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Technical report: Lebanon Construction and Building
Material Industry

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Based on the work of H. Tatsunokuchi
technical consultant

Summary

Along the reconstruction, the construction activity is very intensive in Lebanon, especially in Beirut. There is strong need for developing design standard in building and system to monitor conformity to it.

This delay in developing such standard together with the slow activity during the Civil War may have contributed the practice of construction technologies, which do not meet with current international standard.

Due to the lack of seismic criteria, the current practice of structural frame, wall structure, and floor slab does create adequate structural strength to meet the possibility of earthquakes in Lebanon.

Site excavation and scaffolding should be improved, for concrete work, use of steel forms with ready mixed concrete and concrete pump should be encouraged.

Lack of standard also creates quality problem in aggregate and sand and economic competition for some of high value added interior parts, for which Lebanon industry can be competitive.

There is some confusion of the nature of industrial establishment, such as developer, architect, consultant, contractor, so that there should be development of trade organizations.

Government should proceed with development of standard, incentive for adopting better technology, correct and facilitate relevant information, promote technical training, and create atmosphere for entrepreneur consider prospective business opportunities in building material industries.

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Introduction

This technical report is based upon UNIDO technical mission to Lebanon on August 29 to September 12 1994. The mission consisted of E. Absi, J.M. Butikoter, and H. Tatsunokuchi, as a specialist in building materials for the construction industry.

Based upon the field survey, visits to private companies, and discussion with the Government of Lebanon, this report summarize the current situation of Lebanon construction industry, with particular reference to materials and techniques used, and proposed general directions of alternative building techniques that can be used, industrial subsectors that have to be developed in order to support such techniques, and industrial policy and institutional support that create favorable atmosphere for the development of such techniques and supporting subsectors.

I. Analysis of the Present Status

A. Status of construction industry

Construction boom

Recent construction boom is obviously calling huge demand of materials and manpower that subsequently stimulated the Lebanese economy. On the other hand, this boom raises social problems such as traffic congestion. Uncontrolled digging and dangerous excavation of sand and aggregate cause danger in daily lives of inhabitants and deterioration in environment.

Table 1: Construction of buildings

Year	Thousand of sq. m
1965	3,944.7
1966	4,600.5
1967	3,758.4
1968	3,477.5
1969	2,954.5
1970	2,297.7
1971	3,402.1
1972	5,035.8
1973	5,255.2
1974	4,027.4
1975	2,788.9
1976	59.6
1977	2,002.8
1978	1,577.0
1979	-
1980	5,372.6
1981	6,484.3
1982	6,563.7
1983	7,981.3
1984	4,196.9
1985	5,027.4
1986	6,215.9
1987	4,938.5
1988	4,956.2
1989	1,970.6
1990	2,180.0
1991	6,133.5
1992	12,658.0 *1
1993	15,052.8 *1

*1 These figures include surfaces of permits different from those granted in the five governorates and registered in the preceding table.

(source: Investors Guide, 1994)

Table 2: Evolution of construction surfaces between 1992 and 1993 (in sq. m)

Districts	1992	%	1993	%
Beirut	1,082,485	10.08	1,193,874	8.89
Mont-Lebanon	6,966,796	64.84	9,681,203	72.10
South	1,896,880	17.65	1,919,352	14.30
Bekaa	661,199	6.15	523,901	3.90
North	137,679	1.28	109,014	0.81
Total	10,745,039	100.00	13,427,344	100.00

(source: Investors Guide, 1993)

Material demand for this construction boom is mainly supported by import, except for a few materials as cement, aggregate and sand.

Table 3: Import of construction materials

materials	ton	
sand	315	
stone	5,826	
gypsum	75,580	
cement	540,848	
asbestos	6,113	
wood-product for construction	949	
steel bar	544,639	
shaped steel	45,425	
cast iron pipe	362	
steel pipe	26,625	
construction parts	6,998	*1

*1 door, window, metal pole and other
(source: Custom Data)

This heavy dependence on import, unless there is a clear comparative advantage, is caused by insufficient development of competitive building materials industry and/or lack of certain subsectors in industry.

B. Current practice in building design

Based upon a questionnaire given to established international building contractors and various visits, some aspects of the current practice in building design and construction were found.

In spite of the construction activities mentioned above, there is an urgent problem in building design, namely mechanical strength of building structure, especially resistance to earthquake. Also there is little consideration on safety, such as use of fire alarm, fire extinguish system, and sign systems for escape.

This is basically due to lack in seismic design criteria, which is further aggravated by general lack in attitude to conform to regulations.

Foundation

Spread or raft foundation system is usually adopted. It is based on sufficient bearing capacity of more than 30 ton/m² in ordinary area.

Since there is no need in market, no special subcontractor who could perform pile driving operation is available in Lebanon.

Structural frame

Structural frame of buildings is usually provided by reinforced concrete. However, use of steel frame, which has bigger mechanical strength, seems to be quite rare in Lebanon, as only one example of the use of steel frame was observed in Beirut during the mission.

As seismic criterion is rarely adopted in building design, the above frames are small in their size and arrangement of reinforced bar is scarcely considered.

Walls

Hollow blocks are used for wall structure. Curtain walling is recently introduced. Insulation is seldom provided to walls.

Due to lack of seismic criteria, reinforced bar is rarely used in walls and no earthquake resisting wall is provided.

Floor slab

Combined system of hollow block and reinforced concrete is adopted to floor slabs. Concrete slab with steel deck plate has been recently introduced.

This combined system is not suitable for floor slab because hollow blocks may collapse when earthquake occurs.

C. Current Practice in Construction at Site

Temporary work

(a) Shoring

Excavations at site are carried out almost always without any shoring operation. Rocky subsoil observed in construction sites in Lebanon seems to give some practical stable condition during excavation, which sometimes reaches to depth of more than 10m with almost vertical banks.

However, it is anticipated that in any occasion the caving occurs during excavation which would lead to damages to neighboring buildings.

(b) Scaffolding

As common practices in Lebanon, steel pipe props and timber props are adopted for relatively smaller buildings. And systems scaffoldings are adopted for relatively larger buildings.

Scaffoldings are indispensable for construction to provide safe and suitable work condition. However, inadequate settings are often observed in sites, such as setting on very unstable ground or no provision of safety hand rail.

Concrete work

(a) Form

Wood forms are used commonly in Lebanon, while metal one is rarely adopted, in spite of the fact that there is some shortage of carpenter to work on wood form, which is not used repeatedly.

(b) Ready mixed concrete

Quality control of concrete is much easier if ready mixed concrete is used. However, traffic congestion often prevents truck mixer to arrive construction site in time, before concrete quality becomes deteriorated.

For this reason, there are still many contractors who hesitate to use ready mixed concrete and prefer to mix concrete at construction site.

Since there are around 10 plants in Lebanon, of which three or four are in Beirut, ready mixed concrete should be a practical solution when the traffic congestion problem is improved, thus contribute the improvement of concrete quality.

(c) Pouring concrete

Concrete is usually poured by bucket. Use of chutes is also found in many construction sites, while concrete pump is rarely used.

Because segregation of the materials is likely to occur in the chutes, the use of long chutes has fallen off recent years in most of countries. On the other hand long chutes, sometimes nearly 10m, can still be seen in Lebanon.

D. Building materials supply and demand

Classification of building material according to supply/demand conditions

Major building materials in the building construction in Lebanon can be classified according to the respective material's situation in demand/supply.

Table 4: Classification of materials by supply/demand conditions

supply/demand situation	typical materials
(a) available locally but not sufficient quality	aggregate, sand, aluminum
(b) available locally but not competitive in price	reinforcement bar glass
(c) available locally and competitive in price	cement
(d) available locally and probably in good quality, but not well accepted in market	tile, door or other interior materials
(e) market still realized as no regulation to enforce	safety equipment (i.e. alarm)

(a) available locally but not sufficient quality

Material such as aggregate and sand are available locally. As is the case with most of countries, those bulky and non-industrial local materials are used for domestic building construction.

The basic nature of the quality problem for aggregate and sand is their containment of too small particles, which increase the total particle surface of concrete mixture. In order to achieve required structural strength, total surface area, which determines requirement of cement, the adhesive agent, should not exceed certain value, so that adhesion by cement is effective enough.

This containment of small particle is caused because sieving operation, which separate particles according to their size, is not applied extensive enough, may be not at all sometime.

The standard for the quality of aggregate and sands are thus generally determined by the size of sieves to be applied for the separation of article. It seems that such a standard exist in Lebanon, but practically not applied

carefully, which, in turn, may be caused by consciousness of purchaser of those materials for quality.

(b) available locally but not competitive in price

This category includes some bulk materials such as reinforcement bar and glass, for which economy of scale very clearly applies and price is the most dominant factor for consumers' decision.

There is one factory that produce reinforced steel bar. It is reported that the productive capacity is 480 thousand ton par year but the size of bar is limited.

Reinforced bar is also imported in large amount of quantity. Some estimation is made that market share of the import is 65 % and that of local supply is 35 %.

The import comes mainly from east Europe, which is very price competitive. It was reported that some imported bar was rejected due to quality problem in the past.

In these days, the quality problem has been solved and reinforced bar is imported in good quality with low cost.

Recent demand for reinforcement bar can be estimated from the cement consumption in 1993 as around 1 million ton, by assuming 300 kg cement and 100 kg bar for 1m³ concrete.

However, increasing demand appears to be supplied mainly by importation because of the followings reasons:

- * local products is sometime more expensive
- * large size bar is not locally available
- * quantity is not sufficient for critical projects

It is essential to encourage the existing industry so that it can survive. Beside its self-help on the following, it is recommended to introduce protective system, like priority in material selection for public building construction.

- * improvement production system --- modernize
- * improvement management practices(scheduling, order processing, product delivery, quality control)

Table 5: import of r-bar from East European countries

Country of origin	%	tons
Ukraine	66.2	360,376
Russia	18.8	102,168
Romania	3.6	19,873
Bulgaria	2.1	11,706
Others	9.3	50,516
Total	100	544,639

(c) available locally and competitive in price

Cement may be only product which is locally available and competitive.

One reason of this competitive supply of this product may be that most of production factories are in the Northern part of Lebanon, thus, even during the Civil War, they were not much damaged.

Even the quality production is available, the war damage on the transportation, especially the rail road link between the North and Beirut causes smooth flow of this product difficult, although the transportation by sea supplements this lack of ground transportation.

Cement is mainly supplied by 3 cement companies in Lebanon, whose production was estimated around 3.0 million ton in 1993. In the same year, cement importation reached 541 thousand ton that mainly came from Greece and Bulgaria.

Since Lebanon is rich in raw materials for cement production, cement quality is quite good and supply will easily meet demand increase by extension of production capability. One of the companies is preparing to expand their production.

It is reported that cement supply appears adequate to meet the basic demand. In this report, surplus demand caused by reconstruction is estimated around 450 thousand ton par year.

Based on the above, the shortage of domestic cement supply is estimated around 1 million ton par year in rehabilitation period.

Table 6: Supply and Demand for Cement

Year	Production	Local Consumption	Export or Import
1965	970	924	17
1970	1339	913	402
1974	1744	1329	508
1980	2144	619	1524
1988	1359	1638	(280)
1989	1045	1333	(288)
1991	1438		
1992	2127		
1993	3045	3586	(541)

(unit;1000 ton)

(d) available locally and probably in good quality, but not well accepted in market

This category includes interior and finishing materials such as tile and door. Our hearing of local manufactures of those interior goods, has revealed their complaint that in spite of their competitive quality, consumers generally value imported good more than domestically available goods.

Also the lack of standard, such as size of door, makes it basically impossible to lower cost by mass production.

(e) market still not realized as no regulation to enforce

Some special parts, such as safety alarm, requires some form of law enforcement. As there is a lack of safety consciousness at construction site, there is a lack in building owners for respecting the need of safety equipment, which would inevitably add extra cost.

Observation on local interior/finishing materials

(a) Doors and its Frames

Doors and frames are seems locally supplied. Suppliers are consist of one rather big manufacturer and many small manufactures. The first has modernized system for mass production and the later are specialized in tailor - made doors.

Material of the doors are wood and hard ware which are both imported.

Fire resisting doors, which work important role to prevent extension of fire, have not been introduced. This kind of door can be produced by modernized system and technique, which small manufactures could hardly provide themselves.

(b) Windows and Frames

Windows and frames are usually provided by aluminum and mainly supplied by local manufactures. They are aluminum extractors and assemblers.

It is reported that their productive capabilities are not enough to meet the market but readily expanded. The quality is good for windows and frames, however, not enough to extend their market to the other market like material supply for another manufactures.

Since aluminum productions are imported, there is still room for technical improvement and expansion of production system.

(c) Floor materials

Finishing materials for floor are usually marble, ceramic and stone tile. Plastic sheet like vinyl sheet is limited in use. Access free floor system for intelligent office seems to be rarely introduced in Lebanon.

The supply of floor materials is as follows.

Marble is mainly imported from Italy in spite of availability of the local production, because market prefer white marble rather than colored marble produced locally.

The manufactures are small and many in number.

Ceramic Tile is one manufacture that produce ceramic tiles with around 60 % share in domestic market. It also has enough capacity for exportation, which reaches around 70 % of its production.

Its competitiveness seems to come from its high quality, however, it may still need technical support since CDR has not accepted so far.

This sector of industry suffers the lack of geological data for clay deposit. Insufficient data of raw materials affect their production planning.

Stone tile is made from lime stone locally produced in Lebanon and is rather easy to be worn because of its softness.

The manufactures are small and many in number, same as marble.

The recommendations are summarized as follows.

- * promotion for use of domestic marble
- * adequate certification by establishment of standards and norms
- * provision of geological data for raw material deposits
- * introduction of access free floor and its industry
- * encouragement of plastic industry for floor sheet production

(d) Plumbing Materials

This kind of materials are suited to mass production, that is proceeded by a few companies in Lebanon.

One of the companies manufactures not only for domestic market but for foreign markets and their export capacity seems quite high.

E. Safety

Safety control and provision are related to construction work, safety provision for fire or earthquake in use after construction.

Safety in Construction

As partly mention in previous sections, there is not enough control and provision for safety in any construction site.

Since it is important not only to protect workers from dangers but also to protect people and their properties, special agencies are in charge to control, monitor and instruct in many countries.

Safety Provision for Fire

This provision generally consists of two categories. The first is one regarding building design. The second is one for instrument and equipment.

It is quite questionable whether necessary measures are adequately introduced, because of lack of norms and control by the state.

Safety Provision for Earthquake

To secure the safety against earthquake, it is not enough to provide seismic resistivity to buildings. The materials should be also well considered and selected in order to prevent further damages caused by falling down of broken materials.

It is needless to say that the above consideration is not introduced in Lebanon yet.

Glass is often the cause of secondary accidents, and recommendations are made as follows.

- * fixing exterior windows
- * film attachment on glass
- * use glass provided wire mesh inside

F. Energy Conservation

There are three points to consider in terms of energy saving in building construction.

Insulation

Insulation has been only recently introduced in Lebanon. It is mainly polystyrene form supplied locally. However, the adaptation is still at low level. Rock or glass wool are not used widely.

From view point of fire protection, rock or glass wool is recommended.

Solar Energy

There are many energy saving equipment, like solar water heating system and energy save lamp. In Lebanon, only solar water heating system is manufactured locally and production remains at a low level.

The saving cost usually takes long time to reach the balance to installation capital cost if no incentive is introduced. This long leading period often discourages the consumers from adopting this technology, as observed in Japan.

Thermal Energy Storage by Ice

Since power plants are necessary to generate electric power to meet the peak demand, output is under their capacity in most of their operation time. But once the peak demand exceed the capacity, another power plant is required.

The idea is to storage thermal energy in form of ice by using the surplus electric power during night, and to use ice for air cooler in day time. This system has not been introduced in Lebanon.

In the future when rehabilitation of electric supply is completed, this could be introduced to cut the peak energy demand by storage thermal energy in night.

Thermal energy storage by ice can is more economical as it has smaller capital cost and energy conversion for the purpose of cooling is much more simple and efficient in comparison to other systems. Thus it should reduce the total cost of power supply significantly.

G. Approval practice

Current procedure

The application document for building permission needs signatures of engineers registered in Syndicate of Engineers in the following manner.

Table 7: Requirement of signature by syndicated engineers according to the size and category

<u>floor area (m2)</u>	<u>0 - 500</u>	<u>500 - 2,000</u>	<u>exceed 2,000</u>
architect	*	*	*
civil engineer		*	*
electrician			*
building equipment engineer			*
site engineer			*

*: need signature

The document is then handled through the following steps.

1. the chief engineer of consultant (deposit)
2. Syndicate of Engineers (examination)
3. the general directorate of urbanism (application reception)
4. the local technical services (examination)
5. Mayor (signature)

Problem

The first problem that the application is not examined from the view points of safety for fire or earthquake.

The second problem is that no unified norm is referred for examination. In somewhat ad hoc way, the applicant choose different conceptual framework, such as French system, or American one, by more or less by applicant's choice.

The third is that no authority inspection is applied to the building on site, because of the lack in institutional system and man power.

The fourth is the lack of control system for roads, bridges and structures other than buildings.

H. Industrial organization in building construction

Except for a few large international construction companies, which has been active overseas, even during the War, the domestic companies are quite small, most of them with around 10 employees.

There is also a problem of the nature of such small company, as they appear sometimes developer, planner, consulting engineer, architects, or contractor, according to their decision, as for which form is most advantageous to particular business situation, even though there are two industrial association in the field of construction, Constructors Union and Syndication of Engineers.

This somewhat confusion on the nature of company, makes it also confusing, when qualification of bidders is examined.

Industrial Association often becomes the focus of interaction between business and government, in the field such as developing regulation, industrial standard, and various items to be negotiated.

Such association could also be a focus for government-business cooperation in developing technology, exchange and disseminating information, and other healthy developing of industry.

II. Potential improvement

Based upon the analysis of the current practice in the construction industry, the following improvement can be considered.

A. Building design practice

Based upon a questionnaire given to established international building contractor, which have origin in Lebanon, we have learnt some aspects of the current practice in construction industry.

Foundation

Since there is no need in market, no special subcontractor who could carry pile driving is available in Lebanon. However, as piling may be required in reclaimed area and in the place where rocky subsoil is not encountered, there should be some consideration for encouraging this kind of technology.

Structural frame and the need of establishing seismic criteria

Because seismic criterion is rarely adopted in building design notwithstanding that Lebanon has been suffered occasional earthquake, the size of structural frames are small, if ever used, in their without reinforced bar arrangement. In most of the case, there is no steel structural frame is used.

It is therefore urgently required to establish seismic criteria in Lebanon. And once the criterion is provided, it is important for the government to monitor both building design and implementation so that appropriate seismic resistance is achieved. Appreciation for building permission should be encouraged and probably strictly checked in this point in the future.

Walls

The lack of seismic criteria in Lebanon, also gives the absence of structural consideration in reinforced bar arrangement and lack of earthquake resisting wall.

The same stated for structural frame is recommended.

Such resisting walls for buildings can be provided by curtain walling, pre-cast concrete panel and ALC (Autoclaved Light Weight Concrete) panel as commonly practiced in Japan.

ALC panel has numberless minute bubbles inside, thus also provides good insulation and attain small specific gravity of less than 1.0.

Floor slab

The structure design of the slab is also not meeting the possibility of earthquakes.

For this particular purpose, concrete slab with steel deck plate is one of the common practices used in developed countries such as Japan and has the following advantages.

- (1) Temporary support is not necessary during concrete work and curing.
- (2) No form is necessary under the slab, since steel deck plate works as form.
- (3) These advantages lead to reduced construction cost and shortened construction period.
- (4) Enough strength can be provided.

However, stable supply at reasonable cost is necessary for wide usage of steel deck plate, so that there is a clear need for establishing such material supply industry.

B. Construction Practice at Site

Temporary work

(a) Shoring

The excavation operation in construction site in Lebanon does not apply shoring operation. Even though, the structure of rocky soil seems to give some mechanical strengths, this practice would potentially lead to serious problems.

Adequate shoring should be provided in order to keep safety when excavation is proceeded in large scale especially when the site is close to existing buildings.

Also excavation in roads for pipe installation needs adequate shoring, since their depths sometime exceed 2m and cars run dangerously very close to such excavations.

There are also several other reasons that support the application of shoring operation:

- (1) Rocky subsoil consist of not only rock strata but thin sand and silt strata
- (2) Rock strata is not always monolith but sometime consists of fragments.
- (3) Subsoil other than rock is often observed.

- (4) Excavations are usually extended to very close to boundary of the land, which are set between neighboring existing buildings or roads.

The following shoring systems are recommended.

- (1) tieback shoring
- (2) Tel Arme
- (3) Vertical sheeting with brace (for pipe installation)

(b) Scaffolding

Inadequate settings are often observed in actual practices, such as setting on unstable ground or no provision of safety hand rail.

In order to set scaffolding in correct manner, qualified workmanship is required, thus educational training and certification should be introduced.

Concrete work

(a) Form

Considering shortage of carpenter in Lebanon and preservation of natural resource of woods, metal form is recommended.

In order to make metal form into wider use, beside attaining stable supply of metal form at reasonable cost, building design should be standardized in such manner that column size is taken from provisional table or multiple figure of certain unit length, so that standardized mass production becomes feasible

(b) Ready mixed concrete

This material would give a better and easier control of quality, if the traffic access from construction site to concrete mixing plants is improved.

(c) Pouring concrete

In comparison to using of chutes, concrete pump is more efficient and giving higher quality for large scale concrete pouring especially if ready mixed concrete used together. So after usage of ready mixed concrete becomes more popular, use of concrete pump will improve the quality.

C. Safety

Safety control and provision are related to construction work, safety provision for fire or earthquake in use after construction.

Safety in Construction

There is not enough control and provision in any construction site.

To protect not only workers in construction site but also general public and their properties, the followings are recommended:

- * workers education by each contractor when employed and charged in the new site
- * monitoring by the state as to worker's certification, which prevent unqualified workers from operating machines

In these days, construction equipment have become large and dangerous if miss-operated. The damages caused by such miss-operation affect not only the operators and workers beside the equipment, but the neighboring buildings, facilities and people's life.

- * check by the state as to construction plan like below, when the scale is large
 - excavation plan
 - temporary work plan
 - transportation plan for material
- * monitoring by the state as to safety provision
 - body protection helmet, safety shoes, grabs, safety rope, etc.
 - temporary work, shoring, hand rail, net, etc.

Safety Provision for Fire

This provision generally consists of two categories. The first is one regarding building design. The second is one for instrument and equipment.

The safety provisions that should be planed in design stage are as follows.

- * emergency exit root, indication
- * material selection fire resisting material, harmful gas free material

A system of provision should be considered, for example, in a way to recommend the following instruments and equipment:

- * alarm system, fire detector, and information system
- * fire fighting system, sprinkler system, fire-plug, water reservoir

Safety Provision for Earthquake

To secure the safety against earthquake, it is not enough to provide seismic resistivity to buildings. The materials should be also well considered and selected in order to prevent further damages caused by falling down of broken materials.

Glass is often the cause of secondary accidents, and recommendations are made as follows.

- * fixing exterior windows
- * film attachment on glass
- * use glass provided wire mesh inside

D. Energy Conservation

In terms of energy saving in building construction, use of insulation in wall, solar photovoltaic cells, and thermal storage system by ice should be considered.

Insulation

From view point of fire protection, the use of rock or glass wool insulation should be considered.

Solar Energy

As Lebanon is not rich in natural resources for energy except bright sunlight. It is therefore recommended to make maximum use of the sunlight for not only heating water but generating electric power by photovoltaic cell. In order for customer to more easily adopt this technology, some tax scheme should be considered in order to lessen initial capital investment.

Thermal Energy Storage by Ice

This system has not been introduced in Lebanon. The idea is to storage thermal energy by ice using the surplus electric power during night, and to use ice for air cooler in day time.

In future after rehabilitation of electric supply, this could be introduced to cut the peak energy demand by storage thermal energy in night.

Since power plants are necessary to generate electric power to meet the peak demand, output is under their capacity in most of their operation time. But once the peak demand exceed the capacity, another power plant is required.

Thermal energy storage by ice can reduce the total cost of power supply.

E. Subsectors in need for technical support

In order to introduce the above technique and to strengthen quality control, the following subsectors are needed to be established:

metal industry(iron/aluminum),
electronic instrument assembling industry,
specialized contractor,
testing laboratory.

Metal industry(iron/aluminum)

The absence of the activity during the War, caused the loss in competitiveness, especially to the cheap mass products from Eastern European countries. For the case of aluminum, the precision in production is only adequate that the products can only be used cheap wind frames.

This lack of competitiveness, in turn, hinders incentive to improve the level of this important supporting industry, which is quite necessary for construction technique to be more modernized.

Equipment in factories, as well as the method of operation, including quality control, seems to be not updated, to meet this external challenges. Management may also lack in the sense of new world competitive environment.

Sheet glass

Even though there can be some counter argument against Lebanon's having this industry, as there is some minimum size of factory to enjoy the scale economy, glass is suitable to manufacture domestically as it is heavy and fragile.

In addition to that higher value added products, such as functional glass products are produced in advanced countries, which is more suitable for economies with small domestic market with high technology.

If there is technical cooperation in this industry, transfer of technology of producing functional sheet glass, should be considered.

Precast concrete industry

In order to introduce advanced cement material such as ALC, precast concrete industry should be developed. This can be done through some technical cooperation for existing cement industry, for example.

Such precast concrete can be used as concrete pole, pile, or curtain wall, so that given the competitiveness of domestic cement industry, there is a possibility for establishing profitable domestic enterprises.

Electronic instrument industry

Although not required by the current practice of regulation, for the Lebanese building to meet a modernized security and safety standard, some capacity for assemble and maintenance service should be developed. Unfortunately, this capacity is totally lacking in Lebanon.

Specialized contractor

There is no special contractor, for example for piling for special type of ground, is not existent in Lebanon. This special type of ground include those soft types, such as reclaimed land or the ones without rock foundation. As the height of building increases in the future, and especially if reclaimed land is used for the Beirut area, where land is in principle scarce, such specialized contractor should be developed.

For the case of introducing shoring for on-site excavation, as they require technology such as tie-back, Ter Arme method, specialized contractor should be developed.

laboratory

Although not generally seen as an industry, there seems to be lack in tradition and supporting infrastructure for testing and developing both new materials and construction techniques. As mentioned earlier, in order for Lebanese material industry to compete with cheap foreign products, it should become ones to create higher added value, for which research and development activities are essential.

Training center

Although this is also not an industry, current training institution, if available, does not meet the current advanced industry practice. teaching manual, text, and programme have to be updated, through some effective technical cooperation.

F. Some consideration on developing supporting industry

In considering establishing new industries, including supporting ones for construction activities, some general comments can be made, by reflecting special conditions in Lebanon.

The size of domestic market is very limited, even though there is an immediate expansion due to the reconstruction activities.

This limit in size would lead to need for competing in foreign market, or possibilities of mono- or oligo-poly, which is not desirable from the point of maximizing consumers benefit.

In regard to the current situation in Lebanon, material industries may be classified according to the degree in concentration:

1. many small establishments: for example, hot water supply equipment;
2. a few leading establishment and many small followers: door, kitchen cabinet
3. several large companies: cement
4. one company: steel, tile, sanitary equipment, pipe

On the other hand, the tradition of free economy in Lebanon, makes the flow of import of cheap materials quite easy, so that new industry has hard time or find it impossible, to establish itself, without any deliberate government support, such as high tax rate or import quota.

In terms of technical competency of manufacturing industry, in most of cases, Lebanese industry is not competitive, due to their obsolete production system, including equipment and production methods, and lack in supplying trained engineer and managers.

The development of such human resources require commitment of resources and long lead time, thus it is obvious that given limit in both such resources and the size of the market, there should be some strategy to prioritize certain specific industry.

Also in term of industry concentration, monopoly should be avoided. Industry structure with too small establishment should also be avoided, as it does not make it enough competitive.

If policy is decided to select certain priority industry, there should be some image of industry concentration as well.

Even though free competition is in principle beneficial to consumer, there may be some need to exercise policy to nature such selected industry, to the time when the competitive strength of such industries are achieved, by way like import control, subsidy or tax incentive for domestic industry.

F. Study on regulations

In this mission, during the limited period of 2 weeks, ,.it was not possible to cover the whole aspects of regulations. in systematic way.

Another study mission should be arranged specifically to study this aspects of the construction industry and building materials. In such a mission, the study should be also executed on the aspect seismic criteria and safety provisions.

It is however possible to generally mention the lack in adequate regulation system. It is especially true in terms of seismic criteria, safety provision during construction and fire, are mentioned

The permission system should also be improved by introduction of examination on safety provision. It is also urgently requested to provide laws that call for norms and standards as obligatory reference for the building permission.

The followings have technical problems and need support

- Basis for seismic design
- Full concrete building design
- Fire security
- Loading criteria for snow and wind

Each town and city should have the urban and zoning plans reflecting to which to receive and control the application for permission regarding to landscapes, implantation etc.

It is also need to have a rule to introduce a rule to report commencement and completion of construction to the government.

The nature of companies active in construction industry is sometime confusing, also there is no developed industrial association as a focus for interaction with the government. There should be consideration of developing such industrial organization, on regional basis, or disciplinary basis, for making the qualification standard for project easier and clearer for smaller domestic companies and government support more organized.

G. Activities in the fields of investment promotion

In the field of investment to building material industry, there seem to be a great need and opportunity of foreign direct investment. As it has been mentioned in this report, a coordinated development of the construction industry and its techniques to use, the supporting subsectors of the industry, and government institutional support, is necessary. The lack of statistical data has to be improved in order to facilitate the decision of each entrepreneur to arrive in decision to invest.

H. Institutional support

Although the investment in the building materials industry is basically private decision-making, thus the Government has little to directly influence such process.

The Government, in turn, could create a favorable atmosphere for such decision to be more likely made, and guide construction industry to adopt better construction methodologies which is reaching international standard in building structure, environmentally more sound and economically more attractive.

The following tables summarize the institutional weaknesses and future actions that can improve such weaknesses:

State-level policy, standard and information

Although the country has a long tradition of laissez-faire policy or lack in active guidance in industrial development, lack of industrial standard and systems for disseminating latest technical information has to be improved.

Although there are certain standard for materials and technology, most of them have not been updated since the middle of 1960's, so that in such standard, the introduction of new materials are not incorporated.

At this moment, it is hoped that a foreign technical support will shortly start to develop a system of building regulation. A potential unique problem, depending the system of which developed country such regulatory system is based upon, is the existence of earthquakes in Lebanon. Thus this aspects may have to be supplemented to create locally more suitable regulatory system.

The lack of a developed standard may be, in turn, one of principal reasons of the general feeling some disrespect to conforming to governmental guidance or regulation, which may have to be gradually overcome.

It is not surprising, as the country had been under the civil disturbance for long, that statistical information are not systematically handled. This create a problem for rational planning and decision making as for the selection of and producing materials for construction. Also the lack of data on geographical availability of those materials causes difficulty in logistical planning.

The current weakness and possible actions are summarized in Table 8.

Manpower and training

It was often observed, that on construction sites, skilled technical workers are not readily available in local labor market. Due to its strong union structure, bringing of cheaper foreign work force, which is generally available in construction projects in the Gulf countries, causes some difficulty, especially for foreign companies or small local establishments.

Although the country has a long tradition of valuing more of commercial and financial activities, developing local technical expertise is a pre-requisite for selecting and efficiently using latest construction methodologies. It is also apparent that if building material industry is to develop and produce competitive quality products to serve the local construction industry, not only the availability of top management but also the middle level management at factories have to be secured.

As there is few public vocational schools for basic technical training, each individual private enterprise has to supply such training to their work force. As those work force, sometimes from rural area, lack basic technical skill, even including basic discipline, it creates some financial burden to private enterprise, which are not generally strong financially, if based primarily in the local market.

There is a wide scope of work to be done for the Lebanese government to create a solid foundation for creating such work-force, by either providing some financial aid to private enterprise for technical training, in addition to developing the system of public vocational school.

The current weakness and possible actions are summarized in Table 9.

Table 9: Manpower and training improvement

Weakness	Relevant institutions	Possible Actions
1. Lack of trained middle level manpower a) skilled worker(i.e. carpenter) b) foreman/supervisor c) lack in management staff(i.e. schedule management) d) lack of fund to train factory worker 2. In sufficient vocational training schools a) public b) management school		vocational training school training school financial support/ tax incentive technical support

Problems encountering for planning and executing of construction

In planning of construction projects, before starting design, planner generally starts from studying of two important factors: availability of infrastructure and material.

It is still in a stage of re-construction in Lebanon that three important infrastructure, electric power, telecommunication, and traffic system, are not supplied in a very steady condition. There is some case, private power generation and telecommunication system, can supplement the lack of public service, this of course add an additional cost to the project.

Traffic congestion causes a logistic problem for implementation planning of construction project. As stated before, such congestion is the primarily reason for the slow progress in the use of ready mixed concrete.

This congestion is mainly due to the slow progress in re-construction of road system, especially in the vicinity of Beirut and main eastbound roads from Beirut, construction itself gives additional burden to the road system. A system of coordination, based upon pre-notice of construction project, can be an immediate measure to lessen congestion, when it is partially caused by poor coordination.

As described in detail in the previous chapter, there is need to improve locally available materials. This include locally available and competitive materials such as aggregate and sand, the quality of which is not uniform and require establishment of conformity of standard, that is to meet minimum particle size requirement for achieving mechanical strengths of concrete.

Local supply of reinforcement bar, which are basically low quality bulk produce is encountered with competition from import, which has strong price competitiveness. Thus the local production of reinforcement bar faces a structural problem and probably would not be competitive to cheap supply from Eastern Europe. However, from the resource recycle point of view, recovery of used scrap iron, should not be neglected.

For the case of glass, that can have wide range of the degree of added-value, the local production can shift to higher-value market segment, instead of competing in bulky and less expensive segment.

The situation is very much similar in local aluminum supply to the glass supply. Aluminum metal imported is cut and pressed to certain figure and then assembled to construction parts. The extrusion process is not accurate so that sometimes the thickness of a bar is not uniform.

The quality of local aluminum products is such that it can only be used for cheap aluminum window frame, for which cheap import can be available.

For the local interior supply, such as door and tile, Lebanese products has achieved certain quality level. It seems that there is tendency of market to blindly assume the quality is import is superior to locally produced supply. Given the tradition of bland recognition of "made in Lebanon" products, public objective report on the quality of local product, by such way as comparative quality test, should enhance the market recognition of local products.

Lack of industrial standard of interior parts, such as door, knob, etc., causes diseconomy of scale in local production, as this requires larger number of products, which have wide dimensional variation, meeting practice of several developed countries.

The other big problem in the planning of construction project is securing supply of parts for construction equipment, which causes problems in implementation. Up to now, such supply is on import-on-demand basis, so that stoppage in construction for certain period, until such part is obtained, is expected.

The current weakness and possible actions are summarized in Table 10.

Table 10: Improvement in construction practice

Weakness	Relevant institutions	Possible Actions
1. Insufficient infrastructure a) electric power b) telecommunication c) traffic system/congestion d) public transportation	private power	rehabilitation pre-notice of work
2. Insufficient material supply a) poor sand and aggregate (particle size) b) reinforcing bar c) glass d) aluminum (low quality) e) parts supply for equipment f) fire detector/electric instruments	(local production)	conformity to standard technical support for improving quality more higher value-added improve pressing technology establishing law enforcement
3. Insufficient market development a) political framework b) consumers' lack of awareness of local products		promotion/education

Weakness with regard to establishing production facilities in building material industries

Even when production of certain construction material is economically feasible and technical expertise is available, there are some general problems, which make an investment decision difficult to make.

Good land is generally scarce and expensive and due to high expectation to speculative gain, there may not be enough land traded in market, especially for opportunity as not glamorous as producing industrial materials.

In addition to the scarcity of reasonable priced land in the market, non-compliance to zoning, especially during the Civil War, create mixing of industrial activity with residences thus causes pollution problems. Re-assessment of zoning practice, and perhaps creation of special industrial zoning, in the form of industrial estate of reasonable price, should be studied.

There are certain factors that discourages domestic production of certain building materials, which could have been competitive against import. There is a lack in institution, which gives objective comparative testing, or in the form of certificates (like a national industrial standard), to assure officially qualified domestic products. This lack of information is one of reasons for domestic consumer to keep not recognizing the quality of local products, which is in fact superior to foreign produces.

An industrial standard (certification system) executed by some inspection institute would definitely encourage domestic entrepreneur with technology and insight to particular market.

Even if there are some forms of domestic development finance, it seems that entrepreneur understand the nature of different scheme poorly so that application is sometimes not appropriate. A government PR for the nature of different development financial schemes available for small- and medium-scale industrial start up should be considered.

The points for improvement are summerized in Table 11.

Table 11: Improvement for establishing companies

Weakness	Relevant institutions	Possible Actions
<p>1. Difficulty in acquiring land</p> <p>a) expensive cost</p> <p>b) low availability in market (it is beneficial for owner not to sell land, due to low holding cost and high expectation of capital gain)</p>		<p>zoning, creation of special industrial estate</p>
<p>2. Pollution</p> <p>a) due primarily the mixture of residence and industrial zone)</p> <p>b) caused by uncontrolled excavation of aggregate</p>	<p>Ministry of Environment</p>	<p>zoning and monitoring</p> <p>controlled excavation</p>
<p>3. Lack of incentive for domestic production,</p> <p>a) lack of certification of factory and import products for objective comparison</p> <p>b) poor recognition of local products against cheap imports</p> <p>c) poor research practice</p>	<p>ISO is under preparation/ Industry Institute NCSR*1</p>	<p>creation of inspection institute</p> <p>improving of recognition of local products</p>
<p>4. Difficulty on accessing to long-term, low-interest finance</p>	<p>NIGC*2, Banks</p>	<p>PR for availability of fund. Enhance understanding of the type of financial support available.</p>

*1 NCSR: National Council for Scientific Research; *2 NIGC:

Recommendations

1. The application of construction techniques should be improved as an coordinated way of developing standard, material availability, conformity to regulation and institutional framework.
2. Besides general improvement of building standard, an introduction of seismic criteria should be considered so that structural strength of building will be more prepared to the possibility of earthquake.
3. Such an standard should assume the use of steel structural frame, structural wall, and concrete slab with steel deck plate.
4. Use of shoring operation for excavation at construction site should be considered, and use of such systems as tieback shoring, Tel Arme, or vertical sheeting should also be considered.
5. For the concrete work at site, use of steel form, ready mixed concrete(if traffic condition is improved), and pouring concrete with concrete pump should be considered.
6. There is relatively less consideration and system of inspection on safety at construction site, which have to be developed.
7. Introduction of energy saving measures, such as better insulation, less energy consuming hot water supply, and better refrigeration system, should be examined.
8. In order to introduce the above technique and to strengthen quality control, the following subsectors are needed to establish:
 - metal work industry(iron/aluminum)
 - glass sheet industry
 - precast concrete industry
 - electronic instrument assembling industry
 - specialized contractor, especially for pile driving
 - testing laboratory
9. Introduction of new construction techniques requires a complex coordination of clear governmental guidance as for the merits of such introduction through regulation and information dissemination, introduction of trained man-power for accepting and implementing such techniques, creation of supporting subsectors of industry, timely and competitive supply of needed materials, and favorable atmosphere for creating new enterprises for providing them.

10. There are various immediate and long-term actions the Government should play, in order to facilitate the development of such a complex system:
 - (1) development of industrial standard and regulation (with additional emphasis on seismic criteria)
 - (2) collection, organization and dissemination of information
 - (3) development of training system for middle level technical work force
 - (4) preparation of better infrastructure
 - (5) improve the quality of materials supply
 - (6) zoning procedure to separate production facilities from zoning for reduce environmental problem and facilitate acquisition of land for such production.
 - (7) create local environment for facilitate the creation of small- and medium-scale manufacturing enterprises through such measures as long-term/low-interest industrial development financing.
 - (8) guide or help for developing industry association, by discipline and region, which reduce current confusion on professional qualification in practice.
11. Outdated industrial standard and regulation should be reviewed and if necessary be renewed to meet the type of construction materials which were not available when such standard was made. Also regulation to improve safety of workers during construction should be introduced. Regulation regarding fire protection should also be reviewed.
12. Some systematic method, or public institution in charge, for collection, organization and dissemination of information, such as basic economic data, should be established. Geological data for natural raw materials have to be collected.
13. There should be a development of training system for middle level technical work force, by such methods as improving vocational training system, or by introducing some scheme to subsidy training of new work force by private enterprises.
14. The re-development of infrastructure should be further facilitated to create viable environment and another execution of construction project. In order for material transportation of construction not to cause additional burden on traffic congestion, logistic of transportation should be coordinated and preliminary notified.
15. Zoning procedure to separate production facilities from residences for reduce environmental problem and facilitate acquisition of land for such production

should be considered. Possibility of supplying reasonable price special purpose land, in the form such as industrial estate, should be studied.

16. There should be some monitoring of quality of aggregate and sand to improve the problem inclusion of finer particles that would cause problem of mechanical strength.
17. Given the small size of the domestic market, there should be a focus on creating material industries which can provide higher value-added products, rather than those who compete with cheap foreign import that enjoys cheaper production cost by way such as larger economy of scale.
18. Create local environment for facilitate the creation of small- and medium-scale manufacturing enterprises through such measures as long-term/low-interest industrial development financing. A government PR for the nature of different development financial schemes available for small- and medium-scale industrial start up should be considered.

Annexes:

- A. List of people met
- B. Bibliographies
- C. Details of visit
- D. Questionnaire to civil contractors

Annex A. List of people met

Annex A : LISTING OF PEOPLE

1994. 8. 29

RESEARCH AND MANAGEMENT CONSULTANTS (RAM)

Mr. Yahaya Hakim Director

UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)

Mr. Nadir Hadj - Hammou Deputy Resident
Representative

Mr. Philippe Poinot Junior Professional Officer

1994. 8. 30

CHAMBER OF COMMERCE (SAHLE)

Mr. Edmond Jreissati President

Mr. Ramzi Okais Civil Engineer

Mr. Elie Issa Civil Engineer

Mr. Tony Attalah Communication

Mr. Fawzi Lian Soil Mechanics

ASSOCIATE BUILDERS & CONTRACTORS S.A.R.L.

Mr. Jean Khater

1994. 8. 31

INDUSTRY INSTITUTE

Mr. Sameer E. Samaha Director General

COUNCIL FOR DEVELOPMENT & RECONSTRUCTION

Mr. Boutros A. Labaki Vice President

SOLIDERE

Mr. Hassib Lahoud Market Department

Mr. Nasdim Al Jawhary Engineering Department

Mr. Pierre Edde Engineering Department

1994. 9. 1

AMERICAN UNIVERSITY OF BEIRUT / FACULTY OF ENGINEERING AND ARCHITECTURE

Mr. Nassit H. Sabah, Ph.D., FIEE Professor & Dean

1994. 9. 2

UNIVERSITY SAINT - JOSEPH

Mr. Fadi A. Geara
Mr. Maroun Asmar

Director of Civil Department
Doyen de la Faculte d'Ingenierie

team International

Dr. Tammam Nakkash
Dr. Yusef Salam
Mr. Victor A. Khouri

Managing Partner
Managing Partner

1994. 9. 3

ASSOCIATION OF LEBANESE INDUSTRIALISTS

Mr. Nabil M. Ladki

Director General

ALME

Mr. Imad Maatouk

Secretary General

Liban Cables S.A.L.

Mr. GHASSAN BOULBOL

Chairman and President

CONSOLIDATED CONTRACTORS Co.

Mr. Yusuf A. Kan'an

Manager Beirut Town Office

1994.9.5

CDR

Mr. Fernn

Advisor in Ministry of
Industry and Oil

Ministry of Public Work

Mr. Zssam Beckdash

1994. 9. 6

Association of Entrepreneurs / Focus S. A. R. L.

Mr. Ibrahim Tayara

Architect - Manager

LEBANON REPUBLIC The National Investment Grantee Corporation

Dr. Fawzi Abu - Diab

General Director

SPECTRUM ENGINEERING CONSULTANTS S. A. R. L.

Mr. Ahmed M. Mneimneh

General Manager

UNICERAMIC SAL

Mr. Georges Joseph Ghorra General Manager
1994. 9. 7

CHAMBER OF COMMERCE AND INDUSTRY (SIDON)

Mr. Mohammed Zaatari President

LEBANESE SOLAR ENERGY Co., (LESCO)

Mr. Mustapha H. Ghaddar Architect

LEBANON INVEST

Mr. Bassam Yammine Corporate Finance Officer
Dr. Marwan Ghandour Group Advisor

1994. 9. 8

CHAMBER OF COMMERCE AND INDUSTRY (TRIPOLI)

Dr. Hassan N. Monla President

FOUAD SIBLINI & FILS

Mr. Mounir F. Siblani Electrical Contractors Lighting
Fitting Manufacturers

NEW OKAL S.A.L

Mr. Joseph Moawad General Manager

1994. 9. 9

OK FONDERIES OHANNES H. KASSARDJIAN S.A.L

Mr. Mr. Joe O. Kasardi General Manager

REPUBLIC OF LEBANON NATIONAL COUNCIL FOR SCIENTIFIC
RESEARCH

Mr. Ali Mounzer Scientific Adviser Head of
The Division of Engineering
Sciences and Technology
Mr. Hafez Kobesis Secretary General

1994. 9. 10

dangroup

Mr. Ole Christian Nielsen B. Sc Project Manager, Roads
and Railways
Mr. Werner Sorensen Civil Engineer M. Sc Senior
Consultant

1994. 9. 12

DAR AL - HANDASAH

Mr. Nabil Nassar
Mr. Salim W. Macksoud

Mr. Rabih Batal
Mr. Robert Solomon

Resident Partner
Consultant Resources &
Environment Department
Director
London Office

Annex B. Bibliographies

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Annex C. Details of visit

1. UNICERAMIC Mr. Joseph. G. Ghourra '94.09.06

A. Outline of the company

Plant location : Bekaa Valley (convenience place for raw material place for raw material supply)

Production : Floor tile

Productivity : 3.5 billion m2/year
(10,000m2/day)

US\$, (It has been extended doubly by investment of 10 millions 6 million US\$ out of which was financed by IFC, in 1993.)

Employee : 275

Local market share : 50 ~ 70% (estimated consumption is 2.1 billion m2 in 1993)

Percentage of export : 68.6% (main market is Saudi Arabia : 76%)

Standard : European Norms/EN176 --- internal satisfaction.
(The company is preparing to obtain certification)

Production machine : imported from Italy, Spain and German

Supply of raw material : local supply except 25% of fluxes and some clay import

Future plan : increase product variations and productivity to double

B. Business Environment

(1) Consumers behavior

-There is tendency in Lebanese to require high quality. However, they don't want to pay the cost corresponding to quality.

-Lebanese seem to respect the imported, especially from Europe.

(2) Domestic market

-Lack of static data make it hard to production plan. The specification provided by Bechtel is in accordance with American Cord. CDR has not accepted UNICERAMIC's tile so far, in spite of its 2 times offer.

-Illegal productions (non-conforming to any cord) threaten the market.

(3) Foreign market

-Nearby market, Syria, is closed.

C Weaknesses and Problems

-Tile design is made by Italy, except Arabic design which is made in-house.

-Insufficient data of clay deposit suffers raw material supply in long term.

-Available workers are limited to the place nearby the plant locations, and they are not ready to work in the plant because of lack of team work, leader-ship beside necessity of training for operation. They are basically farmers.

-Research is too costly for a company to conduct. And there is few capable men.

D. Proposal

-The imported and domestic productions should be classified and ranked in terms of quality by Laboratory in accordance to the certain norms and cords. These ranking may work well for the consumers to select the products.

-Statistic data should be established.

-Training program is necessary to change the farmer to factory worker.

-Mining technique (geological map) is necessary for raw materials.

E. Other Information

-Its' sister company "LECICO" produces sanitary ware.

2. LESCO Mr. Mustapha Ghaddar '94.09.07

A. Outline of the company

Plant location	:	Saida
Production	:	Solar water heating system
Productivity	:	20 systems/month (1 tank and collectors/system)
Employee	:	12
Market	:	domestic and export (Sudan, Kuwait, Saudi Arabia)
Standard	:	American Code/Self standard
Production machine	:	Local?
Material supply	:	import (aluminum frame, glass, copper tube, etc.)

B. Business Environment

(1) Domestic Market

- Rapid increase of cost of electricity was made and is expected. This may encourage the market demand for energy save systems.
- The company contacted and promote to SOLIDERE, who showed interest in solar system.
- Lebanese Association for Solar Energy in Beirut has been established in 1989. The association are to promote energy saving, comprising 25 members (i.e. engineer, professor,)

(2) Finance

- It is not easy to find bank that provide long term loan in law interest. LESCO contacted Bank Audie first, but the bank application was refused. LESCO is now contacting to FRANSABANK, who show willingness.

الجمهورية اللبنانية

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مركز مشاريع ودراسات القطاع العام

C Alliance

-LESCO has made the following alliances for technical support to product (assemble) locally.

solar cooling system : a German firm

photo cell : a French firm - PHOTOWATT

D. Proposal

-Tax reduction should be introduced for setting energy saving system, as many countries have already provided.

E. Other

-LESCO will modernize and extend its production system to doubly. The cost is estimated 600,000 US\$ and is expected financed by FRANSABANK.

3. New OKAL Mr. Joseph Moawad

'94.09.08

A. Outline of the company

Plant location : Zouk Mosbeh
Production : door, kitchen cabinet
Productivity : wood door 200/month, interior door 3000/month, kitchen cabin 800/month
(The above productive capacity is based on 1 sift (8 hour/day) operation. 2 sift could be operated.)
Operational rate : 40%
Market : export 30%
Market share : approx. 20%
Material supply : import (hard ware, wood)
Standard : European Norms

B. Business Environment

- Mass production system is not commonly accepted in domestic market, because of the following.
 - Lebanese standard is not provided regarding to structural sizing (i.e., opening high and width, wall thickness, etc.) and material sizing (i.e., block)
 - Domestic market has not called yet high quality, which should be provided regarding to safety (i.e., strength and fire resistivity).
 - Small factories have around 80% share in domestic market, showing their strength in cheap tailor production with low quality.

C Proposal

- There should be a joint activity among manufacturer, government and engineer, in order to help construction sector with regard to material supply that has good and consistent quality and economic advantage.
- .Norms and standards should be provided not only to control quality but to protect users and consumers.
- There should be 2 institute; 1 is to control and certify quality, and the other is to research for establishment of norms
- After norms and standards are established, the followings should be conducted
 - education in universities
 - informing to related parties
 - help of exports providing know-how to introduce

4. OK Fonderies Ohanners '94.09.09
Mr. H. Kssardjian, Mr. Joe. O Kassardjian

A. Outline of the company

Plant location : Beirut

.Production : value, cock, fixing, manhole cover, pipe (material: cast iron, bronze, brass, PVC [pipe and fitting])

.Standard : BS, French code, American code

.Certification : not certified in accordance to ISO 9000

.Market : domestic and foreign (mainly Galf countries)

B. Business Environment

-Even Arabic countries begin to require ISO 9000 certification.

C. Comment on norms and standard

- It is not important to concentrate in establishment of Lebanese standard from the view point of exporting because of the followings.
- Norms and standards are internationally similar as to industrial productions.
- Foreign countries require conformity to their standards. So that manufactures need flexibility in production standards.
- Necessity of norms and standards is limited to materials and practices which are originated in Lebanon such as aggregate, sand, cement and common practices of sizing. They are important with regard to consumer protection.

- If standards are established, the imported should be certified based on the standards for consumer protection. However, it is more economic to establish "Institute of Certificate" than establishment of standards.

D. Problems.

- Obtaining ISO 9000 certificate. There is no inspection agency in Lebanon.
- Lack of subcontracting partner that provides high quality.
- Lack of communication with Ministry of Industry and Oil.

E. Other

- Government is expected to change the model country from Hong Kong to Dubai because of the followings:
 - Hong Kong is mainly developed in financing.
 - Industry is also developed in Dubai beside financing, providing "export free zone."
 - Lebanon should be open as to sectors to be developed.
- When need is expressed, UNIDO is expected to assist directly each industry.
- Building materials are imported with no tax.
- Consultants prepare tender documents in accordance to their familiar country's specification.
- CDR uses private inspection companies(s) for controlling quality of the imported.

Non-manufacturing Institutions

1. Mr. A. Semaan / Libnor '94.08.29

-Present activity of Libnor is limited to provide the codes, which were prepared by Lebanese Standard Institute (established in 1955), however, no complete set is available. Up-dating these codes are also necessary, but so far Libnor has not arranged to revise them due to shortage of budget.

2. Mr. Y. Hakim / RAM Consultants '94.08.29

- Ministry of Industry is charged to established statistic dates. By the end of 1994, the data will be compiled.

- "10 years plan" gives general instruction on priority for industrial development, however, no specific priority has not been set.

- The new zoning plan is under preparation by Ministry of Interior, Environment, and Transport, that individually make permission for development plans.

- It may be very essential for Lebanon to study proper building style and design using unique materials from the view point of conformity to its climate and culture. This kind of study may light the sector to be developed.

3. Mr. N. H. Hammou, Mrs. S. ELIE, '94.08.29
Mr. P. Poinot / UNDP

- Adult Training Center are to open in 1994. Oct. It is being prepared by UNIDO under Ministry of Labor. There will be 6 training programs for 576 persons, who are displaced or unemployed, with 1 year duration. There are a few private training centers, which are expensive for trainees.

- After the accident(s) such as landslip, registration system has been introduced to quarry. It works so far, but monitoring system should be strengthen. It is essential for environmental preservation and for keeping good working condition to introduce monitoring system, since the laws have been set already.

4. Mr. E. F. Issa, and his colleagues / '94.08.30

chamber of Commerce (Zahle)

- Building Design
 - Unified standard is not applied in checking design prepared for application of building permission. This check should be done by engineer(s), and so far the designs are judged depending on their individual experience.
 - Seismic design is not applied in Zahle, One of the reasons is that building height is limited up to 22.5 m and 3 ~ 4 floor building are dominant.
 - Reinforced Concrete is mainly applied as structural frame with spread or raft footing. Steel is applied only to roof structure.
- Common Building Material
 - Locally produced stone is usually used for wall (at least 60% in Zahle)
 - Materials are selected by cost, not from the view point of quality and conformity to specification if any.
 - Materials are sufficiently supplied from abroad and locally except aggregate and sand. Leaching and maintenance service is also meeting to demand for construction equipment.
 - There are 2 problems about quarry. One is bad quality of sand, which is mainly from mountain. The other is supply shortage that is caused by environmental control.
- Others.
 - Industrial activity in Zahle has been continued without interruption even during the Civil War. However, the capacity of each firm is not big and needs cooperation with foreign enterprises.

5. Mr. Jean Khater /Associated Builders & Contractors S.A.R.L
'94.08.30

A. Building materials

- The quality of reinforced bar imported from Eastern Europe is getting better, after experience to refuse the import due to the test result not conforming to GR60.
- The quality of cement imported from Greece was once bad, which was also found by his self test.
- Sand quarried from mountain side needs study on quality and quantity. Beach sand has problem as to quality with dirt, beside the environmental problem
- Contractors are still careful to use ready mixed concrete, since the traffic congestion badly affects concrete delivery. While the situation becomes better, and the quality is good and cost is competitive.

B. Safety

- Safety at construction site is not made important. Strong action is expected for safety in excavation , work at high places, and so on beside workers' protection.
- Fire fighting system is usually not applied in building.
- EDL (Official Company of Lebanon's Electricity) should inspect power receiving facilities in newly constructed buildings before commencement of power supply.

C. Others

- Governmental control on construction is not working sufficiently, since the officers are discouraged with their low salary(US\$250/month) .
- There are not enough rental apartments for young professionals like lawyers and engineers. It is partly caused by owner's hesitation to rent due to the rental system that make difficult to increase the rental fee from the initial rate. It may be better to provide apartment sold in lots.

6. Mr. S. E. Sammaha / Industry Institute (II) '94.08.31

- II has been established in 1995 as a non-profit independent institute. It is connected to the Ministry of Industry and Oil.
- II has been set to cover testing, research, and consulting in order to secure industrial and technical development. In this context, it has prepared the states norms and codes.
- II was started with 85 staffs, but reduced during the Civil Conflict to 15 in 1994. And the equipment for testing has been destroyed. The estimated cost to rehabilitate and to up-date is around 3.7 million dollars. 1.5 million dollars are already founded by Belgium.
- II. is willing to contribute to provision and updating he norms and to be a reference institute for such as technical envision. II. needs assist for equipment, manpower, technique and foreign investigation to play the above roles.

7. Mr. P. Edde, Mr. N. A. Jawhary, Mr. H. Lahound / Solider

'94.08.31

- Solider has its own standard specifications referring to British Standard, and is ready to coordinate to Lebanese standards. Regarding to seismic design, Solider is planning to consult to private firm.
- Solider recognizes the importance safety and quality control, however, construction cost increases 15 ~ 20% for these. Material tests are requested to A.U.B., since commercial laboratories are not many.
- There are following conditions that affect construction
 - rapid increase of labor cost
 - shortage of fabrication shop for steel frame (electric power, welder)
 - shortage of spare parts for construction equipment

8. Dr. Assaad Rizk / Minister of Industry and Oil '93.08.31

- UNIDO is expected (through hit mission) to assist the ministry to provide and up-date Lebanese norms and standards as one of the best internationally.
- The priority is placed on up-dating the norms related construction, especially seismic design criteria.
- In the above context, law modification are discussed regarding to Libnor and Industry Institute.
- Minister desires to establish all kinds of industries calling back the engineers spread abroad, who have internationally high technology. However, investment is basically thought as business of private sector and the states doesn't want to interfere the private activity.

9. Dr. Butros Labaki / Vice President of CDR

- Main construction materials and equipment are supplied in the following condition.

cement: There are 3 factories in the states, and one of which is planed to extend.

gravel: Quarry if facing the environmental problem and low quality. Adequate equipment is expected to be introduced for high quality production.

rebar: There used to be a re-bar factory in the states. Rebar is now imported mainly from the eastern Europe.

ceramic: There are several companies that supply sanitary ware. UNICERAMIC is one of them and has international competitiveness.

equipment: Almost construction equipment is imported. Domestic supply is seen only in concrete mixer.

paint: There are many suppliers in the statue (eg. Okal)

- CDR controls quality of materials and technology by using 4 companies (CEP, etc.), Materials are tested by S'nt Joseph University.
10. Dr. N. Sabah / American University in Beirut (AUB) '94.09.01

- Most of construction material is imported and not conforming to specification.
- Material tests are available for concrete, reinforced bar and so on, but not for pipe, cable and Chube in AUB's laboratory. AUB considers the laboratory mainly for education and research, and the tests on private firm's request are considered as just services. So far the government does not require any report of material test.
- AUB follows British code or American code. Since not all materials is produced here, it is reasonable to follow the code where the object material is produced.
- Regarding to Industry Institute (II), the official certificate and comprehensive tests may be better to belong to II. And II is expected to help industry for its main purpose.
- No check is done for private buildings. Also safety control in construction is in quite primitive stage for 70 ~ 80% due to lack of low.

11. Dr. T. A. Hajj / Lebanese University (LU) '94.09.01

- Education in LU is free and adopts American system.
- Research was started from the last year for civil, mechanical and electric engineering.
- He proposed to UNESCO the necessity of unified international code for concrete in 1963, and UNESCO accepted. This unified code was printed in 1968 by UNESCO. In 1969, he also proposed to Union of Arab Engineer the necessity of Arab code for concrete. Now, LU is printing the Arab code for concrete as 3rd tone, however, non conformity can be seen in many cases.

12. Mr. T. Nakkash / Team International (T. E) '94.09.02

- TE has its unique feature in combination of engineering and managing service. It was established in 1971 in Beirut and became a international consultant firm during the civil conflict setting many offices in abroad.
- TE could offer services from assisting to get permission to construction supervision beside feasibility study. Recently, TE assisted CDR for pre-qualification, document preparation and tending.
- Problems and weaknesses that can be seen in construction in Lebanon are as follows.
 - 1)Missing of stillness and workmanship i.e. equipment operator, carpenter, etc.,
 - 2)Lack of foreman level worker
 - 3)Weakness in construction management such as scheduling formation
 - 4)Lack of adequate firm that offers special work such as piling.

13. Mr. M. Asmar, Mr. F.A. Geaca / '94.09.02
Sn't Joseph University (SJU)

- Laboratory
 - Available tests are for concrete, aggregate, steel bar, asphalt and soil. It's instruments and technology are supported 3 French laboratories in alliance.
 - Laboratory tests are requested from both public and private sector, and the number of test in 1994 has already reached to the previous annual level of 500 ~ 600.
 - SJU prepares mixing design on request of ready-mixed-concrete companies. Around 4 companies out of 10 in Lebanon are operating in Beirut. They request concrete

strength test for certification, beside test in their own laboratories.

- SJU is in alliance with soil investigation companies that work in field testing and provide laboratories.
- Dynamic strength test and pile load test are not available in SJU.
- SJU provides electro-mechanic and electronic department, maintenance of the instruments can be done by itself if necessary.
- Norms
 - Seismic Code should be prepared in hurry. AUB provides a master course where theoretical education are given about seismic. Since SJU teaches seismic design in practical manner, it could take the initiative for drafting seismic code.
 - There is a station in Bhannes that continuously observes seismic move.
 - Japanese seismic code could be reference for drafting Lebanese code.
 - If the norm is followed, the number of test should be much more than that of actual request.
- Others.
 - Too much content of fines affect sand quality, that supplied from mountains.
 - There is one factory in Beirut that supplies reinforce bar.

14. Mr. Elie Bsaybes / Syndicate of Engineers '94.09.02

A. Constitution and activity

- The syndicate works to help engineers and acts as a part of building permission system.

- Registration in the syndicate is not obligatory for engineers, however, application documents for building permission need signature of registered engineers.
- The number of registered engineers is 16,500 in Beirut and 3,500 in Tripoli. The engineers not registered are around 2,000.

B. Building Permission

- Procedure
 - The application document for building permission needs signatures of 5 engineers (architect, civil engineer, electrician, building equipment engineer and site engineer) if the floor area exceeds 2,000 m².
When the area is within 500 m², one signature by architect is enough. If it the area exceeds 500 m², signature of civil engineer is required.
 - The document is then deposited with the chief engineer of consultant, who send it to Syndicate of Engineers for examination. After examination, the application is sent to the government.
 - It is first sent to the general directorate of urbanism and then sent to the capital for examination by the local technical services. Passing this, it finally gets Mayor's signature.
- Validity
 - The permission is valid for 4 years and can be extended for another 4 years if necessary.

C. Problems

- Present system for control construction is not sufficient, since only buildings are required the permission. Roads, bridges and structures other than buildings are now designed and constructed without any governmental control.
- Examination of application document for permission is not carried out base on the unified norm.

- Engineer registration is not integrated. Engineers in public works and industries should be included.

- The followings have technical problems and need support
 - Basis for seismic design
 - Full concrete building design
 - Air conditioning
 - Fire security
 - Insulation
 - Pre- cast concrete
 - Tiles and pipes
 - Loading criteria for snow and wind

D. Proposal

- It is urgently requested to provide laws that call for norms and standards as obligatory reference for the building permission.
- The norms and standards should be unified and are desirable to follow international European norms (ISO).
- Each town and city should have the urban plan and the section that receives and controls the application for permission regarding to landscapes, implantation etc.
- It is expected to introduce a rule to report commencement and completion of construction to the government.

15. Mr. Imad Maatouk

'94.09.03

/ Lebanese Energy Saving Association (ALME)

- ALME is non governmental organization and working on research, training and so on for energy saving, financially assisted by ADEME that covers Jordan, Syria and Lebanon. Priority is placed in the followings.
 1. Information data bank
 2. Training
 3. International network for aerial operation
- ALME has found that large part of energy is consumed by several industry firms, like aluminum industry. It wishes to instruct such firms to save energy consumption, however, has no support from the government.

- It is recommended to introduce insulation, solar energy, double sash and energy saving light, but no norm has been provided so far.

16. Mr. Nabil M. Ladki / Association of Lebanese Industrialists
'94.09.03

- The association has published the directory of industry, based on their survey carried out door to door base. The directory covers 2,980 firms, those employ more than 7 workers and proceed mass production.
- The association prepares the certification agency for ISO 9000.
- Construction sector did not show any extension and work in late 1980.

17. Mr. Ghassan Boulbol / Liban Cable S.A.L
'94.09.03

- So far the government has not shown any clear or long term policy regarding to industrial development. Certain guidance and legal frame should be set. The followings are the expected policy.
 - protection of national industry promotion to buy national product
 - encouragement on investment control land tax to prevent speculation
 - foreign market negotiation with foreign countries instruction which country could be a market
 - infrastructure establishment of public transportation, rapid recovery of electric supply and preparation of industrial estate

- Statistic data is essentially important for industrialists and is pressed to be established. However it is not established except trading data in 1993.
The data was once managed by Ministry of Planning, but that was abolished. CDR is gathering the data but doesn't make statistic data.
- It is hard to access to adequate credit that industrialists can be satisfied as to terms, rate and timing.
- Middle scale companies should be developed, because they have buying power but their number has been reduced during the war.
- It is not likely that Lebanese returned from abroad make investment. The industrialists remained in Lebanon during the event are patiently waiting economic recovery, since they have invested in the country.
- Industry is compelled to burden the extra cost due to insufficient infrastructure. For example, he has set a 4,000 KVA generator for his cable plant.

18. Mr. Yussuf Kan'an / Consolidated Contractors Co. '94.09.03

- The company has 2100 employees and enough experience, procedures and staffs to proceed sufficient control in quality and safety.
- Since the company works internationally, it could easily arrange any labor force from adequate countries, like India.
- The company has no intention to compete with the local contractors.

19. Mr. Ferrn / CDR Adviser in Ministry of Industry and Oil
'94.09.05

- He expects following priority for the mission.
 - 1) business opportunity
 - 2) concrete proposal on implementation of norms and standards
 - 3) meeting industrialists as much as possible

- Local industries should be protected in intelligent and selective manner, not blindly.
- The followings are not supportable: taxation on land to lower its price to medium term credit technology transfer immediate action to save energy
- The following are supportable: maintenance of road and public building stronger role of the state strengthening effort to correct electricity bills public transportation operated by private assisting establishment of small and intermediate industry increase public service salary establishing underground space for car parking

20. Mr. Islam Beckdash / Ministry of Public Works '94.09.05

- Ministry of Public Works (MPG) has the mission for building and roads to proceed comparably large scale construction like school and public buildings.
In these days, CDR has initiative in the above task and carries 75 % of the constructions, while MPG carries 25 %.
- The maintenance for those buildings and structures is to be proceeded by CDR for 1 year after their completion, and then MPG will succeed the maintenance.
MPG has no personnel for the above maintenance now and will have staffs for this purpose.
- French code is applied to concrete, cement and buildings in MPG. Road design is based on American code (AASHO).
- Norms and standards should be provided for seismic design and building equipment. Seismic criterion is urgent, since earthquake interval is said 55 years and the last occurred in 1956.

21. Mr. Ibrahim Tayara / Association of Entrepreneurs '94.09.06

Building Materials

-Aggregate

Permitted quarries are located in remote mountain side, some quarry is 40 km far from the construction site.

-Cement

Best quality can be available in Lebanon.

-Concrete

Delivery of ready mixed concrete is badly affected by traffic congestion, so that delivery is limited to early in the morning or night.

-Sand

Since the quality of mountain sand is bad, crushed stone is sometime used. Importation is also considered.

-Reinforced Bar (re-bar)

There is a factory in Lebanon, that supplies 35 % of the market demand.

The rest of 65 % is imported mainly from Eastern Europe.

The import from Russia is not good, because diameter of re-bar is not conforming to requirement. While the quality of the import from Czechoslovakia is best.

-Stone Tile

Marble is imported from Italy, Greece, Turkey and so on.

Local supply is limestone that is soft and porous so that water proof is necessary.

-Insulation

Polystyrene form is sufficiently supplied by the local manufactures.

-Safety Equipment (fire detector etc.)

There is no market in Lebanon, since no regulation requests provision of safety equipment.

Therefore no assembling factory is in Lebanon and all equipment is imported if necessary.

-Precast Concrete

Precast concrete is sometime used for buildings, however, it is not feasible because transportation is not easy.

Technical support may be necessary in this segment of industry, since engineers have gone to Gulf.

Others

- Unskilled labors are mainly Egyptians and Syrians.
Many of the skilled workers have left Lebanon and won't come back. Since the civil conflict lasted around 20 years, new generation has come.
The Ministry of Professional and Technical Teaching is preparing 12 training schools, that will be set equal to high school.
- He applies French code to seismic design, setting the zone B. The latest earthquake occurred in south of Beirut in 1967 and 30 % of the buildings were destroyed.
- Emergency exit is not stipulated in regulations and is seldom provided to buildings.

21. Mr. Fawzi Abu Diab / National Investments Guarantee Co.

'94.09.06

- National Investments Guarantee Co. (NIGC) has become the representative in Inter Arab Guarantee (IAG) on request to arrange guarantee of IAG.
He is also a member of Multilateral Investment Guarantee Agency (MIGA).
- NIGC is proposing a new law that enlarges its region to cover.
- He was in Ministry of Industry in 1974 and tried to standardize mass productive building materials such as windows, door and so on. However, he could not receive wide understanding.
- NIGC guarantees any non commercials such as civil war and it also guarantees leasing.
- So far, no request comes for factory investment. The guarantee requests have been only made for restaurants and hotels.

22. Mr. M. Zaatal Mr. M. Dandachli / Chamber of Commerce
(Saida) '94.09.07

- This district is basically an agricultural area and the industry is related to agriculture. There is no factory that produces building materials, except plants for ready mixed concrete.
- There are 125 contractors in this district and they have around 600 employee. It is hard for these contractors to participate in the CDR's projects.
- The unemployment rate is extremely high and estimated around 20 % in this region, especially young people are hard to get job.
- The chamber is planning to start training center and the building itself is expected to be completed in 2 months. However, the curriculums, objective people and the way of management are under study and needs support from adequate agency.
- No regulation is provided to leasing business and this situation makes difficult to find adequate firm to rend if the business is started.
Legal system should be set for this sector.

23. Mr. H. N. Monla Mr. J. E. Bort / Chamber of Commerce
(Tripoli) '94.09.08

- Destruction caused by the conflict has been very little in this area, as the event was far from here.
- There are many industries in active as shown below.

Food industry:	beverage, olive oil, sugar, salt
Building Material:	plywood, reinforce bar, marble, tile
Metal industry:	Plastic industry
Chemical industry:	aluminum assembling, can
Ceramic industry:	fertilizer, soup
Wood industry:	cement, glass (except sheet glass)
Others:	furniture
	paper bag, clothing

- The factory was recently stopped producing reinforce bar, because the price of the import from Eastern Europe is cheap.
- Marble is locally produced but its color does not meet the market preference.
- Industry Area for small and medium size factory is necessary in the north and the south of Lebanon. The following advantages are expected by setting Industry Area.
 - Factory location can be restricted in order to control noise and pollution.
It is now possible for any one to construct and operate any kind of factory at any place without any consideration regarding to environment.
 - Infrastructure can be sufficiently provided.
 - Low price can be set on land.
- Information of foreign specifications is necessary for industry to get quality competitiveness in exportation. Lebanese industries should have high quality, since they may not compete regarding to cost that the industries in other countries like Syria can offer in much lower level.

24. Mr. M. F. Sibilini / Fouad Sibilini & Fils (producer of lamp fittings) '94.09.08

- Professional workers are not sufficiently available and training is difficult for electric manufacture.
- The business environment is not easy for lighting equipment production, since there are many manufactures in Gulf exporting to Lebanon with strong cost competitiveness.
- Lamp tube is not produced in Lebanon. One of the reasons is the hardness to burden the cost for renewal of the production line that is necessary to follow the model change. The model change takes place nearly in annual bases.

Contractors are divided in 2 categories, one is for road and the other is for building.

- The numbers of the objective firms are as follows and classified in 4 ranks, namely major, medium, minor and small.

-building contractors:	340
-road contractors:	180
-consultants:	120

- Since it is important to keep independence from any association, they are collecting necessary data for pre qualification directly from each firms by visiting.

- Consultants are hard to survey, since several offices usually make a team for each project and the office has a different role in each team.

The role ranges from developer, contractor to designer.

27. Mr. R. Solomon Mr. R. Batal Mr.N. Nassar Mr. S. W. Macksoud
/ DAR AL- HANDASAH '94.09,12

- Exceptional condition is observed in Beirut as follows.

- Lebanese entrepreneurs do not needs Lebanese and country of Lebanon. They sustained their operation even during the war, equipping the facilities out side of the country.

- The war impact has segmented the market.

- Public education has collapsed regarding to training skill. Vocational system is 20 years out of day, that we can see texts and manuals kept old.

- Lebanon needs elevation of standards and transparency to quality certification.

Domestic market does not respect quality but cost, while exporting requires high quality. Local industries should consider exportation in future

- Saudi Arabia had the same problem of quality and price when it started industries in 1960's. Now it has competitiveness, thanks to cheep energy and tax, free

infrastructure and previous administrative protection that call for preferred use of local products in public works.

- Service of design and architect is much more important than local industries from the view point of construction development, since the services facing difficulty in Lebanon.
- Precast concrete is not feasible in Lebanon, since there are individual plans that only request small market.

D. Questionnaire to civil contractors

1. Chamber of Commerce / Saida
2. Association of Entrepreneurs
3. Consolidated Contractors International Company S.A.L

Chamber of Commerce / Saida

1- WHICH INDUSTRIES CONTINUED TO OPERATE DURING THE CIVIL CONFLICT AND WHICH WERE STARTED AFTER THE CESSATION OF THE CONFLICT ?

1- MOST CONSTRUCTION AND BUILDING MATERIALS INDUSTRIES CONTINUED TO OPERATE DURING THE CIVIL CONFLICT. IT WAS MORE A MATTER OF GEOGRAPHIC LOCATION WHICH DETERMINED THE INDUSTRIES CONTINUATION OR CESSATION OF ACTIVITIES. MOREOVER, AS THE CONFLICT WAS MOBILE AND MOVED FROM ONE AREA TO ANOTHER AT DIFFERENT PERIODS, ALL INDUSTRIES HAD EACH, THEIR SHARE OF INTERRUPTIONS.

AS MOST CONSTRUCTION INDUSTRIES EXISTED BEFORE THE CONFLICT NO NEW INDUSTRY DEVELOPED YET AFTER THE CESSATION.

2- HAS THE GOVERNMENT ADOPTED ANY MEASURES OR INCENTIVES FOR THE REHABILITATION OF INDUSTRIAL ENTERPRISES ? PLEASE PROVIDE DETAILS.

2- THE GOVERNMENT HAD ITS SHARE OF DISRUPTION DURING THE CONFLICT AND DID NOT CONTRIBUTE TO THE REHABILITATION OF THE INDUSTRIAL SECTOR, WHICH ENDURED ALL THE HARDSHIP OF INFRASTRUCTURAL DISRUPTIONS.

3-/A- WHAT INDUSTRIES ARE CONSIDERED PRIORITY FOR DEVELOPMENT

B- ARE THERE ANY GOVERNMENT REGULATIONS, MEASURES OR INCENTIVES WHICH PROVIDE ASSISTANCE IN THE SETTING-UP OR THE DEVELOPMENT OF THESE INDUSTRIES? PLEASE EXPLAIN.

3- A- LEBANON ALREADY HAS FAIRLY WELL DEVELOPED BASIC CONSTRUCTION INDUSTRIES. WHAT IS REALLY NEEDED IS FOR THESE INDUSTRIES TO REMAIN UP TO DATE WITH THE TECHNOLOGY AND IN LINE WITH THEIR OVERSEAS COUNTERPART. FOR THAT THE INDUSTRIES IN LEBANON WILL REQUIRE FINANCIAL SUPPORT IN THE FORM OF SOFT LOAN EITHER FROM THE BANKING SECTOR OR THE SPECIALIZED INTERNATIONAL ORGANIZATIONS.

usual loan
long term and low interest loan *13-20% Leasing from*
11% dollars

HIGH TECH INDUSTRIES IN THE DOMAIN OF ELECTRONICS, E.G. TELECOMMUNICATION NEED TO BE DEVELOPPED AS THESE ARE NON EXISTENT YET.

B- THE GOVERNMENT ROLE IN THE ASSISTANCE OF INDUSTRIES HAS SO FAR BEEN LIMITED TO RECORD KEEPING.

4- DOES THE GOVERNMENT HAVE ANY REGULATIONS FOR PROTECTING THE ENVIRONMENT IN SELECTING THE LOCATION OF PLANTS? PLEASE PROVIDE INFORMATION ON ZONING PLANS, IF ANY.

4- THE GOVERNMENT HAS ASSIGNED A NUMBER OF LOCATIONS FOR INDUSTRIES TAKING INTO CONSIDERATION ENVIRONMENTAL FACTORS. ZONING PLANS CAN BE EASILY OBTAINED FROM THE MINISTRY OF INDUSTRY.

5- THE MATERIALS AND CONSTRUCTION METHODS PRESENTLY IN COMMON USE OR EXPECTED TO BE INTRODUCED IN THE NEAR FUTURE ARE AS FOLLOWS :

	PRESENTLY USED -----	TO BE INTRODUCED SHORTLY -----
<u>PROVISIONAL STRUCTURES :</u>		
SCAFFOLDING	X	
SHEETING		
<u>FOUNDATION :</u>		
PILES		X
NON PILE		
PIER		
<u>STRUCTURAL FRAME :</u>		
REINFORCED CONCRETE	X	
STEEL		
<u>WALL :</u>		
BLOCK	X	
REINFORCED CONCRETE	X	
CURTAIN WALL	X	X
<u>WALLING (SIDING) :</u>		
PLASTER	X	
TILE	X	
BLOCKS	X	
PLASTER BOARD	X	X

*

	PRESENTLY USED -----	TO BE INTRODUCED SHORTLY -----	
<u>ROOF :</u>			
TILE	X		
ASPHALT SINGLE	X		
ABESTOS CEMENT			
<u>FLOORING :</u>			
TILE	X		
<u>PARTITION :</u>			
BLOCKS	X		
GYPSUMBOARD	X	X	*
<u>PLUMBING :</u>			
SANITARY FIXTURE (CERAMICS)	X		
PIPING		X	*
<u>AIR-CONDITIONING :</u>			
DUCT	X		
SPLIT SYSTEM	X		
<u>ELECTRIC SERVICES :</u>			
LIGHTING	X		
RECEPTACLE			
FIRE ALARM	X		
TELEPHONE CONDUIT	X		
<u>PRAVEMENT :</u>			
ASPHALT	X		
<u>SEWER AND DRAINAGE :</u>			
DITCH	X		
UNDER GROUND PIPE	X		

Which of the following materials or construction methods is presently in common use in Lebanon or is expected to be introduced in the near future :

Description	Common Use	Near Future
BUILDINGS:		
Provisional structure :		
Scaffolding	XXXX	
Sheeting (for deep excavation)		XXXX
Foundation		
Piles	XXXX	
Non Pile	XXXX	
Pier		XXXX
Structural Frame		
Reinforced concrete (re-bar, steel)	XXXX	
Steel	XXXX	
Others / Wood	NO	
Wall		
Brick	NO	
Block	XXXX	
Reinforced concrete	XXXX	
Curtain wall	XXXX	
Others		
Walling (Siding)		
Plaster	XXXX	
Tile	XXXX	
Dry wall finish (plaster board, etc.)		
Roof		
Tile	XXXX	
Asphalt single	XXXX	
Asbestos - cement single		NO
Others		
INTERIOR		
Flooring		
Wood	XXXX	
Carpet	XXXX	
Flag		NO
Vinyl	XXXX	
Linoleum	XXXX	
Others		

Description	Common Use	Near Future
Partition Wall(ing)		
Fibreboard		NO
Gypsum board	XXXX	
Wallpaper	XXXX	
Ceiling		
Fibreboard		NO
Gypsum board	XXXX	
Wallpaper	XXXX	
Sash and Door		
Steel	XXXX	
Aluminium	XXXX	
Wood	XXXX	
BUILDING EQUIPMENT		
Plumbing		
Sanitary fixture (ceramics)	XXXX	
Piping duct	XXXX	
Air conditioning		
Duct	XXXX	
Unit	XXXX	
Electric Services		
Lighting	XXXX	
Receptacle	XXXX	
Fire Alarm	XXXX	
Telephone conduit	XXXX	
INFRASTRUCTURE		
Pavement		
Asphalt	XXXX	
Concrete	XXXX	
Flagging		NO
Sewer & Drainage		
Ditch	XXXX	
Under ground pipe	XXXX	
Others		
Electric Supply	XXXX	
Telephone Cable (under ground or not)	XXXX	

What is the demand and local production of the following materials and products

Description	Demand	Local Production
CATEGORY 1 :		
Bulk Material		
Crushed stone	XXXX	
Gravel	XXXX	
Sand	XXXX	
Stone	XXXX	
Wood	XXXX	
Basic Material		
Cement	XXXX	
Plaster	XXXX	
Re-bar	XXXX	
Structural Steel	XXXX	
Plant Supply Material		
Ready mixed concrete	XXXX	
Asphalt concrete	XXXX	
CATEGORY 2:		
Processed Material		
Precast concrete products	XXXX	
Timber	XXXX	
Fabrication Shop Material		
Re-bar	XXXX	
Structural steel	XXXX	
Assembled Products		
Window frame	XXXX	
Door	XXXX	
Sash	XXXX	
Plastics	XXXX	
CATEGORY 3 :		
Basic Products		
Tile	XXXX	
Board	XXXX	
Brick	XXXX	
Piping	XXXX	
Glass	XXXX	
Finish Hardware (cement, plaster, re-bar, structural steel)	XXXX	

Consolidated Contractors International Company S.A.L

I. The main structural materials and construction methods that are common in Lebanon are :

a. Buildings

- **Temporary work** : Scaffolding, steel/timber props for small size buildings, systems scaffolding for complex structures.
- **Shoring** : 400mm bored contiguous piles.
- **Steel piles** : are rarely used.
- **Foundation** : Simple footings or rafts, piles are rarely used. Multi-storey buildings have at least one basement.
- **Structural frame** : reinforced concrete.
- **Walls** : masonry units (blockwork); curtain walling is recently being introduced in the area.
- **Walling (siding)** : sand cement plaster generally.
- **Roof** : concrete slabs, on which waterproofing is sometimes applied.

b. Interior

- **Flooring** : mostly tiles (marble or terrazo). Carpet for office buildings.
- **Partition wall(ing)** : concrete masonry units (blockwork) with plaster and paint.
- **Ceiling** : paint in residential buildings and mineral fibre false ceiling in offices.
- **Sash & Door** : interior doors are usually made of timber. Exterior doors and windows can be either timber or aluminium.

c. Exterior

- **Pavement** : Bituminous surfacing laid on subbase/base course. Sidewalks are paved with concrete grooved tiles.
- **Sewer & drainage** : some urban areas are served by a combined sewage/drainage system discharging into the sea. This will be replaced gradually by separate systems. GRP or PVC are utilised for sewers and asbestos cement for surface drainage.
- **Water supply** : asbestos cement and ductile iron pipes are commonly used.
- **Electrical cables** : are usually through overhead lines.
- **Telephone cables** : are buried.

d. Building Equipment

- **Plumbing** : galvanized steel/carbon steel piping are locally manufactured. Sanitary fixtures are normally imported.
- **Air Conditioning** : is not an absolute requirement. Split or window units are normally used to service existing buildings. New office and medium/high quality buildings are being equipped with central HVAC system.
- **Electric services** : lighting and telephone conduits are essential.

II. Self supply-demand & supply capacity for construction in Lebanon

Water and electricity are usually self supply.

a. Category 1

- **Bulk material** : there is adequate local supply of crushed stone, gravel, sand, stone and wood.
- **Basic material** : cement, plaster, rebar and structural steel are available from local manufacturers/suppliers.
- **Plant supply material** : ready mixed concrete and asphalt concrete are available but not in sufficient quantities.

b. Category 2

- **Processed material** : Timber supply is adequate to meet the local demand. Only certain types of precast concrete products are manufactured locally.
- **Fabrication shop material** : rebar and structural steel are available. Fabricated structural steel is also available but not from reliable subcontractors.
- **Assembled products** : the capacity of existing factories to produce window frames, doors, sash & plastics is adequate to satisfy the local demand.

c. Category 3

- **Basic products** : tiles, bricks, piping, glass are available in sufficient quantities. Gypsum board is rarely used. Finish hardware is usually imported.
- **Industrial products** : sanitary fixture, flooring material, paint, adhesive, wallpaper sealant, cable, lighting, receptacle, equipment are available. Part is locally manufactured.

III. Construction Equipment in Lebanon

- **Excavation** : excavation works are normally carried out by backhoes; for bulk excavation bulldozers are sometimes used.
- **Transportation** : transportation of excavated material is carried out by dump trucks.
- **Concrete work** : concrete is usually mixed on site and placed by chutes. Recently new plants have been installed for the supply of ready mix concrete which is placed by pump.
- **Piling works** : piles foundations are rarely utilized in Lebanon. They are executed by cranes with pile driving attachments.
- **Field steel work** : structural steel is rarely used in building construction. Erection is executed usually by crane.

Lease and maintenance in Lebanon are available for the following equipment : excavators, dozers, dump trucks. The availability of cranes for lease is low.

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