Energy cost is rising constantly and alternative energy sources are being developed every day. Solar energy is one of the cleanest energy sources on the planet, and with the location of the Murur Complex project, photovoltaic solar panels can be a good source of energy.

Analysis 2: Solar Shading

Due to the high solar irradiance in the region where the project is located, windows gain a huge amount of heat which enters the building and cause discomfort to the tenants. Solar louvers can keep the direct sun light off the windows and save a large amount of BTUs each year.

Analysis 3: Interior Work Prefabrication

Time and money are two of the most important aspects of any project. Interior finishes are one of the most time and labor consuming activities in construction projects. Prefabrication has gained a lot of attention from many contractors in the past few years. Prefabricating the interior work has many benefits especially to large projects like the Murur Complex.

B. Project Overview

Murur Mixed-use Complex is a huge project located in the heart of the city of Ajman in the United Arab Emirates. The project consists of a 3 story shopping mall, a 26 story office tower and a 20 floors + penthouse residential tower. The project is a reinforced concrete project. The total area of the project is about 2.3 million SF. The exact cost was not provided but an estimate of 600 million Dhs (\$164 million) was given. The projected completion date is November 8th, 2011.

The Site of the Murur Mixed-use Complex is located in a busy part of Ajman City. It is surrounded by a populated area and main roads all around. In such cases, construction of high-rise towers is always a challenge for the contractor. Luckily, there is an empty plot on the other side of the main road that the contractor was able to lease. This plot is used for the trailers, staff parking, and for storing materials that are needed for this fast track project.



The contract between the client and the General contractor, Ali Moosa and Sons is a lump sum contract. The delivery system in the project is design-build.

The project does not seek LEED accreditation and value engineering is not focused on in any part of the project.

C. Analysis 1: Photovoltaic Panels

Problem Identification:

With energy prices rising every year and with the desire of cleaner air around the world; the search of alternative energy sources does not stop. Companies invent and develop new technologies each day to make alternative energy sources less expensive, more reliable and efficient.

Potential Solution:

Photovoltaic panels can produce electricity. It has a high initial cost but very low maintenance and operating cost along its lifetime.

Methodology:

- Research PV panels and solar systems
- Determine the desired type and quantity of panel
- Analyze the connection between the solar system and the building electric system
- Determine the cost of the system's material and installation
- Calculate the discounted payback period of the system



Expected outcome:

Solar energy produced by photovoltaic panels can be above average due to the high solar radiation and high clearness index in the UAE. Research and design will determine the power produced by the panels and the cost of the material and installation of the system.

Electrical Breadth:

Connecting the electrical power produced by the photovoltaic solar panels to the building's power system will require some analysis. The calculations of the power produced, the size of the inverters and wires, and any other electrical equipment will be discussed in the electrical breadth within the photovoltaic panel's analysis.

D. Analysis 2: Solar Shading

Problem Identification:

Direct sunshine has a great effect on the interior climate of a building. In the United Arab Emirates, most of the days of the year are sunny, and the country is located very close to the Tropic of Cancer which makes the sunshine at its highest effect during the summer months. Most of the new buildings' exteriors are glass curtain walls, and this type of exterior is the most affected by the sunshine. The office tower is a glass curtain wall building and the sun will be heating it all year around.

Potential Solution:

Solar Shading by solar louvers can be used to reduce the direct sunshine heating the interior of the building.



Methodology:

- Research the solar shading techniques in the industry
- Determine the type of louvers to be used as solar shades
- Research the energy gained by the building with and without the shading
- Analyze the constructability if the solar shading on the building exterior walls
- Determine the cost of the system's material and installation
- Calculate the system's discounted payback period

Expected outcome:

It is believed that the solar shading will save a big amount of energy and the system will payback in a short period of time. Research and calculations will determine the effect of the solar shading louvers and if it is worth installing.

Mechanical Breadth:

The solar shading will lower the number of BTUs that the building interior is getting by the solar radiance. The number of BTUs saved will be calculated and the savings in the mechanical system of the building will be discussed as a mechanical breadth in the solar shading analysis.

E. Analysis 3: Interior Prefabrication

Problem Identification:

Time and money are the most important aspects of any project. Interior work takes large percentage of the total project time to complete. Many aspects also take part in expanding the time needed to finish the interior work such as site congestion, and lack of storage area. Currently, interior work in the Murur Mixed-use Complex takes more than 400 days and it is on the critical path of the project. All the interior work is done on site and all the material is stored in different areas around the site.

Potential Solution:

Prefabrication of the interior work might be very beneficial to the project.

Methodology:

- Research prefabrication technologies in the industry
- Contact industry specialties (from AE 476)
- Determine the most effective areas in Murur Complex for prefabrication
- Calculate the time and cost saved by prefabrication

Expected outcome:

After completing the research about prefabrication, it is expected that the project will cost less than the original cost, and finish in a shorter period of time, with keeping the quality of work in the required range; and most probably better than the original quality of work.

F. Weight Matrix

Table 1 is a weight matrix shows the distribution of work on each core area of investigation. The effort allocated for each core is represented by percentages.

Analysis Description	Research	Value Engineering	Construction Review	Schedule Reduction	Total
PV Panels	-	15%	15%	-	30%
Solar Shading	-	20%	15%	-	35%
Prefabrication	20%	5%	-	10%	35%
Total %	20%	40%	30%	10%	100%

Table 1

G. Conclusion

Through research and studies, the proposed technical topics will be analyzed to prove their efficiency and effectiveness. It is expected that the photovoltaic panels will provide an amount of energy and that the system will payback in a reasonable period of time. The solar shading will probably save a big number of BTUs that will affect on the mechanical system of the building. Prefabrication is predicted to have the most benefit on many aspects of the project, cost, schedule, and quality of work can be improved through prefabrication.