Building Construction for Palestine Refugees

Mazzeh Co-ed School at Mazzeh Camp, Syria
Designed by UNRWA Design Unit, Technical Office, HQ (A), Jordan

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Acknowledgement

Firstly: I wish to thank the Swedish Government (represented by ***SIDA***) for enabling me to participate in this course, from which I hope to learn many things among them:

Learn from all Lecturers at LTH, and specifically at LCHS (the real organisers of this course) the modern ways of construction technology and construction management, by which I can acquire more experience and thus improve my assistance to Palestinian refugees and also Jordanian citizens.

I had a chance to meet 47 different participants from 30 different countries (in addition to the Swedish and Danish) supervisors, and thus learn more about their culture, building technologies and hear a lot about their living conditions.

I have lived within the local society of (Lund-Sweden), among a friendly people that have received us in a very good way, and tried to help us as much as they could in order not to feel strange or Homesick.

Get a direct contact with environmental friendly living conditions (preserving natural resources and introducing more green areas), and investigate ways of transferring these conditions to my country, and implement them within our standards and building specifications.

Secondly: A special thanks to my Agency for putting up with two months of my absence from work in order to familiarise myself with new technology that can benefit me as much as it will benefit my work in UNRWA.

Thirdly: The last but not the least, I wish to thank my wife for standing with me in these two months and carrying the burden of the family alone.

Summary

The project I am going to discuss in this paper is an ***UNRWA*** two storey school building, comprising nine standard classrooms, three administrative rooms, one science laboratory, one library, one multipurpose room, one girls toilet block, one boys toilet block, two stores and the associated landscaping around the building. This building is in MAZZEH Camp, Syria.

UNRWA, the ***United Nations Relief and Works Agency for Palestine refugees in the Near East*** has been providing Education, Health Relief and Social services to registered Palestine refugees in Jordan, Lebanon, the Syrian Arab Republic, and the West Bank and Gaza Strip for nearly 50 years (UNRWA looks after all persons that lived in Palestine before the year 1948, whether they were Palestinians or from different nationalities). Beginning operations in May 1950, its task was to give emergency assistance to the hundreds of thousands of Palestinians displaced by the Arab-Israeli conflict. Now it is providing the services for 3.5 million refugees (according to 1997 statistics). The mandate of the Agency, deriving from a resolution adopted by the ***United Nations General Assembly*** in December 1949, has been renewed repeatedly, pending a solution to the Palestine question. The seventeenth mandate extends to 30 June 1999.

The projects that are designed by UNRWA's Technical Office are for Palestinians living in different countries, this means we have to follow the local regulation in each country we design for. Our policy is to build low cost buildings with long life; low maintenance cost, and provides the best service for the users. In order to do this, we have to regularly update our standards to meets the needs of our users within our limited budget. We prefer to use local products in our buildings, and to give the tenders to local contractors, which in turn will provide work for Palestinian refugees.

According to the municipal regulations in Jordan, certain area of the land is used for building purposes; the rest is left for services and to provide distance from the

neighbouring houses. These areas are divided into 4 categories:

Category “A”: the land area is 1000 m² and only 36% of the land is used for building purposes.

Category “B”: the land area is between 750 - 1000 m² and only 42% of the land is used for building purposes.

Category “C”: the land area is between 500 – 750 m² and only 48% of the land is used for building purposes.

Category “D”: the land area is between 250 – 500 m² and only 52% of the land is used for building purposes.

Smaller pieces of land (150 m²) can be provided by the government to the poor people for a long term repayment plan, provided that they will build on it within 2 years from owning them, otherwise the government will get it back from them and give it to another family.

UNRWA has specialised offices for the design and the supervision of the building construction. The design office is called ***Design Unit*** – which is responsible for producing all the drawings and contract documents and send it to the other office to do the tendering procedures. The second office is called the ***Technical Department*** – which is responsible for carrying out all the tendering procedures, analysing the tender, recommending the contractor, and carrying out all the on-site supervision works. Later on, the entire maintenance programme is prepared by this office and supervised by them (the same like the construction procedure).

After the peace treaty between Jordan and Israel, the construction sector in Jordan has realised a big jump towards infrastructure construction for tourism, which has resulted in building more than 5 Big hotels in Amman (the Capital only), that will accommodate more than 1000 rooms, in addition to preparations for the millennium celebrations in Jordan and the Palestinian National Authority areas (which expect about 40 million tourist for the coming year). This boost in the construction sector has given opportunities to workers in Jordan who has suffered from 2 years of stagnation in this sector due to the world’s bad economic conditions.

In this paper, I will show the procedures used in my country for buildings works, maintenance works, and methods used for planning. Although there is a big difference between our methods and regulations in the constructions sector and those applied in Sweden, I have learned a lot about the way things could be improved back in my country, using the information technology, proper planning, property management and long term scheduling for building and maintenance costs.

The course was divided into three stages:

Design stage

Production stage

Property management stage

The first stage covers almost the same procedures we have back at my country, but I have learnt a lot about ***Project Planning and Financing*** which involves the preparation of cost estimate, expenses and the final cost of the structure.

The production stage covers the tendering procedures and the construction works. The Swedish system takes a different approach in dealing with these issues, I think we are not ready yet in my country to apply the same approach, but I learnt more in the economic control.

The last stage is important for me, because it has not yet been taken seriously in my country, due to shortage of funds, but after calculating the risks of delaying the maintenance works, which could lead to the demolition of the structure, I think I would rather put a budget for the maintenance now, than loose the structure in its middle life cycle later.

Introduction

Basic Information about Jordan

Jordan is a middle-east country with a size of about 91,880 square kilometres; most of it consists of arid desert topography. Dead Sea, which is located to the Far West part of the country, is considered the lowest point on the surface of earth (more than 400 meters below sea level), and Jabal Ram (1754) is Jordan’s highest point. Except for a short coastline on Gulf of Aqaba. The country is Landlocked except at its southern extremity, where nearly twenty-six kilometres of shoreline along the Gulf of Aqaba provide access to the Red Sea. Palestine and Israel surround it from west, Iraq and Saudi Arabia from east, Syria from north and Saudi Arabia from south. A great north-south geological rift, forming the depression of Lake Tiberias (Sea of Galilee), the Jordan Valley, and the Dead Sea, is the dominant topographical feature.

Photo 1: Map of Jordan

When the Emirate of Transjordan was created in 1921, the vast majority of the people consisted of an assortment of tribally organised and tribally oriented groups, some of whom were sedentary cultivators and some nomadic or seminomadic. The formerly rural society of Jordan had been transformed since independence into an increasingly urban one; many Transjordanians had migrated from their rural and /or desert villages to urban centres in search of work for themselves and education for their children, by 1985 nearly 70 percent of the population resided in urban centres that were growing at an annual rate of between 4 and 5 percent.

Jordan has experienced three major immigrations which, in addition to the annual growth rate, has pushed the population from 340,000 before the 1948 war to reach 4.5 millions in 1997 (1.4 ***million of them are Palestine refugees***, representing about 33 per cent of the country's total population and 41 per cent of all refugees registered with UNRWA). The first immigration was as result of the 1948 war between Arabs and Israel, the second one was after the 6 days war in 1967 (between Arab countries neighbouring Israel and Israel) and the third one was as a result of the Gulf war in 1990 between Iraq and the 30 Allied countries, which brought back to Jordan more than 500,000 persons who used to live and work in most of the Arab Gulf countries. These compulsory immigrations have introduced a huge pressure on the number of apartment or houses needed every year as predicted by the normal growth of the housing market.

Basic Information about UNRWA

UNRWA, the ***United Nations Relief and Works Agency for Palestine refugees in the Near East*** has been providing Education, Health Relief and Social services to registered Palestine refugees in Jordan, Lebanon, the Syrian Arab Republic, and the West Bank and Gaza Strip for nearly 47 years. Beginning operations in May 1950, its task was to give emergency assistance to the hundreds of thousands of Palestinians displaced by the Arab-Israeli conflict. The mandate of the Agency, deriving from a resolution adopted by the ***United Nations General Assembly*** in December 1949, has been renewed repeatedly, pending a solution to the Palestine question. The seventeenth mandate extends to 30 June 1999.

UNRWA is a strange creature: a humanitarian agency set up to provide temporary answers to questions which can only be permanently resolved by political means; provided with a mandate to give short-term relief which has evolved into an emphasis on the kind of public service activities normally undertaken by governments; a United Nations agency which represents the will of the international community yet which is staffed largely by Palestinians, most of them refugees themselves.

Today, UNRWA's largest programme is education, taking up 47 per cent of the 1997 budget, followed by health at 17 per cent, and relief and social services (including the construction works) at 11 per cent of the 360 million US $ yearly Budget, the rest 25 percent of the budget is spent on the Support and Common Services. Special assistance of 222 million US$ was given to ***UNRWA's Peace Implementation Programme*** (1993-1998) after the Oslo accord was signed between the Palestinians and the Israeli's (44 per cent of it came from the European Countries). The PIP funding allowed UNRWA to finish building 13 Schools, six additional Classrooms, 11 Specialised Rooms, 4 Health Centres, 3 Community Rehabilitation Centres, and 4 other Specialised Centres for women and children. In addition to that ***500 Special Hardship Families (out of 195,359 Families which represent 5.5% of all registered refugees)*** benefited from PIP fund to rehabilitate their shelters, and the Agency was able to carry out comprehensive maintenance on 20 schools.

Over the past 46 years, the number of Palestine refugees registered with UNRWA has increased from 876,000 in 1950 to 3.5 million in 1997 (32.5 per cent of them still live in camps), and they are served by 21,725 staff members mainly Palestinians with 123 International posts only.

Despite the increasingly serious financial crisis that UNRWA faces nowadays, the international community considers UNRWA a stabilising factor in the Middle East. The refugees themselves look upon UNRWA programmes as the international community's guarantee that their claim to a just and comprehensive settlement has not been forgotten.

Aim of the paper: A review of the Construction Sector in UNRWA

In this paper I will be discussing the construction works that are prepared by the Technical Office and executed under the supervision of the Technical Departments working in the five fields of operation in which UNRWA is carrying out its programmes (Jordan, Syria, Lebanon, West Bank and Gaza Strip), the last two fields are now known as Palestine and under the control of the Palestinian National Authority.

When UNRWA first started its work on 1949, the main aim was to help Palestine refugees to fulfil their daily needs (as they were immigrated from their land) until they have the chance to go back, but when the political situation became more complicated, UNRWA found that she should provide more help to those refugees (such as education, health care), which later on lead to the construction of the facilities that can provide such services.

Due to the poverty that was developing quickly among the families living in the refugee camps (special areas were given by the hosting countries through UNRWA to the refugees, administered under the auspices of UNRWA), UNRWA was then involved in helping the hosting countries in providing some sort of a place to protect those families from the hot sun in summer and the cold and rainy weather in winter. This kind of protection is called Shelters (which is only provided to the poorest sector of refugees who can't support themselves or sometimes don't have relatives in the same hosting countries), started as a temporarily structure made of Zinc sheets walls and roof, which sooner was transformed to a concrete block walls with a zinc roof, and finally to a reinforced concrete roof (after getting the approval of the hosting countries, so that this will not be understood as settlements for Palestinians in the hosting countries and forgetting the main issue, which is getting those refugees to their homeland Palestine).

The Technical Office in UNRWA takes the role of monitoring the works carried out by the five Technical Departments in the areas of operation. The Designs are mainly prepared by three design units: The first one is located in Jordan and prepares the Contract documents for the Fields of Jordan, Syria and Lebanon, and also supports the other two designs units which are located at West Bank and Gaza Strip.

The most distinguished designs prepared by my Design Unit at HQ (Amman) are:

Beddawi Housing Project for displaced families (at Beddawi Camp, Lebanon)

Waqqas Comprehensive Services Compound (at the Jordan Valley, Jordan)

The first project was prepared as an exceptional case to find a proper housing for displaced families, who escaped from their villages in the southern Lebanese area, due to the Israeli invasion to that area (UNRWA is not involved in any political settlements in the hosting countries, but this was a special case to move the villagers who settled down in UNRWA's Beddawi camp school yard, and formed a zink sheet colony). The idea behind this project was to provide low cost building with acceptable humanitarian conditions for the displaced people.

The other project comprises of a Health Centre, a Women's Programme Centre, a Kindergarten and a Community Rehabilitation Centre, all of which were cited in different places before, which made it difficult for the local community to get the benefit of these facilities. These centres and programmes are all community managed. The compound is a good example of how host authorities, donors, UNRWA and the local community work together to bring a project to fruition.

Organisation of UNRWA's Technical Office

The Technical Office consists of [see fig (1)]:

Head of the Technical Office

Senior Structural Engineer

Senior Architect

Senior Quantity Surveyor

The work of this office is mainly to monitor the construction works carried out in the different fields of operation, and check the design work done by the three design units situated in three different fields.

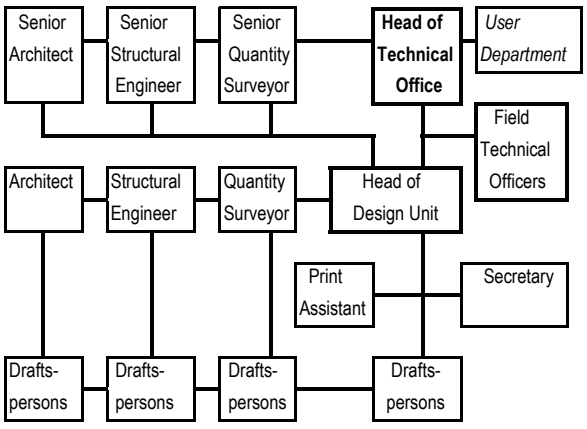

Fig. 1: Organisation Chart for the Technical Office (Design Office)

Organisation of UNRWA's Design Units

The Design Units consists of:

Head of the Design Unit (who is usually an Architect).

Structural Engineer, who is responsible for all structural design works, and producing the structural drawings carried out by the draftspersons.

Assistant Architect, who is responsible for preparing the preliminary and final architectural designs and drawings along with the main architect (who is the HDU).

Quantity Surveyor, who is responsible for preparing the Bills of Quantities, cost estimates, the contract forms and conditions.

Draftspersons.

Secretary and Print assistant

Design of Buildings

Building Sector in Jordan

The building works in Jordan are carried out by three different sectors:

The Governmental sector.

The private sector.

The Non-Governmental Organisation Sector.

The first sector is mainly concerned in providing low cost housing units for the poor people (Low class, and sometimes for Middle class governmental employees), through building housing complexes and housing cities, and also in providing the infra-structure for the whole country. This role is now played by the ***Ministry of Public Works and Housing*** which is involved in the infra-structure, and the ***Ministry of Rural and Municipal Affairs*** which is mainly carrying out the Housing projects along with the ***Housing Foundation***.

The second sector is mainly involved in building housing units, apartment and Villas, and sell them to the Upper Middle class (who can afford buying such luxurious unit), and this sectors has encountered some success during the immigrations that flooded Jordan during the past 20 years, therefore it was recently organised through the ***Jordan Association for the Housing Establishments***.

The third sector which includes my organisation (UNRWA) is a non profitable sector that provides service buildings for the community, and after a fixed period most of its buildings will become the property of the Jordanian Government or its municipality. This sector is mainly involved in building Schools, Community Centres, Youth Centres, Mosques, Churches, and the like.

Building Regulations in Jordan

Lands in Jordan are divided into four categories, (depending on the organisation of the municipality council), category A, B, C and D. This categorisation is mainly used to define the percentage of the land area to be use for the building, the rest of the area is for services,

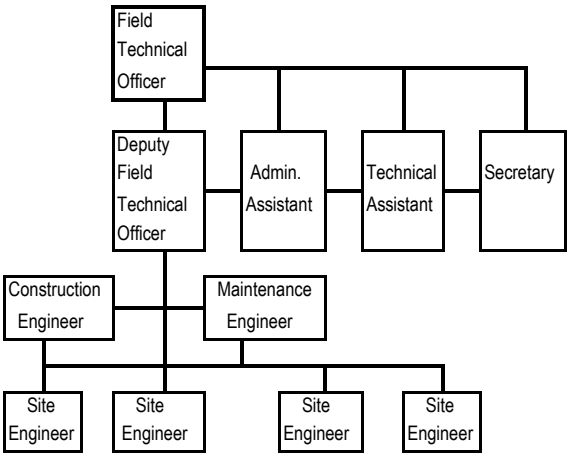

Fig. 2: Organisation Chart for the Technical Department (Supervision Office)

and to keep distance from the neighbouring pieces of land. The first step in the design process is getting a new ***General Location Drawing*** for the location of the land (this can only be found at the ***Land and Survey Department)***, and the last map of streets passing that area to check of their will be any deduction of the land for the common use (this is called the ***Site Organisation Drawing*** and can only be found at the ***Municipality Office***. The second step is signing an agreement with an Engineering Office registered at the ***Jordan Engineers Association*** to carry out the design works for the project and later on the supervision works (in order to ensure that the works are carried out according to the drawings, the local ***Jordanian Code of Practise,*** the ***Jordanian Technical Specifications for Building Works*** and the municipality regulations (both the Code and the Specifications are issued by the ***Ministry of Public Works and Housing***).

No work can be carried out in the Building sector without the approval of two Authorities:

Jordan Engineers Association (which is responsible for the technical side of the building works) approves annually about 4 million m² of building drawings ready for the building permit from the Municipality. It is the only authority that can give an approval on the design from the Structural, Mechanical and Electrical point of view. If the Association doesn't approve the designs, then the Designing Office is called for a meeting in the Association, and gets the explanation for the rejection, and unless he proves that the building design is safe according to the ***Jordanian Code of Practise*** (which is mainly derived from the British and American Code of Practise), he will never be able to build the building.

The Technical Committee in the Municipality of concerned town is the Official Authority that gives the building permit (depending on the technical approval of the Jordanian Engineering Association). The committee consists of two Engineers and some administrative persons, who check if the land is in the housing area or in an agricultural area (where only a small service house is allowed). If the approval of the Association was not granted, then no permit will be issued.

The common residential buildings are allowed to go as high as 4 floors from the highest street level passing near the land. Some land lie on two streets, therefore they can increase the number of floors built on it, since they take 4 floors from the highest street of the two around the land, which in turn raises the price of the land, that is usually bought by housing establishments. Housing projects carried out by the governmental establishments can go as high as 6 floors above the highest street passing by the land.

Design stages in UNRWA

Preliminary Drawings

The design stages usually are defined from the beginning. They start when we have the requirements from our client or user (the department that is going to use the building). Then we prepare the preliminary drawings that mainly consist of architectural plan of every floor and one elevation and one section through the building, in order to give an idea to the user on the location of the rooms and services, and also on the facades (in this stage, we don't make any detailed drawings, this will be done later after we receive the approval on the preliminary design from the user). In case we receive some comments or a proposal to change something in these plans, we usually have a joint meeting between the designers and the users to discuss these changes, before we reach the detailed design stage and start preparing the architectural drawings, the structural drawings and the contract documents.

Detailed Drawings

The detailed design stage consists:

Architectural Design
Structural Design works
Electrical Design works
Mechanical Design works

The architectural design takes into consideration using low cost local materials, preserving the overall spirit of the camp areas and providing enough natural lighting into the building. The circulation inside the premises in of a great importance especially when dealing with public places like schools or health centres. Recently we have taken into consideration all measures to ease on displaced people the entrance to school, the circulation inside, access to toilet blocks, special toilet suites for handicapped, and the accessibility to the Laboratory, Library and the Multi-purpose room. As a matter of fact, UNRWA is considered a pioneer in this field and we have received many visits from both private and public sectors to benefit from our experience in this field.

Due to the economical situation in the fields of operation for UNRWA, the need for more Shelters have endorsed more pressure on the design units, which led to the preparation of a typical design for these shelters. This design comprises a 4 x 4 m room, a 2 x 2.5 m Kitchenette and a small toilet room 1.5 x 1.5 m. The Kitchenette is provided only with a sink, small cupboard and a covering marble stone.

Design of Buildings with respect to Climate Conditions and Building Materials

Jordan consists mostly of arid desert topography except for a small strip in the Jordan valley adjacent to the Dead Sea. The temperatures vary from –3 to 14 in winter (sometimes we have snow and as low as –12 in high mountains), while in summer we have temperatures varying from 25 to 45 degrees centigrade (especially in the Jordan valley. Therefore when designing for areas in the higher region we should take into consideration the thermal insulation of the building, which could be done by building the external walls in two layers:

First case:

1- 20 cm thick Plain Concrete wall with reinforced strengthening columns and 5 cm stone cladding.
2- 5 cm void for thermal and sound insulation sometimes filled with an insulating agent such as Rockwool or polystyrene boards.
3- 10 cm thick Hollow Concrete Blockwall as an inner wall.

Second case:

1- 20 cm thick Hollow or Solid Concrete Blockwall between structural bearing columns or 20 cm Plain concrete bearing wall strengthened with reinforced concrete columns.
2- 5 cm void for thermal and sound insulation sometimes filled with an insulating agent such as Rockwool or polystyrene boards.
3- 10 cm thick Hollow Concrete Blockwall as an inner wall.

The first case is used inside Cities and Municipal areas, because they have strict rules regarding the buildings in this area, while the second case is used in Camps and remote area. For UNRWA buildings, it is too expensive to build according to these cases, so we usually use a 20 cm thick Hollow Concrete Blockwalls on Closed facades, and a 15 cm thick Hollow Concrete Blockwalls on facades that have windows or openings in it. For internal partitions we use always 15 cm thick Hollow Blockwalls in all cases, except for partitions in toilets, where we use a 10 cm Hollow Concrete Blockwalls.

Wall and Soffit finishes: All exposed surfaces of concrete and block are then covered with two coat concrete plastering for internal surfaces and concrete rendering for external surfaces with approved dampproof admixture (whether they are walls or soffits), including the installation of 200 mm wide reinforcing wire mesh for all Electro-mechanical chases, and to the junctions between blockwork and concrete members. We also use the Stop beads, Angle beads, Movement beads for all corners of columns or walls, or expansion joints, or the connection between two different materials (such as Blockwork and Concrete members. The expansion joints are filled with Bitumen impregnated fibreboards, and finished with polysulphide mastic sealant. The finishing for these walls and soffits is two coats of Emulsion Paint for internal surfaces, and Acrylic based coating for external surfaces. All walls in toilets are usually finished with Gazed wall tiles after plastering.

Internal floor finishes: All internal floors receive terrazzo concrete tiles in rooms and corridors with terrazzo skirtings, and ceramic floor tiles for toilet and kitchens with ceramic skirtings (where applicable).

External floor finishes: All external floors are finished with concrete pavements with an average thickness of 11 cm sloping away from the building with joints at 2m on centre over a 15 cm compacted granular fill. Exposed pavements receive a broom finished surface, while the pavements topped with concrete tiles have only wood trowelled finishing.

Windows and Opening: All windows are Aluminium with 6 mm single glazing, usually sliding type and not hinged type to avoid any hazards for students when opening the sides inward. Security steel frames and wires are mainly provided to protect the glazed panes from children's stones, and not as a protection from burglars, because they are not as good as burglar bars.

The only Furniture provided during the construction works are the fixed furniture parts, such as worktops in Laboratory and Multi-purpose rooms, cupboards, Teacher benches and experiment benches in Laboratory, Wooden shelves in Library and specialised furniture in Vocational rooms.

Mechanical works Design involves the water distribution network, water fittings, drainage for washbasins and sink, rainwater collection pipes, surface water disposal, and the sewage collection network. Central heating system is not used in our premises due to shortage of funds, so in some cold areas, we just provide openings for Diesel stoves (to be fixed later when bought by the money provided from the school budget).

Electrical works Design involves providing the Main Electrical Distribution Board, along with a Sub-Distribution board for every floor of the building, lighting units and switches, sockets and some points for loud speaking system. Every building is provided with an Earthing system connected to the Main Electrical Distribution Board, and fixed according to the local regulations.

Jordan has an Arid climate (as mentioned earlier), therefore, we have to provide all the buildings with water storage tank (usually made of Galvanised zinc sheets). For bigger installations such as Schools, Health centres and Community rehabilitation centres we usually build an under ground water reservoir of about 27 m^3 volume, especially that some areas in summer receive the water from the municipality once a week and sometimes once a month.

Earthquake Design

Some parts of Jordan fall within the Jordan Valley rift that was formed due to a destructive earthquake that hit the whole region many years ago. Therefore Jordan is considered an active area for earthquakes. This has led to the development of the ***Local Jordanian Earthquake Code***, which is compulsory for all the buildings higher than 12 m or 4 stories. Accordingly, UNRWA was a pioneer in this area and started designing the whole buildings taking into consideration the above-mentioned code. The code divides Jordan into four active areas, the most dangerous one lies adjacent to the Jordan valley, and as you go further east, the possibility of an earthquake effect reduces to the minimum. Taking this factor into

consideration (earthquake design) has increased the cost of buildings designed for UNRWA, and accordingly this was shown on our preliminary study for any new project presented to Donors.

Preparing Contract Documents

The *Contract Documents* consists of:

Tender Form
Building Contract
General Notes and Instructions on pricing and measurements
Particular Conditions
Preliminaries
Bills of Quantities
Schedule of Basic Cost
Drawings

Tender Form

In this form we have all the required bank guarantees from the contractor, and all the conditions required for the acceptance of his tender to be studied along with other contractors offers [see Fig 3].

Building Contract

In the Building Contract we define all the rights of the Client and also all the rights of the contractor in addition to the obligations of the two parties. We have sections dealing with Insurance Policies, Time Extension, Sub-Contractors, and Liquidated Damages.

General Notes and Instructions on pricing and measurements

This section is prepared depending on the Standard Method of Measurement (SMM7), used in the British contracts, in which we inform the contractor that the measurement on site will be done in the same way the contract Bills of Quantities was done in the design office, he can also know what thing are included in the item, so that he can take this into consideration when pricing the individual items of the BOQ.

Particular Conditions

This section is used for special projects that need special conditions, which cannot be applied in the usual contract (such as in some Electrical or Mechanical projects).

Preliminaries

These are the works required from the Contractor before starting the works (such as the Sign in front of the project, the office of the supervisor, … etc)

Bills of Quantities

The Bills are done in a systematic way, in order to separate every section of work alone and giving an alphabetic letter to every section, the same letter is used in all our projects for the same kind of work. For example: Electrical works have the letter ***M***, the Drainage works have the letter ***N***.

Every building is given a different number for its Bill of Quantity, for instant the main building takes Bill No. 1,

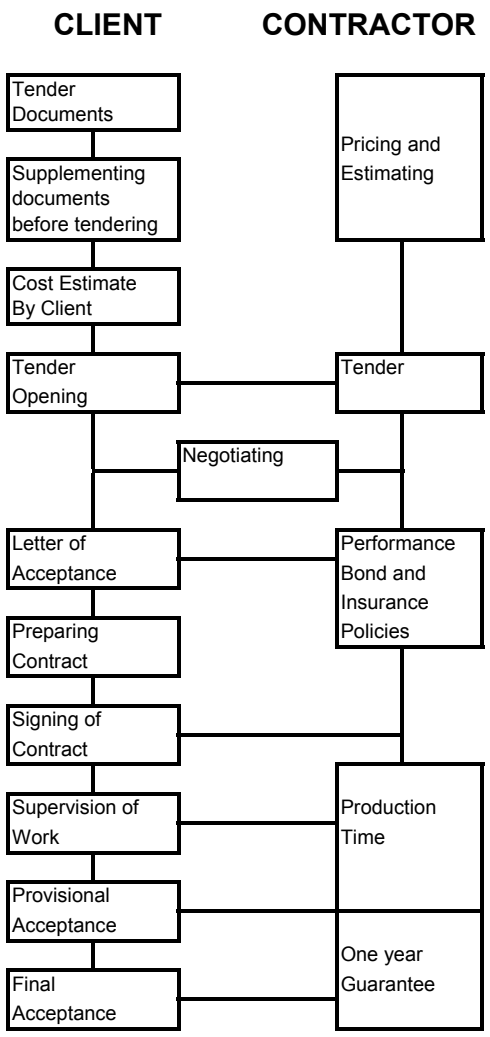

Fig. 3: UNRWA Contracting Procedures

the external works take Bill No. 2, the Girls Toilet Block takes Bill No. 3, the Boys toilet Block takes Bill No. 4, and so on.

If we want to refer to the first item in the electrical works in the first page of the main building we say **a/1/M.1**.

By using this method, we eliminate any possibility of having misunderstanding between the contractor and the client in the correspondences about the project.

Project planning and financing

Project Proposal

A project proposal prepared by the ***Projects & Development Office*** in the Headquarters is the first step in planning for the project. This proposal depends on the information provided from the department that will run the project after construction, in which they state their needs, the reason for this particular project and the priority of this project to other planned projects. In this case the project proposal contains:

Background: It is about UNRWA, the role it plays in the Palestine refugees life, the country where the project is planned to be constructed and why the project is needed.

Project outline: which describes the school. In this case the school consists of:

9 standard classrooms (area per classroom is 52 m²)
3 administrative rooms
1 Multi-purpose room
1 library
1 science laboratory
2 toilet blocks (1 for girls and 1 for boys)
2 stores
1 playground
And the associated external works and landscaping.

Beneficiaries: the beneficiaries of this project will be 270 elementary and preparatory students (140 boys and 130 girls) who will attend the school immediately, as well as the expected natural growth of the Palestinian community.

Project duration: duration is expected to be 42 weeks.

Cost estimate: It is 443,000 US dollars for the construction (main building area is 1,325 m²), and 48,071 US dollars for the equipments and the furniture. A 12% of the total is added, as a programme support costs, then the total cost is 550,000 US dollars.

Donation Agreement

After receiving the approval from the donating country that they are supporting such a project and in this area, we prepare an agreement in with we state all the conditions of the donor for this project. This agreement is usually signed by the ***Commissioner General of UNRWA*** (highest authorised person in UNRWA) and the Ambassador of the denoting country in our case it is the ***Government of the Federal Republic of Germany*** (in the country where the headquarters office of UNRWA is located) or the representative of the donating firm if it is an NGO firm. After that the money is transferred to UNRWA's account, and accordingly the design stage starts (as mentioned before). Then the contract documents and the final drawings are sent to the concerned ***Technical Department*** to follow up the process by preparing a cost estimate of all the works included in the contract, and sending the cost estimate to the ***Technical Office*** in HQ (A) for checking before the tender stage starts.

Information Technology

Information Technology during the Design Stage

The computer has taken an essential role in the information technology in the recent years in our country, especially during the design stage, this has enabled us to explore more ideas and prepare more proposals during the preliminary design to present to the client. We now use many computer programmes related to CAD:

ACAD R14 for preparing the general drawings.

AEC VER. 4 for preparing specialised architectural drawings.

RC-CAD for preparing the Structural drawings.

3D-MAX for the preparation of the presentations to the client and the donors as well.

For the Design stage, we use the following programmes:

Beamd for the Structural design of beams.

Quick Frame for the analysis of the frames (for the earthquake forces mainly).

Retwall for the design of the retaining walls.

Base for the design of the foundations.

Q.S. Elite and the MasterBill programmes are used for the preparation of the Bills of Quantities, the Cash Flow and the Cost Estimate.

Excel programme is used for the calculation of the quantities.

This technology has also enabled us to keep a good source for the future projects.

Experiences to use in Future (acquired from the course)

Design Stage

The most important thing in this stage is the Project Planning and Financing. It is essential to get the real estimated cost of the construction, in order to limit the budget and reduce any variation orders that come in the production stage. It is also important to estimate the duration of construction and defining the critical paths in which any delay even for one day will increase the whole project duration, and planning for this can be done by Critical Path Method (CPM) or Bar Chart (Gantt's Chart).

I have also learnt a lot about the gender issuse, which means in this stage we should involve the women in the design criteria, and allow them to participate in deciding the type of house they are going to live in future.

Conclusions

Design Stage

This stage is important in deciding the cost of the project or structure we are planning to build. In this stage, we choose the system used in building, the materials and the overall shape of the facades. In ***UNRWA*** we aim at providing our services to the biggest portion of the refugees communities in different areas, which means the simplest facades with more sustainable materials that can withstand difficult weather conditions in our region is given the priority, which in turn will reduce the maintenance costs in later stages. In this course, I have learned more about the role of cost estimate, which involves many parties from the earliest stages, in order to reduce the cost of the production phase. In addition to that, I have realised the importance of the quality assurance, which can be achieved by preparing a good description for all the elements used during the construction.

Production Stage

Tendering and Contract

Tendering Procedures

UNRWA Technical Departments have prepared their own list of approved contractors, since UNRWA was established to provide relief and work for Palestine refugees, we encourage the Palestinian contractors to apply for our projects, so that they can give a chance to the Palestinian labourers to work. By this way we are relieving the ***Hosting Countries*** from the burden of the unemployment within the refugees population. The list divides the contractors in four categories:

Category (**A**) for the Big Construction projects.
Category (**B**) for the Small Construction projects.
Category (**C**) for the Specialised Works.
Category (**D**) for Minor works (which includes urgent maintenance works, replacing damaged fittings and contracts under 1000 US $).

The tender is usually announced in the local news-papers, and the contractors that satisfy the required category can apply for the project. According to UNRWA's regulations, we don't have to give any reason for the acceptance of any bid (if we don't choose the lowest bidder).

Contract Proposal

After receiving the contractors bids, the bids are analysed, and during this process we compare the prices of all BOQ sections with the ***Agency Cost Estimate (ACE)*** prepared by the Technical Department. In case there is a big difference between the ***ACE*** and the Contractors price in some sections, the contractor is requested to give a reasonable explanation for this difference or his bid will not be taken into consideration. After analysing all the bids, a contract proposal is prepared for the successful bidder in which we state the amount needed for the construction. The total amount needed consists of:

The cost of constructions works (according to the contractor's price).

The cost of site supervision (which will be carried out by the Construction Division in the Technical Department).

The cost of materials (if to be provided by UNRWA).

Contingencies for the unforeseen works or some extra works needed due to site condition after excavation works are completed.

The contract proposal is sent to the ***Field Contract Committee (FCC)***, which is usually chaired by the Director of the UNRWA Affairs in the country of the project, for approval. After getting the approval of the FCC, the contract proposal is sent to the ***Headquarters Contract Committee (HQCC)*** for approval. Upon the approval of ***HQCC***, a contract is prepared between UNRWA and the successful tenderer and signed duly announcing the beginning of the Construction Stage.

Production Planning

The contractor is requested to present the programme upon which he plans to work in order to finish the construction works within the required time in the contract. This programme should be submitted within the first three weeks of the contract for the Director of Works approval (the ***DOW*** here is the ***Field Technical Officer***). If the ***DOW*** sees that the programme can't be finished within the contract period, a meeting with the contractor is held for discussing ways of improving the output of the programme (the programme for this project Mazzeh School **[BAR CHART]** is shown below).

Quality Control

The works are executed according to UNRWA's Specifications for Building Construction. These specifications are based upon the British Standards. Every contractor classified in UNRWA under one of the four categories is provided with a copy of this book. Several meetings were held with the contractors to explain to them the required quality, the procedures followed for inspection and acceptance of work. The assigned site engineer from the Construction Division, who is always available on site during the normal working hours, carries out the Quality Control. He is authorised by the ***DOW*** to inspect, give the approval for concrete casting works and the installation of Mechanical and Electrical fittings and equipments. A site meeting between the Contractor, ***DOW*** and their representatives on site is held every week or every other week for co-ordination and for solving problem. Many methods are used for quality control among these are:

Cube tests: Six cubes 15 x 15 x 15 cm are taken for every 50 m³ concrete works cast on site or brought to site by transit mixers. Three cubes are tested after 1 week and the rest three are tested after 28 days. In case the cube results were under the specified crushing strength, some on-site tests are carried out awaiting for the 28 days results. If the on-site tests also fail, the contractor has to demolish the cast concrete and replace with better quality.

Slump test: This test is done to ensure the durability of the concrete mix without jeopardising the strength of it.

3- Schmidt Hammer test (Rebound test): This is a non-destructive test carried out on the concrete member that didn't show approved test results. This test is carried out by pressing this machine against the member; this will give the crushing strength of the concrete used in the casting process. The results are usually 60-70% reliable.

4- Loading test: This is also a non-destructive test. It is carried out on a specified member for 12 hours, after which the deflection is measured, and if the member couldn't stand this test, then we use the destructive tests.

5- Core test: This test is used only when the previous four tests fail to show that the concrete member is strong enough to withstand the loads it was designed for. A cylindrical machine of 100 mm diameter , drills through the concerned member to provide a test sample (without reinforcement if possible). This sample is then capped with sulphate and crushed in the laboratory to give an idea about the concrete strength of this member.

Operation	Duration of Activity (WEEKS)
	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42
Site Preparations	
Demolitions	
Excav. & Backfill	excavations backfilling
Foundations	
Columns	Fn. L. G. L. First Floor Level
Beams	G. B. 1st F. B. 2nd Floor B.
Slabs	G.F. 1st 2nd F.
Walls	G.F. 1st 2nd F.
Internal Plastering	G.F. 1st F. 2nd F.
External Rendering	G.F. 1st F. 2nd F.
Internal Floor Finish	G.F. 1st 2nd F.
Internal Plumbing	G.F. 1st F. 2nd F. Slab G.F. 1st F. 2nd F. Fittings
External Plumbing	
Painting Works	G.F. 1st 2nd F.
Metal Works	G.F. 1st 2nd F.
Electrical Works	G.F. 1st F. 2nd F. Slab G.F. 1st F. 2nd F. Fittings
Drainage	G.F. Slab
Grading oversite	
Carpark	
Playground	
Path and steps	
Retaining Walls	
Bound Walls	
Surface Water	
Shading Sheds	
Handing over	

Photo 2: The Front Façade of Mazzeh School.

6- Crushing test: this test is used for the concrete blocks as well as for the terrazzo floor tiles, which have a minimum strength that should be achieved according to the Jordanian Specifications for Buildings.

The presence of the site engineer on the site and the co-operation between him and the contractor is considered the first step in the quality control process, and the continuos inspection done by the site engineer will enable the contractor to take all the measures to rectify the error before it reaches to the destructive test stage.

In Jordan, we face a lot of problems to ensure that the quality we are seeking can be reached, some of these problems are:

Lack of skilled labours and a classification for their capabilities. The ***Directorate of Vocational Training (DVT)*** has declared many times during the past 10 years that a programme for testing and classifying the labour working in both the construction sector and the industrial sector according to their skills, which will in turn assign a certain minimum wage for every class. This system didn't have a chance to become a reality due to the enormous number of foreign cheap labourer working in the construction sector, that came from the neighbouring countries in the region to Jordan due to the bad economic conditions in their countries.

Lack management tools for some contractors, and thus under estimating the role of quality control, which in turn will raise the contractors cost due to rectifying measures taken afterwards.

Construction in remote areas is more expensive than that in the big cities, which will force the clients to award the contracts to unqualified contractors, only because they live in the same area and have a reasonable overheads, and no need to transfer their equipment.

High fees for Qualified Consultants (who usually carry out the Supervision and inspection part), prevents most of individual house owners from having a proper supervision during the construction period, and thus might end up with a devastating results (e.g. collapse of Buildings).

Tendering procedures & regulations, which normally say that the lowest bidder is the successful contractor, and this doesn't mean that we have a qualified contractor.

Economic Control – Budget review

At the beginning of the construction works, we prepare a ***Cash Flow Chart***, in which we can see the amount of money needed for the monthly instalments (payments) for the contractor. These amounts are directly related to the progress percentage, and usually are updated whenever we have ***Variation Orders (VO)***. Variation Orders are usually needed for the infrastructure works, which includes the excavations under foundations.

Before entering the design stage, a Soil test report is prepared, the report includes the analysis of boreholes taken at every corner of the site, with some additional in the middle (the number of boreholes are decided according to the area of the land with 3 boreholes as minimum for 200 m² piece of land). These boreholes are supposed to give us an idea about the strata of the land we are using for construction, but sometimes we face some problems with cavities or weak soil areas that need further analysis, and could lead to the revision of the foundation design. For cases like this a variation order is prepared to cover for the extra works needed, and covered from the contingencies allocated in the contract proposal.

Experiences to use in Future (acquired from the course)

Production Stage

In this stage many factors affect the work, for instance the way we choose the contractors, contract forms, managing the construction site, quality control (although we have a different system in my country, where we rely more on the consultant for the quality control than on the contractor, I still believe that if the contractor is aware of the benefits of producing a good quality product for him and for the employer, then it would be easier for us to distribute the burden of the quality control on both the contractor and the consultant).

Conclusions

Production Stage

In our region the production stage is the most important stage because it involves many actors: The Client, the Consultant (site supervisor, who is sometimes the same office that prepared the design works), the contractor and the sub-contractors. All these actors have a common interest, which is completing the project within time, and within budget. The big role is here for the consultant who has the responsibility for the Quality Control procedures, which involve some tests and site investigations, but also it involves a great deal of planning. During the course we learnt more about the planning part, either by Critical Path Method (**CPM**) or by other means. Quality policy for the project is: **A**- Don't receive or accept defects. **B**- Do things in the right way. **C**- Deliver a correct final product. This can be achieved by choosing a qualified contractor, and carrying out a good control on the quality, because repairing defects at this stage (if any), costs much less than after the structure is finished.

Property Management

Life cycle economy

The reinforced concrete buildings in Jordan have a hypothetical life of 60 years minimum. While the stone cladded reinforced concrete buildings usually have a longer lifetime, it may reach 100 years.

The first year after construction, the contractor on his own expense carries out maintenance works (after the provisional taking over of the project by the client). The client carries out the final taking over after the completion of all maintenance work by the contractor. During the first 10 years of the life time of the building, minor maintenance works (such as replacing missing or broken

Photo 3 The site of the low cost housing project for displaced families at Beddawi Camp before construction – Lebanon

fittings for doors, windows, or clearing blocked sewer pipes) are carried out all through the year, while the real maintenance works are planned for the summer time.

Life Cycle Cost

The life cycle cost for the MAZZEH School is:

LCC = I + N * (R+M) –S

I = Initial costs

N= Life cycle factor in years

R= cost per annum

M=Maintenance cost per annum, direct costs

S=Scrap value (Residual value)

LCC = 443,000 + (1,000 * 34.7609) = 477,760.90 US $

[34.7609 – 2%, 60 years, table 5]

Yearly cost is:

477,760.90 * 0.02877 = 13,745.18 US $/year

[0.02877 – 2%, 60 years, table 6]

Maintenance Planning

Maintenance works in UNRWA falls under the responsibility of the maintenance Engineer (as shown earlier in the Field Organisation Chart), and are divided into two types:

Running maintenance

Periodical or Preventive maintenance.

Running maintenance

This type of maintenance is required through the year for installations that are occupied by enormous numbers of users, such as: schools, health centres…etc.

In this case, the Area Maintenance Engineer (**AME**) hire a serviceman or a specialised contractor under category 'D' as mentioned earlier, to carry out the

Photo 4 shows the entrance stair for a low cost housing project for displaced families at Beddawi Camp Lebanon.

urgent works such as: replacing a glazed pane for a window, replacing a door or window handle, servicing a blocked sewer line, or servicing a damaged water pipe or fitting.

All the works that require a special technical experience and might affect the soundness of the structure are co-ordinated with the Design Unit. A special budget is prepared every year for such works (depending on the budget of the past five years and on the general condition of the structure under discussion).

Periodical or Preventive maintenance

This type of maintenance is planned in advance and in some cases with the help of the Structural Engineer in the Design Unit, who assesses the condition of the structure and the safety degree. In order to prepare for this type of maintenance it is divided into two types:

General maintenance: which is usually carried out every other year, and involves the replacement of missing parts of furniture or fittings, hacking off some deteriorated parts of plastering or external finishes…etc. The studies for this type of maintenance are usually prepared by the (**AME**) during the spring time, to allow for the preparation of the tender documents and tendering procedure, so that the actual maintenance works can take place in Summer time (especially for schools and training centres).

Upgrading maintenance: which is usually done every ten years and involves the major works done on the structure

such as: replacing the floor tiles, replacing the roof asphalt or finish, replacing the old

wooden or steel windows by aluminium windows, and sometimes this involves some structural support for the old buildings, which is usually done under the supervision of the Structural Engineer of the Design Unit.

Connection to the Design Stage – Feedback

This stage is very important to the designers (both Architects and Structural Engineers), because by this feedback they can assess the design, make any changes to the future projects to ease the maintenance procedures and to use materials that can withstand difficult weather conditions. In this feedback, we usually get information regarding the additional elements that can be introduced during the design process and yet reduce the cost of adding such elements afterwards during the maintenance

or upgrading, such as : display boards in the corridors to be used for students works in schools, or for health centres to be used for healthcare advertisements and illustrations. In some other cases we had to change the hinged aluminium windows that open inwards to a sliding type windows to avoid the accidents between school students. In one of the cases, the circulation of the students inside the school using the stairs between the floors had to be re-organised due to the congestion of students flow at the break time.

Experiences to use in Future (acquired from the course)

Property Management

After spending a fortune on the construction of a certain building, it is important to safeguard this investment by carrying a planned maintenance on it and carrying a continuous check on the soundnace of the structure. This will enable us to give a safe, healthy environment for the users of the building, and minimise the maintenance expenses when it is done in proper time.

It is important during this stage to have a database for the maintenance cost of the different elements, and the labour cost, which will serve as a background for both the construction and maintenance works.

Conclusions

Property Management

The Life Cycle of the structure is of great importance, not only for the maintenance works but also from the economical point of view [if we need to buy a building, we should know: Who used this building?, What kind of maintenance was done for it? What are the intervals between the maintenance works? Was it ever upgraded? Did it receive any structural support for any portion of it? How old is it? What kind of materials were used in building it? All the answers for these questions constitute the Life Cycle of the building].

In order to have a successful project you should start by a proper planning, choosing the proper materials for the weather and the surroundings, designing according to the needs of the users, using the proper methods for tendering in order to have a qualified contractor, enforcing an organised quality control programme, keeping records of the construction process, planning for the construction period, and afterwards carrying out a planned maintenance programme along with a periodic check on the soundness of the structure.

For a non-profit organisation (like my agency ***UNRWA***), it is of a great importance to reduce the construction and maintenance costs in order to serve more portions of the community with the limited budget we have, which means having a great deal of control on both construction and maintenance qualities, and thus maintaining the safety of the users.

Planning for future maintenance requires a feedback from the persons involved in the everyday maintenance works for the structures. Using the formula's and examples given to us in this course, we will be able to have more realistic figures for the maintenance budget needed for any project (whether it is annual maintenance or upgrading maintenance, carried out every 10 years).

I have seen some good examples from other developing countries in this course, that can be applied in my country, such as involving the beneficiaries in the maintenance works for there houses, and bring more awareness in them to keep the structure in a good condition, for their own good as well as for the agency which has given them the opportunity to live in a better

weather proof conditions. The co-operation between NGO's like FUPROVI, HABITAT-CUBA and the people they are working for can be a good example for all developing countries, where the poor people are willing to help themselves, but they don't know how, and need somebody to put them at the starting point of the road of hope and better future.

In Sweden as well as in my country, energy is the most important factor in the running costs. I have seen the way the Swedish designer are dealing with the insulation of the buildings, and I think this can also be applied in my country. Adding a small amount of money on the construction cost, can reduce a lot of expenses in the running costs on the long run.

Finally, I think that being able to see the modern ways in construction during the site visits arranged by LCHS , has given me a broad and important experience that can never be gained only by reading researches about such subjects. We had a chance to see some projects that were at a time a burden on the community converted to the most attractive areas in the region, by dealing with the users of the buildings in more positive ways that lead them to preserve their environment and improve it with their own resources, for the benefit of their children's future.

It may take some time to apply this experience in my country, but I hope that if I come again to Sweden, I can proudly talk about some success in achieving few of the goals I have came here for.

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